Survey of Black Hills Montane Grasslands

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prepared for the
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Table of Contents

Introduction 1

Study Area 1

Previous Work 5

Methods 6

Results 9
- Montane Grassland Sites 9
- Black Hills Montane Grassland Plant Association Description 46
  - Classification, Global Distribution and Status 46
  - Environmental Description 46
  - Vegetation Description 47

Discussion 53
- Conservation and Management Needs 53
- Additional Survey Needs 54

Literature Cited 54

Figures

1. Location of the Black Hills, on the western Great Plains in western SD and northeastern WY 2
2. Geomorphic zones of the Black Hills 3
3. Approximate boundaries of montane grassland study area 4
4. Maps showing locations of Black Hills montane grassland survey sites where in-depth surveys were done 36
5. Forb-rich montane grassland inside grazing exclosure; Castle Creek 49
6. Black Hills montane grassland with strong graminoid dominance 49
7. More xeric phase of Black Hills montane grassland 50
8. Black Hills montane grassland on drainage bottom and lowermost slopes; more mesic phase 50
9. Shrubby cinquefoil in montane grassland on lower slopes; quaking aspen on grassland margins 51
10. White spruce and ponderosa pine on slopes above montane grassland 51

Tables

1. Ranking criteria for size and condition for Black Hills montane grasslands. ... 8
2. Black Hills montane grassland survey sites; sorted by overall rank. 10
3. Black Hills montane grassland survey sites where reconnaissance showed quality to be too low for additional survey 18
4. Black Hills montane grassland survey sites where in-depth surveys were done 28
5. Black Hills montane grassland candidate conservation sites (overall rank B or better) 41
6. Potential montane grassland survey sites NOT visited in 1998 or 1999 55

Appendices

Appendix A. Sample Field Forms
Appendix B. Scientific, common names for plant species referred to in text.

Introduction

Black Hills montane grasslands are wildflower-rich grasslands endemic (restricted) to the Black Hills. Their extent has been severely reduced with settlement since the late 1800s. The montane grassland vegetation type has been given a status rank of G1S1 (globally- and state-imperilled) by the Natural Heritage Network and The Nature Conservancy. In 1998, during the Black Hills Community Inventory (Marriott *et al.* 1999), a week was devoted to survey of high-elevation grasslands. Much of the potential habitat had been converted to hay meadows or homesites, or had heavy burdens of non-native species, but some small stands of native montane grassland were found, suggesting the need for comprehensive survey. In 1999, an inventory of Black Hills montane grasslands was done under a grant from the Wildlife Division of the SD Dept. of Game, Fish and Parks, with assistance from Black Hills National Forest and The Nature Conservancy.

Study Area

The Black Hills are a small isolated mountain range located on the western Great Plains in western SD and northeastern WY (Fig. 1). The range trends roughly northwest-southeast, and is approximately 120 miles in length and 60 miles across. It was uplifted during the mountain-building events that produced much of the Rocky Mountains ca. 60 million years ago.

The Black Hills uplift is a rounded dome consisting of concentric geomorphic zones (Fig. 2). The oldest rocks are exposed at high elevations in the center, and are surrounded by progressively younger strata moving outward and down in elevation. Precambrian granites and metamorphic rocks, greater than 1.6 billion years in age, are exposed at the highest elevations in the Central Core (up to 7242 ft. elevation at Harney Peak). Surrounding the Central Core are exposures of Paleozoic (300-million-year-old) limestone. On the west side of the Black Hills, the limestone underlies a broad high area called the Limestone Plateau, which extends approximately forty miles from north to south, and averages roughly ten miles from east to west. Elevations generally are greater than 6000 ft., with a high point of 7200 ft. at Odakota Mountain. This plateau forms the main drainage divide of the Black Hills (Froiland 1990). Moving outward from the limestone zone, elevations drop rather sharply through the Minnehakta Foothills to the Red Valley and Hogback Rim, the outermost geomorphic zone.

Most potential habitat for Black Hills montane grassland occurs on the Limestone Plateau west of the Central Core. The study area for this project (Fig. 3) included the Limestone Plateau from the area around Moskee, WY, in the northwest Black Hills (ca. 13 air miles southeast of Sundance, WY), southeast to O'Neil Pass on US Highway 85 southwest of Lead, SD, and then south, staying just east of the state line, to ca. five air miles north of US Highway 16. The limestone zone extends further south, but elevations drop and conditions are too xeric for montane grassland. Slate and Reynolds Prairies, large grasslands in the adjacent

Figure 1. Location of the Black Hills, on the western Great Plains in western SD and northeastern WY (from USDA Forest Service, Black Hills National Forest map).

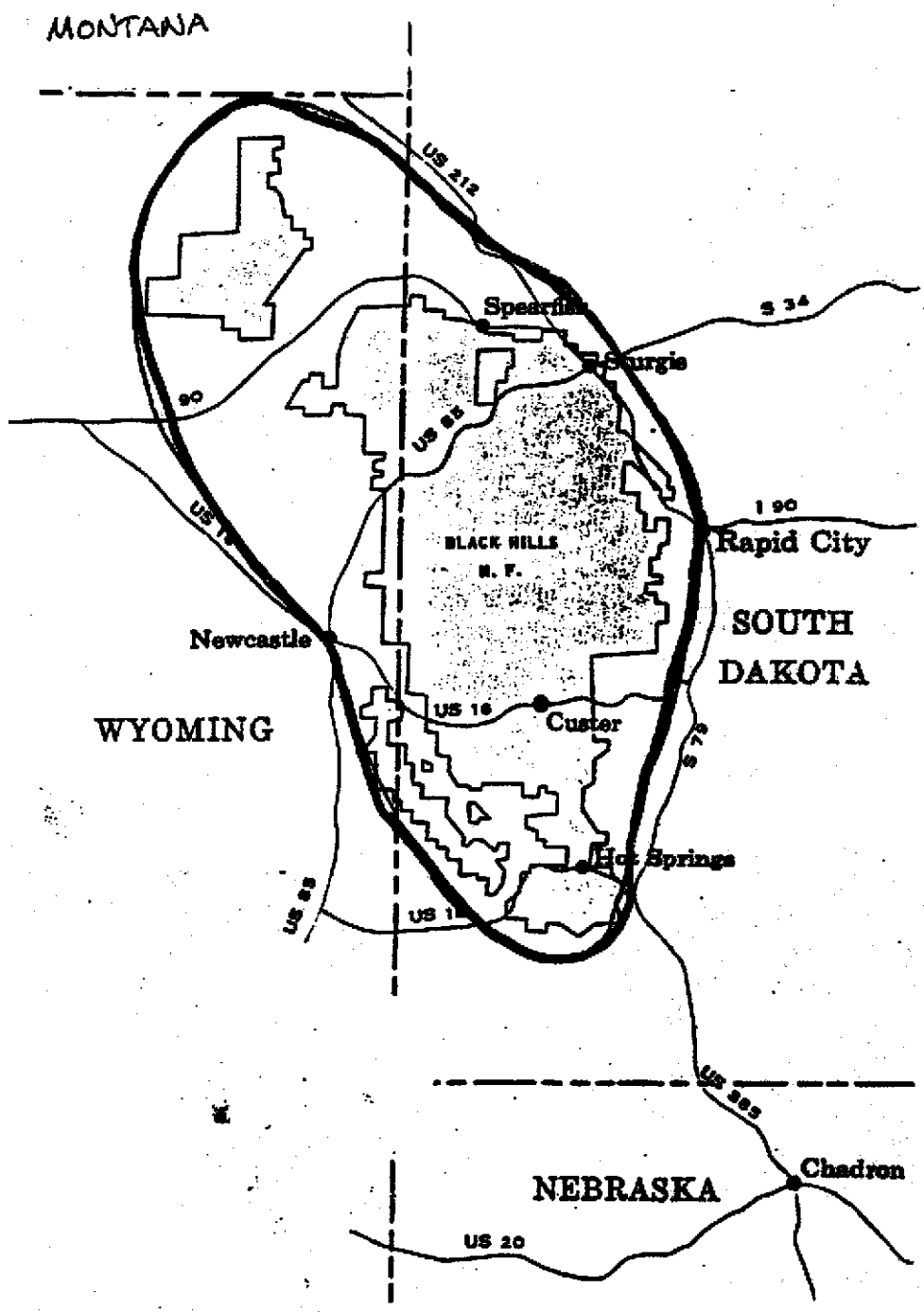


Figure 2. Geomorphic zones of the Black Hills (from Marriott *et al.* 1999; after DeWitt *et al.* 1989, Froiland 1990; map produced by The Nature Conservancy, Midwest Conservation Science Center).

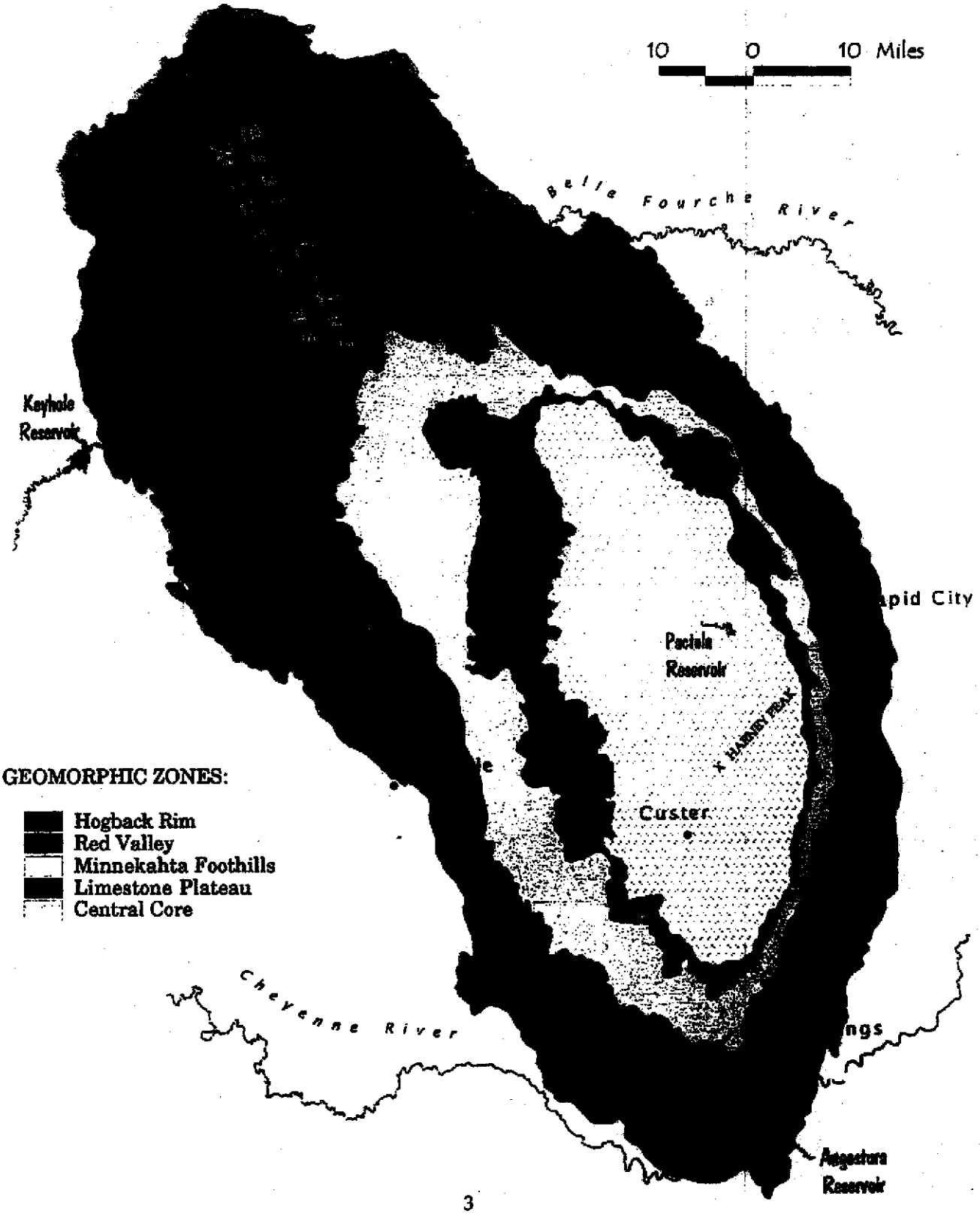
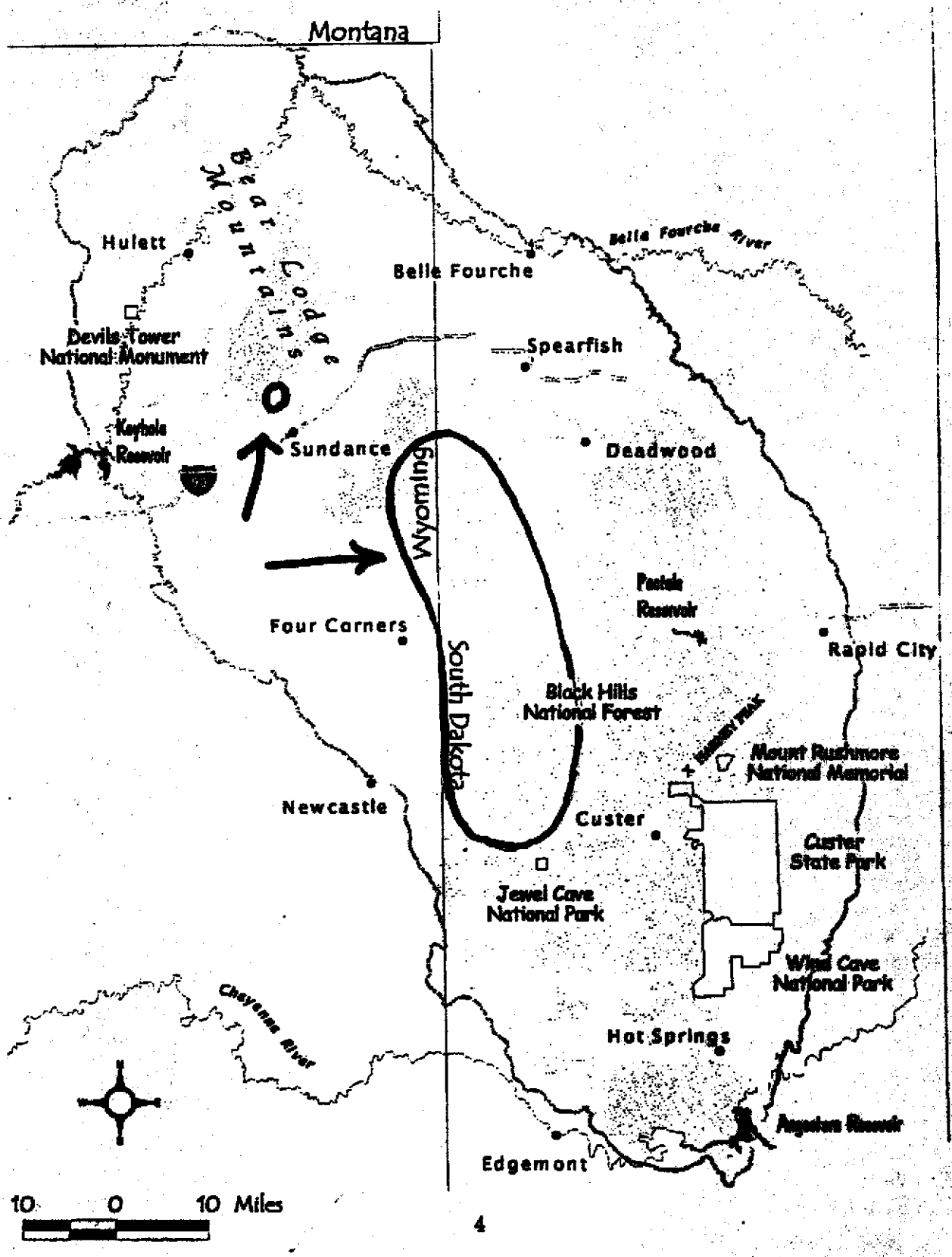


Figure 3. Approximate boundaries of montane grassland study area; note disjunct location in southern Bear Lodge Mountains (from Marriott *et al.* 1999; map produced by The Nature Conservancy, Midwest Conservation Science Center).



Central Core zone near Deerfield Lake, were included in the study area. High-elevation grasslands at two disjunct sites in the northwest Black Hills in WY were surveyed also: the summit of Cement Ridge ca. 15 air miles east-southeast of Sundance, and the summits of Warren Peaks in the southern Bear Lodge Mountains ca. six air miles north-northwest of Sundance.

There is a prominent north-south climatic gradient in the Black Hills; the northern part is cooler, and receives significantly more precipitation. For example, Deadwood, SD, at 4500 ft. elevation in the northern Black Hills, averages 29 inches of precipitation annually. For Custer, SD, at 5300 ft. elevation in the southern Hills (45 miles south of Deadwood), average annual precipitation is 19 inches (Froiland 1990). Because of cooler wetter conditions, vegetation zones drop in elevation going north in the study area. For example, montane grasslands extend down to elevations in the range of 5000 ft. in the northern Black Hills, but generally are found only above 6000 ft. in the south.

Previous Work

The first description of the large grasslands and meadows found at higher elevations in the Black Hills was made by Lt. Col. George A. Custer, who travelled through the area in 1874:

> "Every step of our march that day was amid flowers of the most exquisite colors and perfume ... it was a strange sight to glance back at the advancing columns of cavalry, and behold the men with beautiful bouquets in their hands, while the head-gear of the horses was decorated with wreaths of flowers fit to crown a queen of May. Deeming it a most fitting appellation, I named this Floral Valley." (in Frost 1979)

High-elevation meadows in the Black Hills were more formally described by McIntosh (1930), who provided general habitat descriptions with lists of species encountered. He considered the "mountain meadow stage" a preclimax or development stage in succession from wetland to climax forest. He described two phases, with timothy (*Phleum pratense)* dominating lower meadows, and prairie dropseed (*Sporobolus heterolepis)* and speargrasses (*Stipa* spp.) common on well-drained slopes.

Prior to this project, only limited survey of montane grasslands had been done since McIntosh's time. In the late 1980s and early 1990s, some grassland stands at higher elevations were sampled during an ECODATA survey of Black Hills National Forest (Girard ca. 1991). However, the subsequent analysis generated no grassland associations restricted to high elevations.

In 1998, during the third field season of the Black Hills Community Inventory (Marriott *et al.* 1999), Black Hills montane grasslands were the focus of one week of reconnaissance and sampling. Much of the potential habitat, especially in the northern Black Hills, was found to be strongly dominated by timothy. Many other

stands were dominated by timothy and non-native clovers (*Trifolium pratense, T. hybridum, T. repens*), and often had been heavily grazed. Noxious weeds and other invaders were common. A dozen sites were found with the native species reported by McIntosh (1930) at least as prevalent as non-natives. Most stands were small, and all of the better examples represented McIntosh's well-drained slope phase. Five of these stands were considered large enough for sampling, and data were collected from nine plots. Results from the 1998 survey are included with 1999 findings in this report.

Methods

The project consisted of a range-wide survey of high elevation grasslands in the Black Hills. The objectives were:

(1) assess status of Black Hills montane grasslands by evaluating stand quality throughout the range of the type;

(2) identify candidate montane grassland conservation sites, and provide a list of candidate conservation sites prioritized by stand quality; and

(3) describe the Black Hills montane grassland natural community(ies), addressing composition, structure, range of variation and habitat.

Prior to field survey, potential survey sites were identified within the study area using 7.5-minute USGS topographic maps. Candidate sites included flat-to-gently-rolling non-forested areas greater than 10 acres in size. All survey was done in August, in both 1998 and 1999, when montane grassland diagnostic species were in flower and fruit, and recognizable.

Survey consisted of drive-by reconnaissance with in-depth observations done in stands of sufficient quality. There is an extensive network of roads of varying quality in the Black Hills, and most of the candidate survey sites were accessible by two-wheel-drive high-clearance vehicle. As a result, many of the potential sites were assessed in some fashion (76 out of 93).

Initially it was planned to identify potential survey sites through consultation with knowledgeable residents and public land managers. Although some useful suggestions were obtained, it was apparent early in the process that the best approach would be to simply visit as many potential sites as possible. Approximately half-way through the field season, it became clear that survey would be most productive in the southern two-thirds of the study area, as stands north of US Highway 85 were consistently found to be in poor condition or largely non-native in composition. Some additional survey was done of easily accessible sites in that area, but more time was devoted to sites south of US Highway 85.

Public and private lands were included in the study area, with written permission obtained for survey on private lands. Most of the survey was done on

public lands, for two reasons. First, it proved to be difficult and time-consuming to obtain the necessary permission to work on private lands. Second, drive-by reconnaissance showed that many of the privately-owned stands were not of sufficient quality for survey, having been converted for agricultural use and residences.

Where grasslands of sufficiently quality were found, in-depth surveys were done. In most cases, these stands were at least ten acres in size, with native species contributing roughly 75% or more of the overall vegetative cover. Stands with heavy cover of native increasers, such as rigid goldenrod and western snowberry, were excluded.

Stands were mapped on 7.5-minute USGS topographic maps, and data were collected using The Nature Conservancy's *Community Ranking and Characterization* forms. A sample form is included in Appendix A of this report, and copies of completed forms were sent to the SD Natural Heritage Program and the WY Natural Diversity Database. Information collected included location, directions, habitat characteristics (elevation, slope, aspect, landform, topographic position), landscape description, site use and management, summary data on vegetation composition and structure, non-native and increaser species present, disturbances, and other existing and potential impacts to the vegetation.

Using the same form, Black Hills montane grasslands were ranked as to quality. Subranks were assigned for size, condition and landscape context, and an overall rank was then chosen. Ranking specifications for size and condition are shown in Table 1. For all stands surveyed, landscape context received a rank of B, which is assigned to areas on the order of 25,000 acres with partially disturbed natural or semi-natural vegetation (Marriott *et al.* 1999).

Overall quality ranks depended heavily on condition subranks. For example, very large stands in poor condition received low overall ranks. The most important factors contributing to condition rank included presence/absence of exotic species, presence/absence of roads and other developments, and degree of utilization by livestock. Ranking of montane grasslands is relative to some degree. Specifically, the burden of exotics allowed in B-ranked stands is higher than would probably be allowed for most vegetation types. However, all montane grassland stands surveyed had some burden of exotics, and it was necessary to make this adjustment to differentiate among stands based on condition.

Quantitative data for analysis was collected from representative stands with the sampling methodology used in the Black Hills Community Inventory (Marriott *et al.* 1999; see sample form in Appendix A). Plots were 10 x 10 m in size. Environmental data collected included elevation, slope, aspect, soil moisture, and non-vegetative cover. Canopy cover was estimated both for strata and for all species present. These data have been entered into the PLOTS database maintained by The Nature Conservancy, and are included in an analysis currently being done in preparation of Community Characterization Abstracts for all vegetation types of the Black Hills (Marriott and Faber-Langendoen in prep.).

Table 1. Ranking criteria for size and condition for Black Hills montane grasslands.

Specifications for Size Rank

A-ranked size:	> 500 acres	C-ranked size:	10-50 acres
B-ranked size:	50-500 acres	D-ranked size:	< 10 acres

Specifications for Condition Rank

NOTE: Intermediate condition ranks of AB, BC and CD were used in two types of situations: 1) for stands in significantly better condition than other stands receiving a given rank (e.g. AB vs. B); 2) for stands with a range of conditions. It is simplest to think of the ranking system for condition as a relative one based on the following order: A, AB, B, BC, C, CD and D.

A-ranked condition:

a) Native dominant and indicator species contributing at least 90% of overall vegetative cover, including a mix of forbs and some combination of the following graminoids: *Agropyron subsecundum, Danthonia intermedia, Nassella viridula, Sporobolus heterolepis, Stipa richardsonii* and *Stipa spartea*. Native forbs often abundant with 25-50% overall vegetative cover. The significance of heavy forb cover in montane grasslands is not clear. Forb cover greater than 50% probably is indicative of heavy utilization, and such stands should receive a condition rank less than A. Native increaser species, e.g. *Solidago rigida* and *Symphoricarpos occidentalis*, absent or occasional, with overall cover less than 10%.

b) Some light grazing by livestock may have occurred; roads and other developments absent.

B-ranked condition:

a) Native dominant and indicator species contributing at least 75% of overall vegetative cover, including a mix of forbs and some combination of the following graminoids: *Agropyron subsecundum, Danthonia intermedia, Nassella viridula, Sporobolus heterolepis, Stipa richardsonii* and *Stipa spartea*. Native forbs often abundant with 25-50% overall vegetative cover. The significance of heavy forb cover in montane grasslands is not clear. Forb cover greater than 50% probably is indicative of heavy utilization, and such stands should receive a condition rank less than B. Native increaser species, e.g. *Solidago rigida* and *Symphoricarpos occidentalis*, occasional with overall cover less than 10%.

b) Some grazing by livestock may have occurred, but vegetation is not closely-cropped; roads and other developments may be present, but are found on stand margins, or large unfragmented grassland patches remain (greater than 100 acres).

C-ranked condition:

a) Native dominant and indicator species contributing at least 50% of overall vegetative cover, including a mix of forbs and some combination of the following graminoids: *Agropyron subsecundum, Danthonia intermedia, Nassella viridula, Sporobolus heterolepis, Stipa richardsonii* and *Stipa spartea*. Native forbs often abundant and may contribute 50% or more of overall vegetative cover. Native increaser species, e.g. *Solidago rigida* and *Symphoricarpos occidentalis*, may be abundant with overall cover greater than 10%.

b) Grazing by livestock may have occurred, and vegetation may be closely cropped, but dominant species are identifiable; roads and other developments may be present.

D-ranked condition:

a) Native dominant and indicator species contribute less than 50% of overall vegetative cover. Native increaser species, e.g. *Solidago rigida* and *Symphoricarpos occidentalis*, may be abundant.

b) Grazing by livestock may have occurred, with vegetation so closely cropped that identification is impossible; cultivated fields may be present; roads and other developments may be present.

Results

Montane Grassland Sites

A total of 76 sites were surveyed in 1998 and 1999, out of 93 identified as potential survey sites. Of these, 26 were considered of sufficient quality for in-depth data collection. Quantitative data were collected from a total of 16 plots at 11 sites. Overall ranks for montane grasslands surveyed ranged from AB to D. Survey sites ordered by overall rank are shown in Table 2. Ranking factors are presented in more detail in Tables 3 - 5. Table 3 contains sites where reconnaissance showed quality to be too low for additional survey. Table 4 contains sites where in-depth surveys were done, and is followed by maps showing site locations (Fig. 4). Seven sites were considered of sufficient quality (overall rank of B or higher) to qualify as conservation targets (Anderson *et al.* 1999). These sites are shown in Table 5. An additional five stands were ranked B?, indicating lower confidence levels; a lower rank may be more appropriate, and more information is needed before these sites can be chosen as conservation targets (see Table 4).

More detailed information about these sites is available from the SD Natural Heritage Program and the WY Natural Diversity Database, where copies of all survey forms and maps are on file. Some information, such as data from lands in private ownership, may be treated as sensitive by these agencies, not for distribution to the general public.

Table 2. Black Hills montane grassland survey sites; sorted by overall rank.

Table 2. Montane Grassland Survey Sites, sorted by overall rank.

Legal Description	Directions	Condition	Size	Overall Rank
T2S R2E Sec 1, 2, 11, 12; T2S R3E Sec 6, 7; T1S R2E Sec 25, 26, 36	Headwaters of Gillette Cyn. and Ditch Cr., in vicinity of Sixmile and Ditch Cr. Rds. (301, 291); ca. 5 air mi. NW of Bear Mt. Lookout; extends down Gillette Cyn. to Sec 14/15 boundary; site downstream is Upper Gillette Cyn.	AB	A	AB
T2S R2E Sec 8, 9, 14, 15, 16, 17, 18, 19	Gillette Canyon upstream from Custer-Limestone Rd. (284); ca. 7 air mi. W of Bear Mt. Lookout. Next site upstream is Gillette Cyn. Headwaters - above private land in Sec 14; site downstream is Middle Gillette Cyn.	AB	A	AB
T2S R2E Sec 24, 25, 36; T2S R3E Sec 19, 30, 31; T3S R2E Sec 1 NW4NE4	Lemming Draw and tributary to NW, ca. 5 air mi. SW of Bear Mt. Lookout; along FS Rd. 383.	AB?	AB	AB?
T3S R3E Sec 6, 7, 8, 18?	Bear Spring Cr. drainage along and off of Custer-Limestone Rd. (FS Rd. 284) ca. 5 air mi. SW of Bear Mt. Lookout.	B	B	B
T1N R3E Sec 17, 18, 19, 20; T1N R2E Sec 13	Reynolds Prairie - public lands in S half (N of Deerfield Lake); ca. 13 air mi. NW of Hill City, SD.	B	A	B
T52N R63W Sec 19, 20, 29	Summits of Warren Peaks in southern Bear Lodge Mountains, ca. 6 air mi. NNW of Sundance.	B	A	B
T50N R60W Sec 4, 5	Cement Ridge at head of Sand Cr., ca. 15 air mi. ESE of Sundance, WY.	B	B	B
T1S R1E Sec 2, 3, 11, 13, 14, 15, 22, 24	Redbird Draw from FS Rd. 294 (Redbank Spring) S to Sixmile Road (301); ca. 15 air mi. NE of Newcastle, WY.	B?	A	B?
T1S R2E Sec 20, 29, 30, 31, 32; T2S R2E Sec 4?, 5, 8	Redbird Canyon from Sixmile Rd. (301) S to Gillette Canyon; ca. 15 air mi. ENE of Newcastle, WY.	B?	A	B?
T1N R3E Sec 22, 25, 26, 27	State Prairie NE of Deerfield Lake, ca. 8 air mi. NW of Hill City, SD.	B?	A	B?
T1S R2E Sec 19, 29, 30, 32, 33	Coulsen Hughes Draw from confluence with S Fork Castle Cr. N to head (access via FS Rd. 591 N from Rd. 294); ca. 6 air mi. WSW of Deerfield Dam.	B?	B	B?
T48N R60W Sec 27, 28 (public) + T47N R60W Sec 5, 6, 7, 8 (private)	NE part of Canyon Springs Prairie ca. 5 air mi. NE of Four Corners, WY on FS land on ridge SW of road just W of state line.	AB?	C	B?

Table 2. Montane Grassland Survey Sites, sorted by overall rank.

Legal Description	Directions	Condition	Size	Overall Rank
T3N R1E Sec 35, 36	Headwaters of Spearfish Cr. along and S of Rd. 231; includes meadow at jct of 231/206 which drains into S Fork Rapid Cr.; ca. 4 air mi. ESE of O'Neil Pass on US Hwy. 85.	BC	B	BC
T3N R1E Sec 10, 11, 15	Just N of US Hwy 85 and E of O'Neil Pass, at westernmost of 3 trailheads of Eagle Cliffs cross-country ski area. This is the western of 2 occurrences at the survey site.	BC	B	BC
T3N R1E Sec 19, 30	Near O'Neil Pass on US Hwy 85; headwaters of Grand Canyon ca. 0.5 air mi. NW of Hardy Guard Station.	BC	B	BC
T2N R1E Sec 21, 28, 29, 32, 33	Dry Beaver Cr. from headwaters to confluence with Stockade Beaver Cr.; NE of Mallo Camp and ca. 6 air mi. ENE of Four Corners WY; vicinity of jct. of FS Rds. 110, 109.	BC	B	BC
T2N R1E Sec 35 (continues onto private lands)	Upper Castle Cr., near jct. of FS Rd. 117 and Deerfield Rd. (Manganese Draw area), ca. 9.5 air mi. WNW of Deerfield Dam.	BC	B	BC
T1N R1E Sec 15, 16	Beaver Cr. drainage ca. 1.8 air mi. WSW of Crows Nest Peak, at jct. of FS Rds. 111 and 117; ca. 6 air mi. E of Four Corners, WY.	BC	A	BC
T1S R2E Sec 4, 5; T1S R1N Sec 30, 31, 32; T1N R1E Sec 23, 24, 25, 26	S Fork Castle Cr. along FS Rd. 294 from near Coulsen Hughes Draw W to upper end and upper tributaries; ca. 7 air mi. WSW of Deerfield Dam.	BC	AB	BC
T2S R2E Sec 22, 23, 27, 34; T3S R2E Sec 3	West Hell Canyon in vicinity of Lemming Draw Rd. (FS Rd. 383); ca. 6.0 air mi. WSW of Bear Mt. Lookout; S to crossing of Custer-Limestone Rd. (284) near Cooper Ridge and perhaps further (private - not surveyed).	BC?	B	BC?
T1N R1E Sec 2, 3, 10	Broad meadows in drainage bottoms NW of Crows Nest Peak along FS Rd. 117, ca. 8.5 air mi. ESE of Four Corners, WY.	BC?	B	BC?
T2S R1E Sec 30	Summit Peak lookout and ridge to N along FS Rd.265; ca. 8 air mi. ENE of Newcastle, WY.	C	C	C
T3S R3E Sec 6; T3S R2E Sec 36	Lower Lemming Draw along Custer-Limestone Rd (284) downstream to Bear Spring Cr.; ca. 5.5 air mi. SW of Bear Mt. Lookout.	C	B	C
T2S R1E Sec 16, 20, 21	Boles Canyon ca. 5 air mi. S of Moon, SD, along FS Rd 117; ca. 9 air mi. E of Newcastle, WY.	C	C	C

Table 2. Montane Grassland Survey Sites, sorted by overall rank.

Legal Description	Directions	Condition	Size	Overall Rank
T3N R1E Sec 12	Just N of US Hwy 85 and E of O'Neil Pass, at easternmost of 3 trailheads of Eagle Cliffs cross-country ski area (eastern of 2 occurrences at survey site).	BC	C	C
T1S R3E Sec 33; T2S R3E Sec 4, 5	Long Canyon (aka Long Draw), running SW from Odakota Mt. (along FS Rd. 693); ca. 4 air mi. NNW of Bear Mt. Lookout.	C	B	C
T1N R2E Sec 23 SW4NE4	Horsethief Cr. drainage near confluence with Castle Cr., ca. 2.5 air mi. W of Deerfield Dam.	C	C	C
T2S R1E Sec 10 SW4	Ridge between Sled and Redbird Canyons along Custer-Limestone Rd (FS Rd. 284); ca. 10.5 air mi. ENE of Newcastle, WY.	B	D	C
T2S R1E Sec 13 NW4	Along Custer-Limestone Rd. (FS Rd. 284) on Dumbuck Ridge in area of Rogers Lake; ca. 12.5 air mi. ENE of Newcastle, WY.	B	D	C
T48N R60W Sec 17, 18, 19, 20	E of US Hwy. 85 ca 4-5 miles NE of Four Corners, WY, where Soldier Cr. crosses highway.	CD	B	C
T2S R2E Sec 28, 33	Cooper Ridge on W side of upper W Hell Canyon, along Custer-Limestone Rd. (284); ca. 8 air mi. WSW of Bear Mt. Lookout.	C?	B	C?
T2S R2E Sec 19 NW4 and S2, Sec 30 NE4	Gillette Canyon along Custer-Limestone Rd. (FS Rd. 284) and possibly downstream (private, not surveyed); ca. 8 air mi. WSW of Bear Mt. Lookout. Next site upstream is Middle Gillette Cyn.	C?	C	C?
T3S R3E Sec 4, 8, 9	Sourdough Draw in vicinity of Custer-Limestone Rd. (284), ca. 4 air mi. S of Bear Mt. Lookout	C?	B	C?
T1N R3E Sec 5, 6, 7, 8, 17, 18; T1N R2E Sec 12, 13, 24	Reynolds Prairie, ca. 15 air mi. NW of Hill City, SD; private lands in N half (S half includes public lands on N side of Deerfield Lake).	C?	A	C?
T1S R2E Sec 16, 17, 21, 28	Headwaters of Pole Cr., N of Sixmile Rd. (FS Rd. 301) and E of Redbird Canyon; ca. 8 air mi. NW of Bear Mt. Lookout.	C?	B	C?
T1S R1E Sec 4, 9, 15	Upper Antelope Draw along FS Rd. 117 ca. 2 mi. N of Moon; ca. 13 air mi. NE of Newcastle, WY.	C?	B	C?

Table 2. Montane Grassland Survey Sites, sorted by overall rank.

Legal Description	Directions	Condition	Size	Overall Rank
T50N R61W Sec 21 (public), 28-33 (private)	Area around Moskee, WY, ca. 13 air mi. SE of Sundance, WY, on FS Rd. 807 (Crook Co. Rd. 141).	C?	A	C?
T3S R3E Sec 9, 16	Upper Lightning Cr. along FS Rd. 288, ca. 5 air mi. NE of Jewel Cave Nat. Mon.	CD	B	CD
T4N R1E Sec 10 to T3N R1E Sec 8 and 9	Little Spearfish Cr. drainage along FS Rd. 134 and trail at N end, from Timon Campground on Rd. 222 S to headwaters on Rd 177; includes draw with Van Horn Spring.	D	AB	CD
T3N R1E Sec 26, 27, 28, 34	NW headwaters of Spearfish Cr. ca. 2 mi. SE of US Hwy. 85 at O'neil Pass.	CD	B	CD
T3N R1E Sec 17, 20, 28, 30, 31	Along and in vicinity of US Hwy. 85 W of O'Neil Pass.	CD	B	CD
T2S R1E Sec 10 E2, 11 NW4, 15 NE4	Redbird drainage N and S of Custer-Limestone Rd (FS Rd 284) just W of Dumbuck Ridge; ca. 11 air mi. ENE of Newcastle, WY.	CD	C	CD
T1S R2E Sec 1, 3, 10, 11	Lower S Fork Castle Cr. in vicinity of Pole, Ditch and Heely confluences, downstream to Deerfield Rd.; also Pole Cr. drainage bottom; ca. 5 air mi. SW of Deerfield Dam.	CD	B	CD
T1S R2E Sec 11, 14, 23	Lower Ditch Cr., from S Fork Castle Cr. S (upstream) to Sec 23/26 boundary (next site S is Gillette Canyon Headwaters); ca. 6 air mi. SSW of Deerfield Dam.	CD	B	CD
T1S R3E Sec 26, 36; T1S R4E Sec 31, 32; T2S R4E Sec 5, 6	Negro, Long and Coon drainages E of Medicine Mt., ca. 6 air mi. WSW of Hill City.	CD	B	CD
T1N R2E Sec 3, 10, 15	Hughes Draw N of Castle Cr, ca. 6 air mi. NW of Deerfield Dam - access via upper end, FS Rd. 129 running S from FS Rd. 189.	CD	B	CD
T1N R2E Sec 5, 6, 8, 9, 16; T2N R2E Sec 31; T2N R1E Sec 36	Castle Cr. above Deerfield Lake, along Deerfield Rd. from Hughes Draw upstream to FS land near junction with Rd. 117.	CD	B	CD
T2N R1E Sec 24, 25, 26	Headwaters of Castle Cr. N of junction of Deerfield Rd. and FS Rd. 117; ca. 9.5 air mi. NW of Deerfield Dam.	CD	B	CD

Table 2. Montane Grassland Survey Sites, sorted by overall rank.

Legal Description	Directions	Condition	Size	Overall Rank
T2N R2E Sec 17, 20, 21, 29, 32	Upper Rhoads Fork and Bombard Draw (tributaries to S Fk. Rapid Cr.); ca. 9 air mi. NW of Deerfield Dam.	CD	A	CD
T2S R1E Sec 4, 9; T1S R1E Sec 21, 28, 33	Large prairie E of FS Rd. 117 from Moon, SD, S ca. 4 mi.; ca. 11 air mi. NE of Newcastle, WY.	CD	A	CD
T1N R2E Sec 22, 23	Silver Cr. above confluence with Castle Cr., ca. 3 air mi. W of Deerfield Dam; access via FS Rd. 157 (stays above meadows at lower end)	CD	B	CD
T1N R2E Sec 28, 33	Trail Draw ca. 6 mi air mi. WSW of Deerfield Dam; access via FS Rd 157.	CD	C	CD
T2N R2E Sec 33; T1N R2E Sec 4	Upper Hughes Draw ca. 6 air mi. NW of Deerfield Dam; access from head via FS Rd. 129 off of Rd. 189.	CD	B	CD
T2S R3E Sec 17	Headwaters of Bear Spring Cr. above Bear Spring, along FS Rd. 291 ca. 2 air mi. W of Bear Mt. Lookout.	CD	C	CD
T2S R1E Sec 9	Sled Canyon, at W end of Custer-Limestone Rd. (FS Rd. 284), ca. 10 air mi. ENE of Newcastle, WY.	CD	C	CD
T2N R1E Sec 6, 7, 8, 9, 16; T48N R60W Sec 9, 10	Cold Cr. along FS Rds. 268 (968 in WY) and 279; ca. 4 air mi. SSW of US Hwy. 85 at O'Neil Pass.	CD	B	CD
T50N R60W Sec 4, 7, 8, 9, 16, 17	Upper Rattlesnake Cyn, Balm of Gilead Gulch, and Guidinger Spring, along FS Rds 804, 850 S and SW of Cement Ridge; ca. 15 air mi. ESE of Sundance.	CD	B	CD
T49N R60W Sec 13 NW4	Deer Cr. along RS Rd. 807 W of SD/WY state line and SE of Moskee, WY; ca. 18 air mi. SE of Sundance.	CD	C	CD
T50N R60W Sec 19, 20, 21; T50N R61W Sec 24	Wagon Canyon along FS Rd. 805 from Grand Canyon E to SD/WY state line; ca. 15 air mi. ESE of Sundance.	CD	B	CD
T49N R60W Sec 6; T50N R60W Sec 31; T50N 61W Sec 24, 25	Grand Canyon from Wagon Cyn. upstream to where FS Rd. 875 leaves drainage (towards Bald Mt. Quarry); ca. 6 air mi. SSW of Cement Ridge Lookout.	CD	B	CD

Table 2. Montane Grassland Survey Sites, sorted by overall rank.

Legal Description	Directions	Condition	Size	Overall Rank
T48N R60W Sec 21, 22, 27, 28; T2N R1E Sec 19	Headwaters of Soldier Cr. below and above state line (as far as seismic station); ca. 5.5 air mi. NE of Four Corners, WY.	CD	B	CD
T3N R2E Sec 33	Meadow at FS Rds. 206/231 jct., at head of drainage upstream from Black Fox campground; ca. 12 air mi. NNW of Deerfield Dam.	CD?	C	CD?
T1S R2E Sec 36; T1S R3E Sec 28, 29, 30, 31, 32	Sixmile Draw along FS Rd 301, and drainages to N (Williams, Hay, Sawmill, Windmill); ca. 4.5 air mi. NNW of Bear Mt. Lookout.	CD?	B	CD?
T3N R2E Sec 22, 25, 26, 27	Besant Park and Tillson Cr. below; only meadows on Forest Service land just N of Besant Park were surveyed; ca. 13 air mi. SSW of Lead, SD.	D	B	D
T2N R1E Sec 1, 2, 3, 11, 12; T3N R1E Sec 34, 35	Stovehole Park and headwaters to E, NW of FS Rd. 117, ca. 4 air mi. SE of Hardy Guard Station on US Hwy 85.	D	B	D
T4N R1E Sec 5, 6; T5N R1E Sec 31, 32, 33	Headwaters of Beaver Cr. and head of Schoolhouse Gulch (SW of Old Baldy Mt.); ca. 13 air mi. SW of Spearfish.	D	C	D
T4N R1E Sec 5, 6, 7	South Fork above confluence with Schoolhouse Gulch, ca. 13 air mi. WSW of Lead.	D	B	D
T3N R3E Sec 19, 20; T3N R2E Sec 24	Buskala Cr. ca 2 mi WNW of Nahant, SD, and ca. 10 air mi. S of Lead, SD.	D	C	D
T3N T1E Sec 29, 33; 2N Sec 4	Turnoff US Hwy 85 across from Hardy Guard Stn. on FS Rd. 183 SE then S (stop at private land; McInermy Spring is at head of this drainage).	D	B	D
T3N R1E Sec 24	Lander Spring, ca. 1.5 air mi. S of US Hwy 85, ca. 5 air mi. E of Hardy Guard Station.	D	C	D
T3N R2E Sec 3, 10	Long Draw, ca. 1.7 air mi. SW of Hanna, along FS Rd. 209; ca. 9 air mi. SW of Lead, SD.	D	C	D
T1S R1E Sec 22, 27, 34, T2S R1E Sec 2	Redbird Draw from Antelope Draw downstream to Redbird Canyon; ca. 12 air mi. ENE of Newcastle, WY.	D	B	D

Table 2. Montane Grassland Survey Sites, sorted by overall rank.

Legal Description	Directions	Condition	Size	Overall Rank
T2N R2E Sec 15, 16, 21	Lower Rhoads Fork from confluence with S Fork Rapid Cr. upstream to jct. with FS Rd. 189; ca. 8 air mi. NNW of Deerfield Dam.	D	B	D
T2N R1E Sec 10, 11, 14, 15	Headwaters Cold Springs Cr. in vicinity of Pennington/Lawrence Co. line, ca. 4 air mi. E of US Hwy. 385 at Buckhorn, WY.	D	B	D
T2N R1E Sec 32, 33	Tributaries E of Dry Beaver Cr. near jct. FS Rds 109, 110; ca. 7 air mi. ENE of Four Corners, WY.	D	B	D
T49N R60W Sec 17, 20, 21, 28; T3N T1E Sec 19, 20	Grand Canyon along FS Rd. 175/875 from US Hwy. 85 NW to where canyon narrows and Rd. 875 leaves drainage ca. 4 air mi. NW of Hwy. 85.	D	A	D

Table 3. Black Hills montane grassland survey sites where reconnaissance showed quality to be too low for additional survey; sorted by state and county.

Table 3. Montane grassland sites NOT surveyed in depth due to low rank; sorted by state, county.

State SD **County** Custer **Legal Description** T2S R2E Sec 28, 33

USGS 7.5' Quad(s) Dead Horse Flats **Overall Rank** C?

Directions Cooper Ridge on W side of upper W Hell Canyon, along Custer-Limestone Rd. (284); ca. 8 air mi. WSW of Bear Mt. Lookout.

Comments Very heavily utilized in places; patches of western snowberry; E of jct. with Antelope Ridge Rd, (283) is better; adjacent private land in West Hell Canyon is much more utilized; major gravel road; residence

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State SD **County** Custer **Legal Description** T2S R1E Sec 30

USGS 7.5' Quad(s) Fanny Peak **Overall Rank** C

Directions Summit Peak lookout and ridge to N along FS Rd.265; ca. 8 air mi. ENE of Newcastle, WY.

Comments Weedy with non-native clovers; grazed and closely cropped; not montane grassland; possibly western wheatgrass - green needlegrass, but condition makes id difficult.

State SD **County** Custer **Legal Description** T3S R3E Sec 9, 16

USGS 7.5' Quad(s) Signal Hill **Overall Rank** CD

Directions Upper Lightning Cr. along FS Rd. 288, ca. 5 air mi. NE of Jewel Cave Nat. Mon.

Comments Very weedy with timothy, smooth brome, quackgrass; rigid goldenrod, western snowberry locally abundant

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State SD **County** Custer **Legal Description** T3S R3E Sec 4, 8, 9

USGS 7.5' Quad(s) Signal Hill **Overall Rank** C?

Directions Sourdough Draw in vicinity of Custer-Limestone Rd. (284), ca. 4 air mi. S of Bear Mt. Lookout

Comments Heavily-grazed; heavy western snowberry cover; prominent fenceline contrasts; hard to tell herbaceous composition due to close cropping; crossed by major gravel road; private ownership and residences in area.

State SD **County** Custer **Legal Description** T3S R3E Sec 6; T3S R2E Sec 36

USGS 7.5' Quad(s) Signal Hill **Overall Rank** C

Directions Lower Lemming Draw along Custer-Limestone Rd (284) downstream to Bear Spring Cr.; ca. 5.5 air mi. SW of Bear Mt. Lookout.

Comments Heavy timothy, rigid goldenrod mixed with natives; subdivided lots for sale; major gravel road.

State SD **County** Custer **Legal Description** T2S R1E Sec 16, 20, 21

USGS 7.5' Quad(s) Fanny Peak **Overall Rank** C

Directions Boles Canyon ca. 5 air mi. S of Moon, SD, along FS Rd 117; ca. 9 air mi. E of Newcastle, WY.

Comments Grazed and closely cropped, heavy western snowberry; probably not montane grassland; possibly western wheatgrass - green needlegrass, but condition makes id difficult.

Table 3. Montane grassland sites NOT surveyed in depth due to low rank; sorted by state, county.

State SD **County** Lawrence **Legal Description** T4N R1E Sec 10 to T3N R1E Sec 8 and 9

USGS 7.5' Quad(s) Savoy, Old Baldy Mt, Buckhorn **Overall Rank** CD

Directions Little Spearfish Cr. drainage along FS Rd. 134 and trail at N end, from Timon Campground on Rd. 222 S to headwaters on Rd 177; includes draw with Van Horn Spring.

Comments Very weedy throughout, many stands of timothy and smooth brome, grazed, gravel road.

State SD **County** Lawrence **Legal Description** T3N R2E Sec 22, 25, 26, 27

USGS 7.5' Quad(s) Nahant **Overall Rank** D

Directions Besant Park and Tillson Cr. below; only meadows on Forest Service land just N of Besant Park were surveyed; ca. 13 air mi. SSW of Lead, SD.

Comments Timothy meadows on FS land just N of Besant Park; timothy on private land seen from rd.

State SD **County** Lawrence **Legal Description** T2N R1E Sec 1, 2, 3, 11, 12; T3N R1E Sec 34, 35

USGS 7.5' Quad(s) Crooks Tower **Overall Rank** D

Directions Stovehole Park and headwaters to E, NW of FS Rd. 117, ca. 4 air mi. SE of Hardy Guard Station on US Hwy 85.

Comments Timothy along Rd 117 - appears to continue up to Stovehole Park.

State SD **County** Lawrence **Legal Description** T4N R1E Sec 5, 6; T5N R1E Sec 31, 32, 33

USGS 7.5' Quad(s) Old Baldy Mt. **Overall Rank** D

Directions Headwaters of Beaver Cr. and head of Schoolhouse Gulch (SW of Old Baldy Mt.); ca. 13 air mi. SW of Spearfish.

Comments Heavy timothy and locally weedy with other exotics; heavily grazed.

State SD **County** Lawrence **Legal Description** T4N R1E Sec 5, 6, 7

USGS 7.5' Quad(s) Old Baldy Mt. **Overall Rank** D

Directions South Fork above confluence with Schoolhouse Gulch, ca. 13 air mi. WSW of Lead.

Comments Meadow in Sec 7 surveyed - timothy

State SD **County** Lawrence **Legal Description** T3N R3E Sec 19, 20; T3N R2E Sec 24

USGS 7.5' Quad(s) Nahant **Overall Rank** D

Directions Buskala Cr. ca 2 mi WNW of Nahant, SD, and ca. 10 air mi. S of Lead, SD.

Comments Timothy, smooth brome, non-native clovers.

Table 3. Montane grassland sites NOT surveyed in depth due to low rank; sorted by state, county.

State SD **County** Lawrence **Legal Description** T3N R1E Sec 26, 27, 28, 34

USGS 7.5' Quad(s) Crooks Tower **Overall Rank** CD

Directions NW headwaters of Spearfish Cr. ca. 2 mi. SE of US Hwy. 85 at O'neil Pass.

Comments Mainly timothy in bottoms; some areas with more native vegetation.

State SD **County** Lawrence **Legal Description** T3N R1E Sec 17, 20, 28, 30, 31

USGS 7.5' Quad(s) Buckhorn **Overall Rank** CD

Directions Along and in vicinity of US Hwy. 85 W of O'Neil Pass.

Comments drive-by in 99 - not worth stopping; small meadows in Sec 17, 20 have heavy timothy; areas along highway S of Hardy Guard Stn. are hard hit and weedy.

State SD **County** Lawrence **Legal Description** T3N T1E Sec 29, 33; 2N Sec 4

USGS 7.5' Quad(s) Buckhorn **Overall Rank** D

Directions Turnoff US Hwy 85 across from Hardy Guard Stn. on FS Rd. 183 SE then S (stop at private land; McInermy Spring is at head of this drainage).

Comments Timothy meadows on public land; private land is haygrass for as far as the eye can see (with binos)

State SD **County** Lawrence **Legal Description** T3N R2E Sec 33

USGS 7.5' Quad(s) Nahant **Overall Rank** CD?

Directions Meadow at FS Rds. 206/231 jct., at head of drainage upstream from Black Fox campground; ca. 12 air mi. NNW of Deerfield Dam.

Comments Heavily grazed or cut meadow - identifiable species include timothy, Kentucky bluegrass, western yarrow, non-native clovers.

State SD **County** Lawrence **Legal Description** T3N R1E Sec 24

USGS 7.5' Quad(s) Crooks Tower **Overall Rank** D

Directions Lander Spring, ca. 1.5 air mi. S of US Hwy 85, ca. 5 air mi. E of Hardy Guard Station.

Comments Small stand; heavy timothy

State SD **County** Lawrence **Legal Description** T3N R2E Sec 3, 10

USGS 7.5' Quad(s) Nahant **Overall Rank** D

Directions Long Draw, ca. 1.7 air mi. SW of Hanna, along FS Rd. 209; ca. 9 air mi. SW of Lead, SD.

Comments Timothy meadow

Table 3. Montana grasslands sites NOT [illegible] in depth due to low rank; sorted by state, county.

State SD **County** Pennington **Legal Description** T1N R3E Sec 5, 6, 7, 8, 17, 18; T1N R2E Sec 12, 13, 24

USGS 7.5' Quad(s) Deerfield **Overall Rank** C?

Directions Reynolds Prairie, ca. 15 air mi. NW of Hill City, SD; private lands in N half (S half includes public lands on N side of Deerfield Lake).

Comments Cultivation, grazing, gravel roads, exotics, residences - condition, overall rank may be CD (driveby only).

State SD **County** Pennington **Legal Description** T2S R1E Sec 10 E2, 11 NW4, 15 NE4

USGS 7.5' Quad(s) Preacher Spring **Overall Rank** CD

Directions Redbird drainage N and S of Custer-Limestone Rd (FS Rd 284) just W of Dumbuck Ridge; ca. 11 air mi. ENE of Newcastle, WY.

Comments Weedy, heavily grazed

State SD **County** Pennington **Legal Description** T1S R1E Sec 22, 27, 34, T2S R1E Sec 2

USGS 7.5' Quad(s) Preacher Spring **Overall Rank** D

Directions Redbird Draw from Antelope Draw downstream to Redbird Canyon; ca. 12 air mi. ENE of Newcastle, WY.

Comments Not surveyed, but hayfields visible from Sixmile Rd. (FS Rd. 301).

State SD **County** Pennington **Legal Description** T1S R2E Sec 16, 17, 21, 28

USGS 7.5' Quad(s) Preacher Spring **Overall Rank** C?

Directions Headwaters of Pole Cr., N of Sixmile Rd. (FS Rd. 301) and E of Redbird Canyon; ca. 8 air mi. NW of Bear Mt. Lookout.

Comments Private lands not surveyed, not much information for ranking - area seen from Sixmile Road is very heavily utilized; natives locally common, some timothy.

State SD **County** Pennington **Legal Description** T1S R2E Sec 1, 3, 10, 11

USGS 7.5' Quad(s) Ditch Creek, Deerfield **Overall Rank** CD

Directions Lower S Fork Castle Cr. in vicinity of Pole, Ditch and Heely confluences, downstream to Deerfield Rd.; also Pole Cr. drainage bottom; ca. 5 air mi. SW of Deerfield Dam.

Comments Very weedy mountain meadows and hayfields; timothy, smooth brome, canada thistle, musk thistle, dense stands of western snowberry; new residence

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State SD **County** Pennington **Legal Description** T1S R2E Sec 11, 14, 23

USGS 7.5' Quad(s) Ditch Creek **Overall Rank** CD

Directions Lower Ditch Cr., from S Fork Castle Cr. S (upstream) to Sec 23/26 boundary (next site S is Gillette Canyon Headwaters); ca. 6 air mi. SSW of Deerfield Dam.

Comments Very weedy bottom - campground area is "canada thistle haven"; mainly timothy, smooth brome, canada thistle with some limited areas with more natives.

Table 3. Montane grassland sites NOT surveyed in depth due to low rank; sorted by state, county.

State SD **County** Pennington **Legal Description** T1S R2E Sec 36; T1S R3E Sec 28, 29, 30, 31, 32

USGS 7.5' Quad(s) Ditch Creek **Overall Rank** CD?

Directions Sixmile Draw along FS Rd 301, and drainages to N (Williams, Hay, Sawmill, Windmill); ca. 4.5 air mi. NNW of Bear Mt. Lookout.

Comments Heavy timothy especially upper part and sidedraws; lower end has mix of natives and exotics; some areas grazed hard with heavy non-native clover; heavy western snowberry in places.

State SD **County** Pennington **Legal Description** T1S R3E Sec 26, 36; T1S R4E Sec 31, 32; T2S R4E Sec 5, 6

USGS 7.5' Quad(s) Medicine Mountain **Overall Rank** CD

Directions Negro, Long and Coon drainages E of Medicine Mt., ca. 6 air mi. WSW of Hill City.

Comments Heavily grazed; heavy burden of exotics;lots of timothy, smooth brome locally abundant; some very large stands of canada thistle; musk thistle, henbane locally common; large stands of western snowberry with horsemint (eg entire hillslopes)

State SD **County** Pennington **Legal Description** T1N R2E Sec 3, 10, 15

USGS 7.5' Quad(s) Deerfield **Overall Rank** CD

Directions Hughes Draw N of Castle Cr, ca. 6 air mi. NW of Deerfield Dam - access via upper end, FS Rd. 129 running S from FS Rd. 189.

Comments bottom is mix of timothy, smooth brome; some areas have native grasses; rigid goldenrod common; grazed

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State SD **County** Pennington **Legal Description** T1N R2E Sec 5, 6, 8, 9, 16; T2N R2E Sec 31; T2N R1E Sec 36

USGS 7.5' Quad(s) Crows Nest Peak **Overall Rank** CD

Directions Castle Cr. above Deerfield Lake, along Deerfield Rd. from Hughes Draw upstream to FS land near junction with Rd. 117.

Comments Cultivated; grazed; residences; canada thistle and other exotics locally abundant; slopes generally in better condition.

State SD **County** Pennington **Legal Description** T2N R1E Sec 24, 25, 26

USGS 7.5' Quad(s) Crows Nest Peak **Overall Rank** CD

Directions Headwaters of Castle Cr. N of junction of Deerfield Rd. and FS Rd. 117; ca. 9.5 air mi. NW of Deerfield Dam.

Comments Timothy; slopes somewhat better occasionally.

State SD **County** Pennington **Legal Description** T2N R2E Sec 17, 20, 21, 29, 32

USGS 7.5' Quad(s) Crows Nest Peak, Crooks Tower **Overall Rank** CD

Directions Upper Rhoads Fork and Bombard Draw (tributaries to S Fk. Rapid Cr.); ca. 9 air mi. NW of Deerfield Dam.

Comments Varies from heavily utilized (beyond good id) to mix of timothy, Kentucky bluegrass, green needlegrass and forbs; smooth brome, timothy locally abundant; timothy more abundant going upstream (W) along Rd 189.

Table 3. Montane grassland sites NOT surveyed in depth due to low rank; sorted by state, county.

State SD **County** Pennington **Legal Description** T2N R2E Sec 15, 16, 21

USGS 7.5' Quad(s) Nahant **Overall Rank** D

Directions Lower Rhoads Fork from confluence with S Fork Rapid Cr. upstream to jct. with FS Rd. 189; ca. 8 air mi. NNW of Deerfield Dam.

Comments Small meadows along road are all heavy timothy.

State SD **County** Pennington **Legal Description** T2N R1E Sec 10, 11, 14, 15

USGS 7.5' Quad(s) Crooks Tower **Overall Rank** D

Directions Headwaters Cold Springs Cr. in vicinity of Pennington/Lawrence Co. line, ca. 4 air mi. E of US Hwy. 385 at Buckhorn, WY.

Comments Timothy.

State SD **County** Pennington **Legal Description** T2S R1E Sec 4, 9; T1S R1E Sec 21, 28, 33

USGS 7.5' Quad(s) Moon **Overall Rank** CD

Directions Large prairie E of FS Rd. 117 from Moon, SD, S ca. 4 mi.; ca. 11 air mi. NE of Newcastle, WY.

Comments Grazed, cultivated, residences, gravel rd; locally heavy burden of exotics, rigid goldenrod; smooth brome, canada thistle, musk thistle locally abundant; public lands on margins are Kentucky bluegrass, non-native clovers, western yarrow, areas of timothy.

State SD **County** Pennington **Legal Description** T1S R1E Sec 4, 9, 15

USGS 7.5' Quad(s) Moon, Preacher Spring **Overall Rank** C?

Directions Upper Antelope Draw along FS Rd. 117 ca. 2 mi. N of Moon; ca. 13 air mi. NE of Newcastle, WY.

Comments Heavily grazed with vegetation cropped short; some patches E of road look better.

State SD **County** Pennington **Legal Description** T1N R2E Sec 22, 23

USGS 7.5' Quad(s) Deerfield, Crows Nest Peak **Overall Rank** CD

Directions Silver Cr. above confluence with Castle Cr., ca. 3 air mi. W of Deerfield Dam; access via FS Rd. 157 (stays above meadows at lower end)

Comments Kentucky bluegrass - green needlegrass on slopes; smooth brome locally abundant; appears to be hay grasses in bottom; upper end is heavily grazed, with smooth brome, rigid goldenrod, Kentucky bluegrass, timothy visible

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State SD **County** Pennington **Legal Description** T1N R2E Sec 28, 33

USGS 7.5' Quad(s) Crows Nest Peak **Overall Rank** CD

Directions Trail Draw ca. 6 mi air mi. WSW of Deerfield Dam; access via FS Rd 157.

Comments Heavily grazed, with smooth brome, rigid goldenrod, Kentucky bluegrass, timothy visible.

Table 3. Montane grassland sites NOT surveyed in depth due to low rank; sorted by state, county.

State SD **County** Pennington **Legal Description** T2N R1E Sec 32, 33

USGS 7.5' Quad(s) Parmlee Canyon **Overall Rank** D

Directions Tributaries E of Dry Beaver Cr. near jct. FS Rds 109, 110; ca. 7 air mi. ENE of Four Corners, WY.

Comments Heavy timothy, smooth brome

State SD **County** Pennington **Legal Description** T2N R2E Sec 33; T1N R2E Sec 4

USGS 7.5' Quad(s) Crows Nest Peak **Overall Rank** CD

Directions Upper Hughes Draw ca. 6 air mi. NW of Deerfield Dam; access from head via FS Rd. 129 off of Rd. 189.

Comments Mix of timothy, smooth brome with some areas of native grasses; rigid goldenrod common; grazed; survey limited due to poor condition here and at downstream end (visible from Deerfield Rd.).

State SD **County** Pennington **Legal Description** T2S R3E Sec 17

USGS 7.5' Quad(s) Ditch Creek, Signal Hill **Overall Rank** CD

Directions Headwaters of Bear Spring Cr. above Bear Spring, along FS Rd. 291 ca. 2 air mi. W of Bear Mt. Lookout.

Comments Lots of timothy in meadow in bottom

State SD **County** Pennington **Legal Description** T2S R1E Sec 9

USGS 7.5' Quad(s) Moon **Overall Rank** CD

Directions Sled Canyon, at W end of Custer-Limestone Rd. (FS Rd. 284), ca. 10 air mi. ENE of Newcastle, WY.

Comments Meadow in drainage bottom is very heavily grazed making id impossible.

State SD **County** Pennington **Legal Description** T2S R1E Sec 10 SW4

USGS 7.5' Quad(s) Preacher Spring **Overall Rank** C

Directions Ridge between Sled and Redbird Canyons along Custer-Limestone Rd (FS Rd. 284); ca. 10.5 air mi. ENE of Newcastle, WY.

Comments Small grassland in opening in pine forest; diverse, not grazed, but small and vulnerable to pine invasion and human disturbance; too small and ephemeral to track; no timothy, non-native clovers only near road and light.

State SD **County** Pennington **Legal Description** T2S R1E Sec 13 NW4

USGS 7.5' Quad(s) Preacher Spring **Overall Rank** C

Directions Along Custer-Limestone Rd. (FS Rd. 284) on Dumbuck Ridge in area of Rogers Lake; ca. 12.5 air mi. ENE of Newcastle, WY.

Comments Small grassland in opening in pine forest; diverse, not grazed, but small and vulnerable to pine invasion and human disturbance; too small and ephemeral to track; no timothy, non-native clovers only near road and light.

Table 3. Montane grassland sites NOT surveyed in depth due to low rank; sorted by state, county.

State SD, WY **County** Lawrence, Crook **Legal Description** T2N R1E Sec 6, 7, 8, 9, 16; T48N R60W Sec 9, 10

USGS 7.5' Quad(s) Buckhorn **Overall Rank** CD

Directions Cold Cr. along FS Rds. 268 (968 in WY) and 279; ca. 4 air mi. SSW of US Hwy. 85 at O'Neil Pass.

Comments Closely cropped timothy, non-native clovers with western yarrow, hounds tongue, musk thistle; downstream are large areas of Kentucky bluegrass, green needlegrass with heavy western snowberry; heavy smooth brome near downstream end.

State WY **County** Crook **Legal Description** T50N R60W Sec 4, 7, 8, 9, 16, 17

USGS 7.5' Quad(s) Moskee, Old Baldy Mt. **Overall Rank** CD

Directions Upper Rattlesnake Cyn, Balm of Gilead Gulch, and Guidinger Spring, along FS Rds 804, 850 S and SW of Cement Ridge; ca. 15 air mi. ESE of Sundance.

Comments Either too grazed for id or heavy timothy, smooth brome; some natives but very weedy.

State WY **County** Crook **Legal Description** T49N R60W Sec 13 NW4

USGS 7.5' Quad(s) Dry Draw **Overall Rank** CD

Directions Deer Cr. along RS Rd. 807 W of SD/WY state line and SE of Moskee, WY; ca. 18 air mi. SE of Sundance.

Comments Very weedy, grazed, gravel road

State WY **County** Crook **Legal Description** T50N R60W Sec 19, 20, 21; T50N R61W Sec 24

USGS 7.5' Quad(s) Old Baldy Mt. **Overall Rank** CD

Directions Wagon Canyon along FS Rd. 805 from Grand Canyon E to SD/WY state line; ca. 16 air mi. ESE of Sundance.

Comments Heavy smooth brome and timothy cover (nearly pure stands in places), canada thistle locally abundant; residence (large); slopes are in better condition - more natives, with heavy forb cover (artifact of grazing?)

State WY **County** Crook **Legal Description** T49N R60W Sec 6; T50N R60W Sec 31; T50N 61W Sec 24, 25

USGS 7.5' Quad(s) Old Baldy Mt. **Overall Rank** CD

Directions Grand Canyon from Wagon Cyn. upstream to where FS Rd. 875 leaves drainage (towards Bald Mt. Quarry); ca. 6 air mi. SSW of Cement Ridge Lookout.

Comments Heavy smooth brome; weedy; more native cover going N in vicinity of Wagon Cyn turnoff.

State WY **County** Weston **Legal Description** T48N R60W Sec 17, 18, 19, 20

USGS 7.5' Quad(s) Buckhorn, Parmlee Cyn **Overall Rank** C

Directions E of US Hwy. 85 ca 4-5 miles NE of Four Corners, WY, where Soldier Cr. crosses highway.

Comments hayfields with small relic meadow vegetation on lowermost slopes

Table 3. Montane grassland sites NOT surveyed in depth due to low rank; sorted by state, county.

State WY, SD **County** Crook, Lawrence **Legal Description** T49N R60W Sec 17, 20, 21, 28; T3N T1E Sec 19, 20

USGS 7.5' Quad(s) Buckhorn **Overall Rank** D

Directions Grand Canyon along FS Rd. 175/875 from US Hwy. 85 NW to where canyon narrows and Rd. 875 leaves drainage ca. 4 air mi. NW of Hwy. 85.

Comments Huge fields of hay grasses - based on observations of main drainage from road, and public lands in side drainages crossed by road

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State WY, SD **County** Weston, Pennington **Legal Description** T48N R60W Sec 21, 22, 27, 28; T2N R1E Sec 19

USGS 7.5' Quad(s) Parmlee Canyon **Overall Rank** CD

Directions Headwaters of Soldier Cr. below and above state line (as far as seismic station); ca. 5.5 air mi. NE of Four Corners, WY.

Comments Smooth brome, timothy, rigid goldenrod, non-native clovers, heavy western snowberry in places; heavy utilization.

Table 4. Black Hills montane grassland survey sites where in-depth surveys were done; sorted by overall rank. Maps of locations follow (Figure 4).

Table 4. Montane grassland sites surveyed in depth: sorted by overall rank.

State SD **County** Pennington **Legal Description** T2S R2E Sec 1, 2, 11, 12; T2S R3E Sec 6, 7; T1S R2E Sec 25, 26, 36

Survey Site Gillette Canyon Headwaters **USGS 7.5' Quad(s)** Ditch Creek

Directions Headwaters of Gillette Cyn. and Ditch Cr., in vicinity of Sixmile and Ditch Cr. Rds. (301, 291); ca. 5 air mi. NW of Bear Mt. Lookout; extends down Gillette Cyn. to Sec 14/15 boundary; site downstream is Upper Gillette Cyn.

Comments Mostly native species; allotment N of Sixmile Rd. is more heavily utilized and soon drops in condition going N.

Estimated Size (acres) 500 ***Ranks*** **Condition** AB **Size** A **Context** B **Overall Rank** AB

Ownership Black Hills National Forest

State SD **County** Pennington **Legal Description** T2S R2E Sec 8, 9, 14, 15, 16, 17, 18, 19

Survey Site Upper Gillette Canyon **USGS 7.5' Quad(s)** Ditch Creek, Preacher Springs, Dead Horse Flats

Directions Gillette Canyon upstream from Custer-Limestone Rd. (284); ca. 7 air mi. W of Bear Mt. Lookout. Next site upstream is Gillette Cyn. Headwaters - above private land in Sec 14; site downstream is Middle Gillette Cyn.

Comments Good native cover; few exotics; gravel road along margin of middle part. This stand has far less forb cover than most seen - is this a better condition?

Estimated Size (acres) 500 ***Ranks*** **Condition** AB **Size** A **Context** B **Overall Rank** AB

Ownership Black Hills National Forest, private (not surveyed)

State SD **County** Custer **Legal Description** T2S R2E Sec 24, 25, 36; T2S R3E Sec 19, 30, 31; T3S R2E Sec 1 NW4NE4

Survey Site Lemming Draw **USGS 7.5' Quad(s)** Signal Hill

Directions Lemming Draw and tributary to NW, ca. 5 air mi. SW of Bear Mt. Lookout; along FS Rd. 383.

Comments Good native cover; exotics light or localized; rigid goldenrod occasional only; non-native clovers present but localized and not common in area surveyed. Lemming Draw above Rd 383 in significantly better condition; drainage bottom along 383 more heavily utilized.

Estimated Size (acres) 300 ***Ranks*** **Condition** AB? **Size** AB **Context** B **Overall Rank** AB?

Ownership Black Hills National Forest

State SD **County** Custer **Legal Description** T3S R3E Sec 6, 7, 8, 18?

Survey Site Bear Spring Creek **USGS 7.5' Quad(s)** Signal Hill

Directions Bear Spring Cr. drainage along and off of Custer-Limestone Rd. (FS Rd. 284) ca. 5 air mi. SW of Bear Mt. Lookout.

Comments One private parcel surveyed (AB condition); FS lands show more grazing impact and are locally weedy with smooth brome, non-native clovers, but generally good native cover; some large patches of western snowberry.

Estimated Size (acres) >100 ***Ranks*** **Condition** B **Size** B **Context** B **Overall Rank** B

Ownership Black Hills National Forest, private (surveyed in part)

Table 4. Montane grassland sites surveyed in depth, sorted by overall rank.

State SD **County** Pennington **Legal Description** T1N R2E Sec 17, 18, 19, 20; T1N R2E Sec 13

Survey Site Reynolds Prairie (south part) **USGS 7.5' Quad(s)** Deerfield

Directions Reynolds Prairie - public lands in S half (N of Deerfield Lake); ca. 13 air mi. NW of Hill City, SD.

Comments Good native cover; exotics localized - mainly in drainage bottoms; hiking / horse trails.

Estimated Size (acres) 1200 ***Ranks*** **Condition** B **Size** A **Context** B **Overall Rank** B

Ownership Black Hills National Forest, mostly within Deerfield Lake Recreation Area

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State WY **County** Crook **Legal Description** T52N R63W Sec 19, 20, 29

Survey Site Warren Peaks **USGS 7.5' Quad(s)** Sundance West

Directions Summits of Warren Peaks in southern Bear Lodge Mountains, ca. 6 air mi. NNW of Sundance.

Comments Good native cover overall, but exotics locally common; fire lookout and old Air Force installation; grazed; old 2-track roads; major gravel road (and paved road from Sundance); old mining exploration remains; some areas heavily grazed.

Estimated Size (acres) 800 ***Ranks*** **Condition** B **Size** A **Context** B **Overall Rank** B

Ownership Black Hills National Forest, private (not surveyed)

State WY **County** Crook **Legal Description** T50N R60W Sec 4, 5

Survey Site Sand Creek Headwaters **USGS 7.5' Quad(s)** Old Baldy Mt.

Directions Cement Ridge at head of Sand Cr., ca. 15 air mi. ESE of Sundance, WY.

Comments Good native cover; grazing, gravel road, fire lookout, exotics occasional.

Estimated Size (acres) 80 ***Ranks*** **Condition** B **Size** B **Context** B **Overall Rank** B

Ownership Black Hills National Forest

State SD **County** Pennington **Legal Description** T1S R1E Sec 2, 3, 11, 13, 14, 15, 22, 24

Survey Site Redbird Draw **USGS 7.5' Quad(s)** Preacher Spring

Directions Redbird Draw from FS Rd. 294 (Redbank Spring) S to Sixmile Road (301); ca. 15 air mi. NE of Newcastle, WY.

Comments Condition is much better in S half with good native cover; timothy locally abundant but not extensive (though hard to say for N half due to heavy utilization).

Estimated Size (acres) 500 ***Ranks*** **Condition** B? **Size** A **Context** B **Overall Rank** B?

Ownership Black Hills National Forest, private at W, S and N ends (not surveyed)

Table 4. Montane grassland sites surveyed in depth; sorted by overall rank.

State SD **County** Pennington **Legal Description** T1S R2E Sec 20, 29, 30, 31, 32; T2S R2E Sec 4?, 5, 8

Survey Site Redbird Canyon South **USGS 7.5' Quad(s)** Preacher Spring

Directions Redbird Canyon from Sixmile Rd. (301) S to Gillette Canyon; ca. 15 air mi. ENE of Newcastle, WY.

Comments Condition varies from A (good native cover) to BC (mix of natives, exotics) in areas surveyed - large areas not surveyed but don't look that great; continues N of Sixmile Rd, - not surveyed nor included in this site.

Estimated Size (acres) 400 ***Ranks*** **Condition** B? **Size** A **Context** B **Overall Rank** B?

Ownership Black Hills National Forest, private (not surveyed)

State SD **County** Pennington **Legal Description** T1N R3E Sec 22, 25, 26, 27

Survey Site Slate Prairie **USGS 7.5' Quad(s)** Rochford, Deerfield

Directions Slate Prairie NE of Deerfield Lake, ca. 8 air mi. NW of Hill City, SD.

Comments Condition quite variable over large area; cultivation common in draws; grasslands on slopes and ridgecrests vary from heavily grazed to excellent condition; overall area of montane grassland not known; size rank refers to mosaic including other types.

Estimated Size (acres) 1000 ***Ranks*** **Condition** B? **Size** A **Context** B **Overall Rank** B?

Ownership Black Hills National Forest, private (surveyed in part)

State SD **County** Pennington **Legal Description** T1S R2E Sec 19, 29, 30, 32, 33

Survey Site Coulsen Hughes Draw **USGS 7.5' Quad(s)** Crows Nest Peak, Preacher Spring

Directions Coulsen Hughes Draw from confluence with S Fork Castle Cr. N to head (access via FS Rd. 591 N from Rd. 294); ca. 6 air mi. WSW of Deerfield Dam.

Comments Good native cover; timothy, smooth brome, non-native clovers locally dominant, especially in very bottom and along roads; rigid goldenrod locally common but not extensive; timothy burden generally light overall, but hard to tell for sure due to grazing.

Estimated Size (acres) 150 ***Ranks*** **Condition** B? **Size** B **Context** B **Overall Rank** B?

Ownership Black Hills National Forest

State WY **County** Weston **Legal Description** T48N R60W Sec 27, 28 (public) + T47N R60W Sec 5, 6, 7, 8 (private)

Survey Site Canyon Springs Prairie **USGS 7.5' Quad(s)** Parmlee Canyon

Directions NE part of Canyon Springs Prairie ca. 5 air mi. NE of Four Corners, WY on FS land on ridge SW of road just W of state line.

Comments Unclassified grassland type - drier than montane grasslands on Limestone Plateau to E, but also high elevation. Rank applies to this very small part of Cyn. Springs Prairie, much of which is cultivated, or with heavy rigid goldenrod, Kentucky bluegrass, smooth brome.

Estimated Size (acres) 1000+ ***Ranks*** **Condition** AB? **Size** C **Context** B **Overall Rank** B?

Ownership Black Hills National Forest, private (not surveyed)

Table 4. Montane grassland sites surveyed in depth; sorted by overall rank.

State SD **County** Lawrence **Legal Description** T3N R1E Sec 35, 36

Survey Site Powerline Draw **USGS 7.5' Quad(s)** Crooks Tower

Directions Headwaters of Spearfish Cr. along and S of Rd. 231; includes meadow at jct of 231/206 which drains into S Fork Rapid Cr.; ca. 4 air mi. ESE of O'Neil Pass on US Hwy. 85.

Comments Mix of natives and exotics; slopes in much better condition than bottoms; gravel road, grazed, powerline; both heavy timothy and timothy/natives mix present; head of draw and up to Crooks Tower-lots of timothy.

Estimated Size (acres) 150 ***Ranks*** **Condition** BC **Size** B **Context** B **Overall Rank** BC

Ownership Black Hills National Forest, private (surveyed in part)

State SD **County** Lawrence **Legal Description** T3N R1E Sec 10, 11, 15

Survey Site Eagle Cliffs (west) **USGS 7.5' Quad(s)** Crooks Tower

Directions Just N of US Hwy 85 and E of O'Neil Pass, at westernmost of 3 trailheads of Eagle Cliffs cross-country ski area. This is the western of 2 occurrences at the survey site.

Comments Timothy and non-native clovers locally abundant in drainage bottom, less so on slopes and slopes have good native cover; grazed; dirt road and trails on margin of stand.

Estimated Size (acres) 100+ ***Ranks*** **Condition** BC **Size** B **Context** B **Overall Rank** BC

Ownership Black Hills National Forest, private (not surveyed)

State SD **County** Lawrence **Legal Description** T3N R1E Sec 19, 30

Survey Site Hardy **USGS 7.5' Quad(s)** Buckhorn

Directions Near O'Neil Pass on US Hwy 85; headwaters of Grand Canyon ca. 0.5 air mi. NW of Hardy Guard Station.

Comments Mix of natives and exotics; heavily utilized in places and hard to judge composition, cover; may be larger - private lands downstream not surveyed and condition unknown.

Estimated Size (acres) 60 ***Ranks*** **Condition** BC **Size** B **Context** B **Overall Rank** BC

Ownership Black Hills National Forest, private (not surveyed)

State SD **County** Pennington **Legal Description** T2N R1E Sec 21, 28, 29, 32, 33

Survey Site Upper Dry Beaver Creek **USGS 7.5' Quad(s)** Parmlee Canyon

Directions Dry Beaver Cr. from headwaters to confluence with Stockade Beaver Cr.; NE of Mallo Camp and ca. 6 air mi. ENE of Four Corners WY; vicinity of jct. of FS Rds. 110, 109.

Comments Grazed and closely cropped at time of 98 survey; gravel road; invasives locally abundant; parts of lower drainage surveyed in 99 are better with timothy, smooth brome cover variable and natives more abundant.

Estimated Size (acres) 200 ***Ranks*** **Condition** BC **Size** B **Context** B **Overall Rank** BC

Ownership Black Hills National Forest, private (not surveyed)

Table 4. Montane grassland sites surveyed in depth: sorted by overall rank.

State SD **County** Pennington **Legal Description** T2N R1E Sec 35 (continues onto private lands)

Survey Site Upper Castle Creek **USGS 7.5' Quad(s)** Crows Nest Peak

Directions Upper Castle Cr., near jct. of FS Rd. 117 and Deerfield Rd. (Manganese Draw area), ca. 9.5 air mi. WNW of Deerfield Dam.

Comments Timothy stand at top of slope, gravel road, grazed; slopes are in better condition; bottom is mix of natives and exotics.

Estimated Size (acres) 80 ***Ranks*** **Condition** BC **Size** B **Context** B **Overall Rank** BC

Ownership Black Hills National Forest; private (not surveyed)

State SD **County** Pennington **Legal Description** T1N R1E Sec 15, 16

Survey Site Upper Beaver Creek **USGS 7.5' Quad(s)** Crows Nest Peak

Directions Beaver Cr. drainage ca. 1.8 air mi. WSW of Crows Nest Peak, at jct. of FS Rds. 111 and 117; ca. 6 air mi. E of Four Corners, WY.

Comments Mix of natives and exotics; currently grazed (some areas closely cropped), gravel road, some cultivated areas (private), exotics locally abundant.

Estimated Size (acres) 500+ ***Ranks*** **Condition** BC **Size** A **Context** B **Overall Rank** BC

Ownership Black Hills National Forest, private (not surveyed)

State SD **County** Pennington **Legal Description** T1S R2E Sec 4, 5; T1S R1N Sec 30, 31, 32; T1N R1E Sec 23, 24, 25, 26

Survey Site South Fork Castle Creek **USGS 7.5' Quad(s)** Preacher Spring, Crows Nest Peak

Directions S Fork Castle Cr. along FS Rd. 294 from near Coulsen Hughes Draw W to upper end and upper tributaries; ca. 7 air mi. WSW of Deerfield Dam.

Comments Native species dominant over large area, but with smooth brome, timothy, non-native clovers locally abundant; heavy timothy at W end; western snowberry locally common; grazed and well-utilized in places.

Estimated Size (acres) 300 ***Ranks*** **Condition** BC **Size** AB **Context** B **Overall Rank** BC

Ownership Black Hills National Forest

State SD **County** Custer, Pennington **Legal Description** T2S R2E Sec 22, 23, 27, 34; T3S R2E Sec 3

Survey Site West Hell Canyon **USGS 7.5' Quad(s)** Signal Hill

Directions West Hell Canyon in vicinity of Lemming Draw Rd. (FS Rd. 383); ca. 6.0 air mi. WSW of Bear Mt. Lookout; S to crossing of Custer-Limestone Rd. (284) near Cooper Ridge and perhaps further (private - not surveyed).

Comments Little information for ranking condition - N part is ok but grassland around Cooper Ridge is part of short duration intensive grazing system with adjacent private lands - some areas very heavily utilized.

Estimated Size (acres) 80? ***Ranks*** **Condition** BC? **Size** B **Context** B **Overall Rank** BC?

Ownership Black Hills National Forest, private (not surveyed)

Table 4. Montane grassland sites surveyed in depth; sorted by overall rank.

State SD **County** Pennington **Legal Description** T1N R1E Sec 2, 3, 10

Survey Site Crows Nest Peak West **USGS 7.5' Quad(s)** Crows Nest Peak

Directions Broad meadows in drainage bottoms NW of Crows Nest Peak along FS Rd. 117, ca. 8.5 air mi. ESE of Four Corners, WY.

Comments Mix of natives and exotics; timothy < 20% overall cover; rigid goldenrod present but not common; natives well represented with variable burden of exotics (increased exotic cover going north); id, cover, condition somewhat difficult to judge due to grazing.

Estimated Size (acres) 100 ***Ranks*** **Condition** BC? **Size** B **Context** B **Overall Rank** BC?

Ownership Black Hills National Forest, private (surveyed in part)

State SD **County** Lawrence **Legal Description** T3N R1E Sec 12

Survey Site Eagle Cliffs (east) **USGS 7.5' Quad(s)** Crooks Tower

Directions Just N of US Hwy 85 and E of O'Neil Pass, at easternmost of 3 trailheads of Eagle Cliffs cross-country ski area (eastern of 2 occurrences at survey site).

Comments Bottom is quite weedy with timothy, non-native clovers; slopes are in better condition with good native cover; small stand.

Estimated Size (acres) 30 ***Ranks*** **Condition** BC **Size** C **Context** B **Overall Rank** C

Ownership Black Hills National Forest

State SD **County** Pennington **Legal Description** T1S R3E Sec 33; T2S R3E Sec 4, 5

Survey Site Long Canyon **USGS 7.5' Quad(s)** Ditch Creek

Directions Long Canyon (aka Long Draw), running SW from Odakota Mt. (along FS Rd. 693); ca. 4 air mi. NNW of Bear Mt. Lookout.

Comments Natives with heavy timothy, canada thistle burden, but not a total hayfield; gravel road

Estimated Size (acres) 50 ***Ranks*** **Condition** C **Size** B **Context** B **Overall Rank** C

Ownership Black Hills National Forest

State SD **County** Pennington **Legal Description** T1N R2E Sec 23 SW4NE4

Survey Site Horsethief Creek **USGS 7.5' Quad(s)** Deerfield

Directions Horsethief Cr. drainage near confluence with Castle Cr., ca. 2.5 air mi. W of Deerfield Dam.

Comments Condition rank varies from B (slopes) to CD (bottom); slopes have good native cover; bottom has heavy smooth brome, canada thistle, timothy, non-native clovers.

Estimated Size (acres) 50 ***Ranks*** **Condition** C **Size** C **Context** B **Overall Rank** C

Ownership Black Hills National Forest

Table 4. Montane grassland sites surveyed in depth: sorted by overall rank.

State SD **County** Custer **Legal Description** T2S R2E Sec 19 NW4 and S2, Sec 30 NE4

Survey Site Middle Gillette Canyon **USGS 7.5' Quad(s)** Dead Horse Flats

Directions Gillette Canyon along Custer-Limestone Rd. (FS Rd. 284) and possibly downstream (private, not surveyed); ca. 8 air mi. WSW of Bear Mt. Lookout. Next site upstream is Middle Gillette Cyn.

Comments Mix of natives and exotics; western snowberry locally abundant; smooth brome, rigid goldenrod, non-native clovers locally abundant; clover often closely cropped.

Estimated Size (acres) 50 ***Ranks*** **Condition** C? **Size** C **Context** B **Overall Rank** C?

Ownership Black Hills National Forest, private? (not surveyed)

State WY **County** Crook **Legal Description** T50N R61W Sec 21 (public), 28-33 (private)

Survey Site Moskee **USGS 7.5' Quad(s)** Moskee

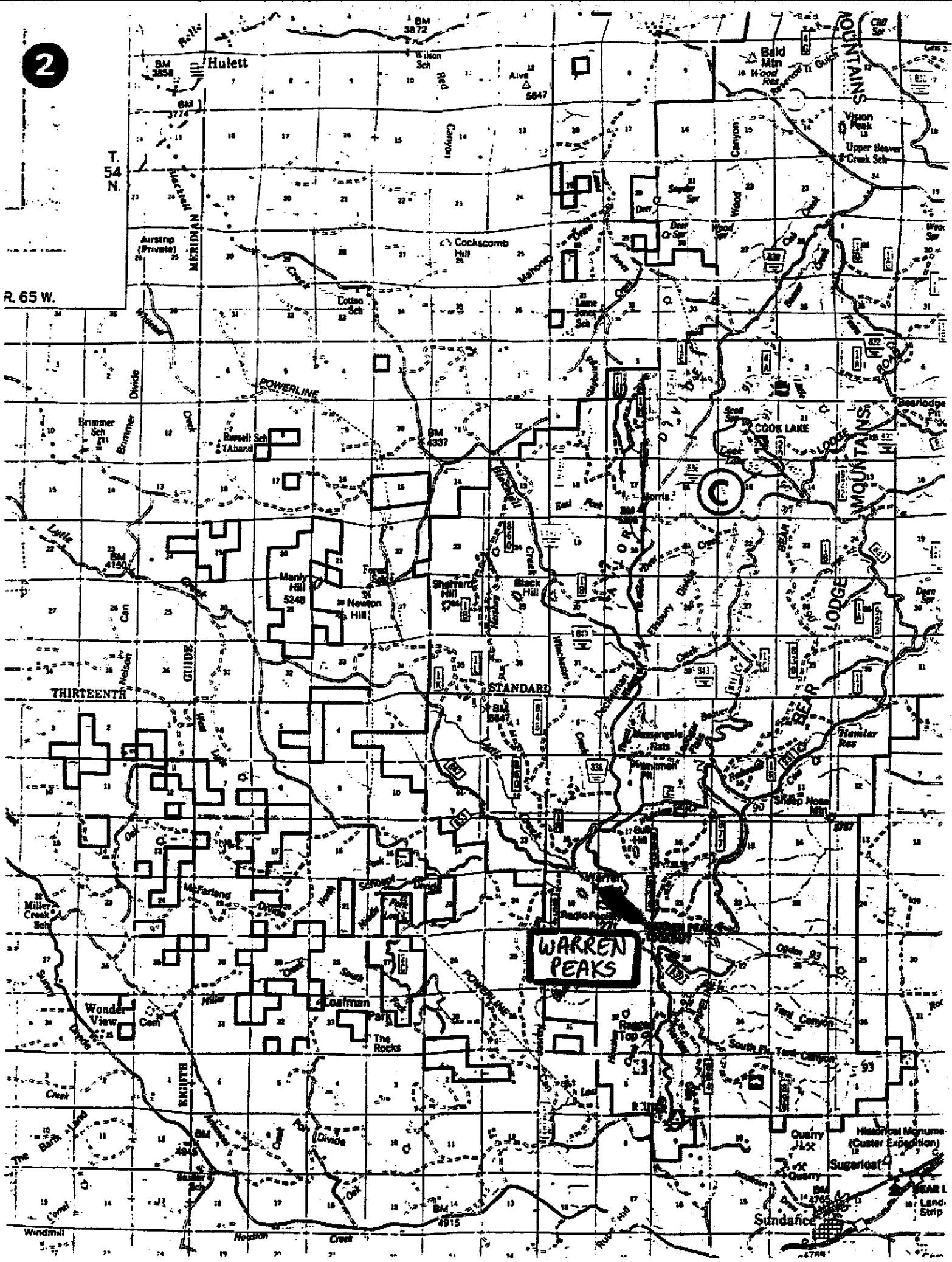
Directions Area around Moskee, WY, ca. 13 air mi. SE of Sundance, WY, on FS Rd. 807 (Crook Co. Rd. 141).

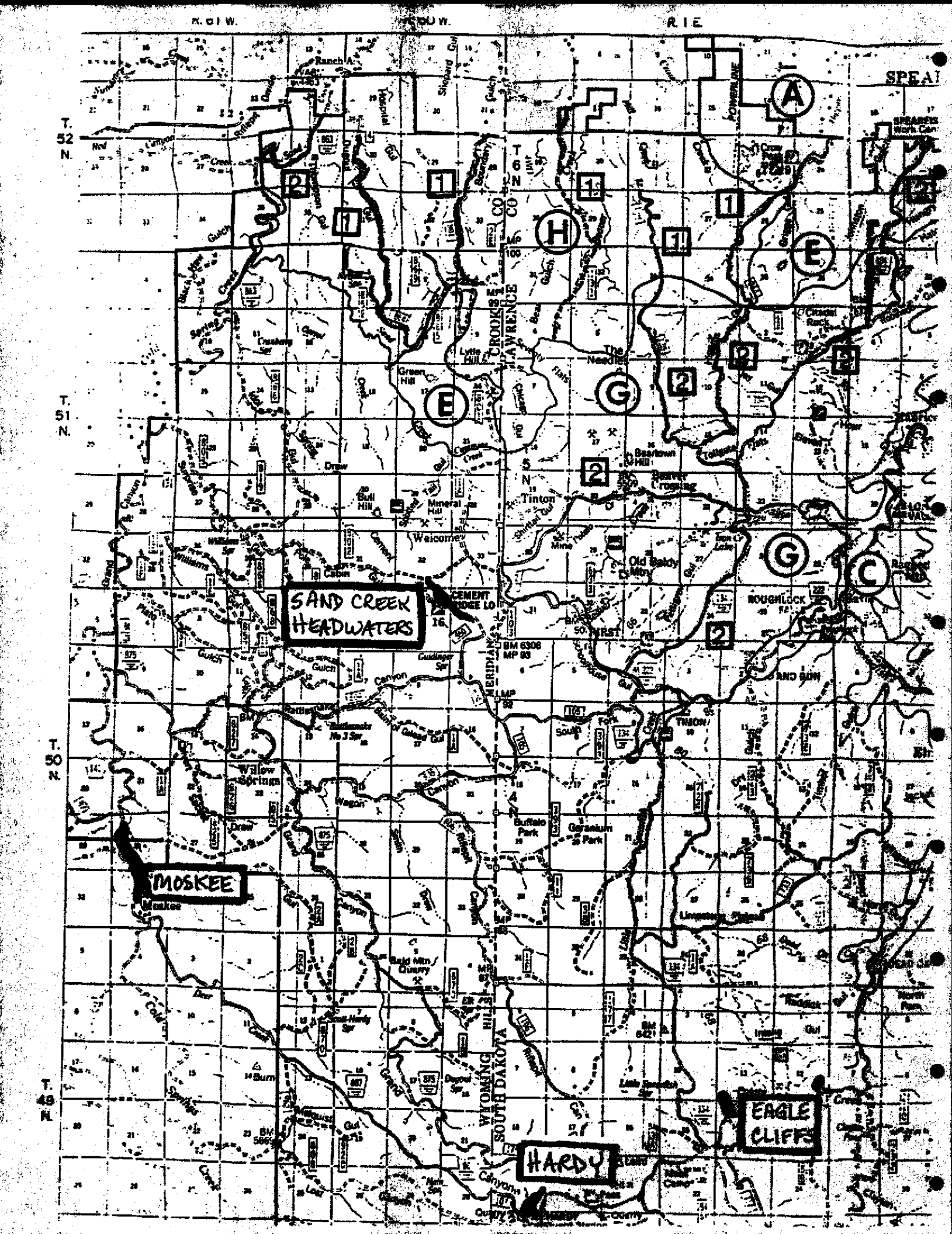
Comments Grazing, some cultivation, residence, gravel road, invasives locally common. Mix of natives and exotics on public lands; overall quality not known due to lack of survey (private).

Estimated Size (acres) 500 ***Ranks*** **Condition** C? **Size** A **Context** B **Overall Rank** C?

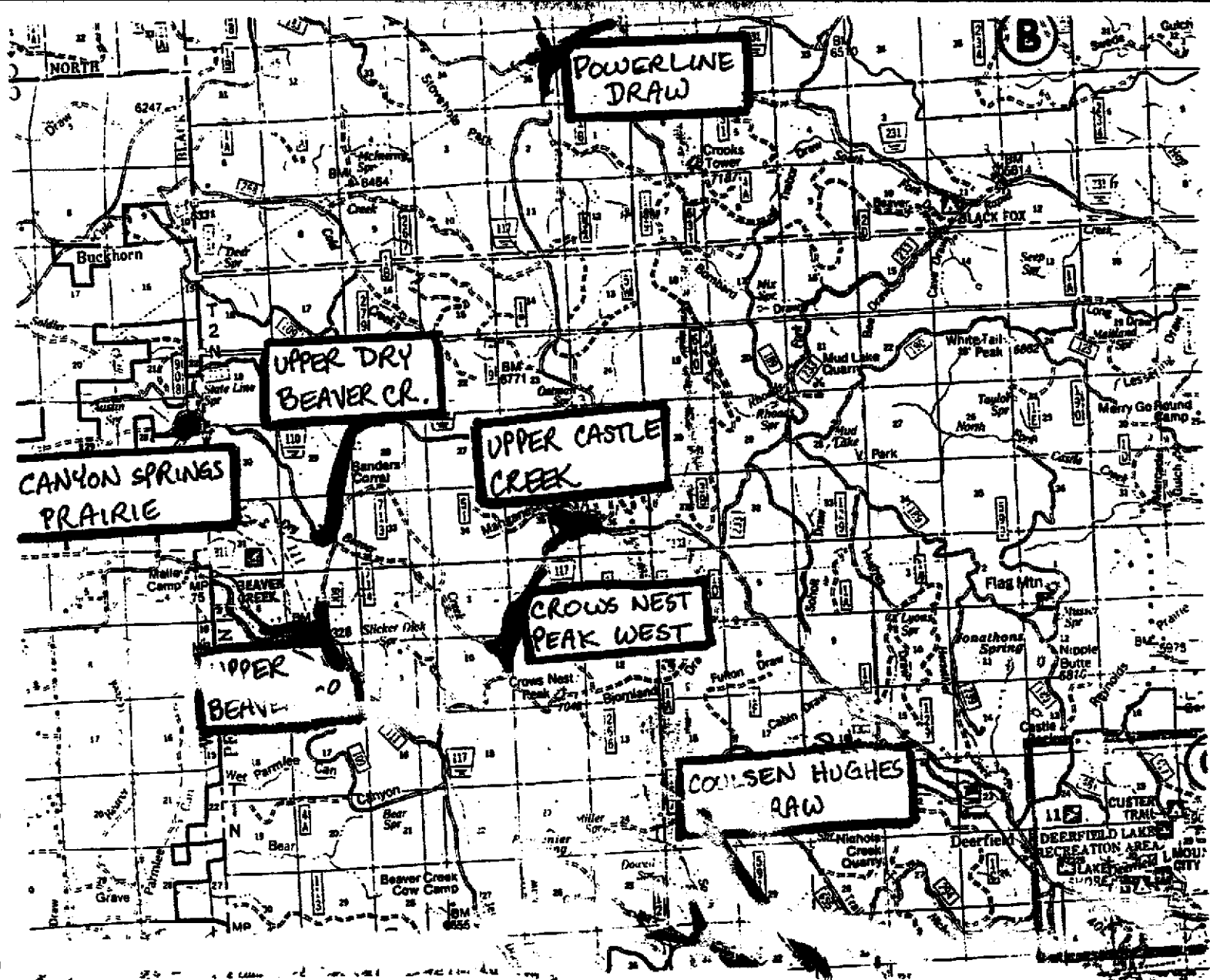
Ownership Black Hills National Forest, mostly private (not surveyed)

Figure 4. Maps showing locations of Black Hills montane grassland survey sites where in-depth surveys were done (see Table 4 for site information).


2
Hulett
T. 54 N.
R. 65 W.
Airstrip (Private)
Cockscomb Hill
Cotton Sch
Lame Jones Sch
Bald Mtn
Vision Peak
Upper Beaver Creek Sch
Brimmer Sch
Russell Sch
Manly Hill 5248
Newton Hill
Sherrard Hill
Black Hill
Morris
COOK LAKE
Bearlodge Pit
THIRTEENTH
STANDARD
Messengale Rats
Whitman Pit
Sheep Nose Mtn
Miller Creek Sch
Wonder View
Loafman Park
The Rocks
Ragged Top
Quarry
Historical Monument (Custer Expedition)
Sugarloaf
Sundance
Windmill
WARREN PEAKS
POWERLINE
MERIDIAN
GUIDE
EIGHTH
BEAR LODGE MOUNTAINS



R. 61 W.
R. 1 E.
T. 52 N.
T. 51 N.
T. 50 N.
T. 49 N.
T 6 N
T 5 N
SAND CREEK HEADWATERS
MOSKEE
EAGLE CLIFFS
HARDY
CROOK CO
LAWRENCE CO
WYOMING
SOUTH DAKOTA
MERIDIAN
Tinton
Weicome
Green Hill
Lytle Hill
The Needles
Beartown Hill
Beaver Crossing
Old Baldy Mtn
Mineral Hill
Bull Hill
Willow Springs
Buffalo Park
Geranium Park
Bald Mtn Quarry
Limestone Plateau
Citadel Rock
Ranch A
Cabin
Mine
Canyon
Gulch
Draw
Wagon
Rattlesnake
Guidinger Spr
Scott-Hardy Spr
Little Spanish Spr
Dugout Spr
Burn
Quarry
Raddick
Inning Gul
Cold
Deer
Creek
Spring
Williams
Plato
Grand
Cement
Hospital
Shepard Gul
Boundary
Bear
Chicago
Shirttail Gul
Tollgate
Flats
Eleven
Hour
Ranch
Crow Peak
Rough Lock
Tinton
South Fork
Mine
Pass
Camp
Lake
Ragged
Elm
North Park
A
E
G
H
C
1
2


POWERLINE DRAW
UPPER DRY BEAVER CR.
UPPER CASTLE CREEK
CANYON SPRINGS PRAIRIE
CROWS NEST PEAK WEST
COULSEN HUGHES DRAW
Buckhorn
Crooks Tower
BLACK FOX
Mud Lake Quarry
White Tail Peak
Merry Go Round Camp
Flag Mtn
Nipple Butte
Deerfield
DEERFIELD LAKE RECREATION AREA
Beaver Creek Cow Camp
Crows Nest Peak
Bjornland
Fulton Draw
Nichols Creek Quarry
Castle Rock
Bear Spr
Wet Parmlee Can
Canyon
Grave
Parmlee
Sanders Corral
Slicker Dick Spr
Malle Camp
BEAVER CREEK
Mud Lake
Park
Taylor Spr
Lyons Spr
Jonathons Spring
Hat Mtn
Hesly
DITCH CREEK
REDBIRD DRAW
POWERLINE
Canyon
Thomson
Thomson Kinney
Red Bird Quarry
Twin Lake
Gillette Well
Four Corners
Fox Flat
Dumbuk Ridge
Summit Spr
Park Spr
Howell Spr
Bogers Spr
REDBIRD CANYON SOUTH
Kinney
Thomson
Canyon
Hay Draw
Spring

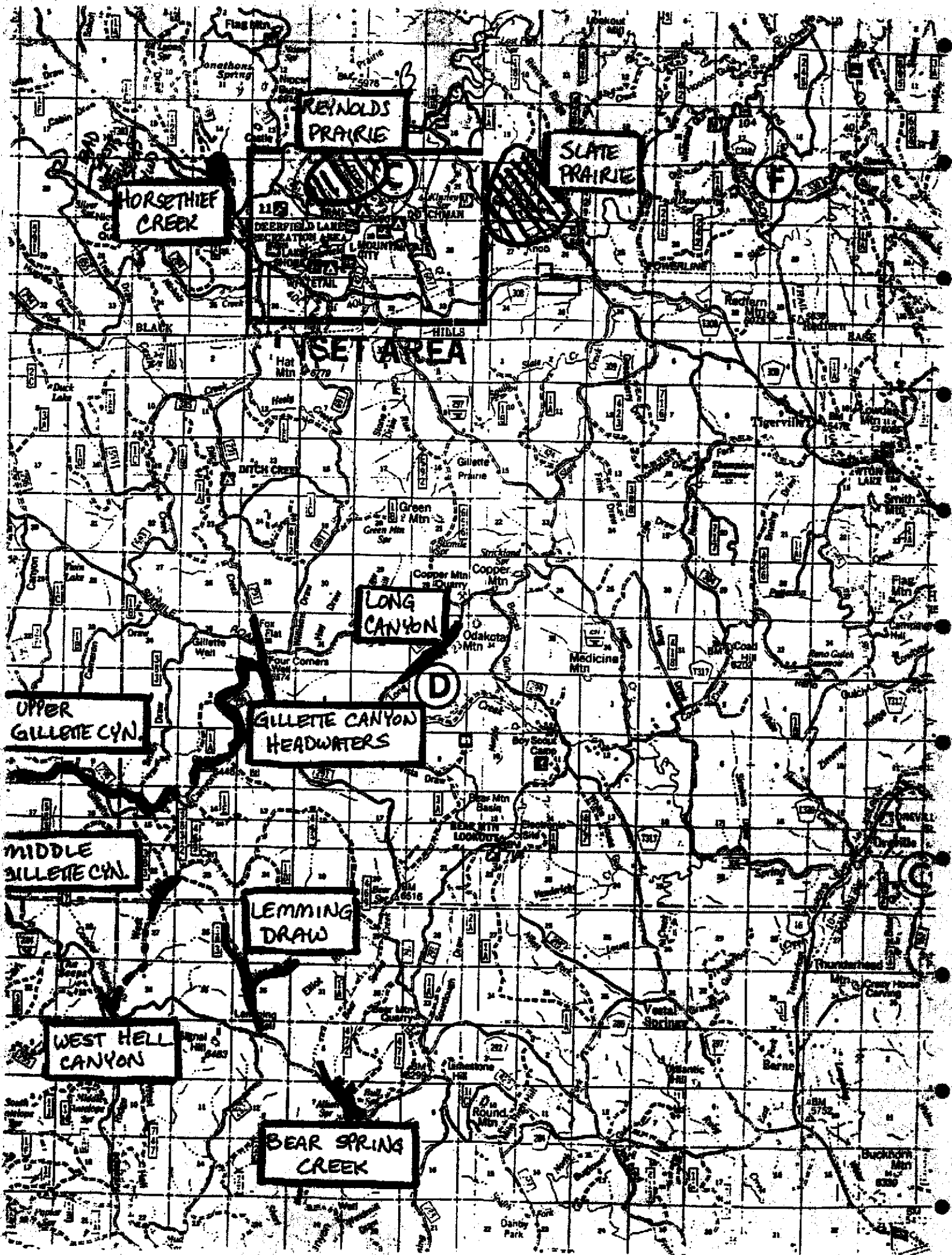

REYNOLDS PRAIRIE
SLATE PRAIRIE
HORSETHIEF CREEK
INSET AREA
LONG CANYON
UPPER GILLETTE CYN.
GILLETTE CANYON HEADWATERS
MIDDLE GILLETTE CYN.
LEMMING DRAW
WEST HELL CANYON
BEAR SPRING CREEK
C
D
F
Flag Mtn
Jonathons Spring
Hat Mtn
Green Mtn
Copper Mtn
Odakota Mtn
Medicine Mtn
Four Corners
Gillette Prairie
Tigerville
Redfern Mtn
Smith Mtn
Bear Mtn Basin
Vestal Springs
Round Mtn
Limestone Hill
Buckhorn Mtn
Thunderhead Mtn
Crazy Horse Carving
Barne
Orville
Danby Park

Table 5. Black Hills montane grassland candidate conservation sites (overall rank B or better); sorted by survey site name. See Fig. 4 for site locations (follows Table 4).

Table 5. Montana grassland candidate conservation sites (overall rank of B or better)

State SD **County** Custer **Legal Description** T3S R3E Sec 6, 7, 8, 18?

Survey Site Bear Spring Creek

USGS 7.5' Quad(s) Signal Hill

Directions Bear Spring Cr. drainage along and off of Custer-Limestone Rd. (FS Rd. 284) ca. 5 air mi. SW of Bear Mt. Lookout.

Vegetation Description Grasslands in drainage bottom and on lowermost slopes; slopes have less cover, with Sporobolus heterolepis, Schizachyrium scoparium, Solidago ptarmicoides common; stands in bottom more variable: Poa pratensis, Nassella viridula, Artemisia ludociana most common species in area surveyed. Graminoid cover generally greater than forb cover, but forbs common and diverse.

Classification Comments Xeric (slopes) and mesic (bottoms) phases present.

Ranking Comments One private parcel surveyed (AB condition); FS lands show more grazing impact and are locally weedy with smooth brome, non-native clovers, but generally good native cover; some large patches of western snowberry.

Estimated Size (acres) >100 ***Ranks*** **Condition** B **Size** B **Context** B **Overall Rank** B

Ownership Black Hills National Forest, private (surveyed in part)

State SD **County** Pennington **Legal Description** T2S R2E Sec 1, 2, 11, 12; T2S R3E Sec 6, 7; T1S R2E Sec 25, 26, 36

Survey Site Gillette Canyon Headwaters

USGS 7.5' Quad(s) Ditch Creek

Directions Headwaters of Gillette Cyn. and Ditch Cr., in vicinity of Sixmile and Ditch Cr. Rds. (301, 291); ca. 5 air mi. NW of Bear Mt. Lookout; extends down Gillette Cyn. to Sec 1S/14 boundary; site downstream is Upper Gillette Cyn.

Vegetation Description Forb-rich grassland in very broad drainage bottoms; mostly native species; more cover in more mesic areas (bottoms vs. slopes). Dominant graminoids are Danthonia intermedia, Poa pratensis, Stipa spartea; Sporobolus heterolepis a co-dominant on drier sites. Forbs are common and diverse, including Solidago nemoralis, Potentilla hippiana, Geranium viscosissimum, Geum triflorum.

Classification Comments Mesic and xeric phases but much overlap in composition.

Ranking Comments Mostly native species; allotment N of Sixmile Rd. is more heavily utilized and soon drops in condition going N.

Estimated Size (acres) 500 ***Ranks*** **Condition** AB **Size** A **Context** B **Overall Rank** AB

Ownership Black Hills National Forest

Table 5. Montane grassland candidate conservation sites (overall rank of B or better)

State SD **County** Custer **Legal Description** T2S R2E Sec 24, 25, 36; T2S R3E Sec 19, 30, 31; T3S R2E Sec 1 NW4NE4

Survey Site Lemming Draw

USGS 7.5' Quad(s) Signal Hill

Directions Lemming Draw and tributary to NW, ca. 5 air mi. SW of Bear Mt. Lookout; along FS Rd. 383.

Vegetation Description Grassland and forb-rich grassland; drier sites have more Sporobolus heterolepis and less vegetative cover; more mesic sites have heavier Poa pratensis; species composition otherwise similar; dominant graminoids are Poa pratensis, Danthonia spicata, Danthonia intermedia, Agropyron subsecundum, Stipa richardsonii, Stipa spartea; most common forbs are Geum triflorum, Potentilla hippiana, Solidago rigida (occasional only).

Classification Comments Hard to split into two phases in area surveyed - too much overlap in composition.

Ranking Comments Good native cover; exotics light or localized; rigid goldenrod occasional only; non-native clovers present but localized and not common in area surveyed. Lemming Draw above Rd 383 in significantly better condition; drainage bottom along 383 more heavily utilized.

Estimated Size (acres) 300 ***Ranks*** **Condition** AB? **Size** AB **Context** B **Overall Rank** AB?

Ownership Black Hills National Forest

State SD **County** Pennington **Legal Description** T1N R3E Sec 17, 18, 19, 20; T1N R2E Sec 13

Survey Site Reynolds Prairie (south part)

USGS 7.5' Quad(s) Deerfield

Directions Reynolds Prairie - public lands in S half (N of Deerfield Lake); ca. 13 air mi. NW of Hill City, SD.

Vegetation Description Large prairie on rolling uplands with shallow drainages; grassland with areas of high forb density. Mix of montane grassland and other types, including Schizachyrium scoparium, Poa pratensis, Pascopyrum smithii - Nassella viridula associations. Variable local dominance in montane grasslands: Stipa spartea, Festuca ovina, Stipa richardsonii, Danthonia intermedia, Agropyron subsecundum; Sporobolus heterolepis common on drier sites. Graminoid cover generally greater than forb cover, but forbs common, diverse.

Classification Comments Mix of types suggests this area is transition zone from low elevation grasslands to montane grasslands.

Ranking Comments Good native cover; exotics localized - mainly in drainage bottoms; hiking / horse trails.

Estimated Size (acres) 1200 ***Ranks*** **Condition** B **Size** A **Context** B **Overall Rank** B

Ownership Black Hills National Forest, mostly within Deerfield Lake Recreation Area

Table 6. Montane grassland candidate conservation sites (overall rank of B or better)

State WY **County** Crook **Legal Description** T50N R60W Sec 4, 5

Survey Site Sand Creek Headwaters

USGS 7.5' Quad(s) Old Baldy Mt.

Directions Cement Ridge at head of Sand Cr., ca. 15 air mi. ESE of Sundance, WY.

Vegetation Description Forb-rich grassland on rocky summit ridge; more common graminoids include Festuca ovina, Nassella viridula, Koeleria macrantha; Poa pratensis locally common. Forb rich, with Achillea millefolium, Heterotheca villosa, Geum triflorum and Anemone patens most common.

Classification Comments Forb-rich grassland on rocky soils derived from Tertiary intrusive rocks - differs somewhat in composition from Limestone Plateau stands.

Ranking Comments Good native cover; grazing, gravel road, fire lookout, exotics occasional.

Estimated Size (acres) 80 ***Ranks*** **Condition** B **Size** B **Context** B **Overall Rank** B

Ownership Black Hills National Forest

State SD **County** Pennington **Legal Description** T2S R2E Sec 8, 9, 14, 15, 16, 17, 18, 19

Survey Site Upper Gillette Canyon

USGS 7.5' Quad(s) Ditch Creek, Preacher Springs, Dead Horse Flats

Directions Gillette Canyon upstream from Custer-Limestone Rd. (284); ca. 7 air mi. W of Bear Mt. Lookout. Next site upstream is Gillette Cyn. Headwaters - above private land in Sec 14; site downstream is Middle Gillette Cyn.

Vegetation Description Graminoid-dominated grassland (ie with low forb cover compared with other stands surveyed) in drainage bottom; mainly native species; dominant graminoids are Stipa richardsonii, Danthonia intermedia, Poa pratensis, Stipa spartea; Sporobolus heterolepis co-dominant on drier spots. Upstream end of this site is forb-rich grassland similar to Gillette Canyon Headwaters site.

Classification Comments This stand has significantly less forb cover than other montane grasslands surveyed.

Ranking Comments Good native cover; few exotics; gravel road along margin of middle part. This stand has far less forb cover than most seen - is this a better condition?

Estimated Size (acres) 500 ***Ranks*** **Condition** AB **Size** A **Context** B **Overall Rank** AB

Ownership Black Hills National Forest, private (not surveyed)

Table 5. Montane grassland candidate conservation sites (overall rank of B or better)

State WY **County** Crook **Legal Description** T52N R63W Sec 19, 20, 29

Survey Site Warren Peaks

USGS 7.5' Quad(s) Sundance West

Directions Summits of Warren Peaks in southern Bear Lodge Mountains, ca. 6 air mi. NNW of Sundance.

Vegetation Description Large grasslands on "bald" summits; heterogeneous in composition; heavier graminoid cover on northerly aspects; less cover, more forbs on southerly aspects especially where rocky. Dominant graminoids locally variable: Danthonia intermedia, Agropyron subsecundum, Nassella viridula, Festuca ovina, Koeleria macrantha, Carex heliophila; Poa pratensis locally common on more mesic sites. High forb diversity; more common forbs include Heterotheca villosa, Geum triflorum, Thermopsis rhombifolia.

Classification Comments Forb-rich grassland on rocky granitic soils (inclusion in Tertiary magma) - differs somewhat in species composition from Limestone Plateau stands.

Ranking Comments Good native cover overall, but exotics locally common; fire lookout and old Air Force installation; grazed; old 2-track roads; major gravel road (and paved road from Sundance); old mining exploration remains; some areas heavily grazed.

Estimated Size (acres) 800 ***Ranks*** **Condition** B **Size** A **Context** B **Overall Rank** B

Ownership Black Hills National Forest, private (not surveyed)

Black Hills Montane Grassland Plant Association Description

With extensive survey and sampling in 1998 and 1999, we now have a better understanding of montane grassland composition and habitat. At one time there probably were two distinct associations corresponding to McIntosh's low meadow and well-drained slopes phases, but the native form of the more mesic phase appears to be gone. The Black Hills montane grassland association as described here includes the well-drained slope phase of McIntosh, as well as somewhat more mesic stands found in drainage bottoms in the southern part of the study area.

Classification, Global Distribution and Status

COMMON NAME: Black Hills montane grassland
SCIENTIFIC NAME: *Sporobolus heterolepis - Stipa richardsonii - Danthonia intermedia* Herbaceous Vegetation
NATURAL HERITAGE NETWORK GLOBAL CODE: CEGL002240
GLOBAL DISTRIBUTION: Black Hills in western SD and northeastern WY
NATURAL HERITAGE NETWORK ELEMENT RANK: G1S1 (globally- and state-imperilled)

Black Hills montane grassland is endemic to the Black Hills. It is equivalent to the mountain meadow stage of McIntosh (1930), a successional stage found on low ground in mountain valleys in the "Limestone District" (now called the Limestone Plateau). McIntosh recognized two phases: a lower meadow phase with timothy (*Phleum pratense*) most abundant, and a drier phase on well-drained slopes with spear-grasses (*Stipa* spp.) and prairie dropseed (*Sporobolus heterolepis)* most conspicuous. The montane grassland association described here is equivalent to the well-drained slope phase of McIntosh, but includes somewhat more mesic stands in drainage bottoms in the drier southern part of its range. McIntosh's lower meadow phase is not included in this type. Its original composition is unclear, for even in McIntosh's day stands were dominated by timothy.

Environmental Description

Black Hills montane grasslands occur at higher elevations in the western and northwestern Black Hills, where snow cover is typically present from November through April. At elevations above 6500 ft., patchy snow cover persisting through May is not uncommon. Most montane grassland habitat lies above 5900 ft., with the highest documented site at 6900 ft. However, there is a prominent north-south climatic gradient in the Black Hills, with the northern part cooler, with significantly more precipitation. Montane grasslands extend to elevations in the range of 5000 ft. in the northern Black Hills, but generally are found only above 6000 ft. in the south.

Most montane grasslands occur on bottoms and lowermost slopes of broad drainages on the Limestone Plateau, on sites ranging from flat to moderately sloping with variable aspect (Fig. 4 - 9). There are some significant exceptions. Slate and

Reynolds Prairies in the Central Core zone northwest of Hill City, SD, are large grasslands on rolling uplands underlain by Precambrian schist and slate. Cement Ridge and Warren Peaks in the northwestern Black Hills in WY, are non-forested ridgecrests and summits underlain by Tertiary igneous rocks and granitic inclusions. Stand composition is similar to stands on the Limestone Plateau to the south, with some differences (see Vegetation Description below).

Vegetation Description

Black Hills montane grasslands usually are graminoid-dominated but forb-rich (Fig. 5). Overall cover is in the 60-100% range. The ratio of graminoid cover to forb cover is variable, ranging from 3:1 to 2:1 at most sites surveyed. Some stands were found with forb cover greater than graminoid cover (see discussion of grazing impacts below). A single large stand of montane grassland surveyed in Gillette Canyon in the south part of the Limestone Plateau was strongly graminoid-dominated, with forbs contributing less than 20% of the overall cover (Fig. 6).

The Black Hills montane grassland association as currently defined includes several phases. On the driest sites, including slopes, ridgecrests, summits and rockier areas in drainage bottoms, overall cover typically is in the 50-75% range (Fig. 7). Dominant graminoids include prairie dropseed (*Sporobolus heterolepis*), Richardson's needlegrass (*Stipa richardsonii*) and timber oatgrass (*Danthonia intermedia*). Bearded wheatgrass (*Agropyron subsecundum*) and porcupine grass (*Stipa spartea*) are commonly present. On more mesic sites in drainage bottoms, overall cover is often 100% (Fig. 8). Dominant graminoids vary, but often include Kentucky bluegrass (*Poa pratensis*) and green needlegrass (*Nassella viridula*) in addition to those listed above. Prairie dropseed is absent in these more mesic situations.

Timothy, a non-native hay grass, often is present in montane grassland habitat in drainage bottoms, varying from occasional to overwhelmingly dominant. It is less common in the southern part of the study area. Stands strongly dominated by timothy are common and extensive in drainage bottoms from Castle Creek north. Smooth brome (*Bromus inermis*) is equally abundant in drainages in the northwest part of the study area in WY. There is little information regarding the native composition of these mesic mountain meadows, for even in McIntosh's day stands were dominated by timothy. In the most mesic sites surveyed during this project that were not heavily dominated by timothy or smooth brome, green needlegrass and Kentucky bluegrass were the grasses most commonly found.

Black Hills montane grasslands have been described as forb-rich since the time of Custer's explorations (Frost 1979). As currently defined, the type includes a range of forb dominance, which may be induced to some degree by grazing. Stands that are strongly forb-dominated probably are artifacts of grazing, as evidenced by the abundance of native increasers, especially rigid goldenrod (*Solidago rigida*). A single stand of montane grassland surveyed in Gillette Canyon in the southwest part of the Limestone Plateau was strongly graminoid-dominated, with forbs contributing less than 20% of the overall cover (Fig. 6). Overall utilization was low with seed heads

remaining on most grasses. It may be that in the absence of grazing, the Black Hills montane grassland association is not as forb-rich as it currently appears to be.

The forb component of stands typically is diverse, often with more than 25 species in a 10 x 10 m plot. Consistently common species include sticky geranium (*Geranium viscossismum*), three-veined fleabane (*Erigeron subtrinervis*), prairie smoke (*Geum triflorum*), purple meadow-rue (*Thalictrum dasycarpum*), and several cinquefoils (*Potentilla* spp.). Non-native clovers are the most common exotic forbs found in montane grasslands, and can be locally abundant and extensive. In wetter drainages, canada thistle (*Cirsium arvense*) often was abundant in meadows surveyed.

In the southern part of the study area (south of Castle Creek), shrub cover may be locally significant in montane grasslands (Fig. 8). Both western snowberry (*Symphoricarpos occidentalis*) and shrubby cinquefoil (*Pentaphylloides floribunda*) are occasional grassland components that increase with heavy grazing. The former appears to be more common in drainage bottoms, the latter on lower slopes.

Two geographical variants of Black Hills montane grassland have been documented. Within the Central Core just east of the Limestone Plateau, montane grasslands occur in mosaics with other prairie types on the rolling rocky uplands of Reynolds and Slate Prairies. Montane grassland patches included sheep fescue (*Festuca ovina*) and little bluestem (*Schizachyrium scoparium*) as local dominants, as well as the more typical graminoids. The mix of types found at these sites suggest that this is a transition zone from lower elevation grasslands to montane grassland habitat. In the northwestern Black Hills in WY, extensive grasslands occur on the summits of Cement Ridge (6600 ft. elev.) and Warren Peaks (6650 ft. elev.), in areas underlain by igneous rocks. Stands are similar to those found on the Limestone Plateau to the south, but sheep fescue is co-dominant, and prairie dropseed is absent.

Black Hills montane grasslands are typically large. Surveyed stands ranged in size from 10 to over 1000 acres. Stands in the smaller size range occur in narrow drainage bottoms and in forest openings. Larger stands occupy broad drainage bottoms, rolling uplands, ridgecrests and summits.

Where Black Hills montane grassland occurs in broad drainage bottoms, the slopes above typically have forests dominated by white spruce (*Picea glauca*) on north-facing slopes and ponderosa pine (*Pinus ponderosa*) on other aspects (Fig. 9). Small stands of quaking aspen (*Populus tremuloides*) are commonly found along grassland margins (Fig. 8). Aspen stands are more frequent and larger in the northern part of the study area. Montane grasslands may include riparian and wetland vegetation where surface or shallow subsurface water is present. However, many of the drainages on the Limestone Plateau are dry, or may have a few springs at most.

Black Hills montane grassland also occurs on rolling uplands, the two largest examples being Reynolds and Slate Prairies northwest of Hill City, SD. At these sites, montane grassland occurs as patches in mosaics with several other prairie types and small stands of ponderosa pine. In the northwestern Black Hills, montane grassland on the summit of Cement Ridge is surrounded by ponderosa pine. At Warren Peaks, also in the northwestern Black Hills, ponderosa pine and aspen occur on the slopes below the large montane grasslands on the summits.

Figure 5. Forb-rich montane grassland inside grazing exclosure; Castle Creek near junction of Forest Service Road 117 and Deerfield Road (Marriott photo; August 1999).

Figure 6. Black Hills montane grassland with strong graminoid dominance; forb cover at this site was less than 20% overall. Upper Gillette Canyon, along Forest Service Road 296 (Marriott photo; August 1999).

Figure 7. More xeric phase of Black Hills montane grassland on lower slopes and rockier sites in drainage bottom; prairie dropseed co-dominant. Gillette Canyon headwaters (Marriott photo, August 1999).

Figure 8. Black Hills montane grassland on drainage bottom and lowermost slopes; more mesic phase with greater cover and prairie dropseed absent. Gillette Canyon headwaters (Marriott photo, August 1999).

Figure 9. Shrubby cinquefoil in montane grassland on lower slopes; quaking aspen on grassland margins. West of Crows Nest Peak near Forest Service Road 117 (Marriott photo; August 1999).

Figure 10. Stands of white spruce and ponderosa pine on slopes above montane grassland. Upper Ditch Creek along Forest Service Road 291 (Marriott photo; August 1999).

Discussion

Survey in 1998 and 1999 confirmed that Black Hills montane grassland is among the most endangered of vegetation types found in the area. Of 76 stands visited, only 26 were considered of sufficient quality for in-depth survey, and of these, only seven were considered conservation priorities with overall ranks of B or better. The most common factors behind down-ranking were heavy burdens of exotics (especially timothy, smooth brome, non-native clovers and canada thistle), heavy utilization by livestock, heavy cover of native increaser species (especially rigid goldenrod and western snowberry), cultivated fields, gravel and dirt roads, and residences and other developments. In addition to existing developments, subdivision for summer and year-round residences has become a significant threat to remaining montane grasslands. Two of the larger grasslands seen on private lands in 1999 had been subdivided, with lots for sale.

At one time there probably were two distinct plant associations corresponding to McIntosh's low meadow and well-drained slopes phases of montane grassland, but the native form of the more mesic phase appears to be gone. All stands surveyed during this project that had sufficient native cover for classification fell within the more xeric type. There is little information available regarding native composition of the lower meadow phase, for even in McIntosh's day these stands were dominated by timothy. Timothy meadows remain abundant and extensive in the Black Hills, especially in the northern half of the study area.

Conservation and Management Needs

Protection of Black Hills montane grassland remains one of the highest conservation concerns in the Black Hills. The seven survey sites with montane grassland stands ranked B or better (Table 5) should be considered high priority conservation targets by agencies and organizations concerned with protection of biodiversity in the Black Hills. An additional five stands were ranked B?, indicating lower confidence levels; lower ranks may be appropriate, and more information is needed before choosing these sites as conservation targets. The nine stands ranked BC or BC? might qualify as conservation targets, especially if they occur in conjunction with high-ranking stands of other vegetation types. More detailed information about these sites is available from the SD Natural Heritage Program and the WY Natural Diversity Database, where copies of all survey forms and maps are on file.

Subdivision, road construction and other developments are obvious threats to montane grasslands in the Black Hills. However, appropriate grazing management is equally important to maintain and improve remaining montane grasslands. Over-utilization leads to heavy forb dominance, dominance of native increasers such as rigid goldenrod and western snowberry, and greater burdens of exotics. All of the higher-ranked montane grasslands are located in the drier southern Black Hills, where lack of water has led to less livestock use. Managing agencies should not be tempted to develop water at these sites to improve conditions for livestock. Also of concern are

high-intensity, short-duration rotational grazing systems that have been instituted on some allotments in the area. While these highly-managed systems may increase overall range production and species diversity, such increases will be based on increased forb cover, including invasion by exotics in the area.

Additional Survey Needs

Many of the sites identified as potential montane grassland habitat were surveyed in some fashion in 1998 and 1999 (76 out of 93 potential sites). Of those that remain unsurveyed, only a few are thought to possibly have stands of sufficiently quality for in-depth survey. The others are either in the northernmost part of the study area where meadows were found to be of consistently-poor quality, or in the southernmost part of the study area at elevations now known to be too low for montane grassland. Unsurveyed sites are listed in Table 6, with comments as to potential for montane grasslands.

Also of interest are high-elevation grasslands that develop on steeper slopes following fires with high tree mortality. These grasslands have not been surveyed, and their relationship to the Black Hills montane grassland type is not known.

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State SD **County** Lawrence **Legal Description** T4N R1E Sec 19, 20, 30

USGS 7.5' Quad Old Baldy Mt.

Directions Buffalo Park, Geranium Park, McGeorge Spr. downstream to state line; ca. 6 air mi. NNW of Hwy 85 at O'Neil Pass.

Comments Other drainages surveyed in this area have heavy burdens of exotics.

State SD **County** Lawrence **Legal Description** T4N R1E Sec 7, 17, 18

USGS 7.5' Quad Old Baldy Mt.

Directions Wagon Canyon Spring, Stearns Park; ca. 8 air mi. NNW of US Hwy. 85 at O'Neil Pass.

Comments Other drainages surveyed in this area have heavy burdens of exotics.

State SD **County** Lawrence **Legal Description** T3N R1E Sec 5, 6, 7, 8, 16, 17; T4N R1E Sec 31, 42

USGS 7.5' Quad Old Baldy Mt., Buckhorn

Directions Riflepit drainage E and SE of state line; ca. 4 air mi. NNW of US Hwy. 85 at O'Neil Pass.

Comments Many other drainage bottoms surveyed in this area have heavy burdens of exotics; slopes tend to be better.

State SD **County** Lawrence **Legal Description** T3N R2E Sec 6; T4N R2E Sec 31; T4N R1E Sec 35, 36

USGS 7.5' Quad Savoy

Directions Dead Ox Cr., Raddick Gulch, W of upper Spearfish Cr.; ca. 11 air mi. SW of Lead, SD.

Comments Other drainages surveyed in this area have heavy burden of exotics.

State SD **County** Lawrence **Legal Description** T4N R1E Sec 22, 23, 24, 26, 27

USGS 7.5' Quad Savoy

Directions Dry Gulch headwaters S of Little Spearfish Cr. ; ca. 11 air mi. WSW of Lead, SD.

Comments Other drainages surveyed in this area have heavy burden of exotics.

State SD **County** Pennington **Legal Description** T1N R1E Sec 23, 26, 34, 35

USGS 7.5' Quad Crows Nest Peak

Directions Headwaters of Redbird Draw, N of FS Rd. 294; ca. 9.5 air mi. ESE of Four Corners, WY.

Comments Mix of public, private; no road; Redbird Draw survey site is downstream - upper end is only fair condition (improves downstream).

State SD **County** Pennington **Legal Description** T1N R1E Sec 27, 28, 34

USGS 7.5' Quad Crows Nest Peak

Directions Jenks Draw, along FS Rd. 117 N of Rd. 294; ca. 9 air mi. SE of Four Corners, WY.

Comments Private; agricultural use seen from road.

State SD **County** Pennington **Legal Description** T1N R3E Sec 27, 28, 33

USGS 7.5' Quad Deerfield

Directions Dutchman Cr. drainage ca. 2 air mi. SSE of Deerfield Dam.

Comments Non-forested uplands; from Deerfield Rd., looks similar to Slate, Reynolds Prairies - mix of grassland types.

State SD **County** Pennington **Legal Description** T2N R3E Sec 31, 32, 33; T1N R3E Sec 4; T2N R2E Sec 25, 26, 36

USGS 7.5' Quad Deerfield

Directions N Fork Castle Cr. from confluence with Castle Cr. upstream to near head; ca. 6 air mi. NNW of Deerfield Dam.

Comments Mostly private except upper end.

Table 6. Potential montane grassland sites NOT surveyed: sorted by state, county.

State SD **County** Pennington **Legal Description** T1S R3E Sec 5, 8, 9; T1N R3E Sec 32
USGS 7.5' Quad Ditch Creek
Directions Gold Run NW of Gillette Prairie; ca. 3.5 air mi. S of Deerfield Dam.
Comments Other drainages surveyed in this area have heavy burdens of exotics.

State SD **County** Pennington **Legal Description** T1S R3E Sec 10, 15, 16, 22, 23
USGS 7.5' Quad Ditch Creek, Medicine Mountain
Directions Gillette Prairie
Comments Private; upland; probably similar to Slate, Reynolds Prairies.

State SD **County** Pennington **Legal Description** T1S R3E Sec 1, 2, 11; 1N Sec 36
USGS 7.5' Quad Medicine Mountain
Directions Slate Cr. drainages NE of Gillette Prairie; ca. 8 air mi. WNW of Hill City, SD.
Comments Probably too low for montane grassland (5800-6000); lower part very weedy.

State SD **County** Pennington **Legal Description** T1S R1E Sec 20, 21, 29
USGS 7.5' Quad Moon
Directions Upper Thompson Cyn. ca. 1 mi. W of Moon, SD; ca. 11 air mi. NE of Newcastle, WY.
Comments Private; small; may be too low (5800-6100).

State SD **County** Pennington **Legal Description** T1S R1E Sec 9, 17
USGS 7.5' Quad Moon
Directions Upper Stots Cyn. ca 1.5 mi. NNW of Moon, SD; ca. 12 air mi. NE of Newcastle, WY.
Comments Private; small.

State SD **County** Pennington **Legal Description** T1S R1E Sec 32
USGS 7.5' Quad Moon
Directions Upper Kinney Cyn. ca 2.5 mi SSW of Moon, SD; ca. 11 air mi. NE of Newcastle, WY.
Comments Private; small; may be too low (5900-6000).

State SD **County** Pennington **Legal Description** T1S R2E Sec 7, 17, 18, 19, 20
USGS 7.5' Quad Preacher Spring
Directions Redbird Canyon N of Sixmile Rd. (FS Rd. 301); ca. 8 air mi. SW of Deerfield Dam.
Comments Redbird Canyon S of Sixmile Rd. is mix of natives, exotics and is grazed; condition improves going S.

State WY **County** Crook **Legal Description** T49N R60W Sec 29, 30
USGS 7.5' Quad Buckhorn
Directions Lost Canyon ca. 4 air mi. W of US Hwy. 85 at O'Neil Pass; downstream to 6000 ft. elev.
Comments Private; other drainage bottoms in area have heavy burdens of exotics; slopes often better.

Appendix A.
Sample Field Forms

Form 2: Community Ranking and General Description Draft: Spring, 1997

A. Identifiers / Location (general EOR information)

Sci.name: 1. SNAME: _____

2. GNAME: _____

3. GNAME.TRANS: _____

4.Site name: _____ 4a. Sitecode: _____

5.Survey site name: _____

6.Quad name/scale(s): _____

6a. Quad code(s): _____ 7. County name(s): _____ 8.County code(s): _____

9.Town (LOCALJURIS): _____ 9a. T/R/S: _____ 10. Lat/Long: _____ 11. Photos: _____

12. Directions: _____

13. Sourcecode: _____ 14.Survey date: ____.____.____ 15. Last obs: ____.____.____ 16.First obs: ____.____.____ 17.State: _____

18.Surveyors: _____

B. General Community Description (General EOR information)

19.Transect: _____ 20. Observation point number: _____ 21. Size: _____

22. Community Description (HETEROGENEITY): (brief word picture of community; include characteristic spp., inclusion of other communities. If community occurs as mosaic, depict spatial distribution and associated community types) _____

23.Fauna.note: _____

24.Evidence of community processes: _____

25.General description (Describe landscape context of EO (GEN DESC)): _____

26.Management comments and monitoring needs (MGMTCOM): _____

27. Maintenance comments (PROTCOM): _____

28.Owner(s): _____

29.Owner comments (OWNERCOM): _____

30.Comments: _____

C. Specific community description (EOR-C information)

31. Minimum elevation: _____ ft. 32. Maximum elevation: _____ ft. 33. Topo.position: _____ 34. Slope: _____ 35. Aspect: _____

36. Survey type: _____ 37. Landform: _____

38. Geology comments: _____

39. Soil type: _____ 40. Soil moisture: _____

41. Hydrological influence: _____

42. Cow. System: _____ Terrestrial _____ Palustrine _____ Estuarine 43. Physiognomic class: _____ 44. Leaf phenology: _____

45: Strata/life form:

	height	% cover	most abundant species	diagnostic species	other species
Emergent tree					
Tree Canopy					
Tree sub-canopy					
Tall shrub					
Short shrub					
Herbaceous					
Non-vascular					
Epiphyte / liana					
Unvegetated surf.					

D. Element occurrence ranking information

46. Succession.com : Age, successional stage: _____

47. Disturbance.com / Condition.com:

a. Known land use history: _____

b. Inferred land use history: _____

c. Other anthropogenic or unnatural disturbance: _____

d. Pesticides (known or suspected): _____

e. Presence of invasives: _____

f. Alterations in natural processes: _____

g. Other factors: _____

h. Integrity / fragmentation of community: _____

48. Landscape.context.rating: _____

49. Size.rating: (indicate size relative to other occurrences and whether full extent of occurrence is known): _____

50. Potential impacts (on-site): _____

51. Potential impacts (off-site): _____

52. EO Rank: comments: _____

53. (Overall) Element Occurrence Rank: _____ 54. EORANKDATE: _____

A. Identifiers / Location (general EOR information)

Sci. name: 1.SNAME: _____
2.GNAME: _____
3.Site name: _____ 3a.Site #: _____
4.Survey site name: _____
5.Quad name(s): _____ 6.Quad code/scale(s): _____
7.County name(s): _____ 8.County code(s): _____
9.Town (LOCALJURIS): _____
10.Lat: __ __ __ __ __ __ N 11.Long: 0 __ __ __ __ __ __ W 12.Directions: _____

13.Sourcecode: _____ 14.Survey date: _____.___.___
15.Last obs: _____.___.___ 16.First obs: _____.___.___ 17.State: _____
18.Surveyors: _____

B. ENVIRONMENTAL DESCRIPTION

19.Transect / Observation point #	20.Image annotation #	21.Elevation:
22.Topographic position: __Interfluve __Backslope __High slope __Step in slope __High level __Lowslope __Midslope __Toeslope __Low level __Channel wall __Channel bed __Basin __Other	23.Topographic sketch:	24.Slope degrees: _____ 25.Slope aspect: _____ 26.Parent material: 26a:Landform:
27.Soil profile description: note depth, texture, and color of each horizon. Note significant changes such as depth to mottling, depth to water table, root penetration depth (SOILCOM) 28.Organic horizon depth: _____ 29:Organic horizon type: _____ 30.Average pH of mineral soil: _____	31.Soil moisture regime: __Extremely dry __Somewhat wet __Very dry __Wet __Dry __Very wet __Somewhat moist __Permanently inundated __Moist __Periodically inund.	32.Stoniness: __Stone free <0.1% __Moderately stony 0.1-1% __Stony 3-15% __Very stony 15-50% __Exceedingly stony 50-90% __Stone piles >90%
	33.Soil drainage: __Excessively drai. __Somewhat poorly drained __Well drained __Poorly drained __Moderately well drained __Very poorly drained	34.Average texture: __ sand __ clay loam __ sandy loam __ clay __ loam __ peat __ silt loam __ muck __ other _____
	34a.Inundation: __Never inundated __Periodic inundation, frequency unknown __Infrequently inundated __Always submerged by shallow water < 30 cm __Regularly inundated __Always submerged by deep water > 30 cm __Frequently inundated for periods greater than 6 months	
	35.Unvegetated surface: ____ % Bedrock ____ % Litter, duff ____ % Large rocks (cobbles, boulders > 10 cm) ____ % Wood (> 1 cm) ____ % Small rocks (gravel, 0.2-10 cm) ____ % Water ____ % Sand (0.1-2 mm) ____ % Other: _____ ____ % Bare soil	
	36.Environmental Comments: Note homogeneity of vegetation, erosion / sedimentation, inundation, etc. 37.Plot representativeness:	

C. VEGETATION 38.Cowardin System: ___ Terrestrial ___ Palustrine ___ Estuarine 39. Plot #:_____ 40.Plot size:_____

41.Leaf type:	42.Leaf phenology:	43.Physiognomic type:
__Broad-leaf	__Deciduous	__Forest
__Semi-broad-leaf	__Semi-Deciduous	__Woodland
__Semi-needle-leaf	__Semi-Evergreen	__Shrubland
__Needle-leaf	__Evergreen	__Dwarf-shrubland
__Graminoid	__Perennial	__Herbaceous
__Broad-leaf herbaceous	__Annual	__Sparse vascular
__Pteridophyte		__Other_____

44.	height	% cover
T1 Tree canopy		
T2 Tree sub-canopy		
S1 Tall shrub		
S2 Short shrub		
H Herbaceous		
N Non-vascular		
E Epiphyte		
V Vine / liana		

Appendix B. Scientific and common names for plant species referred to in text.

Agropyron subsecundum	bearded wheatgrass
Cirsium arvense	canada thistle
Danthonia intermedia	timber oatgrass
Erigeron subtrinervis	three-veined fleabane
Festuca ovina	sheep fescue
Geranium viscossismum	sticky geranium
Geum triflorum	prairie smoke
Nassella viridula	green needlegrass
Phleum pratense	timothy
Picea glauca	white spruce
Pinus ponderosa	ponderosa pine
Poa pratensis	Kentucky bluegrass
Populus tremuloides	quaking aspen
Potentilla spp.	cinquefoil
Schizachyrium scoparium	little bluestem
Sporobolus heterolepis	prairie dropseed
Stipa richardsonii	Richardson's needlegrass
Stipa spartea	porcupine grass
Stipa spp.	spear- or needlegrasses
Symphoricarpos occidentalis	western snowberry
Thalictrum dasycarpum	purple meadow-rue
Trifolium hybridum	Alsike clover
Trifolium pratense	red clover
Trifolium repens	white clover