APPENDIX N
BIOLOGICAL EVALUATION

FINAL
BIOLOGICAL EVALUATION[1]
FOR THE
NEBRASKA AND SOUTH DAKOTA
BLACK-TAILED PRAIRIE DOG MANAGEMENT

Nebraska National Forest and Associated Units

Buffalo Gap and Fort Pierre National Grasslands, South Dakota

Oglala National Grassland, Nebraska

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[1]Meets the standards for a Biological Evaluation (FSM 2672.42).

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Table of Contents

APPENDIX N BIOLOGICAL EVALUATION 1

I. Introduction N-1

II. Description of the Proposal and Analysis Process N-1

Purpose and Need N-1

Area Affected N-2

Existing Condition N-3

Summary of Alternatives N-3

Process N-8

Field Reconnaissance N-9

Biological Determinations Process N-9

III. Species at Risk Considered in the Analysis N-10

Region 2 Sensitive Species N-10

Rocky Mountain bighorn sheep (Ovis canadensis) N-12

American peregrine falcon (Falco peregrinus) N-12

Brewer's sparrow (Spizella breweri) N-12

Cooper's mountain snail (Oreohelix strigosa cooperi) N-12

Greater prairie chicken (Tympanuchus cupido) N-12

Greater sage grouse (Centrocercus urophasianus) N-12

Hall's bulrush (Schoenoplectus hallii) N-13

Lesser bladderwort (Utricularia minor) N-13

Lesser panicled sedge (Carex diandra) N-13

Lesser yellow lady's slipper (Cypripedium parviflorum) N-13

Lewis' woodpecker (Melanerpes lewis) N-13

McCown's longspur (Calcarius mccownii) N-13

Mountain plover (Charadrius montanus) N-14

Northern goshawk (Accipiter gentilis) N-14

Ottoe skipper (Hesperia Ottoe) N-14

Plains leopard frog (Rana blairi) N-14

Slender cottongrass (Eriophorum gracile) N-14

Sturgeon chub (Macrhybopsis gelida) N-15

Pearl dace (Margariscus margarita) N-15

Finescale dace (Phoxinus neogaeus) N-15

Plains minnow (Hybognathus placitus) N-15

Flathead chub (Platygobio gracilis) N-15

Trumpeter swan (Cygnus buccinators) N-15

Yellow widelip orchid (Liparis loeselii) N-15

American bittern (Botaurus lentiginosus) N-15

Barr's orphaca / Barr's milkvetch (Astragalus barrii) N-16

Black tern (Chlidonias niger) N-16

Fringed myotis (Myotis thysanodes) N-16
Loggerhead shrike (Lanius ludovicianus) N-16
Northern leopard frog (Rana pipiens) N-16
Townsend's big-eared bat (Corynorhinus townsendii) N-16
Visher's eriogonum / Dakota buckwheat (Eriogonum visheri) N-17
Yellow-billed cuckoo (Coccyzus americanus) N-17

IV. Analysis of Effects – General Discussion N-17
Direct Effects N-17
Indirect Effects N-18
Cumulative Effects N-19

V. Detailed Analysis of Effects – Sensitive Species N-25
Region 2 Sensitive Species Analyzed N-25
Bald eagle (Haliaeetus leucocephalus) N-25
Black-tailed prairie dog (Cynomys ludovicianus) N-27

VII. References N-91

I. Introduction

The purpose of this Biological Evaluation (BE) is to determine the likely effects of black-tailed prairie dog (prairie dog) (*Cynomys ludovicianus*) management in the interior-colony management zone (IMZ) on the Nebraska National Forest (NNF) for Forest Service (FS) sensitive species (FSM 2670.32). The IMZ is the area that is farther from private land than the boundary management zone (BMZ). For South Dakota national grasslands, the BMZ has been defined on the Buffalo Gap National Grassland (BGNG) as less than one-half mile from private land and less than a quarter mile on the Fort Pierre National Grassland (FPNG). On the Oglala National Grassland (ONG) in Nebraska, the BMZ is less than one-half mile from private land.

In August of 2005, a record of decision for Black-tailed Prairie Dog Conservation and Management (BTPDCM) on the Nebraska National Forest and Associated Units was signed (USDA Forest Service 2005e). This decision provided general guidance and direction for prairie dog management within the BMZ on the national forests and associated units. This BE tiers to and incorporates by reference as applicable the information and references used in the Biological Assessment (BA) and BE for the 2005 BMZ decision. These prior documents and can be found in the administrative record for that decision housed in the Nebraska National Forest Supervisor's Office in Chadron, Nebraska.

The Forest Service has established direction in Forest Service Manual 2670 (USDA Forest Service 2007) to guide habitat management for Threatened, Endangered, Proposed, and Sensitive species (TEPS).

II. Description of the Proposal and Analysis Process

Purpose and Need

The 2005 FEIS and Record of Decision for Black-tailed Prairie Dog Conservation and Management on the Nebraska National Forest and Associated Units focused on the encroachment of prairie dog colonies from National Grasslands onto adjoining private or tribal agricultural lands, where ranchers and farmers are concerned about losses in agricultural production, costs of managing prairie dogs, effects on land values, and risks to health and safety (USDA Forest Service 2005c, USDA Forest Service 2005e). That effort dealt with the prairie dog colonies near the Forest boundaries in boundary management zones (BMZs) and the impacts as colonies expanded onto non-Forest Service lands. The 2001 Forest Plan did not set acre objectives for prairie dog colonies outside the BMZs, and it limited rodenticide use to very specific situations (USDA Forest Service 2001c).

This current project focuses on the effects of prairie dog colonies in the interior of the National Grasslands and evaluates alternatives for managing black-tailed prairie dog populations in these interior-colony management zones (non-MA 3.63 areas only). The purpose of the decision was to provide direction for management of prairie dog colonies through the following:

- Setting objectives for desired acres of prairie dog colonies within the interior of the National Grasslands to move toward desired prairie dog acres, and to maintain or move toward desired vegetation cover, protect topsoil, and prevent the potential establishment of noxious and invasive species.
- Managing black-tailed prairie dog habitat designated as a black-footed ferret management area (MA 3.63) in the 2002 Forest Plan to sustain populations of black-footed ferrets and associated species.

There is a need to evaluate whether we are meeting Forest Plan objectives for vegetation, prairie dogs, and black-footed ferrets (2001 Forest Plan, Chapters 1-3) and whether those objectives are still valid. The need for evaluation is driven by the following information, resource conditions, and socio-economic concerns:

The reduction of vegetation, exacerbated by the ongoing drought, has influenced prairie dog expansion and increased the potential for soil erosion impacts. Seven years of drought of varying intensities have resulted in suppressed plant growth and more bare soil on prairie dog colonies, and the potential establishment of noxious and invasive species (USDA Forest Service 2008b).

Ranchers and counties claim this decreased growth from drought and prairie dog utilization has led to blowing soil (soil erosion) and there are concerns that this will occur across the national grasslands (Pennington County Commissioners 2004). Although the majority of the non-MA 3.63 areas are not currently reflecting soil erosion impacts, my decision is proactive in maintaining existing vegetation.

Recent inventories (USDA Forest Service 2008a) have shown that prairie dog colonies continue to expand within the National Grasslands and in some areas, they continue to encroach from federal land on to private land despite the use of rodenticide and non lethal methods within the BMZs of the encroaching colonies (USDA Forest Service 2008b). Prairie dogs compete with livestock for available forage (Detling 2006; Vermeire et. al. 2004; Derner et. al. 2006). The Forest has received requests to limit the amount of prairie dogs on National Grasslands (Rittberger letters 2007) to limit competition with livestock and to limit encroachment from federal on to private lands.

Viable prairie dog colonies are often primarily on National Grasslands. From 2004 to 2007, there have been aggressive control efforts on intermingled non-federal (primarily private) land within the national grasslands in the project area (Smith 2007). Control efforts on state and private land have limited prairie dog dispersal and expansion to smaller areas on the National Grasslands. Concentrating prairie dogs on the National Grasslands can heighten the potential impacts to the animal, plant, and soil resources. This is especially true when large acreages of prairie dog colonies are needed for black-footed ferret habitat and there is a limited amount of national grassland surrounding the colony, with livestock and prairie dogs competing for the vegetation. This situation makes it imperative that current resource conditions are maintained or improved and necessitates having the maximum tools available to achieve that goal.

Area Affected

The areas affected by the black-tailed prairie dog management plan are the Buffalo Gap and Fort Pierre National Grasslands in South Dakota and the Oglala National Grassland in Nebraska.

Buffalo Gap National Grassland and Associated Geographic Areas. The Buffalo Gap National Grassland is located in southwestern South Dakota and includes approximately 595,000 acres of land that borders and is intermingled with private, state, Indian reservation, and national park lands. The eastern half of this unit extends from near Kadoka, South Dakota, on the east, to the Cheyenne River on the west, north to U.S. Highway 14, and south to the Pine Ridge Indian Reservation. The Wall Ranger District (WRD), Wall, South Dakota, administers the eastern half. The WRD is divided into 3 geographic areas (Wall North, Wall Southeast, and Wall Southwest). The Wall Southeast Geographic area contains an area identified in the LRMP as 3.63 Black-footed Ferret Reintroduction Habitat. The Wall Southwest Geographic area contains Conata Basin, which is also a 3.63 Black-footed Ferret Reintroduction Habitat. Ferrets have been successfully reintroduced into this area. The western half of the Buffalo Gap National Grassland extends from the Cheyenne River on the east to the Wyoming and Nebraska borders on the west and south, respectively. The Fall River Ranger (FRRD) District, Hot Springs, South Dakota, administers this unit. The FRRD is divided into 3 geographic areas (Fall River West, Fall River

Southeast, and Fall River Northeast). The Fall River Southeast Geographic area contains an area that is identified in the LRMP as the Smithwick 3.63 Black-footed Ferret Reintroduction Habitat.

Fort Pierre National Grassland and Geographic Area. The Fort Pierre National Grassland lies south of Pierre, South Dakota, north of Interstate 90, and west of the Lower Brule Indian Reservation. The Fort Pierre National Grassland consists of mixed-grass vegetation on a rolling hill landscape just west of the Missouri River.

Oglala National Grassland and Geographic Area. The Oglala National Grassland lies in Dawes and Sioux counties of northwestern Nebraska and contains mostly mixed-grass vegetation. Topography consists of rolling hills and badlands. The grassland is administered by the Pine Ridge Ranger District, Chadron, Nebraska.

Existing Condition

Approximate prairie dog colony acreage for each unit in the project area is displayed in Table N-1. A map of potential prairie dog habitat is maintained in the project record.

Table N-1. **Acres of active prairie dog colonies located within the interior management zone in 2006 on national grassland (NG) and individual geographic areas (GA).**

Location	Acres of Active Colonies*	Approximate Number of Colonies	Average Colony Acreage (range)
Fall River West GA	210	11	19
Fall River Southeast GA	545	36	15
Fall River Northeast GA	1,130	60	19
Wall North GA	454	14	32
Wall Southeast GA	1,414	37	38
Wall Southwest GA	26,698	237	112
Fort Pierre GA	1,735	46	38
Oglala GA	1,125	26	43

* Active prairie dog acres from data 2005 to 2006, rodenticide treatment in BMZ has occurred. A prairie dog colony is define in the LRMP as a colony that supports a prairie dog density that has not been noticeably reduced by poisoning, plague, or shooting and that is essentially at its carrying capacity.

Summary of Alternatives

The following lists the alternatives being analyzed. For a more detailed description of the alternatives refer to Chapter 2 of the FEIS. Table N-2 quantifies the differences between the alternatives and is used for effects analysis.

Alternative 1

Summary Description: This alternative employs adaptive management in emphasizing a mix of multiple uses while sustaining black-footed ferrets and associated species within Management Area 3.63 (MA 3.63). MA 3.63 is designated as a black-footed ferret management emphasis in the 2001 Forest Plan. This alternative is based on a moderate objective for prairie dogs while incorporating adaptively applied active and passive management tools. Alternative 1 addresses sustainability of black-footed ferrets, concerns about vegetation condition, and social/economic issues. In the Conata

Basin MA 3.63 where ferrets currently exist, this alternative prioritizes ferrets and the associated need for prairie dog colonies over other multiple uses. This alternative utilizes an Adaptive Response Protocol (See Appendix H) to help make implementation decisions at the site-specific level.

In addition to 2001 Forest Plan direction, this alternative provides objectives for maximum and minimum acres of active prairie dog colonies at the Geographic Area (GA) scale, excluding the acreage within MA 3.63. In MA 3.63, the specific maximum and minimum acreage is designed to provide habitat for sustainable populations of black-footed ferrets based on prairie dog densities. The acre objectives for Alternative 1 are defined as follows:

- GA – The maximum acreage occupied by active prairie dog colonies is 3 percent of the total aggregate National Grassland acres within the specific GA. The 3 percent objective was chosen based on recommendations from the ranching community and counties and consideration for the biological needs of wildlife species associated with prairie dog colonies, public desires, and the multiple uses that also need to occur on the National Grasslands.
- The minimum acreage for GAs is one prairie dog colony complex defined as 1,000 acres by the 2001 Forest Plan (USDA Forest Service 2001c). Exceptions to this include the Fall River Southeast GA, where prairie dog acres will be dedicated to MA 3.63 at Smithwick, and the Wall Southwest GA, where prairie dog acres will be dedicated to MA 3.63 at Conata Basin. Prairie dog colony acres in these two GAs will be addressed only after acreage requirements are met in the associated MA 3.63 areas of the GA.
- MA 3.63 (Conata Basin and Smithwick) – The maximum acre objective for Conata Basin is based on what is required to sustain 100 breeding adult ferrets when prairie dog densities are low because of such factors as drought. The minimum acre objective for Conata Basin is based on what is required to maintain 100 breeding adult ferrets when prairie dog densities are high (USDA Forest Service 2005c, Livieri 2005). The maximum acre objective for Smithwick is based on what is required to maintain 30 breeding adult ferrets. The minimum acre objective is based on a recent environmental assessment (EA) for a similar ferret reintroduction need in Wind Cave National Park (National Park Service 2006a, 2006b). Table N-2 provides the acreage objectives for black-tailed prairie dogs under this alternative.

Alternative 2 – No Action (Current Forest Plan Direction)

Summary Description: This alternative is the current prairie dog management on the National Forest and Grasslands as defined in the 2001 Forest Plan and the Record of Decision for Black-tailed Prairie Dog Conservation and Management on the Nebraska National Forest and Associated Units, Including Land and Resource Management Plan Amendment 2 (BTPDCM) (USDA Forest Service 2005e). The 2001 Forest Plan did not set specific acreage objectives for prairie dog colonies. The current management objective for prairie dogs located in the IMZ is to achieve population regulation and management through non lethal methods and limited rodenticide use where human health and safety or infrastructure is threatened (USDA Forest Service 2001c).

The 2001 Forest Plan projected that there would be between 24,400 and 39,800 acres of prairie dogs on the Nebraska National Forest by 2012. The BTPDCM also used the expansion model with more current acreage numbers and projected there would be between 29,600 to 41,400 acres of prairie dogs on the Nebraska National Forest by 2012. There are currently 33,311 acres of occupied prairie dog colonies (see FEIS Appendix B), an indication that the 2001 Forest Plan projections are still relevant.

From 1996 to 2006, expansion rates varied tremendously across the National Grasslands due to precipitation, plague, and rodenticide use (see tables in FEIS Appendix B). From 2002 to 2006, actual annual growth rates in the IMZ indicate an average forestwide expansion of 25 percent. This time frame was selected because drought was occurring and there were no control activities; drought and no

rodenticide use are two primary causative agents of expansion in the IMZ. A 25% expansion rate was used to determine predicted acres of prairie dogs on the Nebraska National Forest in the next 10 years (2017). More specific geographic area objectives are listed in Table N-2.

For analysis purposes, the following prairie dog acreage assumptions were made to maintain consistency with the 2001 Forest Plan:

- GA – This alternative is passive with regard to controlling prairie dog acres except within BMZs and in limited instances of threat to infrastructure or public health. For this reason, the minimum acreage objective is assumed to be the current inventory. Maximum acres were determined using 25 percent average annual growth rate per year and the current colony inventory as a base starting point.
- MA 3.63 (Conata Basin and Smithwick) – For Conata Basin, the minimum acreage defined by the 2001 Forest Plan is three prairie dog complexes (3,000 acres). This alternative is passive with regard to controlling prairie dog acres, and the current inventory exceeds the 2001 Forest Plan minimum of 3,000 acres as shown in the following table. For this reason, the minimum acreage objective is assumed to be the current inventory. The 2001 Forest Plan minimum acreage for Smithwick is represented by one prairie dog complex as defined under GA descriptions. As with the GAs, the maximum acre objectives were determined using the average annual growth rate of 25 percent and the current colony inventory as a base starting point.

Alternative 3

Summary Description: This alternative was suggested and supported through initial scoping input from several county agencies, groups, and individuals. It employs adaptive management with a focus on ensuring there is not a disproportionate share of prairie dog acres in any county containing National Grasslands. Table 2-11 provides a list of adaptive management tools currently available for implementing this alternative. This alternative would establish two primary objectives: 1) at a minimum, maintain a similarity index of 25 to 50 percent and 2) define the "proportionate share of prairie dog acres" as the maximum acreage objectives displayed in the following table. This alternative utilizes an Adaptive Response Protocol (See Appendix H) to help make implementation decisions at the site-specific level.

GA – In South Dakota, this alternative sets a maximum objective only, providing for acreages not to exceed 3% of the aggregate total of National Grasslands in each county (See Chapter 2 of the FEIS to see how the county acreages break out). No minimum acreages are established in South Dakota for Alternative 3. The minimum numbers are essentially set by the vegetative condition of each prairie dog colony (based on a NRCS Ecological Site Similarity Index threshold - Natural Resource Conservation Service – USDA 2006). If the similarity index falls below 25 percent, the prairie dogs will be reduced to 10 percent of the active colony acreage. On the Oglala GA in Nebraska, the range of acres of active prairie dog colonies is set at 100 to 900 acres.

MA 3.63 (Conata Basin and Smithwick) – No specific acreages are suggested for the 3.63 areas.

Alternative 4

This alternative employs adaptive management with details and prairie dog recommendations derived from the South Dakota Black-tailed Prairie Dog Conservation and Management Plan - Feb. 2005, (SD Plan) and/or other state statutes. The SD Plan was approved by the South Dakota Legislature and is codified in state law. This alternative emphasizes four major objectives:

- Follow the "good neighbor" policy (as described in the SD Plan) to prevent the unwanted encroachment of prairie dogs from U.S. Forest Service lands to adjoining private lands.
- Follow the guidelines in the SD Plan regarding prairie dog management goals and "triggers" as they apply to inventoried state prairie dog acreage estimates.
- Manage prairie dog populations to minimize situations exposing the land to bare soil by maintaining a similarity index of no less than 20 percent. Grass or grass sod conditions should be the management goal on all prairie dog colonies.
- Sustain the black-footed ferret population. Maintaining active prairie dog colony acreages within the established parameters of between 8,000 and 12,000 acres will be the management goal.

Prairie Dog Acre Objectives: In addition to 2001 Forest Plan objectives, this alternative provides specific objectives only for the Conata Basin MA 3.63. The SD Plan did not set specific acreage figures for areas outside of Conata Basin. It set objectives at the statewide level for tribal and non-tribal acreage. The plan identified the presence of prairie dogs on federal lands but did not set specific acreage objectives for the federal lands included in this analysis. This alternative does incorporate a range condition objective based on the NRCS Ecological Site Similarity Index. The objective for this alternative is a minimum similarity index of 20 percent or greater on all GAs and MAs. The state of Nebraska does not currently have a prairie dog management plan and no specific acreage has been identified for the Oglala GA. Specifically, those objectives are defined in Table N-2.

Alternative 5

Summary Description: This alternative employs adaptive management and emphasizes two major objectives within the IMZ: 1) a larger population of black-footed ferrets and associated species and 2) higher levels of black-tailed prairie dog colony acreages on all GAs and MAs. It would provide priority for ferrets over other multiple uses within both MA 3.63 areas. It would also provide priority for black-tailed prairie dogs over other multiple uses when minimum acre objectives are not being met. This alternative utilizes an Adaptive Response Protocol (See Appendix H) to help make implementation decisions at the site-specific level. Table 2-11 provides a list of adaptive management tools currently available for implementing this alternative.

Historical occupancy for black-tailed prairie dogs across South Dakota has been estimated to range from 33,000 acres to 1,757,000 acres (Cooper and Gabriel 2005). This occupancy undoubtedly fluctuated with precipitation and herbivory patterns, but it does provide goals by which National Grasslands can contribute to the overall conservation of black-tailed prairie dogs and their associated species. This alternative would provide habitat to maintain a well-distributed population of black-tailed prairie dogs and other associated species across the National Grasslands. Under this alternative, prairie dog acreage expansion would not continue indefinitely.

Prairie Dog Acre Objectives: In addition to 2001 Forest Plan objectives, this alternative provides objectives for a range (maximum and minimum) of active prairie dog acreage at the GA scale, excluding the acreage in MA 3.63 where the specific range of acreage is designed to optimize populations of black-footed ferrets based on prairie dog acreage. Specifically, those objectives are defined below and listed in Table N-2.

- GA – The minimum and maximum acreage occupied by active prairie dog colonies would be 10 percent and 20 percent, respectively, of the total aggregate acres in the specific GA.
- MA 3.63 (Conata Basin and Smithwick) – There are two acre objectives for Conata Basin: 1) minimum acres required to maintain 125 breeding adult ferrets (using average home range size data collected in Conata Basin, adjusted for unoccupied areas) and 2) maximum acres equal to the total suitable acres in the IMZ to optimize the potential for adult ferrets. For Smithwick, the minimum is based on what is required to maintain a minimum of 50 breeding adults while the maximum optimizes potential of the area for breeding adults. With regard to ferret numbers, this alternative places priority on number of ferrets in the MA 3.63 areas.

Table N-2. Range of active prairie dog acres to be maintained by alternative.

Geographic Area	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Oglala	1,000 to 2,800	1,125 to 13,097	100 to 900	N/A	9,500 to 18,900
Fall River Northeast GA	1,000 to 2,700	1,130 to 13,155	0 to 2,700	N/A	9,100 to 18,300
Fall River West GA	1,000 to 3,600	210 to 2,445	0 to 3,600	N/A	12,000 to 24,000
Fall River Southeast GA	No acreage objective	42 to 489	0 to 2,500	N/A	8,700 to 17,300
MA 3.63 Black-footed ferret reintroduction area (Smithwick)	2,100 to 5,000	503 to 5,856	0 to 800	N/A	9,600 to 17,000
Wall North GA	1,000 to 2,100	454 to 5,285	0 to 2,100	N/A	6,900 to 13,900
Wall Southeast GA	1,000 to 2,700	1,414 to 16,461	0 to 2,800	N/A	9,100 to 18,200
Wall Southwest GA	No acreage objective	214 to 2,491	0 to 830	N/A	2,600 to 5,100
MA 3.63 Black-footed ferret reintroduction area (Conata Basin)	12,500 to 19,000	26,484 to 46,400	0 to 2,200	8,000 to 12,000	27,000 to 46,400
Fort Pierre GA	1,000 to 3,500	1,735 to 20,198	0 to 3,470	N/A	11,600 to 23,200

Process

Supporting Information and Pre-field Review. A list of plant and animal species was developed that included species considered sensitive by Region 2 of the Forest Service (Table N-6). Information on species at risk and their habitats was obtained from a large volume of published and unpublished references including regional programmatic BEs (Table N-3).

Table N-3. Programmatic biological evaluations and assessments prepare for impacts of grazing in Region 2 of the Forest Service that were consulted during the preparation of this document.

Type of document	Species	Author and date
Biological Evaluation	Swift fox	USDA Forest Service 1995f
	American bittern	USDA Forest Service 1995g
	Long-billed curlew	USDA Forest Service 1995h
	Ferruginous hawk	USDA Forest Service 1995i
	Burrowing owl	USDA Forest Service 1995j
	Mountain plover	USDA Forest Service 1995k
	Trumpeter swan	USDA Forest Service 1995l
	Black tern	USDA Forest Service 1995m
	Northern leopard frog	USDA Forest Service 1995n
	Regal fritillary butterfly	USDA Forest Service 1995o
	Sensitive species not impacted by grazing	USDA Forest Service 1995p
	Sensitive species in riparian areas	USDA Forest Service 1995q
Biological Assessment	Bald eagle	USDA Forest Service 1995d, 1995e

The Regional Leadership Team initiated the Species Conservation Project (SCP) in April, 2000. The purpose of the project is to compile scientific information, and develop a comprehensive approach to conservation of fish, wildlife and plant species. Chartered as a 5-year project, it was designed to:

- Develop consistent scientific information and tools to improve our efforts to provide for species viability and ecosystem sustainability.
- Change and improve planning and implementation by integrating ecological objectives and outcomes early in the design phase, rather than mitigating negative impacts.
- Improve organizational effectiveness by streamlining analyses and building internal and external credibility.

Table N-4. SCP technical conservation assessments consulted during the preparation of this document.

Species	Author and date	Species	Author and date
Fringed myotis *Myotis thysanodes*	Keinath 2004	Loggerhead shrike *Lanius ludovicianus*	Wiggins 2005a
Townsend's big-eared bat *Corynorhinus townsendii*	Gruver and Keinath 2006	Brewer's sparrow *Spizella breweri*	Holmes and Johnson 2005
Swift fox *Vulpes velox*	Stephens and Anderson 2005	Grasshopper sparrow *Ammodramus savannarum*	Slater 2004
Rocky Mountain bighorn sheep (*Ovis canadensis*	Beecham et al. 2007	Trumpeter swan *Cygnus buccinator*	Slater 2006
American bittern *Botaurus lentiginosus*	Wiggins 2006	Black tern *Chlidonias niger surinamensis*	Naugle 2004

Species	Author and date		Species	Author and date
Greater prairie chicken *Tympanuchus cupido*	Robb and Schroeder 2005		Lewis's woodpecker *Melanerpes lewis*	Abele et al. 2004
Yellow-billed cuckoo *Coccyzus americanus*	Wiggins 2005b		Plains leopard frog *Rana blairi*	Smith and Keinath 2005
Long-billed curlew *Numenius americanus*	Sedgwick J.A. 2006		Northern leopard frog *Rana pipiens*	Smith and Keinath 2007
Northern harrier *Circus cyaneus*	Slater and Rock 2005		Sturgeon chub *Macrhybopsis gelida*	Rahel and Thel 2004
Northern goshawk *Accipiter gentiles atricapillus*	Kennedy 2003		Lesser panicled sedge *Carex diandra* Schrank	Gage and Cooper 2006
Ferruginous hawk *Buteo regalis*	Collins and Reynolds 2005		Lesser yellow lady's slipper *Cypripedium parviflorum* Salisb.	Mergen 2006
Chestnut-collared longspur *Calcarius ornatus*	Sedgwick 2004a		Slender cottongrass *Eriophorum gracile* W. D. J. Koch	Decker et al 2006
McCown's longspur *Calcarius mccownii*	Sedgwick 2004b		Hall's bulrush *Schoenoplectus hallii* (Gray) S.G. Sm.	Beatty, et al 2004
Short-eared owl *Asio flammeus*	Wiggins 2004		Barr's milkvetch *Astragalus barrii* Barneby	Ladyman 2006a
Burrowing owl *Athene cunicularia*	McDonald et al. 2004.		Visher's buckwheat *Eriogonum visheri* A. Nelson	Ladyman 2006b
Mountain plover *Charadrius montanus*	Dinsmore 2003		Lesser bladderwort *Utricularia minor* L.	Neid 2006

Field Reconnaissance

Surveys, research, and inventories have been conducted by the Forest Service and/or others with regards to sensitive species like the swift fox, mountain plover, greater prairie chicken, sage grouse, western burrowing owl, and regal fritillary butterfly. Surveys of prairie dog colonies have also been conducted by the Forest Service. Incidental sightings of sensitive species have also been recorded. Information gathered from such field work was used to help describe species distributions, habitat use, and habitat suitability. The information was also useful in helping to determine potential effects from implementation of each of the alternatives.

Biological Determinations Process

To reduce the number of analyses, any species listed Table N-6 that meet one or more of following criteria (screens) was eliminated from further analyses:

- **Screen 1 - (Importance of Area)** Presence of the species or suitable habitat is doubtful or has not been documented.
- **Screen 2 - (Threats)** The species or potential habitat for the species may occur, but it's highly unlikely that land uses and allocations authorized by the Forest Service would affect the species and/or its habitat either on NFS lands or downstream.

This BE process culminates with a determination of the likely effects of the alternatives on each species. Direction in Forest Service Manual 2670 (USDA Forest Service 2007) establishes the types of determinations for Forest Service-designated sensitive species. The determinations (and abbreviations) made for these species are presented in Table N-5. A biological determination is being made for each species for each national grassland and forest where the species or suitable habitat is located.

Table N-5. Biological determinations for Forest Service Region 2 sensitive species.

Determination	Abbreviation
No impact	NI
Beneficial impact	BI
May adversely impact individuals but not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing or a loss of species viability rangewide	MAII
Likely to result in a loss of viability on the planning area, in a trend to federal listing, or in a loss of species viability range-wide	LRLV

Each species inhabiting the project area depend on prairie dog colonies to a different degree ranging from the black-footed ferret, that without prairie dogs would become extinct, to the grasshopper sparrow, that because of their aversion to low structure habitat will avoid a prairie dog colony altogether. We will evaluate each species individually and discuss species viability across the planning area and make biological determinations for each of the proposed alternatives.

III. Species at Risk Considered in the Analysis

Region 2 Sensitive Species

Table N-6 lists the species that are on the U. S. Forest Service Region 2 sensitive species list that could occur on the individual GAs in the project area (USDA Forest Service 2005b).

Table N-6. Region 2 sensitive species located on NFS lands in the project area.

	Buffalo Gap National Grassland						Fort Pierre GA	Oglala GA
	FRRD West GA	FRRD SE GA	FRRD NE GA	WRD North GA	WRD SW GA	WRD SE GA		
MAMMALS								
Fringed-tailed myotis	P	P	K	P	K	P	---	K
Townsend's big-eared bat	P	P	P	P	K	K	---	P
Black-tailed prairie dog	K	K	K	K	K	K	K	K
Swift fox	P	K	K	K	K	K	K	K
Rocky Mountain bighorn sheep	---	---	---	---	---	---	---	---
BIRDS								
American bittern	K	K	P	P	P	P	K	K
Bald eagle	K	K	K	K	K	K	K	K
Greater prairie-chicken	---	---	---	---	---	---	K	---
Yellow-billed cuckoo	---	---	K	P	P	P	P	K
Long-billed curlew	K	K	K	K	K	K	K	K
American peregrine falcon	P	K	K	P	P	P	K	K
Northern goshawk	P	P	K	P	P	P	P	P
Greater sage grouse	K	---	---	---	---	---	---	---
Northern harrier	K	K	K	K	K	K	K	K
Ferruginous hawk	K	K	K	K	K	K	K	K
Chestnut-collared longspur	K	K	P	P	P	P	K	K
McCown's longspur	---	---	---	---	---	---	---	K

	Buffalo Gap National Grassland						**Fort Pierre GA**	**Oglala GA**
	FRRD West GA	**FRRD SE GA**	**FRRD NE GA**	**WRD North GA**	**WRD SW GA**	**WRD SE GA**		
Short-eared owl	K	K	K	K	K	P	K	K
Western burrowing owl	K	K	K	K	K	K	K	K
Mountain plover	---	---	---	---	K	---	---	---
Loggerhead shrike	K	K	K	K	K	K	K	K
Brewer's sparrow	K	---	---	---	---	---	---	K
Grasshopper sparrow	K	K	K	K	K	K	K	K
Trumpeter swan	---	---	---	---	K	K	---	---
Black tern	K	K	---	K	---	---	K	K
Lewis's woodpecker	---	---	---	---	---	---	---	K
AMPHIBIANS								
Plains leopard frog	---	---	---	---	---	---	---	---
Northern leopard frog	K	K	K	K	K	K	K	K
FISH								
Sturgeon chub	---	---	K	---	K	---	---	---
Pearl dace	---	---	---	---	---	---	---	---
Finescale dace	---	---	---	---	---	---	---	---
Plains minnow	P	P	P	P	P	P	P	P
Flathead Chub	K	K	K	K	K	K	---	K
MOLLUSCS								
Cooper's mountain snail	---	---	---	---	---	---	---	---
INSECTS								
Regal fritillary butterfly	K	---	K	P	---	P	K	---
Ottoe skipper	---	---	---	---	---	---	P	---
PLANTS – Monocots								
Carex diandra	---	---	---	---	---	---	---	---
Cypripedium parviflorum	---	---	---	---	---	---	---	---
Eriophorum gracile	---	---	---	---	---	---	---	---
Liparis loeselii	---	---	---	---	---	---	---	---
Schoenoplectus hallii	---	---	---	---	---	---	---	---
PLANTS – Dicots								
Astragalus barrii	P	K	K	P	K	P	---	P
Eriogonum visheri	P	P	P	P	K	K	---	P
Utricularia minor	---	---	---	---	---	---	---	---

K = Known occurrence in vicinity; date of last observation indicates that species still occurs in area.

P = Possible but unconfirmed occurrence.

Region 2 Sensitive Species Eliminated From Further Analysis

SCREEN 1 (IMPORTANCE OF AREA)

Rocky Mountain bighorn sheep (Ovis canadensis)

Rationale: Rocky Mountain bighorn sheep inhabit open or semi-open, often precipitous, terrain characterized by a mix of steep or gentle slopes, broken cliffs, rock outcrops, and canyons and their adjacent river benches and mesa tops. They use slopes of 36 to 80 percent, while avoiding slopes less than 20 percent (Beecham et al. 2007). There are sheep in the badlands topography of the Badlands National Park in South Dakota and the Pine Ridge area of Nebraska. They would be considered rare visitors to the National Grasslands.

American peregrine falcon (Falco peregrinus)

Rationale: Occurrence of this species on or near the planning units is highly incidental, unpredictable and limited to migrants passing through these areas. Potential and suitable nesting habitat within the planning area either does not exist or is negligible.

Brewer's sparrow (Spizella breweri)

All geographic areas with the exception of the Fall River West Geographic Area and the Oglala Geographic Area.

Rationale: The Brewer's sparrow is an obligate of sagebrush communities. Throughout most of the Brewer's sparrow's breeding range it is most closely associated with landscapes dominated by big sagebrush (*Artemisia tridentata*). The breeding range includes extreme southeastern South Dakota and northwestern Nebraska (Holmes and Johnson 2005). The only GAs that are within the breeding range and include enough sagebrush habitats for Brewer's sparrows are the Fall River West and the Oglala.

Cooper's mountain snail (Oreohelix strigosa cooperi)

Rationale: Cooper's Rocky Mountain snail is known only from the Black Hills National Forest. It is a sensitive species in the Rocky Mountain. Known locations of this species are concentrated in the northern and western sections of the Black Hills National Forest. They are found from forested areas and talus slopes. The litter layer is very important to snails for food and shelter and well-developed litter (but not thick or fungus-matted) are preferable, i.e., areas with very rich and comparatively wet, but loose soil (Anderson 2005). These habitats do not exist on or near prairie dog colonies

Greater prairie chicken (Tympanuchus cupido)

All Geographic Areas with the exception of FPNG.

Rationale: The Buffalo Gap National and Oglala National Grasslands are outside of the current distribution of the greater prairie chicken (Svedarsky et al. 2003).

Greater sage grouse (Centrocercus urophasianus)

All geographic areas with the exception of the Fall River West Geographic Area.

Rationale: The greater sage grouse is dependent on extensive areas of sagebrush for its existence (Rowland 2004). The only Geographic Area that currently has enough sagebrush to sustain a greater sage grouse population is the Fall River West GA.

Hall's bulrush (Schoenoplectus hallii)

Rationale: Hall's bulrush is an obligate wetland species that inhabits moist sands to sandy-peaty substrates of shores and bottoms of shallow ephemeral ponds, sinkhole ponds and other sand prairie habitats where widely fluctuating water levels keep a sand substrate free of other vegetation (NatureServe 2006) (Beatty et. al. 2004).

These are habitats not affected by prairie dog management

Lesser bladderwort (Utricularia minor)

Rationale: Lesser bladderwort is a circumboreal species found in open bogs, sedge meadows and marshlands and prefers calcium-rich shallow water (Northern Prairie Wildlife Research Center 2004). It is an affixed (as opposed to free-floating) aquatic species that grows in a variety of low energy aquatic environments. It grows in shallow water (up to approximately 12 inches deep) with a penetrable substrate Individuals tend to grow in places like inundated mudflats or areas with emergent vegetation (Neid 2006).

These are habitats not affected by prairie dog management.

Lesser panicled sedge (Carex diandra)

Rationale: Lesser panicled sedge is a circumboreal species found in wet meadows, springs and fens on floating and non-floating moss mats at 6100-8600 feet (Wyoming Natural Diversity Data Base 2004). Within Region 2, it is found primarily in fens, which are peat-forming wetlands influenced hydrologically and geochemically by groundwater inputs. Sites in Nebraska, however, are primarily associated with springs or seeps, which appear similarly dependant on groundwater inputs (Gauge and Cooper 2006).

These are habitats not affected by prairie dog management.

Lesser yellow lady's slipper (Cypripedium parviflorum)

Rationale: Lesser yellow lady's slipper is found in Northern Lowland Forests, Northern Upland Forests and Shrub-Carrs (Northern Prairie Wildlife Research Center 2004). This species of orchid is generally found in shady deciduous and mixed woodlands; relatively open oak (*Quercus*), ash (*Fraxinus*), and hazelnut (*Corylus*) woodland; or shrublands, swamps, bogs, and spruce (*Picea*) and pine (*Pinus*) forests. Soil moisture may be a limiting factor for this species in Region 2 (Mergen 2006).

These are habitats not affected by prairie dog management.

Lewis' woodpecker (Melanerpes lewis)

Rationale: Occurrence of this species on or near the planning units is highly incidental, unpredictable. This species prefers open forest and woodland, often logged or burned, including oak, coniferous forest (primarily ponderosa pine, riparian woodland and orchards, less commonly in pinyon-juniper. Distribution closely associated with open ponderosa pine forest in western North America, and is strongly associated with fire-maintained old-growth ponderosa pine (NatureServe 2006) (Abele et al. 2004). Potential and suitable nesting habitat within the planning area either does not exist or is negligible.

McCown's longspur (Calcarius mccownii)

All geographic areas with the exception of Oglala N.G.

Rationale: The Buffalo Gap National and Fort Pierre National Grasslands are outside of the current distribution of the McCown's longspur (Dechant et al. 2003d).

Mountain plover (Charadrius montanus)

Fort Pierre GA

Rationale: There has never been a documented occurrence of the mountain plover on, or in the vicinity of, the Fort Pierre National Grassland.

Northern goshawk (Accipiter gentilis)

Rationale: Occurrence of this species on or near the planning units is highly incidental, unpredictable, and currently limited to migrants passing through these areas.

Ottoe skipper (Hesperia Ottoe)

Rationale: This small, uncommon to rare butterfly has been noted locally north and south of Ft. Pierre National Grassland and in southwest South Dakota (Marrone 1992). It inhabits mid-height to tall grass prairie with abundant nectar sources (Marrone 1992). There are no observation records of Ottoe skippers on any of the National Grasslands in the project area. Also, they would not likely be found on prairie dog colonies, nor would they feed on poisoned oats.

Plains leopard frog (Rana blairi)

Rationale: The plains leopard frog's range centers on the plains of southeastern Nebraska, Kansas, northern Missouri, and Illinois. The eastern plains of Colorado and the western plains of Nebraska and Kansas are at the limits of this species' range, as is northern Texas. In Region 2, the plains leopard frog is only likely to occur in eastern and southern Nebraska, Kansas, and southeastern Colorado (Smith and Kienath 2005). This is not within the study area.

Plains leopard frogs are wetland obligates, using a wide variety of aquatic habitats, such as springs, slow streams, marshes, reservoirs, and lakes. It is most often found at sites with permanent water and rooted aquatic vegetation (NatureServe 2006). Prairie dogs would not be found in the aquatic habitat.

Slender cottongrass (Eriophorum gracile)

Rationale: Globally, slender cottongrass is found in cool temperate, alpine, and arctic regions, in alpine and subalpine wetlands with peaty soils and poor drainage that are supported by groundwater discharge or snowmelt. In Region 2, *E. gracile* is typically found in fens and subalpine wet meadows with saturated soils, where vegetation is dominated by graminoids and forbs (Decker et. al. 2006) (Northern Prairie Wildlife Research Center 2004).

Habitat for the following species will not affected by prairie dog management.

Sturgeon chub (Macrhybopsis gelida)

Pearl dace (Margariscus margarita)

Finescale dace (Phoxinus neogaeus)

Plains minnow (Hybognathus placitus)

Flathead chub (Platygobio gracilis)

Rationale: It is highly unlikely that any management direction affecting prairie dogs could significantly affect aquatic habitat and sensitive fish species that are native in the project area. While zinc phosphide is highly toxic to fresh water fish **(**Extension Toxicology Network 1993), it is highly unlikely that zinc phosphide could be carried from a prairie dog colony treated with the rodenticide to any perennial stream inhabited by any of these species in high enough concentrations to harm the fish. Factors that would prevent zinc phosphide from being carried from a treated prairie dog colony to a perennial stream include: Federal label restrictions allow bait to only be applied to active holes in limited quantities insuring most of the zinc phosphide treated grain would be quickly consumed by prairie dogs. The prairie dog colonies are located in intermittent drainages some distance from the streams and precipitation is low in the fall when the bait is being applied. If a precipitation event occurred that had potential to move water from the prairie dog colony to a perennial stream occupied by any of these fish, hydrolysis of bait would most likely occur before the bait reached the stream. Rodenticide treatment will occur around constructed water impoundments but these impoundments do not provide habitat for any of these sensitive fish species. USDA APHIS (1994) also concluded that there was no probable risk to aquatic habitats expected from the use of 2 percent zinc phosphide bait in prairie dog colonies.

Trumpeter swan (Cygnus buccinators)

Fort Pierre GA and Oglala GA

Rationale: The only trumpeter swan sightings have been on Buffalo Gap National Grassland and Samuel R. McKelvie National Forest.

Yellow widelip orchid (Liparis loeselii)

Rationale: Yellow widelip orchid exists in aquatic and wetland environments such as perennially wet meadows and wet forests (Northern Prairie Wildlife Research Center 2004).

These are habitats not affected by prairie dog management.

SCREEN 2 - (THREATS)

American bittern (Botaurus lentiginosus)

Rationale: American bitterns use tall, dense, shallow- or deep-water emergent vegetation in wetlands; native vegetation in wet meadows; and moderately tall, dense, native or tame vegetation in uplands adjacent to wetlands. American bitterns prefer relatively large (≥ 8 acres) wetlands, ranging in size from 8 to 550 acres (Dechant et al. 2003a). American bitterns feed primarily on insects, amphibians, crayfish, small fish, and small mammals (Wiggens 2006)

Prairie dogs have no effect on the wetland habitat and bitterns will not be at risk of being poisoned by zinc phosphide treated oats.

Barr's orphaca / Barr's milkvetch (Astragalus barrii)

Rationale: Barr's milkvetch grows primarily on dry, rocky prairie knolls, hillsides and barren areas. Populations are found on sparsely vegetated badlands and breaks of whitish, sandy-silty calcareous at elevations of 3700-5700 feet (Wyoming Natural Diversity Data Base 2004) (Ladyman 2006a). These are habitats not affected by prairie dog management.

Black tern (Chlidonias niger)

Rationale: Black terns may be limited by wetland size as they were absent from Iowa marshes < 5 ha (12.3 acres) and were most common in wetlands > 20 ha (49.4 acres) (Naugle 2004). Black terns are primarily insectivorous on the breeding grounds where they capture insects at or near the water surface, but fish comprise a large part of the diet in some habitats (Naugle 2004). They will not be affected by the zinc phosphide treated grain. Prairie dogs will not be found in the wetland habitat.

Fringed myotis (Myotis thysanodes)

Rationale: Typically, these bats roost in caves, natural rock crevices and abandoned buildings. Males, when netted, were frequently found to have dirt or clay like substances within there fur and crevices of their wing membranes suggesting day roosting in soft soil crevices (Tigner and Dowd Stukel 2003) (Tigner 2005). They feed on insects and will not be affected by poisoned grain. There is no information to suggest there are more flying insects on prairie dog colonies or that bats use prairie dog burrows.

Loggerhead shrike (Lanius ludovicianus)

Rationale: Loggerhead shrikes breed in a wide variety of open habitats including native and non-native grasslands, sage scrub, and other areas with a scattering of bushes and trees and bare ground. The nesting habitat requirements of loggerhead shrikes are scattered trees, shrubs, or low bushes as nesting substrate, elevated perches for hunting and courtship activities, foraging areas comprised of open, short vegetation with some relatively bare areas (Wiggens 2005a). They are largely insectivorous, but do eat some small mammals, birds and reptiles (DeGraaf et al. 1991) and will not be effected by the zinc phosphide treated grain. They migrate in September (Tallman et al. 2002). Prairie dogs will not be found in woodland habitat.

Northern leopard frog (Rana pipiens)

Rationale: Northern leopard frog is a wetland obligate, using a wide variety of aquatic habitats, such as springs, slow streams, marshes, reservoirs, and lakes. It is most often found at sites with permanent water and rooted aquatic vegetation (NatureServe 2006) (Smith and Keinath 2007). Prairie dogs would not be found in the aquatic habitat.

Townsend's big-eared bat (Corynorhinus townsendii)

Rationale: Townsend's big-eared bat requires spacious cavern-like structures for roosting during all stages of its life cycle. Typically, they use caves and mines, but have been found in attics and abandoned buildings and under bridges (Tigner and Dowd Stukel 2003) (Gruver and Keinath 2006). Generally, Townsend's big-eared bats are found in the dry uplands throughout the West. They feed on insects and will not be affected by poisoned grain. There is no information to suggest there are more flying insects on prairie dog colonies or that bats use prairie dog burrows.

Visher's eriogonum / Dakota buckwheat (Eriogonum visheri)

Rationale: Dakota buckwheat occupies barren shale and clay outcrops of badland formations. It occurs amidst relatively harsh growing conditions. Ground cover is lean, with a minimum of 50 percent bare ground, and more often an excess of 90 percent bare ground. Light is open, with minimal shading from surrounding geology. Erosion and deposition rates are high. Where the species occupies the badlands outwash, the slopes are low; where the species occupies the edges of alluvium the slopes are steep (NatureServe 2006) (Ladyman 2006b). These are habitats not affected by prairie dog management. Prairie dogs may create conditions that are suitable for *E. visheri*, but would not normally colonize what is currently considered optimum suitable habitat for this species.

Yellow-billed cuckoo (Coccyzus americanus)

Rationale: Yellow-billed cuckoos favor moderately dense thickets near watercourses, as well as second growth woodlands. They are mainly insectivorous and will not be affected by poisoned grain (Wiggins 2005b). Prairie dogs will have no effect on the woodland habitat.

IV. Analysis of Effects – General Discussion

Direct Effects

Direct effects are caused by the action and occur at the same time and place (50 CFR 1508.8). Application of rodenticide is proposed in all the action alternatives and therefore, the following effects analysis would apply to all action alternatives. Under the No Action Alternative, Alternative 2, rodenticide use would continue in the BMZ as directed in the LRMP Amendment 2 and in limited circumstances in the IMZ regarding threats to public health and infrastructure.

Prairie dog rodenticide (2 percent zinc phosphide bait) when properly applied is highly effective in reducing prairie dog populations within treated colonies. Poisoning of non-target species can occur but is minimized when the rodenticide is applied according to label specifications, time of year, and during favorable weather. In studies conducted in Conata Basin, measurable reductions in non-target populations were documented for deer mice (*Peromyscus maniculatus*), ants (Hymenoptera), and darkling beetles (Coleoptera), but there was no measurable reduction in avian and other invertebrate populations (Apa et al. 1991, Deisch et al. 1990, Uresk et al. 1985a, 1985b, and 1986).

Zinc phosphide is a heavy, finely ground gray black powder that is practically insoluble in water. When exposed to moisture it decomposes slowly and releases phosphine gas. Phosphine gas generates rapidly when in contact with dilute acids in the stomach, causing death. Animals that ingest lethal amounts of bait are asphyxiated within 3-5 hours (Timm 1983).

Zinc phosphide is a strong emetic (causes vomiting) which can factor into how much of the chemical it takes to kill the animal and whether or not an animal dies after ingesting the chemical (Schitoskey 1975).

Grain bait (oats) is treated with zinc phosphide for consumption by prairie dogs. Untreated grain (prebait) is typically applied to prairie dog colonies a few days prior to zinc phosphide application to promote grain consumption. Prairie dogs usually will not eat the grain bait until early fall when their natural forage matures and dries (South Dakota Department of Agriculture et al. 1994). When proper procedures are followed, efficacy of zinc phosphide bait is typically 90 percent or higher (South Dakota Department of Agriculture et al. 1994).

Zinc phosphide is highly toxic to wild birds. It is also toxic to non-target mammals. Nearly sixty studies have been conducted on the toxicity of this rodenticide to wild animals. The most sensitive bird species

which have been evaluated are geese (LD50 of 7.5 mg/kg for the white- fronted goose). Pheasants, morning doves, quail, mallard ducks and the horned lark are also very susceptible to this compound. Blackbirds are less sensitive (Extension Toxicology Network 1993). Seed eating animals on the national grasslands will be at risk from poisoning by zinc phosphide treated oats. Granivorous species that exist in the project area that are Forest Service sensitive include black-tailed prairie dogs, greater prairie chickens, chestnut-collared longspurs, McCown's longspurs, Brewer's sparrows, grasshopper sparrows, and trumpeter swans.

Results of laboratory studies generally indicate that zinc phosphide poses little secondary risk to non-target wildlife. Zinc phosphide breaks down rapidly in the digestive tract of affected animals, so predators and scavengers are generally not exposed to the compound. Species that were fed zinc phosphide-poisoned prey during lab studies and showed no negative physiological symptoms included Siberian ferrets, mongooses, coyotes, kit foxes, mink, black vultures, bald eagles, golden eagle, and great-horned owls (USDA Animal Plant and Health Inspection Service 1994).

Zinc phosphide is not stored in the muscle or other tissue of poisoned animals and therefore there is no true secondary poisoning. However, zinc phosphide remains toxic for several days in the gut of dead rodents. Other animals can be poisoned if they consume enough of the gut content of rodents recently poisoned by zinc phosphide (Timm 1983). This threat is lessened because most prairie dogs poisoned die inside their burrows (Tietjen 1976).

There is only a small amount of deterioration of zinc phosphide baits due to the evolution of phosphide gas; therefore, dry baits must be considered toxic indefinitely. Lecithin-mineral oil, added to zinc phosphide to adhere to grain bait, offers protection against moisture, and therefore increases its stability. Under field conditions, zinc phosphide baits remain toxic for several months until eroded by weather, decomposition of the carrier or the grain is removed by insects (Timm 1983).

Translocation of phosphine gas has been demonstrated, but it is rapidly converted to harmless phosphates (Timm 1983).

The LRMP prohibits the use of rodenticides (above-ground baits) outside the period October 1 to January 31 to reduce risks to migratory birds. To reduce risk to other wildlife, the LRMP does not allow burrow fumigants in prairie dog colonies.

The act of applying rodenticide may also directly affect some species. Trucks are used to haul pre-bait and bait over two-track trails to the application site. Once at the site, all-terrain vehicles are operated on the prairie dog colonies to allow people applying the oats to reach all prairie dog holes. The use of vehicles in the areas, may directly impact some species by running them over or temporarily displacing them.

Indirect Effects

Indirect effects are caused by the action and are later in time or farther removed in distance, but still reasonably foreseeable (50 CFR 1508.8).

The four action alternatives propose a range of prairie dog acres by geographic area. The "no action" alternative does not propose any specific range of acres. In general, the alternatives can be group or displayed by total amount of prairie dog acres allowed by geographic area. Thus for analysis purposes, Alternative 5 would display the most potential prairie dog acres within the geographic areas, followed by Alternative 2 (predicted acres based on an expansion model). Alternative 3 displays the lowest range of prairie dog acres, while Alternative 1 falls in between both groups. Alternative 4 only displays a proposed range of acres for the Conata Basin Black-footed ferret Management Area 3.63.

An indirect effect is the loss of habitat as a result of rodenticide use and reductions in prairie dog populations. Prairie dogs cut taller vegetation in their colonies, creating low structure grassland.

Permanently removing prairie dog populations from an area could shift the vegetative community from a buffalograss/ blue grama sod to a western wheatgrass/green needle community (depending on the soil type at the prairie dog colony). This in turn could alter habitat suitability for a variety of wildlife species. Forest Service sensitive species that prefer tall vegetation are; greater prairie chickens, greater sage grouse, northern harriers, short-eared owls, grasshopper sparrows, and regal fritillary butterflies. The animal species that are Forest Service sensitive that prefer short are; burrowing owls, mountain plovers, McCown's longspurs, chestnut-collared longspurs, long-billed curlews, ferruginous hawks and swift foxes.

Prairie dog burrows create a unique habitat for other creatures, including burrowing owls, badgers, rabbits, snakes, salamanders, and insects. Without live prairie dogs to maintain the burrow system, the burrows will deteriorate. Within a few years the burrow system breaks down, and its value to other wildlife is reduced. The Forest Service sensitive species that uses the prairie dog burrow system is the burrowing owl.

An indirect effect is reduction of prey base as a result of rodenticide use in prairie dog colonies. Vegetation on inactive prairie dog colonies can shift to a mixed grass prairie, with reduced densities of both small mammals and birds (Agnew 1983). Forest Service sensitive predatory species are: swift foxes, northern harriers, ferruginous hawks, short-eared owls, bald eagles and burrowing owls.

Cumulative Effects

NEPA defines cumulative effects as the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of agency (federal or non-federal) or person that undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (50 CFR 1508.7). Drought, poisoning, livestock grazing, plague, recreational prairie dog shooting, land use conversions, and future travel management direction are reasonably foreseeable to occur in the project area on both private and federal lands in the planning geographic areas and beyond those areas. The interaction of past, present, and foreseeable future actions with the actions of each proposed alternative are reviewed in this BE. Cumulative effects apply to the sensitive species carried forward for analysis (black-tailed prairie dog, swift fox, greater prairie chicken (Ft. Pierre GA), long-billed curlew, greater sage grouse (Fall River West GA), northern harrier, chestnut-collared longspur, McCown's longspur (Oglala GA), western burrowing owl, mountain plover, ferruginous hawk, short-eared owl, Brewer's sparrow (Fall River West GA), grasshopper sparrow, trumpeter swan (Buffalo Gap NG), and the regal fritillary butterfly.

The alternatives propose various prairie dog acreages by geographic area. Alternative 5 maintains the most prairie dog acres within the geographic areas, followed by Alternative 2 (predicted acres based on an expansion model). Alternative 3 retains the lowest range of prairie dog acres, while Alternative 1 falls in between both groups. Alternative 4 only displays a proposed range of prairie dog acres for the Conata Basin Black-footed ferret Management Area 3.63.

The comparison of total interior prairie dog colony acreages among alternatives in the light of cumulative effects frames the effects analysis for the species at risk. Impacts on species that are dependent on high or low vegetation structure, burrows or the abundant prey found in prairie dog colonies would depend in part on total prairie dog colony acreages. Although vegetative structure varies in a prairie dog colony, more acres of prairie dog colonies will yield more habitat for species dependent upon low structured grasslands. This is also true for predatory animals and animals that use prairie dog burrows and the converse would be true for animals that prefer high structured grassland habitat.

The interaction of past, present, and foreseeable future actions with the proposed actions of each proposed alternative will satisfy the hard look required for cumulative effects.

Cumulative Effects for Sensitive Species

Drought: Periods of low precipitation can occur annually intermixed with normal and above precipitation periods. However, an extended period of low precipitation (drought) has occurred during the last 5 or 6 years, resulting in reduced plant productivity and expansion of prairie dog colonies, albeit, with low densities of prairie dogs. Drought also reduces prairie dog productivity. Climate history indicates that drought may persist into the future; however, periods of drought are normal. Prairie dog colony expansion during drought in combination with action alternatives that favor higher prairie dog acreages would likely benefit species dependent upon low structured grasslands such as burrowing owl, ferruginous hawk, mountain plover, McCown's longspur, chestnut-collared longspur, long-billed curlew, and swift fox. Alternatives that favor reducing prairie dog acreages in combination with drought would stress species dependent on food sources such as prairie dogs. During drought, prairie dog densities decline significantly and predators adapt by increasing their home ranges. The reduction in plant productivity caused by drought will have a detrimental effect on species that prefer high structured grasslands. Alternatives that favor increasing prairie dog acreages in combination with drought would negatively affect the sensitive species that need high cover such as greater prairie chickens, greater sage grouse, northern harriers, short-eared owls, grasshopper sparrows, and regal fritillary butterflies.

Prairie dog control: Most ranchers view prairie dog colonies as an economic hardship and tolerate only small prairie dog colonies on their private land and desire the same on leased land. Consequently, most prairie dog colonies on private land are routinely poisoned and opportunities for prairie dog conservation on such lands are minimal.

A cumulative effect to this action is the reduction of prairie dog populations resulting from rodenticide use by the United States Forest Service (USFS) in their boundary management program and other entities (including but not limited to the State of South Dakota and private land owners). A suspension of prairie dog control on the National Grasslands started in 1999 and continued until the fall of 2004. Control programs resumed in the boundary management zones of the Nebraska National Forest in November of 2004. The USFS authorized the control of 6,733 acres of prairie dog colonies in 2004, 8,110 in 2005, and 12,905 in 2006 on lands administered by the Nebraska National Forest (Table N-7). In addition the State of South Dakota controlled 24,369 in 2004, 14,725 in 2005, and 29,502 in 2006 (Smith 2007) with the objective of their program being to help private land owners control prairie dogs that were moving from public lands onto private land. The majority of this control work was completed in the vicinity of the project area.

Table N-7. A summary of prairie dog control conducted on the Nebraska National Forest by geographic area in the fall and winter of 2004, 2005, and 2006.

			Total Acres Controlled			
National Grassland	**District**	**GA**	**2004**	**2005**	**2006**	**2 and 3-Yr Ave.**
Oglala NG	Pine Ridge	Oglala GA	0	1,011	926	969
Buffalo Gap NG	Fall River	Fall River Northeast GA	2,106	1,998	2,844	2,316
		Fall River West GA	768	780	372	640
		Fall River Southeast GA	363	411	282	352
		Fall River Southeast GA Smithwick MA 3.63	3	68	20	30

			Total Acres Controlled			
National Grassland	**District**	**GA**	**2004**	**2005**	**2006**	**2 and 3-Yr Ave.**
	Wall	Wall North GA	60	497	940	499
		Wall Southeast GA	237	950	1,370	852
		Wall Southwest GA	0	0	279	279
		Wall Southwest GA Conata Basin MA 3.63	3,196	2,184	5,251	3,544
	Buffalo Gap NG MA 3.63		3,199	2,252	5,271	3,574
	Buffalo Gap NG Non-MA 3.63		3,534	4,636	6,087	4,752
	Total Buffalo Gap		6,733	6,888	11,358	8,326
Fort Pierre NG	Fort Pierre	Fort Pierre GA	0	211	621	416
Totals			**6,733**	**8,110**	**12,905**	

Effective poisoning of a prairie dog colony requires about 6 ounces of zinc phosphide treated oats per acre (Andelt 2006). Between July 1, 2006 and winter, the bait production plant at Pierre, South Dakota sold 274,500 lbs of zinc phosphide treated oats (South Dakota State Department of Agriculture 2007), enough to control 732,000 acres of prairie dog colonies. All poisoning by the State of South Dakota and the Forest Service was completed with this bait but not all of the bait produced is sold in the project area or even in South Dakota. Moreover, the South Dakota bait plant is not the only source of zinc phosphide treated oats. Nevertheless, a large number of prairie dogs were controlled in 2006 and this trend is likely to continue. Consequently, opportunities for healthy prairie dog colonies on private land are limited. The overall impacts from control of prairie dogs on both federal and private lands would favor high structure dependent sensitive species if livestock grazing utilization remained conservative. The opposite would be true for low structure dependent, predatory, and burrow dependent sensitive species.

Prairie dog shooting: Prairie dog shooting is extensive in South Dakota and affects prairie dog populations. In 2000, 12,219 residents and 3,081 non-residents of South Dakota shot prairie dogs during over 100,000 recreational shooting days (Gigliotti 2000). Shooters killed 1.23 million prairie dogs on non-tribal lands with about 84% shot on private land. Prairie dog shooting occurs throughout the year with peak shooting in the summer.

Although small mammals such as lagomorphs and squirrels recover quickly from hunting via density-dependent vital rates, such recovery is not observed in the black-tailed prairie dog (Pauli and Buskirk 2007a). Because of their coloniality, prairie dogs possess certain life-history traits that predispose them to be particularly susceptible to hunting associated disturbances, which have cascading effects on population-level processes (Pauli and Buskirk 2007). Shooting of prairie dogs may significantly reduce prairie dog densities (Vosburg and Irby 1998) and indefinitely maintain reduced densities in smaller isolated colonies (Knowles 1987).

Prairie dogs show no evidence of density dependence in overwinter survival or next-year natality. Rather, shooting induces not only additive effects on survival but also leads to reproductive near-collapse the summer following shooting (Pauli and Buskirk 2007). Surviving prairie dogs increase alert behaviors eightfold and reduce both aboveground activity and time spent foraging by 66%. Changes in behaviour lower the body condition of surviving adults by 35%. Survivors of shooting, especially juveniles, exhibited elevated stress levels; fecal corticosterone concentrations increased by 80% among juveniles. Pauli and Buskrik (2007) discovered that overwinter survival rates did not

increase in response to reduced prairie dog density. Pregnancy rates declined by 50% and reproductive output fell by 82%. Risk-disturbance overwhelmed any possible density-dependent effects of shooting in prairie dogs, which exhibited additive mortality in response to hunting, and reproductive failure 1 year after shooting. Risk-disturbance was the predominant mechanism whereby individuals and colonies were affected by hunting. The cumulative effect of shooting prairie dogs on and off NFS lands is to lower the quality of prairie dog colony habitat.

Shooting prairie dogs in colonies that have been previously poisoned could likely prevent or slow population recovery in those colonies. In South Dakota, prairie dog shooting is allowed between June 15 and February 28 on all areas of the National Grasslands except the Conata Basin Management Area 3.63. The overall impacts from the recreational shooting of prairie dogs on both federal and private lands would favor high structure dependent sensitive species if the shooting activity resulted in substantial reductions of prairie dogs. The opposite would be true for low structure dependent sensitive species. In general shooting could be detrimental to predatory species.

Another effect of shooting is secondary lead poisoning of non-target species caused by lead fragments left in the prairie dog carcasses after they have been shot by prairie dog shooters. In a study conducted in eastern Wyoming two types of bullets were tested to determine how much lead was present in the prairie dog carcasses after they had been shot: a soft point and a full metal jacket (both from .223 caliber rifles). Eighty-seven per cent of prairie dogs shot with soft point bullets contained bullet fragments compared to 7 percent of those shot with full metal jackets. Furthermore, the amount of lead found in prairie dog carcasses differed between the two bullet types; full metal jacket only averaged 19.8 mg of lead, while soft point averaged 225.2 mg of lead (Pauli and Buskirk 2007). Therefore, it would be likely that a scavenger, such as the bald eagle, ferruginous hawk or swift fox, could eat a prairie dog carcass and suffer from lead poisoning.

Regarding the inadvertent or intentional killing of non-target animals while shooting prairie dogs, the extent of this problem is likely tied to the visual similarity of a non-target animal to a prairie dog and the experience and scruples of the shooter. It is possible to mistake a burrowing owl for a prairie dog. It is always possible for an unethical prairie dog shooter to kill any animal within shooting range.

Travel management planning and potential changes in motorized access: This could increase or decrease opportunities for prairie dog viewing/recreational shooting and would result in similar impacts discussed above related to shooting activities.

Plague: Prairie dogs are highly susceptible to sylvatic (plague), which is considered to be a serious threat to the persistence of local prairie dog populations. Plague has been killing prairie dogs in the western two thirds of their geographic range since the 1940's. Plague in the recent past was rare, almost totally absent among prairie dogs east of a line that approximates the 102nd meridian (Cully et al. 2006). In the project area this line is very close to the Wyoming state line. Recent documented incidences of plague in Custer (2004), Shannon (2005) and Pennington (2008) counties in South Dakota (there is very strong evidence of plague in Fall River County, SD) suggest the plague line has shifted approximately 100 miles east.

Plague was documented in the Conata Basin area of the Buffalo Gap National Grassland in the Spring of 2008 (USDA Forest Service - 2008c). Plague was also confirmed in a prairie dog colony in western Custer County, South Dakota in September, 2004 near the border of Wyoming and South Dakota. This is less than 10 miles from the northern most boundary of the Fall River West Geographic Area. In the summer of 2005 prairie dog densities within some of the colonies north of Highway 18 in the Fall River West Geographic Area were noticeably reduced. Although not officially documented, it is believed that plague has occurred within these colonies. Also, plague positive prairie dogs were found in Shannon County in 2005. This plague documentation is less than 10 miles from the eastern boundary of the Fall River Southeast Geographic Area. In the summer of 2005 prairie dog densities

within some of the colonies in the Fall River Southeast Geographic Area were noticeably reduced. A reasonable explanation for these die offs is plague.

The potential for plague to persist in prairie dog populations on the national grasslands and forests in the project is unknown, but it is acknowledged that plague can have dramatic impacts on prairie dog populations. The presence of plague will affect the ability of land managers to maintain acreages of prairie dog colonies suggested in any of the alternatives. Negative impacts from plague resulting in a reduction of prairie dog acreages could impact some sensitive species including the black-tailed prairie dog, burrowing owls, mountain plovers, McCown's longspurs, chestnut-collared longspurs, long-billed curlews, and swift foxes. The result from an epidemic of plague in the long-term would positively impact several sensitive species, such as the greater prairie chickens, greater sage grouse, northern harriers, short-eared owls, grasshopper sparrows, and regal fritillary butterflies. In general plague could be detrimental to the predatory species.

Land use conversions: Private land use conversions can reduce and/or alter the habitat suitability for black-tailed prairie dogs. The loss of this suitable habitat on private lands would likely result in a negative impact on those sensitive species that rely on prairie dog colonies, such as the burrowing owl. Land use conversion from native prairie to a row-crop or other farming practice would negatively impact other grassland dependent species. Grassland continues to be converted to cropland. Conversion of grassland that had no prior cropping history to cropland in South Dakota, for example, was 54,404 acres in 2005 and 47,167 acres in 2006 (U.S. Government Accountability Office 2007). The cumulative effect is that more and more land is becoming unsuitable for prairie dog colonies.

Relative Impacts Summarized

The impacts of the alternatives to the different wildlife species can best be summarized by grouping the species into 5 categories: granivorous (seed eaters), predators, animals that prefer high structured grassland habitat, animals that prefer low structure grassland habitat, and animals that use or live in the burrows created by the prairie dogs (Table N-8).

Granivorous animals could be directly affected by eating the poison grain and dying. The alternatives are ranked as to the amount of control that it is believed it would take to maintain the range of acres in each of the alternatives. It is logical to believe that the more prairie dogs that will be allowed by the alternative in the IMZ of each GA, the less poisoning that will take place. This is true within the IMZ, but the possibility exists that as prairie dogs are allowed to expand in the IMZ that more control will take place in the BMZ and adjacent private lands. This analysis is limited to the IMZ and assumes the BMZ is “prairie dog free” for analysis purposes.

Predators are attracted to the prairie dog colonies by the abundant prey that exists in and around the colony. An increase in prairie dog acreages will have a positive impact on these species while a decrease will have a negative impact.

Species that prefer high grassland structure would avoid prairie dog colonies and an increase in prairie dog acreages could be detrimental to them. Objectives for high structure habitat are set in the LRMP. Environmental analysis completed for the LRMP determined that these levels are adequate for the viability of these species. By directive in the LRMP, high structure grassland will be provided on each GA. This is the reason it is believed that there will be no impact on these species if the acreages for high structure can be maintained within the stated structure objectives of the LRMP on each GA. This can be accomplished for all alternatives in all GAs except Alternative 5 in Conata Basin.

Species that prefer low grassland structure would be attracted to prairie dog colonies and an increase in prairie dog acreages could be beneficial to them. Objectives for low structure habitat are set in the LRMP. Environmental analysis completed for the LRMP determined that these levels are adequate for the viability of these species. By directive in the LRMP, low structure grassland will be provided

on each GA. This is the reason it is believed that there will be no impact on these species if the acreages for low structure can be maintained within the stated structure objectives of the LRMP. This can be accomplished for all alternatives in all GAs except Alternative 5 in Conata Basin.

The last group of species affected by this decision is the animals that can be found using the burrows for hunting, denning, nesting, or any activity in their life cycle. Some of these species require prairie dog colonies for their existence (black-footed ferret and burrowing owl) and will be impacted by the range of acreages suggested in the alternatives. An increase in prairie dog acreages will have a positive impact on these species while a decrease will have a negative impact.

Table N-8. Relative impacts on animal species groups of each alternative.

Animal Category	Variable used to determine impact	Relative impact by alternative				
		High Impact ←			→	Low Impact
Seed Eater[1]	Amount of control	Alt. 3	Alt. 4[6]	Alt. 1	Alt. 2	Alt. 5
Predator[2]	Acres of Prairie dog colonies	Alt. 3	Alt. 4[6]	Alt. 1	Alt. 2	Alt. 5
Prefers High Grassland Structure[3]	Acres of Prairie dog colonies	Alt. 5	Alt. 2	Alt. 1	Alt. 4[6]	Alt. 3
Prefers Low Grassland Structure[4]	Acres of Prairie dog colonies	Alt. 3	Alt. 4[6]	Alt. 1	Alt. 2	Alt. 5
Uses the Prairie Dog Burrows[5]	Acres of Prairie dog colonies	Alt. 3	Alt. 4[6]	Alt. 1	Alt. 2	Alt. 5

[1]black-tailed prairie dogs, greater prairie chickens, chestnut-collared longspurs, McCown's longspurs, Brewer's sparrows, grasshopper sparrows, and trumpeter swans

[2]swift foxes, northern harriers, ferruginous hawks, short-eared owls, bald eagles and burrowing owls

[3]greater prairie chickens, greater sage grouse, northern harriers, short-eared owls, grasshopper sparrows, and regal fritillary butterflies

[4]mountain plovers, McCown's longspurs, chestnut-collared longspurs, long-billed curlews, and swift foxes

[5] black-tailed prairie dogs, and burrowing owls

[6]This alternative only provides acreages for the Conata Basin area. The ranking is determined by comparing acreages for Conata Basin only.

V. Detailed Analysis of Effects – Sensitive Species

Region 2 Sensitive Species Analyzed

Bald eagle (Haliaeetus leucocephalus)

Distribution and Status. Bald eagles are mainly winter residents or migrating individuals in South Dakota, Wyoming, Colorado, and Nebraska, with few, but increasing, isolated nesting occurrences. It is a fairly common winter resident in suitable habitat along major riparian areas and river systems. In South Dakota, they are listed as an uncommon migrant (SDOU 1991), but there has been an increase in nesting pairs recently. In Nebraska, the first successful nest was documented in1992 on the Loup River, and successful nests have been reported each year since (Central Nebraska Public Power and Irrigation District 2004).

Habitat. The bald eagle is mostly found near water, primarily on river systems, large lakes, reservoirs and coastal areas. These birds are mainly scavengers, feeding on dead and dying fish, rodents, waterfowl, and other animals. Bald eagles generally roost together in large mature trees surrounded by a buffer of smaller trees (Ashton and Dowd 1991).

ESA Status and Other Organizational Rankings

ESA Status	Conservation Status[1]
ESA – (No Status)	G5, N5B, N5N; Forest Service – sensitive species; Nebraska - S1; South Dakota - S1B, S2N

[1] Definitions - http://www.natureserve.org/explorer/nsranks.htm

Recovery and Conservation Planning. Nebraska and South Dakota are included in the Northern States Bald Eagle Recovery Zone. The recovery plan for the northern states was prepared in 1983 (U.S. Fish and Wildlife Service 1983). Although critical habitat has been designated, none of the areas is on or near NFS lands within the planning area. The general goals for delisting the species is 1,200 occupied breeding territories in the Northern States recovery zones. Delisting goals have already been met for the Northern States recovery zone (U.S. Fish and Wildlife Service 1995 and 1999).

Existing Conditions. There are no documented bald eagle nests on the NNF. In South Dakota, the first nest was reported in 1994. In 2004 and 2005, SDGFP worked with the U.S. Fish and Wildlife Service, the National Park Service, Nebraska Game and Parks, and a number of tribes to locate and monitor all of the active bald eagle nests in the state. In 2006, there were 46 active bald eagle nests in South Dakota, 35 of which successfully fledged young. Nests were found in Fall River and Lyman counties which are in the vicinities of the Buffalo Gap National Grassland and Fort Pierre National Grassland respectively (SDGFP Web Page 2006). Winter roost and spring nest surveys have been completed on the segments of the Cheyenne River that are part of the Buffalo Gap National Grassland. Individual bald eagles have been sighted but no winter roost concentrations or nests have been found (Hetlet 1994-2006).

Direct, Indirect, and Cumulative Effects. Bald eagles could be exposed to the zinc phosphide treated grain. They are not a granivorous species so direct consumption of the treated grain is not expected. They are known to feed on carrion (Ashton and Dowd, 1991), so consumption of prairie dogs that have been poisoned is a possibility. This threat is lessened, because most prairie dogs poisoned with zinc phosphide treated grains die inside their burrows (Tietjen 1976). Tietjen (1976) cited two studies, one in which bald eagles were fed zinc phosphide killed nutria (*Myocaster coypus*); in the other, golden eagles (*Aquila chrysaetos*) were fed jackrabbits (*Lepus californicus*) that were killed with zinc phosphide. In

both cases, the eagles showed no sign of secondary intoxication. Incidental contact with crews applying rodenticide may disturb the birds temporarily, but they should not be displaced for long from foraging areas on prairie dog colonies.

Bald eagles could be shot or injured by prairie dog shooters, but this would be rare and deliberate, since it is unlikely to mistake a bald eagle for a prairie dog. It is always possible for an unethical prairie dog shooter to kill an eagle. The fact that the bald eagle is protected under the Bald and Golden Eagle Protection Act and it is against the law to kill or harass them should also be a deterrent. Gunfire and other hunter activities may scare birds locally, but this will not be a factor concerning their population viability on the area. They are known to feed on carrion (Ashton and Dowd, 1991), so consumption of prairie dogs that have been shot is a possibility. Prairie dog shooting can leave lead fragments in prairie dog carcasses posing a potential risk to scavengers (Pauli and Buskirk 2007).

Because of abundant prey, it would be expected that bald eagles would frequent prairie dog colonies for hunting, but they are not dependent on prairie dogs or prairie dog colonies for their survival. Prey base for bald eagles could be reduced when prairie dog colonies are managed. In the short term, prairie dogs and other susceptible species are killed directly by the poison. In the long term, after repeated treatment, the habitat could convert from a prairie dog colony to a mixed grass prairie. The densities of both small mammals and birds were less on mixed grasslands compared to prairie dog colonies in a study completed in South Dakota (Agnew 1983). This is not expected to affect bald eagle populations, considering that the most important habitat for the bald eagle is near lakes and large rivers where they feed mostly on fish (DeGraaf et al. 1991).

Other activities in the area that may affect bald eagles and bald eagle habitat include but are not limited to, livestock grazing, animal damage control, trapping, and hunting.

DETERMINATION OF EFFECT AND RATIONALE FOR THE BALD EAGLE

The biological determination for the bald eagle for Alternatives 1, 3, 4, and 5 is *"may adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing."*

Rationale: In all of the above alternatives, significant application of zinc phosphide treated oats could occur to keep prairie dog colonies within an acceptable range of acres and to prevent encroachment on private land. The ranges of acres that will be allowed in order to meet the stated objectives are listed in Table N-2.

Also, considering that bald eagles do not eat grain and the threat of secondary poisoning is small, the direct effect of the increase in rodenticide use over the current program will be slight. The reduction in acreage of prairie dog colonies could be an impact to bald eagles in the area because of the decreased prey base. Considering a bald eagle is a wide ranging species and that prairie dog colonies make up a small component of their habitat, this decrease in prey base may affect a few individuals but will have little effect on overall populations. The bald eagle is mostly found near water, primarily on river systems, large lakes, reservoirs and coastal areas. These birds are mainly scavengers, feeding on dead and dying fish, rodents, waterfowl, and other animals.

Alternative 2: (No Action) Current LRMP Direction

This alternative was evaluated in the Biological Assessment and Evaluation for the Black-tailed Prairie Dog Conservation and Management on the Nebraska National Forest and Associated Units which made a decision regarding boundary management. The bald eagle was a threatened species at the time the above document was written. The determination made in that document was: "*May affect, not likely to adversely affect.*" In this decision, because of delisting, the bald

eagle is treated as a sensitive species and the appropriate determination is: *"May adversely impact individuals but not likely to result in a loss of viability on the planning area, nor cause a trend to federal listing or a loss of species viability rangewide."*

Rationale: In Alternative 2 (no action), no poisoning will be administered within the IMZ except for public safety and health situations as described in the LRMP. Rodenticide use will continue in the boundary management zone as described in the LRMP Amendment 2. For analysis purpose, minimum acres are the active prairie dog acreages present in 2006 and maximum acreages were determined using 25 percent average annual growth rate per year using current colony inventory as a base starting point. It should be noted that it is likely that prairie dog acres will increase under this alternative. The increase in prairie dog acreages could result in a beneficial impact to bald eagles, but because there is still a chance of there being "effects" in the BMZ a "may effect" determination is appropriate.

Black-tailed prairie dog (Cynomys ludovicianus)

Distribution and Status. Throughout the Great Plains, the range of the prairie dog extends from southern Canada to northern Mexico and prairie dog colonies occupy approximately 1.8 million acres (U.S. Fish and Wildlife Service 2004a, Luce et al. 2006, Manes 2006). The current extent of colonies is a small fraction of perhaps tens of millions of acres of colonies that probably once existed in the Great Plains (Nelson 1919, cited in Summers and Linder 1978). Colony sizes once topped tens of thousands of acres. Introduced plague and poisoning are largely responsible for the destruction of prairie dog colonies. Conversion of grassland to cropland was also a major contributor to the decline of the prairie dog. Because prairie dogs have been traditionally viewed as competitors with cattle for rangeland grasses and forbs, eradication programs have reduced populations to less than two percent of those fifty years ago. Currently, where their populations are relatively uncontrolled by humans (federal and tribal lands), prairie dog colonies range in size from a few acres to several thousand acres. At average, densities of prairie dog colonies are 10 to 55 animals/ha (4 to 22 animals/ acre) (Knowles 1986). Today, most colonies are small (<30 acres) on private land, reflecting the limits of social acceptance of prairie dogs.

Habitat The prairie dog colony is a unique feature in the Great Plains. The colonies are easily visible on the ground, to aircraft, and even to orbiting, imaging satellites because they are fundamentally different from surrounding grassland. The U.S. Geological Survey's vegetation mapping program classifies prairie dog colonies as the "black-tailed prairie dog town grassland complex." This complex occurs widely throughout the Great Plains of the central United States.

Visible features (conditions) at prairie dog colonies include numerous dome burrow mounds (up to 2.5 m in diameter) and crater mounds barren of vegetation, and short-statured vegetation and bare areas. Prairie dogs are diurnal and short vegetation, barren mounds, and bare areas greatly facilitate the detection of predators. In addition, prairie dogs feed on grasses and forbs. Prairie dogs are attracted to livestock and other ungulate grazing. Such grazing along with prairie dog herbivory helps establish and even expand prairie dog colonies by increasing the amount of short-statured vegetation and bare areas. Drought restricts plant growth leading to expansion of prairie dog colonies, more short-statured vegetation, and more bare areas than during times of normal precipitation. Prairie dog densities decrease because food resources decrease during drought. Indeed, during drought prairie dogs consume underground plant matter such as the roots of grasses and forbs.

Fundamentally, the clipping and foraging habits of prairie dogs create a unique habitat (unique conditions) of bare ground and short, sparse vegetation. Some species such as the mountain plover require prairie dog colonies containing from 40-60% bare ground (Knowles et al. 1982). Prairie dog colonies can contain from near 0% bare ground to 80% bare ground (Magle 2003) depending upon precipitation, grazing, and colony age.

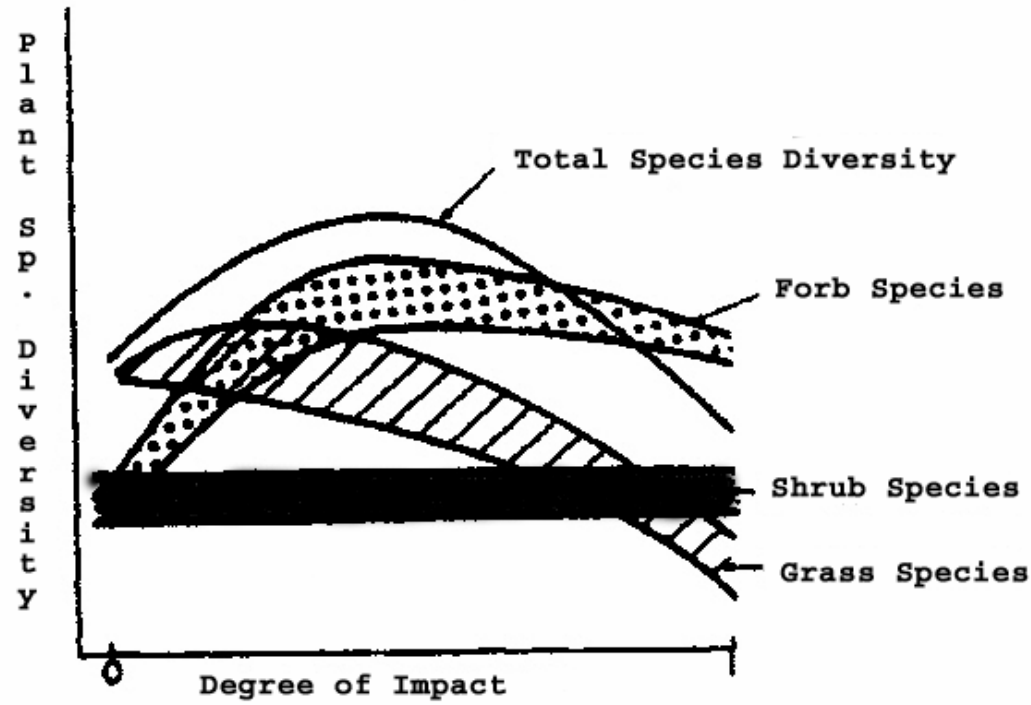


Figure N-1. Changes in plant species diversity on prairie dog colonies with increasing impact or disturbance (grazing, drought). An undisturbed site is represented at 0 on the x-axis, while a severly disturbed and highly modified system is at 1. Total species diversity is maximized at intermediate disturbances because forb diversity has increased, but grass diversity has not yet substantially decreased (Whicker and Detling 1988,Cpppock et al. 1983, Archer et al. 1987)

Vegetation species diversity and per cent bare ground changes under different levels of impacts such as grazing and drought (see previous figure).

Prairie dog colonies are located on a wide variety of soils, including clay, clay loam, silty loam and some sandy loam soils deposited following erosion from adjacent uplands, including badlands formations. Soils are deep, structured and not easily eroded. This type is found on level sites along drainages, in broad valleys, on gentle to moderately sloping hills, and flats on tables and buttes (Von Loh et al. 1999). Prairie dogs create extensive burrows in their towns. Large volumes of soil are moved, improving filtration, hastening the incorporation of organic matter, facilitating nutrient cycling, and increasing the spatial heterogeneity of vegetation, soils, and other ecosystem components.

Although several plant species are consistently found in the prairie dog towns, overall vegetation characteristics are highly variable depending upon size and age of the town and its position on the landscape. The vegetation in all colonies usually tends toward a prostrate growth form because of intensive grazing by prairie dogs and livestock. The overall pattern of vegetation appears in relatively

concentric zones relating to the outward expansion of town boundaries over time. Vegetation cover varies from <25% to almost 100%.

Prairie dog colonies are located in open mixed grass or shortgrass prairie habitat, and their activity has both direct and indirect effects on the vegetation. Prairie dogs keep the surrounding vegetation clipped close to the ground, presumably to improve their ability to detect stalking predators. This clipping gives the impression of a mowed lawn, or overgrazed rangeland. Prairie dogs repeatedly clip and graze plants, rarely allowing shoots to reach full size. Changes in plant species composition may begin as early as 2 or more years after colonization. Shortgrass species, such as blue grama (*Bouteloua gracilis)* and buffalo grass (*Buchloe dactyloides)*, and annual forbs, become abundant and replace mid-height or tall grasses.

Bison and livestock may be attracted to the prairie dog colonies, and a series of studies found that bison preferentially graze them (Coppock et al. 1983, Coppock and Detling 1986). The forage on the colonies is more nutritious than off, with higher nitrogen content and younger shoots, apparently because the animal waste products are deposited there. In turn, the presence of bison and livestock waste products further increases the soil fertility and forage quality.

Prairie dog colonies can exhibit considerable antiquity. Studies at Wind Cave National Park, South Dakota indicate that prairie dog colonies have occupied some areas for about 400 years and other areas for several thousand years (White 1986) suggesting that despite periodic drought and varying levels of domestic and native ungulate grazing, the prairie dog colony persists.

Grazing. Studies of cattle-prairie dog interactions show a synergistic relationship between cattle grazing and prairie dog habitat occupancy (Belak 2001). Knowles (1982), studying prairie dog distribution in eastern Montana, concluded that prairie dog distribution was mainly influenced by heavy livestock grazing pressure and other land disturbances created by humans. Cincotta (1985) reported that prairie dog colony expansion on the adjacent Badlands National Park was greater in heavily grazed areas and areas previously disturbed by homesteading activity.

Drought. Drought is also significant in the natural history of the prairie dog and one of the stimulants for this FEIS. However, drought must be put into ecological and historical context. Drought promotes short-statured vegetation and prairie dog colonies can expand rapidly establishing large colonies with low densities of prairie dogs as food sources decline under drought. Drought has played a major role in the expansion of prairie dog colonies on the NNF, including in Conata Basin. However, droughts occur regularly and prairie dog colonies persist even continuously for hundreds of years in the same location despite drought or wet periods (Figure 2) (White 1986). The 42-year wet cycle (1957-1999) was unusually long and it has been the period during which most living Americans have lived. Extended drought is a new experience for most people. But again, the phenomenon is normal over the past 800 years (Figure 2).

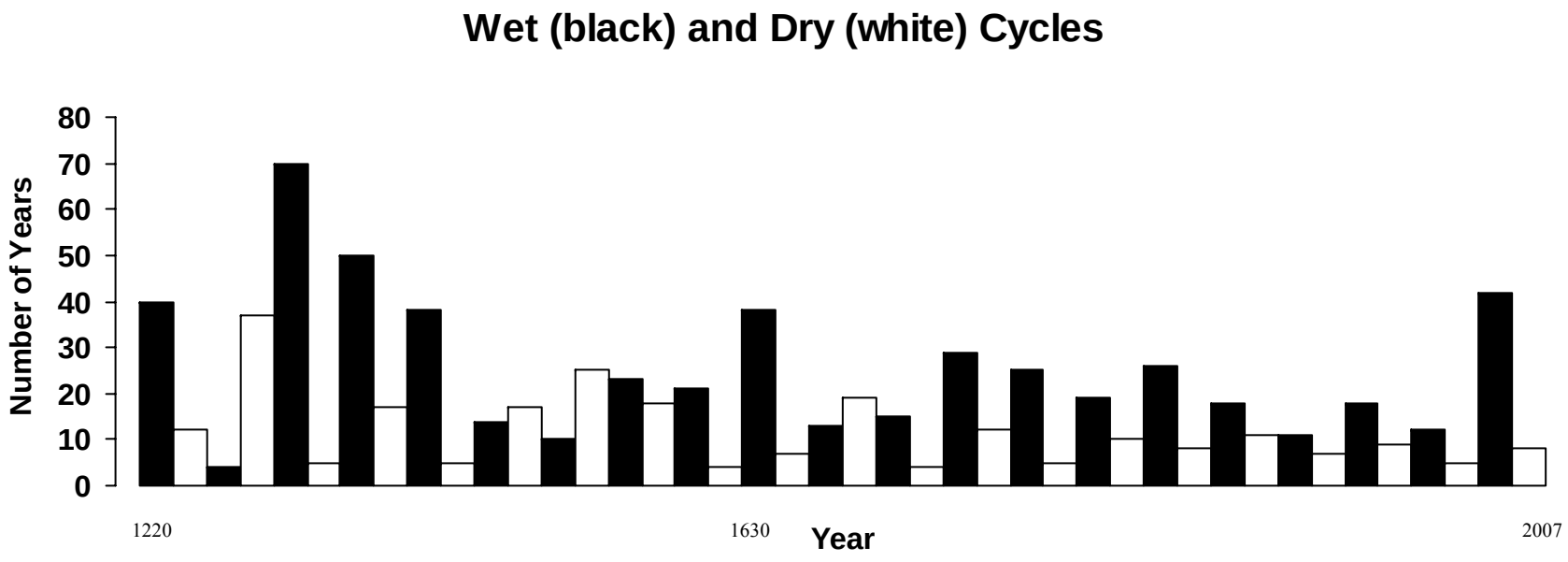


Figure N-2. Tree ring data show repeated droughts of five years or longer in western Nebraska since 1200 (Source: University of Nebraska).

Poisoning of Prairie Dogs. The century-old poisoning of prairie dog colonies persists because prairie dogs consume the grasses and forbs consumed by domestic livestock. Therefore, private landowners and agencies have directed extensive programs to eliminate prairie dogs (Hoogland 2006). Much of the rural public in the Great Plains views the prairie dog as a pest whether on private or federal land. A minority of ranchers favor the retention of small to medium-sized prairie dog colonies on federal lands.

Forrest and Luchsinger (2006) summarize the extent of prairie dog poisoning since European settlement. By 1911, prairie dogs were gone from 2 million acres in Kansas. From 1903 through 1912, strychnine eliminated 91% of Colorado's prairie dogs

Plague. Sylvatic plague is an exotic disease foreign to the evolutionary history of North American species and did not exist on this continent prior to 1900 (Gage and Kosoy 2006). It was first observed in prairie dogs in 1932 in Arizona (Cully 1993). Plague is caused by the bacterium, *Yersinia pestis*, which fleas acquire from biting infected animals and transmit to other animals via a bite. The disease can also be transmitted pneumonically among infected animals or via the consumption of contaminated food items (e.g., black-footed ferrets eating plague-killed prairie dogs) (Godbey et al. 2006). Plague quickly kills close to 100 percent of prairie dogs in a colony when an epizootic outbreak occurs. Plague is also highly prevalent in prairie dog colonies in an enzootic state without any obvious epizootic (Hanson et al. 2007). Although plague devastates populations of numerous species of marmots, ground squirrels, and chipmunks, prairie dogs are especially susceptible when compared to other species of ground-dwelling squirrels. One likely explanation for this difference is that prairie dogs are more densely colonial than other squirrels, and thus are more susceptible to costs of coloniality such as increased transmission of diseases. On the other hand, their extreme vulnerability to plague relative to other taxonomic relatives might be an artifact that results because highly interactive prairie dogs in large colonies amidst low vegetation are easier to census and track than other, less interactive ground-dwelling squirrels that live in smaller colonies amidst taller vegetation.

The higher densities and higher rates of social contact of black-tailed and Gunnison's prairie dogs particularly enhance the spread of plague (Cully 1993). The disease is present throughout the range of white-tailed and Gunnison's prairie dogs and is present in approximately the western two-thirds of the range of the black-tailed prairie dog (Barnes 1993, Lockhart et al. 2006). The vagaries of plague impacts on black-footed ferret reintroduction efforts emphasize the value of establishing wild populations in areas free of plague.

Until recently, plague had been documented at or within 25 miles of all black-footed ferret reintroduction sites, except the 4 active sites in South Dakota (Conata Basin, Cheyenne River Sioux Reservation, Lower Brule Reservation and Rosebud Sioux Reservation) and the reintroduction site in northern Chihuahua, Mexico (U.S. Fish and Wildlife Service 2006a). In 2007 plague was documented on the Cheyenne River Sioux reservation and in the spring of 2008 plague was killing prairie dogs in the Conata Basin reintroduction site. Efforts to assess the impact of plague on the Conata Basin site are currently proceeding (USDA Forest Service 2008c). Conata Basin prairie dog colonies support the largest black-footed ferret population and have provided a surplus of kits for translocation to other reintroduction areas (Lockhart et al. 2006). However, in 2005, plague struck prairie dogs approximately 25 miles south of Conata Basin. Some recovery of prairie dog colonies is occurring. During the late summer and fall of 2005, approximately 3,500 pounds of the insecticide deltamethrin, a synthetic pyrethroid, were applied to 7,000 acres of occupied prairie dog burrows in known black-footed ferret habitat in an effort to eliminate fleas, the most likely plague vector. Dusting continued in 2006 and may be a useful management tool to deter plague from Conata Basin (Seery 2006).

Prairie dog as a keystone species. Paine (1969) developed the keystone species concept when species composition and physical appearance of the ecosystem is greatly modified by the activities of a single native species high in the food web. Populations of such species are the "keystone of the community's structure, and the integrity of the community and its unaltered persistence through time are determined by

their activities and abundances." The keystone concept can promote conservation not only for the prairie dog, but also for its grassland ecosystem (Kotliar 2000; Miller et al. 2000; Soule et al. 2003).

Miller et al. (2007) summarize the unique role played by prairie dogs. They also move soil, influence nutrient cycling (Coppock et al. 1983a), increase nitrogen content of soil and plants, change vegetation structure and community dynamics (Coppock et al. 1983a), aerate the ground, alter soil chemistry, and deepen water penetration. They provide a ready source of prey to many predators and burrows for shelter to other animals and insects (Kotliar et al. 1999). This combination of effects gives the prairie dog its role as a highly interactive (keystone) species in the ecosystem, creating a matrix of different habitats that increases diversity across the grassland (Kotliar et al. 1999).

Kotliar et al. (2006) describe the prairie dog as a keystone species because the species has a unique, significant, disproportionately large impact on its ecosystem. The species' influence on grassland ecosystems varies with its abundance and certain keystone functions also vary with abundance. Even though small, isolated colonies of prairie dogs are better than no colonies at all in the Great Plains, they cannot support the full complement of species that naturally associate with prairie dogs (Kotliar 2000). About 100 years ago, both large and small colonies occurred throughout the prairie dog's geographic range (Proctor et al. 2006a). A similar combination of small and large colonies (e.g., Conata Basin) is probably a good mechanism for maintaining today's prairie dogs and their keystone functions.

ESA Status and Other Organizational Rankings

ESA Status	Conservation Status[1]
ESA (no status)	G4, N4; Nebraska – S3S4; South Dakota – S4; Forest Service - Sensitive Species

[1] Definitions - http://www.natureserve.org/explorer/nsranks.htm

Recovery and Conservation Planning. The State of South Dakota has completed the "South Dakota Black-tailed Prairie Dog Conservation and Management Plan" in Feb. of 2005 (Cooper and Gabriel 2005) for the prairie dog. Other species assessments include "The Black-tailed Prairie Dog Conservation Assessment and Strategy" (Van Pelt 1999), "An Umbrella, Multi-state Approach for the Conservation and Management of the Black-tailed Prairie Dog, *Cynomys Ludovicianus*, in the United States" (Luce 2001) and "A Multi-State Conservation Plan for the Black-tailed Prairie Dog in the United States" (Luce 2003). The U.S. Fish and Wildlife Service (2000b) determined that listing of the black-tailed prairie dog was warranted but precluded by other higher priority listing actions. Later, the U.S. Fish and Wildlife Service (2004a) concluded that the black-tailed prairie dog did not warrant listing.

History of Black-tailed Prairie Dog management on the Nebraska National Forest

Black-tailed prairie dog Management Pre 1972

Through the late 1960s and early 1970s, Forest Service prairie dog plans called for colonies to be limited to a total of 3,000 acres (USDA Forest Service 1978). It was estimated that in 1968 there were approximately 3,000 acres of prairie dogs on land administered by the Nebraska National Forest (USDA Forest Service 1978). A USFWS study conducted in 1968 showed that in a 400 square mile area in Conata Basin there were 79 prairie dog colonies and 1,651 acres of active prairie dog colonies (USDA Forest Service 1978).

1972 Executive Order

In 1972, Presidential Executive Order 11643 banned the use of chemical toxicants on federal lands that pose secondary poison risk to non target species. This stopped all prairie dog control on the National Grasslands. The result of this action was a substantial increase of prairie dogs on the

Nebraska National Forest. By 1977, the Forest Service estimated there were approximately 21,000 acres of prairie dogs on the National Grasslands administered by the Nebraska National Forest (USDA Forest Service 1978). This was an increase of approximately 18,000 acres of active prairie dog colonies from pre-Executive Order levels.

Table N-9. The number of acres and number of colonies on the NNF grasslands in the spring of 1977 (USDA Forest Service 1978).

Location	Acres of Active Colonies	Approximate Number of Colonies
Buffalo Gap National Grassland		
Fall River Ranger District	2,507	57
Wall Ranger District	17,286	377
Fort Pierre National Grassland	995	27
Oglala National Grassland	97	2
Total	20,885	463

In 1976, the USFWS estimated that there were 369 colonies and 15,660 acres of prairie dogs on the same 400 square mile area in Conata Basin listed above (USDA Forest Service 1978).

1978 EIS and Plan

In the spring of 1978, in response to the expansion of prairie dogs that occurred after the pesticide ban, the Forest Serve completed an EIS on Prairie Dog Management with an accompanying decision. The core goal of the plan was to reduce the acres of prairie dog colonies on lands administered by the NNF. The following is from the summary sheet that accompanied the 1978 EIS:

> "Primary consideration is given in the overall proposal to the need for improving range forage conditions on some areas were prairie dogs are present. Range recovery will be accomplished through reduction in livestock grazing combined with attaining prescribed distribution and size of prairie dog colonies. Reductions in prairie dog colonies will be done with the use of chemical toxicants.
>
> A feature of the plan is to manage prairie dogs on a 92 square mile area of the Buffalo Gap National Grassland (Conata Basin) to protect habitat for the black-footed ferret. In this area, the objective will be to maintain a prescribed size, distribution and acreage of prairie dog colonies that best meets the needs of the black-footed ferret. The plan will provide for maintenance of approximately 2,800 to 5,000 acres of prairie dog colonies in the area. Acreage at any one time will vary depending upon the stage of the plan implementation and relative rates of colony reestablishment.
>
> The total acreage of prairie dog colonies on all the lands administered by the Supervisor of the Nebraska National Forest was estimated to be 21,000 acres in the spring of 1977. The plan provides for reducing this to an acreage that will vary from 7,000 to 9,000 acres."

The significant guideline listed in the plan for Conata Basin divided Conata Basin into 4 units. Each unit was required to have 12 active prairie dog colonies that were at least 30 acres in size and at least

two of these colonies must be 100 or more acres in size. This resulted in a minimum of 500 acres of prairie dogs on each unit (10 x 30 = 300 and 2 x 100 = 200).

The two most important conditions listed in the 1978 EIS to trigger prairie dog control in Conata Basin were: 1) an individual prairie dog colony shall not be allowed to expand over 320 acres in size or to occupy more than 10 % of the suitable livestock range within a unit. 2) An entire prairie dog colony may be poisoned only if there are at least two other colonies of 10 or more acres within a one mile radius of the colony to be controlled.

The Forest Service's initial analysis showed there were 14,843 acres of prairie dogs in Conata Basin in 1978. The decision proposed to control 10,133 acres and to leave 4,710 acres of prairie dogs in the Basin.

The goal for management of prairie dogs outside of Conata Basin listed in the 1978 EIS was: "To maintain rangeland vegetation and habitat in a productive state for all uses." With the accompanying objective being: "Prairie dog colonies are not to exceed 2 percent of the area suitable for grazing within an allotment."

Conditions under which prairie dog control may be implemented included when: 2 % of the acres suitable for grazing within an allotment are covered with prairie dogs, an individual prairie dog colony exceeds 80 acres in size, a prairie dog colony is a threat to improvements, a prairie dog colony is causing accelerated soil erosion, a prairie dog colony expands unto private land, the land a prairie dog colony is on can be used for a higher use, and a prairie dog colony is threat to public health and safety. Conditions under which a colony can be eliminated were if any of the above conditions were met and two or more active prairie dog colonies occurred within a one mile radius of the colony to be eliminated.

The Forest Service's initial analysis showed there were 6,042 acres of prairie dogs within the NNF but outside Conata Basin in 1978. The decision proposed to control 2,993 acres and to leave 3,049 acres of prairie dogs outside of Conata Basin.

Table N-10. A summary of the initial action called for in the 1978 EIS

Location	Acres of Active Colonies	Acres to be retained	Acres to Control
Buffalo Gap National Grassland			
Fall River Ranger District	2,507	1,140	1,367
West GA	265	215	50
Southeast GA	671	412	259
Northeast GA	1,571	513	1,058
Wall Ranger District	17,286	5,823	11463
Conata Basin	14,843	4,710	10,133
Outside Conata	2,443	1,113	1,330
Fort Pierre National Grassland	995	740	255
Oglala National Grassland	97	56	41
Total	20,885	7,759	13,126
Total Conata Basin	14,843	4,710	10,133
Total Outside Conata Basin	6,042	3,049	2,993

1981 Prairie Dog Amendment

Prairie dogs continued to expand so it was believed that the "current prairie dog management program was not going far enough in controlling prairie dogs and needed to be improved from a cost effective stand point" (USDA Forest Service 1981).

Table N-11. A summary of the Black-tailed prairie dog distribution during the spring of 1980 on National Grasslands Administered by the NNF

Location	Acres of Active Colonies	Approximate Number of Colonies[1]
Buffalo Gap National Grassland		
Fall River Ranger District	7,500	90
Wall Ranger District	35,100	260 [2]
Fort Pierre National Grassland	940	43
Oglala National Grassland	130	2
Total	43,670	395

[1]acreages include the treated acres since prairie dogs continue to reinvade and occupy treated areas.

[2]Approximate figure due to the difficulty in distinguishing between individual colonies in Conata Basin.

An Environmental Analysis (EA) was completed and a decision was made to reduce the minimum number of protected areas in each unit of Conata Basin from 12 to 8 colonies of 30 or more acres and two of these colonies had to be at least 100 acres. This decision lowered the minimum acreage in each unit of Conata Basin from 500 acres to 380 acres.

Outside of Conata Basin the stipulation "An entire prairie dog colony may be poisoned only if there are at least two other colonies within a one mile radius of the colony to be controlled." was removed. This reduced the number of prairie dog acreages to be retained to 1,570.

Forest Land and Resource Management Plan 1984

A new Forest Land and Resource Management Plan FLRMP was approved in 1984. In this plan it was decided to carry through the management direction for prairie dogs in the 1978 EIS (1981 amendment) unchanged (FLRMP 1984 ROD). However, the ROD stated that a review of current management direction would be forthcoming subsequent to completion of appropriate analysis and public involvement (USDA Forest Service 1984).

Black-tailed Prairie Dog Management Decision Notice 1988

An analysis was conducted, a public involvement group was formed, and the decision that was made was signed on November 3, 1988. The following table summarizes that decision.

The number of colonies and acres of untreated colonies called for in the 1988 black-tailed management plan by administrative unit (USDA Forest Service 1988).

Table N-12. The number of colonies and acres of untreated colonies called for in the 1988 black-tailed management plan by administrative unit (USDA Forest Service 1988).

Area	# of Colonies	# of Acres
East Half (Wall)	20-40	5,400-6,180
West Half (Fall River)	3-8	700-1200
Fort Pierre	10-20	150-250
Oglala	1-3	150-250
NNF (Halsey)	8-10	100-120
Total	42-81	6,500-8,000

1998 Petition and Suspension of Control

In 1998, the black-tailed prairie dog was petitioned for listing and protection under the Endangered Species Act (ESA). In 2000, the U.S. Fish and Wildlife Service designated the black-tailed prairie dog as a candidate for possible listing as a threatened species under ESA protection (U.S. Fish and Wildlife Service 2000). The USFWS had concluded that listing of this species for federal protection under the Endangered Species Act was "warranted." The Forest Service followed by issuing national guidance to limit use of prairie dog rodenticide to situations involving public health and safety risks and damage to facilities.

2001 LRMP revision.

This direction was incorporated into the revised Land and Resource Management Plan (LRMP) and 2002 Record of Decision (2001 LRMP Revision, Chapter 1, Section H Animal Damage Control) (USDA Forest Service 2001c).

Limit use of rodenticides (grain baits for reducing prairie dog populations to the following situations:

- Public health and safety risk occur in the immediate area.
- Damage to private and public facilities, such as cemeteries and residences.

2004 Settlement Agreement to allow control of prairie dogs on the NNF

The Chief of the Forest Service rescinded the national guidance in February, 2004. In August, 2004, the U.S. Fish and Wildlife Service concluded that the species was not likely to become endangered in the foreseeable future and removed it from the candidate list.

The drought in South Dakota and Nebraska (started in the late 1990's to the present) led to accelerated expansion of prairie dog colonies, and increased complaints about unwanted colonization of lands adjoining national grasslands. In response to these complaints and a request by the Governor of South Dakota, application of prairie dog rodenticide (2% zinc phosphide, EPA Label Registration No. 56228-14) in selected colonies was conducted by the State of South Dakota on private lands and by the USDA Animal and Plant Health Inspection Service – Wildlife Services (APHIS-WS) on the Buffalo Gap National Grassland in 2004. Prior to the initiation of rodenticide use, a lawsuit was filed by several conservation/environmental organizations. A stipulated settlement agreement was reached that allowed emergency rodenticide use. As part of the stipulated settlement agreement, no further use of rodenticide would occur until the completion of an environmental impact statement (EIS) and LRMP amendment addressing a long-term solution for management of prairie dog colonies.

LRMP Amendment 2 - August 2005

The Nebraska National Forest releases the *Final Environmental Impact Statement for Black-tailed Prairie Dog Conservation and Management on the Nebraska National Forest* (Forest Plan

Amendment 2). The selected alternative prescribed expanded rodenticide use and non-lethal management along the boundaries between federal and private lands. Boundary management zones on the federal lands are 0.25 miles wide for the Fort Pierre National Grasslands and 0.5 miles wide for the rest of the NNF (USDA Forest Service 2005c).

Existing Conditions. The black-tailed prairie dog is listed as a sensitive species in Region 2, which includes the project area. Prairie dog colonies occur on Fort Pierre National Grassland, Buffalo Gap National Grassland and Oglala National Grassland. Approximate colony acreage for each unit is displayed in Table N-1. Prairie dog control work has been carried out in the BMZ of all of the GAs at various times between 2004 and 2007 (Table N-7).

Plague was documented in the Conata Basin area of the Buffalo Gap National Grassland in the Spring of 2008. Plague was also confirmed in a prairie dog colony in western Custer County, South Dakota in September, 2004 near the border of Wyoming and South Dakota. This is less than 10 miles from the northern most boundary of the Fall River West Geographic Area. In the summer of 2005 prairie dog densities within some of the colonies north of Highway 18 in the Fall River West Geographic Area were noticeably reduced. Although not officially documented, it is believed that plague has occurred within these colonies. Also, plague positive prairie dogs were found in Shannon County in 2005. This plague documentation is less than 10 miles from the eastern boundary of the Fall River Southeast Geographic Area. In the summer of 2005, prairie dog densities within some of the colonies in the Fall River Southeast Geographic Area were noticeably reduced. Although undocumented, it is believed that plague caused the reductions of prairie dogs in these areas.

Direct, Indirect, and Cumulative Effects. The prairie dog is the target species for the rodenticide use programs outlined in the proposed action. The rodenticide is 2 percent zinc phosphide bait (oats). When proper procedures are followed, efficacy of zinc phosphide bait is typically 90 percent or higher (South Dakota Department of Agriculture et al. 1994). Where other active colonies are nearby, prairie dog populations in colonies treated with rodenticide commonly recover to pre-treatment levels within 3 to 5 years (Knowles 1986, Uresk and Schenbeck 1987).

As a management tool, the recreational shooting of prairie dogs has potential to limit prairie dog populations (Vosburgh and Irby 1998). Prairie dog shooting can affect prairie dog populations and densities. As a minimum, it is suspected that shooting of prairie dogs can significantly reduce prairie dog densities (Vosburg and Irby 1998) and indefinitely maintain reduced densities in smaller isolated colonies (Knowles 1987). Shooting prairie dogs in colonies that have been previously poisoned could likely prevent or slow population recovery in those colonies. In a study conducted in eastern Wyoming, recreational shooting increased the alertness and decreased above ground activity of black-tailed prairie dogs, which in turn reduced the time spent foraging and resting. This resulted in a decrease in body condition of surviving adult prairie dogs and reduced pregnancy rate and reproductive output (Pauli 2005).

Vosburgh and Irby (1998) estimated prairie dog population declines to be approximately 2 times higher and the minimum survival to be 22 percent lower in hunted versus non-hunted prairie dog colonies. It is estimated that shooting reduces the number of prairie dogs by 2.25 per acre per year as derived from reports by Schenbeck and Mason (1994) for the Conata Basin/Badlands area. A summary from the South Dakota Department of Game, Fish and Parks (2001) states that, on non-tribal lands, recreational shooters killed 1.52 million prairie dogs in 2001, of which 86.3 percent were shot on private land. Shooting by residents occurs throughout the year and mostly in the summer, while nonresidents do most of their shooting in May, June or October depending on the type of license they possess (South Dakota Game, Fish and Parks 2001). Vosburgh and Irby (1998) noted an increase in prairie dog hunters during September of 1994, explaining that some hunters hunt prairie dogs in addition to other species they specifically planned to hunt.

Plague was first confirmed in South Dakota in 2004 in Fall River County on the Wyoming boundary. A collected prairie dog tested positive for plague. On the nearby Pine Ridge Indian Reservation south of Conata Basin and east of Fall River Ranger District, plague rapidly affected over 25,000 acres of prairie dog colonies in 2005. However, there are over 110,000 acres of colonies on the reservation. To date, plague has not appeared in Conata Basin, although a coyote near Interior, South Dakota tested positive for exposure to plague.

On the Buffalo Gap National Grassland plague is probably responsible for prairie dog die offs in all three of the Geographic Areas (GA) located on the Fall River Ranger District (Fall River Southeast GA, Fall River Northeast GA, and Fall River West GA), however, no prairie dog carcasses have been collected for analysis. Few prairie dogs can be seen on some colonies in the above areas (see maps at end of this BA). On the Fall River Northeast GA plague has probably occurred on two colonies (approximately 375 acres). On the Fall River Southeast GA plague has probably occurred on 20 colonies (approximately 1,940 acres). On the Fall River West GA plague has probably occurred on 5 colonies (approximately 500 acres). Plague may have occurred on additional colonies because only colonies that were not controlled in the past 3 years were examined. Plague was documented in the Conata Basin area of the Buffalo Gap National Grassland in the Spring of 2008 and the assessment of the outbreak is ongoing.

The potential for plague to persist in prairie dog populations on the national grasslands and forests in the project is unknown, but it is acknowledged that plague can have dramatic impacts on prairie dog populations. Plague may have affected some prairie dog towns within the IMZ on the Geographic Areas of the Fall River Ranger District. If plague persists and spreads throughout the project area this would result in a substantial loss of prairie dog habitat.

Cumulatively, the use of prairie dog rodenticide, limited regulated shooting and plague would likely be expected to keep prairie dog populations at lower levels in areas where all are occurring. The impacts of shooting may be a contributing factor to prairie dog population fragmentation, in that recovery of colonies could be delayed or precluded by other factors, including rodenticide use (U.S. Fish and Wildlife Service 2000b).

Prairie Dog Viability

The definition of a viable population given in Appendix G of the LRMP (USDA Forest Service 2001c) is:

> "A group of individuals of a particular species that produces enough offspring for long-term persistence and adaptation of the species or population in a given place. For planning purposes, 36 CFR 219.19 defines a viable population as one that has the estimated numbers and distribution of reproductive individuals to ensure that a continued viable population is well-distributed in the planning area. A planning area is further defined by 36 CFR 219.3 as the "area of the National Forest System covered by a regional guide or forest plan." Direction estimated numbers and distribution of reproductive individuals to ensure the continued existence of the species throughout its existing range (or range required to meet recovery for listed species) within the planning area."

When attempting to determine the viability of prairie dogs it needs to be understood that there are two different prairie dog population levels that could be considered. The first being the number of prairie dogs it takes to ensure the long-term survival of the prairie dog as a species (prairie dog species viability). The second being the number of prairie dogs it takes to ensure the long-term survival of the species that depend on prairie dog colonies for their continued existence (associated species viability). A third element that factors in the viability of prairie dogs is the presence or absence of plague.

Prairie Dog Species Viability: Many factors need to be considered when attempting to determine species viability, including the number of individuals, number of colonies, environmental variables, and their juxtaposition on the landscape.

The authors of the Revised 2001 LRMP (USDA Forest Service 2001c) proposed that large prairie dog complexes are the best approach to ensure prairie dog population viability. They based their definition of a colony complex on several sources of viability information, including the Northern Great Plains Terrestrial Assessment NGPTA (USDA Forest Service 2000) and literature found in the LRMP FEIS Bibliography by Hanski and Lande, and Knowles (Hanski 1997; Lande 1995) and (Knowles 2000). Elements considered in defining a prairie dog colony complex included genetics, metapopulation principles, dispersion distances, effective population size and average adult animals per acre. The definition for a prairie dog colony complex in Appendix G of the revised LRMP is:

> "A group of at least 10 prairie dog colonies with nearest-neighbor intercolony distances not exceeding 6 miles and with a total colony complex acreage of at least 1,000 acres."

The ten colonies was taken from a general discussion on meta-populations by Hanski (1997) who suggested that for species in general an adequate successful network of small habitat fragments should have a minimum of 10-15 well-connected fragments. Hanski indicated that even this number may be insufficient if regional stochasticity is strong and local dynamics are strongly correlated. The six-mile maximum for inter-colony distance is taken from Knowles (1985) who published the farthest known dispersal distance for the black-tailed prairie dog

There are differences throughout the literature as to the definition of a complex with the center of contention revolving around the distance between colonies. The Multi-State Conservation Plan for the Black-tailed Prairie Dog *Cynomys ludovicianus* in the United States (Luce 2003) defines a complex as:

> A group of prairie dog colonies distributed such that individual prairie dogs can physically disperse from one colony to another. For the purposes of this document, this is defined as 7 km (4.3 mi) which is the longest nightly movement recorded for the black-footed ferret, an obligate predator on prairie dogs. Inter-colony movements of black-tailed prairie dogs are typically confined to approximately 8 km (5 mi).
>
> Summary of justification for definition of a complex from the scientific literature: Black-tailed prairie dog movement between colonies is most often confined to about 8 km (5 mi) (Smith 1967). Ten km (6 mi) movement has been documented but is considered rare (Knowles 1985). Garrett and Franklin (1988) documented movement of up to 5.2 km (3 mi). The longest nightly move by black-footed ferrets at Meeteetse, Wyoming was 7 km (4.3 mi) (Biggins and Fagerstone 1984, Richardson et al. 1987, Biggins et al. 1993).

Hoagland (2006) defines a complex as a group of two or more colonies in which each colony is less than 4 miles from another colony.

In the Northern Great Plains Terrestrial Assessment NGPTA (USDA Forest Service 2000), a conservation strategy for maximizing the contribution that the Forest Service and National Grasslands add to the long-term viability of black-tailed prairie dogs is to establish 2 or more prairie dog colony complexes on each national grassland within the range of the black-tailed prairie dog. The assessment does not state an optimum size of a prairie dog complex but does state there should be at least 10, preferably 15 colonies in a complex and the complexes should be identified and managed on the basis of maximum effective dispersal distance of prairie dogs which was 10 km (6.21 miles). The only reference to the size of prairie dog colonies in the NGPTA is:

> "Although not specific to long-term viability of black-tailed prairie dog populations, complexes should be or have the potential of growing to a size capable of supporting future reintroductions of black-footed ferrets"

This statement reiterates that there is a difference between prairie dog species viability and associated species viability.

The authors of the Multi-State Conservation Plan for the Black-tailed Prairie Dog *Cynomys ludovicianus* in the United States – Addendum 2003 (MCP) (Luce 2003) uses 1,000 acres of prairie dogs as a minimum in their definition of Conservation Focus Areas (CFA) which is:

> "An area greater than 1,000 acres of suitable prairie dog habitat, encompassing either an existing complex of occupied prairie dog colonies or an area where a complex of colonies can be created to sustain a viable population of prairie dogs for long-term management."

The Forest Plan and Mutli-State Plan rely upon several reports and papers, including Knowles (2000) who discusses five levels of prairie dog population viability, including the 1,000-acre level (Table N-12a). These levels address random demographic events, loss of genetic diversity, extinction due to normal environmental variables, catastrophic events such as plague, and associated species viability. Table N-12a displays a summary of Knowles' (2000) probable minimum population levels required to reduce the likelihood of extinction from these factors. Knowles (2000) examined the history of prairie dog colonies on the 46,000-acre South Unit of Theodore Roosevelt National Park, North Dakota, "the best long-term data on prairie dog populations in an area not known to have experienced a plague epizootic." During 1947-1997, prairie dog colonies occupied from 184-782 acres (0.4-1.7%) of the South Unit and 19 prairie dog generations occurred. During the 51-year monitoring period, 27 prairie dog colonies were observed and 11 went extinct for at least one year. Twenty-one colonies were active in 1997.

Knowles suggest that for long-term viability (51-100 years) without plague, the larger complexes approaching 1,000 acres appear to contain a suitable population base to survive environmental variables (including drought, extremely cold winters, and flooding). Knowles goes on to say that prairie dog complexes occupying about 1% of the landscape and a minimum of 1,000 acres are probably necessary to assure long-term population viability of prairie dogs in the absence of plague.

The LRMP FEIS Chapter 3 also discusses viability. Recommendations from the NGPTA (USDA Forest Service 2000) for maintaining viable prairie dog populations on the national grasslands in the planning area were incorporated into LRMP direction. This increased the probability of maintaining viable populations of the prairie dog across the planning unit. These additional conservation measures for the species increase the probability of sustaining viable populations in the future if plague epizootics become problematic (LRMP FEIS Chapter 3, pages 3-271 to 3-272).

Table N-12a. The acres of active prairie dog colonies needed to ensure population viability of prairie dogs and associated species (Knowles 2000).

VIABILITY		NECESSARY ACRES OF PRAIRIE DOG COLONIES
Prairie Dog: Short-term viability		10
Prairie Dog: Genetic viability		100
Prairie Dog: Long-term viability – no plague		1,000
Prairie Dog: Long-term viability – plague		10,000
Prairie Dog Associated Species:	Burrowing Owl	1,000-4,000
	Mountain Plover	3,000-9,000
	Ferruginous Hawk	10,000-15,000
	Black-footed Ferret	10,000-15,000

Knowles viewed 51 years (1947-1997) as an adequate time for genetic and demographic problems to emerge and for environmental variables to affect the prairie dog population. Knowles concluded that in the absence of plague, a "50,000-acre block of land with 1-2% prairie dog occupancy distributed among approximately 20 population centers (500 to 1,000 acres, or an estimated 5,000 to 10,000 individual prairie dogs)" would be suitable for long-term prairie dog population viability. A metapopulation such as the South Unit population can persist as long as rate of recolonization exceeds rate of extinction, even though no local population may survive continuously over time (McCullough 1996). Ability of prairie dogs to disperse among colonies is critical because recolonization after local extinction is essential for regional persistence of metapopulations (Fahrig and Merriam 1994, Hanski 1999, Hanski and Simberloff 1997, Harrison and Taylor 1997, Roach et al. 2001).

Another example is the Black-tailed Prairie Dog Management Plan for Wind Cave. It set the limits of prairie dog colonies within the park between 1,000 and 3,000 acres (3.6 - 11% of the park's land base or 12 – 35% of its 8,566 acres of suitable prairie dog habitat). This alternative represents natural regulation, with the acreage range allowing for natural variation while maintaining a sustainable level, for both the long-term viability of the prairie dog population and the availability of forage and habitat for other species within the park (USDI NPS 2006).

Larger catastrophic events, such as plague, would require a much larger population level to reduce the likelihood of extinction from an area. Knowles (2000) recommends that at least 10,000 acres of prairie dog colonies be maintained for long-term population viability.

> Plague is a serious catastrophic event and has the capability to reduce a large viable prairie dog colony complex to the point where genetic viability and even random demographic events become important factors. A plague epizootic event can depopulate large prairie dog complexes in a matter of a few years. Typically, when a plague epizootic occurs in a prairie dog colony, at best only a few individuals survive the event and in some cases none survive. For example, on the Northern Cheyenne Indian Reservation in south-central Montana, a plague epizootic reduced an 11,000 acre prairie dog colony complex to about 650 acres in approximately three years…This colony complex was situated within a corridor of approximately 75,000 acres of prairie and breaks habitats along the Tongue River….Prairie dog numbers dropped below the long-term viability level (10,000 individuals) but did not reach a point that genetic or demographic viability would be an issue. Subsequently, prairie dog numbers have increased well above the point that long-term viability would be a concern. Plague, however, will probably always be a factor with this complex and only over the long-term will it be known if prairie dogs will be able to maintain a viable population.
>
> Prairie dog population viability with plague is a completely different situation than in areas without plague….Prairie dogs have no immunity to plague and their dense colonial life style makes them highly vulnerable to epizootics. Population reductions of greater than 99% have been reported in individual prairie dog colonies and prairie dog complex acreage reductions of 57 to 96% have been documented in Montana….Plague has the potential to decimate prairie dog complexes and at present there is no cost effective method of controlling plague epizootics.
>
> Data collected in Montana would suggest the prairie dog complexes of 10,000 acres or larger can survive a plague epizootic…In Montana, the population consequences of plague have been monitored at two major prairie dog complexes that originally exceeded 10,000 acres….The Phillips and Blaine Counties prairie dog complex in north-central Montana was and still is Montana's largest prairie dog complex. This complex reached its peak acreage around 1990 when mapping data indicated approximately 51,000 acres of prairie dogs and 450 colonies. Plague was first suspected in 1992 and occupied prairie

> dog acreage began a downward trend. It should be noted that in the 20 year period where prairie dogs increased from 5,000 acres in 1972 to 51,000 acres in 1990, there was no official prairie dog control program.

The distinction that Knowles (2000) makes between 1,000 and ≥10,000 acres is important. Prairie dog colony acreage viability goals are dependent upon the presence of plague. A management objective for prairie dog viability in an area without plague requires significantly less acreage (suggested 1,000 acres) of prairie dog colonies than an area where plague is present. A management objective for prairie dog viability in an area with plague requires significantly more acreage (suggested 10,000 acres) of prairie dog colonies Knowles (2000). Plague was not known to occur in the Nebraska National Forest (NNF) planning area at the time of the 2001 Forest Plan. Since then, plague has been documented in the Conata Basin which is located in the Wall Southwest GA and on Pine Ridge Indian Reservation which adjoins Fall River Northeast, and Fall River Southeast GAs. Although not documented prairie dog die offs that occurred in the Fall River West, Fall River Northeast and Fall River Southeast GAs are believed to have been caused by plague. Elsewhere in South Dakota, plague is present in prairie dog colonies on Cheyenne River Indian Reservation.

Associated Species Viability: Prairie dogs are considered a keystone species. The MCP definition of a keystone species is:

> "A species that (1) has a large overall effect on ecosystem structure or function, (2) has a disproportionately large effect relative to it's abundance, (3) has a unique function in the system not provided by other species."

The number of prairie dogs needed to maintain viable populations of each species found on a prairie dog colony is highly variable depending on the individual species and degree of dependence on prairie dogs for there survival. Proctor et al. (2006) attempted to quantify the number of prairie dogs needed as a result of the prairie dog's status as a keystone species in their definition of focal areas as:

> "A "focal area" for the restoration and conservation of prairie dogs is a site of sufficient size so that a colony or complex can be large enough to provide suitable habitat for black-footed ferrets, burrowing owls, mountain plovers and other species that depend on prairie dogs for their survival. But, what do we mean by "sufficient size"? Bigger is always better, but an area of 4,000 hectares (9,884 acres) for a colony complex is probably the minimum necessary for a fully functional grassland ecosystem."

Knowles (Knowles 2000) again suggests in his viability assessment that prairie dog associated species would benefit by an increased abundance and distribution of prairie dogs. A functional prairie dog ecosystem can be achieved with about 1% of the landscape being inhabited by prairie dogs.

Each species inhabiting the project area depend on prairie dog colonies to a different degree ranging from the black-footed ferret, that without prairie dogs would become extinct, to the grasshopper sparrow, that because of their aversion to low structure habitat will avoid a prairie dog colony altogether. We will evaluate each species individually and make determinations on how it is believed each species will react to each of the proposed alternatives.

In the broader aspect of species viability is the ecological effective density as discussed in Soule' et. al. 2005. Ecological effective density is defined as the population level that prevents undesired changes in a defined ecological setting. Soule' suggests that strongly interactive species, such as the prairie dog, should receive special attention for recovery – beyond demographic viability if its absence or unusual rarity causes undesired changes to the functionality or composition of ecosystems. With the possibility of plague occurrence, estimating ecological effective densities of prairie dogs is difficult due to changing prairie dog numbers and the historic "shifting mosaic" between prairie dog colonies and grasslands. However, he indicates it is clear that ecologically effective densities of prairie dogs are far higher than the

densities required for population persistence. Estimating effective density is strongly contextual, and depends on variables that fluctuate spatially and temporally (i.e. locality, season, and productivity). A challenge for natural resource managers is that ecological effectiveness for strongly interactive species is not specifically addressed in current environmental laws. Soule' continues by saying that biodiversity of ecosystems will degrade unless the interactions of species are maintained in as many regions as feasible, particularly those areas within the historic range. It is critical that these species be distributed as broadly as possible and protected within well-distributed secure areas.

Managers are often inhibited by the constraints of multiple uses, funding, and social-political issues when considering implementing management prescriptions to address new ecological concepts such as ecological effective density. As a whole, addressing ecological effective density must be addressed by policymakers and multiple land management entities, and across a much broader geographic scale than this proposed action on the Nebraska National Forest. Proposed actions within the alternatives that provide for more than minimum viability requirements (1,000 acre colony complex as discussed above) and increasing species distribution would lend towards addressing this broader ecological diversity and resiliency of ecosystems.

DETERMINATION OF EFFECTS AND RATIONALE FOR THE BLACK-TAILED PRAIRIE DOG

Alternative 1

The biological determination for prairie dogs under Alternative 1 is**:** *"may adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing."*

Control of prairie dog colonies within the IMZ with zinc phosphide treated oats can be carried out under Alternative 1 as the thresholds are met. This will have direct effects on individual prairie dogs within the prairie dog population.

The Fall River West GA, Fall River Southeast GA and Wall North GA currently (Table N-1) have less than the minimum acreages required by Alternative 1. Although not officially documented it is suspected that plague has moved through the colonies in the Fall River West GA north of Highway 18 and the Fall River Southeast GA. As a result the numbers of prairie dogs in these colonies have been notably reduced. Active management (which includes but is not limited to - dusting with insecticides if plague is a problem, prescribed fire, grazing, and translocation of prairie dogs) may be necessary to increase the prairie dogs in these GA's to reach the minimum acreages required by Alternative 1

The prairie dog acreages on the Oglala National Grassland, the Fall River Northeast GA, the Wall Southeast GA, and the Fort Pierre National Grassland are currently within the ranges of acreages suggested in Alternative 1 (Table N-2). Only periodic monitoring will be required initially for these areas. This periodic monitoring would occur until acreage and vegetation thresholds are approached. At that time monitoring may require more frequent and detailed monitoring actions.

At this time plague is suspected to have killed the prairie dogs in one colony on the extreme south end of the Fall River Northeast GA. Plague has not yet suspected to have had any effect on the prairie dogs in any of the other GAs. Annual monitoring of prairie dog populations to watch for signs of plague will be necessary.

Plague has moved into the Wall Southwest GA in the spring of 2008. It is currently being monitored and the total effects will not be known for some time. Before the plague moved into the area, the Wall Southwest GA had approximately 26,698 acres of active prairie dog colonies (214 outside the Black-footed Ferret Reintroduction Habitat and 26,484 within the Black-footed Ferret Reintroduction Habitat)

within the IMZ. The 26,698 acres of fully active prairie dog colonies is more than the maximum (19,000) called for in Alternative 1 and prairie dog acreages would be decreased to meet this goal.

There are two primary components to maintaining a viable population, those being habitat to support at least a minimum number of reproductive individuals and that the habitat must be well distributed so that those individuals can interact with others (36 CFR 219.19). The definition of a viable population given in Appendix G of the revised 2001 LRMP is "a group of individuals of a particular species that produces enough offspring for long-term persistence and adaptation of the species or population in a given place."

The Forest Service defines a prairie dog colony complex as: "A group of at least 10 prairie dog colonies with nearest neighbor intercolony distances not exceeding 6 miles and with a total colony complex acreage of at least 1,000 acres" (USDA 2007c). The Multi-state Conservation Plan for the Black-tailed Prairie Dog *Cynomys ludovicianus* in the United States (MCP) (Luce 2003) defines a Conservation Focus Areas (CFA) as "An area greater than 1,000 acres of suitable prairie dog habitat, encompassing either an existing complex of occupied prairie dog colonies or an area where a complex of colonies can be created to sustain a viable population of prairie dogs for long-term management." Knowles (2000) suggest in his Black-tailed Prairie Dog Population Viability Assessment for North Dakota, that for long-term viability (51-100 years) without plague, the larger complexes approaching 1,000 acres appear to contain a suitable population base to survive environmental variables (including drought, extremely cold winters, and flooding). Knowles goes on to say that prairie dog complexes occupying about 1% of the landscape and a minimum of 1,000 acres are probably necessary to assure long-term population viability of prairie dogs in the absence of plague. Larger catastrophic events, such as plague, would require a much larger population level (10,000 acre complex) to reduce the likelihood of extinction from an area.

In the revised LRMP, there are stated objectives to maintain three or more prairie dog complexes in the Wall Southwest GA, one or more prairie dog complexes in the Fort Pierre National Grasslands and one prairie dog complex in each of the Oglala National Grassland and Fall River Southeast GA (USDA Forest Service 2001c). This juxtaposition of prairie dog colonies complexes warranted a "may adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing" viability call in the Biological Evaluation for the revised LRMP (USDA Forest Service 2001b). Alternative 1 establishes 4 additional areas that will have a minimum of 1,000 acres of active prairie dog colonies and this alternative requires a minimum of 2,100 acres of active prairie dog colonies on the Southeast GA of the Fall River Ranger District and a minimum of 12,500 acres of active prairie dog colonies on the Southwest GA of the Wall Ranger District. Alternative 1 would provide for an adequate distribution of prairie dogs for a viable population. Considering that these complexes (a total 10 or more complexes across the planning unit) and with the Wall Southwest GA having enough prairie dogs to meet the "focal area" definition provided by Proctor et al (2006), are spread throughout the National Grasslands administered by the NNF. These National Grasslands occur from the Missouri River in Central South Dakota to the South Dakota - Wyoming Stateline and into extreme northwestern Nebraska.

Looking at each GA individually all of them under Alternative 1 will meet the minimum requirement for a viable population of prairie dogs as suggested in the LRMP, Knowles (2000), and the multi-state plan, which is a minimum of 1,000 acres. When plague is introduced into the equation the situation is not as simple. Knowles (2000) suggests that larger catastrophic events, such as plague, would require a much larger population level (10,000 acre complex) to reduce the likelihood of extinction of prairie dogs from an area. Only the Conata Basin will have enough prairie dogs to survive a plague outbreak on its own if Knowles (2000) is correct. It is the only area that has at least 10,000 acres of prairie dogs. In the other GAs a broader area has to be examined to get the true picture. The Fall River Northeast and Southeast GAs are located very near a large expanse of prairie dogs that exist on the Pine Ridge Indian Reservation (Map N-1). Using a 5 mile inter colonial distance the prairie dogs on these GAs can be linked to the Pine Ridge prairie dog complex and would be considered part of this complex. This entire area more than exceeds the 10,000 acres of prairie dog colonies that Knowles (2000) believes is the minimum for a

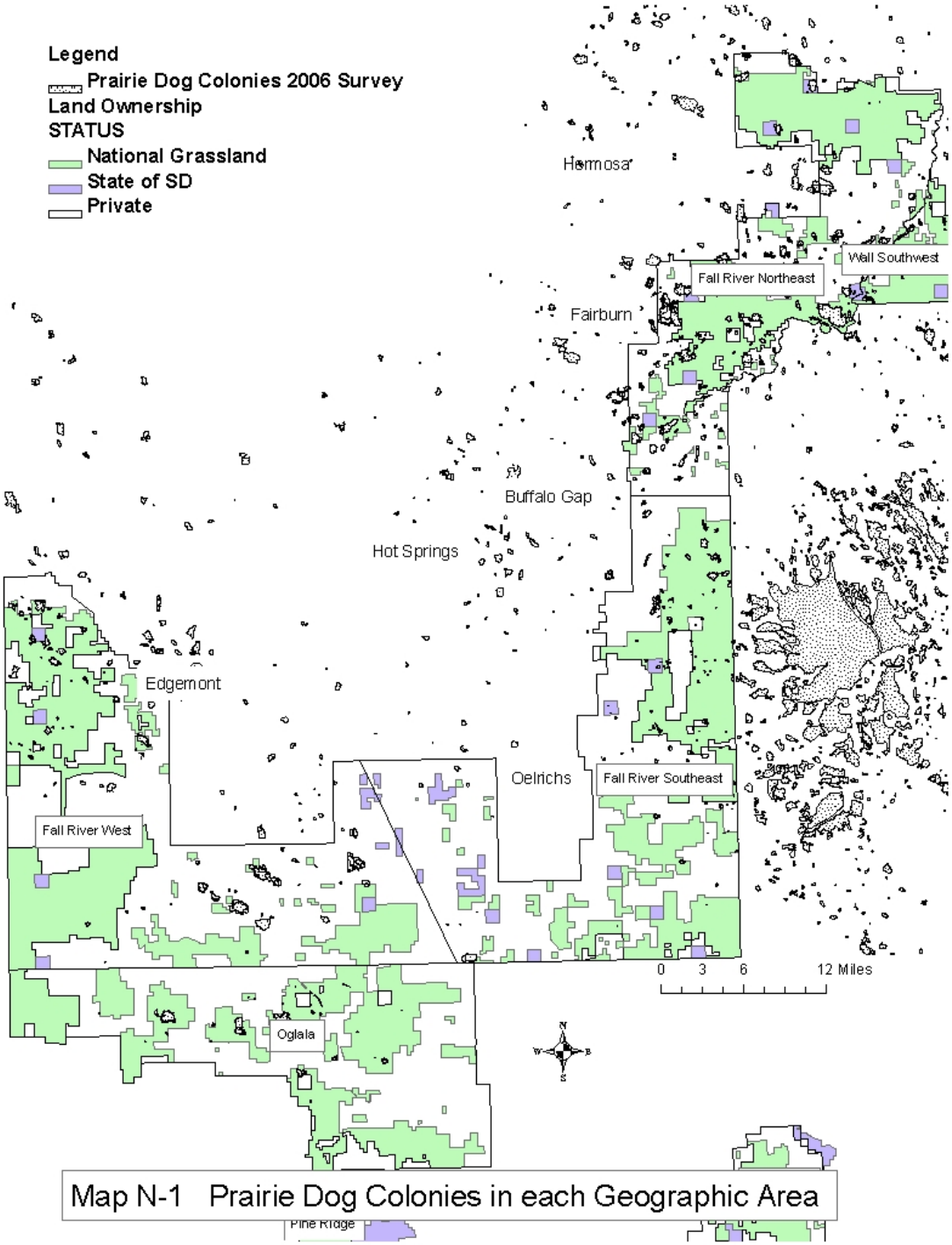
prairie dog complex to survive a plague out break. It should be noted that starting in the summer of 2005 plague moved through the Pine Ridge prairie dog complex and the prairie dog colonies located within the Southeast GA. Before the plague struck this complex, there were over 100,000 acres of active prairie dog colonies in the area, if Knowles is correct the area should survive the plague outbreak. This is also true for the GA's on the Wall Ranger District which are in close proximity to the Badlands National Park and the Conata Basin prairie dog populations (Map N-2). The Fort Pierre & Oglala National Grasslands are further isolated and a plague event may be more of an issue. Neither have a history of plague but monitoring will be imperative. The Fall River West GA is arguable not a part of a 10,000 acre complex. It already has experienced a suspected plague outbreak. The problem here will be not getting 10,000 acres of prairie dogs to ensure a survival through a plague outbreak but to manage to ensure the survival of prairie dogs in the area. It may be difficult to produce a sustained population of 1,000 acres of prairie dogs if plague persists in the area and extraordinary measures may need to be taken.

In addition, there is an established minimum acreage under this alternative. Active management measures would be applied when monitoring shows that acres of prairie dogs fall below the minimum levels. This aspect of this alternative further ensures that a viable population of prairie dogs will exist across the planning area.

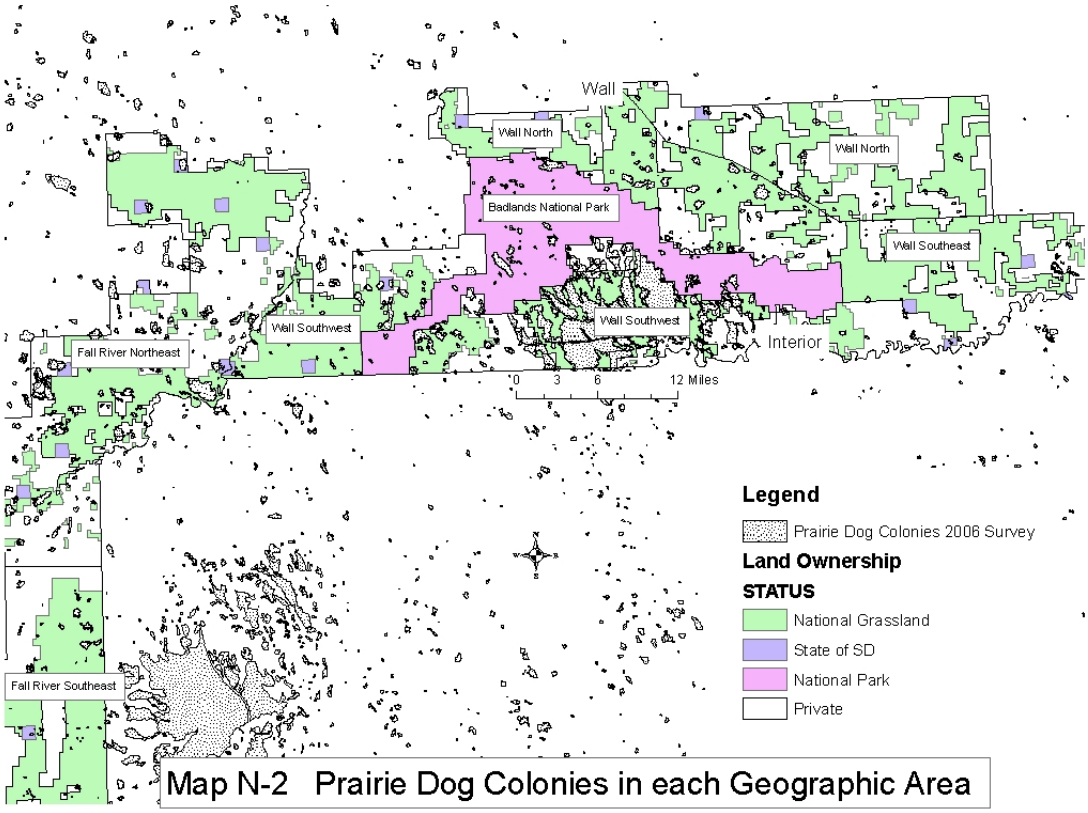
Alternative 2

This alternative was evaluated in the 2002 LRMP FEIS and the Biological Assessment and Evaluation for the 2005 FEIS for the Black-tailed Prairie Dog Conservation and Management on the Nebraska National Forest and Associated Units (LRMP Amendment 2) which made a decision regarding boundary management. The determination made in those documents is brought forward for this species under this no action alternative. The determination is *"may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing."*

In Alternative 2 (No Action), no poisoning will be administered within the IMZ except for public safety and health situations as described in the LRMP. Rodenticide use will continue in the boundary management zone as described in the LRMP Amendment 2. The acreage figures displayed in Table N-2 represent a 25% expansion rate for the next 10 years. The minimum acres are the current acres for each GA. Overall, this alternative could have a beneficial impact on prairie dog populations on the interior portions of the geographic areas. It should be noted that if prairie dog colony expansion would exceed predicted expansion to inhabit the majority of suitable prairie dog habitat, the LRMP would need to be reviewed to determine if the Plan's objectives are still being met.



Map N-1 Prairie Dog Colonies in each Geographic Area



Map N-2 Prairie Dog Colonies in each Geographic Area

Alternative 3

The biological determination for prairie dogs under Alternative 3 is**:** *"Likely to result in a loss of viability on the planning area, in a trend to federal listing, or in a loss of species viability range-wide."*

Rationale: Alternative 3 recommends the maximum acreages be set at 3 % of the aggregate total public land in each county (Table N-2). No minimum acreage figure is suggested. There is no doubt that if the prairie dog acreages are maintained at or near the maximum levels, that viability of the black-tailed prairie dog will be maintained on the planning area (see rational for Alternative 1). Minimum acreages are not presented (exception is the Oglala NG which 100 acres), so some assumptions will have to be made.

Under this alternative prairie dog colonies will be controlled if rangeland analyses of specific prairie dog colonies show the similarity index (SI) to be below 25% or trending downward. The prescribed action for this threshold is rodenticide treatment will be applied to 90% of the prairie dog holes in the allotment. This threshold could result in 90% of the current acres of the project area being controlled. It is difficult to determine if leaving 10% of a colony after control will cause the colony to die out or if it will build back to a more viable number. Under normal conditions most prairie dog colonies would survive. With plague, shooting, drought, and the possibility of significant moisture and the ensuing high vegetative production, there is a possibility that the all of the prairie dogs in all or some of the GA's in the project area could die off or be held at very low numbers. Also, the application of rodenticide at the rates that are

possible under this alternative could compromise the distribution of prairie dogs across the planning area further threatening the viability of prairie dogs.

Alternative 4

Entire Project Area with the exception of the 3.63 Black-footed Ferret Reintroduction Habitat located in the Wall Southwest GA (Conata Basin)

The biological determination for prairie dogs under Alternative 4 is: *"Not Applicable."*

Rationale: This alternative proposes a range of acreages only for the Conata Basin 3.63 Ferret Reintroduction Habitat (Table N-2).

3.63 Black-footed Ferret Reintroduction Habitat located in the Wall Southwest GA (Conata Basin):

The biological determination for prairie dogs under Alternative 4 is**:** *"may adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing."*

This alternative results in management activities that assure an acreage range of prairie dogs between 8,000 and 12,000 in the 3.63 Black-footed Ferret Reintroduction Habitat (Conata Basin Area).

Plague has moved into the Wall Southwest GA in the spring of 2008. It is currently being monitored and the total effects will not be known for some time. Before the plague moved into the area, there was approximately 26,698 acres of active prairie dog colonies within the IMZ. Twenty five thousand nine hundred thirty nine acres of fully active prairie dog colonies is more than the maximum (12,000) called for in this alternative and prairie dog acreages could be decreased to meet this goal.

Control of prairie dog colonies within the IMZ with zinc phosphide treated oats can be carried out as the various thresholds are met. This will obviously be detrimental to the prairie dogs that are poisoned. The long-term viability of the prairie dog population on the unit is likely if the range of acres of active prairie dog colonies is maintained between 8,000 and 12,000 as required in this alternative. This meets the criteria for a prairie dog complex (USDA Forest Service 2001c). It also meets the criteria for a "focal area" (Proctor et al. 2006) and long term viability with plague (Knowles 2000) which is a minimum of 10,000 acres of active prairie dog colonies.

Alternative 5

The biological determination for prairie dogs under Alternative 5 is: *"may adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing."*

Alternative 5 does authorize prairie dog control if certain thresholds are met. When the range of active acres of prairie dog colonies allowed in Alternative 5 is compared to the acres projected if prairie dog colonies expanded at a rate of 25% per year for 10 years, none of the projected acres exceed the maximum acres allowed in Alternative 5. In fact, in the Fall River West GA, Fall River Southeast GA (both in and out of the Smithwick 3.63 MA), Wall North GA and Wall Southwest GA (outside of the Conata Basin 3.63 MA), the 10-year projected acres do not even meet the minimum acres required in this alternative. Thus very little, if any, prairie dog control would occur under this alternative.

Alternative 5 meets the criteria for a prairie dog complex (USDA Forest Service 2001c) in each GA. Also, the range of acres in each GA will meet the criteria for a "focal area" (Proctor et al 2006) and long term viability with plague (Knowles 2000) which is a minimum of 10,000 acres of active prairie dog colonies.

Brewer's sparrow *Spizella breweri*

Distribution and Status. Brewer's sparrows breed from southern British Columbia east to southeastern Alberta and southwestern Saskatchewan, south through the Columbia River Basin east of the Cascade crest, and throughout the Great Basin east of the Sierra Nevada crest as far south as southern California, southern Nevada, and northern Arizona. The species regularly breeds east to northwestern New Mexico, eastern Colorado, northwestern Nebraska, western South Dakota, and southwestern North Dakota, with sporadic breeding in western Nebraska, extreme southwestern Kansas, western Oklahoma, and northern Texas (Walker 2004). In South Dakota, they are listed as an uncommon summer resident in the extreme southeast and northwest (SDOU 1991, Holmes and Johnson 2005). In Nebraska the have been documented in Sioux county (Ducey 1988, Mollhoff 2001, Sharp et al. 2001, Holmes and Johnson 2005).

Habitat. Brewer's sparrows are closely associated with shrublands dominated by big sagebrush (*Artemisia tridentata*). For that reason, they generally are considered a "sagebrush-obligate" or "shrubland-obligate" species (Walker 2004). Suitable habitat includes sagebrush-dominated shrublands with >10 percent average shrub cover and an average shrub height of 0.5 - 1.5 m (Walker 2004). In general, Brewer's sparrow abundance decreases as average shrub cover decreases below 10-13 percent, and Brewer's sparrows disappear entirely when average shrub cover decreases below 3-8 percent (Walker 2004). Brewer's sparrow abundance may decrease if shrub cover exceeds 50 percent (Walker 2004).

In spring and summer, Brewer's sparrows consumes many insects (e.g., alfalfa weevils, aphids, beet leafhoppers, caterpillars, beetles) and in the fall and winter they feeds on seeds (NatureServe 2006).

ESA Status and Other Organizational Rankings

ESA Status	Conservation Status[1]
ESA (no status)	G5, N5B, N5N; Nebraska – S3; South Dakota – S2B; Forest Service - Sensitive

[1] Definitions - http://www.natureserve.org/explorer/nsranks.htm

Recovery and Conservation Planning. A conservation assessment for the brewer's sparrow was prepared for the Forest Service, December 8, 2003 by Jennifer Holmes and Matthew Johnson in 2005.

Existing Conditions. The only sagebrush habitat large enough to have a substantial Brewer's sparrow population occurs in the western part of the Buffalo Gap National Grassland. This geographic area is identified in the LRMP as the Fall River West (FRW) Geographic area. Within the FRW the LRMP identifies a 45,760 – acre area as 3.64 Special Plant and Wildlife Habitat: Sage Grouse. This is the sagebrush habitat and where the Brewer's sparrow can be found. The FRRD has initiated a study in this area in which 72 bird point count plots were set up and surveys were completed in June of 2003 and 2004. In 2003, Brewer's sparrows were detected on 51 percent of the plots, and in 2004, 42 percent of the counts had Brewer's sparrows. Small amounts of sagebrush habitat occur on Oglala National Grassland.

Direct, Indirect, and Cumulative Effects. The Brewer's sparrow feeds primarily on seeds in the fall and winter. If they are in the area during rodenticide use, they would be susceptible to primary poisoning.

The Brewer's sparrow is a summer resident of the grasslands. They migrate in September. The latest dates of migration in South Dakota were listed as 27th of September and the 2nd of October (SDOU 1991). Generally they would not be in the area after October 1 when rodenticide use would commence. Also, Brewer's sparrows do not inhabit areas in which the average shrub cover is below 3-8 percent (Walker 2004). Sagebrush in general is absent from prairie dog colonies. Even if Brewer's sparrows are present in the area when rodenticide is applied, they do not inhabit prairie dog colonies, so they would not be exposed to rodenticide bait under normal circumstances.

Sagebrush shrubland is the habitat of the Brewer's sparrow. Prairie dogs tend to avoid the sagebrush habitat because they are less able to see predators and are more susceptible to predation. One of the prairie dog colonies in this area is surrounded by sagebrush and has not appreciably expanded in the last 15 years.

DETERMINATION OF EFFECT AND RATIONALE FOR THE BREWER'S SPARROW

Fall River West GA and Oglala GA The biological determination for the Brewer's Sparrow under Alternatives 1, 3, 4, and 5 is: *"may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing."*

Rationale: The Brewer's sparrow feeds primarily on seeds in the fall and winter. If they are in the area during rodenticide application, they would be susceptible to primary poisoning, which is the primary reason for the "may impact" determination.

Factors that could lessen the impact of poisoning on the Brewer's sparrows are: they migrate in September and they normally do not inhabit prairie dog colonies. In general, Brewer's sparrow would not be in the area after October 1 when the rodenticide application could begin. Brewer's sparrows do not inhabit areas in which the average shrub cover is below 3-8 percent (Walker 2004). Prairie dogs could move into the sagebrush areas of the Fall River West GA and Oglala GA which could negatively affect sagebrush habitat used by the Brewer's sparrow. To this point there has been very little movement of prairie dogs into the sagebrush habitat and it is expected that this trend will continue, considering there is ample habitat for prairie dog expansion that is not covered by sagebrush.

Alternative 2: (No Action) Current LRMP Direction

Fall River West GA and Oglala GA: This alternative was evaluated in the Biological Assessment and Evaluation for the Black-tailed Prairie Dog Conservation and Management on the Nebraska National Forest and Associated Units which made a decision regarding boundary management. The determination made in that document is brought forward for this species under Alternative 2. The determination is *"no impact."*

In Alternative 2 (no action), no poisoning will be administered within the IMZ except for public safety and health situations as described in the LRMP. Rodenticide use will continue in the boundary management zone as described in the LRMP Amendment 2. The acreage figures displayed in Table N-2 represent a 25 % expansion rate for the next 10 years. The minimum acres are the current acres for each GA.

Burrowing owl *Athene cunicularia*

The following discussion often relies upon a thorough and recent species assessment completed by McDonald et al. (2004), and the references cited therein as well as additional references cited in this discussion.

Distribution and Status. The burrowing owl has a wide distribution in Canada, Mexico, and the western U.S. In the Great Plains, the species is found on all national grasslands and forests, although extirpated from the Sheyenne National Grassland in eastern North Dakota.

The historical range of the western burrowing owl once included the southern interior of British Columbia, east into Manitoba, south including Minnesota, Iowa and south-central Texas, but it is now extirpated from these areas. The historical range in Mexico is not known, though museums specimens in Mexico suggest that burrowing owls were once found in 28 of 32 states.

Most jurisdictions in Canada and the U.S. have shown overall declines in populations since the 1980s. No historical numbers of burrowing owls prior to the decline detected in the mid 1980s exist. The historical breeding distribution of burrowing owl was likely more extensive in the late 1800s when North America was covered by over 100 million acres of prairie dog colony habitat. This specific type of breeding habitat has been reduced to only 1.9 million acres, a substantial loss of breeding habitat.

Burrowing owls are currently undergoing a decline in range and abundance. The current breeding range of the western burrowing owl stretches from southern Alberta and Saskatchewan in Canada, south to central Mexico. The range has contracted in the east and north.

A comprehensive, continental survey has not been conducted. A population estimate of the entire sub-species can only be derived from regional estimates. A survey of biologists in North America estimated that in 1992 there were 20,000-200,000 burrowing owls in the U.S., 2,000-20,000 in Canada, and an unknown number in Mexico. The broad estimates indicate a low confidence in their figures.

The number of breeding pairs of burrowing owls in Canada declined in the 1990's at a rate of over 20 percent per year. Saskatchewan's Operation Burrowing Owl program indicates a 95 percent decline from 1988 to 2000. A summary of findings in preferred states in the U.S. indicates:

- 12-27 percent decrease in the number of breeding pairs in California in 1986-91
- 58 percent decline in western Nebraska from 1990-1996
- 89 percent vacancy of historical sites in 1998 in Wyoming
- No owls in the eastern third of North Dakota
- Uncommon to rare in the best habitats in North Dakota north and east of the Missouri River
- Widespread but uncommon in Arizona
- Mixed trends in New Mexico depending on the status of suitable habitat
- Restricted primarily to the panhandle in Oklahoma

There is virtually no published information on population estimates or trends of resident or migrant burrowing owls in Mexico. Most studies in Mexico are anecdotal, mainly distributional records, with only a few referring to its ecology.

The Forest Service considers the burrowing owl to be a sensitive species throughout the Great Plains. The U.S. Fish and Wildlife Service lists the burrowing owl as a National Bird of Conservation Concern and designates high-priority conservation status to the species in five Bird Conservation Regions relevant to USFS Region 2 (BCR 9, 11, 16, 17, and 18). The Colorado Division of Wildlife lists the burrowing owl as threatened, and the state wildlife agencies within Wyoming, South Dakota, Nebraska, and Kansas list the burrowing owl as a Species of Concern. The species is listed as endangered in Canada and threatened in Mexico.

The status of burrowing owls in the Great Plains of Region 2 is closely tied to that of prairie dogs because of the owls' requirement for mammal-excavated burrows. Continued loss of prairie dog colonies through active eradication, habitat loss, or disease will negatively impact burrowing owl population viability. Most of the states in Region 2 have tentative evidence for recent and ongoing declines, especially in the eastern portions of the Great Plains. Recent genetic studies, however, suggest that burrowing owls are panmictic (genetically connected by extensive dispersal) and do not yet show evidence of genetic isolation among populations. They have the ability to re-colonize suitable habitat via dispersal after favorable conditions return. Little is known about threats on the wintering grounds outside Region 2. Matrix-based demographic analyses suggest that the survival rate of adult females is a key element in the population dynamics of burrowing owls.

The ultimate causes of burrowing owl population declines remain unclear. For example, in Canada the documented recent causes related to the decline are reduced productivity, high rates of pre-migratory mortality, permanent emigration, and low recruitment rates. Possible limiting factors across western North America include a reduction in prey availability and loss of habitat. Current productivity rates may be depressed by an overall low availability of prey due to control of insects and small mammals. Significant increases in productivity rates were achieved with supplemental feeding and noted during the availability of high prey densities. The loss of ephemeral wetlands used by small mammal prey and the cultivation of prey habitat alongside roadway and railways have also degraded burrowing owl habitat. The disappearance of prairie dogs across much of western North America dramatically decreased the availability of suitable nesting and roosting burrows. Additional threats to burrowing owls may include increased predation due to habitat fragmentation/degradation and an increase in avian predator perches (utility poles, etc) and nesting trees, illegal shooting, pesticides and other contaminants, and vehicle collisions.

Habitat. Burrowing owl habitat typically consists of open, dry, treeless areas on plains, prairies, and deserts. These areas are also occupied by burrowing mammals and other animals that provide nest burrows. The prairie dog is a keystone species in the Great Plains and its burrows were undoubtedly the principal breeding habitat of the burrowing owl. Indeed, the burrowing owl is often viewed as one of the unique species of a prairie dog colony. Although burrowing owls are capable of using badger and coyote burrows, and still use the burrows of Richardson's ground squirrel (*Spermophilus richardsonii*) in the far northern Great Plains, in grasslands without prairie dogs burrowing owls occur at very low densities.

Because burrowing owls spend most of their time on or in the ground and are extremely susceptible to predation, short vegetation structure is also a requirement to allow for better detection of predators and visibility of prey. Given this requirement for short vegetation, burrowing owls are commonly found in association with cattle, prairie dogs, and other grazers that clip vegetation.

Burrowing owls nest in clusters within prairie dog colonies. In small colonies, burrowing owls either nest closer together or there are a lower number of owls within a cluster. The number of burrowing owls within a cluster positively influences reproductive success. For example, burrowing owls may alert each other to predators. In small colonies where owls nest at high densities, nests may be successful but they fledge fewer young perhaps due to competition with neighboring owls. In prairie dog colonies, burrowing owl reproductive success has been most strongly correlated with active prairie dog burrow densities and the number of nesting pairs. At the prairie dog colony scale, colonies that have enough desirable habitats to allow for greater mean spacing of nests allow early arriving nesting pairs to select these colonies and to achieve greater reproductive success. The key element is colony size. Larger prairie dog colonies fledge more young than small colonies. Lower burrowing owl pair densities which are found in larger colonies have greater mean egg clutch sizes.

The total extent of burrowing owl habitat loss in western North America is not known. The open grasslands of the Great Plains eco-region occur from southern Canada south to central Mexico encompassing 19 percent of the total land cover of North America. Of the several million square miles of the central grasslands of North America, 28 percent is in Canada, 58 percent is in the U.S. and another 14 percent is found in Mexico. However, less than 25 percent of the original grasslands remain as native vegetation in Canada and the U.S., and in some states and provinces as little as 1 percent remains. Grassland patches in Mexico were originally widely distributed throughout several ecosystem types, but most grassland has since disappeared through human activities. Regions of suitable grasslands and desert habitat occur west of the continental divide, although the relatively high density of human activity especially in western coast states exerts tremendous pressure towards conversion of suitable habit to agriculture or urban development. Since burrowing owls require the open habitats that are also preferred for agriculture and development, continued conversion of land will likely lead to further declines of owls in those areas.

Burrowing owls hunt by ground forging, hovering, from a perch or by flycatching. Burrowing owls eat primarily small mammals and insects. Land use management of native habitat, particularly grazing intensity, may affect the abundance of prey. In addition, grasshopper control has greatly reduced the intensity and frequency of grasshopper outbreaks in the past century, a potentially significant source of prey for burrowing owls.

Pesticides can be either lethal to burrowing owls or sub-lethal leading to reduced fitness of the owls. Indirect pesticide effects include reduced potential prey availability, secondary poisoning through scavenging dead rodents and other prey items, and reduction in productivity due to anticholinesterase insecticides. Granular carbofuran is restricted in the U.S. and Canada and its liquid formulations are banned in Canada but still used in the U.S. in corn and alfalfa fields. Although DDT was banned in the U.S. in 1972, burrowing owl eggshell thinning associated with DDT metabolites in eggs and feathers is occasionally problematic in California. An evaluation of pesticide use on the wintering grounds has not been conducted.

ESA Status and Other Organizational Rankings

ESA Status	Conservation Status[1]
ESA (no status)	G4, N4B, N4N; Nebraska – S5; South Dakota – S3S4B; Forest Service - Sensitive Species

[1] Definitions - http://www.natureserve.org/explorer/nsranks.htm

Recovery and Conservation Planning. Nebraska and South Dakota are included in the Status Assessment and Conservation Plan for the Western Burrowing Owl in the United States (Klute et al. 2003). Several other conservation and assessment efforts have been published (Holroyd et al. 2001, Johnson and Anderson, 2002). Canada, Mexico, and the United States have drafted a North American Conservation Action Plan for the burrowing owl to be published in 2005 (Commission for Environmental Cooperation 2005).

Existing Conditions. Throughout the years burrowing owls have been seen on almost all of the established prairie dog colonies at one time or another. Buffalo Gap National Grassland, Conata Basin in particular, contains one of the largest concentrations or complexes of prairie dog colonies in South Dakota, indeed anywhere in the range of the prairie dog. Fort Pierre National Grassland and Oglala National Grassland contain relatively small areas of prairie dog colonies when compared to Buffalo Gap National Grassland and tribal lands. Buffalo Gap National Grassland and tribal lands in South Dakota contain the largest prairie dog complexes of significance to the burrowing owl throughout the burrowing owl's breeding range. To the north and west of South Dakota burrowing owl occurrence on prairie dog colonies declines dramatically for unknown reasons. Therefore, the large prairie dog colony complexes in South Dakota are unique for burrowing owls. No such areas exist on private lands or public lands in the Great Plains that could sustain large populations of burrowing owls.

Large complexes of prairie dogs have existed in South Dakota for several decades. Many colonies are of some antiquity (White 1986). They are colonies of "historic" importance to burrowing owls – likely used every year by burrowing owls. Burrowing owls often reuse the same territories (and even burrows) as the previous year. This is an indication of site fidelity and the importance of specific site characteristics or a combination of both.

Direct, Indirect, and Cumulative Effects. The status of burrowing owls in the Great Plains of Region 2 is closely tied to that of prairie dogs. The owls use the burrows for nesting, hunt on the colonies and prefer the short vegetation structure provided on the colonies. Any action that results in an increase in the

acreages of black-tailed prairie dogs will increase the habitat available to burrowing owls and the converse is also true.

The burrowing owl feeds primarily on insects, including macro-arthropods and small mammals but also take some birds, fishes, and frogs. Although the burrowing owl does not normally feed on prairie dogs, it has been noted to die from secondary poisoning following prairie dog rodenticide programs (Tyler 1968). Burrowing owls do not eat rodenticide bait (oats) although they could eat deer mice and northern grasshopper mice (*Onochomys leucogaster*) that have been poisoned by rodenticide. Deer mice and northern grasshopper mice populations are higher on prairie dog colonies than on uncolonized areas (Agnew et al. 1986). Changes in deer mice densities and populations of deer mice have been reported following rodenticide application (Wood 1965, Uresk et al. 1986, Deisch et al. 1990). Arthropod populations are higher on prairie dog colonies than on adjacent uncolonized prairie (Agnew et al. 1988). Rodenticide use can reduce the arthropod populations upon which burrowing owls depend.

Burrowing owls migrate in late September. The latest dates of migration in South Dakota were listed as 13th of October and the 26th of October. Consumption of poisoned mice during migration on attractive habitat such as the large colony complexes on Buffalo Gap National Grassland may take an unknown number of burrowing owls. Incidental contact with crews applying rodenticide may disturb the birds temporarily, but they should not be displaced for long from foraging areas on prairie dog colonies.

Any action that reduces prairie dog colonies will affect burrowing owls. Rodenticide use has already occurred in the project area. The USFS authorized the control of 6,733 acres of prairie dog colonies in 2004, 8,110 in 2005, and 12,905 in 2006 on lands administered by the Nebraska National Forest. In addition the State of South Dakota controlled 24,369 in 2004, 14,725 in 2005, and 29,502 in 2006 (Smith 2007) in the State of South Dakota. The majority of the States control work was located in the project area. An additional number that can be presented to attempt to quantify the number of prairie dogs controlled outside of the study area is the amount of bait sold at the South Dakota bait plant located in Pierre SD. Since July 1, 2006, the bait plant sold 274,500 lbs of zinc phosphide treated oats (South Dakota State Department of Agriculture 2007). To control a typical prairie dog colony-site, about 6 ounces of zinc phosphide treated oats are applied per acre (Andelt 2006). Consequently, enough bait was sold to control 732,000 acres of prairie dogs between July 1 of 2006 and the issue date of the winter South Dakota State Department of Agriculture newsletter. These numbers can be manipulated in different ways and produce different acreages, but the point of this discussion is that a large number of prairie dogs have been controlled in 2006 and there is no indication that this trend will not continue. Cumulatively, past and planned prairie dog rodenticide use represents a loss of burrowing owl habitat.

The potential for plague to persist in prairie dog populations on the national grasslands and forests in the project is unknown, but it is acknowledged that plague can have dramatic impacts on prairie dog populations. Plague appears to have already reduced the populations of prairie dogs within the IMZ on the Geographic Areas of the Fall River and Wall Ranger Districts. If plague persists and spreads throughout the project area this would result in a substantial loss of burrowing owl habitat.

Prairie dogs are highly susceptible to sylvatic (plague), which is considered to be a serious threat to the persistence of local prairie dog populations. Plague has been annihilating prairie dogs in the western two thirds of their geographic range since the 1940's. Plague is rare, almost totally absent among prairie dogs east of a line that approximates the 102nd meridian (Cully et al. 2006). In the project area this line is very close to the Wyoming state line.

Plague was documented in the Conata Basin area of the Buffalo Gap National Grassland in the Spring of 2008. Plague was confirmed in a prairie dog colony in western Custer County, South Dakota in September, 2004 near the border of Wyoming and South Dakota. This is less than 10 miles from the northern most boundary of the Fall River West Geographic Area. In the summer of 2005 prairie dog densities within some of the colonies north of Highway 18 in the Fall River West Geographic Area were

noticeably reduced. Although not officially documented, it is believed that plague has occurred within these colonies. Also, plague positive prairie dogs were found in Shannon County in 2005. This plague documentation is less than 10 miles from the eastern boundary of the Fall River Southeast Geographic Area. In the summer of 2005 prairie dog densities within some of the colonies in the Fall River Southeast Geographic Area were noticeably reduced. Once again although undocumented it is believed that plague may have caused the reductions of prairie dogs in these areas.

Shooting as a byproduct of recreational prairie dog shooting is a potential source of anthropogenic mortality in burrowing owls. Shooting reduced the adult population of prairie dogs by 69 percent in a Montana colony (Knowles 1987). In one Oklahoma population, shooting accounted for 66 percent of total burrowing owl adult mortality, and in a Canadian study, three burrowing owl populations were greatly reduced by prairie dog shooting. Recreational shooting in prairie dog colonies also has a potentially more widespread though subtle and indirect effect on burrowing owl survival and productivity. Nest success rates and number of young fledged by owls in prairie dog colonies subject to recreational shooting are significantly lower than in colonies where shooting of prairie dogs did not occur. Shooting restrictions and LRMP management decisions on behalf of ferrets appear to have a beneficial effect on burrowing owls. Unrestricted shooting reduces active burrow densities and results in burrowing owl mortality. Prairie dog shooting can leave lead fragments in prairie dog carcasses posing a potential risk to scavengers (Pauli and Buskirk 2007). In South Dakota, prairie dog shooting is allowed between June 15 and February 28 on all areas of the National Grasslands except for 73,590 acres of the 3.63 Management Area (Conata Basin Black-footed Ferret Reintroduction Habitat) located in the Wall Southwest Geographic area.

Rates of badger predation on burrowing owls are inversely related to measures of prairie dog density. Rates are likely due to the dilution effect, that is, prairie dogs are “preferred” prey by badgers but once prairie dogs are removed (or reduced) from the system, burrowing owls become alternative prey. The burrowing owls are more obvious once the prairie dogs are removed (or reduced) which may also increase vulnerability to predation. Increased rates of badger predation have the greatest impact on the survival of juveniles and adult females (sole incubator of eggs and young).

Burrowing owl populations exhibit significant declines concurrent with reductions in active prairie dog burrow densities. There is, however, a time lag in burrowing owl response to changes in prairie dog densities, possibly because they return to the same sites in subsequent years and when the habitat quality changes as a result of rodenticide application there is increased susceptibility of the nest and incubating female to predation. As a result, over time, the population will decline. This may also be related to the fact that burrowing owls have a higher return rate at sites where they bred successfully the previous year. As reproductive success declines in prairie dog colonies in which rodenticides have been applied there may be a combination of higher mortality and lower site fidelity amongst burrowing owls. The end result may be that the burrowing owl population declines and may eventually be extirpated from the area.

DETERMINATION OF EFFECT AND RATIONALE FOR THE BURROWING OWL

Breeding Bird Survey (BBS) data is frequently cited to display population trends for certain species. However, the downfall is that this is a road-side survey and doesn’t necessarily reflect the actual regional habitat change. Burrowing owls are almost completely relegated to prairie dog colonies in this part of their range. For example, a colony with a few owls along a particular BBS route may shrink or become extirpated from poisoning or plague, and thus, there would be a decreasing trend in the population for later years. However, there could be several thousand acres of prairie dog expansion happening nearby where burrowing owl numbers are actually increasing but since the BBS route doesn't go near that site the trend will be declining.

There is a slight negative trend in BBS sightings survey-wide (-1.6) and within South Dakota (-4.8) from 1966-2006 while there has been a relatively large positive trend for Nebraska (32.8) during this same

time-period. However, research conducted in western Nebraska from 1989-1993 indicated a decline in the burrowing population and subsequent poor reproductive output from extensive prairie dog poisoning on and around the study site (Desmond et al. 2000).

A closer look indicates that there are a total of 72 BBS routes in South Dakota but only 16 of these have any trend data for burrowing owls. There are two routes on the Wall Ranger District; (1) the Badlands route, which is entirely within Badlands National Park except for Conata Basin Road in the south, and (2) the Cedar Pass route in the eastern part of the District. The Badlands route has a positive trend of 41.68 because three owls were observed in 2005 and 2006. Cedar pass is negative at -2.26, but there have only been three years owls have ever been recorded on that route. A good example of "issues" with a route is the Rosebud route, which is probably a major contributor to the statewide declining trend, which was at -75.0 up to 2003 but is now at -49.7 for 2006 even though very few owls have ever been observed along that route (Sauer et al. 2007). There are no other BBS routes through either the Conata Basin or Scenic Basin where available habitat has fluctuated from 17,648 acres in 1993 to 9,370 acres in 1999 to 31,372 acres in 2007.

The most relevant and extensive data collection related to actual burrowing owl populations and nesting success in western South Dakota took place from 1999-2000 in the Conata and Scenic Basin of the Wall Ranger District (Griebel 2000, 2007). There were 63 prairie dog colonies totaling 5,123 acres in 1999 and 6,126 acres in 2000 that were extensively surveyed. This time period saw above average rainfall and active prairie dog colony acreage in the Conata and Scenic Basin was 9,370 acres in 1999 (lowest amount recorded in last 15 years). Over the two-year period, burrowing owls nested on 70% of the sampled prairie dog colonies (range in size: 3.7 - 1,729 acres); most (85%) of the unoccupied colonies were <25 acres in size (Griebel 2000, 2007). Burrowing owl breeding pair density, figured as breeding pairs/ha of each occupied prairie dog colony averaged 0.16 pairs per hectare (.064 pairs per acre) (15.625 acres per pair) of prairie dog colony (Griebel 2000). Including all colonies, even those not selected, breeding pair density averaged 0.12 pairs per hectare (.049 pairs per acre) (20.408 acres per pair) of prairie dog colony. It is this data that the potential habitat for burrowing owl breeding pair population is based-on and alternatives analyzed.

Alternative 1

The biological determination for burrowing owls under Alternative 1 is**:** *"may adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing."*

Control of prairie dog colonies within the IMZ with zinc phosphide treated oats can be carried out under Alternative 1 as the thresholds are met. This will have little direct effect on the burrowing owl since that vast majority will have migrated out of the area prior to October 1 – earliest poisoning can occur. However, the reduction in prairie dog density and active burrows will have an indirect effect. It is common for burrowing owls to occupy a prairie dog colony that has recently undergone a major population reduction either through poisoning or plague as long as the burrows haven't collapsed. However, within two to three years the lack of open burrows and prairie dogs makes the colony less desirable. Badger predation of burrowing owl nest sites is common in low density prairie dog colonies and accounted for 48% of the nest failures in western Nebraska (Desmond et al. 2000). Badger predation was rare in Buffalo Gap National Grassland and only four nests were lost from 1999-2000 (Griebel 2000, 2007). High density prairie dog colonies decrease the probability of a badger selecting a burrowing owl nest site as opposed to a prairie dog occupied burrow.

Cumulatively, active prairie dog colony acreage will continue to decline on private land. There is no way to predict what the acreage will be like on nearby Tribal lands, currently there are large active prairie dog complexes on tribal lands next to Conata Basin. Additionally, Badlands National Park will be doing some limited prairie dog control in certain areas but encouraging expansion through management (i.e.,

prescribed fire) in other areas. The threat of plague exists and has the ability to significantly reduce prairie dog populations.

The Fall River West GA, Fall River Southeast GA and Wall North GA currently (Table N-1) have less than the minimum acreages required by Alternative 1. Although not officially documented it is believed that plague has moved through the colonies in the Fall River West GA north of Highway 18 and the Fall River Southeast GA. As a result the numbers of prairie dogs in these colonies have been notably reduced. Active management will be necessary to increase the prairie dogs in these GA's to reach the minimum acreages required by Alternative 1.

The prairie dog acreages on the Oglala National Grassland, the Fall River Northeast GA, the Wall Southeast GA, and the Fort Pierre National Grassland are currently within the range of acres suggested for each GA in Alternative 1 (Table N-2). Only monitoring will be required initially for these areas.

The Wall Southwest GA currently has approximately 26,698 acres of active prairie dog colonies (214 outside the Black-footed Ferret Reintroduction Habitat and 26,484within the Black-footed Ferret Reintroduction Habitat) within the IMZ. The 26,698 acres of fully active prairie dog colonies is more than the maximum (19,000) called for in Alternative 1 and prairie dog acreages will be decreased to meet this goal. All GAs except Fall River SE and Wall SW (outside of MA 3.63) will maintain a minimum of 1,000 acres of active prairie dog colony habitat except for the Conata Basin and Smithwick MA 3.63 sites, where minimum acres will be 12,500 and 2,100 respectively. The estimated breeding pair density using the 20.408 acres/pair formula would equate to 49 breeding pairs (i.e., 98 individuals) for the 1,000 acre minimum. Using the minimum acres in Table 2 for each GA, across the Nebraska National Forest there could be a minimum breeding pair population of 1,010 pairs (2,020 individuals); using a mean fledge rate of 2.6 young per nesting attempt (i.e., Conata Basin results for 1999 and 2000 combined; Griebel 2000, 2007), then the total fall population theoretically could be 4,646 individuals (i.e., total young + total adults). This is just considering what the bare minimum acreage would be on the Nebraska National Forest and does not include adjacent private, tribal and other federal lands (i.e., Badlands National Park) that would also be contributing to the local population. In 1999, there were 9,370 acres of active prairie dog colonies in the Conata Basin (well below the 12,500 minimum suggested for this alternative). The 70% prairie dog colony occupation rate, a nesting success rate of 76% and fledge rate of 2.6 per nesting attempt indicates that this area very well could be serving as a burrowing owl source population, even back in 1999 when compared to other northern Great Plains prairie dog complexes. Other prairie dog colony occupancy rates have been documented at 16% in southwestern Montana (Restani 2002), 21-29% in North Dakota (Davies 2005, Restani 2002), 21-26% in northeastern Colorado (Pezzolesi 1994) and 59% in western Nebraska (Ekstein 1999).

Also, because there is a minimum acreage that will be applied, in an adaptive management scheme, active management measures will be applied when monitoring shows that acres of prairie dogs fall below the minimum levels. Even in a catastrophic situation where for some reason all prairie dogs are eliminated from a particular GA measures will be taken to restore the populations to the minimum acreages provided in each GA.

Alternative 2

This alternative was evaluated in the Biological Assessment and Evaluation for the Black-tailed Prairie Dog Conservation and Management on the Nebraska National Forest and Associated Units which made a decision regarding boundary management. The determination made in that document is brought forward for this species under Alternative 2. The determination is *"may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing."*

In Alternative 2 (no action), no poisoning will be administered within the IMZ except for public safety and health situations as described in the LRMP. Rodenticide use will continue in the boundary

management zone as described in the LRMP Amendment 2. The acreage figures displayed in Table 2 represent a 25 % expansion rate for the next 10 years. The minimum acres are the current acres for each GA. Overall, this alternative could have a beneficial impact on burrowing owls on the interior portions of the geographic areas.

Alternative 3

The biological determination for burrowing owls under Alternative 3 is**:** *"Likely to result in a loss of viability on the planning area, in a trend to federal listing, or in a loss of species viability range-wide."*

Alternative 3 recommends the maximum acreages be set at 3% of the aggregate total public land in each county (Table N-2). No minimum acreage figure is suggested. If the prairie dog acreages are maintained at or near the maximum levels, viability of the burrowing owl may be maintained on the planning area (see rational for Alternative 1). Minimum acreages are not presented (exception is the Oglala NG with 100 acres), so some assumptions will have to be made.

Under this alternative prairie dog colonies will be controlled if rangeland analyses of specific prairie dog colonies show the similarity index (SI) to be below 25% or trending downward. The prescribed action for this threshold is rodenticide treatment will be applied to 90% of the prairie dog holes in the allotment. This threshold could result in 90% of the current acres of the project area being controlled. The area may serve as marginal habitat for burrowing owls after year 1, but repeated control and the collapse of the burrows within 2-3 years will result in a prairie dog colony that supports a very small number or no owls at all. There is a possibility that the all of the prairie dogs in all or some of the GA's in the project area could die off or be held at very low numbers. Also, the application of rodenticide at those rates could compromise the distribution of prairie dogs across the planning area further threatening the viability of burrowing owls. This alternative would seriously reduce the amount of available habitat and fragment what is left-over, which is a driving factor in the decline of the species (Desmond et al. 2000, Warnock and James 1997).

Alternative 4

Entire Project Area with the exception of the 3.63 Black-footed Ferret Reintroduction Habitat located in the Wall Southwest GA (Conata Basin)

The biological determination for burrowing owls under Alternative 4 is: *"Not Applicable."*

This alternative proposes a range of acreages only for the Conata Basin 3.63 Ferret Reintroduction Habitat (Table N-2).

3.63 Black-footed Ferret Reintroduction Habitat located in the Wall Southwest GA (Conata Basin):

The biological determination for burrowing owls under Alternative 4 is**:** *"may adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing."*

This alternative results in management activities that assure an acreage range of prairie dogs between 8,000 and 12,000 in the 3.63 Black-footed Ferret Reintroduction Habitat (Conata Basin Area).

This area currently has approximately 26,698 acres of active prairie dog colonies within the IMZ. Twenty five thousand nine hundred thirty nine acres of fully active prairie dog colonies is more than the maximum (12,000) called for in this alternative and prairie dog acreages could be decreased to meet this goal.

Rodenticide control of prairie dogs will have little direct effect on the burrowing owl since that vast majority will have migrated out of the area prior to October 1 – earliest poisoning can occur. However, the reduction in prairie dog density and active burrows will have an indirect effect. It is common for

burrowing owls to occupy a prairie dog colony that has recently undergone a major population reduction either through poisoning or plague as long as the burrows haven't collapsed. However, within two to three years the lack of open burrows and prairie dogs makes the colony less desirable. Badger predation of burrowing owl nest sites is common in low density prairie dog colonies and accounted for 48% of the nest failures in western Nebraska (Desmond et al. 2000). Badger predation was rare in Buffalo Gap National Grassland and only four nests were lost from 1999-2000 (Griebel 2000, 2007). High density prairie dog colonies decrease the probability of a badger selecting a burrowing owl nest site as opposed to a prairie dog occupied burrow.

Cumulatively, active prairie dog colony acreage will continue to decline on private land. There is no way to predict what the acreage will be like on nearby Tribal lands, currently there are large active prairie dog complexes on tribal lands next to Conata Basin. Additionally, Badlands National Park will be doing some limited prairie dog control in certain areas but encouraging expansion through management (i.e., prescribed fire) in other areas. The threat of plague exists and has the ability to significantly reduce prairie dog populations.

The 8,000 acre minimum for active prairie dog colonies in the Conata Basin should support a viable population of burrowing owls. The estimated breeding pair density using the 20.408 acres/pair formula would equate to 392 breeding pairs (i.e., 784 individuals) for the 8,000 acre minimum. Using a mean fledge rate of 2.6 young per nesting attempt (i.e., Conata Basin results for 1999 and 2000 combined; Griebel 2000, 2007), then the total fall population theoretically could be 1,803 individuals (i.e., total young + total adults). This is just considering what the bare minimum acreage would be in the Conata Basin and does not include adjacent private, tribal and other federal lands (i.e., Badlands National Park and parts of the Grassland) that would also be contributing to the local population.

Alternative 5

The biological determination for burrowing owls under Alternative 5 is: *"may adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing."*

Alternative 5 does authorize prairie dog control if certain thresholds are met. This is the reason for the 'may adversely impact individuals' determination. The only GA that is currently within the desired range of prairie dogs called for in Alternative 5 is the Wall Southwest GA. All of the rest are far below the minimum acreages so the use of any poison will be very limited. This increase in acreages of prairie dog colonies will for the most part be beneficial to the burrowing owl population on the entire Nebraska National Forest.

Chestnut-collared longspur *Calcarius ornatus*

Distribution and Status. Chestnut-collared longspurs breed from southern Alberta to southern Manitoba, south to west central Colorado, and east through North Dakota and South Dakota to western Minnesota (Dechant et. al. 2003c). They winter from northern Arizona, central and northern New Mexico, eastern Colorado, and central Kansas south into Mexico (DeGraff et al. 1991).

The chestnut-collared longspur is listed as "secure" both globally and nationally. There is some indication of reduction of historic breeding and winter ranges and long-term population declines. Elimination of prairie habitat by cultivation and conversion to urban development is listed as the primary threat. Long term population declines are likely to continue as native rangeland is converted to cropland (Nature Serve 2006). All of the units in the project area are within their breeding range with the exception of the Sandhills units (Bessey Ranger District, Samuel R. McKelvie National Forest) (Dechant et. al. 2003c). The USFS Region 2 state with the highest average relative abundance of chestnut-collared longspurs is South Dakota, with 21.98 individuals (Sedgwick 2004a).

Habitat. Chestnut-collared longspurs use level to rolling mixed grass and shortgrass uplands, and, in drier habitats, moist lowlands. They prefer open prairie and avoid excessively shrubby areas. Grasslands with dense litter accumulations are avoided (Dechant et. al. 2003c).

In their literature review Dechant et al. (2003c) makes no mention of chestnut-collared longspurs using prairie dog colonies Sedgwick (2004a) states "while the association between longspurs and prairie dogs has not been investigated, chestnut-collared longspurs evolved under the intense but uneven grazing of bison, pronghorn, and prairie dogs". They prefer native pastures with fairly short vegetation and sparse litter accumulation. This type of habitat certainly exists within some prairie dog colonies, especially in areas that have recently been colonized. In dry, sparse shortgrass prairie, light to moderate grazing is more appropriate, and heavy grazing or overgrazing may be detrimental to chestnut-collared longspurs (Dechant et. al. 2003c). In the interior areas of prairie dog colonies, especially during a drought, the levels of cover in prairie dog colonies are comparable to heavy grazing or overgrazing and are probably avoided by chestnut-collared longspurs.

ESA Status and Other Organizational Rankings

ESA Status	Conservation Status[1]
ESA (no status)	G5, N5B, N5N; Nebraska – S2; South Dakota – S4B; Forest Service - Sensitive

[1] Definitions - http://www.natureserve.org/explorer/nsranks.htm

Recovery and Conservation Planning. A conservation assessment for the chestnut-collared longspur was prepared for the Forest Service, October 7, 2004 by Sedgwick, J.A. (2004a)

Existing Conditions. Chestnut-collared longspurs have only been documented on the west half of the Buffalo Gap National Grassland, Oglala National Grassland, and Ft. Pierre National Grassland.

All of the grassland areas with level to rolling hills of the Buffalo Gap National Grassland, Fort Pierre National Grassland, and Oglala National Grassland are potential chestnut-collared longspur habitat. The chestnut-collared longspur, in most cases, will be found on the moderately to heavily grazed sites. Only one of the sightings was within a prairie dog colony.

Direct, Indirect, and Cumulative Effects. The chestnut-collared longspur feeds primarily on grass seed and some insects, which are gleaned from the ground. If they are in the area during the rodenticide application, they would be susceptible to being poisoned by the zinc phosphide treated grain.

The majority of these birds migrate in September. The latest date a chestnut-collared longspur was seen in South Dakota is Oct 13 (SDOU 1991).

Chestnut-collared longspurs could be shot or injured by prairie dog shooters, but this would be rare and deliberate, since it is unlikely to mistake a chestnut-collared longspur for a prairie dog. It is always possible for an unethical prairie dog shooter to kill a longspur. The fact that chestnut-collared longspurs and all song birds are a protected species and it is against the law to kill or harass them should also be a deterrent. There are very stiff penalties for killing or injuring a protected species, and this is well known. Gunfire and other hunter activities may scare birds locally, but this will not be a factor concerning their population viability on the area.

The chestnut-collared longspur is not dependent on prairie dog colonies for its existence. Breeding habitat for chestnut-collared longspur is low to moderate structure mid grass prairie. This habitat can be found on or off prairie dog colonies depending on many factors, like precipitation, site potential, and length of time prairie dogs have inhabited the area. In the project area, the overriding factor influencing

grassland structure is livestock grazing. Objectives, standards and guidelines within the LRMP establish levels at which grassland structure will be managed by geographic area.

DETERMINATION OF EFFECT AND RATIONALE FOR THE CHESTNUT-COLLARED LONGSPUR

The biological determination for the chestnut-collared longspur under Alternatives 1, 3, 4, and 5 is: *"may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing."*

Rational: In all of the above alternatives, significant application of zinc phosphide treated oats could occur to keep prairie dog colonies within an acceptable range of acres and to prevent encroachment on private land. The ranges of acres that will be allowed in order to meet the stated objectives are listed in Table N-2.

Under these alternatives, there could be rodenticide use and a chance of individual chestnut-collared longspurs ingesting rodenticide bait (the reason for the "may impact" determination). Chestnut-collard longspurs are a summer resident of the grasslands with the fall migration occurring in September (Tallman et al. 2002). Timing restrictions (October 1 start date for poisoning) on the application of rodenticide make large-scale poisoning of longspurs improbable, because most of the birds will have left the area before rodenticides are used. So, it is unlikely that the rodenticide use outlined in these alternatives will have a large effect on chestnut-collared longspur populations that use the area seasonally.

Alternative 2: (No Action) Current LRMP Direction

This alternative was evaluated in the Biological Assessment and Evaluation for the Black-tailed Prairie Dog Conservation and Management on the Nebraska National Forest and Associated Units which made a decision regarding boundary management. The determination made in that document is brought forward for this species under Alternative 2. The determination is *"may adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing"*.

In Alternative 2 (no action), no poisoning will be administered within the IMZ except for public safety and health situations as described in the LRMP. Rodenticide use will continue in the boundary management zone as described in the LRMP Amendment 2. The acreage figures displayed in Table N-2 represent a 25 % expansion rate for the next 10 years. The minimum acres are the current acres for each GA. The increase in prairie dog acreages could result in a beneficial impact to chestnut-collared longspurs under this alternative.

Ferruginous hawk *Buteo regalis*

Distribution and Status. The ferruginous hawk is an open-country raptor that inhabits grasslands, shrub steppes, and deserts in the central and western part of North America (Bechard and Schmutz 1995). These hawks are a summer resident and rare winter visitor on all the units included in this evaluation (Peterson et al. 1991, Graupman et al. 1991, Mollhoff et al. 1993, and Peterson 1993). The species was petitioned for listing under the Endangered Species Act in 1991 but was rejected (Ure et al. 1991). Cultivation of the prairie, grazing, poisoning small mammals, along with mining and fire in nesting habitats, were factors that caused ferruginous hawk declines (Olendorff 1993), with cultivation being the most serious.

Habitat. This species prefers unbroken, semiarid grassland with elevated nesting sites such as trees, rock outcrops, hills and ridgelines (Johnsgard 1990). Ferruginous hawks are closely associated with areas that contain high densities of rodents and lagomorphs (Johnsgard 1990). Research in the Estancia Valley of New Mexico has shown that ferruginous hawks prefer to nest within 0.7-2.8 km of a prairie dog colony.

Additionally, there was a positive relationship between the abundance of prairie dog remains located at a nest site and the number of young fledged per nest, and a negative logarithmic relationship between abundance of prairie dog remains at a nest site and distance to the nearest prairie dog colony. This suggests that ferruginous hawks nesting closer to prairie dog colonies consume more prairie dogs and have greater reproductive success (i.e., greater number of young surviving to fledging age) than those nesting farther away (Cook et al. 2003). Prairie dog colonies additionally serve as fall and winter habitat for the species (Plumpton and Andersen 1997, Seery and Matiatos 2000, Smith and Lomolino 2004). Numbers of wintering ferruginous hawks in the Rocky Mountain Arsenal National Wildlife Refuge in Colorado were highly correlated with black-tailed prairie dog populations ($r^2 = 0.97$, $P < 0.001$) and area occupied by prairie dogs ($r^2 = 0.96$, $P < 0.001$) (Seery and Matiatos 2000).

After killing, prey is eviscerated routinely, which may retard degradation of the carcass (Schmutz et al. 1989). These hawks place their nests-- constructed of sagebrush stems, sticks, twigs, or ground debris (Bechard and Schmutz 1995)--in trees and shrubs (49 percent), on cliffs (21 percent), on utility structures (12 percent), or on ground outcrops (10 percent) (Olendorff 1993).

ESA Status and Other Organizational Rankings

ESA Status	Conservation Status[1]
ESA (no status)	G4, N4B, N4N; Nebraska – S1; South Dakota – S4B; Forest Service - Sensitive

[1] Definitions - http://www.natureserve.org/explorer/nsranks.htm

Existing Conditions. Ferruginous hawk observations have been well distributed across Oglala National Grassland, Buffalo Gap National Grassland and Fort Pierre National Grassland. The birds are seen both on and off prairie dog colonies in the summer and more recently the winter, although the majority of observations have been off colonies.

Nests were found on Oglala National Grassland in 1988, 1994, 1996, 2003 and 2004. The 2003 nest was about five miles from a prairie dog colony. The 2004 nest was approximately 10 miles from a prairie dog colony.

On the west half of Buffalo Gap National Grassland, one nest was observed in 2002, 2003, and 2004; none were within one mile of a prairie dog colony. In the past, up to five nests have been found in a single year there, even when acres covered by prairie dog colonies were less than they are today.

These hawks are currently sighted on the east half Buffalo Gap National Grassland on a frequent basis, although nests have not been documented recently. Five nests were recorded in 1991, four of which were in Conata Basin. All of those nests were within a half-mile of prairie dog colonies.

Ferruginous hawks are fairly common on Fort Pierre National Grassland, and are often seen on prairie dog colonies. Adult hawks were spotted at two tree nests in spring 2004. One nest was 1.75 mile from a prairie dog colony. The other was over three miles from a colony. All nests that have been observed on this grassland in the past have been in trees. They have been scattered across the area in drainages where cottonwoods grow, not in the northeast grassland near the large complex of prairie dog colonies.

Direct, Indirect, and Cumulative Effects. Ferruginous hawks do not eat grain, so there should be no risk of primary poisoning. Secondary effects from consuming recently poisoned prairie dogs are unlikely, since carcasses are routinely eviscerated. Eagles and owls that were routinely fed zinc phosphide-killed rodents or rabbits showed no ill effects (Tietjen 1976). Incidental contact with crews applying rodenticide may disturb the birds temporarily, but they should not be displaced for long from foraging areas on prairie dog colonies.

Considering indirect effects, the area over which ferruginous hawks can effectively hunt for food may be diminished as prairie dog colonies are treated with rodenticide and the sites grow taller grass. Ferruginous hawks feed on prairie dogs, cotton-tailed rabbits, and ground squirrels, all of which are often more common on prairie dog colonies than off. Ferruginous hawks are a soaring raptor, and they are mobile in searching for food. The hawks may be able to adjust their hunting patterns to forage on remaining prairie dog colonies.

Rodenticide use and reduced prairie dog populations may negatively affect ferruginous hawk reproductive output (Cook et al. 2003) as well as fall and winter habitat (Plumpton and Andersen 1997, Seery and Matiatos 2000, Smith and Lomolino 2004). However, prairie dog colonies are not the sole--or even the major--source of food in some parts of South Dakota. The north-central part of the state east of the Missouri River has many confirmed ferruginous hawk nests (Peterson 1995) but is not a major prairie dog area.

Ferruginous hawks could be shot or injured by prairie dog shooters, but this would be rare and deliberate, since it is unlikely to mistake a ferruginous hawk for a prairie dog, even at long distances. It is always possible for an unethical prairie dog shooter to kill a ferruginous hawk. The fact that they are a protected species and it is against the law to kill or harass them should be a deterrent. There are very stiff penalties for killing or injuring a protected species, and this is well known. Shooting will obviously reduce the number of prairie dogs on a colony, but enough rodents and rabbits should remain as a food source for these raptors. Gunfire and other hunter activities may scare birds locally, but this will not be a factor concerning their population viability on the area. Hawks can also learn that gunfire means easy prey availability, and the birds may be attracted to it (Bechard and Schmutz 1995). Prairie dog shooting can leave lead fragments in prairie dog carcasses posing a potential risk to scavengers (Jonathan Pauli pers. communication).

Harmful cumulative effects include plowing private rangelands and prairie to produce grain. Rodenticide application within the Boundary Management Zone (BMZ) and on private lands has resulted in more fragmented and smaller colonies, especially outside of the Conata Basin. Thus, most prairie dog colonies outside the MA 3.63 zone may fall below the minimum threshold size to actually serve as habitat for the species (Seery and Matiatos 2000) although they may still exist in some small capacity after poisoning. Fragmentation of the mixed-grass prairie by cropland and tree plantings would favor other raptor species that might compete with ferruginous hawks for food or space. Intentional shooting of hawks by individuals who think they are reducing predation on game birds or mammals also occurs.

DETERMINATION OF EFFECT AND RATIONALE FOR THE FERRUGINOUS HAWK

Alternatives 1, 4, and 5

Entire Project Area. The biological determination for the ferruginous hawk under Alternatives 1, 4, and 5 is: *"may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing."*

In all of the above alternatives, application of zinc phosphide treated oats could occur to keep prairie dog colonies within an acceptable range of acres and to prevent encroachment on private land. The ranges of acres that will be allowed in order to meet the stated objectives are listed in Table N-2. Ferruginous hawks do not eat grain, so there should be no risk of primary poisoning. Secondary effects from consuming recently poisoned prairie dogs are unlikely, since carcasses are routinely eviscerated.

The reduction in acreage of prairie dog colonies could negatively affect reproductive output (Cook et al. 2003) and reduce fall and winter habitat (Plumpton and Andersen 1997, Seery and Matiatos 2000, Smith and Lomolino 2004). Although the alternatives do call for some level or range of acres for prairie dogs,

the amount of acreage available for each alternative should be adequate to maintain viability for the species across the planning area. Ferruginous hawks are a soaring raptor, and they are mobile in searching for food. The hawks may be able to adjust their hunting patterns to forage on remaining prairie dog colonies.

Alternative 2: (No Action) Current LRMP Direction

This alternative was evaluated in the Biological Assessment and Evaluation for the Black-tailed Prairie Dog Conservation and Management on the Nebraska National Forest and Associated Units which made a decision regarding boundary management. The determination made in that document is brought forward for this species under Alternative 2. The determination is *"may adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing"*.

In Alternative 2 (no action), no poisoning will be administered within the IMZ except for public safety and health situations as described in the LRMP. Rodenticide use will continue in the boundary management zone as described in the LRMP Amendment 2. The acreage figures displayed in Table N-2 represent a 25 % expansion rate for the next 10 years. The minimum acres are the current acres for each GA. It should be noted that it is likely that prairie dog acres will increase under this alternative. The increase in prairie dog acreages could result in a beneficial impact to ferruginous hawks under this alternative.

Alternative 3

The biological determination for the ferruginous hawk under Alternatives 3 is: *"likely to result in a loss of viability on the planning area, in a trend to federal listing, or in a loss of species viability range wide."*

The total prairie dog allowable acreage in this alternative is only a fraction of the current condition with the bulk of that acreage being eliminated from the Conata Basin MA 3.63 site. Going from approximately 26,698 acres to 2,200 acres drastically reduces desirable habitat.. Additionally, the bulk of the prairie dog colonies located outside of the Conata Basin are generally small and fragmented; ferruginous hawks need a minimum colony size and subsequent prairie dog population. Research suggests that wintering ferruginous hawks utilize prairie dog colonies >14 acres in size and when they fall below that the bird(s) response is to move elsewhere (Seery and Matiatos 2000).

Further isolating and fragmenting prairie dog colonies may force the birds to nest farther away from a prairie dog colony than desirable and result in decreased productivity and nesting success (Cook et al. 2003). With the reduction in desirable habitat in the Conata Basin alone, the viability and overall population would likely be negatively affected.

Grasshopper sparrow *Ammodramus savannarum*

Distribution and Status. The grasshopper sparrow has a widespread distribution throughout most of the Americas, but it often breeds locally and is considered rare to uncommon in much of its range (Vickery 1996) (Dechant 2003h).

The grasshopper sparrow is considered globally "secure" by the Natural Heritage Program because of its wide distribution across North America. However, according to the Breeding Bird Survey, grasshopper sparrow populations have declined by over 60 percent during the past 25 years. The U.S. Fish and Wildlife Service list the grasshopper sparrow as a species of special concern. Within the states of Forest Service Region 2, which represent the core of this species breeding range, grasshopper sparrow populations have also exhibited long-term declines. Declines in Colorado and South Dakota have outpaced national trends.

These small ground-dwellers sing in a hissing, insect-like buzz (Sibley 2000). Hawks are infrequent predators, and loggerhead shrikes commonly impale adult and immature grasshopper sparrows (Vickery 1996). Low-level parasitization of grasshopper sparrow nests by brown-headed cowbirds also occurs (Smith 1968).

Habitat. During the nesting season, these sparrows generally occupy intermediate height grassland habitat and prefer drier, sparser sites in tall grass prairies and thicker, brushier sites in short-grass prairies (Vickery 1996). The sparrow prefers moderately open grasslands and prairies with patchy bare ground, avoiding extensive shrub cover (Vickery 1996). They have been known to inhabit bunchgrasses over sod-forming grasses, although research on Fort Pierre National Grassland did not confirm this (Fritcher 1998). On Fort Pierre National Grassland, positive correlations of grasshopper sparrows with mean vegetation height, litter depth, and visual obstruction indicated western wheatgrass (*Agropyron smithii*) and green needlegrass (*Stipa viridula*) habitats supported the highest densities of grasshopper sparrows (Fritchner 1998), and there was a negative correlation with bare ground and short buffalograss (*Buchloe dactyloides*). These birds are more likely to occupy large tracts of habitat than small fragments (Samson 1980). They nest near the ground in a domed structure in over-hanging grasses with a side entrance (Vickery 1996). The birds forage on open ground in summer to satisfy a diet that consists of about 60 percent invertebrates—preferably grasshoppers—and 40 percent seeds (Vickery 1996). Grasshopper sparrows have been known to use prairie dog colonies in South Dakota (Sharps and Uresk 1990).

ESA Status and Other Organizational Rankings

ESA Status	Conservation Status[1]
ESA (no status)	G5, N5B, N5N; Nebraska – S4; South Dakota – S4B; Forest Service - Sensitive

[1] Definitions - http://www.natureserve.org/explorer/nsranks.htm

Existing Conditions. These prairie sparrows are summer residents across the project area (Peterson 1991; Graupman et al. 1991; Peterson 1993; Mollhoff et al. 1993). Fall migration usually occurs from mid-August through early September, although individuals may be in South Dakota until about October 26 (Tallman et al. 2002).

Direct, Indirect, and Cumulative Effects. This species eats grain and if they are in the area during rodenticide use, they would be susceptible to primary poisoning. They usually migrate from the area well before rodenticide is applied in prairie dog colonies. The short grasses of prairie dog colonies are not preferred habitat, and there are not likely to be many, if any, grasshopper sparrows in the immediate vicinity when the rodenticide is applied.

Eliminating prairie dogs would result in the vegetation on the colony changing from shortgrass to a mixed-grass prairie that supports taller vegetation, like western wheatgrass and green needlegrass. Small prairie dog colonies may provide some foraging sites for this bird, but generally, mixed-grass prairie is better habitat for this species than large expanses of short structure grassland. As a result, rodenticide application to prairie dogs would increase habitat for grasshopper sparrows.

Grasshopper sparrows could be shot or injured by prairie dog shooters, but this would be rare and deliberate, since it is unlikely to mistake a grasshopper sparrow for a prairie dog. The short grasses of prairie dog colonies are not preferred habitat, and there are not likely to be many, if any, grasshopper sparrows in the immediate vicinity when shooting is occurring. It is always possible for an unethical prairie dog shooter to kill a grasshopper sparrow. The fact that the grasshopper sparrow is a protected species and it is against the law to kill or harass them should also be a deterrent. There are very stiff penalties for killing or injuring a protected species, and this is well known. Gunfire and other hunter

activities may scare birds locally, but this will not be a factor concerning their population viability on the area.

Cumulative effects detrimental to grasshopper sparrows include urban development and conversion of grasslands to cropland (Slater 2004). Grasshopper sparrows require intermediate amounts of grass cover, so they benefit from frequent disturbances in the lush, more productive eastern grasslands of the region, where grass is taller and recovers more quickly (Slater 2004). In the region's arid, shorter grasslands, frequent disturbances negatively affect sparrow habitat (Slater 2004). Overgrazing in mixed and shortgrass prairies is a serious threat to grasshopper sparrow habitats (Slater 2004). They are area-sensitive birds, preferring larger grassland patches, and fragmentation of grassland poses a threat (Slater 2004).

DETERMINATION OF EFFECT AND RATIONALE FOR THE GASSHOPPER SPARROW

The biological determination for the grasshopper sparrow under Alternatives 1, 3, 4, and 5 is: *"may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing."*

Rationale: In all of the above alternatives, significant application of zinc phosphide treated oats could occur to keep prairie dog colonies within an acceptable range of acres and to prevent encroachment on private land. The ranges of acres that will be allowed in order to meet the stated objectives are listed in Table N-2.

Mixed-grass prairie is better habitat for this species than large expanses of short structure grassland. In general, prairie dog colonies would not be considered grasshopper sparrow habitat. Assumptions made are the structure and seral stage objectives in the LRMP would be adhered to, subsequently an increase in prairie dogs would not reduce the high to intermediate structured mix-grassed prairie preferred by the grasshopper sparrow.

This species eats grain and if they are in the area during rodenticide use, they would be susceptible to primary poisoning. Grasshopper sparrows are a summer resident of the grasslands with the bulk of there migration occurring in September (Tallman 2002).

Alternative 2: (No Action) Current LRMP Direction

This alternative was evaluated in the Biological Assessment and Evaluation for the Black-tailed Prairie Dog Conservation and Management on the Nebraska National Forest and Associated Units which made a decision regarding boundary management. The determination made in that document is brought forward for this species under Alternative 2. The determination is *"may adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing"*.

Rationale: In Alternative 2 (no action), no poisoning will be administered within the IMZ except for public safety and health situations as described in the LRMP. Rodenticide use will continue in the boundary management zone as described in the LRMP Amendment 2. The acreage figures displayed in Table N-2 represent a 25% expansion rate for the next 10 years. The minimum acres are the current acres for each GA. The increase in prairie dog acreages could result in a negative impact to grasshopper sparrows under this alternative.

Greater prairie chicken *Tympanuchus cupido*

Distribution and Status. Before European settlement, greater prairie chicken generally inhabited tall grass prairies (Johnsgard 1983) in the central and northeast United States. Today they occupy less than 10 percent of this maximum historic range (Johnsgard 1983).

Habitat. Life requisites that potentially limit greater prairie chicken populations are the lack of tall and dense grass nesting cover or the lack of winter food (Prose 1985). The most important aspect of secure nesting cover lies in its structure rather than in plant species composition (Eng et al. 1988). A study on Fort Pierre National Grassland showed that prairie chickens generally nest at least 200 ft. from fence lines (Rice and Carter 1982). Of all the grouse, prairie chickens are the most granivorous. High-energy grain from row-crops is an important winter food, and the birds may travel many miles to utilize it (Fredrickson 1996). This prairie grouse is a resident of Fort Pierre National Grassland (Peterson 1991) and the Bessey unit in the Nebraska Sand Hills (Mollhoff et al. 1993).

ESA Status and Other Organizational Rankings

ESA Status	Conservation Status[1]
ESA (no status)	G4, N4; Nebraska – S5; South Dakota – S4; Forest Service - Sensitive

[1] Definitions - http://www.natureserve.org/explorer/nsranks.htm

Existing Conditions. Fort Pierre National Grassland and Bessey Ranger District have high-structure grass for prairie chicken cover. Grassland on the former is interspersed with private grain fields, and the latter has prairie that supports many food-bearing forbs and shrubs, such as rose and poison ivy. On the Fort Pierre National Grassland, many spring prairie chicken courtship display grounds have been noted close to prairie dog colonies (Fort Pierre National Grassland files).

This grouse is a management indicator species for the units mentioned above, as well as a Region 2 sensitive species. Prairie chickens are game birds in both South Dakota and Nebraska.

Direct, Indirect, and Cumulative Effects. Fort Pierre National Grassland is the only area that would be affected by rodenticide use and reduced prairie dog populations near active prairie chicken habitat.

Prairie chickens eat grain, and the potential exists for them to ingest zinc phosphide treated oats. Observations of wild birds in a wide variety of situations where this rodenticide had been placed have shown that some birds can be killed and others are unaffected (Tietjen 1976). However, prairie dog colonies are not preferred prairie chicken feeding areas, which lowers the probability of bait ingestion. Also, if safety precautions and label directions are followed during application, operations can be carried out without undue risks to nontarget species (Tietjen 1976). Factors that contribute to lower hazards are the food habits of nontarget species, the relatively low concentration of zinc phosphide in the bait, the small amount of bait applied per unit area, the widely scattered bait distribution pattern and the short time most of the bait is exposed (Tietjen 1976). Disturbances created by crews applying rodenticide may temporarily displace prairie chickens from the vicinity of the treated colonies, further reducing non-target risks.

Removing prairie dogs from an area could produce high-structure nesting cover if the range site is productive and if subsequent grazing is not too heavy. Some range sites with prairie dog colonies, such as thin claypans, are probably not capable of producing enough grass cover to provide secure nest sites for prairie chickens.

DETERMINATION OF EFFECT AND RATIONALE FOR THE GREATER PRAIRIE CHICKEN

Fort Pierre GA: The biological determination for the greater prairie chicken under Alternatives 1, 3, 4, and 5 is: *"may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing."*

Rationale: In all of the above alternatives, significant application of zinc phosphide treated oats could occur to keep prairie dog colonies within an acceptable range of acres and to prevent encroachment on private land. The ranges of acres that will be allowed in order to meet the stated objectives are listed in Table N-2.

Life requisites that potentially limit greater prairie chicken populations are the lack of tall and dense grass nesting cover or the lack of winter food (Prose 1985). An objective listed in the LRMP is to manage the Fort Pierre National Grassland to maintain 30 – 50% of the area in high structure. None of the above alternatives would prevent this objective from being implemented. Implementation of any of the above alternatives would not change the essential habitat for the greater prairie chicken on the Fort Pierre National grassland.

Although the probability is remote, individual prairie chickens could die from ingesting rodenticide bait.

Alternative 2: (No Action) Current LRMP Direction

Fort Pierre GA: This alternative was evaluated in the Biological Assessment and Evaluation for the Black-tailed Prairie Dog Conservation and Management on the Nebraska National Forest and Associated Units which made a decision regarding boundary management. The determination made in that document is brought forward for this species under Alternative 2. The determination is *"may adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing."*

Rationale: In Alternative 2 (no action), no poisoning will be administered within the IMZ except for public safety and health situations as described in the LRMP. Rodenticide use will continue in the boundary management zone as described in the LRMP Amendment 2. The acreage figures displayed in Table N-2 represent a 25 % expansion rate for the next 10 years. The minimum acres are the current acres for each GA. The increase in prairie dog acreages could result in a negative impact to greater prairie chickens under this alternative.

Greater sage grouse *Centrocercus urophasianus*

Distribution and Status. Currently, greater sage grouse occur in somewhat disjunct ranges within suitable sagebrush habitats in central Washington through southern Idaho, much of Montana, extreme southeastern Alberta and southwestern Saskatchewan, south to the southwestern corner of North Dakota, northwestern and southwestern South Dakota, most of Wyoming, western Colorado, and portions of Utah, and west to Nevada, extreme eastern California, and southeastern Oregon (Rowland 2004).

The sage grouse is relatively common in the core of its range, but range has contracted significantly (now extirpated in five states and one province). Populations have declined 45 to 80 per cent since the 1950s and by an average of 33 per cent across ten states (essentially rangewide) since 1985. The birds are threatened by loss, fragmentation and degradation of sagebrush habitat (NatureServe 2006). In South Dakota, they are listed as a locally uncommon permanent resident of the far west on the sagebrush prairies (Tallman et al. 2002). The only occurrence on the NNF is in the Fall River West Geographic Area (FRWGA).

Habitat. Sagebrush shrubland is the habitat of the sage grouse. Sagebrush is the primary food of sage grouse during the summer and is almost the exclusive diet during winter. Almost all sage grouse activity occurs in sagebrush or in meadows or openings adjacent to sagebrush.

Sage grouse are unique in that they lack a muscular gizzard like other gallinaceous birds and cannot grind and digest seeds (Wallestad 1975), so they feed exclusively on soft material, mostly sagebrush during the winter and a combined diet of sagebrush and various forbs during the spring and summer. Juveniles initially consume a diet of forbs and invertebrates.

ESA Status and Other Organizational Rankings

ESA Status	Conservation Status[1]
ESA (no status)	G4, N4; Nebraska – S1; South Dakota – S2; Forest Service - Sensitive

[1] Definitions - http://www.natureserve.org/explorer/nsranks.htm

Existing Conditions. The only sagebrush habitat large enough to have a population of sage grouse occurs in the Fall River West Geographic Area of the Buffalo Gap National Grassland. Within this geographic area, the LRMP identifies a 45,760 acre area as 3.64 Special Plant and Wildlife Habitat: Sage Grouse Area (SGA). Within this area, the sage grouse is identified as a management indicator species. One sage grouse display ground has been monitored in the area since 1991, and the maximum number of birds observed on the display ground each year is listed in Table N-13.

Table N-13. Number of sage grouse observed on the established sage grouse lek located in the 3.64 Sage Grouse Area.

Year	# of Birds	Year	# of birds
1991	17	2000	11
1992	8	2001	4
1993	4	2002	4
1994	4	2003	0
1995	6	2004	0
1996	10	2005	0
1997	10	2006	0
1998	11	2007	0
1999	14	2008	2

No birds have been seen on the display ground since 2002. In the spring of 2005 one male sage grouse was observed displaying in the northwest portion of the sage grouse area. On subsequent visits to that area in 2005 and 2006 no birds were seen; indicating that this was a wondering male. In the spring of 2006 5 males and 3 females were observed exhibiting courtship behavior approximately 1 mile southeast of the spot of the 2005 sighting. When the site was visited later that spring no birds were observed. This area was surveyed again in the spring of 2007 and 2008 and no birds were found.

A study was conducted in the SGA (Hodorff 2005) in 2003 and 2004. While completing this study all of the sagebrush in the 3.64 area was mapped and the canopy coverage of sagebrush was determined. Table N-14 is a summary of the results of this study.

Table N-14. The acres and % of the total area of the different categories of sage brush canopy coverage located within the 3.64 Sage Grouse area.

Sagebrush Density Classification	Acres	% of the area
<1 %	30,929	64.5
1-10%	9,979	20.8
11-30%	2,764	5.8
>30%	223	0.5
Shale Breaks 11-30%	222	0.5
Shale Breaks 1-10%	1,365	2.8
Silver sagebrush	141	0.3
Sand sagebrush	14	0.0
Greasewood	2,335	4.9
Grand Total	**47,971**	**100.0**

The final conclusion of the above study was that the limiting factor for sage grouse productivity in the SGA is the amount of sagebrush habitat present.

Direct, Indirect, and Cumulative Effects. FRWGA is the only area that would be affected by rodenticide use and reduced prairie dog populations near sage grouse habitat.

Sage grouse are a year-around resident of the grasslands, so they could be exposed to the zinc phosphide treated grains. They lack a muscular gizzard and cannot grind and digest seeds. They do not eat grain and are not susceptible to being poisoned by the zinc phosphide treated grain.

Sagebrush shrubland is the habitat of the sage grouse. Prairie dogs tend to avoid the sagebrush habitat, because the sagebrush is difficult for them to cut it down. This in turn will reduce their viewing distance and makes them more susceptible to predators. But, there are incidences of prairie dogs moving into the sagebrush and clipping it off.

Within the SGA there are examples of both of the above scenarios. Colonies CW27 and SN30 are both located in the sagebrush habitat. The following pictures are digital satellite photography images of colonies CW27 and SN30. Overlain on the photographs are the GPS's maps of the boundaries of the colonies and the canopy coverage of the sagebrush that occurred in the vicinity of the colonies, as determined by the 2003-2004 sagebrush study. Photo # 1 is of CW27. It was measured using a global positioning system (GPS) in 1992 and 2004 and it was found to be 126 and 153 acres in size respectively. This equates to a 1.75 % expansion rate per year. The prairie dog expansion between 1993 and 2004 occurred for the most part in areas were the sagebrush canopy coverage was low (< 1 % Canopy Coverage). In this case the prairie dogs seemed to avoid the areas of dense sagebrush. Photo #2 is SN30. It did not exist in 1991 and the exact time and location it was established is unknown. This colony started and is expanding in an area with moderate sagebrush cover (1-10 % Canopy Coverage). As you can see in the photograph, the colony is located around a stock dam which is a water source for livestock on the pasture. Prairie dogs are attracted to the low statured vegetation that will occur around livestock watering points. This may be a contributing factor to the establishment of a prairie dog colony within the sagebrush habitat. Another factor is the sagebrush in the area is not very dense (1-10 % Canopy Coverage) which would make it easier for the colony to establish and maintain itself.

Photo #1

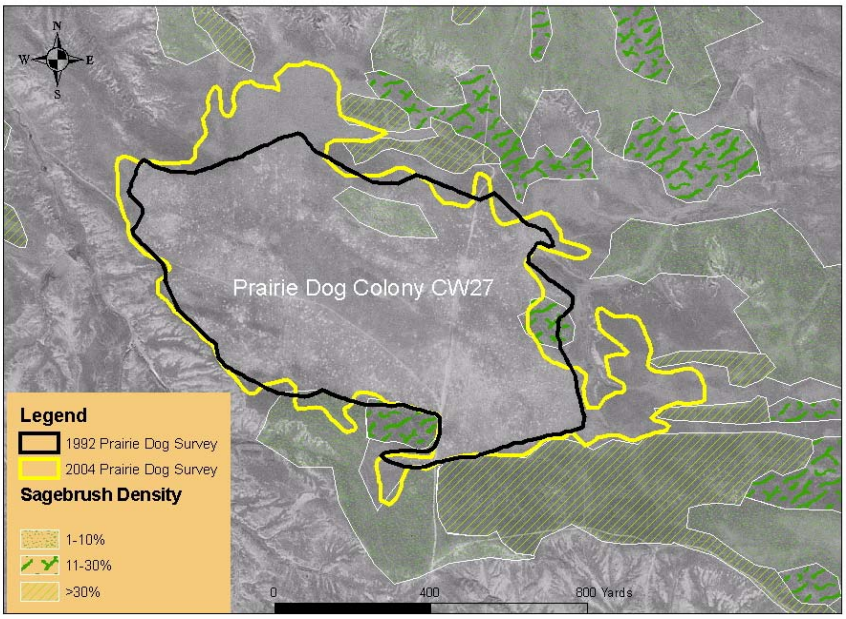
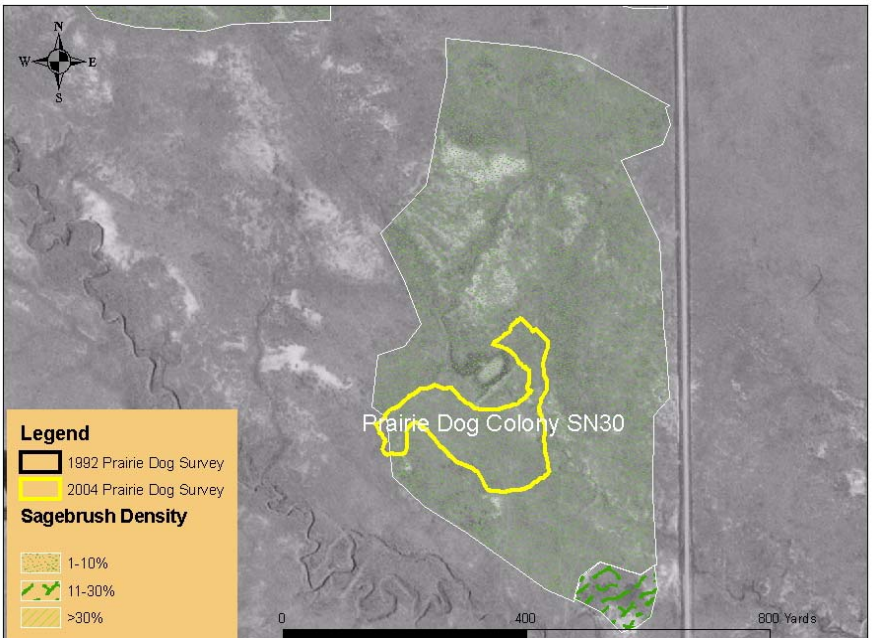


Photo #2



DETERMINATION OF EFFECT AND RATIONALE FOR THE SAGE GROUSE

Alternatives 1, 3 and 5

Fall River West GA: The biological determination for sage grouse under Alternatives 1, 3 and 5 is: *"may adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing."*

Rationale: In all of the above alternatives, significant application of zinc phosphide treated oats could occur to keep prairie dog colonies within an acceptable range of acres and to prevent encroachment on private land. The range of acres that will be allowed in order to meet the stated objectives for the Fall River West GA are listed in Table N-2.

Sage grouse are a year-around resident of the Fall River West GA, so they could be exposed to the zinc phosphide treated grains. They lack a muscular gizzard and cannot grind and digest seeds. They will not eat grain and are not susceptible to being poisoned by the zinc phosphide treated grain.

Prairie dogs could move into the sagebrush areas of the Fall River West GA which could negatively affect sagebrush habitat used by the greater sage grouse. There are 119,749 acres in the Fall River West GA. Within this geographic area, the LRMP identifies a 45,760 acre area as SGA. Of the action alternatives listed considered in this decision, Alternative 5 could have the greatest number of prairie dogs (24,000 acres). If necessary all 24,000 acres could be maintained out of the SGA. Additionally, the 2003-4 study determined approximately 65 % of the SGA had less than 1 % sagebrush coverage. The final conclusion of the above study was that the limiting factor for sage grouse productivity in the SGA is the amount of sagebrush habitat present. So, within the SGA there is 31,000 acres that have virtually no sagebrush. Therefore, these acres could be inhabited by prairie dogs with little impact to the sage grouse in the area.

An objective listed in the LRMP is to manage the Fall River West GA that could affect the sage grouse in the area is 10 - 30 % of the area should be maintained in high structure habitat. This will provide habitat for species that prefer high structure and in turn facilitate nesting for sage grouse. None of the above alternatives would prevent this objective from being implemented. Once again alternative 5 has the potential to contain the largest number of acres of active prairie dog colonies which is 24,000 acres which is only 20 % of the GA.

Alternative 2: (No Action) Current LRMP Direction

Fall River West GA

This alternative was evaluated in the Biological Assessment and Evaluation for the Black-tailed Prairie Dog Conservation and Management on the Nebraska National Forest and Associated Units which made a decision regarding boundary management. The determination made in that document is brought forward for this species under Alternative 2. The determination is *"may adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing."*

In Alternative 2 (no action), no poisoning will be administered within the IMZ except for public safety and health situations as described in the LRMP. Rodenticide use will continue in the boundary management zone as described in the LRMP Amendment 2. The acreage figures displayed in Table N-2 represent a 25 % expansion rate for the next 10 years. The minimum acres are the current acres for each GA. The increase in prairie dog acreages could result in a negative impact to greater sage grouse under this alternative.

Long-billed curlew *Numenius americanus*

Distribution and Status. Long-billed curlews breed from interior British Columbia and southern Alberta through southern Manitoba, south to central California and east to western North Dakota, central South Dakota, central Nebraska, western Kansas, northeastern New Mexico, and northern Texas (Dechant et al. 2003b). All of the units of the NNF are within their breeding range.

Long-billed curlews are ranked as secure both globally and nationally. Population declines in the western U.S. are local, not widespread, and they are apparently declining in Utah (Nature Serve 2006). In South Dakota, they are listed as a fairly common summer resident in suitable habitat west of the Missouri River (SDOU 1991).

Habitat. Long-billed curlews use expansive, open, level to gently sloping or rolling grasslands with short vegetation such as shortgrass or recently grazed mixed-grass prairie. Proximity to water may be an important factor in habitat selection (Dechant et. al. 2003b). This type of habitat certainly exists within prairie dog colonies, especially in areas that have recently been colonized.

Grassland structure is an important component of long-billed curlew habitat. Long-billed curlews in Nebraska used areas in which 75 percent of the total vertical vegetation density (number of plant contacts with a thin rod inserted vertically into the canopy) was found at heights <10 cm (Dechant et. al. 2003b). Preference for areas in which vegetation density is concentrated near ground level may be important in terms of the feeding behavior of long-billed curlews or their ability to see potential predators.

Long-billed curlew's breeding season diet includes insects (especially grasshoppers, but also beetles and butterflies; and other invertebrates, berries, toads, bird eggs, and nestling birds. Curlews forage in grasslands, cultivated fields, stubble fields, wet meadows, prairie dog (*Cynomys*) colonies, and occasionally along wetland margins (Dechant et. al. 2003b). The SDOU (1991) states the fall migration occurs first week of August with the latest date a long-billed curlew was seen in South Dakota as Oct 25.

ESA Status and Other Organizational Rankings

ESA Status	Conservation Status[1]
ESA (no status)	G5, N5B, N5N; Nebraska – S5; South Dakota – S3B; Forest Service - Sensitive

[1] Definitions - http://www.natureserve.org/explorer/nsranks.htm

Existing Conditions. All of the grassland areas of the Buffalo Gap National Grassland, Fort Pierre National Grassland, and Oglala National Grassland are potential long-billed curlew habitat depending on the slope, potential production and grazing intensity. The long-billed curlew, in most cases, will be found on the moderate to heavily grazed sites. It is not uncommon to find them in and around prairie dog colonies.

Direct, Indirect, and Cumulative Effects. The long-billed curlew feeds primarily on insects and other invertebrates. They will not eat the poison grain and are not susceptible to being poisoned by the zinc phosphide treated grain. The SDOU (1991) states the fall migration for them occurs first week of August with the latest date a long-billed curlew was seen in South Dakota as Oct 25. It would be rare for a long-billed curlew to be present after October 1st when the rodenticide application will take place.

Long-billed curlews could be killed or injured by prairie dog shooters, long-billed curlews are but this would be rare and deliberate, since it is unlikely to mistake a long-billed curlew for a prairie dog. It is always possible for an unethical prairie dog shooter to kill a curlew. The fact that the long-billed curlew is a protected species and it is against the law to kill or harass them should also be a deterrent. There are very stiff penalties for killing or injuring a protected species, and this is well known. Gunfire and other

hunter activities may scare birds locally, but this will not be a factor concerning their population viability on the area.

The long-billed curlew is not dependent on prairie dog colonies for its existence. Breeding habitat for the long-billed curlew is low to moderate structure midgrass prairie. This habitat can be found on or off prairie dog colonies depending on many factors, like precipitation, soils, etc. On the NNF the overriding factor influencing grassland structure is livestock grazing. Objectives, standards and guidelines within the LRMP establish levels at which grassland structure will be managed by geographic area.

DETERMINATION OF EFFECT AND RATIONALE FOR THE LONG-BILLED CURLEW

The biological determination for the long-billed curlew under Alternatives 1, 3, 4, and 5 is: *"may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing."*

Rationale: In all of the above alternatives, significant application of zinc phosphide treated oats could occur to keep prairie dog colonies within an acceptable range of acres and to prevent encroachment on private land. The ranges of acres that will be allowed in order to meet the stated objectives are listed in Table N-2.

The long-billed curlew feeds primarily on insects and other invertebrates. They do not eat grain and are not susceptible to being poisoned by the zinc phosphide treated grain. The SDOU (1991) states the fall migration for long-billed curlews occurs first week of August with the latest date a long-billed curlew was seen in South Dakota as Oct 25. It follows that he majority of the birds migrate out of the study area before October 1 (the first day rodenticides can be applied).

The long-billed curlew is not dependent on prairie dog colonies for its existence. Breeding habitat for the long-billed curlew is low to moderate structure midgrass prairie. This habitat can be found on or off prairie dog colonies depending on many factors, like precipitation, soils, etc. On the NNF the overriding factor influencing grassland structure is livestock grazing. Objectives within the LRMP establish levels at which grassland structure will be managed by geographic area. None of the above alternatives would prevent this any of these objectives from being implemented.

Alternative 2: (No Action) Current LRMP Direction

This alternative was evaluated in the Biological Assessment and Evaluation for the Black-tailed Prairie Dog Conservation and Management on the Nebraska National Forest and Associated Units which made a decision regarding boundary management. The determination made in that document is brought forward for this species under Alternative 2. The determination is *"may adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing"*.

In Alternative 2 (no action), no poisoning will be administered within the IMZ except for public safety and health situations as described in the LRMP. Rodenticide use will continue in the boundary management zone as described in the LRMP Amendment 2. The acreage figures displayed in Table N-2 represent a 25% expansion rate for the next 10 years. The minimum acres are the current acres for each GA. The increase in prairie dog acreages could result in a beneficial impact to long-billed curlews under this alternative.

McCown's longspur *Calcarius mccownii*

Distribution and Status. McCown's longspurs breed from southern Alberta and southern Saskatchewan, south through Montana, eastern and central Wyoming, and north central Colorado, and east to western Nebraska, north central South Dakota and southwestern North Dakota (Dechant et. al. 2003d). In Region

2 of the Forest Service, they commonly breed only on the Pawnee National Grassland in Colorado and the Thunder Basin National Grassland in Wyoming (Sedgwick 2004b).

Most populations appear to be stable or increasing, but due to a historical long-term decline in abundance on both their breeding and wintering grounds, this species is ranked by various state, federal, and private conservation organizations as a grassland "species of concern", "high priority", "imperiled", with "pressing needs", "state imperiled", or a species of "conservation concern" (Sedgwick 2004b). In South Dakota, they're listed as a rare migrant through the western tier of counties (SDOU 1991). In Nebraska, breeding has been documented in southern Sioux County (Johnsgard 1979).

Habitat. McCown's longspurs use grasslands with little litter and low vegetation cover, such as that provided by shortgrass or heavily grazed mixed-grass prairie (Dechant et. al. 2003d) (Sedgwick 2004b). They breed in shortgrass prairie; especially where vegetation coverage is sparse due to low soil moisture or heavy grazing, or where it is interspersed with shrubs or taller grasses blue grama (*Bouteloua gracilis*) and buffalograss (*Buchloe dactyloides*) are dominant plants in nesting (Sedgwick 2004b).

There has been no research on whether or not McCown's longspurs specifically prefer the habitat created by prairie dogs (Sedgwick 2004b). Certainly, areas used by prairie dogs would create habitat characteristics that would be favorable to the McCown's longspur within the study area.

ESA Status and Other Organizational Rankings

ESA Status	Conservation Status[1]
ESA (no status)	G4, N4B, N4N; Nebraska – S3; South Dakota – SUB; Forest Service - Sensitive

[1] Definitions - http://www.natureserve.org/explorer/nsranks.htm

Recovery and Conservation Planning. A conservation assessment for the McCown's longspur was prepared for the Forest Service, October 13, 2004 by J.A. Sedgwick.

Existing Conditions. Suitable habitat for the McCown's longspurs within the project area is the long-term low structure grasslands. All grassland areas on Oglala National Grassland are potential McCown's longspur habitat, depending on management. Prairie dog colonies may be the best long-term habitat within the area.

There have not been any documented McCown's longspur sightings on Oglala National Grassland in recent years. The last McCown's longspur sited on the Oglala National Grassland was in 1994. The Oglala National Grassland is very close to both breeding and wintering population of McCown's longspurs (Dechant et. al. 2003d) (Sedgwick 2004b).

Direct, Indirect, and Cumulative Effects. Oglala National Grassland is the only area that would be affected by rodenticide use and reduced prairie dog populations near McCown's longspur habitat.

The diet of McCown's longspurs consists primarily of grass and forb seeds and insects, including grasshoppers, moths, beetles, and ants. McCown's are primarily granivorous during winter (Sedgwick 2004b). If they are in the area during rodenticide applications, they would be susceptible to primary poisoning if they ingest rodenticide bait. McCown's longspurs fall departure dates from the breeding grounds are variable, extending from August to late September (Saskatchewan, Montana). A few individuals may linger until early to mid-October (Saskatchewan, Colorado). Early arrival dates on the wintering grounds occur from late September (New Mexico), to early October (Arizona), to late October (Texas). They arrive in Mexico by November (Sedgwick 2004b). Although rare, migrating birds could be in the area while rodenticide application is taking place.

McCown's Longspurs use grasslands with little litter and low vegetation cover, such as that provided by shortgrass or heavily grazed mixed-grass prairie (Dechant et. al. 2003d). Blue grama (*Bouteloua gracilis*) and buffalograss (*Buchloe dactyloides*) are dominant plants in nesting (Sedgwick 2004b). The McCown's longspur is not dependent on prairie dog colonies for its existence, but prairie dogs would create habitat characteristics that would be favorable to the McCown's longspur within the Oglala National Grassland. The over riding factor influencing grassland structure is livestock grazing. Objectives, standards and guidelines within the LRMP establish the desired levels of grassland structure.

McCown's longspurs could be shot or injured by prairie dog shooters, but this would be rare and deliberate, since it is unlikely to mistake a McCown's longspurs for a prairie dog. It is always possible for an unethical prairie dog shooter to kill a longspur. The fact that the McCown's longspurs and other song birds are protected and it is against the law to kill or harass them should also be a deterrent. There are very stiff penalties for killing or injuring a protected species, and this is well known. Also, on the Oglala National Grassland, shooting regulations are not changed by this decision from LRMP direction.

DETERMINATION OF EFFECT AND RATIONALE FOR THE MCCOWN'S LONGSPUR

Alternatives 1, 3 and 5

Oglala GA.

The biological determination for the McCown's longspur under Alternatives 1, 3 and 5 is: *"may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing."*

Rationale: In all of the above alternatives, significant application of zinc phosphide treated oats could occur to keep prairie dog colonies within an acceptable range of acres and to prevent encroachment on private land. The ranges of acres that will be allowed in order to meet the stated objectives are listed in Table N-2.

McCown's longspur is not dependent on prairie dog colonies for its existence, but prairie dogs would create habitat characteristics that would be favorable to the McCown's longspur.

There is always a chance of a McCown's longspur eating rodenticide bait. The probability of this happening is lessened by the fact that there are very few McCown's longspurs in the area. So, it is unlikely that rodenticide use as outlined in any of the alternatives will have any lasting affects on the McCown's longspur population in the area.

Alternative 2: (No Action) Current LRMP Direction

Oglala GA

This alternative was evaluated in the Biological Assessment and Evaluation for the Black-tailed Prairie Dog Conservation and Management on the Nebraska National Forest and Associated Units which made a decision regarding boundary management. The determination made in that document is brought forward for this species under Alternative 2. The determination is *"may adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing."*

Rationale: In Alternative 2 (no action), no poisoning will be administered within the IMZ except for public safety and health situations as described in the LRMP. Rodenticide use will continue in the boundary management zone as described in the LRMP Amendment 2. The acreage figures displayed in Table N-2 represent a 25% expansion rate for the next 10 years. The minimum acres are the current acres

for each GA. The increase in prairie dog acreages could result in a beneficial impact to McCown's longspurs under this alternative.

Mountain plover *Charadrius montanus*

Distribution and Status. Mountain plovers breed from southeastern Alberta and southwestern Saskatchewan through central Montana, south to south central Wyoming, east central Colorado and northeastern New Mexico, and east to northern Texas and western Kansas (Dechant et. al. 2003f).

In 1999, the mountain plover was proposed for listing as a threatened species under the Endangered Species Act by the U.S. Fish and Wildlife Service. Higher priority listings precluded further action, until several groups submitted a 60-day Notice of Intent to sue the Secretary of the Department of the Interior for failure to comply with legal deadlines established under the Act for completing listing actions. In response, USFWS re-examined the case. On September 9, 2003, the agency published a notice in the Federal Register (60 FR 53083) withdrawing its proposed rule to list the mountain plover as a threatened species. Following further review and examination of new data, USFWS determined that the mountain plover was not warranted for federal listing because threats to the species were "not as significant as earlier believed" (Dinsmore 2003).

The mountain plover is listed as "imperiled" both globally and nationally. Reasons for the determination are fewer than 100 occurrences, limited suitable nesting habitat and wintering habitat being converted into agricultural land, and the rapid decline of the last few decades is continuing (Nature Serve 2006). In South Dakota they are listed as a former rare breeder in the west (SDOU 1991). There are old records of mountain plovers in Fall River County (SDOU 1991) and a pair was observed in 1977 in Bennett County, one mile north of Tuthill (South Dakota Bird Notes 1977). In Nebraska there are records of mountain plovers inhabiting Dawes and Sioux counties before 1920 but there are no recent sightings in this area (Ducey 1988).

Habitat. Mountain plovers are a disturbed-prairie or semi desert species, rather than a grassland species. They prefer disturbed habitats for nesting, including areas formerly occupied by bison and prairie dogs and agricultural fields (Dinsmore 2003). Mountain plovers prefer large, flat grassland expanses with sparse, short vegetation, and bare ground. Areas disturbed by prairie dogs, heavy grazing, or fire can provide suitable habitat. Mountain plovers were found to selectively inhabit black-tail prairie dog colonies in north-central Montana (Knowles et al. 1982). The species often nests near cow pies, rocks, or clumps of vegetation. In mixed grass prairie and other areas where vegetation is too tall, thick, or shrubby, prairie dog colonies provide a mixture of short grass and bare ground that is suitable for mountain plovers. (Dechant et. al. 2003f).

Departure from the breeding grounds varies latitudinally, with southbound plovers exiting north-central Montana by late September, Wyoming and northeastern Colorado by mid-October, and southeastern Colorado by late October (Dinsmore 2003).

The mountain plover is insectivorous, although its specific food habits have been studied very little. They feed on ground-dwelling invertebrates, primarily beetles (Coleoptera), grasshoppers and crickets (Orthoptera), and ants (Hymenoptera) (Dinsmore 2003).

ESA Status and Other Organizational Rankings

ESA Status	Conservation Status[1]
ESA (no status)	G2, N2B, N2N; Nebraska – S1; South Dakota – SX; Forest Service - Sensitive

[1] Definitions - http://www.natureserve.org/explorer/nsranks.htm

Recovery and Conservation Planning. A conservation assessment for the mountain plover was prepared for the Forest Service, December 8, 2003 by Stephen J. Dinsmore.

Existing Conditions. The suitable habitat for the mountain plover is the long-term low structure grasslands. All of the grassland areas on Oglala National Grassland and Buffalo Gap National Grassland are considered potential mountain plover habitat, depending on the grazing intensity. Prairie dog colonies may be the best long-term habitat.

The Forest Service has carried out numerous systematic and random searches for mountain plover. Survey results did not identify any plover nesting sites nor plover observations (Reports of the mountain plover surveys can be found in the administrative record). The only mountain plover documented in the project area in recent years occurred in Conata Basin in the summer of 2004. None of the national grasslands or forests in the project area is considered in their current breeding range (Dinsmore 2003, Dechant et. al. 2003f). Their historic range included western Nebraska and extreme western South Dakota (Dinsmore 2003), which would include parts of Buffalo Gap National Grassland and Oglala National Grassland.

Direct, Indirect, and Cumulative Effects. The mountain plover feeds primarily on insects and other invertebrates. They do not eat grain and are therefore not susceptible to primary poisoning by ingesting rodenticide bait. Also, they leave their breeding ground in Wyoming (the closest population) by mid October, so most would have migrated prior to October when rodenticide use would begin.

Mountain plovers could be shot or injured by prairie dog shooters, but this would be rare and deliberate, since it is unlikely to mistake a mountain plover for a prairie dog. It is always possible for an unethical prairie dog shooter to kill a plover. The fact that the mountain plover is a protected species and it is against the law to kill or harass them should also be a deterrent. There are very stiff penalties for killing or injuring a protected species, and this is well known. Gunfire and other hunter activities may scare birds locally, but this will not be a factor concerning their population viability on the area.

Mountain plovers prefer large, flat grassland expanses with sparse, short vegetation, and bare ground. The mountain plover is not dependent on prairie dog colonies for its existence, but the prairie dog colonies would be one of the few places in the project area that would produce the vegetation characteristics required by the mountain plover in the long term. The over riding factor influencing grassland structure is livestock grazing. Objectives, standards and guidelines in the LRMP establish desired levels of grassland structure.

DETERMINATION OF EFFECT AND RATIONALE FOR THE MOUNTAIN PLOVER

Entire Project Area (except the Fort Pierre GA which was eliminated from consideration earlier):

The biological determination for the mountain plover under Alternatives 1, 3, 4, and 5 is: *"no impact."*

Rationale: The mountain plover feeds predominantly on insects and other invertebrates. They will not eat the poison grain and are not susceptible to being poisoned by the zinc phosphide treated grain.

The overriding factor in the *"no impact"* determination is the lack of a resident mountain plover population on Buffalo Gap National Grassland (SDOU 1991). The only mountain plover documented in the project area in recent years occurred in Conata Basin in the summer of 2004. None of the national grasslands or forests in the project area is considered in their current breeding range (Dinsmore 2003, Dechant et. al. 2003f).

Alternative 2: (No Action) Current LRMP Direction

Entire Project Area (except the Fort Pierre GA which was eliminated from consideration earlier).

Rationale: This alternative was evaluated in the Biological Assessment and Evaluation for the Black-tailed Prairie Dog Conservation and Management on the Nebraska National Forest and Associated Units which made a decision regarding boundary management. The determination made in that document is brought forward for this species under Alternative 2. The determination is *"no impact."*

In Alternative 2 (no action), no poisoning will be administered within the IMZ except for public safety and health situations as described in the LRMP. Rodenticide use will continue in the boundary management zone as described in the LRMP Amendment 2. The acreage figures displayed in Table N-2 represent a 25 % expansion rate for the next 10 years. The minimum acres are the current acres for each GA. The increase in prairie dog acreages could result in a beneficial impact to mountain plover under this alternative.

Northern harrier *Circus cyaneus*

Distribution and Status. These hawks breed in the northern United States and Canada, and winter in the eastern and southern U.S., and in the western coastal mountains, south through Mexico and Central America (MacWhirter and Bildstein 1996) (Dechant 2003g). They are year-round residents of the central plains (MacWhirter and Bildstein 1996). Northern harriers are summer residents and rare winter visitors on Fort Pierre National Grassland, Buffalo Gap National Grassland, and Oglala National Grassland (Peterson et al. 1991, Graupman et al. 1991, Peterson 1993). They are residents of the Nebraska Sand Hills, including the Bessey Ranger District (Mollhoff et al. 1993).

Habitat. This slim hawk hunts by coursing low over the prairie, catching its prey with a sudden pounce (Sibley 2000). In summer, its foods are small- and medium-sized mammals, primarily rodents, birds (chiefly passerines and small waterbirds), reptiles, and frogs (MacWhirter and Bildstein 1996). In the north during winter, they consume *Microtis* voles almost exclusively (MacWhirter and Bildstein 1996). After killing, small mammals are sometimes eviscerated (MacWhirter and Bildstein 1996). Although harriers can nest in suitable marsh vegetation, they apparently preferred upland sites in North Dakota (Dubbert and Lokemoen 1977). But during the South Dakota Breeding Bird Atlas surveys, 60 percent of harrier nests were in marshes (Peterson 1995). In seeded fields in north central South Dakota and central North Dakota, harriers preferred tall, dense cover as upland nesting sites (Dubbert and Lokemoen 1977). They placed 52 percent of nests in cover more than about 24" tall. Forty-one percent of nests were in cover from about 12 in. to 24 in. tall. The nests were well concealed from the sides but open above. Undisturbed grasslands, especially with western snowberry (*Symphoricarpos occidentalis*) shrubs, were the locations for over half of 129 nests (Kantrud and Higgins 1992).

ESA Status and Other Organizational Rankings

ESA Status	Conservation Status[1]
ESA (no status)	G5 N5B, N5B; Nebraska – S3; South Dakota – S5B; Forest Service – Sensitive

[1] Definitions - http://www.natureserve.org/explorer/nsranks.htm

Existing Conditions. These birds have recently been added to the sensitive species list and are fairly common on all of the National Grasslands.

Northern harriers are likely to occur across all areas being considered for prairie dog management, and these raptors are known to be associated with prairie dog colonies in western South Dakota (Sharps and Uresk 1990). Since prairie dog colonies have short vegetation, and harriers use tall, dense vegetation for placing their nests, the hawks are most likely to use prairie dog colonies as sites to hunt for food.

Direct, Indirect, and Cumulative Effects. Harriers are likely to be present in some areas when rodenticide baits are applied. The hawks do not eat grain so they would not be at risk from direct poisoning. The possibility of secondary poisoning is remote, since most poisoned prairie dogs die in their burrows. Harriers are also known to eviscerate prey before eating, thus removing the dead prairie dog's digestive tract where residual poison is likely to be found. Bald eagles, golden eagle, and great-horned owls were fed zinc phosphide-poisoned prey during lab studies and showed no negative physiological symptoms (USDA Animal Plant and Health Inspection Service 1994). Crews applying rodenticide might disturb harriers, but this would be a temporary occurrence. The birds would continue hunting for food nearby.

An indirect effect of rodenticide use would be the loss of prairie dog colonies as foraging areas, where harriers could prey on vertebrates or invertebrates among the short grass cover. With the prairie dogs removed from the area, however, the grass would likely grow taller. Eventually litter would build up, and the parts of the area would become habitat for voles. Rather than creating a net loss of foraging areas for northern harriers, prairie dog rodenticide treatment would substitute one type of prey for another. If cattle stocking were light on areas where prairie dogs had been treated, tall, dense cover would develop and could be used as harrier nesting cover.

Northern harriers could be shot or injured by prairie dog shooters, but this would be rare and deliberate since they don't regularly sit on prairie dog mounds and it would be difficult to mistake them for prairie dogs, even at a distance. It is always possible for an unethical prairie dog shooter to kill a harrier. The fact that the northern harrier is a protected species and it is against the law to kill or harass them should also be a deterrent. There are very stiff penalties for killing or injuring a protected species, and this is well known. Shooting would reduce the number of prairie dogs in a colony. Harriers feed mostly on animals smaller than prairie dogs, and these food items would not be affected by the change in prairie dog numbers. Gunfire and other hunter activities may scare birds locally, but this will not be a factor concerning their population viability on the area. Prairie dog shooting can leave lead fragments in prairie dog carcasses posing a potential risk to scavengers (Pauli and Buskirk 2007).

Cumulative effects that could harm harriers include plowing prairies to produce mono-typical croplands and draining wetlands that the birds use for nesting or foraging. Over-grazing by livestock results in low grass structure with no cover or litter for voles, which are an important harrier food source. Intentional shooting of harriers by individuals who think they are reducing predation on game birds or mammals also occurs.

DETERMINATION OF EFFECT AND RATIONALE FOR THE NORTHERN HARRIER

The biological determination for the northern harrier under Alternatives 1, 3, 4, and 5 is: *"may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing."*

Rationale: In all of the above alternatives, significant application of zinc phosphide treated oats could occur to keep prairie dog colonies within an acceptable range of acres and to prevent encroachment on private land. The ranges of acres that will be allowed in order to meet the stated objectives are listed in Table N-2.

Harriers are likely to be present in some areas when rodenticide is applied. The hawks do not eat grain so they would not be at risk of primary poisoning. The possibility of secondary poisoning is remote.

Prairie dog colonies provide harrier prey. However, grass structure is likely to increase when prairie dogs are reduced, which provides voles for prey and, possibly, potential nesting sites. Positive and negative aspects of prairie dog management to harriers would tend to offset.

Alternative 2: (No Action) Current LRMP Direction

This alternative was evaluated in the Biological Assessment and Evaluation for the Black-tailed Prairie Dog Conservation and Management on the Nebraska National Forest and Associated Units which made a decision regarding boundary management. The determination made in that document is brought forward for this species under Alternative 2. The determination is *"may adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing."*

Rationale: In Alternative 2 (no action), no poisoning will be administered within the IMZ except for public safety and health situations as described in the LRMP. Rodenticide use will continue in the boundary management zone as described in the LRMP Amendment 2. The acreage figures displayed in Table N-2 represent a 25% expansion rate for the next 10 years. The minimum acres are the current acres for each GA. The increase in prairie dog acreages could result in a beneficial impact to northern harriers under this alternative.

Regal fritillary *Speyeria idalia*

Distribution and Status. These colorful butterflies historically occurred in the central and northeast United States (Scott 1986), although they have rapidly declined from the eastern portion of the range in recent years (Royer and Marrone 1992). Regal fritillaries occupy suitable habitat statewide in South Dakota (Royer and Marrone 1992).

Habitat. These insects inhabit wet meadows and tall grass prairie, in addition to undisturbed prairies in western South Dakota (Marrone 1992). Males emerge in late June, followed by females (Royer and Marrone 1992) who lay eggs near violets (*Viola spp.*) during late August through early September. Generally in about three weeks, upon hatching, larvae crawl to ground where they soon enter hibernation after sheltering themselves with leaves and duff (Royer and Marrone 1992). In spring, larvae feed on emergent violet leaves (Royer and Marrone 1992). On the Northern Prairie, larvae are thought to feed on Nuttall violet (*Viola nutallii*) (Marrone 1992), which grows in prairie sod (Van Bruggen 1992). For feeding adults, nectar sources are long-headed coneflower (*Ratibida columnifera*), purple coneflower (*Echinacera pallida* or *A. angustifolia*), fleabanes (*Erigeron spp.*), black-eyed susans (*Rudbeckia spp.*), gaillardias (*Gaillardia spp.*), milkweeds (*Asclepias spp.*), thistles (*Cirsium spp.*), bergamots (*Monarda spp.*), and blazing stars (*Liatris spp.*) (Moffat and McPhillips 1993). Native prairie with abundant wild flowers provides habitat for the butterflies while re-seeded rangelands without flowers may not (Marrone 1992). The species is always associated with open prairie or ungrazed, reverted pastures, generally in

moist tallgrass virgin prairie (Royer and Marrone 1992). Conversion of prairie to cropland, herbicide or pesticide application, overgrazing, and invasion of introduced plants threaten most remaining habitats (Royer and Marrone 1992).

ESA Status and Other Organizational Rankings

ESA Status	Conservation Status[1]
ESA (no status)	G3, N3; Nebraska – S3; South Dakota – S3; Forest Service - Sensitive

[1] Definitions - http://www.natureserve.org/explorer/nsranks.htm

Existing Conditions. In some years, individuals will be abundant and will scatter widely; while in other years, they are scarce (Marrone 1992).

Many regal fritillaries were spotted on Fort Pierre National Grassland during the 1990's; one observation has been recorded in western Buffalo Gap National Grassland (NNF files).

Direct, Indirect, and Cumulative Effects. Application of zinc phosphide-treated oats should have no direct effect. Adults are not likely to be present and larvae should be hibernating when prairie dog rodenticide is applied. Even if the butterflies were present, they would not likely ingest the rodenticide or active ingredients.

Indirectly, the increase in the height and density of vegetation after rodenticides are applied. Later, prairie dogs will not be present to remove nectar-producing forbs and that may have an additional positive influence.

Shooting and related activities should not have a direct or indirect effect on this species, unless enough prairie dogs are shot so that there is a significant increase in vegetation height and density. In that instance, the butterflies may find the habitat more favorable.

Reductions in prairie dog populations may favor some individual butterflies if habitat and weather conditions are just right. However, positive effects probably will not be numerous or widespread. The best likelihood of positive effects helping this butterfly is on Fort Pierre National Grassland, where regal fritillaries are more abundant.

DETERMINATION OF EFFECT AND RATIONALE FOR THE REGAL FRITILLARY

The biological determination for the regal fritillary under Alternatives 1, 3, 4, and 5 is: *"no impact."*

Rationale: In all of the above alternatives, significant application of zinc phosphide treated oats could occur to keep prairie dog colonies within an acceptable range of acres and to prevent encroachment on private land. The ranges of acres that will be allowed in order to meet the stated objectives are listed in Table N-2.

Regal fritillaries are not likely to ingest the rodenticide or active ingredients.

Assumptions made are the structure objectives in the LRMP would be adhered to, subsequently an increase in prairie dogs would not reduce the high structure habitat preferred by regal fritillary.

Alternative 2: (No Action) Current LRMP Direction

This alternative was evaluated in the Biological Assessment and Evaluation for the Black-tailed Prairie Dog Conservation and Management on the Nebraska National Forest and Associated Units which made a

decision regarding boundary management. The determination made in that document is brought forward for this species under Alternative 2. The determination is *"no impact."*

Rationale: In Alternative 2 (no action), no poisoning will be administered within the IMZ except for public safety and health situations as described in the LRMP. Rodenticide use will continue in the boundary management zone as described in the LRMP Amendment 2. The acreage figures displayed in Table N-2 represent a 25% expansion rate for the next 10 years. The minimum acres are the current acres for each GA. The increase in prairie dog acreages could result in a negative impact to regal fritillaries under this alternative.

Short-eared owl *Asio flammeus*

Distribution and Status. In North America, short-eared owls breed from Alaska and continental Canada, also including the southern Baffin Islands, south to central California, and east through Kansas, eastern Oklahoma, eastern Ohio, Pennsylvania, Maryland, and Prince Edward Island (Dechant et. al. 2003e).

This medium-sized owl of open country is a sensitive species in Region 2 and is a rare resident of the Fort Pierre National Grassland (Peterson et al. 1991), Buffalo Gap National Grassland (Graupman et al. 1991), and Oglala National Grassland (Peterson 1993). It is a rare summer resident of the Nebraska Sandhills (Peterson et al. 1993). Partners in Flight list it as a species of continental concern in the prairie biome (Rich et al. 2004).

Habitat. The short-eared owl ranges over mid and tall grasses and marshes, often hunting during daylight (Sibley 2000). Small rodents, especially voles *(Microtis spp.),* compose a preponderance of its diet, and there have been strong shifts between years in the density and location of breeding owls, depending on fluctuating food resources (Wiggins 2004). The abundance of prairie voles in central South Dakota was positively correlated with vegetation variables that measured the height and density of the vegetation and litter, although vole abundance seemed to be correlated with litter rather than the seral stage of prairie vegetation (Fritcher 1998). Short-eared owls build their nests on the ground in open country (Clark 1975), and nests found in the Dakotas have been in cover about 12 to 24 inches high and were well concealed from the sides (Duebbert and Lokemoen 1977). Clutch size is highly variable both within and between localities (Wiggins 2004), but it is known that clutch size is higher in years of food abundance (Clark 1975, Holt and Leasure 1993). Short-eared owls use prairie dog colonies in the spring, summer, and fall months (Sharps and Uresk 1990). The current and historical threats to viable short-eared owl populations in Region 2 can be ranked as follows: 1. loss of native grassland and wetland habitats; 2. degradation of existing grasslands due to overgrazing by livestock; 3. degradation of grassland habitat due to fragmentation (Wiggins 2004).

ESA Status and Other Organizational Rankings

ESA Status	Conservation Status[1]
ESA (no status)	G5, N5B, N5N; Nebraska – S1; South Dakota – S3B, S3N; Forest Service-Sensitive

[1] Definitions - http://www.natureserve.org/explorer/nsranks.htm

Recovery and Conservation Planning. A conservation assessment for the short-eared owl was prepared for the Forest Service, September 22, 2004 by Wiggins, D. (2004)

Existing Conditions. Short-eared owl habitat exists across the project area where adequate grass for nest sites and habitat for voles is present. Healthy prairie dog colonies have low grass structure with little or no high/dense vegetation cover to provide potential nest sites for medium-sized birds that nest on the ground, such as short-eared owls. The vegetation litter that supports populations of voles is not present,

either, so there is no habitat for the owl's preferred prey. On the other hand, prairie dog colonies may provide diverse short-grass sites on which these owls may forage, although this is not an essential habitat element for them. In this respect, prairie dog colonies may be beneficial if adequate short-eared owl nesting cover and habitat for voles is available elsewhere.

Direct, Indirect, and Cumulative Effects. Short-eared owls do not eat grain, so primary poisoning resulting from ingestion of rodenticide bait is not an issue. There should be no secondary poisoning from consumption of gut contents of dead prairie dogs if specifications on the rodenticide label are adhered to and the few prairie dog carcasses that are found above ground are buried. This threat is lessened because most prairie dogs poisoned with zinc phosphide bait die inside their burrows (Tietjen 1976). Eagles and owls that were routinely fed zinc phosphide-killed rodents or rabbits showed no ill effects (Tietjen 1976). Incidental contact with crews applying rodenticide may disturb the birds temporarily, but they should not be displaced for long from foraging areas on prairie dog colonies.

Because of abundant prey, it would be expected that short-eared owls would frequent prairie dog colonies for hunting, but they are not dependent on prairie dogs or prairie dog colonies for their survival in the area. In fact, voles are the owl's preferred prey, and would not be present on prairie dog colonies because vegetation litter that supports populations of voles is not present.

Where prairie dog colonies sit on low productivity range sites that are heavily grazed, removing the rodents will not provide habitat for short-eared owls. However, if high and dense grass cover develops after prairie dogs have been eliminated, short-eared owls could be indirectly benefited.

Short-eared owls could be shot or injured by prairie dog shooters, but this would be rare and deliberate, since it is unlikely to mistake a short-eared owl for a prairie dog, even at long distance. It is always possible for an unethical prairie dog shooter to kill an owl. The fact that the short-eared owl is a protected species and it is against the law to kill or harass them should also be a deterrent. There are very stiff penalties for killing or injuring a protected species, and this is well known. Gunfire and other hunter activities may scare birds locally, but this will not be a factor concerning their population viability on the area. Shooting will obviously reduce the number of prairie dogs on a colony, but enough of the rodents should survive to maintain a foraging area for these raptors. Prairie dog shooting can leave lead fragments in prairie dog carcasses posing a potential risk to scavengers (Pauli and Buskirk 2007).

Additional cumulative effects that would be harmful to these owls include destruction of private rangelands and prairies through plowing, heavy grazing that leaves little residual cover, and land development for purposes other than habitat preservation or grazing.

DETERMINATION OF EFFECT AND RATIONALE FOR THE SHORT-EARED OWL

The biological determination for the short-eared owl under Alternatives 1, 3, 4, and 5 is: *"may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing."*

Rationale: In all of the above alternatives, significant application of zinc phosphide treated oats could occur to keep prairie dog colonies within an acceptable range of acres and to prevent encroachment on private land. The ranges of acres that will be allowed in order to meet the stated objectives are listed in Table N-2.

Short-eared owls are likely to be present in some areas when rodenticide is applied. The owls do not eat grain so they would not be at risk of primary poisoning. The possibility of secondary poisoning is remote.

Prairie dog colonies provide short-eared owl prey. However, the short-eared owl's preferred habitat is high/dense cover for nesting and litter for vole habitat, the owl's preferred prey. It is unknown if there is a best possible ratio of prairie dog colony to high structure habitat that would create optimum short-eared

owl habitat. Assumptions made are the structure objectives in the LRMP would be adhered to, subsequently an increase in prairie dogs would not reduce the high structure habitat preferred by short-eared owl.

Alternative 2: (No Action) Current LRMP Direction

This alternative was evaluated in the Biological Assessment and Evaluation for the Black-tailed Prairie Dog Conservation and Management on the Nebraska National Forest and Associated Units which made a decision regarding boundary management. The determination made in that document is brought forward for this species under Alternative 2. The determination is *"may adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing."*

Rationale: In Alternative 2 (no action), no poisoning will be administered within the IMZ except for public safety and health situations as described in the LRMP. Rodenticide use will continue in the boundary management zone as described in the LRMP Amendment 2. The acreage figures displayed in Table N-2 represent a 25% expansion rate for the next 10 years. The minimum acres are the current acres for each GA. The increase in prairie dog acreages could result in a beneficial impact to short-eared owls under this alternative.

Swift fox *Vulpes velox*

Distribution and Status. The swift fox is native to the short grass and mixed grass prairie in the Great Plains region of North America. It was considered common or abundant in much of its original range until the late 1800s to the early 1900s. From this period to the 1950s, the swift fox was thought to be extirpated in Kansas, Montana, and Canada, and there were no reported sightings in Oklahoma, Wyoming, South Dakota, North Dakota, and Nebraska (Allardyce and Sovada 2003). Beginning in the 1950s, swift fox numbers appeared to be recovering over much of their former range.

Habitat. This species inhabits open prairies, plains and shrubby desert areas. It is found in areas with gently rolling hills or undulating topography. Swift fox prefer short to midgrass prairies and loamy soils and utilize dens year around (Harrison and Whitaker-Hoagland 2003). Soil type might be a better predictor of swift fox habitat suitability than vegetation type (Harrison and Whitaker-Hoagland 2003). Swift fox select loamy soils over clayey soils for den sites. This species is an opportunistic feeder on small mammals, birds, insects, berries, vegetation and carrion (Ashton and Dowd 1991). Predation by coyotes appears to be the most common mortality factor for swift fox (Allardyce and Sovada 2003) (Stephens and Anderson 2005). The key factor in swift fox management is to provide suitable habitat where the swift fox can obtain prey while avoiding predation.

Uresk and Sharps (1986) found swift fox in close association with prairie dog colonies in Shannon County, South Dakota. Other studies have found swift fox to thrive without prairie dog colonies (Allardyce and Sovada 2003). Size of prairie dog complexes could be very important in determining whether or not swift fox will use prairie dog colonies. Prairie dog colonies, because of the abundant prey, attract many predators. There is a possibility (although not documented in the literature) that swift fox could actually avoid the small prairie dog colonies because the abundance of predators could outweigh the benefits of an increased forage base. Allardyce and Sovada (2003) state "It is apparent from the studies done by the Swift Fox Conservation Team and the individual states during the past 3 to 5 years that swift fox populations in today's altered landscape are not necessarily dependent on the availability of prairie dog colonies and complexes." There is one prairie dog colony near the swift fox population that is on the Buffalo Gap National Grassland near Ardmore, South Dakota. None of the bait stations within 1.5 miles of this prairie dog colony had swift fox tracks in them during the 2003-4 survey (Hetlet 1991-2006).

ESA Status and Other Organizational Rankings

ESA Status	Conservation Status[1]
ESA (no status)	G3, N3; Nebraska – S2; South Dakota – S1; Forest Service - Sensitive

[1] Definitions - http://www.natureserve.org/explorer/nsranks.htm

Recovery and Conservation Planning. Conservation assessment and conservation strategy for the swift fox was prepared in 1997 (Kahn et al. 1997). The goal of the strategy is to maintain or restore swift fox populations within each state to provide spatial, genetic, demographic structure of the United States swift fox population throughout at least 50 percent of the suitable habitat available, to ensure long term species viability and to provide species management flexibility. Nebraska and South Dakota are included in the assessment.

Existing Condition. Swift fox have been located on all three of the national grasslands. The swift fox that have been sighted on the Fort Pierre National Grassland are a result of a reintroduction effort initiated by the Turner Endangered Species Fund (TESF) on the Bad River Ranch west of Fort Pierre National Grassland. The swift fox that have been sighted on the east half of the Buffalo Gap National Grassland are a result of a reintroduction effort initiated by the Badlands National Park. On the Oglala National Grassland there have been incidental sightings of swift fox, but there is no evidence of a resident population.

Swift fox populations have blinked in and out on different areas of the west half of the Buffalo Gap National Grassland (Hetlet 1991-2006) (Hodorff 2004). The only population that has persisted is located near Ardmore, South Dakota. The area is identified in the LRMP as 3.64 Special Plant and Wildlife Habitat: Swift Fox Management Area. This area is referred to as the Ardmore swift fox population.

Direct, Indirect, and Cumulative Effects. Swift fox are a year-round resident of the project area. They are in the area after October 1 (which is when the prairie dog colonies will be treated with rodenticide) and could be exposed to zinc phosphide treated grain. They are not a granivorous species, so direct consumption of the treated grain is not an issue. They are known to feed on carrion (Ashton and Dowd, 1991). Schitoskey (1975) reported that if kit fox (*Vulpes macrotis*) found surface kills that were the result of a rodenticide, there is little doubt that they would eat the carcasses or return them to the den to feed their young. This threat is lessened because most prairie dogs poisoned with zinc phosphide treated grains die inside their burrows (Tietjen 1976). Schitoskey (1975) used the desert kit fox (*Vulpes macrotis arsipus*) to determine effects of zinc phosphide. The LD_{50} for kit fox was 93 (62-140) mg/kg. When kit foxes were fed kangaroo rats (*Dipodomys ordii*) killed with zinc phosphide, there was no secondary poisoning. To put it into perspective, if a kangaroo rat swallowed or stuffed its cheeks with 1 g of the most concentrated zinc phosphide bait, it would theoretically contain 16.4 mg of the chemical. Kit foxes survived repeated feedings of rats dosed with about 29 times this amount of zinc phosphide (Schitoskey 1975). Secondary poisoning of swift fox while using zinc phosphide treated oats is not an issue.

Swift fox could be shot or injured by prairie dog shooters. The fact that swift fox is somewhat similar in appearance to a coyote pup (especially in the spring when the coyote pups are small), could increase the odds of a swift fox being killed or injured by a prairie dog shooter and unethical individuals may intentionally shoot at a swift fox while shooting prairie dogs. The fact that the swift is a protected species in the states of South Dakota and Nebraska and it is against the law to kill or harass them should be a deterrent. Also, swift fox are primarily nocturnal (Allardyce and Sovada 2003), diminishing the chance of a shooter seeing a swift fox. Gunfire and other hunter activities may scare swift fox locally, but this will not be a factor concerning their population viability on the area. Prairie dog shooting can leave lead fragments in prairie dog carcasses posing a potential risk to scavengers (Pauli and Buskirk 2007).

Because of abundant prey, swift fox might frequent prairie dog colonies for hunting. The prey base for swift fox would be reduced when prairie dog colonies are treated with a rodenticide. Swift fox are not dependent on prairie dogs or prairie dog colonies for their survival (Allardyce and Sovada 2003). The generalist foraging behavior of swift fox makes food an unlikely limiting factor (Allardyce and Sovada 2003).

If the prairie dogs are eliminated, the vegetation within the colony would revert from a short grass community to a mixed grass community. Swift fox can do well in short or mixed grass prairie (Allardyce and Sovada 2003, Uresk et al. 2003). It is doubtful that this shift in vegetation will have much effect.

Other activities in the area that may affect swift fox and swift fox habitat include but are not limited to, prairie dog shooting livestock grazing, animal damage control, trapping, and hunting.

DETERMINATION OF EFFECT AND RATIONALE FOR THE SWIFT FOX

The biological determination for the swift fox under Alternatives 1, 3, 4, and 5 is: *"may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing."*

Rationale: In all of the above alternatives, significant application of zinc phosphide treated oats could occur to keep prairie dog colonies within an acceptable range of acres and to prevent encroachment on private land. The ranges of acres that will be allowed in order to meet the stated objectives are listed in Table N-2.

Considering that swift fox will not eat the grain, and the threat of secondary poisoning is small, the direct effect of the increase in rodenticide use over the current program will be slight.

Because of abundant prey, swift fox might frequent prairie dog colonies for hunting. The reduction in acreage of prairie dog colonies could be detrimental to swift fox in the area because of the decreased prey base, but this can not be quantified. Swift fox are not dependent on prairie dogs or prairie dog colonies for their survival (Allardyce and Sovada 2003). Swift fox have been found to occupy habitat with or without prairie dogs. The generalist foraging behavior of swift fox makes food an unlikely limiting factor (Allardyce and Sovada 2003). Considering that the avoidance of large predators may be more important to swift fox survival than obtaining food, the increase in predators around a prairie dog colony may actually be a deterrent. It is not known if there is an optimum number of prairie dogs in an area to support swift fox: without this information it is impossible to determine which range of prairie dog acreages could either be advantages or detrimental to swift fox populations. Clearly more research needs to be done on swift fox / prairie dog relationships.

Alternative 2: (No Action) Current LRMP Direction

This alternative was evaluated in the Biological Assessment and Evaluation for the Black-tailed Prairie Dog Conservation and Management on the Nebraska National Forest and Associated Units which made a decision regarding boundary management. The determination made in that document is brought forward for this species under Alternative 2. The determination is *"may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing."*

Rationale: In Alternative 2 (no action), no poisoning will be administered within the IMZ except for public safety and health situations as described in the LRMP. Rodenticide use will continue in the boundary management zone as described in the LRMP Amendment 2. The acreage figures displayed in Table N-2 represent a 25% expansion rate for the next 10 years. The minimum acres are the current acres for each GA. The increase in prairie dog acreages could result in a beneficial impact to swift fox under this alternative.

Trumpeter swan *Cygnus buccinator*

Distribution and Status. This is North America's largest swan (Sibley 2000). Once, conservationists feared for its survival, but its status has improved, and the bird is no longer considered endangered (Bellrose 1976). This swan was introduced in 1960-1963 to LaCreek National Wildlife Refuge (Tallman et al. 2002), which is southeast of the Conata Basin of the Wall District, Buffalo Gap National Grassland. Most of the local population currently winters at LaCreek or further south into the Nebraska Sand Hills.

Habitat. Trumpeter swans live on shallow lakes and open marshes (Tallman et al. 2002). Their diet is composed of a variety marsh and aquatic plants, including tubers, stems, leaves, and seeds (Bellrose 1976).

ESA Status and Other Organizational Rankings

ESA Status	Conservation Status[1]
ESA (no status)	G4, N4B, N4N; Nebraska – S3; South Dakota – S3B, S3N; Forest Service - Sensitive

[1] Definitions - http://www.natureserve.org/explorer/nsranks.htm

Existing Conditions. Swans have nested and raised young on several ponds on Buffalo Gap National Grassland with one pair nesting numerous times in Conata Basin (NNF files). Nesting occurs mid-April through July, although some nesting activity has been known to occur as late as September (Tallman et al. 2002).

Direct, Indirect, and Cumulative Effects. Since swans eat seeds, they could be susceptible to primary poisoning. Ducks and geese have been poisoned by eating grain baits in agricultural fields (Tietjen 1976). Although prairie dog rodenticide is not applied till after this species nesting season, swans can still be in the area until pond freeze-up typically in November. The activities of a crew applying rodenticide would not adversely affect swans; in fact, human activity might deter swans from using the area where rodenticide is being applied.

Changes in vegetation structure due to increases or decreases in prairie dog acres probably would not affect trumpeter swans, since they utilize primarily wetland habitats.

Trumpeter swans could be shot or injured by prairie dog shooters, but this would be rare and deliberate, since it is unlikely to mistake a trumpeter swan for a prairie dog. It is always possible for an unethical prairie dog shooter to kill a swan. The fact that the trumpeter swan is a protected species and it is against the law to kill or harass them should also be a deterrent. There are very stiff penalties for killing or injuring a protected species, and this is well known. Concentrated prairie dog shooting near trumpeter swan nests might cause nest abandonment.

DETERMINATION OF EFFECT AND RATIONALE FOR THE TRUMPETER SWAN

All GAs located on the Buffalo Gap NG The biological determination for the trumpeter swan under Alternatives 1, 3, 4, and 5 is: *"may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing."*

Rationale: In all of the above alternatives, significant application of zinc phosphide treated oats could occur to keep prairie dog colonies within an acceptable range of acres and to prevent encroachment on private land. The ranges of acres that will be allowed in order to meet the stated objectives are listed in Table N-2.

Individual swans might eat rodenticide bait if it is spread around ponds that they are using. Changes in vegetation structure due to increases or decreases in prairie dog acres probably would not affect trumpeter swans, since wetlands are their primary habitats.

Alternative 2: (No Action) Current LRMP Direction

All GAs located on the Buffalo Gap NG. This alternative was evaluated in the Biological Assessment and Evaluation for the Black-tailed Prairie Dog Conservation and Management on the Nebraska National Forest and Associated Units which made a decision regarding boundary management. The determination made in that document is brought forward for this species under Alternative 2. The determination is *"may adversely impact individuals, but not likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing."*

Rationale: In Alternative 2 (no action), no poisoning will be administered within the IMZ except for public safety and health situations as described in the LRMP. Rodenticide use will continue in the boundary management zone as described in the LRMP Amendment 2. The acreage figures displayed in Table N-2 represent a 25% expansion rate for the next 10 years. The minimum acres are the current acres for each GA. The lack of rodenticide use could result in a *"no impact"* to trumpeter swans under this alternative.

SUMMARY OF DETERMINATIONS OF EFFECTS FOR SENSITIVE SPECIES

Table N-15. Summary sensitive species determinations.

	Alternative 1	Alternative 2 [1]	Alternative 3	Alternative 4	Alternative 5
Black-tailed prairie dog	MAII	MAII	LRLV	MAII	MAII
Ferruginous hawk	MAII	MAII	LRLV	MAII	MAII
Western burrowing owl	MAII	MAII	LRLV	MAII	MAII
Bald Eagle	MAII	MAII	MAII	MAII	MAII
Northern harrier	MAII	MAII	MAII	MAII	MAII
Long-billed curlew	MAII	MAII	MAII	MAII	MAII
Chestnut-collared longspur	MAII	MAII	MAII	MAII	MAII
Short-eared owl	MAII	MAII	MAII	MAII	MAII
Grasshopper sparrow	MAII	MAII	MAII	MAII	MAII
Greater prairie-chicken	MAII	MAII	MAII	MAII	MAII
Greater sage grouse	MAII	MAII	MAII	MAII	MAII
Swift fox	MAII	MAII	MAII	MAII	MAII
McCown's longspur	MAII	MAII	MAII	MAII	MAII
Mountain plover	MAII	MAII	MAII	MAII	MAII
Brewer's sparrow	MAII	MAII	MAII	MAII	MAII
Trumpeter swan	MAII	MAII	MAII	MAII	MAII
Regal fritillary butterfly	N/A	N/A	N/A	N/A	N/A

NI - No impact -- where no effect is expected
BI - Beneficial impact -- where effects are expected to be beneficial and no negative effects are expected to occur
MAII - May adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing -- where effects in the project area are not expected to be significant and the species and its habitat will remain well distributed.
LRLV - Likely to result in a loss of viability in the Planning Area, or in a trend toward federal listing -- where effects are expected to be detrimental and substantial, and the species and its habitat will not be maintained in sufficient numbers or distribution through time.

[1] This alternative was evaluated in the Biological Assessment and Evaluation for the Black-tailed Prairie Dog Conservation and Management on the Nebraska National Forest and Associated Units which made a decision regarding boundary management. The determination made in that document is brought forward for these species under Alternative 2.

VII. References

Abele, S.C., V.A. Saab, and E.O. Garton. 2004. Lewis's woodpecker (*Melanerpes lewis*): A technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http:// www.fs.fed.us/r2/projects/scp/assessments/lewisswoodpecker.pdf [Accessed Nov 2004].

Agnew, W., D.W. Uresk, and R.M. Hansen. 1983. Flora and fauna associated with prairie dog ecosystems. M.S. Thesis. Colorado State Univ., Fort Collins. 47pp.

Agnew, W., D.W. Uresk, and R.M. Hansen. 1986. Flora and fauna associated with prairie dog colonies and adjacent ungrazed mixed-grass prairie in western South Dakota. J. of Range Manage. 39:135-139.

Agnew, W., D.W. Uresk, and R.M. Hansen. 1988. Arthropod consumption by small mammals on prairie dog colonies and adjacent ungrazed mixed grass prairie in western South Dakota. Pages 81-87 In D. W. Uresk, G.L. Schenbeck, and R. Cefkin (technical editors) Eighth Great Plains wildlife damage control workshop proceedings. General technical Report RM-154, Rocky Mountain Forest and Range Experiment Station, USDA Forest Service, Fort Collins, CO.

Allardyce D. and M.A. Sovada. 2003. A review of the ecology, distribution, and status of swift foxes in the United States. Pages 3-18 in M. A. Sovada and L. Carbyn editors The Swift fox: Ecology and conservation of swift fox in a changing world. Canadian Plains Research Center. University of Regina. Regina, Saskatchewan Canada.

Allendorf, F.W. and N. Ryman. 2002. The role of genetics in population viability analysis. Pages 50-85 In S.R. Beissinger and D.R. McCullough, editors, Population viability analysis, University of Chicago Press, Chicago, Illinois, USA.

Andelt, W. F. 2006. Methods and economics of managing prairie dogs. Pages 129-138 in J. L. Hoogland editor. Conservation of the black-tailed prairie dog: saving North America's western grasslands. Island Press, Washington DC.

Anderson, E., S.C. Forrest, T.W. Clark, and L. Richardson. 1986. Paleobiology, biogeography, and systematics of the black-footed ferret, Mustela nigripes (Audubon and Bachman), 1851. Great Basin Naturalist 8:11-62.

Anderson, R.C. 1982. An evolutionary model summarizing the roles of fire, climate, and grazing animals in the origin and maintenance of grasslands: an end paper. Pages 297-308 In J.R. Estes, R.J. Tyrl, and Brunken (editors), Grasses and grasslands; systematics and ecology. University of Oklahoma Press, Norman, Oklahoma.

Anderson, T. (2005). *Oreohelix strigosa cooperi* (Cooper's Rocky Mountain Snail): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/coopersrockymountainsnail.pdf [March 28, 2007]

Apa A. D., D. W. Uresk, and R. L. Linder. 1991. Impacts of black-tailed prairie dog rodenticides on nontarget passerines. Great Basin Naturalist 51(4):301-309.

Apps, C.D. 1999. Space-Use, Diet, Demographics, and Topographic Associations of Lynx in the Southern Canadian Rocky Mountains: A Study. In: Ruggiero, L.F., Aubry, K.B., Buskirk, S.W., Koehler, G.M., Krebs, C.J., McKelvey, K.S., Squires, J.R. Ecology and conservation of lynx in the United States, pp 315-372. General Technical Report, Fort Collins, CO.

Ashton, D.E., and E.M. Dowd. 1991 Fragile legacy; endangered, threatened and rate animals of South Dakota. South Dakota Dept. of Game, Fish and Parks. Rep. 91-04. 150pp.

Baker, R. R. 1978. The evolutionary ecology of animal migration. Holmes and Meier, New York, New York, USA.

Barnes, A.M. 1993. A review of plague and its relevance to prairie dog populations and the black-footed ferret. In Proceedings of the Symposium on the Management of Prairie Dog Complexes for the Reintroduction of the Black-footed Ferret. U.S. Fish and Wildlife Service Biological Report 13. Pp. 28-37.

Beatty, B.L., W.F. Jennings, and R.C. Rawlinson (2004, April 1). *Schoenoplectus hallii* (Gray) S.G. Sm. (Hall's bulrush): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/schoenoplectushallii.pdf [January 24, 2007].

Bechard, M. J., and J. K. Schmutz. 1995. Ferruginous hawk *(Buteo regalis). in* Poole, A., And F. Gill, eds. The birds of North America. Academy of Natural Sciences and American Ornithological Union, Washington D.C.

Beecham, J.J. Jr., C.P. Collins, and T.D. Reynolds. (2007, February 12). Rocky Mountain Bighorn Sheep (*Ovis canadensis*): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/rockymountainbighornsheep.pdf [September 13, 2007].

Beissinger, S.R. and D.R. McCullough (editors). 2002. Population viability analysis. University of Chicago Press, Chicago, Illinois, USA.

Belak, J. R. 2001. Modeling the effects of habitat quality on black-tailed prairie dog habitat occupancy using spatially correlated data. M.S. Thesis, Colorado State University, Fort Collins, Colorado.

Bellrose, F. C. 1976. Ducks, geese, and swans of North America. Stackpole Books. Harrisburg, PA. 544pp.

Biggins, D.E., B.J. Miller, L.R. Hanebury, B. Oakleaf, A.H. Farmer, R. Crete, and A. Dood. 1993. A technique for evaluating black-footed ferret habitat. Pages 73-38 in J.L. Oldemeyer, D.E. Biggins, and B.J. Miller, editors. Proceedings of the Symposium on the Management of Prairie Dog Complexes for the Reintroduction of the Black-footed Ferret. U.S. Fish and Wildlife Service Biological Rep. No. 13.

Biggins, D.E., B.J. Miller, T.W, Clark, and R.P. Reading. 1997. Management of an endangered species: the black-footed ferret. In Principles of Conservation Biology. Edited by G.K. Meffe and C.R. Carroll. Pp. 420-436.

Biggins, D.E., J.L. Godbey, T.M. Livieri, M.R. Matchett, and B.D. Bibles. 2006. Post-release movements and survival of adult and young black-footed ferrets. In Recovery of the Black-footed Ferret: Progress and Continuing Challenges. Edited by J.E. Roelle, B.J. Miller, J.L. Godbey, and D.E. Biggins. US Geological Survey. Pp. 189-198.

Biggins, D.E. 2000. Predation on black-footed ferrets (*Mustela nigripes*) and Siberian polecats (*M. eversmannii*): conservation and evolutionary implications. Colorado State University. PhD Dissertation.

Biggins, D.E. 2005. The symposium in context. In Recovery of the Black-footed Ferret: Progress and Continuing Challenges. Edited by J.E. Roelle, B.J. Miller, J.L. Godbey, and D.E. Biggins. U.S. Geological Survey. Pp. 3-5.

Bolen, E.G. and W.L. Robinson. 2003. Wildlife ecology and management. Prentice-Hall, Upper Saddle River, New Jersey.

Boyce, M.S. 1992. Population viability analysis. Annual Review of Ecology and Systematics 23: 481-506.

Boyce, M.S. 1997. Population viability analysis: adaptive management for threatened and endangered species. Pages 226-236 In M.S. Boyce and A. Haney, editors, Ecosystem management. Yale University Press, New haven, Connecticut, USA.

Boyce, M.S. 2001. Population viability analysis: development, interpretation, and application. Pages 123-136 In T.M. Shenk and A.B. franklin, editors. Modelling in natural resource management. Island press, Washington, DC.

Boyce, M. S., B.M. Blanchard, R. R. Knight, and C. Servheen. 2001. Population viability for grizzly bears. International Association for Bear Research and Management Monograph Series Number 1.

Boyce, M. S., E.M. Kirsch, and C. Servheen. 2002. Bet-hedging applications for conservation. Journal of Biosciences 27:385-392.

Boyce, M. S. 1997. Population viability analysis: adaptive management for threatened and endangered species. Pages 226–236 in M. S. Boyce and A. Haney, eds. Ecosystem management: applications for sustainable forest and wildlife resources. Yale University Press, New Haven, Connecticut.

Breck, S.W., D.E. Biggins, T.M. Livieri, M.R. Matchett, and V. Kopcso. 2005. Does predator management enhance survival of reintroduced black-footed ferrets? In Recovery of the Black-footed Ferret: Progress and Continuing Challenges. Edited by J.E. Roelle, B.J. Miller, J.L. Godbey, and D.E. Biggins. U.S. Geological Survey. Pp. 203-209.

Brussard, P.F., and M.E. Gilpin. 1989. Demographic and genetic problems of small populations. Pages 37-48 In U.S. Seal, E.T. Thorne, M.A. Bogan, and S.H. Anderson, editors, Conservation biology and the black-footed ferret. Yale University Press, New Haven, Connecticut.

CFR. 2007. Code of Federal Regulation. GPO Access, Washington D. C. Available: http://www.gpoaccess.gov/cfr/index.html [March, 2007].

Caughley, G. 1994. Directions in conservation biology. Journal of Animal Ecology 63:215–244.

Caughley, G. and A.R.E. Sinclair. 1994. Wildlife ecology and management. Blackwell Scientific Publications, Cambridge, Massachusetts.

Central Nebraska Public Power and Irrigation District. 2004. Bald eagles in Nebraska [Online]. Available: http://www.cnppid.com/Ragle-viewing.htm [Accessed Dec 2, 2004].

Clark, R. J. 1975. A field study of the short-eared owl, *Asio flammeus* (Pontoppidan), in North America. Wildl. Monogr. 47. 67pp.

Clark, T.W. 1986. Technical introduction. In Great Basin Naturalist Memoirs No. 8 The Black-footed Ferret. S.L. Wood Editor. Brigham Young University. Pp. 8-10.

Clark, T.W., S.C. Forrest, L. Richardson, D.E. Casey, and T.M. Campbell III. 1986. Description and history of the Meeteetse black-footed ferret environment. Great Plains Naturalist 8:72-84.

Clark, Tim W. 1989. Conservation Biology of the Black-footed Ferret (*Mustela nigripes*). Wildlife Preservation Trust, Special Scientific Report No. 3. Philadelphia, Pennsylvania.

Cincotta, R. P. 1985. Habitat and dispersal of black-tailed prairie dogs in Badlands National Park. Ph.D Thesis, Colorado State University, Fort Collins, Colorado.

Clippinger, N.W. 1989. Habitat suitability index model: black-tailed prairie dog. U.S. Fish and Wildlife Service, Biol. Rep. 82(10). 21pp.

Collinge, S. K., W. C. Johnson, C. Ray, R. Matchett, J. Grensten, J. F. Cully, Jr., K. L. Gage, M. Y. Kosoy, J. E. Loye, and A. P. Martin. 2005. Landscape structure and plague occurrence in black-tailed prairie dogs on grasslands of the western USA. Landscape Ecology 20:941–955.

Collins, C.P. and T.D. Reynolds (2005, September 2). Ferruginous Hawk (*Buteo regalis*): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/ferruginoushawk.pdf [January 24, 2007].

Commission for Environmental Cooperation. 2005. Draft North American conservation action plan for the western burrowing owl *(Athene cunicularia hypugaea)*. Prepared by Burrowing Owl Technical Advisory Committee (Working Group) Geoff Holroyd (chair and editor) for Commission for Environmental Cooperation.

Conservation Breeding Specialist Group. 2004. Black-footed ferret population management planning workshop. Final Report. IUCN/SSC Conservation Breeding Specialist Group: Apple Valley, MN.

Cook, R.R., J-L.E. Cartron and P.J. Polechla, Jr. 2003. The importance of prairie dogs to nesting ferruginous hawks in grassland ecosystems. Wildlife Society Bulletin 31:1073-1082.

Cooper, J and L. Gabriel 2005. South Dakota black-tailed prairie dog conservation and management plan. [Online] South Dakota Game Fish and Parks. Available: http://www.sdgfp.info/Wildlife/hunting/Prairiedogfinalplan.pdf [January 30, 2007]

Coppock, D.L., J.K. Detling, J.E. Ellis, and M.I. Dyer. 1983a. Plant- herbivore interactions in North American mixed- grass prairie I. Effects of black –tailed prairie dogs on intraseasonal aboveground plant biomass and nutrient and plant species diversity. Oecolgia 56:1-9.

Coppock, D.L., J.E. Ellis, J.K. Detling and M.I. Dyer. 1983b. Plant- herbivore interactions in a North American mixed-grass prairie II. Responses of bison to modification of vegetation by prairie dogs. Oecologia 56: 10-15.

Cully, J.F. 1993. Plague, prairie dogs, and black-footed ferrets. In Proceedings of the Symposium on the Management of Prairie Dog Complexes for the Reintroduction of the Black-footed Ferret. U.S. Fish and Wildlife Service Biological Report 13. Pp. 38-49.

Cully, J. F., D. E. Biggins, and D. B. Seery. 2006. Conservation of prairie dogs in areas with plague. Pages 157-168 in J. L. Hoogland editor. Conservation of the black-tailed prairie dog: saving North America's western grasslands. Island Press, Washington DC.

Ewer. R.F. 1973. The carnivores. Cornell University Press, Ithaca, New York.

Extension Toxicology Network 1993. Zinc Phosphide. [Online] EXTOXNET. Available: http://pmep.cce.cornell.edu/profiles/extoxnet/pyrethrins-ziram/zinc-phosphide-ext.html [March 1, 2007]

Davies, J.M. 2005. Nesting ecology of Burrowing Owls on the Little Missouri National Grassland. M.Sc. thesis, St. Cloud State Univ., St. Cloud, MN U.S.A.

Dechant, J. A., M. L. Sondreal, D. H. Johnson, L. D. Igl, C. M. Goldade, A. L.Zimmerman, and B. R. Euliss. 2003a. Effects of management practices on grassland birds: American bittern. Northern Prairie Wildlife Research Center, Jamestown, ND. Northern Prairie Wildlife Research Center Home Page. http://www.npwrc.usgs.gov/resource/literatr/grasbird/ambi/ambi.htm (Version 12DEC2003).

Dechant, J. A., M. L. Sondreal, D. H. Johnson, L. D. Igl, C. M. Goldade, M. P. Nenneman, and B. R. Euliss. 2003b. Effects of management practices on grassland birds: long-billed curlew. Northern Prairie Wildlife Research Center, Jamestown, ND. Jamestown, ND: Northern Prairie Wildlife Research Center Home Page. http://www.npwrc.usgs.gov/resource/literatr/grasbird/noha/noha.htm (Version 12DEC2003).

Dechant, J. A., M. L. Sondreal, D. H. Johnson, L. D. Igl, C. M. Goldade, M. P. Nenneman, and B. R. Euliss. 2003c. Effects of management practices on grassland birds: chestnut collared longspur. Northern Prairie Wildlife Research Center, Jamestown, ND. Jamestown, ND: Northern Prairie Wildlife Research Center Home Page. http://www.npwrc.usgs.gov/resource/literatr/grasbird/noha/noha.htm (Version 12DEC2003).

Dechant, J. A., M. L. Sondreal, D. H. Johnson, L. D. Igl, C. M. Goldade, P. A. Rabie, and B. R. Euliss. 2003d. Effects of management practices on grassland birds: McCown's longspur. Northern Prairie Wildlife Research Center, Jamestown, ND. Northern Prairie Wildlife Research Center Online. http://www.npwrc.usgs.gov/resource/literatr/grasbird/mclo/mclo.htm (Version 12AUG2004).

Dechant, J. A., M. L. Sondreal, D. H. Johnson, L. D. Igl, C. M. Goldade, M. P. Nenneman, and B. R. Euliss. 2003e. Effects of management practices on grassland birds: short-eared owl. Northern Prairie Wildlife Research Center, Jamestown, ND. Jamestown, ND: Northern Prairie Wildlife Research Center Home Page. http://www.npwrc.usgs.gov/resource/literatr/grasbird/noha/noha.htm (Version 12DEC2003).

Dechant, J. A., M. L. Sondreal, D. H. Johnson, L. D. Igl, C. M. Goldade, M. P. Nenneman, and B. R. Euliss. 2003f. Effects of management practices on grassland birds: mountain plover. Northern Prairie Wildlife Research Center, Jamestown, ND. Jamestown, ND: Northern Prairie Wildlife Research Center Home Page. http://www.npwrc.usgs.gov/resource/literatr/grasbird/noha/noha.htm (Version 12DEC2003).

Dechant, J. A., M. L. Sondreal, D. H. Johnson, L. D. Igl, C. M. Goldade, M. P. Nenneman, and B. R. Euliss. 2003g. Effects of management practices on grassland birds: northern harrier. Northern Prairie Wildlife Research Center, Jamestown, ND. Jamestown, ND: Northern Prairie Wildlife Research Center Home Page. http://www.npwrc.usgs.gov/resource/literatr/grasbird/noha/noha.htm (Version 12DEC2003).

Dechant, J. A., M. L. Sondreal, D. H. Johnson, L. D. Igl, C. M. Goldade, M. P. Nenneman, and B. R. Euliss. 2003h. Effects of management practices on grassland birds: grasshopper sparrow. Northern Prairie Wildlife Research Center, Jamestown, ND. Jamestown, ND: Northern Prairie Wildlife Research Center Home Page. http://www.npwrc.usgs.gov/resource/literatr/grasbird/noha/noha.htm (Version 12DEC2003).

Decker, K., D.R. Culver, and D.G. Anderson. (2006, February 6). *Eriophorum gracile* W. D. J. Koch (slender cottongrass): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/eriophorumgracile.pdf [January 24, 2007].

DeGraaf, R. M., V. E. Scott, R. H. Hamre, L. Ernst, and S. H. Anderson. 1991. Forest and rangeland birds of the United States - Natural History and Habitat Use. In: USDA Forest Service, Agriculture Handbook 688pp.

Deisch, M.S., D.W. Uresk, and R.L. Linder. 1990. Effects of prairie dog rodenticides on deer mice in western South Dakota. Great Basin Naturalist 50:347-353.

Derner, J.D., J.K. Detling, and M.F. Antolin. 2006. Are livestock weight gains affected by black-tailed prairie dogs? Frontiers in Ecology and Environment 4(9): 459–464.

Detling, J. K. 2006. Do prairie dogs compete with livestock? Pages 65-88 in J. L. Hoogland editor. Conservation of the black-tailed prairie dog: saving North America's western grasslands. Island Press, Washington DC.

Desmond, M.J., J.A. Savidge, and K.M. Eskridge. 2000. Correlations between Burrowing Owl and black-tailed prairie dog declines: a 7-year analysis. *J. Wildl.Manage*. 64:1067–1075.

Dinsmore, S.J. 2003. Mountain plover (*Charadrius montanus*): A technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/mountainplover.pdf [Accessed Dec 2004].

Duebbert, H. F. and J. T. Lokemoen. 1977. Upland nesting of American bitterns, marsh hawks, and short-eared owls. Prairie Naturalist 9:33-40.

Ducey, J.E. 1988. Nebraska birds breeding status and distribution. Simmons and Boardman Books. Omaha, NE. 148pp.

Ekstein, R.T. 1999. Local and landscape factors affecting nest site selection and nest success of Burrowing Owls in western Nebraska. M.Sc. thesis, Univ. of Nebraska, Lincoln, NE U.S.A.

Eng, R. L., J. E. Toepfer, and J. A. Newell. Management of livestock to improve and maintain prairie chicken habitat on the Sheyenne National Grasslands in Bjugstad, A. J., tech. coord. 1988. Prairie chickens on the Sheyenne National Grassland. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, General Technical Report RM-159. 73 pp.

Ernst, A.E., A.L. Clark, and D.R. Gober. 2005. A habitat-based technique to allocate black-footed ferret recovery among jurisdictional entities. In Recovery of the Black-footed Ferret: Progress and Continuing Challenges. Edited by J.E. Roelle, B.J. Miller, J.L. Godbey, and D.E. Biggins. US Geological Survey. Pp. 89-95.

Fagerstone, K.A. and D.E. Biggins. 1986. Comparison of capture-recapture and visual count indices of prairie dog densities in black-footed ferret habitat. In Great Basin Naturalist Memoirs No. 8 The Black-footed Ferret. S.L. Wood Editor. Brigham Young University. Pp. 94-98.

Fagerstone, K.A. and C.A. Ramey. 1996. Rodents and lagomorphs. Pages 83-132 In P.R. Krausman, editor, Rangeland Wildlife. The Society for Range Management, Denver, Colorado.

Forrest, S.C., T.W. Clark, L. Richardson, and T.M. Campbell III. 1985. Black-footed ferret habitat: some management and reintroduction considerations. Wyoming BLM Wildlife Technical Bulletin No. 2.

Forrest, S.C. and J.C. Luchsinger. 2006. Past and current chemical control of prairie dogs. Pages 115-128 In J.L. Hoogland, editor, Conservation of the black-tailed prairie dog. Island Press, Washington, DC.

Frankham, R.J., J.D. Ballou, and D.A. Briscoe. 2002. Introduction to conservation genetics. Cambridge University Press, Cambridge, United Kingdom.

Frankham, R.J., J.D. Ballou, and D.A. Briscoe. 2004. A primer of conservation genetics. Cambridge University Press, Cambridge, United Kingdom.

Fredrickson, L. 1996. The greater prairie chicken. South Dakota Cons. Digest 63(5):11-12.

Fritcher, S. C. 1998. Bird and small mammal populations in relation to seral stage of mixed-grass prairie, Fort Pierre National Grassland, South Dakota. M.S. Thesis, South Dakota State Univ., Brookings. 128pp.

Gage, E. and D.J. Cooper. (2006, June 2). *Carex diandra* Schrank (lesser panicled sedge): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/carexdiandra.pdf [January 24, 2007].

Gage, K.L. and M.Y. Kosoy. 2006. Recent trends in plague ecology. In Recovery of the Black-footed Ferret: Progress and Continuing Challenges. Edited by J.E. Roelle, B.J. Miller, J.L. Godbey, and D.E. Biggins. US Geological Survey. Pp. 213-231.

Gaggiotti, O.E. and I. Hanski. 2004. Mechanisms of population extinction. Pages 337-366 In I. Hanski and O.E. Gaggiotti, editors, Ecology, genetics, and evolution of metapopulations. Academic Press, New York.

Garelle, D., P. Marinari, and C. Lynch. 2006. Black-footed ferret species survival plan. American Zoo and Aquarium Association Population Management Center.

Gigliotti, L.M. 2000. Prairie dog shooting in South Dakota. South Dakota Game, Fish and Parks, Pierre, South Dakota.

Gilpin, M.E., and M.E. Soulé. 1986. Minimum viable populations: processes of species extinction. Pages 19 – 34 in: Soulé, M.E. (ed.). Conservation Biology: The Science of Scarcity and Diversity. Sunderland, MA: Sinauer Associates.

Godbey, J.L., D.E. Biggins, and D. Garrelle. 2006. Exposure of captive black-footed ferrets to plague and implications for species recovery. In Recovery of the Black-footed Ferret: Progress and Continuing Challenges. Edited by J.E. Roelle, B.J. Miller, J.L. Godbey, and D.E. Biggins. US Geological Survey. Pp. 233-237.

Graupman, K., R. A. Peterson, and N. R. Whitney, compilers. 1991. Birds of theBuffalo Gap National Grassland, field checklist. USDA Forest Service. Chadron NE.

Griebel, R. L. 2000. Ecological and physiological factors affecting nesting success of burrowing owls in Buffalo Gap National Grassland. M.S. Thesis, University of Nebraska, Lincoln.

Griebel, R.G., and J.A. Savidge. 2007. Factors influencing burrowing owl reproductive performance in contiguous shortgrass prairie. Journal of Raptor Research 41(3):212-221.

Groves, C.R., and T.W. Clark. 1986. Determining minimum population size for recovery of the black-footed ferret. Great Basin Naturalist Memoirs 8:150-159.

Gruver, J.C. and D.A. Keinath (2006, October 25). Townsend's Big-eared Bat (*Corynorhinus townsendii*): a technicalconservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/townsendsbigearedbat.pdf [January 24, 2007].

Hanebury, L.R. and D.E. Biggins. 2006. A history of searches for black-footed ferrets. Pages 47-65 In J.E. Roelle, B.J. Miller, J.L. Godbey, and D.E. Biggins, editors, Recovery of the black-footed ferret: progress and continuing challenges. U.S. Geological Survey Scientific Investigations Report 2005-5293.

Hanski, I. 1994a. A practical model of metapopulation dynamics. Journal of Animal Ecology 63:151-162

Hanski, I. 1994b. Patch-occupancy dynamics in fragmented landscapes. Trends in Ecology and Evolution 9:131-135.

Hanski, I. 1999b. Metapopulation ecology. Oxford University Press, New York.

Hanski, I. 1997. Metapopulation dynamics: from concepts and observations to predictive models. Pages 69-91 *in* I. Hanski, and M. E. Gilpin, eds. Metapopulation biology: ecology, genetics and evolution. Academic Press, San Diego, CA.

Hanson, D.A., H.B. Britten, M. Restani, and L.R. Washburn. 2007. High prevalence of *Yersinia pestis* in black-tailed prairie dog colonies during an apparent enzootic phase of sylvatic plague. Conservation Genetics 8:789–795.

Harris, R.B., T.W. Clark, and M.L. Shaffer. 1989. Extinction probabilities for isolated black-footed ferret populations. Pages 69-82 In U.S. Seal, E.T. Thorne, M.A. Bogan, and S.H. Anderson, editors, Conservation biology and the black-footed ferret. Yale University Press, New Haven, Connecticut.

Harrison R. L. and J. Whitaker-Hoagland. 2003. A literature review of swift fox habitat and den selection. Pages 79-89 in M. A. Sovada and L. Carbyn editors. The Swift fox: Ecology and conservation of swift fox in a changing world. Canadian Plains Research Center. University of Regina. Regina, Saskatchewan Canada.

Hetlet, L. A. 1991-2006. Swift fox surveys. Final Reports to USDA Forest Service, Fall River Ranger District. Hot Springs SD.

Hetlet, L. A. 1994-2006. Bald eagle surveys. Final Reports to USDA Forest Service, Fall River Ranger District. Hot Springs SD.

Higgins, K.F., E. Dowd Stukel, J.M. Goulet, and D.C. Backlund. 2000. Wild mammals of South Dakota. South Dakota Dept.of Game, Fish and Parks. 278pp.

Hillman, C.N. 1968. Field observations of black-footed ferrets in South Dakota. Transactions of the North American Wildlife and Natural Resources Conference 33:433-443.

Hillman, C.N. and R.L. Linder. 1973. The black-footed ferret. Pages 10-23 In R.L. Linder and C.N. Linder (editors). Proceedings of the black-footed ferret and prairie dog workshop. South Dakota State University, Brookings, South Dakota.

Hillman, C.N., R.L. Linder, and R.B. Dahlgren. 1979. Prairie dog distribution in areas inhabited by black-footed ferrets. American Midland naturalist 102:185-187.

Hillman, C.N. and T.W. Clark. 1980. Mustela nigripes. In Mammalian Species No. 126. The American Society of Mammalogists.

Hodorff, R. A. 2004. Swift fox report and implementation strategy - Fall River Ranger District Buffalo Gap National Grassland. Final Report to U. S. Forest Service, Fall River Ranger District. Hot Springs SD.

Hodorff, R. A. 2005. Sage Grouse Habitat. Final Report 03-CS-11020700-014 MS to South Dakota Game Fish and Parks. Fall River Ranger District. Hot Springs SD.

Holechek, J.L., R.D. Pieper, and C.H. Herbel. 2004. Range management: principles and practices. Pearson Education, Upper Saddle River, New Jersey.

Holmes, E.E. and B.X. Semmens. 2004. Viability analysis for endangered metapopulations: a diffusion approximation approach. Pages 565-597 In I. Hanski and O.E. Gaggiotti, editors, Ecology, genetics, and evolution of metapopulations. Elsevier Academic Press, Burlington, Massachusetts.

Holmes, J.A. and M.J. Johnson 2005. Brewer's sparrow (Spizella breweri): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/brewerssparrow.pdf [Accessed Jan 2005].

Holroyd, G. L., R. Rodriguez-Estrella, S. R. Sheffield. 2001. Conservation of the burrowing owl in western North America: issues, challenges, and recommendations. J. Raptor Res. 35(4):399-407.

Holsinger, K.E. 2000. Demography and extinction in small populations. Pages 55-74 In A. Young and G. Clark, editors, Genetics, demography, and the viability of fragmented populations. Cambridge University Press, Cambridge, United Kingdom.

Holt, D. W., and S. M. Leasure. 1993. Short-eared owl *(Asio flammeus). in* Poole, A., and F. Gill, eds. The birds of North America. Acad. of Nat. Sci., Phil., PA, and American Ornithological Union, Washington D.C.

Hooge, P. N., B. Eichenlaub, and E. Solomon. 1999. The animal movement program. Alaska Biological Science Center, U.S. Geological Survey, Anchorage, Alaska, USA.

Hoogland, J.L., 1995. The black-tailed prairie dog, social life of a burrowing mammal. The University of Chicago Press, Chicago 60637, The University of Chicago Press, Ltd., London. 557pp.

Howard, J, R.M. Santymire, P.E. Marinari, J.S. Kreeger, L. Williamson, and E.E. Wildt. 2006. Use of reproductive technology for black-footed ferret recovery. Pages 28-36 In J.E. Roelle, B.J. Miller, J.L. Godbey, and D.E. Biggins, editors, Recovery of the Black-footed Ferret: Progress and Continuing Challenges. U.S. Geological Survey Scientific Investigations Report 2005-5293.

Hutchins, M., R.J. Wiese, and J. Bowdoin. 1996. Black-footed ferret recovery program analysis and action plan. American Zoo and Aquarium Association.

IUCN. 1996. 1996 IUCN red list of threatened animals. IUCN, Gland, Switzerland.

Jasikoff, T.M. 1982. Habitat suitability index models: ferruginous hawk. U.S. Fish and Wildlife Service. FWS/OBS-82/10.10 18pp.

Johnsgard, P.A. 1979. Birds of the Great Plains, breeding species and their distribution. University of Nebraska Press. Lincoln 539pp.

Johnsgard, P. A. 1983. Grouse of the world. Univ. Nebr. Press., Lincoln. 413pp.

Johnsgard, P. A. 1990. Hawks, owls, and falcons of North America. Smithsonian Inst. Press. Washington, D. C. 403pp.

Johnson, A.S., Anderson, S.H. 2002. Conservation assessment for the western burrowing owl in the Black Hills National Forest, South Dakota and Wyoming. Wyoming Cooperative Fish and Wildlife Research Unit, University of Wyoming. [Online]. Available: http://www.fs.fed.us/r2/blackhills/projects/planning/assessments/burrowing_owl.pdf [Accessed Jan 2005]

Jones, J.K., D.M. Armstrong, R.S. Hoffmann and C. Jones. 1983. Mammals of the Northern Great Plains. University of Nebraska Press, Lincoln. 379pp.

Joslin, G. and H. Youmans, coordinators. 1999. Effects of recreation on Rocky Mountain wildlife: a review for Montana. Committee of Effects of Recreation on Wildlife, Montana Chapter of The Wildlife Society. 307pp.

Kahn, R., L. Fox, P. Horner, B. Giddings, and C. Roy. 1997. Conservation assessment and conservation strategy for swift fox in the United States. Division of Wildlife. Denver CO. 54 pp.

Kantrud, H. A. and K. F. Higgins. 1992. Nest and nest site characteristics of some ground-nesting, non-passerine birds of northern grasslands. Prairie Nat. 24:67-84.

Keinath, D.A. 2004. Fringed Myotis (*Myotis thysanodes*): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/fringedmyotis.pdf [Accessed Nov 2004].

Kennedy, P.L. 2003. Northern Goshawk (*Accipiter gentiles atricapillus*): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/northerngoshawk.pdf [Accessed Nov 2004].

Kilpatrick, C.W., S.C. Forrest, and T.W. Clark. 1986. Estimating genetic variation in the black-footed ferret – a first attempt. Pages 145-149 In S.L. Wood, editor, The Black-footed Ferret. Great Basin Naturalist Memoirs No. 8 .

Klute, D. S., L. W. Ayers, M. T. Green, W. H. Howe, S. L. Jones, J. A. Shaffer, S. R. Sheffield, and T. S. Zimmerman. 2003. Status assessment and conservation plan for the western burrowing owl in the United States. U.S. Fish and Wildlife Service, Denver.

Knowles, C.J. 1982. Habitat affinity, populations and control of black-tailed prairie dogs on the Charles M. Russell National Wildlife Refuge. Ph.D. Dissertation. Univ. of Montana, Missoula. 171pp.

Knowles, C.J. 1986. Population recovery of black-tailed prairie dogs following control with zinc phosphide. J. of Range Manage. 39(3):249-250.

Knowles, C. J. 1987. An evaluation of shooting and habitat alteration for control of black-tailed prairie dogs. Pages 53-56 In D. W. Uresk, G.L. Schenbeck, and R. Cefkin (technical editors) Eighth Great Plains wildlife damage control workshop proceedings. General technical Report RM-154, Rocky Mountain Forest and Range Experiment Station, USDA Forest Service, Fort Collins, CO.

Knowles, C.J. 2000. Black-tailed Prairie Dog Population Viability Assessment for North Dakota. FaunaWest Wildlife Consultants. Prepared for the North Dakota Game and Fish, 100 North Bismarck Expressway, Bismarck, ND 58501-5095. December 14, 2000.

Knowles, C.J., C.J. Stoner S. P. Gieb. 1982. Selective use of black-tailed prairie dog towns by mountain plovers. Condor 84:71-74.

Kotliar, N.B., B.W. Baker, A.D. Whicker, and G. Plumb. 1999. A critical review of assumptions about the prairie dog as a keystone species. Environmental Management 24:177-192.

Kotliar, N.B. 2000. Application of the new keystone-concept to prairie dogs: How well does it work? Conservation Biology 14:1715-1721.

Kotliar, N.B., B.J. Miller, R.P. Reading, and T.W. Clark. 2006. The prairie dog as a keystone species. Pages 53-64 In J.L. Hoogland, editor, Conservation of the black-tailed prairie dog. Island Press, Washington, DC.

Kuchler, A.W. 1964. Potential Natural Vegetation of the Conterminous United States, American Geographical Society, Special Publication No. 36.

Lacy, R.C. 2000. Structure of the VORTEX simulation model for population viability analysis. Ecological Bulletins 48:191-203.

Ladyman, J.A.R. (2006a). *Astragalus barrii* Barneby (Barr's milkvetch): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/astragalusbarrii.pdf [January 24, 2007].

Ladyman, J.A.R. (2006b). *Eriogonum visheri* A. Nelson (Visher's buckwheat): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/eriogonumvisheri.pdf [January 24, 2007].

Lamb, B.L., R. P. Reading, and W. F. Andelt. 2006. Attitudes and perceptions about prairie dogs. Pages 108-114 in J. L. Hoogland editor. Conservation of the black-tailed prairie dog: saving North America's western grasslands. Island Press, Washington DC.

Lande, R. 1995. Mutation and Conservation. Pages 782-791 In Conservation Biology, Vol. 9 (4) August 1995.

Landes, R. 2002. Incorporating stochasticity in population viability analysis. Pages 18-40 In S.R. Beissinger and D.R. McCullough, editors, Population viability analysis, University of Chicago Press, Chicago, Illinois, USA.

Lebreton, J.-D. and J. Clobert. 1991. Bird population dynamics, management, and conservation: the role of mathematical modelling. Pages 105-125 In C.M. Perrins, J.-D. Lebreton, and G.J.M. Hirons, editors. Bird population studies: relevance to conservation and management. Oxford University Press, Oxford, United Kingdom.

Leitzell, T.L. 1986. Species protection and management decisions in an uncertain world. Pages 243-254 In B.G. Norton, editor, The preservation of species. Princeton University Press, Princeton, New Jersey.

Lewis, J.C. 1995. Whooping crane (*Grus americana) in* The birds of North America, No. 153 (A. Poole and F. Gill, eds.). The Acad. of Nat. Sci., Philadelphia, and The American Ornithological Union, Washington D.C.

Livieri, T.L. 2006. Ten-Year History of the Conata Basin Black-Footed Ferret Population: 1996-2005. Report to U.S. Forest Service, Prairie Wildlife Research, Fort Collins, Colorado.

Livieri, T.L. 2007. Estimates of black-footed ferret population viability and spatial requirements. Final report to U.S. Forest Service, Prairie Wildlife Research, Fort Collins, Colorado.

Livieri, T.M. and W. Perry. 2005. Effects analysis of black-tailed prairie dog reduction on black-footed ferret populations in Conata Basin. Unpublished report, Wall, South Dakota.

Lockhart, J.M., E.T. Thorne, and D.R. Gober. 2006. A historical perspective on recovery of the black-footed ferret and the biological and political challenges affecting its future. In Recovery of the Black-footed Ferret: Progress and Continuing Challenges. Edited by J.E. Roelle, B.J. Miller, J.L. Godbey, and D.E. Biggins. U.S. Geological Survey. Pp. 6-19.

Luce, R. J. 2001. An umbrella, multi-state approach for the conservation and management of the black-tailed prairie dog, *Cynomys Ludovicianus*, in the United States – an addendum to the Black-tailed Prairie Dog Conservation Assessment and Strategy, November 3, 1999.

Luce, R. J. 2003. A multi-state conservation plan for the black-tailed prairie dog, *Cynomys Ludovicianus*, in the United States – an addendum to the Black-tailed Prairie Dog Conservation Assessment and Strategy, November 3, 1999.

Luce, R.J. 2006. Areas where habitat characteristics could be evaluated to identify potential black-footed ferret reintroduction sites and develop conservation partnerships. In Recovery of the Black-footed Ferret: Progress and Continuing Challenges. Edited by J.E. Roelle, B.J. Miller, J.L. Godbey, and D.E. Biggins. U.S. Geological Survey. Pp. 69-88.

Ludwig, D. and C.J. Walters. 2002. Fitting population viability analysis into adaptive management. Pages 511-520 In S.R. Beissinger and D.R. McCullough, editors, Population viability analysis, University of Chicago Press, Chicago, Illinois, USA.

MacArthur, R.H. and E.O. Wilson. 1967. The theory of island biogeography. Princeton University Press, Princeton, New Jersey.

Macdonald D. 1983. The ecology of carnivore social behavior. Nature 301: 384–397.

MacDonald D.W. 1981. Resource dispersion and the social organization of the red fox (Vulpes vulpes). In: Proceedings of the Worldwide Furbearer Conference (eds J.A. Chapman and D. Pursely) pp. 918–49. Frostburg, Maryland.

McDonald, D., N.M. Korfanta, and S. J. Lantz. 2004. The burrowing owl (*Athene cunicularia*): A technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/burrowingowl.pdf [Accessed Jan 2005]

MacWhirter, R. B., and K. L. Bildstein. 1996. Northern harrier *(Circus cyaneus)* in Poole, A., and F. Gill, eds. The birds of North America. Acad. of Nat. Sci., Phil., PA, and American Ornithological Union, Washington D.C.

Maehr, D.S., R.C. Lacy, E.D. Land, O.L. Bass, and T.S. Hoctor. 2002. Evolution of population viability assessments for the Florida panther: a multiperspective approach. Pages 284-311 In S.R. Beissinger and D.R. McCullough, editors, Population viability analysis, University of Chicago Press, Chicago, Illinois, USA.

Magle, S. 2003. Black-tailed prairie dog (Cynomys ludovicianus) response to human intrusion and urban development in the Colorado Front Range. M.S. Thesis, University of Wisconsin, Madison, Wisconsin.

Manes, R. 2006. Does the prairie dog merit protection via the Endangered Species Act. Pages 169-183 In J.L. Hoogland, editor, Conservation of the black-tailed prairie dog. Island Press, Washington, DC.

Marinari, P.E. and J.S. Kreeger. 2006. An adaptive management approach for black-footed ferrets in captivity. In Recovery of the Black-footed Ferret: Progress and Continuing Challenges. Edited by J.E. Roelle, B.J. Miller, J.L. Godbey, and D.E. Biggins. U.S. Geological Survey. Pp 23-27.

Marrone, G. 1992. Regal Fritillary *(Speyeria idalia)*. Prairie Pothole Joint Venture of theNorth American Waterfowl Management Plan.

Mergen, D.E. (2006, July 17). *Cypripedium parviflorum* Salisb. (lesser yellow lady's slipper): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/cypripediumparviflorum.pdf [January 24, 2007].

Merriam, C.H. 1902. The prairie dog of the Great Plains. Pages 257-270 in USDA Yearbook.

Miller, B., R.P. Reading, and S. Forrest. 1996. Prairie night. Smithsonian Institution Press, Washington, DC.

Miller, B.J., R.P. Reading, D.E. Biggins, J.K. Detling, S.C. Forrest, J.L. Hoogland, J. Javersak, S.D. Miller, J. Proctor, J. Truett, and D.W. Uresk. 2007. Prairie dogs: an ecological review and current biopolitics. Journal of Wildlife Management 71:2801-2810.

Mills L.S. and Knowlton F.F. 1991. Coyote space use in relation to prey abundance. Canadian Journal of Zoology 69:1516–1521.

Moffat, M. and N. McPhillips, compilers. 1993. Management for butterflies in the Northern Great Plains: A literature review and guidebook for land managers. U.S. Fish and Wildlife Service, Ecol. Ser., South Dakota State Office. Pierre. 14pp.

Mollhoff, W., J. 2001. The Nebraska breeding bird atlas. Nebraska Ornithologist's Union occasional paper No. 7. Nebraska technical series No 20. Nebraska Game and Parks Commission, Lincoln NE. 233pp.

Mollhoff, W., J. E. Ducey, and R. A. Peterson, compilers. 1993. Birds of the Nebraska Sandhills. Samuel R. McKelvie National Forest and Nebraska National Forest (Bessey Ranger District). Field Checklist. USDA Forest Service.

Morrison, M.L., B.G. Marcot, and R.W. Mannan. 2006. Wildlife-habitat relationships. Island Press, Washington, DC.

Moul, F. 2006. The national grasslands: a guide to America's undiscovered treasures. University of Nebraska press, Lincoln.

National Park Service. 2006a. Black-footed ferret reintroduction plan, draft environmental assessment. National Park Service, Wind Cave National Park, Hot Springs, South Dakota.

National Park Service. 2006b. Black-tailed prairie dog management plan, draft environmental assessment. National Park Service, Wind Cave National Park, Hot Springs, South Dakota.

Natural Resource Conservation Service – USDA 2006. National Range and Pasture Handbook –Chapter 4 Inventory and Monitoring Grazing Land Resources 600.0402 Evaluating and Rating Ecological Sites (b) Similarity Index . pages 4-17 and 4-18 Available: http://www.glti.nrcs.usda.gov/technical/publications/nrph.html [March 28, 2007].

National Park Service. 2007. Black-footed ferret reintroduction plan: finding of no significant impact. National Park Service, Wind Cave National Park, South Dakota.

NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life [web application]. . Arlington, VA http://www.natureserve.org/explorer. [March 2007].

Naugle, D.E. 2004. Black Tern (Chlidonias niger surinamensis): A technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/blacktern.pdf [Accessed Nov 2004].

Neid, S.L. (2006, May 15). *Utricularia minor* L. (lesser bladderwort): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/utriculariaminor.pdf [January 24,2007].

Northern Prairie Wildlife Research Center. 2004. Biological Resources [Online]. Available: http://www.npwrc.usgs.gov/resource/resource.htm [Dec , 2004].

Olendorff, R. R. 1993. Status, biology, and management of ferruginous hawks: a review. Raptor Res. And Tech. Asst. Cen., Spec. Rep. USDI Bureau of Land Management L.M., Boise, ID.

Ovaskainen, O. and I. Hanski. 2004. Metatpopulation dynamics in highly fragmented landscapes. Pages 73-103 In I. Hanski and O.E. Gaggiotti, editors, Ecology, genetics, and evolution of metapopulations. Academic Press, New York.

Pauli, J.N. 2005. Ecological studies of the black-tailed prairie dog (*Cynomys ludovicianus*): implications for biology and conservation. M.S. Thesis, University of Wyoming, Laramie, Wyoming. 78 pp.

Pauli, J.N. and S.W. Buskirk. 2007. Recreational shooting of prairie dogs: a portal for lead entering wildlife food chains. Journal of Wildlife Management 71:103-108.

Peterson, R. A., R. Riis, and R. V. Summerside, compilers. 1991. Birds of central South Dakota, including the Fort Pierre National Grassland. Field Checklist. USDA Forest Service.

Peterson, R. A., compiler. 1993. Birds of the Nebraska Pine Ridge. Nebraska National Forest (Pine Ridge Ranger District) and Oglala National Grassland. Field Checklist. USDA Forest Service.

Peterson, R. A. 1995. The South Dakota breeding bird atlas. S. D. Ornithologists' Union, Northern State Univ., Aberdeen. 276pp.

Pezzolesi, L.S.W. 1994. The western Burrowing Owl: increasing prairie dog abundance, foraging theory, and nest site fidelity. M.Sc. thesis, Texas Tech Univ., Lubbock, TX U.S.A.

Plumpton, D.L., and D.E. Anderson. 1997. Habitat use and time budgeting by wintering ferruginous hawks. Condor 99:888-893.

Powell, R. A. 1979. Mustelid spacing patterns: variations on a theme by *Mustela*. Zeitschrift fur Tierpsychologie 50:153-165.

Proctor, J., B. Haskins, and S.C. Forrest. 2006a. Focal areas for conservation of prairie dogs. Pages 232-247 In J.L. Hoogland, editor, Conservation of the black-tailed prairie dog. Island Press, Washington, DC.

Proctor, J., B. Haskins, and S.C. Forrest. 2006b. Identifying focal areas for conservation of black-footed ferrets and prairie dog associates. Pages 271-274 In J.E. Roelle, B.J. Miller, J.L. Godbey, and D.E. Biggins, editors, Recovery of the black-footed ferret: progress and continuing challenges. U.S. Geological Survey Scientific Investigations Report 2005-5293.

Prose, B. L. 1985. Habitat suitability index models: Greater prairie-chicken (multiple levels of resolution). U.S. Fish and Wildlife Service. Biol. Rep. 82(10.102). 33pp.

Rahel, F.J. and L.A. Thel. 2004. Sturgeon Chub (*Macrhybopsis gelida*): A technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/sturgeonchub.pdf [Accessed Nov 2004].

Ralls, K., S.R. Beissinger, and J. Fitts Cochrane. 2002. Guidelines for using population viability analysis in endangered species management. Pages 521-550 In S.R. Beissinger and D.R. McCullough, editors, Population viability analysis, University of Chicago Press, Chicago, Illinois, USA.

Restani, M. 2002. Nest site selection and productivity of Burrowing Owls breeding on the Little Missouri National Grassland. 2001 Annual Report. Prepared for Dakota Prairie Grasslands, USDA For. Serv., U.S.A.

Restani, M, L.R. Rau, and D.L. Flath. 2001. Nesting ecology of Burrowing Owls occupying black-tailed prairie dog towns in southeastern Montana. *J. Raptor Res.* 35:296–303.

Rice, L. A., and A. V. Carter. 1982. Evaluation of South Dakota grassland management practices as they affect prairie chicken populations. 1974-1978. P-R Proj. W-75-R-24. South Dakota Game, Fish and Parks Dept., Pierre. 25pp.

Rich, T.D. et al. 2004. Partners in flight North American landbird conservation plan. Cornell Lab of Ornithology. Ithaca, NY. 84pp.

Robb, L.A. and M.A. Schroeder. (2005, April 15). Greater Prairie-Chicken (*Tympanuchus cupido*): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/greaterprairiechicken.pdf [January 24, 2007].

Rocke, T.E., P. Nol, P.E. Marinari, J.S. Kreeger, S.R. Smith, G.P. Andrews, and A.W. Friedlander. 2006. Vaccination as a potential means to prevent plague in black-footed ferrets. In Recovery of the Black-footed Ferret: Progress and Continuing Challenges. Edited by J.E. Roelle, B.J. Miller, J.L. Godbey, and D.E. Biggins. U.S. Geological Survey. Pp 243-247.

Roelle J. E., B.J. Miller, J.L. Godbey, and D.E. Biggins 2006. Recovery of the Black-footed Ferret: Progress and Continuing Challenges. US Geological Survey. Reston, Virginia Pp. 288.

Rowland, M. M. 2004. Effects of management practices on grassland birds: greater sage-grouse. Northern Prairie Wildlife Research Center, Jamestown, ND. Northern Prairie Wildlife Research Center Online. http://www.npwrc.usgs.gov/resource/literatr/grasbird/grsg/grsg.htm (Version 12AUG2004).

Royer, R. A., and G. M. Marrone. 1992. Conservation status of the regal fritillary *(Speyeria idalia)* in North and South Dakota. U.S. Fish and Wildlife Service, Denver, CO. p. 22-31.

Saether, B. and S. Engen. 2002. Including uncertainties in population viability analysis using population prediction intervals. Pages 191-212 In S.R. Beissinger and D.R. McCullough, editors, Population viability analysis, University of Chicago Press, Chicago, Illinois, USA.

Samson, F. B. 1980. Island biogeography and the conservation of prairie birds. Proc. North Am. Prairie Conf. 7:293-305.

Sandell, M. 1989. The mating tactics and spacing patterns of solitary carnivores. Pages 164-182 *in* J. L. Gittleman, editor. Carnivore behavior, ecology, and evolution Volume 1. Cornell University Press, Ithaca, New York, USA.

Sauer, C.O. 1950. Grassland, climax, fire, and man. Journal of Range Management 3:16-22.

Sauer, J. R., J. E. Hines, and J. Fallon. 2007. The North American Breeding Bird Survey, Results and Analysis 1966 - 2006. Version 10.13.2007. *USGS Patuxent Wildlife Research Center*, Laurel, MD.

Schenbeck, G.L., and G. Mason. 1994. Summary of the 1990 and 1992 prairie dog hunter surveys on the Buffalo Gap National Grassland in the Conata Basin, South Dakota. Unpublished report. Nebraska National Forest, Chadron, NE.

Schenbeck, G.L., and G Mason, and C Loop. 1994. Aerial photograph inventory of black-tailed prairie dog colonies in the Conata Basin/Badlands area of South Dakota, Summer, 1993. Unpublished report. Nebraska National Forest, Chadron, NE.

Schitoskey F. 1975. Primary and secondary hazards of three rodenticides to kit fox.

J. Wildl. Manage. 39(2):416-418.

Schmutz, J. K., and D. J. Hungle. 1989. Population of ferruginous and Swainson's hawks increase in synchrony with ground squirrels. Can J. Zool. 67:2596-2601.

Scott, J. A. 1986. The butterflies of North America. Stanford Univ. Press. Stanford, CA. 327 pp.

Seal, U.S., E.T. Thorne, M.A. Bogan, and S.H. Anderson (editors). 1989. Conservation biology and the black-footed ferret. Yale University press, new Haven, Connecticut.

Sedgwick, J.A. 2004a. Chestnut-collared Longspur (*Calcarius ornatus*): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/chestnutcollaredlongspur.pdf [Accessed Dec 2004].

Sedgwick, J.A. 2004b. McCown's Longspur (Calcarius mccownii): A technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/mccownslongspur.pdf [Accessed Dec 2004].

Sedgwick, J.A. (2006, December 12). Long-billed Curlew (*Numenius americanus*): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/longbilledcurlew.pdf [January 24, 2007].

Seery, D.B., and D.J. Matiatos. 2000. Response of wintering buteos to plague epizootics in prairie dogs. Western North American Naturalist 60:420-425.

Seery, D.B. 2006. Use of pesticides to mitigate the effects of plague Pages 238-242 In J.E. Roelle, B.J. Miller, J.L. Godbey, and D.E. Biggins (editors) Recovery of the Black-footed Ferret: Progress and Continuing Challenges. U.S. Geological Survey Scientific Investigations Report 2005-5293.

Shaffer, M.L. 1987. Minimum viable populations: coping with uncertainty. Pages 69-86 In M.E. Soulé (editor). Viable populations for conservation. Cambridge University Press, New York, New York.

Shaffer, M., L Hood Watchman, W.J. Snape III, and I.K. Latchis. 2002. Population viability analysis and conservation policy. Pages 123-142 In S.R. Beissinger and D.R. McCullough, editors, Population viability analysis, University of Chicago Press, Chicago, Illinois, USA.

Sharp R. S., W. R. Silcock, and J. G. Jorgensen. 2001. Birds of Nebraska their distribution and temporal occurrence. University of Nebraska Press. Lincoln and London. 520pp.

Sharps, J. C., and D. W. Uresk. 1990. Ecological review of black-tailed prairie dogs and Associated species in western South Dakota. Great Basin Nat. 50:339-345.

Sibley, D. A. 2000. The Sibley guide to birds. National Audubon Society. Alfred A. Knopf, New York, N.Y. 545pp.

Sidle, J.G., G.L. Schenbeck, E.A. Lawton, and D.S. Licht. 2006. Role of federal lands in the conservation of the black-tailed prairie dog. Pages 218-231 In J.L. Hoogland, editor, Conservation of the black-tailed prairie dog. Island Press, Washington, DC.

Slater, G.L. 2004. Grasshopper Sparrow (*Ammodramus Savannarum*): A technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/grasshoppersparrow.pdf Accessed [Jan 2005]

Slater, G.L. and C. Rock. (2005, September 30). Northern Harrier (*Circus cyaneus*): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/northernharrier.pdf [January 24, 2007].

Slater, G.L. (2006, August 17). Trumpeter Swan (*Cygnus buccinator*): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/trumpeterswan.pdf [January 24, 2007].

Slobodkin, L. B. 1986. On the susceptibility of different species to extinction: elementary instructions for owners of a world. Pages 226-242 In B.G. Norton, editor, The preservation of species. Princeton University Press, Princeton, New Jersey.

Smith, A. 2007. South Dakota prairie dog control. Report submitted to the Feb 22, 2007 Interagency Animal damage Control meeting, Wall, SD.

Smith, B.E. and D.A. Keinath (2005, December 20). Plains Leopard Frog (*Rana blairi*): a

technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/plainsleopardfrog.pdf [January 24, 2007].

Smith, B.E. and D.A. Keinath. (2007, January 16). Northern Leopard Frog (*Rana pipiens*): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/northernleopardfrog.pdf [January 24, 2007].

Smith, G.A., and M.V. Lomolino. 2004. Black-tailed prairie dogs and the structure of avian communities on the shortgrass plains. Oecologia 138:592-602.

Smith, R. L. 1968. Grasshopper sparrow. Pp. 725-745 *in* Life histories of North American cardinals, grosbeaks, buntings, towhees, finches, sparrows, and allies (O. L. Austin, Jr., ed.) Pt.2 U.S. Natl. Mus. Bull 237.

Soulé, M. E., editor. 1987. Viable populations for conservation. Cambridge University Press, Cambridge, United Kingdom.

Soule', M.E., et. al. 2005. Strongly Interacting Species: Conservation Policy, Management, and Ethics. BioScience, February 2005 / Vol. 55 No. 2.

South Dakota Bird Notes 1977. Sighting of Mountain Plover. South Dakota Bird Notes 30(2):30

South Dakota Department of Agriculture. 2007. Pesticide applicators newsletter. Winter 2007 Issue 35. Division of Agricultural Services. Office of Agronomy Services 523 East Capitol – Foss Building Pierre, South Dakota 57501-3182.

South Dakota Department of Agriculture, South Dakota Department of Game, Fish and Parks, United States Department of Agriculture – ADC, United States Fish and Wildlife Service; Cooperative Extension Service; and United States Department of Agriculture – SCS. 1994. Prairie Dog Management in South Dakota (1.1mb) South Dakota Department of Agriculture 1994. Brochure entitled Prairie Dog Management In South Dakota.

South Dakota Department of Game, Fish and Parks. 2001. Executive Summary, Prairie Dog Shooting in South Dakota. HD-8-02.AMS.

South Dakota Department of Game, Fish and Parks. 2004. Bald eagle [Online]. Available: http://sdgfp.info/Wildlife/WildlifePlans/BEindex/ [Dec 2, 2004].

South Dakota Department of Game, Fish and Parks. 2005. News Release. January 24, 2005.

South Dakota Ornithologist's Union (SDOU). 1991. The birds of South Dakota, 2nd Ed. Aberdeen, SD. 411pp.

Stapp, P., M.F. Antolin, and M. Ball. 2004. Patterns of extinction in prairie-dog metapopulations: plague outbreaks follow El Nino events. Frontiers of Ecology and Environment 2:235-240.

Stebbins, G.L. 1981. Coevolution of grasses and herbivores. Annals of the Missouri Botanical Garden 68:75-86.

Stephens, R.M. and Anderson, S.H. 2005. Swift Fox (*Vulpes velox*): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/swiftfox.pdf [Accessed Feb 1, 2005].

Summers and Linder. 1978. Food habits of the black-tailed prairie dog in western South Dakota. Journal of Range Management 31:134-136.

Svedarsky, W.D., J.E. Toepfer, R.L. Westemeier, and R.J. Robel. 2003. Effects of management practices on grassland birds: Greater prairie-chicken. Northern Prairie Wildlife Research Center, Jamestown, ND. 42p.

Tallman, D. A., D. L. Swanson, and J. S. Palmer. 2002. Birds of South Dakota. South Dakota Ornithological Union, Northern State Univ., Aberdeen. 441pp.

Temple, S.A. and J.R. Cary. 2002. Reserve design. Pages 281-292 In S.E. Gergel and M.G. Turner, editors, Learning landscape ecology: a practical guide to concepts and techniques, Springer Science and Business Media, New York, New York.

Thomas. C.D. 1990. What do real population dynamics tell us about minimum viable population sizes? Conservation Biology 4: 324-327.

Tietjen H. P. 1976. Zinc phosphide-Its development as a control agent for black-tailed prairie dogs. Special Scientific Report-Wildlife No. 195. U.S. Fish and Wildlife Service. Washington DC. 14 pp.

Tigner J. and E. Dowd Stukel. 2003. Bats of the Black Hills: a description of status and conservation needs. South Dakota Game Fish and Parks, Wildlife Division Report 2003-05, Pierre, SD. 94 pp.

Tigner, J. 2005. Buffalo Gap National Grasslands Bat Surveys 2005. Prepared for the SD Dept. of Game, Fish and Parks, Rapid City, SD. Batwork, Rapid City, SD. Pages 9, 10, 18.

Tileston, J. V., and R. R. Lechleitner. 1966. Some comparisons of the black-tailed and white-tailed prairie dogs in north-central Colorado. American Midland Naturalist 75:292-316.

Timm, R. M. 1983. Description of active ingredients. pp.G31-G131. In R.M. Timm ed. Prevention and Control of Wildlife Damage. Great Plains Agricultural Council Wildlife Resource Committee and Cooperative Extension Service University of Nebraska. Lincoln

Turner, M.G., R.H. Gardner, and R.V. O'Neill. 2001. Landscape ecology in theory and practice. Springer-Verlag, New York, New York.

Tyler, J. D. 1968. Distribution and vertebrate associates of the black-tailed prairie dog in Oklahoma. Ph.D. Dissertation, University of Oklahoma, Norman.

USDI NPS 2006. Wind Cave National Park, South Dakota, Black-tailed Prairie Dog Management Plan. Environmental Impact Statement.

U.S. Fish and Wildlife Service. 1983. Northern state bald eagle recovery plan. U. S. Fish And Wildlife Service, Denver, CO. 76 pp.

U.S. Fish and Wildlife Service. 1993. Endangered and threatened wildlife and plants; Proposed establishment of a nonessential experimental population of black-footed ferrets in southwestern South Dakota. Federal Register (Vol 58, No. 95, pp 29176-29186).

U.S. Fish and Wildlife Service. 1994. Endangered and threatened wildlife and plants; Establishment of a nonessential experimental population of black-footed ferrets in southwestern South Dakota. Federal Register (Vol 59, No.159, pp 42682-42694).

U.S. Fish and Wildlife Service, U.S. Forest Service, and U.S. National Park Service. 1994. Final environmental impact statement, black-footed ferret reintroduction, Conata Basin/Badlands, South Dakota.

U.S. Fish and Wildlife Service. 1995. Endangered and threatened wildlife and plants; Final rule to reclassify the bald eagle from endangered to threatened in all of the lower 48 states. Federal Register (Vol 60, No. 133, pp 36000-36010).

U.S. Fish and Wildlife Service and National Marine Fisheries Service. 1998. Consultation Handbook: Procedures for conducting consultation and conference activities under section 7 of the Endangered Species Act. U. S. Government Printing Office. Superintendent of Documents. Washington, DC.

U.S. Fish and Wildlife Service. 1999. Endangered and threatened wildlife and plants; proposed rule to remove the bald eagle in the lower 48 states from the list of endangered and threatened wildlife; proposed rule. Federal Register (Vol 60, No. 133, pp 36000-36010).

U.S. Fish and Wildlife Service. 2000a. 2000-2001 Contingency plan. Federal-state cooperative protection of whooping cranes. Aransas/Matagorda Isl. Nat. Wildl. Ref. Complex. Austwell, TX. 36pp.

U.S. Fish and Wildlife Service. 2000b. Federal Register, Vol. 65, No. 24, February 4, Endangered and Threatened Wildlife and Plants; 12-month finding for a petition to list the black-tailed prairie dog as threatened.

U.S. Fish and Wildlife Service. 2004a. Federal Register, Vol. 69, No. 159, August 18, Endangered and threatened wildlife plants; finding for the resubmitted petition to list the black-tailed prairie dog as threatened.

U.S. Fish and Wildlife Service. 2004b. Species assessment and listing priority assignment for the black-tailed prairie dog. Current States/Counties/Territories/Countries of Occurrence.

U.S. Fish and Wildlife Service. 2006a. Draft recovery plan for the black-footed ferret (Mustela nigripes). U.S. Fish and Wildlife Service, Denver, Colorado.

U.S. Fish and Wildlife Service. 2006b. Draft Five-Year Status Review of the black-footed ferret (Mustela nigripes). U.S. Fish and Wildlife Service, Denver, Colorado.

U.S. Government Accountability Office. 2007. Agricultural conversion: farm program payments are an important factor in landowners' decisions to convert grassland to cropland. GAO-07-1054, Washington, DC.

USDA Animal and Plant Health Inspection Service. 1994. Animal Damage Control Program Final Environmental Impact Statement. Appendix P Risk Assessment of Wildlife Damage Control Methods used by USDA Animal Damage Control Program. USDA APHIS Washington DC. 337 pp.

USDA Forest Service 1978. Final environmental impact statement for Prairie Dog Management. USDA Forest Service.

USDA Forest Service 1981. Decision Notice and Finding of No Significant Impact. Amendments to the Prairie Dog Management Plan of the Nebraska National Forest. USDA Forest Service.

USDA Forest Service 1988. Prairie Dog Management for the Nebraska National Forest, Samuel R. McKelvie National Forest, Oglala National Grassland, Buffalo Gap National Grassland, and Fort Pierre National Grassland. USDA Forest Service.

USDA Forest Service. 1995a. Biological assessment for black-footed ferret. Rocky Mountain Region, USDA Forest Service. Denver CO.

USDA Forest Service. 1995b. Biological evaluation for whooping crane. Rocky Mountain Region, USDA Forest Service, Denver CO.

USDA Forest Service. 1995c. Biological evaluation for American burying beetle. Rocky Mountain Region, USDA Forest Service, Denver CO

USDA Forest Service. 1995d. Biological assessment for bald eagle, need for evaluating livestock grazing permits for allotments which contain occupied breeding areas for bald eagles. Rocky Mountain Region, USDA Forest Service.

USDA Forest Service. 1995e. Biological assessment for bald eagle, assessment on the effects of livestock grazing on the bald eagle and its associated wintering habitat within the grasslands. Rocky Mountain Region, USDA Forest Service.

USDA Forest Service. 1995f. Biological assessment for swift fox. Rocky Mountain Region, Forest Service.

USDA Forest Service. 1995g. Biological assessment for American Bittern. Rocky Mountain Region, Forest Service.

USDA Forest Service. 1995h. Biological assessment for long-billed curlew. Rocky Mountain Region, Forest Service.

USDA Forest Service. 1995i. Biological evaluation for ferruginous hawk. Rocky Mountain Region, Forest Service.

USDA Forest Service. 1995j. Biological assessment for burrowing owl. Rocky Mountain Region, Forest Service.

USDA Forest Service. 1995k. Biological assessment for mountain plover. Rocky Mountain Region, Forest Service.

USDA Forest Service. 1995l. Biological assessment for trumpeter swan. Rocky Mountain Region, Forest Service.

USDA Forest Service. 1995m. Biological assessment for black tern. Rocky Mountain Region, Forest Service.

USDA Forest Service. 1995n. Biological evaluation for northern leopard frog. Rocky Mountain Region, Forest Service.

USDA Forest Service. 1995o. Biological assessment for regal fritillary butterfly. Rocky Mountain Region, Forest Service.

USDA Forest Service. 1995p. Biological evaluation for sensitive plants and wildlife that for the most part are not impacted by domestic livestock grazing. Rocky Mountain Region, Forest Service.

USDA Forest Service. 1995q. Biological evaluation for sensitive species in riparian areas grazed by domestic livestock assessment of the effects of livestock grazing on the sensitive species and their habitats within the rocky mountain region. Rocky Mountain Region, Forest Service. USDA Forest Service 2000. Northern Great Plains terrestrial assessment: a broad-scale

USDA Forest Service. 2000. Terrestrial assessment: a broad-scale look at species viability on the northern Great Plains. Final Report. 127 pp.

USDA Forest Service 2001a. Unpub. Report on the viability and recovery of black-footed ferrets, Chadron, NE.

USDA Forest Service 2001b. Final environmental impact statement for the northern Great Plains management plans revision. USDA Forest Service.

USDA Forest Service 2001c. Land and resource management plan, Nebraska National Forest and associated units, Rocky Mountain Region.

USDA Forest Service 2005a. Conata Basin black-footed ferret reintroduction program summary. Unpublished report, Wall Ranger District, Wall, SD.

USDA Forest Service 2005b. R2 sensitive species list. USDA Forest Service, Rocky Mountain Region, Lakewood, Co. http://fsweb.r2.fs.fed.us/rr/tes/tes_r2ss.html [Accessed January 23, 2007]

USDA Forest Service 2005c. Black-tailed Prairie Dog Conservation and Management on the Nebraska National Forest and Associated Units - Final Environmental Impact Statement . Rocky Mountain Region, Nebraska National Forest. Chadron NE.

USDA Forest Service 2007. Forest Service Manual. USDA Forest Service, Washington D. C. http://fsweb.wo.fs.fed.us/directives/html/fsm.shtml [Accessed March, 2007]

USDA Forest Service. 2008a. District Prairie Dog Monitoring Reports. Multi-year prairie dog monitoring reports from Pine Ridge, Fall River, Wall and Fort Pierre Ranger Districts.

USDA Forest Service. 2008b. Wall Ranger District boundary management zone 2007 monitoring report. On file in the administrative record. Nebraska National Forest. Chadron, NE.

USDA Forest Service. 2008c. Nebraska National Forest – 2008 Plague Folder, Current Status. On file in the administrative record. Nebraska National Forest. Chadron, NE.

Ure, J., P. Briggs, and S.W. Hoffman. 1991. Petition to list as endangered the ferruginous hawk (*Buteo regalis*), as provided by the Endangered Species Act of 1973, as amended in 1982. Ferruginous Hawk Project, Salt Lake City, UT *in* Bechard, M. and J. Schmutz. 1995. Ferruginous Hawk (*Buteo regalis*) *in* The Birds of North America, No. 172 (A. Poole and F. Gill, eds.). The Acad. of Nat. Sci., Philadelphia, and The American Ornithological Union, Washington, D.C.

Uresk, D.W., R. M. King, A. D. Apa, M. S. Deisch, and R. L. Linder. 1985a. Rodenticidal effects of zinc phosphide and strychnine on nontarget species. Final Report Rocky Mountain Range and Forest Experiment Station. Forest Research Laboratory, South Dakota School of Mines and Technology, Rapid City. 22pp.

Uresk, D.W., R. L. Linder, and A. D. Apa 1985b. Efficiency of two black-tailed prairie dog rodenticides and their impacts on non-target bird species. Final Report, Rocky Mountain Range and Forest Experiment Station. Forest Research Laboratory, South Dakota School of Mines and Technology, Rapid City. 72pp.

Uresk, D.W., R. L. Linder, and M. S. Deisch 1986. Evaluation of three rodenticides on nontargetsmall mammals and invertebrates. Final Report, Rocky Mountain Range and Forest Experiment Station. Forest Research Laboratory, South Dakota School of Mines and Technology, Rapid City. 132p.

Uresk, D.W., and J. C. Sharps. 1986. Denning habitat and diet of swift fox in western South Dakota. Great Basin Naturalist 46:249-253.

Uresk, D.W., and G.L. Schenbeck. 1987. Effect of zinc phosphide rodenticide on prairie dog colony expansion as determined from aerial photography. Prairie Naturalist 19(1):57-61.

Uresk, D.W., R. M. King, A. D. Apa, M. S. Deisch, and R. L. Linder. 1988. Rodenticidal effects of zinc phosphide and strychnine on nontarget species. Pages 57-63 In D. W. Uresk, G.L. Schenbeck, and R. Cefkin (technical editors) Eighth Great Plains wildlife damage control workshop proceedings. General technical Report RM-154, Rocky Mountain Forest and Range Experiment Station, USDA Forest Service, Fort Collins, CO.

Uresk, D. W., K. E. Severson and J. Javersak. 2003. Vegetative characteristics of swift fox denning and foraging sits in southwestern South Dakota. USDA Forest Service, Rocky Mountain Research Station, Research Paper RMRS-RP-38. Fort Collins, CO. 4pp.

Van Bruggen, T. 1992. Wildflowers, grasses, and other plants of the Northern Plains and Black Hills. Badlands Nat. History Assoc., Interior, SD. 112pp.

Van Pelt, W.E. 1999. The black-tailed prairie dog conservation assessment and strategy-final draft. Nongame and Endangered Wildlife Program. Arizona Game and Fish Department, Phoenix, AZ.

Vickery, P. D. 1996. Grasshopper sparrow *(Ammodramus savannarum). in* Poole, A., and F. Gill, eds. The birds of North America. Acad. of Nat. Sci., Phil., PA, and American Ornithological Union, Washington, D.C.

Von Loh, J., D. Cogan, D. Faber-Langendoen, D. Crawford, and M. Pucherelli. 1999. USGS-NPS Vegetation Mapping Program, Badlands National Park, South Dakota (Final Report). Technical Memorandum No. 8260-00-02, U.S. Bureau of Reclamation Technical Service Center. Denver, Colorado.

Vosburgh, T.C. and L.R. Irby. 1998. Effects of recreational shooting on prairie dog colonies. J. Wildl. Manage 62:363-372.

Walker, B. 2004. Effects of management practices on grassland birds: Brewer's Sparrow. Northern Prairie Wildlife Research Center, Jamestown, ND. Northern Prairie Wildlife Research Center Online. http://www.npwrc.usgs.gov/resource/literatr/grasbird/brsp/brsp.htm (Version 12AUG2004).

Wallestad, R. 1975. Life history and habitat requirements of sage grouse in central Montana. Montana Dept. Fish and Game. 66pp.

Walters, C. J. 1986. Adaptive management of renewable resources. Macmillan Co., New York, New York.

Waples, R.S. 2002. Definition and estimation of effective population size in the conservation of endangered species. Pages 147-168 In S.R. Beissinger and D.R. McCullough, editors, Population viability analysis, University of Chicago Press, Chicago, Illinois, USA.

Warnock, R.G. and P.C. James. 1997. Habitat fragmentation and Burrowing Owls *Speotyto cunicularia*) in Saskatchewan. Pages 477–486 *in* J.R. Duncan, D.H. Johnson and T.H. Nicholls [Eds.], Biology and conservation of owls of the northern hemisphere: 2nd international symposium. USDA Gen. Tech. Rep. NC-190, St. Paul, MN U.S.A.

White, E.M. 1986. Antiquity, original size and location of prairie dog towns in Wind Cave National Park. Final report for contract CX-1200-4-A040, Wind Cave National Park, Hot Springs, SD.

Wood, J.E. 1965. Response of rodent populations to controls. J. of Wildl. Manage. 29:425-427.

Wiggins, D.A. (2004, Sept. 22) Short-eared owl *(Asio flammeus)*: a technical conservation assessment. (Online). USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/shortearedowl.pdf

Wiggins, D. (2005a). Loggerhead Shrike (*Lanius ludovicianus*): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/loggerheadshrike.pdf [January 24, 2007].

Wiggins, D. (2005b). Yellow-billed Cuckoo (*Coccyzus americanus*): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/yellowbilledcuckoo.pdf [January 24, 2007].

Wiggins, D.A. (2006). American Bittern (*Botaurus lentiginosus*): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/americanbittern.pdf [Jan 11, 2007].

Williams, B.K., J.D. Nichols, and M.J. Conroy. 2002. Analysis and management of animal populations. Academic Press, New York.

Wilson, D.E. and S. Ruff. 1999. The Smithsonian book of North American mammals. Smithsonian Institution Press, Washington, DC.

Wimsatt, J., D.E. Biggins, E.S. Williams, and V.M. Becerra. 2006. The quest for a safe and effective canine distemper virus vaccine for black-footed ferrets. In Recovery of the Black-footed Ferret: Progress and Continuing Challenges. Edited by J.E. Roelle, B.J. Miller, J.L. Godbey, and D.E. Biggins. US Geological Survey. Pp. 248-266.

Wisely, S.M. 2005. The genetic legacy of the black-footed ferret: past, present, and future. Pages 37-43 In J.E. Roelle, B.J. Miller, J.L. Godbey, and D.E. Biggins, editors, Recovery of the Black-footed Ferret: Progress and Continuing Challenges. U.S. Geological Survey.

Wood, J.E. 1965. Response of rodent populations to controls. J. of Wildl. Manage. 29:425-427.

Wood, S.L. Editor. 1986. The black-footed ferret. Great Basin Naturalist Memoirs Number 8.

Wyoming Natural Diversity Data Base 2004. Vegetation [Online]. Available: http://uwadmnweb.uwyo.edu/WYNDD/ [Accessed Dec 2, 2004].