

NEBRASKA NATIONAL FORESTS AND GRASSLANDS

MONITORING REPORT: 2021



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Cover Photo: Fort Pierre Geographic Area. Photo August 2021 by Dan Svingen.

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EXECUTIVE SUMMARY

The USDA Forest Service's Nebraska National Forests and Grasslands (NNFG) administers 1,100,000 acres in Nebraska and South Dakota. Management is conducted under the guidance of a "Land and Resource Management Plan" (LRMP). This report addresses a portion of the LRMP's 33 monitoring questions and provides recommendations based on that data.

On-the-ground monitoring is needed along several stream segments in the Fall River Northeast, Fall River Southeast, Wall North, and Wall Southwest Geographic Areas. Current management of the Bighorn Sheep Management Areas in the Pine Ridge Geographic Area is achieving desired conditions and should continue.

Most prairie dog population and distribution objectives are not being met due to the impact of sylvatic plague. Management and research efforts to reduce plague impacts should continue. Prairie grouse management efforts in the Fort Pierre Geographic Area are achieving LRMP objectives and should continue, but increased efforts should be made to expand native vegetation.

Blowout penstemon, a federally endangered wildflower, is increasing due to propagation at the Bessey National Nursery and out-planting by NNFG and collaborator staffs. That work should continue. Efforts to maintain/restore grassland vegetative diversity in the Bessey and McKelvie Geographic Areas should continue as they likely benefit the American burying beetle (a federally threatened insect).

An examination of recreation opportunities across the NNFG showed excessive recreational demand, particularly in the Bessey and Wall Southeast Geographic Areas. Additional analysis should be conducted there. In the Soldier Creek Wilderness, livestock disturbance should be reduced in riparian areas. Temperature and precipitation changes in Nebraska and South Dakota are expected to further increase weather volatility; this should be considered in future management decisions.

The LRMP established objectives for a diversity of herbaceous vegetative structure. Based on data from the Fort Pierre Geographic Area, collaborative efforts at unbalancing livestock rotations to help achieve that diversity are useful and should be expanded. Soil health management should focus on reducing the impacts of motorized traffic across the NNFG.

Overall, the NNFG is meeting or making measurable progress towards most LRMP objectives. Based on the information in this report, no LRMP changes and no new LRMP assessment are recommended at this time.

Future LRMP monitoring plans should revise the current monitoring indicators, mostly to reduce redundancies and to better reflect management needs. Any future LRMP changes should also modify vegetative structure objectives for the Bessey and McKelvie Geographic Areas to better address blowout penstemon conservation.

INTRODUCTION

The USDA Forest Service's Nebraska National Forests and Grasslands (NNFG) encompass approximately 1.1 million acres of National Forest System lands in Nebraska and South Dakota (**Figure 1**).

Land management on the NNFG is guided by the "LRMP", i.e., the *Land and Resource Management Plan, Nebraska National Forest and Associated Units* (USDA Forest Service 2009). Each year, NNFG staff and cooperators conduct monitoring of that LRMP to assess whether goals, objectives and/or desired conditions are being met. This report provides an update on some of the monitoring that has occurred since our last summary was published (USDA Forest Service 2013).

THE NNFG

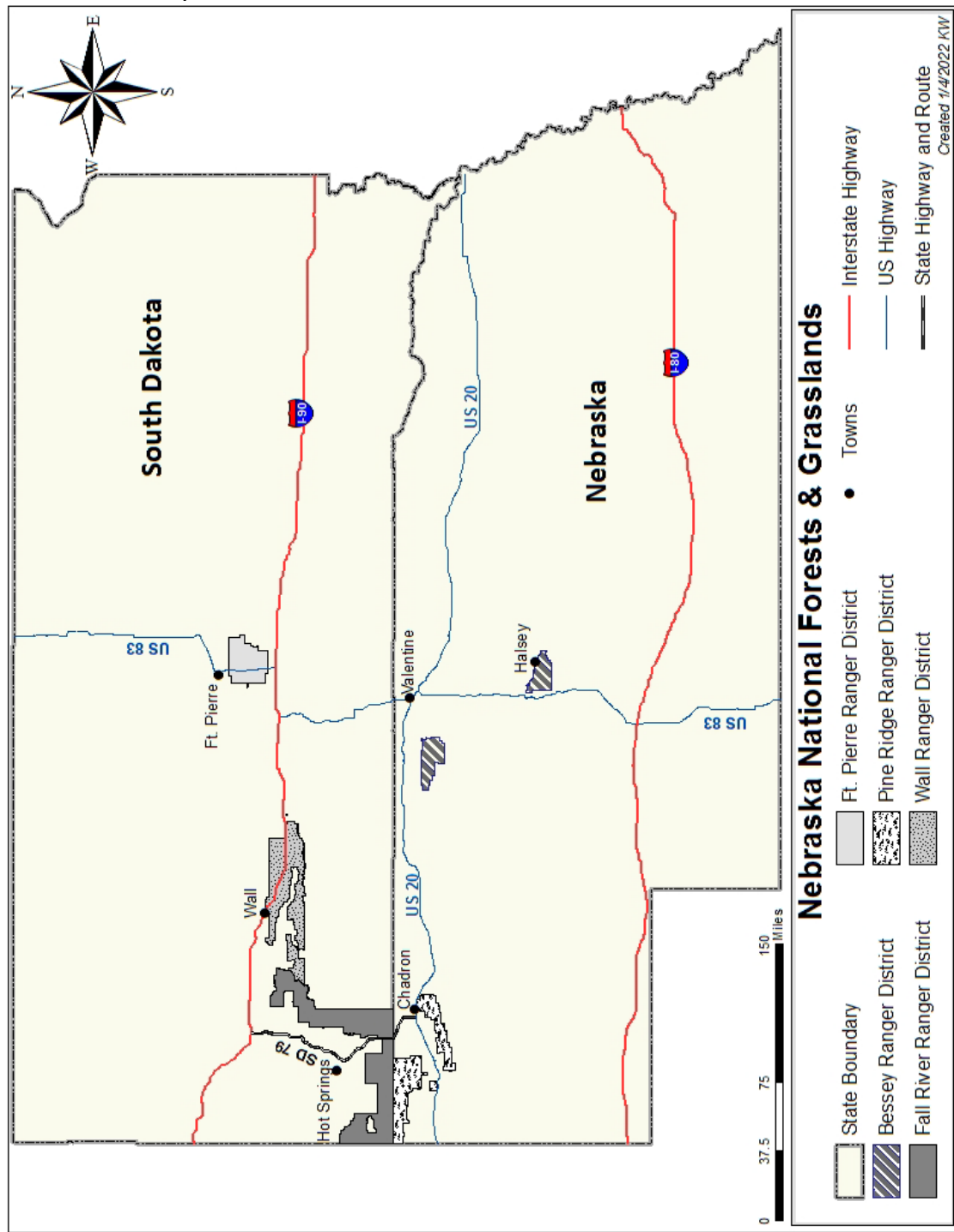
The NNFG contains three National Grasslands and two National Forests. These are administered by five Ranger Districts, which in turn are coordinated by a Supervisor's Office.

The LRMP provides management direction specific to individual "Geographic Areas". Geographic Areas are units of land where management is directed toward achieving specified desired conditions (LRMP p. G-22). Each Ranger District contains one to three Geographic Areas, as follows:

- **BESSEY RANGER DISTRICT**
 - Bessey Geographic Area
 - McKelvie Geographic Area
- **FALL RIVER RANGER DISTRICT**
 - Fall River Northeast Geographic Area
 - Fall River Southeast Geographic Area
 - Fall River West Geographic Area
- **FORT PIERRE RANGER DISTRICT**
 - Fort Pierre Geographic Area
- **PINE RIDGE RANGER DISTRICT**
 - Oglala Geographic Area
 - Pine Ridge Geographic Area
- **WALL RANGER DISTRICT**
 - Wall North Geographic Area
 - Wall Southeast Geographic Area
 - Wall Southwest Geographic Area

The LRMP also provides finer-scale direction at the "Management Area" (MA) level. MA designations indicate a particular locale's management emphasis (LRMP p. G-29). Examples include MA 1.1 (Wilderness), MA 6.1 (Rangeland with Broad Resource Emphasis), and MA 8.6 (Administrative Sites).

FIGURE 1. Map of the Nebraska National Forests and Grasslands.



OUR APPROACH

After a public participation process, the LRMP's monitoring section (i.e., Chapter 4) was revised in 2016 (see Atchley 2016 for details). That revision was necessary to comply with the 2012 Planning Rule. The 2012 Planning Rule requires, among other things, that biennial monitoring reports be produced. This report is intended to fulfill that requirement. This report is not a decision document (see 36 CFR 219.12(b)(4)).

The LRMP's revised monitoring plan (USDA Forest Service 2016) poses 33 questions structured around the required monitoring elements listed in 36 CFR 219.12(a)(5). This report discusses only some of those monitoring questions using data collected in 2021 or before. Specifically, 11 questions, in whole or in part, are addressed. These 11 questions were chosen because relevant data and specialist staff time were available. Some questions involving large data sets were subdivided, with a portion of the data being presented herein. Future reports may address additional portions of those datasets, as well as the remaining 22 questions.

We have noted the monitoring "indicators" associated with each of the monitoring questions that are discussed. The indicators were established during the 2016 revision of the LRMP's monitoring plan. An indicator is a quantitative or qualitative measure used to:

"...indicate whether or not a change to the plan, management activities, or the monitoring program, or a new assessment, may be warranted based on the new information... [and] must be used to inform adaptive management of the plan area" (36 CFR 219.12 (d)(2)).

This report was compiled by an interdisciplinary team (IDT). A summary of the IDT's monitoring findings is presented in tabular form, below. For discussion about:

- Attainment of LRMP goals and objectives (and in some cases, Desired Future Conditions), see **Table 3** (p. 50);
- Future management recommendations, see **Table 4** (p. 52);
- Future monitoring, see **Table 5** (p. 53).

For a cross-reference of this report's monitoring questions with the 2012 Planning Rule's criteria, see **Appendix 1** (p. 60). IDT members are listed in **Appendix 2** (p. 61).

For more information on the NNFG's monitoring program, or to comment on this report, contact our Supervisor's Office at: 125 North Main Street, Chadron, NE 69337; (308) 432-0300; [Nebraska National Forests and Grasslands - Home \(usda.gov\)](https://www.usda.gov/land-management/land-use-planning/nebraska-national-forests-and-grasslands).

MONITORING QUESTIONS

1. Are Streams and Waterbodies meeting State assigned Beneficial Uses and associated water quality criteria?

Indicators = NNFG streams and waterbodies meeting or exceeding state water quality criteria for assigned beneficial uses.

Both Nebraska and South Dakota state governments have recently published information on assigned beneficial uses, water quality standards, and lists of impaired and threatened waters. This report will address impaired and threatened South Dakota waters, including both streams and lakes.

South Dakota has approximately 10,000 miles of perennial rivers and streams and 87,500 miles of intermittent and ephemeral streams (South Dakota Department of Environment and Natural Resources [SDDENR] 2020). To date, South Dakota's water quality monitoring has focused on perennial systems and has found that the majority (78%) of those stream segments do not meet all beneficial uses. The most common concerns were:

- 1) Nonsupport for fish life uses, primarily caused by total suspended solids (TSS) from agricultural nonpoint sources and natural origin, and
- 2) Nonsupport for recreational uses primarily caused by *Escherichia coli* (*E. coli*) contamination from livestock and wildlife.

Listed streams found on National Forest System land managed by the NNFG are noted in **Table 1**, with locations shown in **Figure 2**. All such streams are within the Cheyenne River basin. SDDENR (2020) characterized that basin, in part, as:

"Most of the Cheyenne River drainage basin contains highly erodible soils. The landscape contributes considerable amounts of eroded sediment during periods of heavy rainfall. During normal or lower flow periods, the upper Cheyenne often exceeds irrigation water quality standards for specific conductance and sodium adsorption ratio. Most segments of the Cheyenne River are nonsupporting for *E. coli* bacteria and TSS."

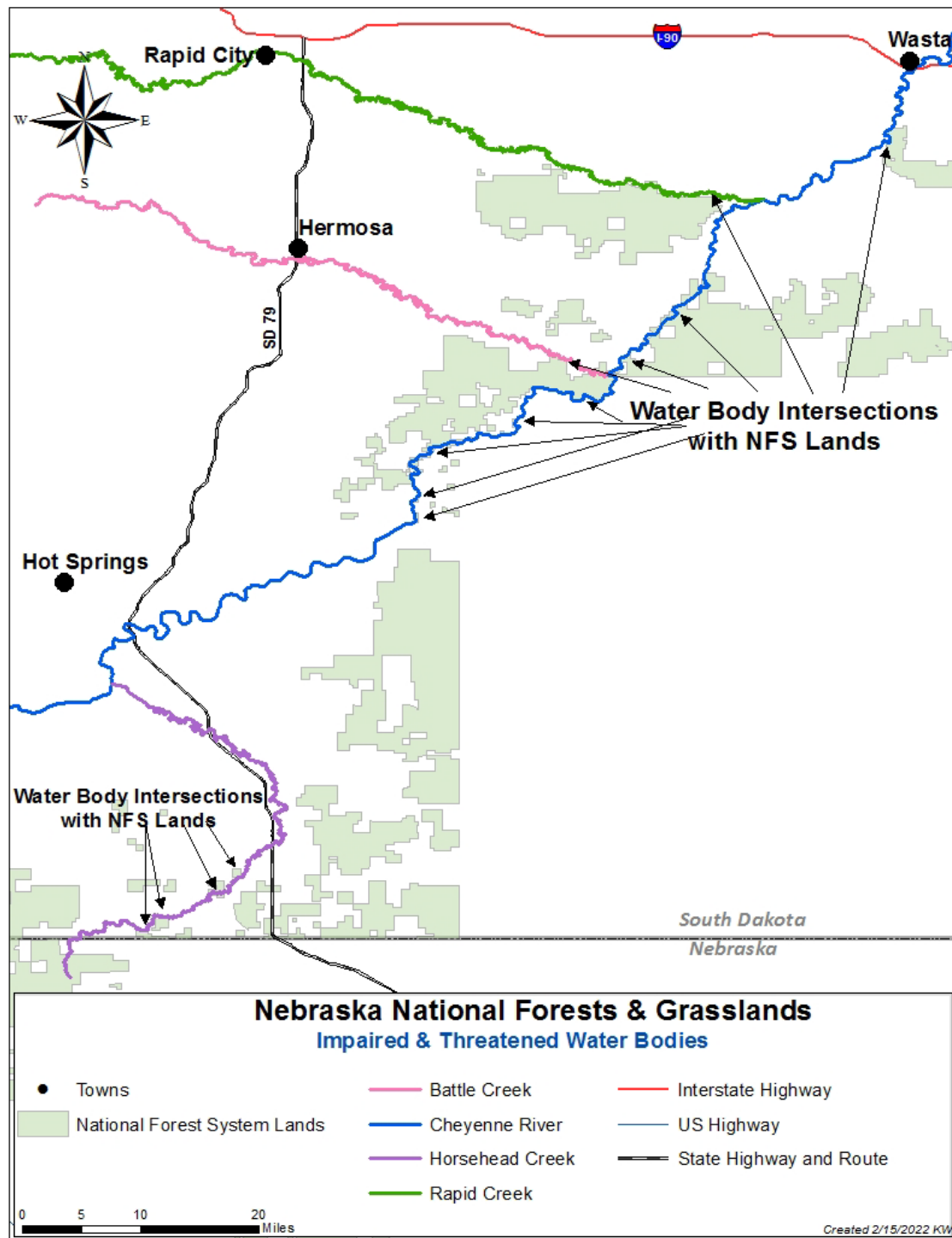
South Dakota has designated 575 lakes and reservoirs for aquatic life and recreational beneficial use classifications (SDDENR 2020). In their most recent assessment, South Dakota noted that only 9% of the lake acreage supported all assigned beneficial uses. SDDENR (2020) described these findings, in part, as:

“The low number of lakes and reservoirs meeting all assigned beneficial uses can be attributed in large part to mercury in fish tissue...the primary source of mercury in South Dakota comes from global atmospheric deposition. Therefore, the high incidence of nonsupport for lakes is not likely to improve until measures to reduce mercury are implemented at a global scale.”

Table 1. Site name and location (i.e.. Geographic Area) of South Dakota impaired and threatened water bodies on the Nebraska National Forests and Grasslands, the beneficial uses not being met, and the reason(s) for that condition.

SITE	LOCATION	NOT MET	REASONS
Battle Creek	Fall River NE	Limited Contact Recreation	E. coli/fecal coliform
Cheyenne River	Fall River NE; Wall North; Wall SW	Warmwater Semipermanent Fish; Immersion Recreation	Total Suspended solids; E. coli/fecal coliform
Horsehead Creek	Fall River SE	Irrigation	Specific Conductivity
Rapid Creek	Fall River NE	Warmwater Permanent Fish; Immersion Recreation; Limited Contact Recreation	Total Suspended solids; E. coli/fecal coliform
Sheriff Dam	Fort Pierre	Fish and wildlife propagation; Recreation; Stock Watering	Mercury in fish tissue

Figure 2. Map of southwestern South Dakota showing locations of streams listed in Table 1.



The NNFG has no current on-the-ground data available for Horsehead Creek or the mainstem Cheyenne River, but an IDT inspected Battle Creek and Rapid Creek in autumn 2021.

Battle Creek (**Figure 2**) drains a large watershed (~193,000 acres) from the east slope of the Black Hills to the Cheyenne River. The 52-mile-long stream reach from South Dakota Highway 79 to the creek's mouth is meeting all state-assigned beneficial uses except for Limited Contact Recreation (**Table 1**). That use is impaired due to E. coli/fecal coliform.

The lowest-most 1.5 miles of Battle Creek crosses National Forest System land (**Figures 2 & 3**). The National Forest System portion of Battle Creek contains several stream meanders and a flood plain forested with cottonwoods and willows. One possible source of E. coli/fecal coliform contamination there is livestock grazing. An IDT visited lower-most Battle Creek in autumn 2021. They determined that while livestock have access to the creek during a portion of the grazing season, the banks appear to be stable and functioning. No excessive livestock use was noted.

Rapid Creek (**Figure 2**) is a 128-mile-long waterway stretching from the east slope of the Black Hills to the Cheyenne River. The stream reach from Rapid City to the creek's mouth is not meeting several state-assigned beneficial uses (**Table 1**).

A 2.2-mile-long segment of Rapid Creek flows across National Forest System Land that includes two small pastures. A fence separates the pastures from the willows and cottonwoods that line Rapid Creek, but that fence is currently non-functional so livestock grazing may be a source of E. coli contamination there. An inspection of the area in autumn 2021, however, found very minor livestock impacts (**Figure 4**). Evidence of wildlife use (beaver, deer, wild turkey, etc.) was extensive.

Likely of more biological importance is the continuing impact of a historic, now defunct, railroad bridge (**Figure 5**). Rapid Creek meanders at this point and continues to excavate new sediment from a 600-foot-long bank (**Figure 6**). The ongoing erosion is likely contributing to the excessive TSS for which the creek is listed, though it is recognized that 600' is a very small fraction of the listed stream reach's 77-mile length.

Sheriff Dam is located approximately 18 miles southwest of Ft. Pierre, South Dakota. It is not used by livestock but is a popular fishing site. It was listed by the SDDENR due to high mercury levels in fish tissue. Local land management does not appear to be contributing to that limitation based on numerous on-the-ground inspections by an IDT.

RECOMMENDATIONS: IDT visits should assess the potential impacts of NNFG management on the Cheyenne River and Horsehead Creek. A more thorough review of livestock management along Battle Creek should be made. The potential to stabilize Rapid Creek near the defunct railroad bridge should be investigated. Future monitoring indicators should focus on streams and waterbodies NOT meeting beneficial uses (see **Table 5** for discussion).

Figure 3. Aerial photo of National Forest System land managed by the Nebraska National Forests and Grasslands that is within the Battle Creek watershed.

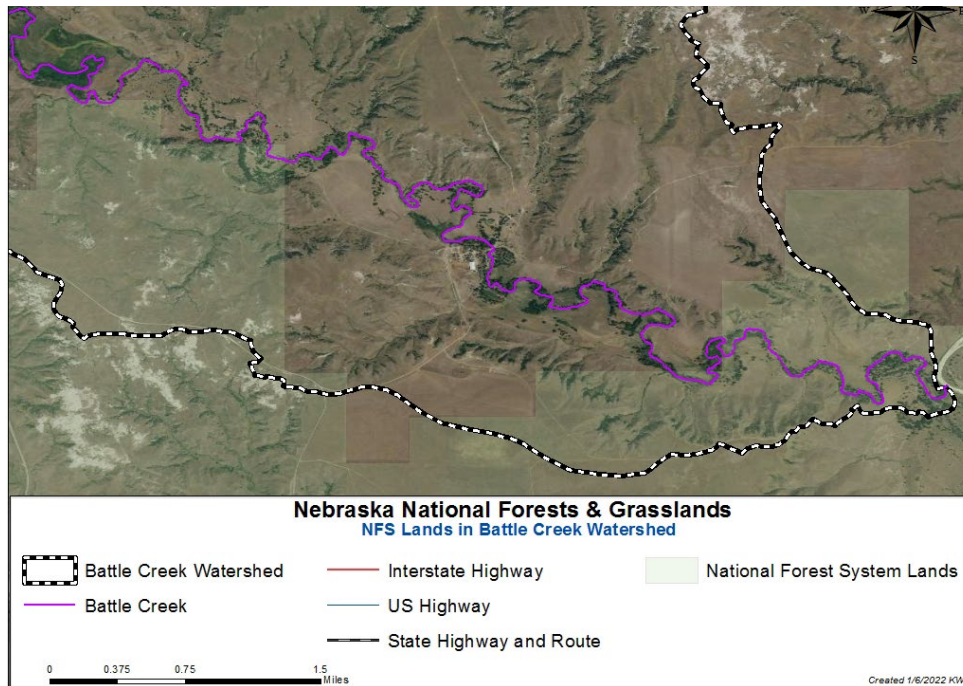


Figure 4. Rapid Creek in Cole Draw Allotment in area accessible to livestock. Note stable banks and vegetation complexity. Photo November 2021 by Julie Wheeler.



Figure 5. Rapid Creek in Cole Draw Allotment, looking downstream. Note the old railroad bridge footings and eroding bank. Photo November 2021 by Julie Wheeler.



Figure 6. Rapid Creek in Cole Draw Allotment at site of old railroad bridge, looking upstream. Note eroding bank. Photo November 2021 by Julie Wheeler.



2. Is habitat effectiveness on designated big game range being maintained or enhanced?

Indicators = Recreational and economic issue and cooperative program with state wildlife agencies.

The only designated big game range on the NNFG is the Bighorn Sheep Habitat (MA 3.51) within the Pine Ridge Geographic Area. MA 3.51 encompasses a 3,193-acre site approximately eight miles southeast of Crawford, Nebraska (**Figure 7**) and a 2,414-acre site approximately four miles south of Chadron, Nebraska (**Figure 8**). Those parcels were selected as MA 3.51 as they have the steep topography, large rock outcrops, and open terrain favored by bighorn sheep.

Bighorn sheep (**Figure 9**) were extirpated from Nebraska in about 1900 (Nordeen et al. 2019). In 1981, the Nebraska Game and Parks Commission reintroduced bighorn sheep into Fort Robinson State Park, just west of Crawford, Nebraska. Supplemental reintroductions have occurred periodically since then. Currently two small herds (named the “Fort Robinson” and “Battle Butte” herds) are present in the Pine Ridge Geographic Area. These animals regularly use the MA 3.51 unit near Crawford. The MA 3.51 unit near Chadron receives occasional use by dispersing bighorn sheep rams (Erin Considine, professional knowledge).

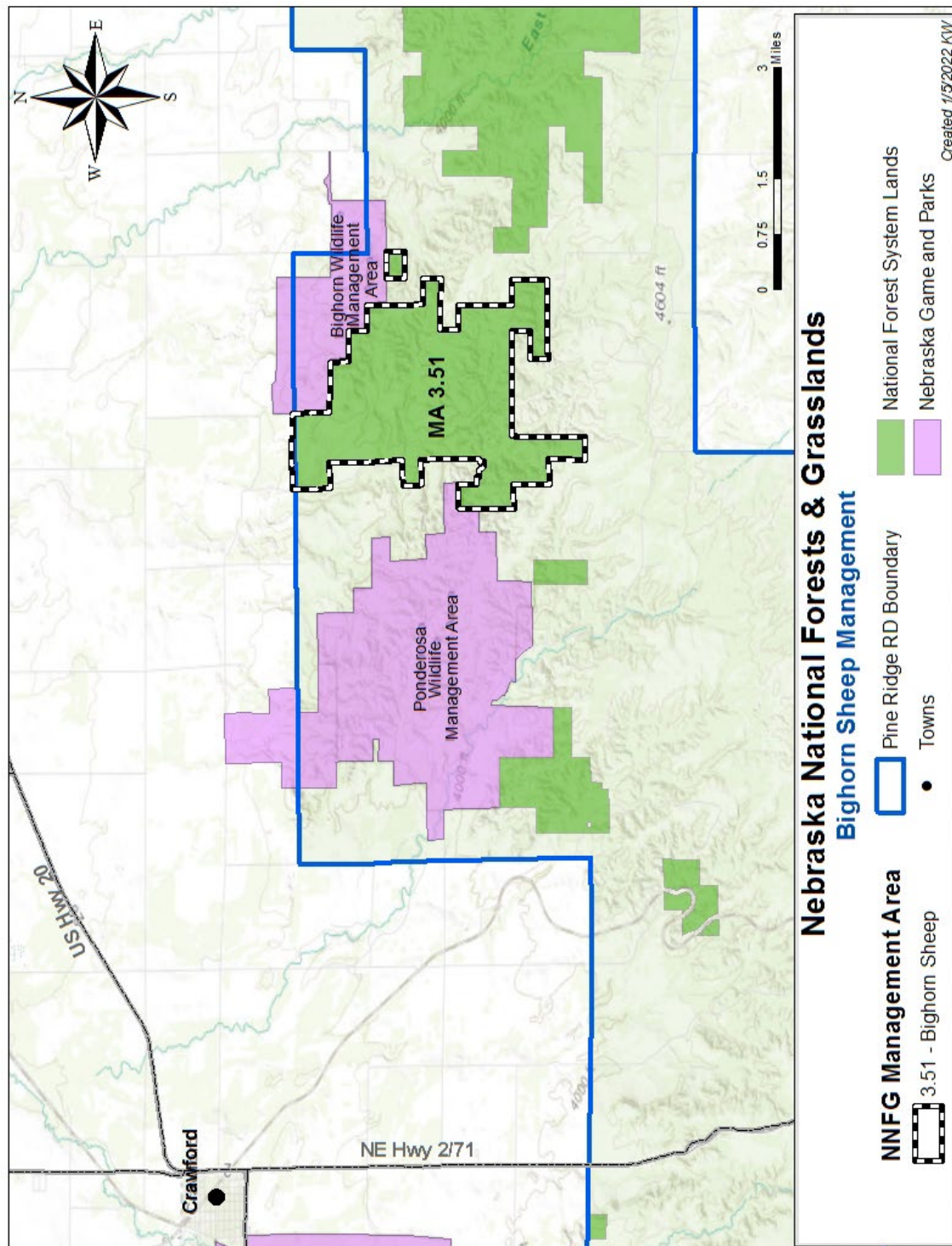
The Fort Robinson and Battle Butte bighorn sheep herds are popular with wildlife watchers as well as big game hunters. The herds are managed by the Nebraska Game and Parks Commission. Among the greatest challenges facing these (and other) bighorn herds is disease, particularly pneumonia (Nordeen et al. 2019).

Big game habitat effectiveness on National Forest System land in and near Management Area 3.51 is being maintained by limiting human disturbance through prohibiting off-road motorized travel (Darnell 2010).

Bighorn sheep habitat effectiveness in MA 3.51 has also been improved by wildfires and fuel reduction projects that have decreased woody cover. These events have helped maintain/restore the open terrain (**Figure 10**) preferred by bighorn sheep (Risenhoover et al. 1988 but see Fairbanks et al. 1987).

RECOMMENDATIONS: Continue current management but modify indicators to more properly assess this issue (see **Table 5** for discussion).

Figure 7. Management Area 3.51 (Bighorn Sheep Management) unit near Crawford, Nebraska, Pine Ridge Geographic Area.



Nebraska National Forests & Grasslands
Bighorn Sheep Management

NNFG Management Area
 3.51 - Bighorn Sheep

Legend:
 [Blue outline] Pine Ridge RD Boundary
 [Green fill] National Forest System Lands
 [Purple fill] Nebraska Game and Parks
 [Black dot] Towns

Map Labels:
 US Hwy 20, Chadron, Wilson Park, Chadron College, Maple St, Ridgeview Country Club, Goffena Rd, Buttermilk Rd, Chadron Creek, Alfred Trail Rd, Rattlesnake Butte, 3684 ft, 4225 ft, 3500 ft, US Hwy 385, Big Bordeaux Creek, N, E, W, S, 0, 0.5, 1, 2 Miles

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Figure 9. Bighorn sheep, Fort Robinson State Park, Sioux County, Nebraska. Photo courtesy of Nebraska Game and Parks Commission.



Figure 10. Looking easterly at MA 3.51 unit near Crawford, Nebraska. Note fire-killed trees & open terrain. Photo November 2021 by Erin Considine.



3. What is the status of black-tailed prairie dog to assess the functional role of colony habitat?

Indicators = historical and current acreage of active prairie dog colonies; prairie dog town occupancy, extent and density; and sylvatic plague extent and changes.

The black-tailed prairie dog (**Figure 11**) is one of the most controversial wildlife species in the Northern Great Plains. Some people advocate for the restoration of historical prairie dog populations while others call for the species' complete eradication.

The LRMP (pp. 1-3, 1-17, 1-20, 1-21, 1-22, 2-23, 2-30, 2-38, 2-48, 2-56, 2-63, 2-70, & 2-77) has extensive direction regarding prairie dog management. That direction can be summarized as:

1. Maintain viable prairie dog populations.
2. Maintain prairie dog populations within specified ranges, and
3. Control unwanted expansion of prairie dog colonies onto neighboring lands.

This monitoring question addresses the first two of these points. A different monitoring question pertains to prairie dog control. That question may be addressed in a future monitoring report.

Figure 11. Black-tailed prairie dogs. Photo by USDI Fish and Wildlife Service.



PRAIRIE DOG HISTORICAL AND CURRENT COLONY ACREAGE:

Black-tailed prairie dogs live in colonies. Approximately 58% of the NNFG is suitable for prairie dog colonies (USDA Forest Service 2001, p. 3-264). Estimates vary on how much of that habitat would have been occupied at any one time (e.g., see Knowles et al. 2002, Vermeire et al. 2004, Vichow and Hygnstrom 2002a, 2002b). If it is assumed that prairie dogs would have been present on 10%-20% of suitable habitat, then historical colony acreage on what is now the NNFG would have been ~ 63,500 to 127,000 acres.

The LRMP (pp. 2-23, 2-30, 2-38, 2-48, 2-56, 2-70, & 2-77) established colony acreage objectives for several Geographic Areas (**Table 2**). Overall, the NNFG is currently not meeting those objectives. Specifically, the NNFG-wide objective is to have 6,000 to 17,400 acres of black-tailed prairie colonies across those locations. Based on the most recent data available, there are currently 5,505 such acres.

On a Geographic Area scale, no location is above the LRMP's acreage objectives (**Table 2**). The Fort Pierre and Wall Southeast Geographic Areas are within LRMP objectives. The Fall River Northeast, Fall River West, Oglala, and Wall North Geographic Areas are below LRMP acreage objectives. Those shortfalls are a result of sylvatic plague outbreaks (see below for discussion).

Table 2. Black-tailed prairie dog colony acreage objectives within the interior management zone (IMZ), by Geographic Area, compared to actual acreages present, 2005-2020. Because data collection dates vary by Geographic Area, the reported years are approximate. IMZ = prairie dog colonies >0.5 mile from private or tribal land except in the Fort Pierre Geographic Area where IMZ = prairie dog colonies >0.25 mile from private or tribal land (Bright 2005). Acres noted for the Wall SE Geographic Area do not include Management Area 3.63 colony acreage.

AREA	OBJECTIVE	2005	2010	2015	2020
Fall River NE	1,000-2,700	1,063	359	334	34
Fall River W	1,000-3,600	191	0	731	130
Fort Pierre	1,000-3,500	1,735	1,567	1,568	1,802
Oglala	1,000-2,800	1,144	1,417	246	584
Wall N	1,000-2,100	452	406	257	561
Wall SE	1,000-2,700	1,565	1,018	998	2,394
TOTALS	6,000-17,400	6,150	4,767	4,134	5,505

The Fall River Southeast and Wall Southwest Geographic Areas do not have an LRMP acreage objective for prairie dog colonies as they contain extensive habitat designated as MA 3.63 (Black-footed Ferret Reintroduction Habitat). The black-footed ferret is an endangered species that is reliant on prairie dogs.

The LRMP (p. 2-30) objective for prairie dogs in the Fall River Southeast Geographic Area is to increase populations and distribution and to develop a colony complex.

Those objectives are not being met. As of 2019, the Fall River Southeast Geographic Area contained 643 acres of prairie dog colonies, a marked decline in both prairie dog populations and distribution. No colony complex is present. Prairie dog declines in the Fall River Southeast Geographic Area are due to plague.

The LRMP (p. 2-63) objective for prairie dogs in the Wall Southwest Geographic Area is to maintain three or more prairie dog colony complexes. That objective is currently being met. As of 2019, the Wall Southwest Geographic Area supported 13,660 acres of prairie dog colonies. Those acres were distributed in such a way that created three or more prairie dog complexes (Phil Dobesh, professional knowledge).

PRAIRIE DOG COLONY OCCUPANCY:

Across the NNFG, prairie dog colony occupancy varies by time and site. Some colonies are abandoned shortly after establishment, while others are continuously occupied for decades. For example, in the Fort Pierre Geographic Area there were 45 prairie dog colonies present in 2010 and 48 colonies present in 2020. Only 38 of those colonies, however, were present both years.

PRAIRIE DOG COLONY EXTENT & DENSITY:

The extent of prairie dog colonies on the NNFG is addressed above (p. 18). Like colony occupancy, colony density varies over time and location (Hoogland 2006). Severson and Plumb (1998) estimated density on the Buffalo Gap National Grassland and in the adjacent Badlands National Park as three to seventeen prairie dogs per acre.

PRAIRIE DOGS & PLAGUE:

Sylvatic plague is a bacterial disease transmitted to mammalian hosts through flea bites. Black-tailed prairie dogs are highly susceptible to plague (Hoogland 2006).

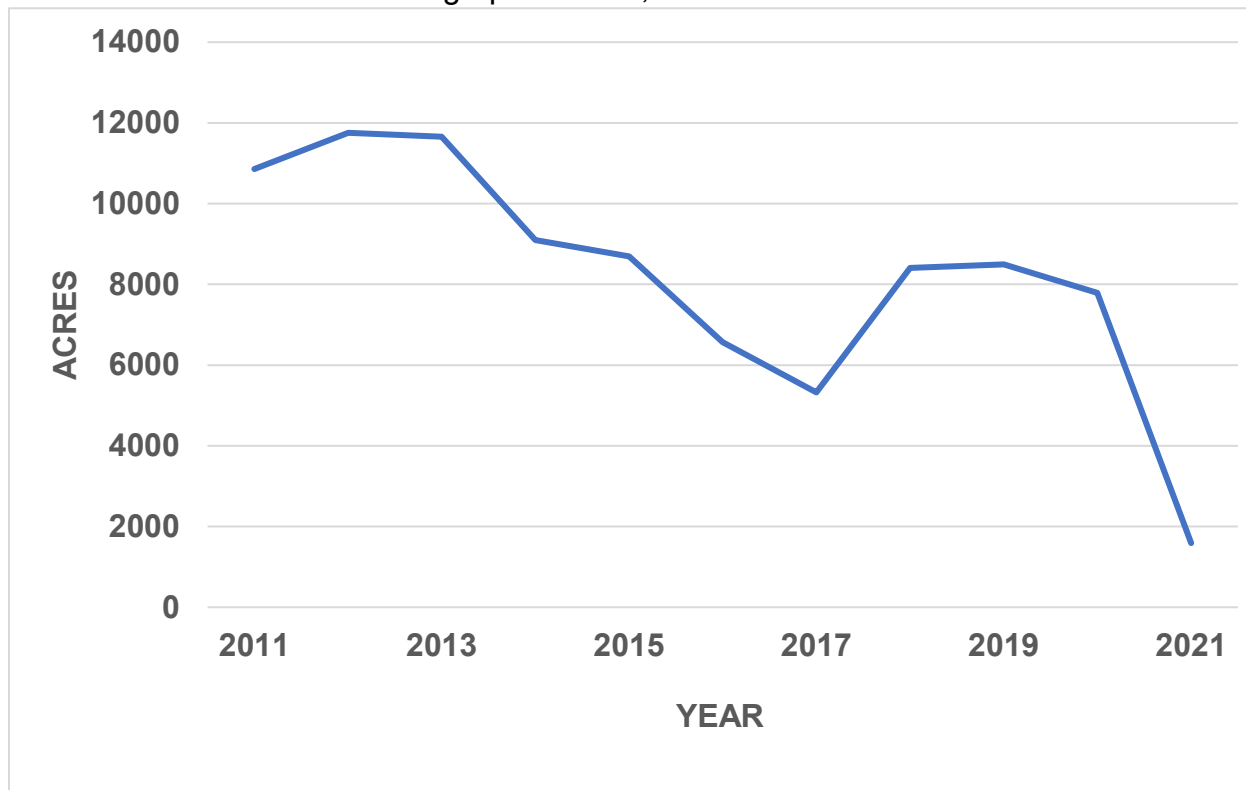
Sylvatic plague was first documented on the Buffalo Gap National Grassland in 2008 and on both the Fort Pierre and Oglala National Grasslands in 2012. Periodic plague outbreaks have occurred since then and have had major impacts on local black-tailed prairie dog populations. For example, a colony in the Oglala Geographic Area decreased from over 600 acres to only four acres following a plague outbreak. Colony fates after outbreaks have varied widely, from extirpation, to recovery, to expansion.

The NNFG has invested heavily in both plague management and plague research. These efforts have been done in conjunction with numerous partners, including Defenders of Wildlife, Prairie Dog Coalition of the Humane Society of the United States, Prairie Wildlife Research, South Dakota Game Fish and Parks, US Department of Defense, USDI Geological Survey, USDI National Park Service, USDI Fish and Wildlife Service, and World Wildlife Fund.

Sylvatic plague management has primarily consisted of applying insecticide to kill fleas in prairie dog burrows. That work has been concentrated in areas supporting black-

footed ferrets (i.e., in the Wall Southeast and Wall Southwest Geographic Areas). Treated acres have declined in recent years (**Figure 12**), primarily due to funding loss.

Figure 12. Prairie dog colony acreage treated with insecticide to control fleas. Wall Southeast and Southwest Geographic Areas, 2011-2021.



Sylvatic plague research on the NNFG has been varied and long running. For example, from 2012-2016, research included evaluation of an oral vaccine. Due to issues with bait production, bait efficacy, and cost, this project has been shelved pending further development.

In 2018 a fipronil-based flea control product was developed and labeled for use. That treatment is delivered to prairie dogs through an oral bait (**Figure 13**). Evaluation of the product's safety and effectiveness is ongoing.

The long-term collaborative sylvatic plague research effort conducted on the NNFG has resulted in more than 20 scientific papers being published. A sample of some of those papers' subjects include:

- Plague impacts on prairie dog colony communities (Antolin et al. 2002, Cully et al. 2010, Keuler et al. 2020, Shoemaker et al. 2014);

- Sylvatic plague control (Abbott et al. 2012, Abbott et al. 2018, Biggins et al. 2021, Bron et al. 2018, Creekmore et al. 2002, Eads et al. 2018, Eads et al. 2019, Eads et al. 2021, Johnson et al. 2014); and
- Understanding plague dynamics and transmission (Bron et al. 2019, Mize and Britten 2016, Poje et al. 2020, Russell et al. 2018).

RECOMMENDATIONS: Management efforts should be made to attain prairie dog objectives across the NNFG, with particular focus given to the continuation of plague mitigation and research. Monitoring indicators should be simplified to reduce redundancy (see **Table 5** for discussion).

Figure 13. Black-tailed prairie dogs eating experimental fipronil-treated bait. Undated photo by David Eads.



4. What is the status of prairie grouse (plains sharp-tailed and greater prairie chicken) to assess the functional role of grassland vegetation habitat?

Indicators = Acres and distribution of potential prairie grouse habitat; Current condition and trend of grassland vegetation structure; Current condition and trend of forb/shrub patches.

Greater prairie-chickens (**Figure 14**) occur regularly in the Bessey, Fort Pierre, and McKelvie Geographic Areas and are occasionally present in the Wall North and Wall Southeast Geographic Areas. Sharp-tailed grouse (**Figure 14**) are found across the NNFG. An overview of the status of these prairie grouse in the Fort Pierre Geographic Area is presented below.

Figure 14. Greater prairie-chicken (left) and sharp-tailed grouse (right) displaying in the Fort Pierre Geographic Area. Photos by Dan Svingen and Ruben Mares, respectively.



PRAIRIE GROUSE & POTENTIAL HABITAT:

Potential prairie grouse habitat is widely distributed in the Fort Pierre Geographic Area. It is estimated that 99% of that area (i.e., 115,000 of 116,100 acres) qualifies as potential prairie grouse habitat (USDA Forest Service 2001).

PRAIRIE GROUSE & GRASSLAND VEGETATION STRUCTURE:

Prairie grouse require a variety of grassland vegetation structure. They use low structure areas to conduct their spring displays (**Figure 14**). High structure areas are preferred for nesting, while sites with mixed vegetative structure are particularly valuable for brood rearing. The current condition and trend of grassland vegetation structure on the Fort Pierre Geographic Area is discussed below (see p. 44).

PRAIRIE GROUSE & FORBS:

The Fort Pierre Geographic Area supports 236 forb species (Svingen et al. 2022). Forbs are monitored using the Similarity Index method. On Clayey Ecological Sites it is expected that forbs make up 7% to 9% of total herbaceous weight, with all species being of native origin (USDA Natural Resources Conservation Service 2008).

In 2016, similarity index monitoring in the Fort Pierre Geographic Area found that forbs comprised, on average, 9% (300/3,244) of the total herbaceous weight. Native forbs made up 90% of that portion; the remaining 10% was from introduced forbs such as alfalfa, field bindweed, pennycress, and yellow sweetclover, among others. In 2021, forbs comprised 4% (88/2,032) of the total herbaceous weight on Clayey Sites, with 89% of that category being native species.

Overall, based on both extensive field visits and similarity index data, forbs are declining in the Fort Pierre Geographic Area. Introduced forbs are increasingly dominating the forb community that is present (**Figure 15**).

Efforts are underway in the Fort Pierre Geographic Area to increase native forbs (**Figure 16**; Svingen 2018, Svingen 2021). Early monitoring has shown that while native forbs can be successfully established (**Figure 17**), the cost is high, and many exotic species persist.

PRAIRIE GROUSE & SHRUBS:

The Fort Pierre Geographic Area supports 20 shrub species (Svingen et al. 2022). The most abundant and widespread species are western snowberry (**Figure 18**) and chokecherry. The greatest diversity of shrub species is found in woody draws. Those habitats receive special management to limit impacts from livestock grazing (DeToy 2003).

Shrub populations in the Fort Pierre Geographic Area are monitored using a combination of aerial photos and field visits. The shrubs' current condition appears to be healthy. Although shrubs are present on only a very small portion of the landscape, they have increased over the last several years. For example, along one riparian monitoring segment, shrubs increased from 0.61 acre in 2004 to 4.44 acres in 2018 (**Figure 19**). This increase is attributed to the special management restricting the duration and season of livestock grazing.

Figure 15. Yellow sweetclover, an exotic forb, dominating the Medicine Creek #1 Pasture, Fort Pierre Geographic Area. Photo July 2014 by Dan Svingen.



Figure 16. Hughes County Soil Conservation District staff sowing native grasses and forbs in the Fort Pierre Geographic Area. Photo May 2020 by Dan Svingen.



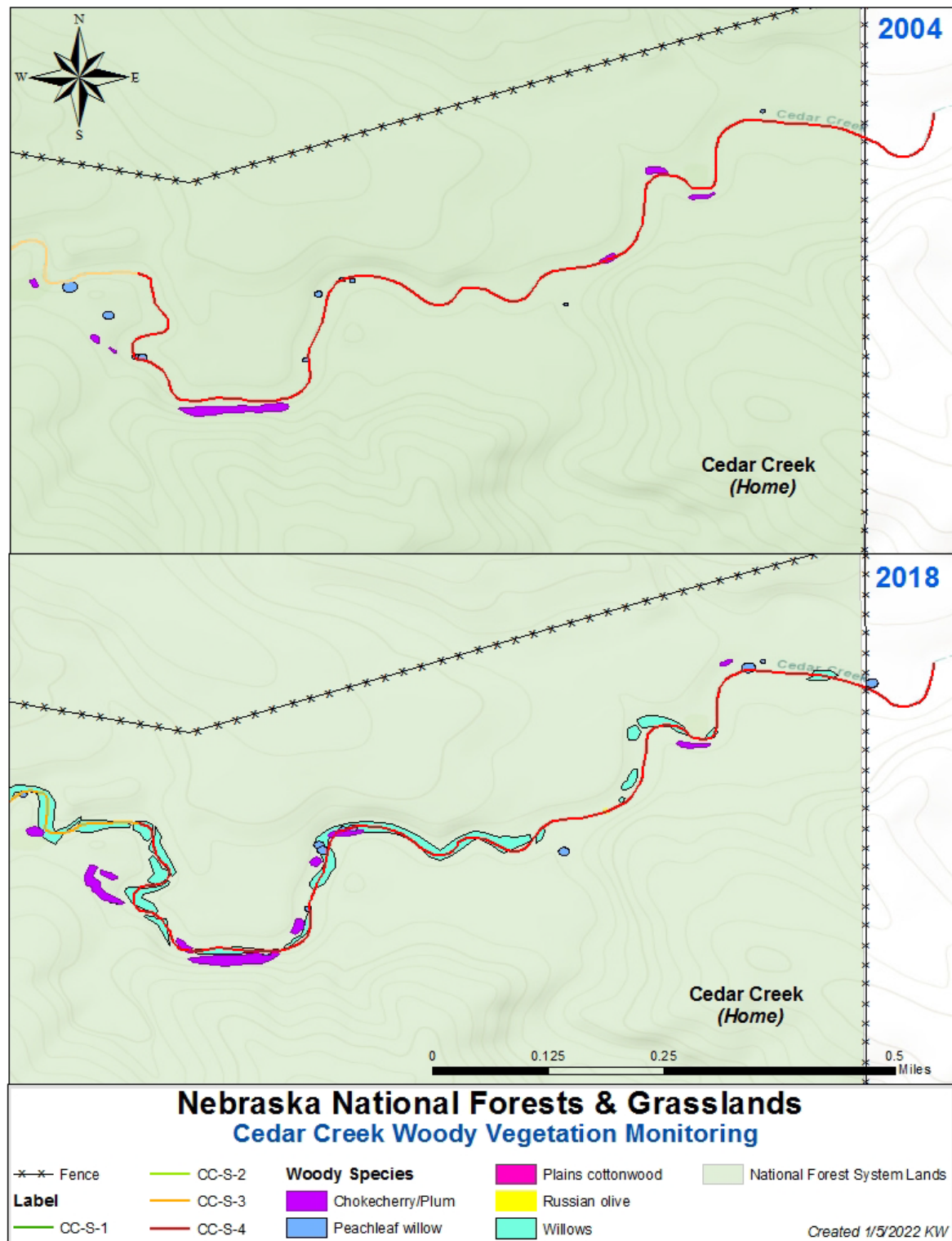
Figure 17. Upright prairie coneflower, one-year post-planting, Site #1, 83 Triangle Pasture, Fort Pierre Geographic Area. Photo July 2020 by Dan Svingen.



Figure 18. Western snowberry, Prairie Hills South Pasture, Fort Pierre Geographic Area. Photo June 2017 by Dan Svingen.



Figure 19. Woody vegetation mapped along Riparian Monitoring Segment #4 in the Cedar Creek Home Pasture, Fort Pierre Geographic Area. Top: 2004. Bottom: 2018.

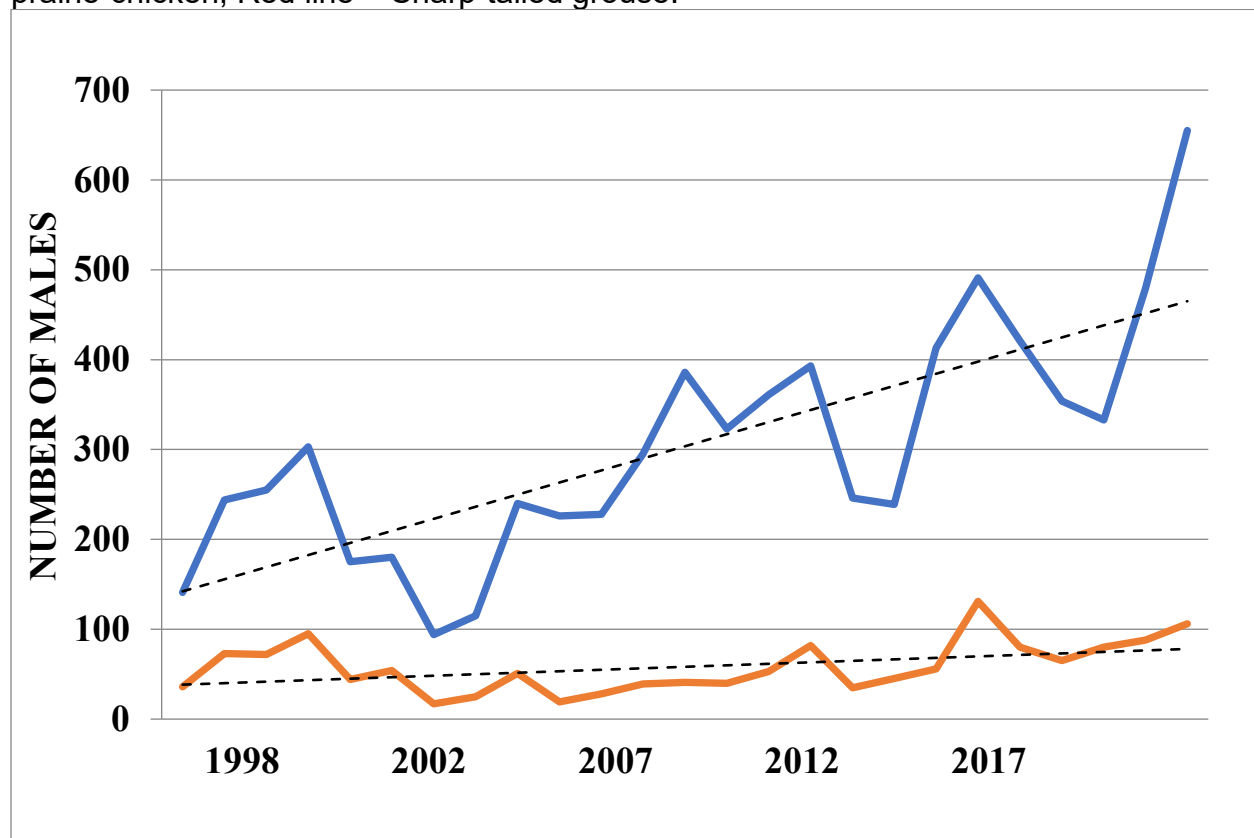


PRAIRIE GROUSE POPULATIONS:

Although not identified as an indicator for this monitoring question, prairie grouse populations are monitored in the Fort Pierre Geographic Area as directed by the grazing allotment management plan (DeToy 2003). The LRMP objective (p. 2-70) is to support stable to increasing populations, long-term. In recent decades, both prairie grouse species' populations have trended upward (**Figure 20**). In spring 2021, record high counts were tallied for greater prairie chickens, while near-record high counts were found for sharp-tailed grouse. Based on decades of monitoring data, however, populations in spring 2022 are expected to be much lower due to the drought conditions dominating during the 2020 and 2021 nesting seasons.

RECOMMENDATIONS: Current management should continue but additional efforts should be made to increase native grasses and forbs. Monitoring indicators should be simplified to reduce redundancy and to be more responsive to LRMP objectives (see **Table 5** for discussion).

Figure 20. Number of displaying male prairie grouse counted at leks within the Cedar Creek Monitoring Unit, Fort Pierre Geographic Area, 1998-2021. Blue line = Greater prairie-chicken, Red line = Sharp-tailed grouse.



5. What is the status and trend of habitat to support the recovery of the blowout penstemon on the planning unit?

Indicators = Sandhill blowout extent and size; Historical vs. current acreage levels of Sandhill blowouts

The blowout penstemon (*Penstemon haydenii*) is a perennial wildflower endemic to the Great Plains. This species (**Figure 21**) was once common in the Nebraska Sandhills but is now classified as endangered (USDI Fish and Wildlife Service 1992).

The blowout penstemon is named after its specialized habitat, i.e., “blowouts”, which are excavations of loose soil, usually sand, created by wind (LRMP p. G-6). The penstemon is particularly resistant to the abrasive impact of blowing sand. Because blowout penstemon is easily outcompeted, it requires lightly vegetated habitat.

Historically, new blowout habitat was regularly created across the landscape by the interactions of wind, fire, drought, and excessive grazing that killed pre-existing grasses. For the last century, however, land management efforts have attempted to stabilize and revegetate blowouts. This has greatly reduced the amount of habitat available (USDI Fish and Wildlife Service 2012). Recent land management has also tried to prevent the formation of new blowouts.

Figure 21. Blowout penstemon. Photo by USDI Fish and Wildlife Service.



The LRMP (pp. 2-9, 2-10, 2-16, 2-17) contains extensive direction to benefit blowout penstemon. Management efforts focus on creating and maintaining suitable habitat, as well as establishing new populations through propagation. Blowout creation and maintenance activities include adjusting livestock grazing, removing invasive cedar trees, conducting prescribed burning, and controlling off-highway vehicle use. It should also be acknowledged, however, that the LRMP effectively restricts the amount of new blowout habitat that can be created by limiting low structure vegetation to 0% to 5% of the landscape (see LRMP pp. 2-7 and 2-15). If 0% low structure vegetation is maintained, new blowouts are unlikely to develop.

Efforts to establish new blowout penstemon populations (**Figure 22**) began in 2000 with the transplanting of seedlings grown at the University of Nebraska - Lincoln. Transplanting efforts have continued ever since. Blowout penstemon seedlings are now produced at the NNFG's Bessey National Nursery (**Figure 23**). Those seedlings are used in restoration efforts throughout the Sandhills region in cooperation with federal and state agencies as well as private landowners. Direct sowing of blowout penstemon seed also occurs. Since 2017, approximately 8,000 grams of seeds have been collected from the NNFG's blowout penstemon populations. Monitoring of the direct sowing projects has shown direct seeding to be a highly effective reintroduction practice for blowouts larger than one acre in size (for more details, see Steinauer 2021, Wright 2021).

Figure 22. Newly established population of blowout penstemon, McKelvie Geographic Area. Photo July 2020 by Greg Wright.



Figure 23. Seedling blowout penstemons, Bessey National Nursery. Photo December 2021 by Rich Gilbert.



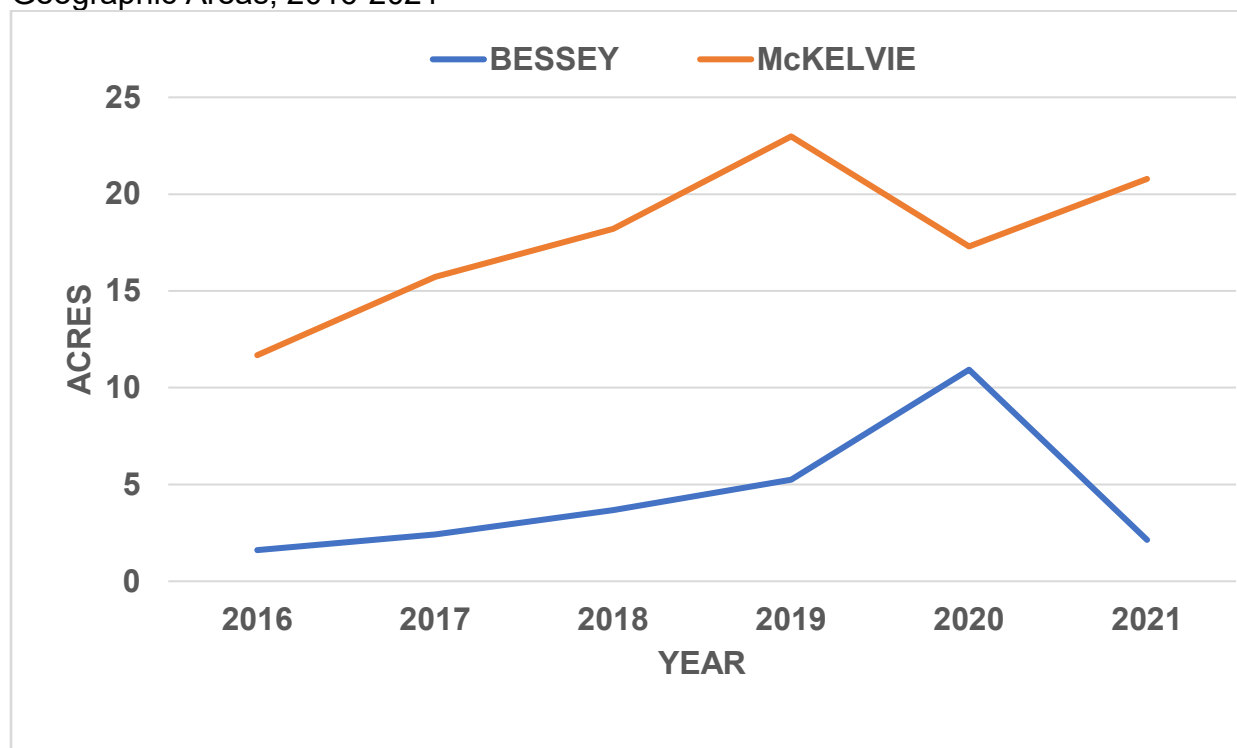
BLOWOUT EXTENT AND SIZE:

In 2015, the extent of blowout habitat within the three counties that contain the Bessey and McKelvie Geographic Areas was estimated to be 332,554 acres (Dudley et al. 2015). Most of those blowouts, however, were not of appropriate size for blowout penstemon persistence.

Bessey Ranger District staff monitor the extent and size of blowout penstemon populations (as opposed to the size of the blowouts). In 2021 there were 22.92 acres of blowout habitat occupied by blowout penstemon. That acreage supported approximately 25,079 plants within the Bessey and McKelvie Geographic Areas (Wright 2021).

As of 2021, blowout penstemon populations were present at ten blowouts in the Bessey Geographic Area and at 11 blowouts in the McKelvie Geographic Area. Overall, the acreage of those populations has increased in recent years in both Geographic Areas (**Figure 24**). That increase is not related to development of new blowout habitat, but rather to increased planting efforts by NNFG staff into existing blowouts.

Figure 24. Acres of occupied blowout penstemon habitat in the Bessey and McKelvie Geographic Areas, 2016-2021



HISTORICAL vs. CURRENT ACREAGE LEVELS OF SANDHILL BLOWOUTS:

The historical and current acreage of Sandhill blowouts on what is now the Bessey and McKelvie Geographic Areas is unknown, though there has undoubtedly been a decline (USDI Fish and Wildlife Service 2012).

Presently there appears to be a slight downward trend in blowout availability as new rotational livestock grazing systems put less pressure on sensitive areas (Greg Wright, professional knowledge; see Darnell 2012 for livestock management details). The loss of blowout habitat has been accelerated by some recent years of above-average precipitation which facilitates blowout revegetation by grasses.

RECOMMENDATIONS: Current propagation efforts should continue; opportunities to create new blowout habitat with livestock grazing should be investigated. Creation of blowout habitat might be facilitated by increasing the LRMP objective (pp. 2-7 and 2-15) for low vegetation structure. Future monitoring indicators should be simplified to reduce redundancy and to focus on more appropriate metrics (see **Table 5** for discussion).

6. What is the status and trend of habitat to support the recovery of the American burying beetle on the planning unit?

Indicators = Acres and distribution of potential habitat; Current condition and trend of grassland vegetation structure

American burying beetles (**Figure 25**) are the largest carrion beetle in the United States. Their name derives from their habit of seeking out the dead bodies of small animals. Once found, the ground below the carcass is excavated until the entire carcass is buried. The beetles then use the interned corpse to feed their young.

Historically, American burying beetles were found throughout much of temperate eastern North America where they used a variety of habitats (USDI Fish and Wildlife Service 1991). During the last 100 years, however, the species has disappeared from large portions of its range. In 1989, the USDI Fish and Wildlife Service designated the American burying beetles as an endangered species; it was reclassified as a threatened species in 2020 (USDI Fish and Wildlife Service 2020).

Figure 25. American burying beetle. Photo by USDI Fish and Wildlife Service.



AMERICAN BURYING BEETLES & POTENTIAL HABITAT:

American burying beetles are known to occur in the Bessey and McKelvie Geographic Areas but are apparently absent from the rest of the NNFG (USDA Forest Service 2001, p. H-29). Locally, American burying beetles are associated with sandy soils, preferring subirrigated sites (Leasure and Hoback 2016). Most beetles are found in large valleys that support warm-season grasses and ephemeral wetlands (Greg Wright, professional knowledge).

More than 200,000 acres of potential habitat for American burying beetles is available in the Bessey and McKelvie Geographic Areas. Optimal habitat, described as subirrigated wet meadows containing a well-formed detritus layer, is far less common, encompassing only about 500 acres (Greg Wright, professional knowledge).

AMERICAN BURYING BEETLES & GRASSLAND VEGETATIVE STRUCTURE:

Ongoing management to increase grassland vegetative structural (and compositional) diversity in the Bessey and McKelvie Geographic Areas is believed to be maintaining/improving overall habitat quality for the American burying beetle. For example, since 2016 invasive eastern red cedar have been removed from over 50,000 acres by using prescribed burning and mechanical treatment. Potential habitat quality for American burying beetles has also been enhanced through implementation of improved livestock grazing practices (see Darnell 2010 for details). These efforts likely benefit a variety of wildlife species, including those with optimum-sized bodies for use by the beetles (e.g., thirteen-lined ground squirrels, Ord's kangaroo rats, western meadowlarks, etc.).

AMERICAN BURYING BEETLES MONITORING AND MANAGEMENT:

Although not identified as an indicator for this monitoring question, we and our partners have conducted American burying beetle surveys in the Bessey and McKelvie Geographic Areas. These efforts have included: presence/absence monitoring, population trend monitoring, and habitat preference and distribution monitoring. Results have shown that American burying beetle densities within proximity to the hand-planted forest in the McKelvie Geographic Area are much lower than those within proximity to the nearby Merritt Reservoir (Farriester et al 2018; Snethen et al. 2018; Snethen et al. 2020).

One of the conservation management measures intended to benefit American burying beetles in the Bessey and McKelvie Geographic Areas is the restriction of pesticide use. Another is to enhance grassland habitat diversity as described above.

RECOMMENDATIONS: Current management efforts should continue. Future monitoring indicators should be simplified and more focused (see Table 5 for discussion).

7. Where does the demand for recreation opportunities warrant development of additional opportunities such as trails or campgrounds?

Indicators = Customer survey and individual public contacts; Name of facility, location, and time existing use exceeds capacity.

The NNFG is heavily used by recreationists. The unit is a major destination for enthusiasts who enjoy open space and adventure. Among the many attractions are Hudson-Meng Education and Research Center, National Grassland Visitor Center (**Figure 26**), Railroad Buttes Off-highway Vehicle (OHV) Use Area, and Toadstool Geologic Park. In addition to numerous dispersed recreation sites, the NNFG offers visitors eighteen developed recreational sites and 377 miles of motorized and non-motorized system trails.

In 2019, the NNFG completed an assessment of its current and projected recreational facilities. Among the needs identified were increased investments at campgrounds and a proposal to increase fees. It was also determined that the National Grasslands Visitor Center and Hudson-Meng Visitor Center required additional analysis due to the complexity of their operations.

Figure 26. Visitors at the National Grassland Visitor Center. Undated photo by Julie Johndreau.



CUSTOMER SURVEY AND INDIVIDUAL PUBLIC CONTACTS:

NNFG staff conducted customer surveys in 2008, 2013, and 2018 using the USDA Forest Service's National Visitor Use Monitoring (NVUM) protocol. Those surveys had two goals: 1) Estimate recreational visitation rates, and 2) Produce descriptive information about that visitation.

Based on NVUM data, the NNFG supported 288,000 recreational site visits in 2018. The top five participation activities were hiking, viewing wildlife, relaxing, driving for pleasure, and viewing natural features. Most (75%) of the recreationists surveyed visited the NNFG one to five times per year. These results were similar to those found in 2013. The NVUM survey is scheduled to be repeated in 2023.

NNFG staff make individual public contacts in the office, in the field, and at outreach events. Recreationist feedback is used to identify additional development needs. For example, recreationist advice was instrumental in the installation of a sweet-smelling toilet (SST) at the Richland Dam Dispersed Recreation Area (**Figure 27**, Svingen 2019). A public request not yet addressed is the addition of boat ramps across the Fort Pierre Geographic Area.

Based on all data available, recreational use of the NNFG is increasing.

Figure 27. Installing a sweet-smelling toilet (SST) at Richland Dam Dispersed Recreation Area, Fort Pierre Geographic Area. Photo April 2020 by Dan Svingen.



FACILITY, LOCATION AND TIME EXISTING USE EXCEEDS CAPACITY:

Two recreational sites on the NNFG that are showing particularly high recreational demand are the Bessey Recreation Complex in the Bessey Geographic Area, and the Pinnacles area in the Wall Southeast Geographic Area.

The Bessey Recreation Complex offers camping, fishing, hiking trails, and motorized trails. The Group Campground (**Figure 28**) is very popular. In 2021, the existing one-group-per-night campground hosted 2,648 campers over 151 nights (an average of ~18 people/night). All summer weekends were reserved, and many groups were turned away due to the site being at full capacity.

The Bessey Ranger District has identified a possible location for another group camping site. Establishment of such a site would require a review and line officer decision in accordance with the National Environmental Policy Act.

Figure 28. Campers at the Bessey Group Campground. Undated photo by Loren Eaton.



The Pinnacles area overlooks Badlands National Park. The only infrastructure there is related to livestock grazing (e.g., fences, vehicle trails, and stock ponds). The area is not specifically designated for recreation. Nonetheless, the site (**Figure 29**) is now one of the most heavily used dispersed camping areas in South Dakota. The Pinnacles area's popularity quickly increased after being featured in an Academy Award winning movie and being listed on numerous "boondocking" websites/apps. The level of

recreational use continues to increase. In July 2020, an average of 32 vehicles per day were observed, while in July 2021 that average was 77 vehicles per day. Peak usage was more than 130 camping units per day.

The demand for camping in the Pinnacles area is exceeding the capacity of the site. To best meet public recreation demand and resource needs, the site needs further analysis. It may warrant a developed campground or a clearly delineated designated dispersed camping area with boundaries and capacity limits. Changing management of the site would provide for visitor safety and protect the quality of the recreational experience. Some potential management changes could be made administratively, while others would require a review and line officer decision in accordance with the National Environmental Policy Act.

RECOMMENDATIONS: Detailed assessments should be made to address excessive recreational demand at the Bessey Ranger District and in the Pinnacles area.

Figure 29. Campers in the Pinnacles area. Undated photo by Travis Mason-Bushman.



8. To what extent are the Soldier Creek Wilderness special features and communities of special concern conserved or enhanced?

Indicators = Condition of features/communities.

The Soldier Creek Wilderness (**Figure 30**) covers 7,800 acres in the Pine Ridge Geographic Area. As recently as 1989, much of this Wilderness was covered with ponderosa pine forest. A series of large wildfires, however, has transformed much of the area into the expansive grassland seen today (**Figure 31**). The Wilderness is very popular with visitors, particularly for hiking, horseback riding, hunting, and fishing. In 2021, for example, over 6,900 vehicles were recorded at the area's campground and trailhead.

Public use within the Soldier Creek Wilderness is centered around the trail system (**Figure 30**). The condition of these features is good to excellent. There are two trails: the 9.7-mile-long Trooper (a.k.a. #21) Trail and the 7.1-mile-long Boots and Saddle (a.k.a. #22) Trail. These trails traverse woody draws, creek crossings, ridges, and grasslands. Approximately 11.1 miles of the trails are inside the Wilderness itself (**Figure 30**). Each trail offers the public an easy-to-follow, moderately-difficult experience. Trooper Trail and Boots and Saddle Trail were both "maintained to standard" during six separate days in July and September 2021. Common maintenance included replacing posts and signs, installing water bars, repairing tread, and removing encroaching foliage.

One of the Soldier Creek Wilderness's plant communities of special concern is the riparian zone along Middle Fork Soldier Creek and South Fork Soldier Creek. The condition of those communities is fair to good and is improving in some areas. For example, along South Fork Soldier Creek, beaver have repeatedly colonized, and then abandoned, the stream. In about 2013, all presence of beaver disappeared, likely due to a high flood event. In 2017, the first new signs of beaver presence were documented. In 2021, over 15 beaver dams (**Figure 32**) were found, along with extensive evidence of beaver use of the area's willows and cottonwoods. Since the most recent beaver recolonization has occurred, numerous sections of South Fork Soldier Creek have widened, creating large wetland areas and deep pools.

The main concern along South Fork Soldier Creek is livestock impacts. The eastern-most three miles of the waterway are heavily grazed. When cattle are present, they rarely leave the riparian zone, thus creating large sections of bare land and heavily sedimentation in the creek.

RECOMMENDATIONS: Trail maintenance efforts should continue. Livestock exclosures should be repaired/constructed along the South Fork Soldier Creek where cattle disturbance is negatively impacting the riparian zone.

Figure 30. Soldier Creek Wilderness map showing trail system.

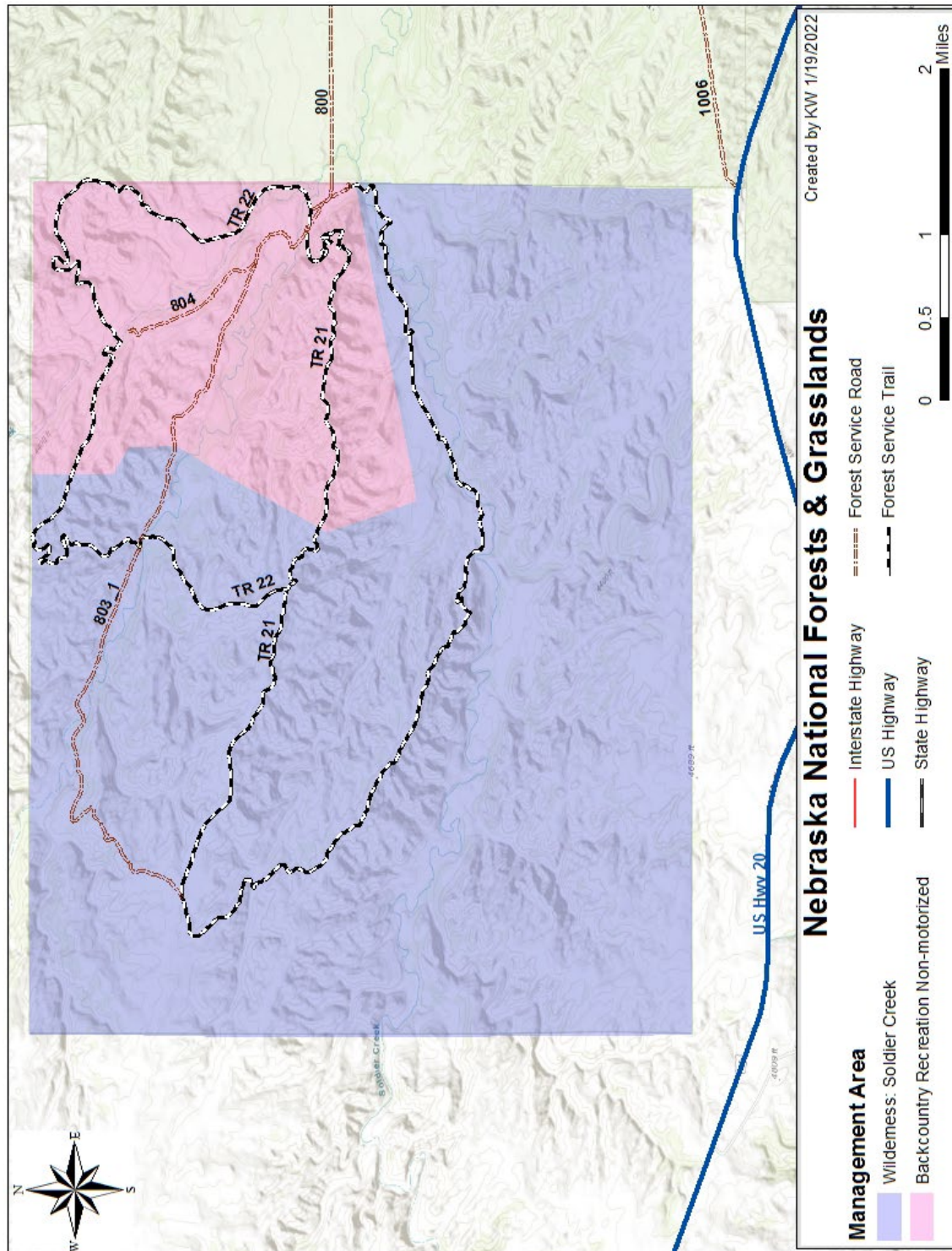


Figure 31. Soldier Creek Wilderness. Undated photo by Jordan Price



Figure 32. New beaver dam along South Fork Soldier Creek. Undated photo by Jordan Price.



9. How have extreme and average temperature and precipitation values changed across the Nebraska National Forests and Grasslands?

Indicators = Timing, type and amount of precipitation; Changes in air temperature

The United States' National Oceanic and Atmospheric Administration (NOAA) has published climate change summaries for each state ([State Summaries 2019 \(ncics.org\)](https://www.ncics.org/)). Results for Nebraska and South Dakota are similar.

Key findings regarding Nebraska were:

- Average annual temperature has increased about 1°F since the early 20th century, with warming concentrated during the winter and spring. Winter warming (**Figure 33**) has been characterized by a much below average occurrence of very cold nights since 1990. Under a higher emissions pathway, historically unprecedented warming is projected by the end of the 21st century.
- Precipitation can vary greatly from year to year (**Figure 34**) in this region of east-to-west transition from humid to semi-arid conditions. Projected increases in winter precipitation may result in both beneficial and negative impacts.
- The agricultural economy of Nebraska makes the state particularly vulnerable to droughts, several of which have occurred in recent years, although the impacts can be mitigated where irrigation is possible. Projected increases in temperature and evaporation rates may increase the intensity of future naturally occurring droughts (Frankson et al. 2017a).

Key findings regarding South Dakota were:

- Average annual temperature has increased approximately 2°F since the early 20th century, with warming concentrated during the winter (**Figure 33**) and spring, and nighttime minimum temperatures increasing about twice as much as daytime maximums. Under a higher emissions pathway, historically unprecedented warming is projected by the end of the 21st century.
- Annual precipitation has varied widely from year to year (**Figure 34**). The wettest multi-year periods were in the late 1990s and from 2008 onward.
- Higher temperatures will increase evapotranspiration rates and increase the rate of loss of soil moisture loss during dry spells, leading to an increase in the intensity of naturally occurring future droughts.
- Winter and spring precipitation is projected to increase, with associated increases in total seasonal snowfall. Heavy precipitation events are also projected to increase (Frankson et al. 2017b).

RECOMMENDATIONS: Potential impacts of climate change should be considered in future land management decisions.

Figure 33. Observed winter temperature in Nebraska (top) and South Dakota (bottom), 1895–2014, averaged over 5-year periods. Note: the dark horizontal line on each graph is the long-term average. From Frankson et al. 2017a, b.

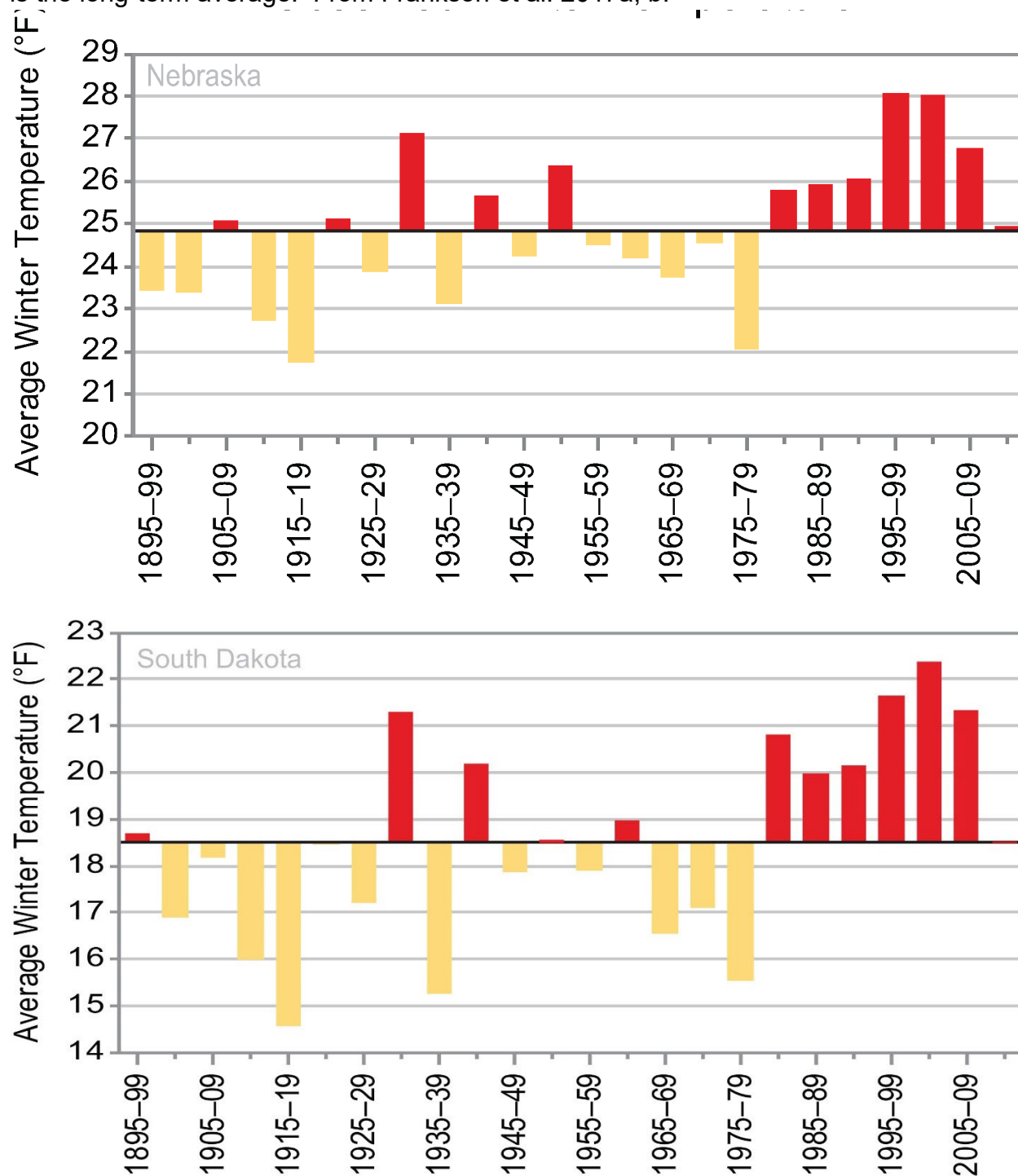
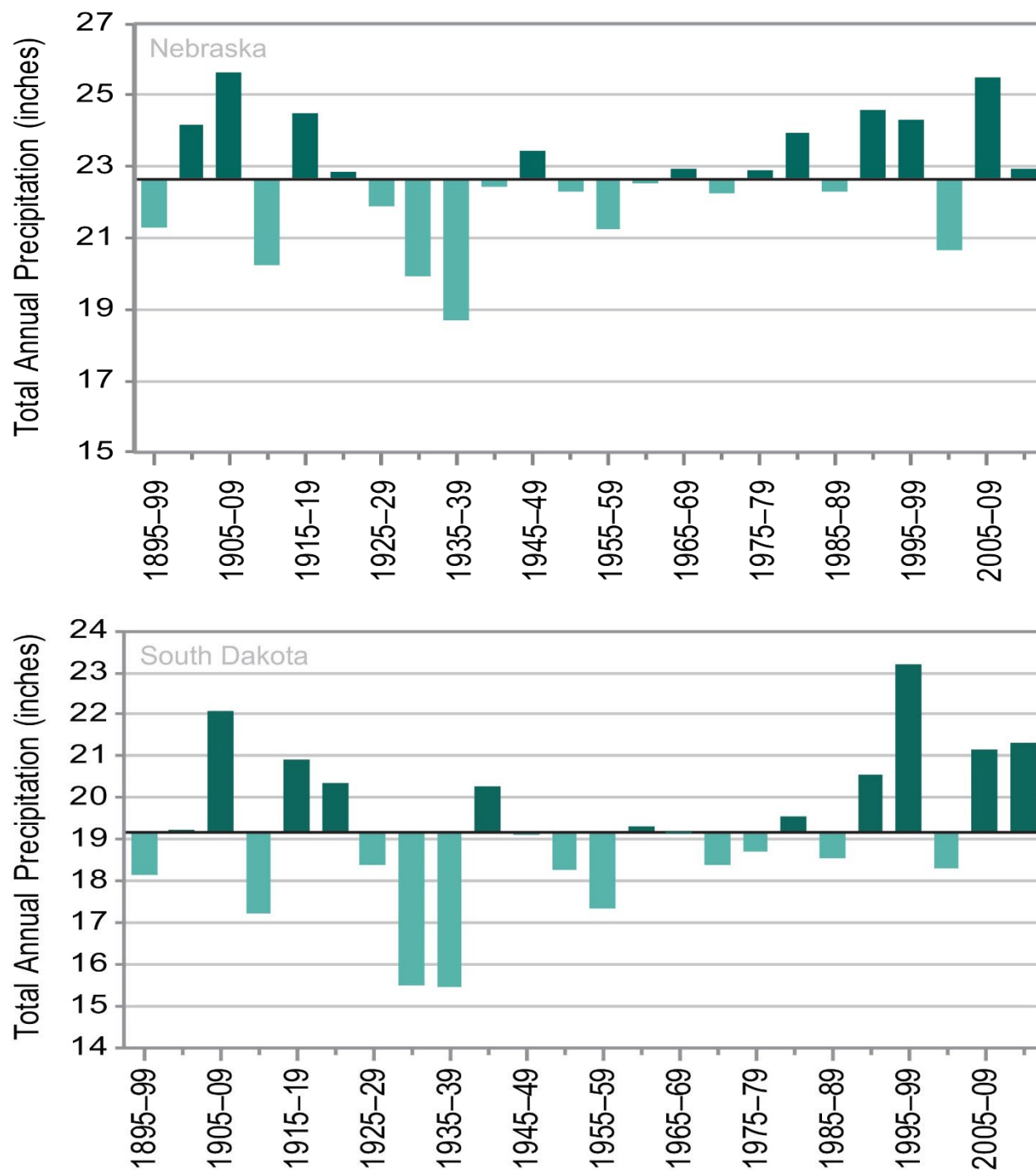


Figure 34. Observed annual precipitation in Nebraska (top) and South Dakota (bottom), 1895-2009, averaged over 5-year periods. Note: the dark horizontal lines represent the long-term average. From Frankson et al. 2017a, b.



10. To what extent are rangeland vegetation structure objectives being met?

Indicators = Location & percent of rangeland area: Meeting, Making measurable progress towards, or Not meeting desired vegetation structure

Rangeland vegetative structure has been monitored in several of the NNFG's Geographic Areas. This report will discuss data from the Fort Pierre Geographic Area.

In the Fort Pierre Geographic Area, vegetative structure is monitored using the visual obstruction reading ("VOR") method (**Figure 35**). Data is regularly collected from about October 1 to about November 15 unless a "season-ending event" occurs. Such an event is typically either persist snow cover or a transitory snow cover that substantially alters the pre-snowstorm vegetative structure.

The LRMP (p. 2-69) set an objective for 10-30% low, 30-50% moderate, and 30-50% high vegetative structure for the Fort Pierre Geographic Area, but did not define those categories. For the purposes of this report, low vegetative structure is defined as VOR of 2" or less (LRMP, p. H-6). High vegetative structure is defined as VOR 75% or more of each year's growth potential as measured in 1-year rest pastures. Moderate vegetative structure is defined as VOR not otherwise qualifying as low or high vegetative structure.

In the last ten years, low structure vegetation has usually been below objective in the Fort Pierre Geographic Area (**Figure 36**). High structure vegetation has also often been below objective. In contrast, there has generally been an overabundance of moderate structure vegetation.

In recent years, District staff have been working with grazing permittees to unbalance grazing rotations to better achieve LRMP herbaceous structure objectives. Specifically, some pastures have been grazed heavy (i.e., >100% of capacity) to achieve low-structure vegetation. Other pastures have been grazed lightly (i.e., <100% of capacity) to achieve high structure vegetation. The resulting mosaic (e.g., **Figure 37**) has provided for a diversity of habitat conditions across the Fort Pierre Geographic Area. Overall, this approach has been successful at meeting or making measurable progress towards desired vegetative structure (**Figure 36**). Note: the excessive amount of moderate structure vegetation in 2020 was likely due to an unusually small sample size occasioned by an atypically early season-ending event.

RECOMMENDATIONS: Efforts to unbalance grazing rotations to increase vegetative structure diversity should be expanded.

Figure 35. Monitoring vegetative structure using the visual obstruction reading (VOR) method, Fort Pierre Geographic Area. Photo October 2019 by Dan Svingen.

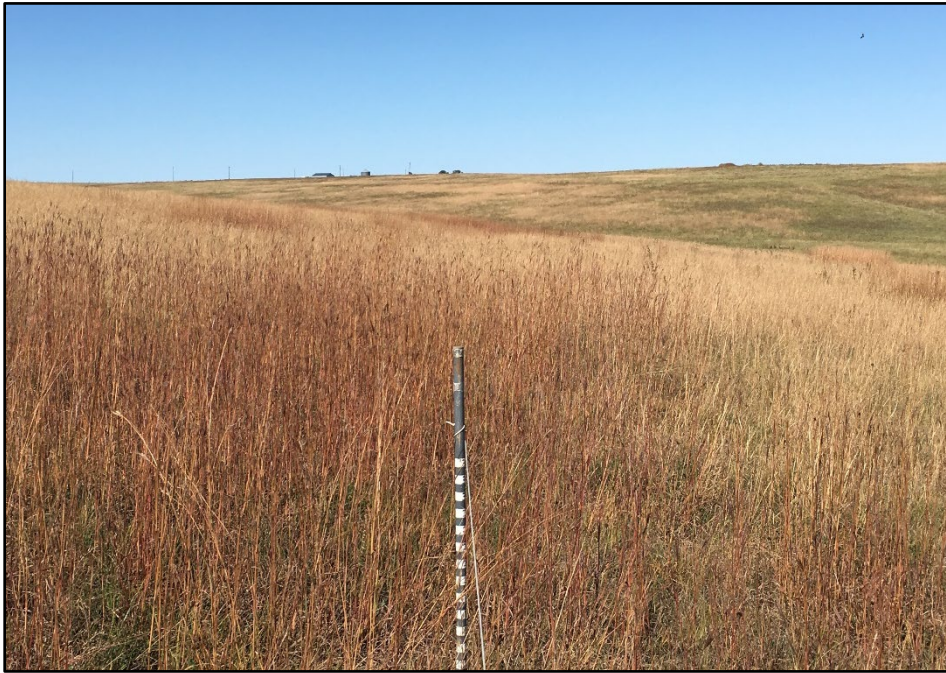


Figure 36. Percentage (%) of VOR transects classified as low, moderate, and high structure vegetation In the Fort Pierre Geographic Area, 2008-2021.

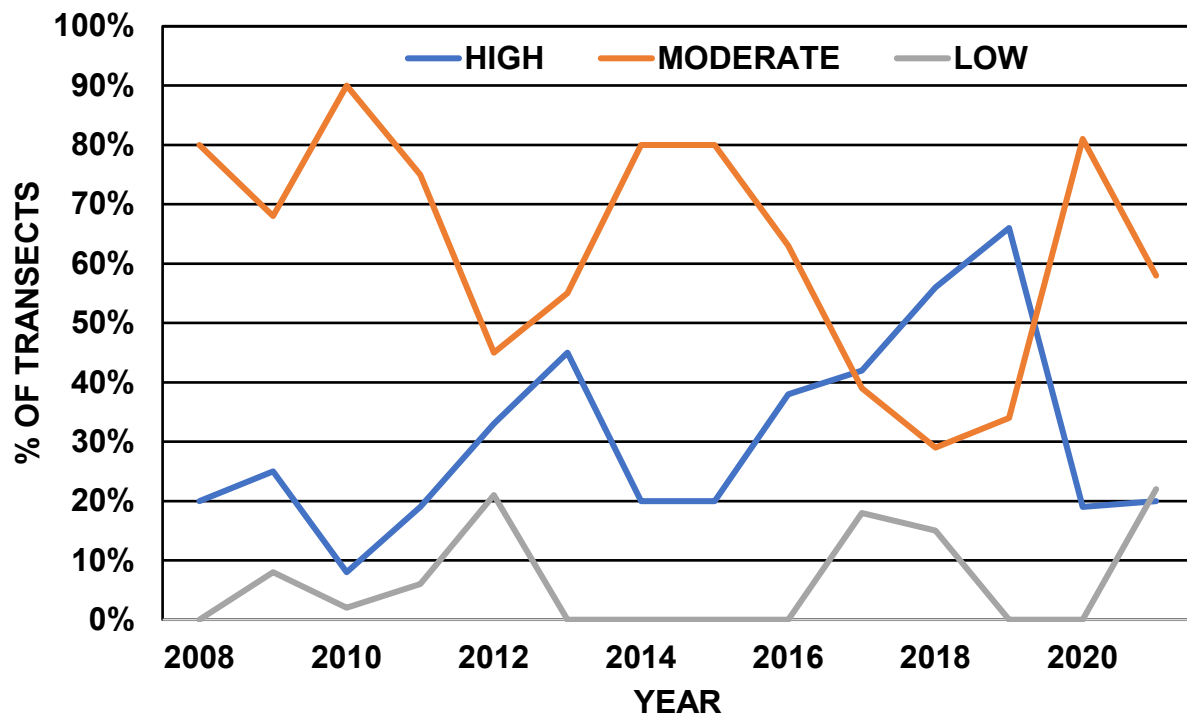
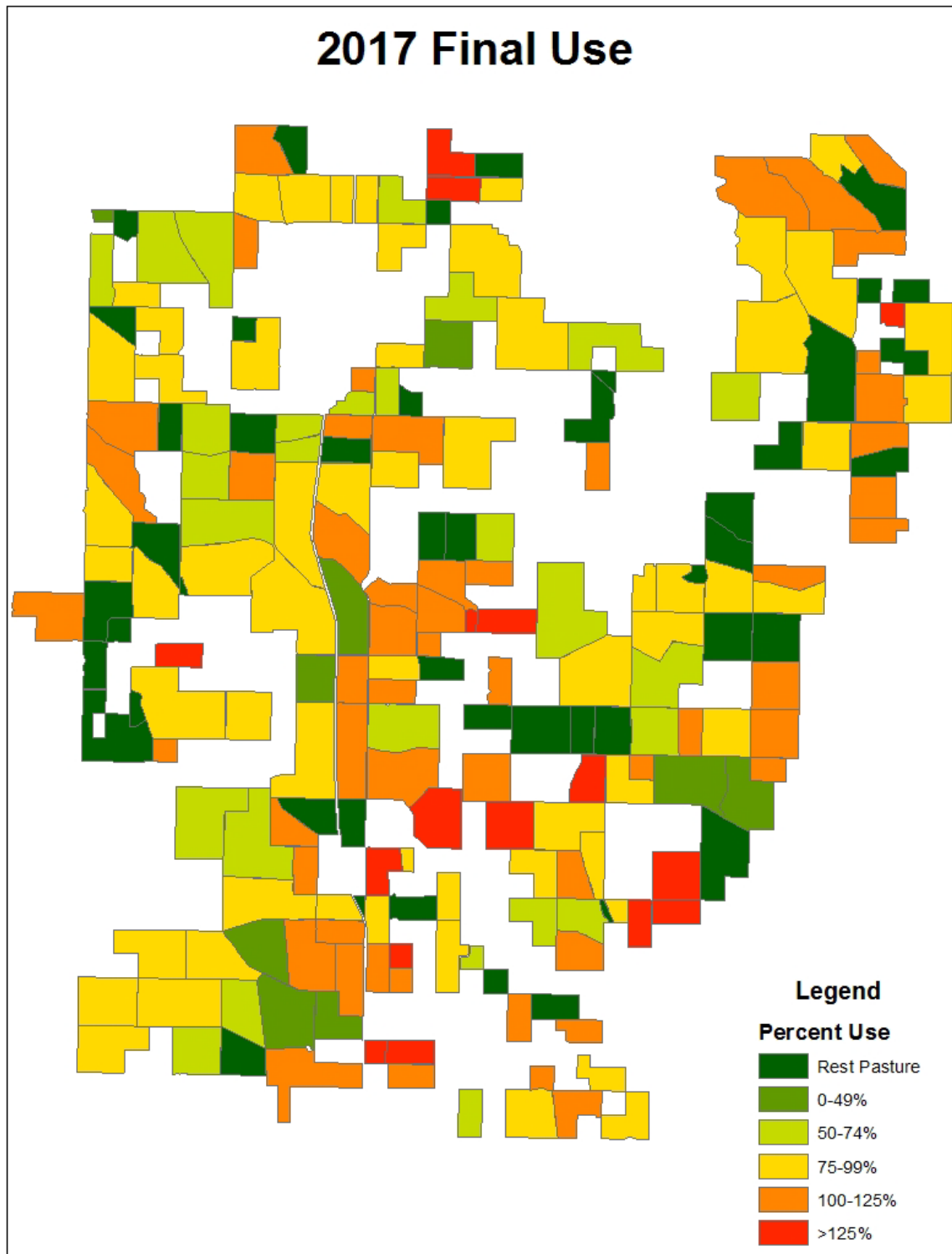


Figure 37. Map of the Fort Pierre Geographic Area showing grazing levels (as % of pasture-capacity) used in 2017 (each polygon is a separate pasture).



11. To what extent has soil health and productivity been degraded by Forest Service management or permitted activities and to what extent have degraded soils been restored?

Indicators = Acres of soils degraded (soil disturbance class 2 or 3) and Acres of soils restored to soil disturbance class 0 or 1 by Forest Service management or permitted activities.

No soil disturbance class surveys (e.g., Napper et al. 2009) have been conducted on the NNFG since our last monitoring report (USDA Forest Service 2013). As discussed in that document, a primary management cause of soil disturbance on the NNFG is motorized vehicle use.

Many of the NNFG's designated travel roads are native-material surfaced (i.e., they are "dirt" roads, not paved or graveled ones). Most of those routes lack drainage structures such as crowned surfaces and lateral ditches, making them even more susceptible to soil disturbance, particularly when wet.

Road maintenance to reduce soil disturbance occurs annually across the NNFG. In the Fort Pierre Geographic Area, we have recently experimented with geotextile fabrics. In road areas particularly prone to rutting, such as at gate or culvert crossings, we installed permeable fabric and then webbing (**Figure 38**). The webbing was held open by filling it with coarse aggregate or crushed gravel. This approach has been a success in some areas (**Figure 39**) but a failure in others (**Figure 40**). Failures necessitated the use of more expensive remedies (**Figure 41**).

Although use of geotextile fabrics is relatively new in the Fort Pierre Geographic Area, preliminary monitoring already allows some conclusions. Geotextile fabrics there are best suited to sites with 1) little lateral water flow, and 2) little to no use by heavy equipment when the structure's foundation is saturated (most often March-May).

Placement of permeable blanket below the geotextile webbing appears useful in retaining fill material within the geotextile webbing (as opposed to that fill simply being pushed down into lower soil layers). Although initially more expensive, use of crushed rock as fill in the webbing material seems to produce a longer-lasting, better-draining structure than does use of coarse aggregate material alone. If crushed gravel is used to fill the webbing, the addition of a shallow coating of coarse aggregate as the structure's final layer seems to help lock the crushed rock in place, making it less prone to displacement.

RECOMMENDATIONS: Use of geotextile fabrics to reduce motorized vehicle impacts to soil health should be expanded. Monitoring indicators should be simplified and focused on metrics more indicative of NNFG management (see **Table 5** for discussion).

Figure 38. Geotextile webbing being filling with crushed gravel. Forest Service Road #207A, Fort Pierre Geographic Area. Photo June 2021 by Dan Svingen.



Figure 39. Stable geotextile fabrics two years after installation. Forest Service Road #203, Fort Pierre Geographic Area. Photo June 2021 by Dan Svingen.



Figure 40. Vehicle high-centered atop failed geotextile fabrics. Forest Service Road #253, Fort Pierre Geographic Area. Photo May 2020 by Dan Svingen.



Figure 41. Culvert, rock, gravel, and coarse aggregate material used as a replacement for failed geofabric fabrics. Forest Service Road #253, Fort Pierre Geographic Area. Photo July 2020 by Dan Svingen.



SUMMARY AND CONCLUSIONS

The monitoring results presented in this report and how they compare to the LRMP's goals, objectives or Desired Future Conditions are summarized in **Table 3**.

Overall, the NNFG is meeting or making measurable progress towards most LRMP goals, objectives or desired conditions. An exception is the low population and distribution of black-tailed prairie dogs due to the impact of sylvatic plague.

As part of this monitoring review, the IDT also considered questions posed by the 2012 Planning Rule 36 CFR 219.12(d). These included:

- 1) Is a change to the LRMP needed?
- 2) Is a new assessment needed?
- 3) Is a change to management activities needed?
- 4) Is a change to the monitoring program needed?

Based on the information in this report, the IDT has recommended no changes to the LRMP in 2022. Any future LRMP revision should consider changing objectives for low structure vegetation (i.e., to >0 acres) to facilitate creation of at least some blowout habitat in the Bessey and McKelvie Geographic Areas.

The IDT did not determine an immediate need for a new LRMP assessment. The IDT did, however, identify the need to change management activities (**Table 4**). The IDT also identified wording recommendations for future monitoring indicators (**Table 5**). Revising monitoring indicators should be done either after all of the LRMP's 33 monitoring questions are assessed, or when the LRMP is updated.

Table 3. Summary statements for the topics and Geographic Areas reviewed in this monitoring report as related to attainment of Land and Resource Management Plan (LRMP) goals, objectives, and desired conditions.

TOPIC	SUMMARY STATEMENTS
1. Water Quality	An LRMP (p. 1-2) goal is to improve and protect watershed conditions. Several South Dakota stream segments and one lake that occur on the NNFG are listed by the state as impaired or threatened. Forest Service staff visited some of these sites to determine whether management activities are contributing to those impairments, and if so, to develop remedial action.
2. Big Game Habitat	The LRMP's (p. 3-22) desired condition for bighorn sheep habitat is to: provide abundant food and cover, protect escape cover, and coordinate with other land managers and landowners. This is being accomplished.
3. Prairie Dog	LRMP (pp. 2-23, 2-30, 2-38, 2-48, 2-56, 2-63, 2-70, & 2-77) objectives regarding prairie dog distribution and

TOPIC	SUMMARY STATEMENTS
	populations are being met in three Geographic Areas but are not being met in five others and are also not being met for the NNFG in its entirety.
4. Prairie Grouse	The LRMP's (p.2-70) prairie grouse population trend objective in the Fort Pierre Geographic Area is being met. The attainment of the LRMP's vegetative structure objectives is addressed below.
5. Blowout Penstemon	LRMP (pp. 2-9, 2-16) objectives regarding blowout penstemon pertain to coordination with other agencies on propagation, reintroduction and creating or maintaining blowout habitat. These objectives are being met, although blowout availability may be declining.
6. American Burying Beetle	The LRMP (p. 1-7) calls for a diversity of vegetative composition and structure. Progress towards that objective in the Bessey and McKelvie Geographic Areas likely benefit American burying beetles.
7. Recreation	The LRMP (p. 1-4) established an objective, in part, to "As demand warrants, increase recreational opportunities where compatible with resource objectives. The opportunities may include trails, campgrounds, and interpretation." The NNFG has identified areas where demand warrants additional evaluation.
8. Wilderness	The LRMP's (p. 1-5) objective is to develop a wilderness plan within five years of Congressional designation. This has been met. The LRMP's desired condition (p. 3-4) is to perpetuate natural conditions and provide moderate opportunities for solitude. This is being accomplished.
9. Climate	The LRMP does not contain any goals, objectives, or desired condition specific to temperature or precipitation other than the objective (p. 1-6) to adjust livestock grazing during drought. Although drought adjustments are not identified as a monitoring indicator, drought adjustments are being done across the NNFG as necessary.
10. Vegetative Structure	Measurable progress is being made towards the LRMP's vegetative structure objective (LRMP p. 2-69) based on data from the Fort Pierre Geographic Area.
11. Soil Health	No data is available to address this question's monitoring indicators. Road maintenance and travel management are helping address one major concern for soil health, i.e., motorized vehicle traffic.

Table 4. Recommendations regarding future management activities on the Nebraska National Forests and Grasslands.

TOPIC	RECOMMENDATIONS
1. Water Quality	Additional IDT review should be conducted on the South Dakota waters listed in Table 1 , particularly along Battle, Horsehead and Rapid Creeks and the Cheyenne River.
2. Big Game Habitat	Current management should continue.
3. Prairie Dog	Continue to manage plague within MA 3.63 to the extent that funding and technology will allow. Continue to work with cooperators to develop cost-effective plague management tools and techniques. Investigate additional opportunities to achieve LRMP objectives.
4. Prairie Grouse	Current management of the Fort Pierre Geographic Area should continue, though additional efforts should be made to increase native grasses and forbs.
5. Blowout Penstemon	Blowout penstemon propagation efforts should continue. Investigate opportunities to intentionally create new blowouts through use of concentrated livestock grazing.
6. American Burying Beetle	Continue to combat invasion by eastern red cedar through use of mechanical treatment and prescribed fire. Promote tall vegetation with a well-formed detritus layer in moist sandy valleys.
7. Recreation	Address recreational demand in the Bessey, Fort Pierre, and Wall Southeast Geographic Areas.
8. Wilderness	Repair/construct livestock exclosures along the South Fork Solider Creek to better protect the riparian zone
9. Climate	NNFG managers should consider climate change adaptations when designing management actions.
10. Vegetative Structure	Fort Pierre Ranger District staff should expand work with livestock permittees to unbalance grazing rotations to better achieve desired vegetation structure diversity.
11. Soil Health	All districts should continue to reduce soil disturbance associated with motorized vehicle travel. Increased use of geotextiles should be pursued where local conditions warrant. Geotextile projects should incorporate a permeable fabric as a base layer, crushed rock as webbing-fill, and a shallow cap of coarse aggregate material.

Table 5. Recommendations for changes in indicators used to monitor the impact of the current or future Land and Resource Management Plan.

QUESTION	RECOMMENDATIONS
1. Are Streams and Waterbodies meeting State assigned Beneficial Uses and associated water quality criteria?	The current indicator reads “NNFG streams and waterbodies meeting or exceeding state water quality criteria for assigned beneficial uses.”, but that would not properly identify where changes are needed (i.e., the current indicator would always result in a conclusion that the status quo was acceptable). To more properly meet the need of § 219.12 (d)(2), this indicator should highlight streams and waterbodies NOT meeting state water quality criteria.
2. Is habitat effectiveness on designated big game range being maintained or enhanced?	The current indicator reads “Recreational and economic issue and cooperative program with state wildlife agencies.” While this is a true statement, it does not meet the need of § 219.12 (d)(2) and should be replaced with something more site-specific and documentable such as “Qualitative discussion of changes in habitat quality”.
3. What is the status of black-tailed prairie dog to assess the functional role of colony habitat?	The current indicators read “Historical and current acreage of active prairie dog colonies; prairie dog town occupancy, extent and density; and sylvatic plague extent and changes.”. These should be simplified to reduce redundancy and to focus on those metrics that are regularly measured. For example: “Changes in active prairie dog colony acreage; Changes in sylvatic plague extent and management”.
4. What is the status of prairie grouse (plains sharp-tailed and greater prairie chicken) to assess the functional role of grassland vegetation habitat?	The current indicators read “Acres and distribution of potential prairie grouse habitat; Current condition and trend of grassland vegetation structure; Current condition and trend of forb/shrub patches”. These should be simplified to reduce redundancy and to focus on those metrics that are regularly measured and are most important to prairie grouse. For example: “Current condition and trend of grassland vegetation structure”. If LRMP objectives continue to include population trends, then indicators to monitor that should also be included.

QUESTION	RECOMMENDATIONS
5. What is the status and trend of habitat to support the recovery of the blowout penstemon on the planning unit?	The current indicators read “Sandhill blowout extent and size; Historical vs. current acreage levels of Sandhill blowouts”. These should be simplified to reduce redundancy and to focus on those metrics that are both measured and important. For example: “Change in availability of blowout habitat; Change in occupied acreage”.
6. What is the status and trend of habitat to support the recovery of the American burying beetle on the planning unit?	The current indicators read “Acres and distribution of potential habitat; Current condition and trend of grassland vegetation structure”. Although a diversity of grassland vegetative structure likely benefits the American burying beetle by diversifying the potential sources of carrion, additional factors such as soil types and moisture levels also play a role in defining suitable habitat. The indicators for this question should be simplified to “Acres and current condition of potential and occupied habitat”.
7. Where does the demand for recreation opportunities warrant development of additional opportunities such as trails or campgrounds?	No changes recommended in current indicators.
8. To what extent are the Soldier Creek Wilderness special features and communities of special concern conserved or enhanced?	No changes recommended in current indicators.
9. How have extreme and average temperature and precipitation values changed across the Nebraska National Forests and Grasslands?	No changes recommended in current indicators. Note: if this monitoring item is retained in future LRMP it should be better tied to LRMP direction.
10. To what extent are rangeland vegetation structure objectives being met?	No changes recommended in current indicators.
11. To what extent has soil health and productivity been degraded by Forest Service management or permitted activities and to what extent have degraded soils been restored?	The current indicators read “Acres of soils degraded (soil disturbance class 2 or 3) and Acres of soils restored to soil disturbance class 0 or 1 by Forest Service management or permitted activities.” This should be simplified to reflect the management activities and monitoring characteristic of the NNFG. For example, the indicator could be: “Qualitative discussion of road management efforts to reduce soil impacts”.

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SUPERVISOR'S STATEMENT

I have reviewed this document, the *Nebraska National Forests and Grasslands Monitoring Report: 2021*. This report meets the intent of the Land and Resource Management Plan's Chapter 4, and 36 CFR 219. This report is approved.

JACK ISAACS
FOREST SUPERVISOR
NEBRASKA NATIONAL FORESTS AND GRASSLANDS

DATE

APPENDIX 1

The 2012 Planning Rule (36 CFR 219.12(5)) specifies eight criteria that are to be addressed by USDA Forest Service biennial monitoring reports. All eight were addressed in this report; see **Table 6** for specifics.

Table 6. Monitoring questions addressed in this report and how they relate to the criteria established by 2012 Planning Rule (36 CFR 219.12(5)).

QUESTION	PLANNING RULE CRITERIA
1. Are Streams and Waterbodies meeting State assigned Beneficial Uses and associated water quality criteria?	The status of select watershed conditions.
2. Is habitat effectiveness on designated big game range being maintained or enhanced?	The status of select ecological conditions including key characteristics of terrestrial and aquatic ecosystems.
3. What is the status of black-tailed prairie dog to assess the functional role of colony habitat?	The status of focal species to assess the ecological conditions required under CFR 219.9.
4. What is the status of prairie grouse (plains sharp-tailed and greater prairie chicken) to assess the functional role of grassland vegetation habitat?	The status of focal species to assess the ecological conditions required under CFR 219.9.
5. What is the status and trend of habitat to support the recovery of the blowout penstemon on the planning unit?	The status of a select set of the ecological conditions required under CFR 219.9 to contribute to the recovery of federally listed threatened and endangered species, conserve proposed and candidate species and maintain a viable population of each species of conservation concern.
6. What is the status and trend of habitat to support the recovery of the American burying beetle on the planning unit?	The status of a select set of the ecological conditions required under CFR 219.9 to contribute to the recovery of federally listed threatened and endangered species conserve proposed and candidate species and maintain a viable population of each species of conservation concern.
7. Where does the demand for recreation opportunities warrant development of additional opportunities such as trails or campgrounds?	The status of visitor use, visitor satisfaction, and progress towards meeting recreation objectives.
8. To what extent are the Soldier Creek Wilderness special features and	The status of visitor use, visitor satisfaction, and progress towards meeting recreation objectives.

QUESTION	PLANNING RULE CRITERIA
communities of special concern conserved or enhanced?	
9. How have extreme and average temperature and precipitation values changed across the Nebraska National Forests and Grasslands?	Measurable changes on the plan area related to climate change and other stressors that may be affecting the plan area.
10. To what extent are rangeland vegetation structure objectives being met?	Progress toward meeting the desired conditions and objectives in the plan, including for providing multiple use opportunities.
11. To what extent has soil health and productivity been degraded by Forest Service management or permitted activities and to what extent have degraded soils been restored?	The effects of each management system to determine that they do not substantially and permanently impair the productivity of the land.

APPENDIX 2

The following Nebraska National Forests and Grasslands staff created this report:

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