United States Department of Agriculture

Thunder Basin National Grassland 2020 Plan Amendment

Draft Environmental Impact Statement

Forest Service Thunder Basin National Grassland October 2019

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Cover photo: Short-stature vegetation on a prairie dog colony on the Thunder Basin National Grassland in proposed management area 3.67. Photo by Monique Nelson.

Thunder Basin National Grassland 2020 Plan Amendment
Draft Environmental Impact Statement
Campbell, Converse, Crook, Niobrara, and Weston Counties, Wyoming

Lead Agency:	USDA Forest Service
Cooperating Agencies:	U.S. Fish and Wildlife Service, Wyoming Field Office; Natural Resources Conservation Service, Wyoming State Office; Wyoming Department of Agriculture; Wyoming Game and Fish Department; Wyoming State Office of Lands and Investments; Wyoming Weed and Pest Council; Campbell County, WY; Converse County, WY; Crook County, WY; Niobrara County, WY; Weston County, WY
Responsible Official:	RUSSELL BACON, FOREST SUPERVISOR 2468 Jackson St. Laramie, WY 82070
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Abstract: The Forest Service proposes an amendment to the Thunder Basin National Grassland Land and Resource Management Plan (grassland plan) to change prairie dog management on National Forest System lands within the administrative boundary of the Thunder Basin National Grassland. This draft environmental impact statement compares the environmental and socioeconomic impacts of (1) continuing current management with (2) a proposed action to conserve 10,000 acres of prairie dog colonies within a 35,367-acre management area in the center of the grassland, (3) a grassland-wide alternative that would conserve 10,000 to 15,000 acres of prairie dog colonies across the grassland, with at least one 1,500-acre complex in a 29,194-acre management area in the center of the grassland, and (4) a prairie dog emphasis alternative that would conserve 27,000 acres of prairie dog habitat in 5 management areas totaling 68,071 acres on the national grassland. These alternatives also analyze different methods of conservation and control, including use of boundary management zones to protect non-Federal lands; where, when, and what kinds of rodenticides can be used; restrictions on recreational shooting; management considerations for sylvatic plague; and density control.

How to comment: Comments on this project, the alternatives, and the analysis are requested for a period of 90 days to help improve the analysis, finalize alternatives, and develop a final environmental impact statement and draft record of decision.

According to the objection regulations at 36 CFR 219,[1] individuals and entities who submit timely, specific written comments regarding a proposed project or activity during any designated opportunity for public comment will have standing to file an objection. This includes the public scoping period as well as this 90-day comment period for the draft environmental impact statement. It is the responsibility of persons providing comments to submit them by the close of established comment periods. Only those who submit timely and specific written comments will have eligibility to file an objection, as stated under 36 CFR 219.53. For objection eligibility, each individual or representative from each entity submitting timely and specific written comments must either sign the comment or verify identity upon request.

[1] 36 Code of Federal Regulations, part 219, subpart B, "Predecisional Administrative Review Process:" https://www.govinfo.gov/content/pkg/CFR-2018-title36-vol2/xml/CFR-2018-title36-vol2-part219.xml

Individuals and organizations wishing to be eligible to object must meet the information requirements in section 219.54. Names and contact information submitted with comments will become part of the public record and may be released under the Freedom of Information Act. Comments submitted anonymously will be accepted and considered; however, Forest Service staff will not be able to send further project information to anonymous commenters.

A notice of availability for this draft environmental impact statement was published in the Federal Register on October 11, 2019, starting a 90-day public comment period for this project that will end on January 9, 2020. During this public comment period, Forest Service staff will host one public meeting and one public online webinar to provide information on the proposal and opportunities for the public to participate in the plan amendment process.

Please submit comments via one of the following methods:

Submit comments online via the project's public participation portal (preferred): https://cara.ecosystem-management.org/Public//CommentInput?Project=55479

Send comments via mail to: Thunder Basin Plan Amendment Comments, Thunder Basin National Grassland Supervisor's Office, 2468 Jackson St, Laramie, WY 82070.

Date comments must be received: January 9, 2020

Public Participation Opportunities

Public meeting:

Date and time: Wednesday, November 20, 2019
5:30 to 7:30 p.m. (Mountain Time)

Location: Converse County Library,
300 East Walnut Street, Douglas, Wyoming

Format: Presentation at 6:00 p.m. View maps and project information and talk with Forest Service staff before and after the presentation.

Public online webinar:

Date and time: Thursday, November 21, 2019
11:00 a.m. to 12:30 p.m. (Mountain Time)

Access: Login information will be posted on the project website.

Format: The presentation is expected to last approximately 45 minutes, and the remainder of the time will be for questions and answers.

For more information, contact Monique Nelson, Interdisciplinary Team Leader, at 307-275-0956 or email monique.nelson@usda.gov.

This draft environmental impact statement, project reference materials, and maps are available on the project website at http://www.fs.fed.us/nepa/nepa_project_exp.php?project=55479.

A variety of information about Thunder Basin National Grassland restoration and prairie dog management is available at https://www.fs.usda.gov/goto/MBRTB/PrairieDogs.

Summary

Challenges related to prairie dog management and the potential reintroduction of black-footed ferret have existed since completion of the 2002 grassland plan. These challenges have continued through prairie dog population cycles of expansion and decline and through several planning efforts. In particular, Forest Service personnel have had limited success in minimizing impacts of prairie dog encroachment onto private and State lands during times of population expansion and minimizing rapid landscape-scale declines during plague epizootics.

In early 2019, the responsible official considered the changed environmental and social conditions, including the extent of mapped prairie dog colonies over time; requests for management and control from adjacent landowners; and requests for change from local, State, and Federal government agencies and determined there is a need to change prairie dog management direction in the grassland plan with a plan amendment

The draft environmental impact statement contrasts a no action and three action alternatives as ways of amending the grassland plan to address ecological, social, and economic issues related to current management of prairie dogs and grassland vegetation on the Thunder Basin National Grassland.

In recent years, dramatic changes in prairie dog populations and increasing conflicts have indicated the need to change the grassland plan to allow Federal land managers to be more responsive to a variety of environmental and social conditions.

The purpose of this proposed plan amendment is to:

- provide a wider array of management options to respond to changing conditions;
- minimize prairie dog encroachment onto non-Federal lands;
- reduce resource conflicts related to prairie dog occupancy and livestock grazing;
- ensure continued conservation of at-risk species; and
- support ecological conditions that do not preclude reintroduction of the black-footed ferret.

Specifically, an amendment is needed to:

- revise management direction in Management Area 3.63 – Black-Footed Ferret Reintroduction Habitat,
- adjust the boundaries of management area 3.63 to be more conducive to prairie dog management;
- increase the availability of lethal prairie dog control tools to improve responsiveness to a variety of management situations, including those that arise due to encroachment of prairie dogs on neighboring lands, natural and human-caused disturbances, and disease.

The notice of intent was published in the Federal Register on April 18, 2019 and asked for public comment on the proposal through May 20, 2019. In addition, approximately 300 letters and 400 emails describing the proposed action and opportunity to comment to local, State, and Federal government staff and leaders; environmental and nongovernmental organizations; grazing association members; and others who expressed interest in the project. Forest Service staff initiated formal consultation with 18 Native American Tribes with an interest in the Thunder Basin National Grassland in April 2019. Approximately 500 comment letters were received, with about 40 unique and substantive comments.

Using the comments from the public, other agencies, and tribes (see the "Issues" section), the interdisciplinary team developed a list of issues to address, including:

- viability of sensitive species and potential species of conservation concern
- black-footed ferret recovery
- forage for permitted livestock
- economic concerns
- health and safety concerns
- recreational shooting
- Federal land boundary management
- use of rodenticides
- cost of implementing the plan amendment
- failure to implement current management plan
- laws, regulations, and policies
- candidate conservation agreements
- greater sage-grouse habitat
- collaborative stakeholder group

Based on a review of public comments and concerns, the interdisciplinary team developed three action alternatives as well as a no-action alternative that are analyzed in detail in the environmental impact statement. The action alternatives include a modified version of the proposed action with the addition of seasonal shooting restrictions and the addition of plan components related to drought and density management; a Grassland-Wide Alternative in which all prairie dog acres on the grassland count toward a desired range for prairie dog colony acres; and a Prairie Dog Emphasis Alternative that would retain much of the management described in the current grassland plan and prairie dog management strategy, but would allow more flexibility in management, especially with regard to boundary management.

Alternative 1 – No Action: Under the no-action alternative, the amended 2002 grassland plan and the 2015 Black-Tailed Prairie Dog Conservation Assessment and Management Strategy would continue to guide management of prairie dogs on the Thunder Basin National Grassland. No changes would be made to either the plan or the 2015 Black-Tailed Prairie Dog Conservation Assessment and Management Strategy. Prairie dog colonies and acreage targets would be managed based on the categories and decision screens described in the 2015 Black-Tailed Prairie Dog Conservation Assessment and Management Strategy. There would continue to be a target of 33,000 prairie dog colonies.

Alternative 2 - Proposed Action: Management Area 3.63 – Black-Footed Ferret Reintroduction would be changed to Management Area 3.67 – Rangelands with Short-Stature Vegetation Emphasis and boundaries revised. Prairie dog colonies would be managed toward a target of 10,000 acres in management area 3.67. Boundary management zones would be established around management area 3.67, rodenticide use would be limited to zinc phosphide, and there would be a seasonal recreational shooting restriction in management area 3.67.

Alternative 3 – Grassland-wide: Management Area 3.63 – Black-Footed Ferret Reintroduction would be changed to Management Area 3.67 – Rangelands with Short-Stature Vegetation Emphasis and boundaries revised. Prairie dog colonies would be managed toward a target range of 10,000 to 15,000 acres across the grassland, with at least one 1,500-acre complex in management area 3.67. Boundary management zones would be established grasslandwide, rodenticide use would be limited to zinc phosphide except in boundary management zones where anticoagulants and fumigants may be approved for use, and there would no recreational shooting restrictions associated with prairie dog management.

Alternative 4 – Prairie Dog Emphasis: This alternative retains much of the management described in the current grassland plan and 2015 Black-Tailed Prairie Dog Conservation Assessment and Management Strategy but allows more flexibility in management, especially with regard to boundary management. Management Area 3.63 – Black-Footed Ferret Reintroduction would be renamed to Management Area 3.67 – Rangelands with Short-Stature Vegetation Emphasis but boundaries would remain the same. Prairie dog colonies would be managed toward a target of 18,000 acres in specific areas, with associated boundary management zones. Rodenticide use would be limited to zinc phosphide, and recreational shooting would be prohibited in management area 3.67.

Action alternatives developed for this plan amendment project would generally decrease the target acreages of habitat for species that use or rely on short-stature vegetation, including prairie dogs. Actions associated with implementation of the plan amendment would have short-term impacts to those species, but are not expected to lead to a loss of viability in the planning area or range-wide. Because no habitat is proposed for conversion to other land uses, the habitat would be available to species with different habitat requirements and may be made available again as short-stature vegetation if management actions change in the long-term. Implementation of a plan amendment is expected to have short and long-term neutral or positive effects on rangeland resources, livestock grazing, and socioeconomic issues. Effects analyses were limited to issues raised internally or during the public scoping period or to analysis required by law, regulation, or policy. Table 1 summarizes the effects of alternatives related to the issues raised during the scoping period.

The responsible official will review the proposed action, the other alternatives, and the environmental consequences of each alternative to make the following decisions: whether to implement a plan amendment to change prairie dog management as described in the proposed action; whether to implement a plan amendment to change prairie dog management as described in an alternative to the proposed action; whether to implement a combination of alternatives analyzed in detail; whether to adopt amended grasslandwide, geographic area, and management area direction consistent with the selected alternative(s); or whether to take no action.

Table 1. Comparison of effects of alternatives related to the issues raised during the scoping period

Issue	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Grassland-wide	Alternative 4 Prairie Dog Emphasis
Ensure viability of sensitive species and potential species of conservation concern	Manages for greatest extent of prairie dog colonies (33,000 acres) and provides adequate extent of habitat so that management "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" for all at-risk species analyzed.	Manages for a lower acreage of prairie dog colonies (10,000 acres) than no action, but provides adequate extent of habitat so that management "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" for all at-risk species analyzed.	Manages for a lower acreage of prairie dog colonies (10,000 to 15,000 acres) than no action, but provides adequate extent so that management "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" for all at-risk species analyzed.	Manages for a slightly lower acreage of prairie dog colonies (27,000 acres) than no action and a greater acreage than the proposed action and grassland-wide alternatives, and provides adequate extent of habitat so that management "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" for all at-risk species analyzed.
Contributions to local economies	The Thunder Basin National Grassland would continue to provide opportunities for livestock grazing that support employment and labor income in communities in the analysis area. Local economic gains from recreational shooting are limited by year-round shooting restrictions in management area 3.63.	The Thunder Basin National Grassland would continue to provide opportunities for livestock grazing that support employment and labor income in communities in the analysis area. Local economic gains from recreational shooting with seasonal shooting restrictions in management area 3.67 may be greater than no action and prairie dog emphasis alternatives but less than the grassland-wide alternative.	The Thunder Basin National Grassland would continue to provide opportunities for livestock grazing that support employment and labor income in communities in the analysis area. Local economic gains from recreational shooting with no shooting restrictions in management area 3.67 may be greater than all other alternatives.	The Thunder Basin National Grassland would continue to provide opportunities for livestock grazing that support employment and labor income in communities in the analysis area. Local economic gains from recreational shooting are limited by year-round shooting restrictions in management area 3.67.

Issue	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Grassland-wide	Alternative 4 Prairie Dog Emphasis
Impacts to private land values and facilities	Some lands and facilities protected from prairie dog encroachment with 1-mile residence buffers, but boundary management zones are not in place along Federal boundaries with state and private lands.	Some lands and facilities protected from prairie dog encroachment with 1-mile residence buffers, and boundary management zones are intended to prevent encroachment along Federal boundaries with state and private lands adjacent to management area 3.67.	Some lands and facilities protected from prairie dog encroachment with 1-mile residence buffers, and boundary management zones are intended to prevent encroachment along Federal boundaries with state and private lands.	Some lands and facilities protected from prairie dog encroachment with 1-mile residence buffers, and boundary management zones are intended to prevent encroachment along Federal boundaries with state and private lands adjacent to management area 3.67, category 1 areas, and category 2 areas.
Exposure to plague	1-mile residence buffers are in place for human health, but boundary management zones are not in place.	1-mile residence buffers are in place for human health grasslandwide, and ¼ mile boundary management zones are in place around management area 3.67	1-mile residence buffers are in place for human health grasslandwide, and ¼ mile boundary management zones are in place grasslandwide	1-mile residence buffers are in place for human health grasslandwide, ¼ mile boundary management zones are in place around category 1 areas, and 1/8 mile boundary management zones are in place around category 2 areas.
Impacts of recreational shooting on target and nontarget species	Impacts are unlikely due to shooting prohibitions and restrictions.	Impacts are more likely than the no action or prairie dog emphasis alternative, but less likely than the grassland-wide alternative due to seasonal shooting restrictions in management area 3.67. When and where allowed, recreational shooting may directly kill species other than prairie dogs or lead to lead poisoning of nontarget species.	Impacts are more likely than other alternatives. Recreational shooting may directly kill species other than prairie dogs or lead to lead poisoning of nontarget species.	Impacts are unlikely due to shooting prohibitions and restrictions.

Issue	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Grassland-wide	Alternative 4 Prairie Dog Emphasis
Recreational shooting opportunities	Fewer opportunities than the proposed action and grassland-wide alternatives due to year-round shooting restrictions in management area 3.67 and category 1 and seasonal or year-round shooting restrictions in category 2 areas.	More opportunities than the no action or prairie dog emphasis alternatives, but fewer opportunities than the grassland-wide alternative due to seasonal shooting restrictions in management area 3.67.	More opportunities than all other alternatives due to no shooting restrictions.	Fewer opportunities than the proposed action and grassland-wide alternatives due to year-round shooting prohibitions in category 1, which may provide the best opportunities for shooting, and seasonal shooting restrictions in category 2, which may provide other opportunities for recreational shooting.
Impacts of rodenticides on nontarget species	Less likely to impact nontarget species than any action alternative due to restricted use of rodenticides.	More likely to impact nontarget species than the no action or prairie dog emphasis alternatives because zinc phosphide would be allowed in boundary management zones and for density control, and on interior colonies with a lower colony acreage threshold for use. Less likely to impact nontarget species than the grassland-wide alternative.	More likely than other alternatives to impact nontarget species because anticoagulants may be used in the boundary management zone after 3 applications of zinc phosphide prove ineffective.	Less likely to impact nontarget species than the other action alternatives because zinc phosphide would be allowed in boundary management zones, and in interior colonies with higher colony acreage thresholds for use.
Effectiveness of rodenticide treatments	Less effective than other alternatives due to limits on where and when use is allowed.	Generally effective. One application of zinc phosphide is generally 75 to 95% effective; repeated applications on the same location can reduce effectiveness over time (for example, bait shyness).	Most effective since anticoagulants and fumigants are allowed in the boundary management zone after 3 applications of zinc phosphide prove ineffective.	Generally effective. One application of zinc phosphide is generally 75 to 95% effective; repeated applications on the same location can reduce effectiveness over time (for example, bait shyness).

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Chapter 1. Purpose of and Need for Action

Introduction

Forest Service personnel published a notice of intent in the Federal Register in April 2019 to amend the Thunder Basin National Grassland land and resource management plan (grassland plan) with regard to prairie dog management. Consistent with that notice, Forest Service personnel have prepared this draft environmental impact statement in compliance with the National Environmental Policy Act and other relevant Federal and State laws and regulations. The draft environmental impact statement contrasts several alternative ways of amending the grassland plan to address ecological, social, and economic issues related to current management of prairie dogs and grassland vegetation on the Thunder Basin National Grassland. It also discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives.

Additional documentation, including more detailed analyses of project area resources, may be found in the project planning record located at the Medicine Bow-Routt National Forests and Thunder Basin National Grassland Supervisor's Office, 2468 Jackson Street, Laramie, WY 82070.

The decision for this project will be subject to the objection regulations for land management planning.[2] According to these regulations, individuals and entities who submit timely, specific written comments during any designated opportunity for public comment will have standing to file an objection. This includes the scoping comment period as well as the 90-day comment period for the draft environmental impact statement, which will begin in October 2019 upon publication of the notice of availability of this environmental impact statement in the Federal Register. The responsible official for this project is Russell Bacon, Forest Supervisor for the Medicine Bow-Routt National Forests and Thunder Basin National Grassland. A decision is expected as early as fall 2020, and implementation of an amended plan would begin 30 days following the final decision.

Document Structure

The document is organized into four chapters:

- **Chapter 1, Purpose of and Need for Action:** This chapter includes information on the history of the plan amendment proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how Forest Service personnel informed the public of the proposal and how the public responded.
- **Chapter 2, Alternatives, Including the Proposed Action:** This chapter provides a more detailed description of the agency's proposed alternative methods for achieving the stated purpose. These alternatives were developed based on key issues raised by the public and other agencies. This section also provides a summary table of the environmental consequences associated with each alternative.

[2] 36 Code of Federal Regulations, part 219, subpart B, "Predecisional Administrative Review Process:" https://www.govinfo.gov/content/pkg/CFR-2018-title36-vol2/xml/CFR-2018-title36-vol2-part219.xml

- **Chapter 3, Affected Environment and Environmental Consequences:** This chapter describes the environmental effects of implementing the alternatives, including effects to botanical resources, soils, fire management, minerals management, rangeland vegetation and livestock management, socioeconomic resources, wildlife resources, and effects to human health from rodenticide and insecticide use.
- **Chapter 4 Contribution and Coordination:** This chapter provides a list of the preparers and information about the distribution of the draft environmental impact statement.
- **Appendices** The appendices provide more detailed information to support the analyses presented in the draft environmental impact statement. Appendix A provides proposed plan components for each alternative, appendix B provides proposed management approaches, appendix C is the biological evaluation for plants, and appendix D is the biological evaluation for animals.

Background

Location and General Management

The Thunder Basin National Grassland is located in the Powder River Basin of northeastern Wyoming, in portions of Campbell, Converse, Crook, Niobrara, and Weston Counties (figure 1). Within the Thunder Basin administrative boundary are approximately 553,000 acres of National Forest System (NFS) land managed by the Forest Service, intermingled with more than 1 million acres of private and State lands. These lands generally lie between Douglas, Wyoming to the south, Newcastle, Wyoming to the east, the Montana border to the north, and Wright, Wyoming to the west. National Forest System lands on the national grassland are managed within the Forest Service administrative hierarchy that includes the Rocky Mountain Region, based in Lakewood, CO; the Medicine Bow-Routt National Forests and Thunder Basin National Grassland, based in Laramie, WY; and the Douglas Ranger District, based in Douglas, WY.

The Thunder Basin National Grassland has a wealth of natural resources and provides extensive ecosystem services (for example, food, energy, biodiversity, recreation, scenic value, carbon storage, and plant and wildlife habitat) at local, regional, and national scales. Most prominent of these are the provision of energy resources, high quality forage for livestock production, and extensive wildlife habitat. Below the land surface, the Thunder Basin has an unusual wealth of coal, oil, gas, and other mineral resources. Above the surface, the national grassland is an area of open mixed and short-grass prairies, sagebrush ecosystems, occasional badlands, and steep but low hills. Cattle and sheep ranching has been the most consistent land use on the national grassland since Euro-American settlement. In the intermingled land ownership, private ranches, State lands, and NFS lands all contribute to substantial open space that serves as wildlife habitat for a variety of grassland and sagebrush species.

The Forest Service has a multiple use mandate for land management, as described in several laws including the National Forest Management Act of 1976, Forest and Rangeland Renewable Resources Planning Act of 1974, Multiple-Use Sustained-Yield Act of 1960,[3] and in the case of the national grasslands, the Bankhead Jones Farm Tenant Act of 1937,[4] as amended.[5] Most specific to the purposes of this environmental analysis, the substantive requirements of NFS land management planning regulations[6] (the 2012 Planning Rule), state that land management plans must provide social, economic, and ecological sustainability within Forest Service authority and consistent with the inherent capability of the plan area (36 CFR 219.8); must provide for the diversity of plant and animal communities within Forest Service authority and consistent with the inherent capability of the plan area (36 CFR 219.9); and while meeting those requirements, must provide ecosystem services and multiple uses, including outdoor recreation, rangelands, timber, watershed, wildlife, and fish, within Forest Service authority and the inherent capability of the plan area (36 CRF 219.10).

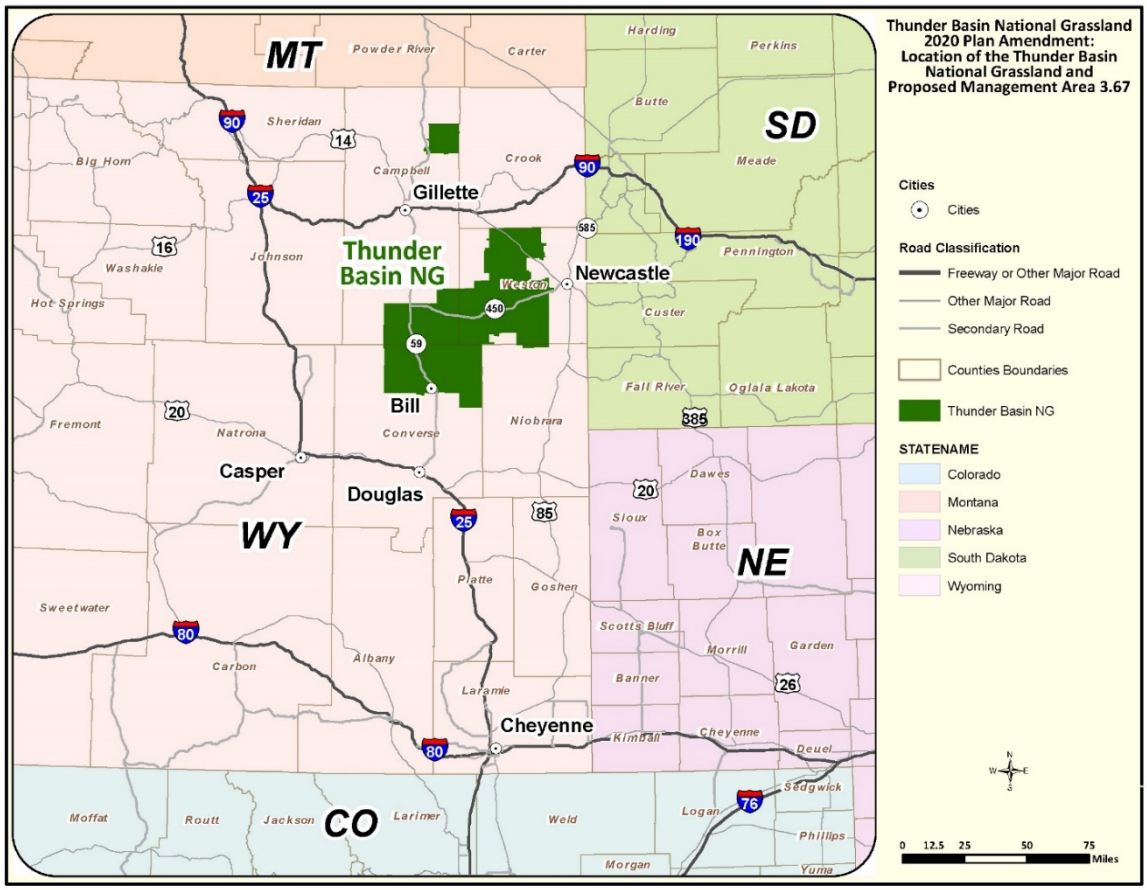

Figure 1. Location of the Thunder Basin National Grassland

[3] As amended through December 31, 1996, Public Law 104-333

[4] 7 U.S. Code section 1000 et seq.

[5] "National Grasslands Management: A Primer" provides and in-depth description of the laws and regulations that govern management of the national grasslands. Available at https://www.fs.fed.us/grasslands/documents/primer/NG_Primer.pdf

[6] 36 Code of Federal Regulations, part 219, subpart A, "National Forest System Land Management Planning" https://www.govinfo.gov/content/pkg/CFR-2018-title36-vol2/xml/CFR-2018-title36-vol2-part219.xml

In creating, revising, amending, and implementing land management plans, Forest Service personnel are charged with conforming to all applicable Federal laws and regulations and seeking an appropriate balance in natural resource management in consideration of local, regional, and national interests. More detailed information on laws, regulations, and policy is included in chapter 3 in the "Other Required Disclosures" section.

Black-Tailed Prairie Dogs on the Thunder Basin National Grassland

Black-tailed prairie dogs (*Cynomys ludovicianus,* figure 2) are native to the grasslands of western North America. Historically, they had an extensive range across the Great Plains from Mexico to Canada, but populations have declined significantly since the early 20th century due to habitat conversion, land management activities, and the introduction of sylvatic plague (*Yersinia pestis*). Black-tailed prairie dogs live in colonies and modify the grassland ecosystem by building burrows in which to live. They clip and maintain short vegetation around their burrows, creating habitat attributes that are essential to many grassland wildlife species. On the Thunder Basin National Grassland, several species, such as mountain plover, burrowing owl, swift fox, and ferruginous hawk, depend on prairie dog colonies to varying degrees for shelter and prey. The endangered black-footed ferret has been extirpated from the grassland, but in reintroduction sites outside of the Thunder Basin National Grassland it depends exclusively on prairie dog colonies for survival.

Figure 2. Black-tailed prairie dog. Photograph by Kelly Krabbenhoft.

Black-tailed prairie dogs are considered a keystone species because they modify and create unique habitat for a variety of other species and because their effects on the ecosystem are disproportionally large relative to their abundance. They have been petitioned for listing under the Endangered Species Act multiple times but were most recently found not warranted for listing by the U.S. Fish and Wildlife Service in 2009 because of their observed resilience to population stressors including sylvatic plague and poisoning.[7] They remain classified as a sensitive species in the Forest Service, Rocky Mountain Region and as a management indicator species on the Thunder Basin National Grassland.

[7] U.S. Fish and Wildlife Service 12-month Finding on a Petition to List the Black-tailed Prairie Dog as Threatened or Endangered: https://www.fws.gov/mountain-prairie/es/species/mammals/btprairiedog/74FR63343.pdf.

Direction related to management of prairie dogs, prairie dog habitat, and species associated with prairie dogs spans chapters 1, 2, 3, and 4 of the grassland plan, as well as the Black-Tailed Prairie Dog Conservation Assessment and Management Strategy, established in 2009 and revised in 2015.[8] When analyzing the ecological sustainability, diversity of plant and animal communities, and ecosystem services within the plan area specific to the proposed plan amendment, prairie dogs and the habitat they provide are critical considerations.

Despite the ecological significance of prairie dogs, the presence of prairie dog colonies can cause problems for people who depend on the lands that prairie dogs occupy. In Wyoming, prairie dogs are classified as an agricultural pest (W.S. 11-5-102(a)(xii)). Prairie dog burrowing and clipping habits and the variable nature of their colony extent can have negative effects on forage availability for domestic livestock; infrastructure such as dams, cemeteries, corrals, and buildings; and the monetary value of pasture, residential, and other lands. Prairie dog burrows can also create a tripping hazard horses, cattle, or humans and prairie dogs can pose a risk for transmission of plague-causing bacterial to humans and domestic animals.

Prairie dog populations and the extent of prairie dog colonies in an area can fluctuate greatly. Table 2 shows general trends in prairie dog occupation on the national grassland since 2001. Because of limitations in surveyed area across the national grassland from year-to-year, the most consistently and accurately portrayed colony acreage is for management area 3.63 (figure 3), located centrally in the grassland and currently managed to host large populations of prairie dogs. Other areas of the grassland and adjacent state and private lands have not been as consistently surveyed, but show general trends in prairie dog occupancy, with clear die-offs in landscape-scale plague epizootics in 2001/2002, 2005/2006, and 2017/2018, followed by periods of colony growth or stability. Conflicts in management can occur even when colony acreages are low, depending on the location of colonies, but more widespread concerns about prairie dog management occur when colony acreages or population densities are high. Since 2012, when prairie dog colonies in management area 3.63 were mapped at nearly 11,000 acres and increasing, there have been consistent problems with prairie dog encroachment onto private and state lands and associated concerns.

[8]The Thunder Basin National Grassland land and resource management and associated documents, including the final environmental impact statement, record of decision, amendments, and the Thunder Basin National Grassland Black-Tailed Prairie Dog Conservation Assessment and Management Strategy, are available on the national forest planning website: https://www.fs.usda.gov/detail/mbr/landmanagement/planning/

Table 2. Extent of black-tailed prairie dog colonies on the Thunder Basin National Grassland (TBNG) and adjacent lands.

Year	Total recorded in acres in Management Area 3.63[a,b,c]	Total recorded acres on the TBNG[a,b,c]	Total recorded acres on the TBNG and adjacent lands[a,b]
2001	12,014	18,758	22,451
2002	2,856	3,869	4,394
2003	945	4,251	5,643
2004	2,875	7,579	9,237
2005	6,168	12,876	15,427
2006	1,080	4,496	5,100
2007	1,568	2,884	3,304
2008	2,121	3,311	3,932
2009	1,876	2,822	2,947
2010	3,538	4,624	4,947
2011	5,886	9,195	9,868
2012	10,970	16,437	17,791
2013	15,382	22,979	23,259
2014	16,040	24,896	26,439
2015	18,316	28,943	29,397
2016	25,075	30,969	36,463
2017	31,521[d]	48,346[d]	76,155[d]
2018	250	625	1,154

[a] Surveys are not comprehensive and do not represent the true extent of active black-tailed prairie dog colonies in any given year; numbers are approximate.

[b] Data for 2001-2015 was collected in surveys conducted by Forest Service personnel. Data for 2016-2018 was collected in surveys conducted by the Thunder Basin Grassland Prairie Ecosystem Association (TBGPEA). Surveyed locations and total area surveyed are not consistent from year-to-year. The TBGPEA surveys cover far more state and private land than the Forest Service surveys, but the Forest Service surveys were not entirely limited to National Forest System land. The TBGPEA surveys cover roughly the vicinity of Management Area 3.63.

[c] All calculations based on 2018 surface ownership and management unit boundaries.

[d] This is combined 2016 and 2017 data. The plague event happened in 2017. Mapping efforts for 2017 measured the extent of empty burrows even after plague mortality in some colonies in order to gauge the full extent of colonies immediately before the plague event.

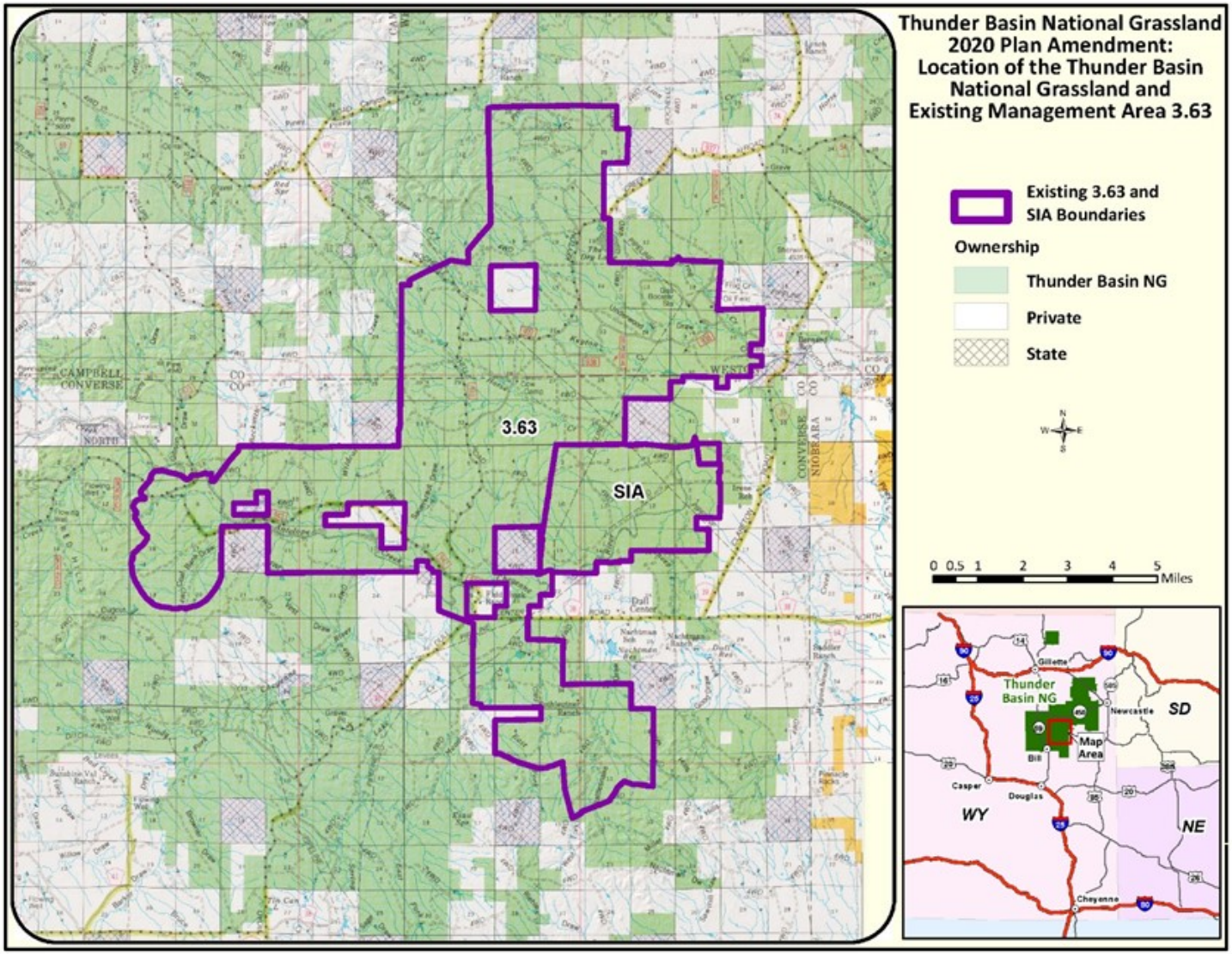

Figure 3. Location of Management Area 3.63 – Black-Footed Ferret Reintroduction Habitat on the Thunder Basin National Grassland

Black-Footed Ferret Reintroduction on the Thunder Basin National Grassland

Black-footed ferrets (*Mustela nigripes,* figure 4) are native to western grasslands and rely almost exclusively on prairie dogs as prey and on prairie dog burrows for shelter. The black-footed ferret was historically found throughout the Great Plains and Rocky Mountain regions, wherever prairie dogs occurred. Their wild populations were reduced to one known site in Meeteetse, Wyoming by 1987, and now all known populations have been reintroduced from captive-bred ferrets. According to the decision notice and finding of no significant impact for management of prairie dogs on Thunder Basin National Grassland signed in 1981, the most recent possible black-footed ferret sighting on the Thunder Basin was in 1980 and the last confirmed black-footed ferret sighting was documented before 1977. The black-footed ferret was listed as endangered by the U.S. Fish and Wildlife Service in 1967 and remains in endangered status today.

Figure 4. Black-footed ferret. Photograph by Michael Lockhart, US Fish and Wildlife Service.

As a Federal agency, the Forest Service has responsibility to contribute to recovery of threatened and endangered species according to section 7 of the Endangered Species Act. Building on the foundation of the National Forest Management Act, the 2012 Planning Rule also states that ecosystem plan components, and, when necessary, species-specific plan components must be in place to provide the ecological conditions to contribute to the recovery of federally listed threatened and endangered species (36 CFR 219.9(2)(b)). In 2002, when the grassland plan was revised as part of the broader Northern Great Plains plan revision effort, Forest Service personnel recognized that the Thunder Basin National Grassland was one of three planning units host to black-tailed prairie dogs that was large enough to support reintroduction of black-footed ferret. A 53,830-acre area of NFS land was set aside as Management Area 3.63 – Black-Footed Ferret Reintroduction Habitat (USDA Forest Service 2000). Since then, prairie dog management on the Thunder Basin National Grassland has focused on expanding prairie dog colonies to provide habitat and to promote reintroduction of black-footed ferrets. However, black-footed ferrets have not been reintroduced.

In October 2015, U.S. Fish and Wildlife Service published a 10(j) rule for black-footed ferrets in the State of Wyoming. The rule promotes reintroduction by establishing all populations in Wyoming as nonessential and experimental, thus relaxing the take and consultation requirements associated with endangered species and facilitating acceptance by local landowners and managers.[9] In this rule, U.S. Fish and Wildlife Service personnel also passed leadership of ferret reintroduction to the Wyoming Game and Fish Department. The Wyoming Game and Fish Department has developed a black-footed ferret management plan[10] based on the U.S. Fish and Wildlife Service black-footed ferret recovery plan[11] that includes the following population objectives to contribute toward recovery of the species:

- maintain a minimum of 341 breeding adults distributed among 5 or more populations statewide
- maintain a minimum of 30 breeding adults in each population, with at least 2 populations containing a minimum of 100 breeding adults
- establish at least 2 populations within white-tailed prairie dog (*Cynomys leucurus*) colonies AND at least 1 population within black-tailed prairie dog colonies, with remaining populations distributed among colonies of either prairie dog species

Both the black-footed ferret recovery plan and Wyoming black-footed ferret management plan estimate 70,000 acres of prairie dog colonies will be needed in black-tailed prairie dog and white-tailed prairie dog habitat across the state to meet Wyoming's portion of the rangewide habitat goal for black-footed ferret down-listing or delisting. According to the 10(j) rule, a minimum of 1,500 acres of black-tailed prairie dogs are required for a reintroduction site; the recovery plan also states approximately 4,500 acres of black-tailed prairie dog colonies are expected to be necessary to support at least 30 breeding adult ferrets and more than 15,000 acres are likely needed to support at least 100 ferrets.

Prairie dog colonies are present across the state of Wyoming, and Wyoming Game and Fish Department personnel have developed a strategy to evaluate and prioritize among potential sites to best allocate efforts to meet recovery goals for the state. The prioritization matrix in the management plan includes the following as the minimum requirements for allocating captive-bred ferrets to a reintroduction site:

- habitat suitability, stability, and management, including the funding and capacity to provide prairie dog boundary control where needed and desired
- disease monitoring and management, with a particular emphasis on sylvatic plague
- ability to address statewide objectives, including the ability to assess and monitor the status of ferret and prairie dog population
- stakeholder support of reintroduction activities, with particular emphasis on local communities and landowners, including adjacent landowners, permittees, and lessees

[9] U.S. Fish and Wildlife Service, Establishment of a Nonessential Experimental Population of Black-footed Ferrets in Wyoming: https://www.govinfo.gov/content/pkg/FR-2015-10-30/pdf/2015-27639.pdf
[10] Wyoming Black-Footed Ferret Management Plan: https://wgfd.wyo.gov/WGFD/media/content/PDF/Wildlife/Nongame/Wyoming-BFF-Management-Plan_11-14-2018.pdf.
[11] U.S. Fish and Wildlife Service Black-Footed Ferret Recovery Plan: https://www.fws.gov/mountain-prairie/es/species/mammals/blackfootedferret/2013NovRevisedRecoveryPlan.pdf

The full prioritization matrix provides additional ranking criteria including extent of available reintroduction habitat and more detailed evaluation of the local social environment (Wyoming Game and Fish Department 2018).

Barriers to reintroduction on the Thunder Basin National Grassland in the past have included cycles of sylvatic plague, which decrease the population and extent of prairie dog colonies; lack of prairie dog control including boundary control during colony expansions; and lack of acceptance of prairie dogs or reintroduction of black-footed ferrets by adjacent landowners and local communities.

Planning Regulations for Plan Amendments

The current (2002) grassland plan, as amended, was written under the direction of the 1982 land management planning regulations. In 2012, Forest Service staff issued a new Planning Rule and in 2015 issued agencywide directives for land management planning in the Forest Service Manual 1920 and Forest Service Handbook 1909.12. An amendment to the 2012 Planning Rule published in December 2016 described in more detail how it applies to plan amendments rather than plan revisions.[12] Several excerpts of pertinent requirements of the amended 2012 Planning Rule are included below. This listing is not intended to be a comprehensive but serves to clarify comments and questions that were raised during the scoping period.

1. A plan may be amended at any time. Plan amendments may be broad or narrow, depending on the need for change, and should be used to keep plans current and help units adapt to new information or changing conditions. The responsible official has the discretion to determine whether and how to amend the plan and to determine the scope and scale of any amendment (36 CFR 219.13(a)).

   The responsible official has proposed a plan amendment that is fairly broad in scope to amend plan direction relevant to prairie dog management.

2. All plan amendments initiated after May 9, 2015 must be initiated, completed, and approved under the requirements of the 2012 Planning Rule (36 CFR 219.17(b)).

   This plan amendment must follow provisions of the 2012 Planning Rule.

3. The responsible official must base an amendment on a preliminary identification of the need to change the plan. The preliminary identification of the need to change the plan may be based on a new assessment; a monitoring report; or other documentation of new information, changed conditions, or changed circumstances (36 CFR 219.13(b)(1)).

   The need to change the plan is described in the section “Purpose and Need for Action” under “Changed Conditions.”

[12] National Forest System Land Management Planning, Amendment to the 2012 Planning Rule, available at: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd527654.pdf.

4. Where the responsible official determines a new assessment is needed to inform an amendment, the responsible official has the discretion to determine the scope, scale, process, and content for the assessment depending on the topic or topics to be addressed (36 CFR 219.6). An assessment is not required to amend a plan (Forest Service Handbook 1909.12, chapter 20, section 21.2).

   The responsible official has chosen not to pursue any assessments as part of this plan amendment process. However, evaluations of animal and plant species to consider for identification as potential species of conservation concern have been completed in support of the plan amendment and are available on the project website.

5. New or amended plan components must follow the applicable format for plan components set out at section 219.7(e) for the plan direction added or modified by the amendment, except that where an amendment to a plan developed or revised under a prior planning regulation would simply modify the area to which existing direction applies, the responsible official may retain the existing formatting for that direction (36 CFR 219.13(b)(2)).

   Proposed amended plan components in the format set in section 219.7 are included in Appendix A.

6. The responsible official must determine which specific substantive requirement(s) of the Planning Rule in sections 219.8 through 219.11 are directly related to the plan direction being added, modified, or removed by the amendment and apply such requirement(s) within the scope and scale of the amendment. The responsible official is not required to apply any substantive requirements in sections 219.8 through 219.11 that are not directly related to the amendment 36 CFR 219.13(b)(5).

   In the April 2019 notice of intent, the responsible official identified substantive requirements of the 2012 Planning Rule that are likely to be applicable to the amendment: 36 CFR 219.8(a) ecological sustainability and (b) social and economic sustainability, 36 CFR 219.9 diversity of plant and animal communities, and 36 CFR 219.10(a) integrated resource management for ecosystem services and multiple use.

   a. With respect to the requirements of the rule at 36 CFR 219.8, the analysis in Chapter 3 shows changes to the plan components maintain ecosystem sustainability and contribute to social and economic sustainability, within the scope of the amendment.

   b. With respect to the requirements at 36 CFR 219.9, the rule states the plan must include ecosystem plan components that maintain or restore the ecological integrity and diversity of ecosystems. The responsible official shall determine whether the ecosystem plan components provide the ecological conditions necessary to contribute to the recovery of federally listed threatened and endangered species, conserve proposed and candidate species, and maintain a viable population of each species of conservation concern within the plan area. If the responsible official determines the ecosystem plan components are insufficient to provide such ecological conditions, additional, species-specific plan components, including standards or guidelines, must be included in the plan to provide such ecological conditions in the plan area.

The 2012 Planning Rule emphasizes use of ecosystem plan components first, then species-specific plan components when needed, to ensure viability of at-risk species. The interdisciplinary team proposes ecosystem plan components that describe desired ecological characteristics of the plan area, the desired rate of progress to move toward those characteristics, and constraints on projects and activities. Some existing and proposed species-specific constraints on projects and activities are also incorporated into plan components where ecosystem plan components are insufficient to provide ecological conditions to conserve those species.

All alternatives include both ecosystem plan components and species-specific plan components for at-risk species (appendix A). Examples of ecosystem plan components are desired conditions and objectives for management areas 3.63 and 3.67, target acreages for prairie dog colony extent, and restrictions on rodenticide use and recreational shooting. Examples of species-specific plan components are specific colony sizes proposed for mountain plover and burrowing owl management.

Contribution to recovery of federally listed species and effects of the proposed changes in plan direction on potential species of conservation concern are analyzed in chapter 3 and in the biological evaluation of animal species.

c. With further respect to the requirements at 36 CFR 219.9, for an amendment to a plan developed or revised under a prior planning regulation, if species of conservation concern have not been identified for the plan area and if scoping or environmental effects analysis for the proposed amendment reveals substantial adverse impacts to a specific species, or if the proposed amendment would substantially lessen protections for a specific species, the responsible official must determine whether such species is a potential species of conservation concern, and if so, apply section 219.9(b) with respect to that species as if it were a species of conservation concern (36 CFR 219.13(b)(6)).

   Species of conservation concern have not been identified for the Thunder Basin National Grassland. In preparation for amending the 2002 grassland plan, Forest Service personnel prepared potential species of conservation concern evaluations for 47 animal and plant species. The 47 species all have factors of rarity and are native to and known to occur on the Thunder Basin National Grassland, meeting the minimum criteria to be considered for identification as potential species of conservation concern, as established in Forest Service directives (Forest Service Handbook 1909.12, chapter 10, section 12.52). These evaluations provide background information and the best available scientific information regarding the condition of each species and its habitat on the Thunder Basin National Grassland to assist in the identification of any potential substantial adverse impacts or substantially lessened protections during the analysis associated with the proposed plan amendment. Effects to potential species of conservation concern are disclosed in the biological evaluation and summarized in chapter 3. The proposed plan amendment will not result in an official designation of species of conservation concern on the Thunder Basin National Grassland by the Rocky Mountain Region regional forester.

d. With respect to the requirement of the rule at 36 CFR 219.10(a), the analysis shows the proposed amendments to prairie dog management should maintain or improve the capability of the plan area to provide for ecosystem services and multiple uses.

7. The responsible official shall use the best available scientific information for assessment; developing, amending, or revising a plan; and monitoring. In doing so, the responsible official shall determine what information is the most accurate, reliable, and relevant to the issues being considered. The responsible official shall document how the best available scientific information was used to inform the assessment, the plan or amendment decision, and the monitoring program as required in sections 219.6(a)(3) and 219.14(a)(3).

   An interdisciplinary team of resource professionals, described in chapter 4 of this environmental impact statement, compiled and evaluated scientific information relevant to the proposed plan amendment. This information includes material that was readily available from public sources (libraries, research institutions, scientific journals, and online literature), including material recommended by commenters during the April-May 2019 project scoping period. It also includes information obtained from other sources, such as unpublished field surveys, direct experience with implementation of proposed conservation and control tools, consultation with local experts, findings from ongoing research projects, workshops and collaborations, and other professional knowledge and experience. The interdisciplinary team utilized and updated a geographic information system database to evaluate spatial effects resulting from implementation of the alternatives.

   Resource specialists considered what is most accurate, reliable, and relevant in their use of the best available scientific information. The best available scientific information used to inform the grassland plan amendment is listed in the literature cited sections of biological evaluations and the draft environmental impact statement. Literature cited may also include scientific information that is discussed in order to address opposing or misaligned scientific findings, interpretations, or conclusions, as required by the National Environmental Policy Act. Conclusions drawn from synthesis of the best available scientific information are documented in chapter 3 and the biological evaluations for plant and animal species.

Purpose and Need for Action

Changed Conditions

Wildlife surveys completed before 2001 in support of the 2002 grassland plan identified 18,340 acres of prairie dog colonies across the Thunder Basin National Grassland (USDA Forest Service 2000). The biological evaluation supporting the grassland plan predicted that 30,000 to 47,000 acres of prairie dogs would be expected on Federal lands across the Thunder Basin National Grassland as populations expanded during the next 10 years, and that within management area 3.63 (53,830 acres), the estimated occupancy of 12,430 acres in the year 2000 would likely expand to 20,300 to 32,200 acres, depending largely on precipitation. At that time, the black-tailed prairie dog was a candidate species for listing under the Endangered Species Act, and grassland-wide, geographic area, and management area direction was written to emphasize conservation and expansion of prairie dog colonies.

Challenges related to prairie dog management and the potential reintroduction of black-footed ferret have existed since completion of the grassland plan. These challenges have continued through prairie dog population cycles of expansion and decline and through several planning efforts.

In particular, Forest Service personnel have had limited success in minimizing impacts of prairie dog encroachment onto private and State lands during times of population expansion and minimizing rapid landscape-scale declines during plague epizootics. To provide more flexibility, a 2009 grassland plan amendment for prairie dog management did four things:

1. It altered the boundary of Management Area 3.63 – Black-Footed Ferret Reintroduction Habitat
2. It allowed increased use of rodenticides to control prairie dogs in select situations
3. It introduced the Thunder Basin National Grassland Black-Tailed Prairie Dog Conservation Assessment and Management Strategy, which was revised in 2015
4. It emphasized work across landownership boundaries to provide habitat for prairie dogs and associated species

The Black-Tailed Prairie Dog Conservation Assessment and Management Strategy designated habitat management categories and established decision making processes for prairie dog control efforts. The strategy was designed to be more flexible and more easily modified than the grassland plan, but challenges with available tools and the ability to make timely decisions continued.

Not long after Forest Service staff completed the 2015 update to the 2015 Prairie Dog Conservation Assessment and Management Strategy, prairie dog colonies on and around the national grassland began to expand significantly. The population expansion continued into 2016 and 2017, exceeding anything seen in recent history. Mapping efforts during these years showed prairie dog colonies expanded to more than 48,000 acres on NFS land in and around management area 3.63. Although these numbers were close to those predicted during the 2002 planning process, the Prairie Dog Conservation Assessment and Management Strategy provided no direction and little flexibility regarding such a management situation. Instead, the strategy states management direction contained in the strategy should be reviewed when colonies exceed 35,000 acres on Federal land grassland-wide.

The colony acreages of 2017 triggered the need to review the 2015 Prairie Dog Conservation Assessment and Management Strategy. Furthermore, the social context surrounding prairie dog management became increasingly contentious as local leadership and grassland staff attempted to work within the constraints of the strategy to provide boundary control and react to the rapid changes taking place on the national grassland. Agency leadership and partner agencies recognized there was likely a need to minimize prairie dog encroachment onto non-Federal lands, change the plan to improve boundary management, provide a wider array of management options to respond to changing conditions, and stabilize colony area to allow better and more consistent management. In 2017, Forest Service, U.S. Fish and Wildlife Service, and Wyoming Game and Fish Department staff documented in a joint statement that:

> "A joint examination of the guiding documents that influence and direct management of the grasslands will identify any potential [management] adjustments necessary based on science, social and economic issues, and altered conditions…Ecological conditions, including occupied prairie dog habitat and grassland conditions, have changed over time necessitating this review…We cooperatively agree that the reintroduction of black-footed ferrets on the grassland is not appropriate at this time. Instead, the current focus surrounds prairie dog management actions, including boundary control and disease control."

In 2017 and 2018, plague became active on the Thunder Basin National Grassland, and by the summer of 2018 the extent of mapped prairie dog colonies decreased by 99 percent to an estimated 625 acres on Federal land, further emphasizing the need to modify management direction to allow for greater stabilization of prairie dog colony area (table 2, figure 5).

In 2018, the Wyoming Department of Agriculture convened a collaborative stakeholder group that included private landowners, nongovernmental organizations, and government representatives to discuss and provide management recommendations related to prairie dog management on the Thunder Basin National Grassland. The stakeholder group was not able to come to consensus on all issues, but following 6 months of work, the group identified a need to change prairie dog management direction in the grassland plan, to revise or eliminate portions of the prairie dog management strategy, and to find a lasting solution to balance multiple uses on the national grassland. Recommendations from this group were reviewed by an interdisciplinary team of resource specialists assigned to the Thunder Basin National Grassland and served as the basis for the proposed action. Since completing recommendations in 2018, the stakeholder group has adopted the name "Thunder Basin Working Group," by which it will be referred throughout this document. In 2019, the Wyoming County Commissioners Association took over as convener, and meetings are expected to continue throughout the plan amendment process and beyond. The planning team will continue to work closely with the working group to ensure all parties are informed on the planning process.

In early 2019, the responsible official considered the changed environmental and social conditions, including the extent of mapped prairie dog colonies over time; requests for management and control from adjacent landowners; and requests for change from local, State, and Federal government agencies and determined there is a need to change prairie dog management direction in the grassland plan with a plan amendment (36 CFR 219.13(b)). Because direction related to prairie dog management and habitat management is included in chapters 1 through 4 of the grassland plan and in the 2015 Black-tailed Prairie Dog Conservation Assessment and Management Strategy, the proposed amendment includes changes to many plan components throughout the plan. Proposed changes to plan components for each alternative are in appendix A.

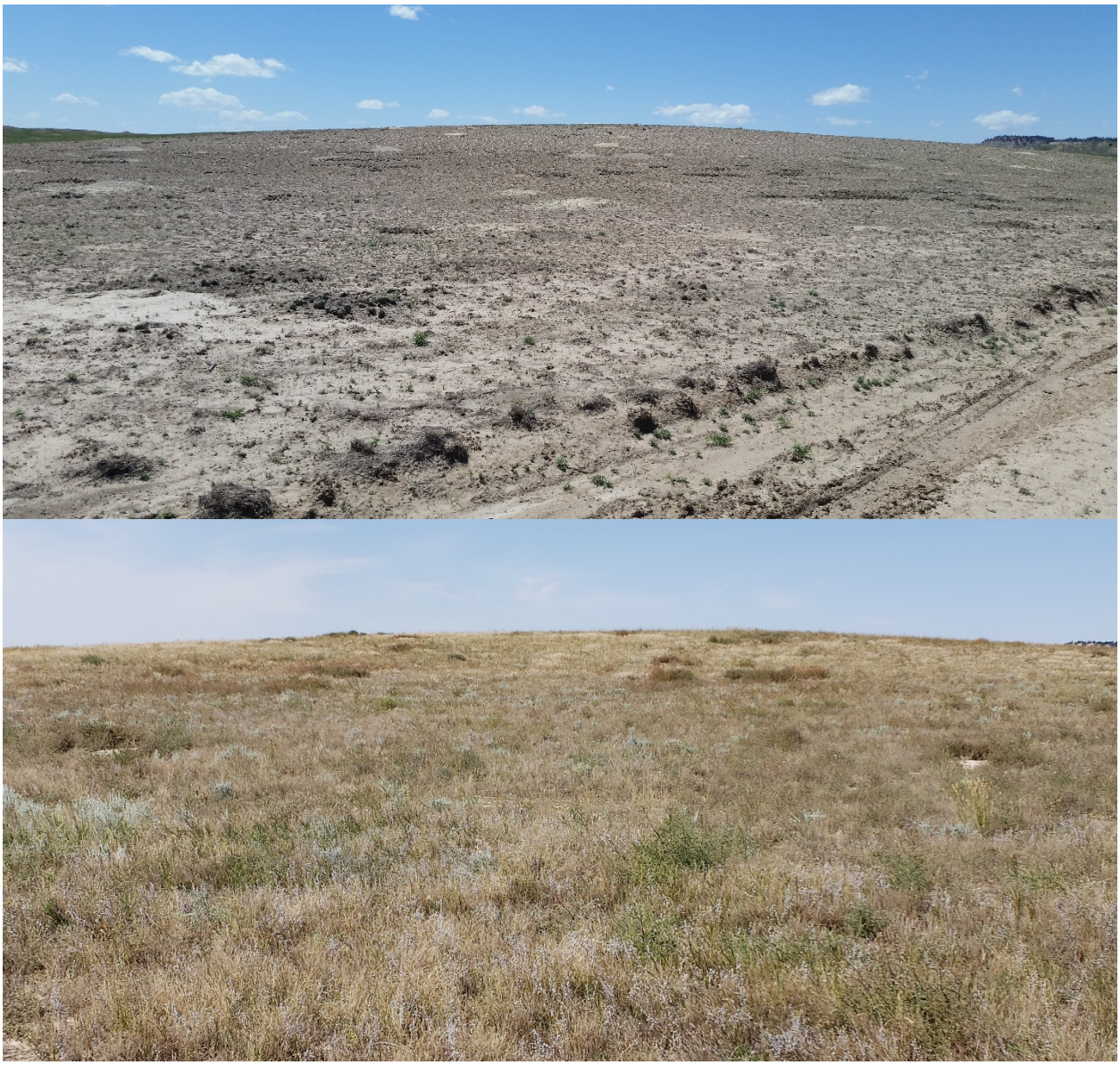

Figure 5. Prairie dog colony on the Rosecrans allotment in 2017 during the height of prairie dog occupancy (top) and in 2018 following the plague event (bottom). This is an example of a highly affected site dominated by annual natives. Not all sites were affected to the same degree or had the same degree of recovery. Photographs by Dave Pellatz

Purpose and Need Statement

In recent years, dramatic changes in prairie dog populations and increasing conflicts have indicated the need to change the grassland plan to allow Federal land managers to be more responsive to a variety of environmental and social conditions.

The purpose of this proposed plan amendment is to:

- provide a wider array of management options to respond to changing conditions;
- minimize prairie dog encroachment onto non-Federal lands;
- reduce resource conflicts related to prairie dog occupancy and livestock grazing;
- ensure continued conservation of at-risk species; and
- support ecological conditions that do not preclude reintroduction of the black-footed ferret.

Specifically, an amendment is needed to:

- revise management direction in Management Area 3.63 – Black-Footed Ferret Reintroduction Habitat,
- adjust the boundaries of management area 3.63 to be more conducive to prairie dog management;
- increase the availability of lethal prairie dog control tools to improve responsiveness to a variety of management situations, including those that arise due to encroachment of prairie dogs on neighboring lands, natural and human-caused disturbances, and disease.

Proposed Action

In April 2019, Forest Service staff released a scoping document that described a proposed action for prairie dog management, including proposed changes to grassland plan direction. The proposed action has been modified following the scoping process as part of the iterative nature of the National Environmental Policy Act and grassland planning process. The major components of the proposal include:

1. Change existing Management Area 3.63 – Black-Footed Ferret Reintroduction Habitat to a new Management Area 3.67 – Rangelands with Short-Stature Vegetation Emphasis.
2. Change the boundaries for management area 3.67 to use natural barriers to minimize prairie dog movement and to reduce conflicts in management.
3. Eliminate requirement to use the Black-tailed Prairie Dog Conservation Assessment and Management Strategy and add necessary plan components to the grassland plan.
4. Establish a minimum quarter-mile boundary management zone along boundaries with private or State property.
5. Where possible, adopt use of the Natural Resources Conservation Service's ecological site descriptions to describe plant communities, evaluate current and desired conditions, and maintain or improve native vegetation and wildlife habitat.
6. Establish a target of 10,000 acres of prairie dog colonies on NFS lands on the Thunder Basin National Grassland to support viable populations of prairie dogs and associated species, such as mountain plover, burrowing owl, and swift fox, and to not preclude reintroduction of black-footed ferret.

Decision Framework

Given the purpose and need for a plan amendment, the responsible official will review the proposed action, the other alternatives, and the environmental consequences of each alternative in order to make the following decisions:

- whether to implement a plan amendment to change prairie dog management as described in the proposed action
- whether to implement a plan amendment to change prairie dog management as described in an alternative to the proposed action
- whether to implement a combination of alternatives analyzed in detail
- whether to adopt amended grasslandwide, geographic area, and management area direction consistent with the selected alternative(s)
- whether to take no action

Public Involvement

The notice of intent to publish an environmental impact statement was published in the Federal Register on April 18, 2019. The notice of intent asked for public comment on the proposal from April 18, 2019 until May 20, 2019. Forest Service personnel sent approximately 300 letters and 400 emails describing the proposed action and opportunity to comment to local, State, and Federal government staff and leaders; environmental and nongovernmental organizations; grazing association members; and others who expressed interest in the project. Forest Service staff initiated formal consultation with 18 Native American Tribes with an interest in the Thunder Basin National Grassland in April 2019.

Agency personnel presented the proposed action to members of the Thunder Basin Working Group on May 6, 2019; hosted a public meeting at the Converse County library in Douglas, WY to reach other local stakeholders on May 6, 2019; and a webinar to reach a broader audience of stakeholders on May 8, 2019. Approximately 50 people were present at the Thunder Basin Working Group meeting, approximately 10 were present at the local public meeting, and approximately 15 were present on the webinar.

Approximately 500 comment letters were received during the public scoping period, with about 40 were unique and substantive comments. Commenters included representatives from State and local governments, grazing association members and ranching representatives, individuals with expertise in wildlife management and black-footed ferret reintroduction, and nongovernmental organizations. Several nongovernmental organizations initiated signature-gathering campaigns that garnered more than 18,000 signatures in opposition to the proposal. Issues raised by this diverse group of stakeholders are described below.

Issues

Issues serve to highlight effects or unintended consequences that may occur from the proposed action or alternatives, giving opportunities during the analysis to reduce adverse effects and compare trade-offs for the decision maker and public to understand. The interdisciplinary team identified stakeholder concerns through the scoping process and wrote issue statements describing those significant issues that may be directly or indirectly caused by implementing the proposed action, may involve potentially significant effects, and could be meaningfully and reasonably evaluated and addressed within the scope of this proposal. The interdisciplinary team then developed alternative management approaches (described in chapter 2) that could address issues while still meeting the purpose and need of the project (40 CFR 1500.2(e)).

Please note the following issue statements do not represent conclusions. They are public concerns that need to be addressed by alternatives and analyzed in the environmental impact statement.

1. Viability of sensitive species and potential species of conservation concern

   Managed reductions in prairie dog colony size, distribution, or density could decrease the ability of prairie dogs and associated species to persist on the national grassland.

   Extreme fluctuations in prairie dog colony extent due to drought, plague, and other environmental disturbances or stressors may occur despite management efforts and could decrease the ability of prairie dogs and associated species to persist on the national grassland.

   Effects of climate change on the grassland ecosystem could impact the ability of prairie dogs and associated species to persist on the national grassland.

2. Black-footed ferret recovery

   Managed reductions in prairie dog colony size, distribution, or density could reduce the availability of habitat for black-footed ferret reintroduction, the ability to reintroduce black-footed ferrets on the national grassland, and the likelihood of achieving rangewide recovery criteria described in the U.S. Fish and Wildlife Service 2013 recovery plan.

   Extreme fluctuations in prairie dog colony extent due to drought, plague, and other environmental disturbances or stressors may occur despite management efforts and could impact the availability of habitat for black-footed ferret reintroduction, the ability to reintroduce black-footed ferrets on the national grassland, and the likelihood of achieving rangewide recovery criteria described in the U.S. Fish and Wildlife Service 2013 recovery plan.

   Social issues surrounding black-footed ferret recovery efforts could decrease the likelihood or success of future reintroduction.

3. Forage for permitted livestock

   Management actions that increase or decrease prairie dog colony size, distribution, or density could change forage availability for livestock production on NFS land.

   Encroachment of prairie dogs onto private and State lands could impact forage availability for livestock production on private and State land.

4. Economic concerns

   Changes to forage availability could impact income and jobs associated with ranching activities.

   Encroachment of prairie dogs onto private lands could decrease land values and impact facilities.

5. Health and Safety Concerns

   Existence of plague among wildlife populations on the Thunder Basin National Grassland could pose a risk to human health.

   Burrows in prairie dog colonies could create safety hazards for permittees, workers, visitors, and livestock on NFS land and where encroachment has occurred on state and private lands.

6. Recreational Shooting

   Prohibitions on shooting may eliminate a tool for controlling prairie dog populations.

   Prohibitions on shooting could reduce recreational opportunities and associated economic benefits for surrounding communities.

   Allowing shooting within management areas 3.63 and 3.67 may disrupt prairie dog reproduction and dispersal dynamics and may cause direct take of associated and protected species.

7. Federal land boundary management

   A boundary management zone of ¼ mile may not be adequate to prevent encroachment onto private and State lands.

8. Use of rodenticides

   Rodenticides used to kill prairie dogs could poison and kill other, nontarget wildlife species.

   Restrictions on rodenticide use could make control of prairie dogs ineffective.

9. Cost of implementing the plan amendment

   Costs associated with staff time, supplies, and other resources could limit the ability to implement the plan effectively.

10. Failure to implement current management plan

    More aggressive implementation of the current plan could reduce conflicts and the need for a plan amendment.

11. Laws, regulations, and policies

    Proposed changes to prairie dog management could conflict with requirements of the National Forest Management Act and 2012 Planning Rule, National Environmental Policy Act, and Endangered Species Act, particularly with regard to rangeland management and management of at-risk species.

    Forest Service may not be fulfilling its role regarding recovery of species listed under the Endangered Species Act.

    Forest Service may not have legal authority to manage national grasslands for multiple uses.

    Forest Service may not be appropriately addressing detrimental environmental impacts from prairie dog occupancy, including soil erosion.

12. Candidate conservation agreements

    Candidate conservation agreements and candidate conservation agreements with assurances could reduce the acres of prairie dog colonies needed on Federal land to provide habitat for associated species across the landscape.

13. Greater sage-grouse habitat

    Occupancy of greater sage-grouse habitat management areas by both prairie dogs and greater sage-grouse could create management conflicts.

14. Collaborative stakeholder group

    If the collaborative stakeholder group is poorly organized, unbalanced in membership, or cannot produce consensus decisions, the group may be ineffective and recommendations may not represent diverse interests.

Other Related Efforts

Thunder Basin Working Group

The collaborative stakeholder group convened by the Wyoming Department of Agriculture in 2018 continues to work toward collaborative solutions to grassland restoration and prairie dog management. Following completion of the effort by the Wyoming Department of Agriculture, the group identified a new convener, the Wyoming County Commissioners Association, and agreed to continue working together under the title, "Thunder Basin Working Group." Thunder Basin National Grassland personnel will continue working with this group throughout this environmental analysis and through implementation, if it remains in place. Many of the projects and activities discussed by the working group are posted to the Thunder Basin National Grassland prairie dog management website. [13]

[13] Thunder Basin grassland restoration and prairie dog management: https://www.fs.usda.gov/goto/MBRTB/PrairieDogs

Prairie Dog Colony Mapping and Monitoring

Mapping and monitoring of prairie dog colonies continues annually, with priorities discussed each year through a partnership with the Thunder Basin Working Group and the Thunder Basin Grassland Prairie Ecosystem Association. Strict protocols have been developed, with priorities for mapping identified each year based on specific needs. Mapping and monitoring efforts will continue into the future, and the protocols for 2019 are included in appendix B.

Memorandum of Understanding for Collaborative Recovery Efforts for the Black-Footed Ferret

The Forest Service is a partner in a memorandum of understanding between the State of Wyoming Game and Fish Commission, the Wyoming Game and Fish Department, and the U.S. Fish and Wildlife Service, Wyoming Field Office, along with the Bureau of Land Management, the Natural Resources Conservation Service, and the Wyoming Department of Agriculture to seek recovery of the black-footed ferret. These groups will continue to work collaboratively to advance the purposes of this memorandum of understanding, including that they will "collaboratively use their respective authorities to aid as appropriate in the ferret recovery effort in the state of Wyoming."

Plan Evaluation and Monitoring

The Medicine Bow-Routt National Forests and Thunder Basin National Grassland updated the monitoring chapter of all three forest and grassland plans in 2016[14]. This update was in response to direction in the 2012 Planning Rule, which required development of monitoring questions and indicators to address eight monitoring topics (36 CFR 219.12(a)(5)) within 4 years of the effective date of the planning regulations (36 CFR 219.12(c)). The Planning Rule requires biennial evaluation of monitoring information (36 CFR 219.12(d)(1)(ii)). At the time of preparation of this environmental impact statement, the first biennial monitoring report, which will incorporate information from monitoring work in 2017 and 2018, is not yet complete.

The following excerpts from the 2016 monitoring plan are relevant to this plan amendment:

1. Status of select ecological conditions including key characteristics of terrestrial and aquatic ecosystems 36 CFR 219.12(a)(5)(ii)

   Monitoring question: How are major vegetation types on the planning unit changing over time?

   Monitoring indicators: Cover type, ecological site conditions, age class, size class, structural stages of forest, shrubland, and grassland vegetation.

[14] Medicine Bow-Routt National Forests and Thunder Basin National Grassland 2016 Monitoring Transition available at: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd500641.pdf

2. Status of focal species to assess the ecological conditions required under 219.9 (36 CFR 219.12(a)(5)(iii)

   Monitoring question: What is the status of black-tailed prairie dog populations as an indicator for short-grass prairie ecosystem integrity?

   Monitoring indicators: Prairie dog town extent, density, and occupancy; current vs. historic population levels; associated species occupancy (mountain plover, burrowing owl, swift fox, raptors); sylvatic plague extent or changes

3. Status of a select set of the ecological conditions required under 219.9 to contribute to the recovery of federally listed threatened and endangered species, conserve proposed and candidate species, and maintain a viable population of each species of conservation concern 219.12(a)(5)(iv)

   Monitoring question: What is the status and trend of suitable habitat to support the recovery of the black-footed ferret on the planning unit?

   Monitoring indicators: Prairie dog town extent, density, and occupancy; sylvatic plague extent or changes

4. Status of visitor use, visitor satisfaction, and progress toward meeting recreation objectives 219.12(a)(5)(iv)

   Monitoring question: What are the status and trends of visitor satisfaction for recreational visits on the planning unit?

   Monitoring indicators: Visitor satisfaction, number of visitors, changes in demand

5. Measureable changes on the plan area related to climate change and other stressors that may be affecting the plan area 219.12(a)(5)(vi)

   Monitoring question: What stressors are impacting the planning unit? Can any trends in these stressors be related to climate change?

   Monitoring indicators: Timing, type and amount of precipitation (rain versus snow); snowpack depth and persistence; changes in air temperature; changes in stream or lake temperature; extent of insect and disease outbreaks; extent of invasive species infestations; extent and severity of wildfires (for fires greater than100 acres); dozer fire line constructed (miles); habitat fragmentation (roads and infrastructure per square mile); number of visitors by activity type; population trends; unauthorized off-highway vehicle use

6. Progress toward meeting the desired conditions and objectives in the plan, including for providing multiple use opportunities 219.12(a)(5)(vii)

   Monitoring question: How are management activities on the planning unit affecting local employment and income?

   Monitoring indicators: Range contributions and effects to local employment and income; timber contributions and effects to local employment and income; recreation and effects to local employment and income; minerals developments and effects to local employment and income

7. Effects of each management system to determine that they do not substantially and permanently impair the productivity of the land

   Monitoring question: What changes in soil properties have been observed in the planning unit?

   Monitoring indicators: Extent of soil disturbance: detrimental soil compaction, detrimental displacement, detrimental erosion

8. Effects of each management system to determine that they do not substantially and permanently impair the productivity of the land 219.12(a)(5)(viii)

   Monitoring question: Are we providing adequate forage for domestic livestock, wild ungulates, and small herbivores commensurate with availability, capability, and sustainability?

   Monitoring indicators: Animal unit months (AUMs) permitted for each allotment; extent of invasive species infestations in capable rangelands (acres per species); utilization of forage; select wildlife population trends; soil type, aspect, slope, precipitation, and elevation.

Chapter 2. Alternatives, Including the Proposed Action

Introduction

This chapter describes and compares the alternatives considered for the Thunder Basin National Grassland 2020 plan amendment. It includes a description and map of each alternative considered. This section also presents the alternatives in comparative form, defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public. Some information used to compare the alternatives is based upon the design of the alternative (for example, target or range of acres of prairie dog colonies on the Thunder Basin National Grassland) and some information is based upon the environmental, social, and economic effects of implementing each alternative (for example, use of various rodenticides for prairie dog control).

Alternatives Considered in Detail

Forest Service personnel developed three action alternatives in response to issues raised by the public and pursued analysis of four alternatives: the no-action alternative, the proposed action, the grassland-wide alternative, and the prairie dog emphasis alternative. Major components of each alternative related to prairie dog management are presented in this section to describe the types of management changes being proposed. These major components will translate into grassland plan direction as part of the amendment process, and proposed amended plan direction (plan components identified as desired conditions, objectives, standards, and guidelines) for each alternative is in appendix A. Definitions of plan components are provided in appendix A to allow a full understanding of the alternatives. Management approaches that describe management intent for working with a collaborative stakeholder group, satellite colonies, density control, plague management, and mapping and monitoring are provided in appendix B.

Alternative 1 - No Action

Under the no-action alternative, the amended 2002 grassland plan, and the 2015 Black-Tailed Prairie Dog Conservation Assessment and Management Strategy would continue to guide management of prairie dogs on the Thunder Basin. No changes would be made to either the plan or the 2015 Black-Tailed Prairie Dog Conservation Assessment and Management Strategy. If on-the-ground management changes occur, they would be within the bounds of the current plan and strategy. For comparative purposes with other alternatives, major components of prairie dog management are described here:

Management Area 3.63 and the Cheyenne River Zoological Special Interest Area

- Management Area 3.63 – Black-footed Ferret Reintroduction Habitat would keep its current management area name and associated plan direction and would remain in its current location and size at approximately 51,000 acres (figure 3).
- The Cheyenne River Zoological Special Interest Area would keep its current management area name and associated plan direction and would remain in its current location and size at approximately 5,900 acres (figure 3).

- In addition to management area 3.63, the 2015 Black-Tailed Prairie Dog Conservation Assessment and Management Strategy identifies locations for category 1, category 2, and category 3 prairie dog management areas (figure 6). The category 1 area, which overlaps management area 3.63 almost in its entirety, was drawn based on the historic distribution of prairie dogs across the planning landscape and on including the most potential and suitable prairie dog habitat and the largest block of continuous public lands on the Thunder Basin National Grassland. The category 1 area is intended to provide habitat to support the reintroduction of black-footed ferrets and to support the variety of species associated with prairie dog colonies. The five category 2 locations were selected based on habitat potential and historic distribution of prairie dogs and are intended to provide an adequate distribution of prairie dogs and associated species across the landscape. Category 3 areas include small, isolated colonies on the Thunder Basin that do not fall into category 1 or 2 areas. These colonies provide a source for natural dispersal to category 1 and 2 areas and a broad geographic distribution of prairie dog colonies and associated species across the Thunder Basin National Grassland.

Prairie Dog Colony Acre Targets and Distribution

- Prairie dog colonies and acreage targets would be managed based on the categories described in the 2015 Black-Tailed Prairie Dog Conservation Assessment and Management Strategy. These targets do not represent upper limits, and colonies may continue to grow after targets are reached.
- Category 1: 18,000 acres; category 2: 9,000 acres; category 3 (rest of the national grassland): 6,000 acres.
- The 2015 Black-Tailed Prairie Dog Conservation Assessment and Management Strategy states it should be reviewed when acreages exceed 35,000 across the national grassland.

Boundary Management Zones

- Boundary management zones are not in place, but prairie dog control would continue to be allowed within 1 mile of residences and where there is damage to public and private facilities, regardless of management area or prairie dog management category.

Thresholds for Rodenticide Use

- Approved rodenticides for reducing prairie dog populations (zinc phosphide) may continue to be used in the following situations regardless of the category of prairie dog habitat involved:
    - public health and safety risks occur in the immediate area
    - damage to private and public facilities, such as cemeteries and residences
- Category 1 area: Any control efforts proposing rodenticides may only be initiated if cumulative acreage of active prairie dog colonies within category 1 exceeds 18,000 acres, except in cases of human health and safety. Use of rodenticides on Federal lands may only be employed within approximately ½ mile of the Thunder Basin National Grassland boundary and only in cases where appropriate and available nonlethal options have been considered and used, unless they have been found to be ineffective for changing the rate and direction of colony expansion.

- In category 2 areas and in other locations across the national grassland, use of rodenticides is conditional based on decision screens in the 2015 Black-Tailed Prairie Dog Conservation Assessment and Management Strategy. Non-lethal control methods are preferred in category 2 areas.
- Prairie dog control efforts that propose to use rodenticides outside categories 1 and 2 may only be initiated if cumulative acreage of active prairie dog colonies on category 3 colonies exceeds 6,000 acres, except for protection of human health and safety.

Approved Rodenticides

- Zinc phosphide approved for use in the State of Wyoming.

Recreational Shooting

- Recreational shooting of prairie dogs would continue to be prohibited within management area 3.63 and the category 1 area.
- Recreational shooting of prairie dogs would continue to be prohibited on all National Forest System lands within the five category 2 areas, with exceptions. Recreational shooting could be allowed (1) with seasonal restrictions on all category 2 areas if the total category 2 acreage exceeds 9,000 acres or (2) on individual category 2 areas prior to meeting the total category 2 objective if expansion onto private lands is an issue and if appropriate and available nonlethal options have been considered, used, and found to be ineffective for changing the rate and direction of colony expansion. Use of nontoxic or non-expanding bullets is recommended to reduce possible secondary lead poisoning.
- Recreational shooting of prairie dogs would continue to be allowed on all category 3 colonies on National Forest System lands, unless the colonies are located inside Management Area 3.63 – Black-Footed Ferret Reintroduction Habitat. Information would continue to be provided to encourage shooters to use nontoxic and non-expanding bullets to minimize the potential risk of exposing nontarget wildlife to lead poisoning. Seasonal restrictions may be applied to those colonies where there is documented use by associated species of conservation concern such as burrowing owls and mountain plovers.

Management Strategy and Collaborative Stakeholder Group

- The 2015 Prairie Dog Conservation Assessment and Management Strategy would remain in effect, with a collaborative stakeholder group in place.

Drought Plan

- No specific management changes under drought conditions.

Plague Management

- Plague control tools including deltamethrin (“Delta Dust”), an insecticide used to control fleas that are a vector for sylvatic plague, and sylvatic plague vaccine, which can be administered to prairie dogs, may be used in prairie dog colonies across the grassland.

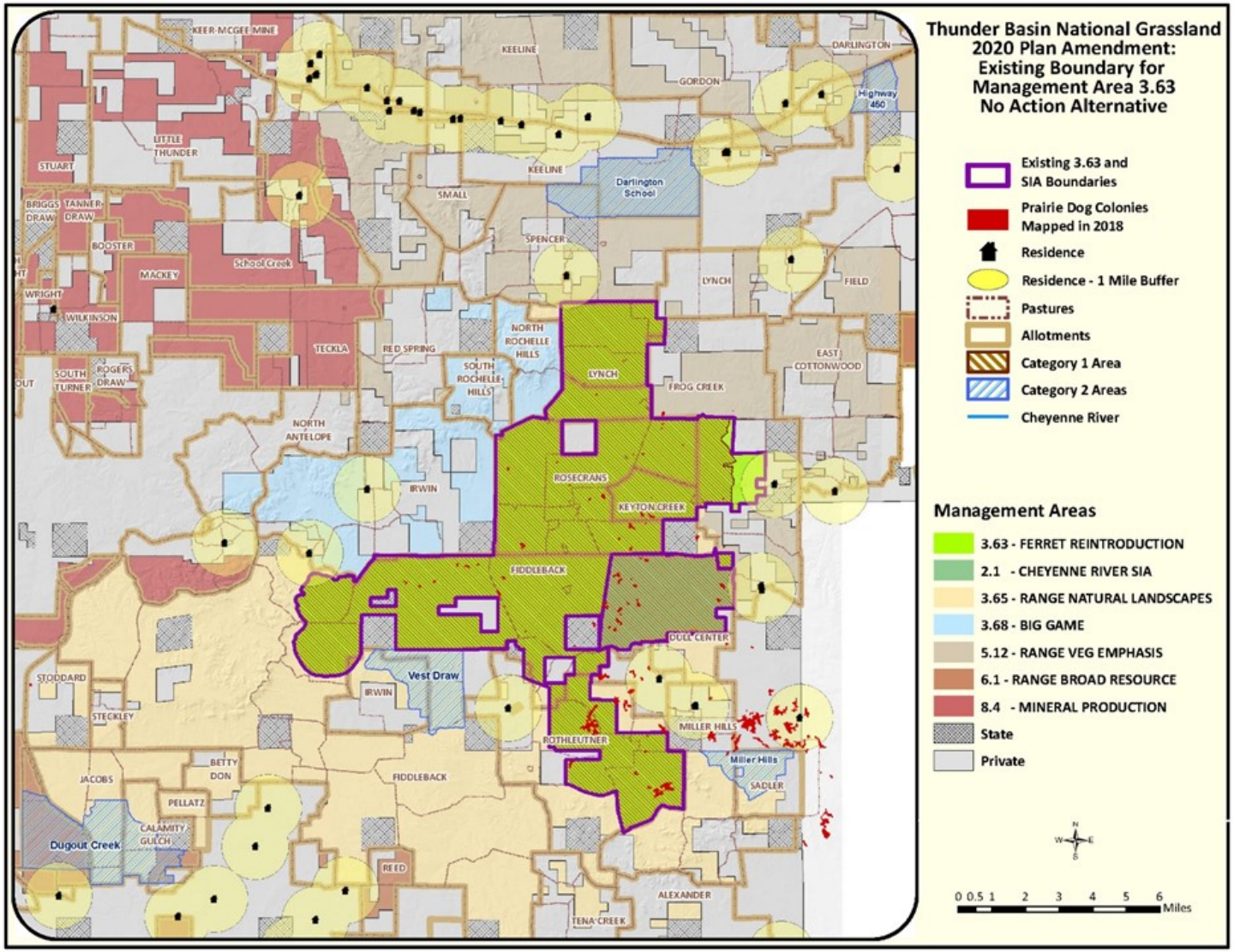

Figure 6. Delineation of management area 3.63, the Cheyenne River Zoological Special Interest Area, and category 1 and category 2 areas in the no-action alternative, with allotment boundaries

Density Control

- Use of management actions to reduce the number of live prairie dogs within a colony, or density control, is not addressed in the grassland plan. However, all forms of lethal control including the use of rodenticides for density control are prohibited in categories 1 and 2 and management area 3.63. Density control using rodenticides could be applied in category 3 if acreage targets are met. Non-lethal forms of density control such as translocation (figure 7) are allowed at any time in categories 1, 2, and 3 and management area 3.63 at the discretion of the responsible official. All lethal and non-lethal forms of density control are allowed at any time outside of categories 1, 2, and 3.

Figure 7. Translocation of prairie dogs is one form on non-lethal control that can be used for density control and boundary management. Translocation can also be used as a conservation tool to increase colony numbers or extents toward target acreages. Photograph by US Forest Service

Alternative 2 - The Proposed Action

The proposed action is similar to the proposed action presented to the public during the April 2019 scoping period, but has been modified in response to public comments. The most substantial change to the proposed action is the addition of seasonal shooting restrictions in management area 3.67. For comparative purposes with other alternatives, major components of prairie dog management are described here:

Management Area 3.63 and the Cheyenne River Zoological Special Interest Area

- Management area 3.63 would be changed to Management Area 3.67 – Rangelands with Short-Stature Vegetation Emphasis. Management area size would change from approximately 51,000 to approximately 35,000 acres (figure 8 and figure 9).

- The Cheyenne River Zoological Special Interest Area would be drawn to follow the Cheyenne River along the southeast border of management area 3.67 (figure 8). The emphasis on zoology would be removed from the special interest area, and management direction would be updated to reflect an emphasis on riparian habitat. Special interest area size would change from approximately 5,900 to approximately 3,800 acres. Management area 3.67 direction would not apply within the special interest area.

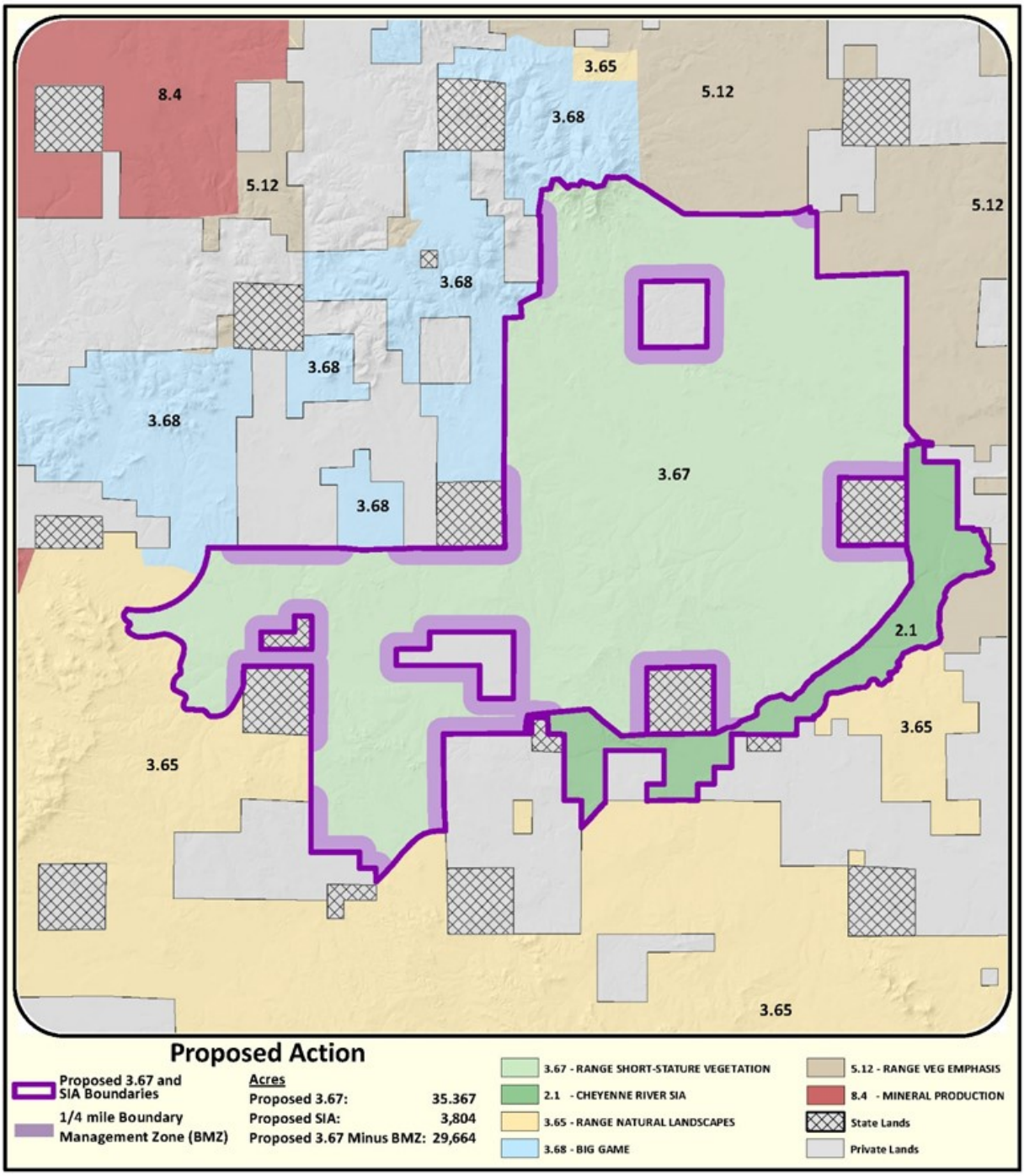

Figure 8. Delineation of management area 3.67 and the Cheyenne River Special Interest Area in the proposed action, showing boundary management zones

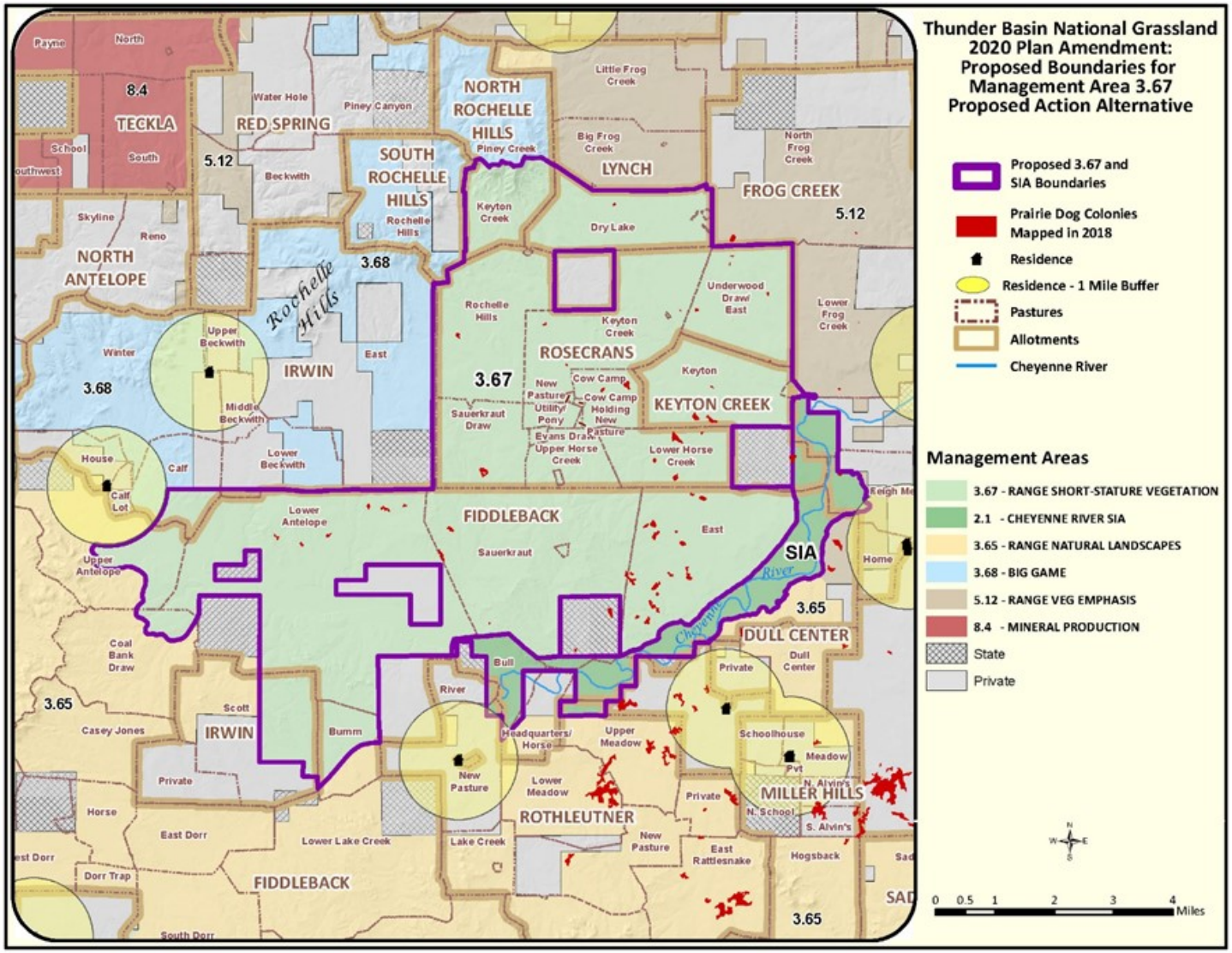

Figure 9. Delineation of management area 3.67 and the Cheyenne River Special Interest Area in the proposed action, with allotment and pasture boundaries

Prairie Dog Colony Acre Targets and Distribution

- Prairie dog colonies within management area 3.67 would be managed toward a target of 10,000 acres to support associated species such as mountain plover, burrowing owl, and swift fox. Management that adapts to fluctuations of colony acreage could occur while managing toward the 10,000-acre target.
- To optimize habitat for burrowing owls, prairie dog colonies would continue to be managed to expand to larger than 80 acres, where appropriate and consistent with geographic area and management area direction.
- A target of 10,000 acres implies that when total prairie dog colony acreages are lower than 10,000 acres, management activities would focus on efforts to increase the extent of prairie dog colonies using tools such as translocation and vegetation management. When total prairie dog colony acreages are above 10,000 acres, management activities would focus on controlling the growth of colonies using tools such as visual barriers and rodenticides. Forest Service personnel would consider colony acreage trends and site-specific information when making decisions on which management actions to pursue.

Boundary Management Zones

- Control of prairie dogs within 1 mile of residences would continue to be the highest priority for control, and all lethal and nonlethal control tools not otherwise restricted in this plan would continue to be available within 1 mile of residences at any time. To ensure effectiveness of treatments, prairie dog control efforts by Forest Service personnel would be prioritized where the adjacent landowner engages in concurrent control efforts.
- One-quarter-mile boundary management zones within management area 3.67 would be established where the national grassland shares a border with private or State property. Within the boundary management zones, control of prairie dogs using rodenticides would be prioritized to reduce impacts to surrounding landowners. All other lethal and nonlethal control tools not otherwise restricted in this plan would also be available in the boundary management zones at any time. To ensure effective treatments in boundary management zones, prairie dog control efforts by Forest Service personnel would be prioritized where the adjacent landowner engages in concurrent control efforts to remove prairie dogs from adjacent private or state lands. Colonies within boundary management zones would not count toward the 10,000-acre colony acreage target.
- Where persistent or imminent prairie dog colony encroachment occurs within management area 3.67, a temporary 3/4-mile boundary management zone could be used to prevent encroachment. Requests would be considered by Forest Service personnel in the context of acreage targets, compliance with other plan standards and guidelines, and site-specific information. To ensure effective treatments, prairie dog control efforts by Forest Service personnel should be prioritized where the adjacent landowner engages in concurrent control efforts.

Thresholds for Rodenticide Use

- All prairie dog colony management tools not otherwise restricted by this plan would be available for use when the colony acreage in management area 3.67 is greater than 7,500 acres. The identification of situations warranting the use of lethal control when the total colony acreage in management area 3.67 is less than 10,000 acres and greater than 7,500 acres is at the discretion of the responsible official.

- When the acreage of colonies within management area 3.67 is less than 7,500 acres, lethal control tools would not be used except in the following situations:
- Use in boundary management zones

Density control

- If Forest Service personnel determine lethal control beyond density control is warranted and the total area of prairie dog colonies is less than 7,500 acres within management area 3.67, then satellite colonies[15] could be identified outside management area 3.67 to temporarily allow lethal control within management area 3.67. The sum of satellite colony acres and colony acres in management area 3.67 should be greater than 7,500 acres before allowing lethal control within management area 3.67, so at least 7,500 acres remain following control.
- In prairie dog colonies designated as satellite colonies, lethal prairie dog control would be prohibited, with the following exceptions:
- Lethal control could be used to prevent a satellite colony from exceeding the area it occupied at the time it was designated as a satellite colony.
- Density control could occur in no greater than 50 percent of the area of a satellite colony.
- The designation of satellite colony would be removed only when the total acreage of prairie dog colonies within management area 3.67 has reached 7,500 acres.

Approved Rodenticides

- All forms of zinc phosphide approved for use in Wyoming could be used.
- To avoid bait aversion, rodenticide application should not occur for more than 3 consecutive years in a given location.
- The use of anticoagulant rodenticides and fumigants would be prohibited.

Recreational Shooting

- Recreational prairie dog shooting would be prohibited from February 1 to August 15 in management area 3.67, including in the boundary management zone.
- In prairie dog colonies designated as satellite colonies, recreational shooting of prairie dogs would be prohibited from February 1 to August 15.

Drought Plan

- During drought, to mitigate colony expansion, the total acreage of colonies in management area 3.67 and satellite colonies could be managed toward a temporary alternate target of 7,500 acres.

Plague Management

- Plague control tools including deltamethrin (“Delta Dust”), an insecticide used to control fleas that are a vector for sylvatic plague (figure 10), and sylvatic plague vaccine, which can be administered to prairie dogs, may continue to be used in prairie dog colonies across the grassland.
- Appendix B describes management considerations for plague management.

[15] Satellite colony: A prairie dog colony that occupies National Forest System lands outside of Management Area 3.67 and has been designated for the purpose of meeting colony acreage targets within Management Area 3.67.

Figure 10. Deltamethrin is applied to prairie dog burrows to control fleas that are a vector for sylvatic plague. Photograph by US Forest Service

Density Control

- Density control (for example, using rodenticides, translocation, or collapsing of burrows to reduce the number of live prairie dogs within a colony) could be used to maintain desired vegetation conditions within a prairie dog colony. Desired vegetation structure and composition may vary by ecological site or colony.
- Where density control occurs, pretreatment data would be collected, and monitoring data would be collected for a minimum of two years after treatment.
- When the total area of prairie dogs in management area 3.67 and satellite colonies is less than 7,500 acres, density control would not occur in more than 50 percent of the area of any colony.
- Appendix B describes management considerations for density control.

Management Strategy and Collaborative Stakeholder Group

- The grassland plan would no longer refer to the 2015 Black-tailed Prairie Dog Conservation Assessment and Management Strategy.
- A collaborative stakeholder group could provide management recommendations to Forest Service personnel.
- Appendix B describes how Forest Service personnel expect to interact with a collaborative stakeholder group.

Alternative 3 – Grassland-Wide Alternative

During scoping, Forest Service personnel presented the concept of a grassland-wide alternative in which all prairie dog acres on the national grassland count toward a single target. Several commenters encouraged the analysis of a grassland-wide alternative. For comparative purposes with other alternatives, major components of prairie dog management are described here:

Management Area 3.63 and the Cheyenne River Special Interest Area

- Management area 3.63 would be changed to Management Area 3.67 – Rangelands with Short-Stature Vegetation Emphasis. Management area size would change from approximately 51,000 to approximately 29,000 acres (figure 11 and figure 12).
- The Cheyenne River Zoological Special Interest Area would be drawn to follow the Cheyenne River along the southeast border of management area 3.67 and Antelope Creek along the southwest border of management area 3.67 (figure 11). The emphasis on zoology would be removed from special interest area and management direction would be updated to reflect an emphasis on riparian habitat. Special interest area size would change from approximately 5,900 to approximately 5,700 acres. Management area 3.67 direction would not apply within the special interest area.

Boundary Management Zones

- Control of prairie dogs within 1 mile of residences would continue to be the highest priority for control, and all lethal and nonlethal control tools not otherwise restricted in this plan would continue to be available within 1 mile of residences at any time. To ensure effectiveness of treatments, prairie dog control efforts by Forest Service personnel should be prioritized where the adjacent landowner engages in concurrent control efforts.
- One-quarter-mile boundary management zones would be established where the Thunder Basin National Grassland shares a border with private or State property. Within the boundary management zones, control of prairie dogs using rodenticides would be prioritized to reduce impacts to surrounding landowners. All other lethal and nonlethal control tools not otherwise restricted in this plan would also be available in the boundary management zones at any time. To ensure effective treatments in boundary management zones, prairie dog control efforts by Forest Service personnel would be prioritized where the adjacent landowner engages in concurrent control efforts. Colonies within boundary management zones would not count toward the 10,000-acre to 15,000-acre colony area target range.
- Where persistent or imminent prairie dog colony encroachment occurs, a temporary 1-mile boundary management zone could be used to prevent encroachment. Requests would be considered by Forest Service personnel in the context of acreage targets, compliance with other plan standards and guidelines, and site-specific information. To ensure effective treatments, prairie dog control efforts by Forest Service personnel should be prioritized where the adjacent landowner engages in concurrent control efforts.

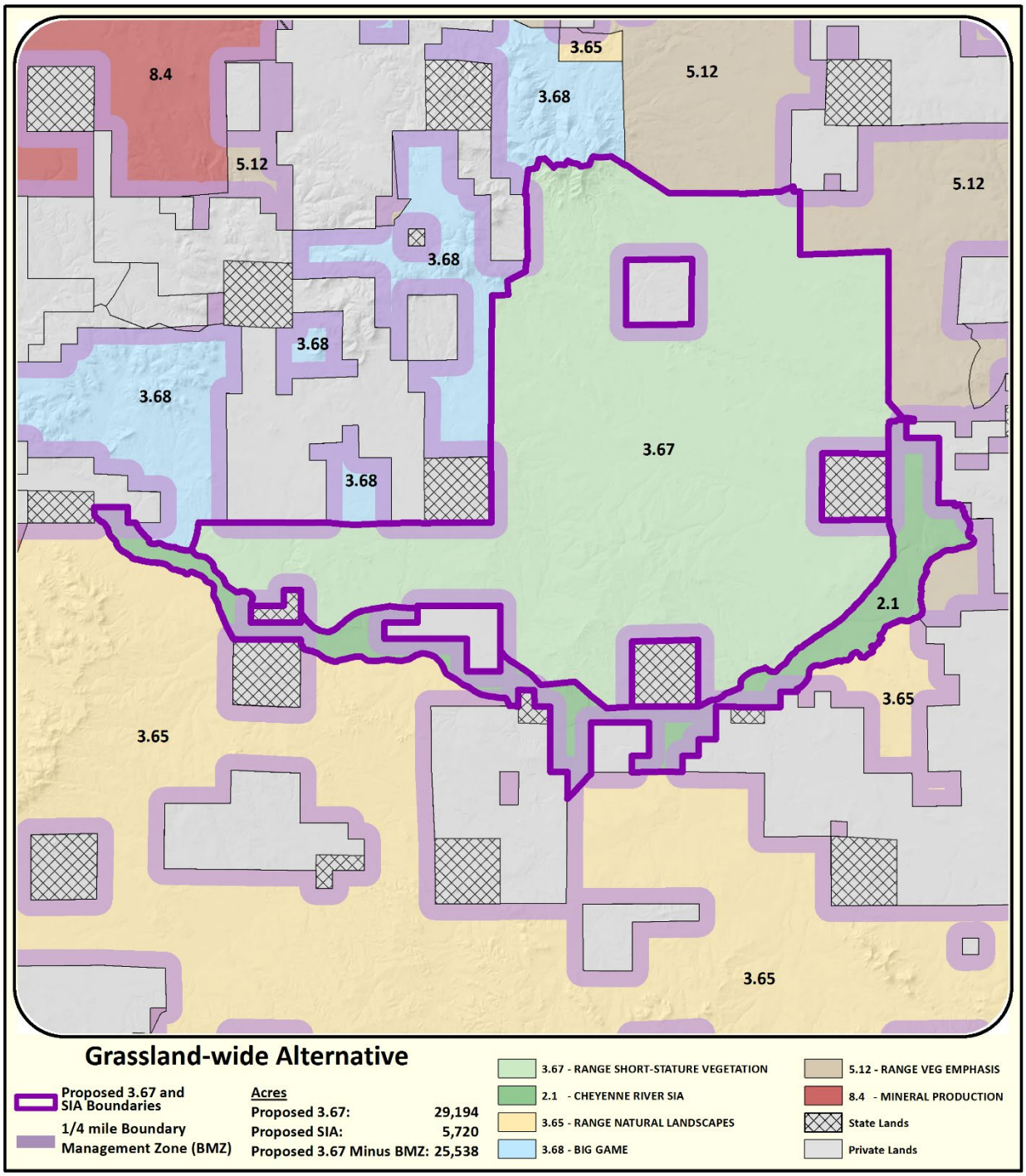

Figure 11. Delineation of management area 3.67 and the Cheyenne River Special Interest Area in the grassland-wide alternative, showing boundary management zones

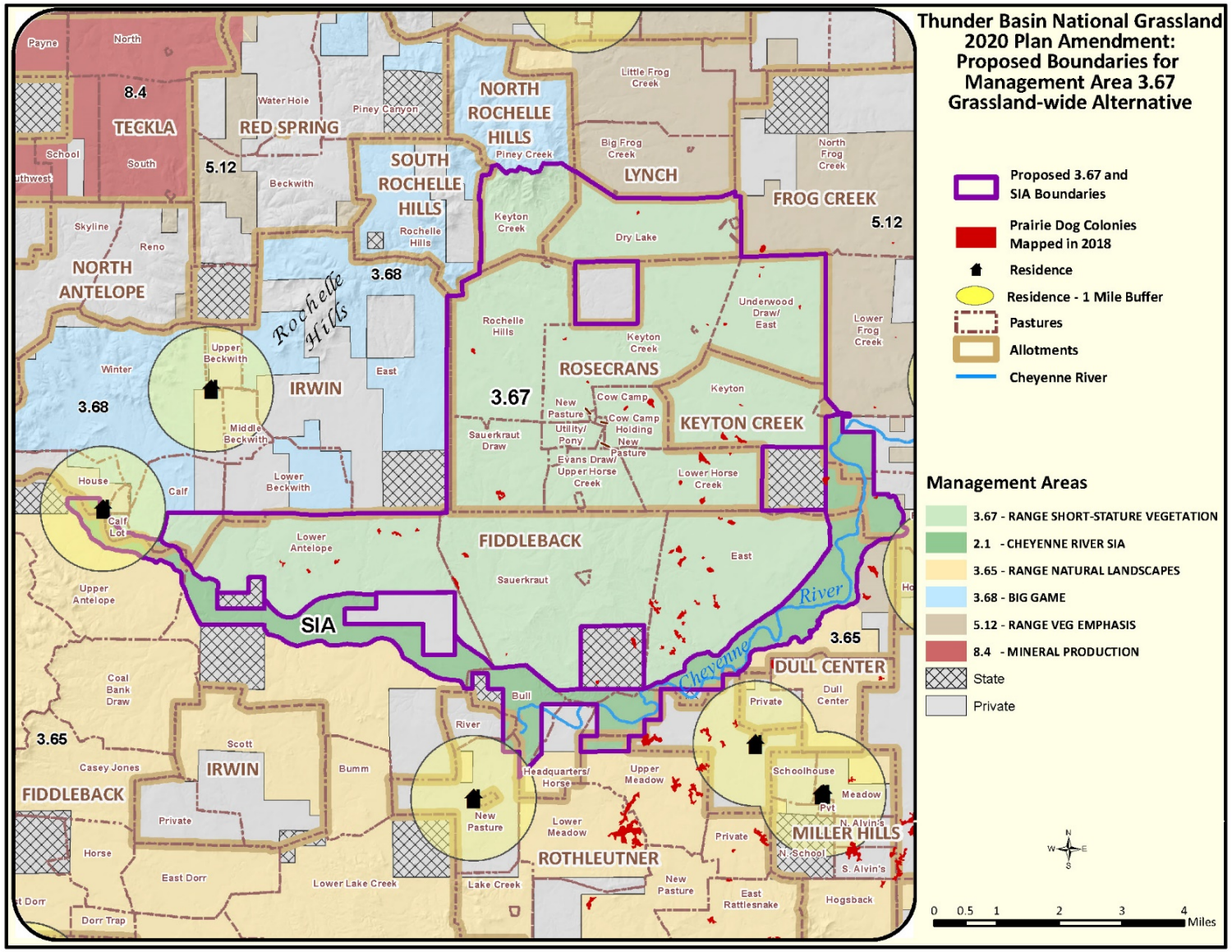

Figure 12. Delineation of management area 3.67 and the Cheyenne River Special Interest Area in the grassland-wide alternative, with allotment and pasture boundaries

Prairie Dog Colony Acre Targets and Distribution

- Prairie dog colonies would be managed toward a target range of 10,000 to 15,000 acres across the Thunder Basin National Grassland. To work toward acreage targets, a variety of conservation and control tools may be used.
- At least one complex of at least 1,500 acres of prairie dog colonies would be maintained in management area 3.67.
- To optimize habitat heterogeneity for mountain plover, prairie dog colonies would be managed to vary in size up to approximately 1,000 acres with an emphasis on colonies of 200 to 500 acres.
- A target range of 10,000 to 15,000 acres implies that when total prairie dog colony acreages are lower than 10,000 acres, management activities would focus on efforts to increase the extent of prairie dog colonies using tools such as translocation and vegetation management. When total prairie dog colony acreages are above 15,000 acres, management activities would focus on controlling the growth of colonies using tools such as visual barriers and rodenticides. Forest Service personnel would consider colony acreage trends and site-specific information when making decisions on which management actions to pursue.

Thresholds for Rodenticide Use

- When the total area of prairie dog colonies across the Thunder Basin National Grassland is less than 10,000 acres, lethal control would be prohibited, except in the following situations:
- Lethal control in boundary management zones
- Density control

Approved Rodenticides

- All forms of zinc phosphide approved for use in Wyoming could be used.
- Fumigants and anticoagulant rodenticides could be used only in boundary management zones and only after three consecutive applications of zinc phosphide. Fumigants and anticoagulant rodenticides could be used only if applied by a Forest Service-approved contractor (through direct contract or agreement) or Forest Service staff.
- To avoid bait aversion, application of a specific grain-bait rodenticide would not occur for more than 3 consecutive years in a given location.

Recreational Shooting

- There would be no restrictions on recreational shooting of prairie dogs in this alternative, so recreational shooting could occur in management area 3.67 throughout the year.

Drought Plan

- During drought conditions, to mitigate prairie dog colony expansion, prairie dog colonies would be managed toward the lower end of the target range (10,000 acres) across the Thunder Basin National Grassland.

Plague Management

- Plague control tools including deltamethrin ("Delta Dust"), an insecticide used to control fleas that are a vector for sylvatic plague, and sylvatic plague vaccine, which can be administered to prairie dogs, may continue to be used in prairie dog colonies across the grassland.
- Appendix B describes management considerations for plague management.

Density Control

- Density control (for example, using rodenticides, translocation, or collapsing of burrows to reduce the number of live prairie dogs within a colony) could be used to maintain desired vegetation conditions within a prairie dog colony. Desired vegetation structure and composition may vary by ecological site or colony. Where density control occurs, pretreatment data would be collected, and monitoring data would be collected for a minimum of two years after treatment.
- When the total area of prairie dogs across the Thunder Basin National Grassland is less than 10,000 acres, density control would not occur in more than 50 percent of the area of any colony.
- Appendix B describes management considerations for density control.

Management Strategy and Collaborative Stakeholder Group

- The grassland plan would no longer refer to a separate prairie dog management strategy.
- A collaborative stakeholder group could provide management recommendations to Forest Service personnel.
- Appendix B describes how Forest Service personnel expect to interact with a collaborative stakeholder group.

Alternative 4 - Prairie Dog Emphasis Alternative

Several commenters suggested taking an approach that integrates the current prairie dog management strategy with improved boundary management. The interdisciplinary team developed an alternative based on these comments. It retains much of the management described in the current grassland plan and 2015 Black-Tailed Prairie Dog Conservation Assessment and Management Strategy but allows more flexibility in management, especially with regard to boundary management. For comparative purposes with other alternatives, major components of prairie dog management are described here:

Management Area 3.63 and the Cheyenne River Zoological Special Interest Area

- Management area 3.63 would be changed to Management Area 3.67 – Prairie Dog Emphasis, but would remain in its current location and size at approximately 51,000 acres (figure 13).
- The Cheyenne River Zoological Special Interest Area would keep its current management area prescription and would remain in its current location and size at approximately 5,900 acres (figure 13).
- The category 1 area would remain in its current location and size. Category 2 areas would be modified to remove Highway 450 and Miller Hills areas and add the Spring Creek area (figure 13).

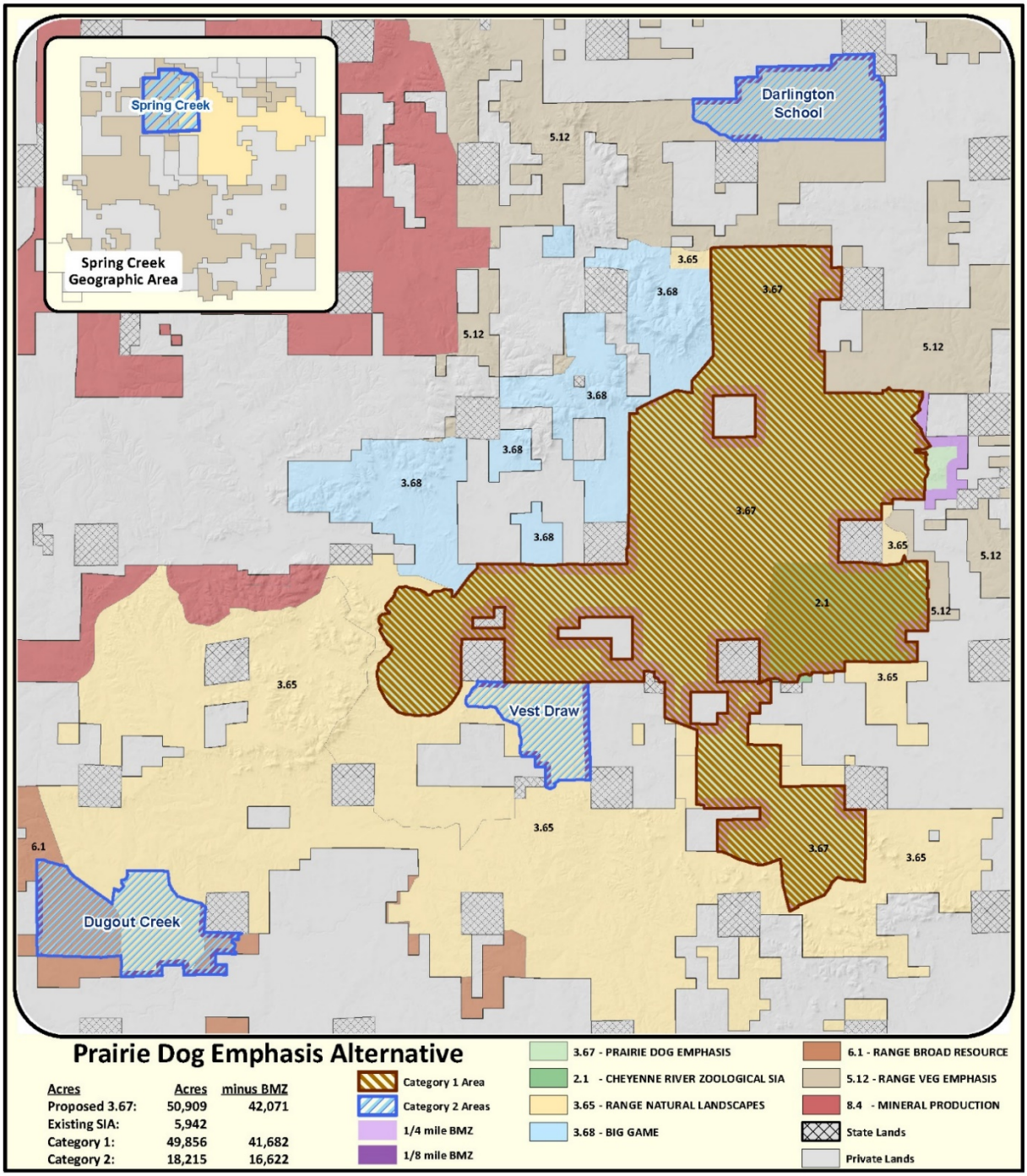

Figure 13. Delineation of management area 3.67, the Cheyenne River Zoological Special Interest Area, category 1, and category 2 areas in the prairie dog emphasis alternative, showing boundary management zones

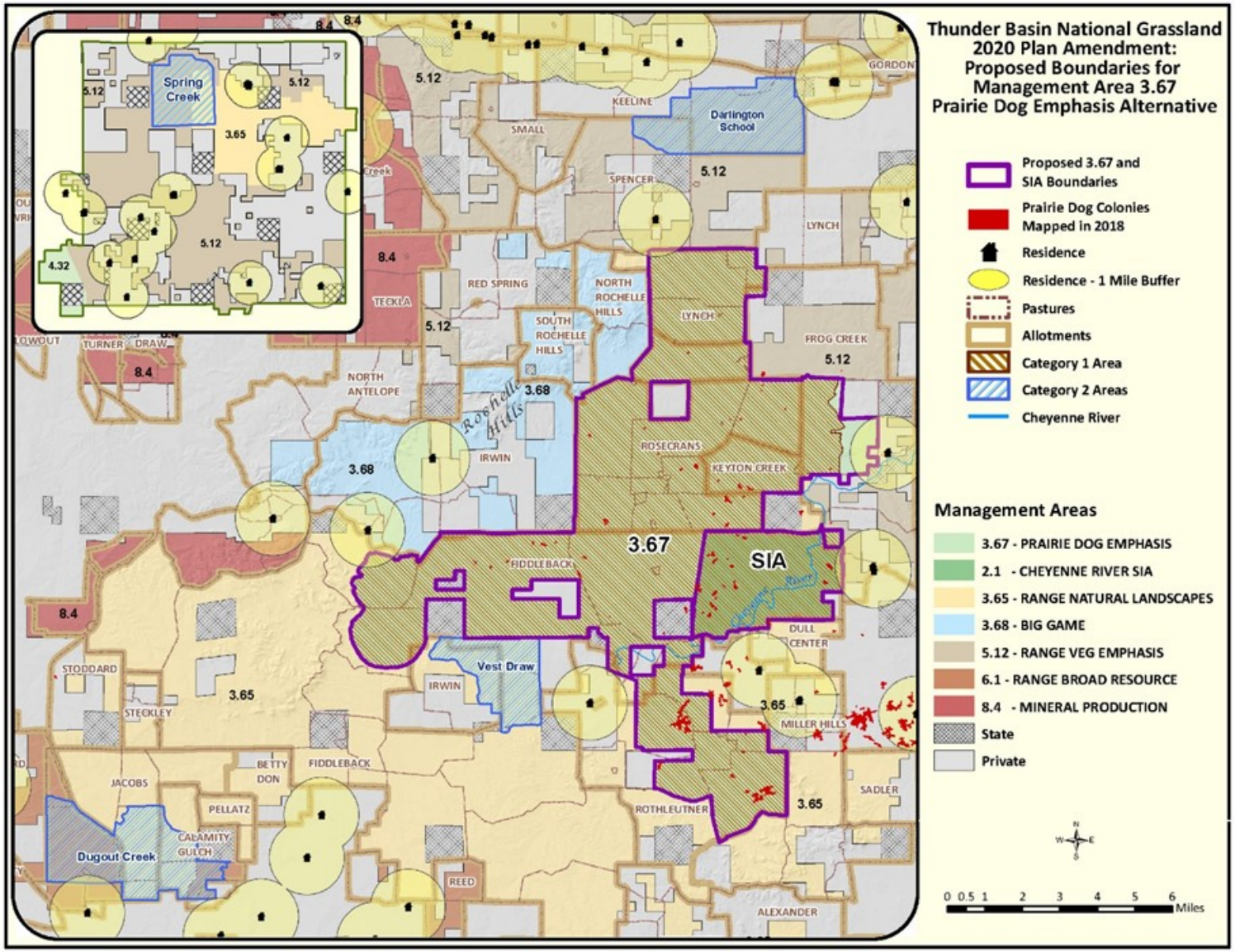

Figure 14. Delineation of management area 3.67, the Cheyenne River Zoological Special Interest Area, category 1, and category 2 areas in the prairie dog emphasis alternative, with allotment boundaries

Boundary Management Zones

- Control of prairie dogs within 1 mile of residences would continue to be the highest priority for control, and all lethal and nonlethal control tools not otherwise restricted in this plan would continue to be available within 1 mile of residences at any time. To ensure effectiveness of treatments, prairie dog control efforts by Forest Service personnel would be prioritized where the adjacent landowner engages in concurrent control efforts.
- One-quarter-mile boundary management zones would be established in category 1 where the Thunder Basin National Grassland shares a border with private or state property. One-eighth-mile boundary management zones would be established in category 2 areas where the national grassland shares a border with private or State property. Within the boundary management zones, control of prairie dogs using rodenticides would be prioritized to reduce impacts to surrounding landowners. All other lethal and nonlethal control tools not otherwise restricted in this plan are also available in the boundary management zones at any time. To ensure effective treatments in boundary management zones, prairie dog control efforts by Forest Service would be prioritized where the adjacent landowner engages in concurrent control efforts. Colonies within boundary management zones would not count toward acreage targets for categories 1 and 2.

Prairie Dog Colony Acre Targets and Distribution

- Prairie dog colonies would be managed toward a target of 18,000 acres in category 1 and 9,000 acres in all four category 2 areas combined.
- Category 3 targets would be removed.
- To develop prairie dog colony complexes, management would emphasize connectivity of colonies where possible by maintaining colonies within 4.5 miles of one another. At a minimum, two complexes of at least 4,500 acres would be developed or maintained in management area 3.67.

Thresholds for Rodenticide Use

- When the total area of prairie dog colonies in category 1 is less than 18,000 acres, and when the total area of prairie dog colonies in category 2 areas combined is less than 9,000 acres, lethal control would be prohibited in those areas, except for in boundary management zones.

Approved Rodenticides

- All forms of zinc phosphide approved for use in Wyoming could be used.
- To avoid bait aversion, rodenticide application would not occur for more than 3 consecutive years in a given location.
- The use of anticoagulant rodenticides and fumigants would be prohibited.

Recreational Shooting

- Recreational shooting of prairie dogs would continue to be prohibited in category 1 areas and management area 3.67. Recreational shooting of prairie dogs would continue to be prohibited in category 2 areas when the total area of prairie dog colonies in those areas is less than 9,000 acres. When the total colony area is more than 9,000 acres in category 2 areas, recreational shooting would be prohibited in those areas from February 1 to August 15.

Drought Plan

- No specific management changes under drought conditions.

Plague Management

- Plague control tools including deltamethrin ("Delta Dust"), an insecticide used to control fleas that are a vector for sylvatic plague, and sylvatic plague vaccine, which can be administered to prairie dogs, may continue to be used in prairie dog colonies across the grassland.
- Appendix B describes management considerations for plague management.

Density Control

- All forms of lethal control including the use of rodenticides for density control are prohibited in categories 1 and 2 when colony areas have not met targets. Non-lethal forms of density control are allowed at any time in categories 1 and 2 at the discretion of the responsible official. All lethal and non-lethal forms of density control are allowed at any time outside of categories 1 and 2.

Management Strategy and Collaborative Stakeholder Group

- The grassland plan would no longer refer to the 2015 Black-Tailed Prairie Dog Conservation Assessment and Management Strategy.
- A collaborative stakeholder group would provide management recommendations to Forest Service personnel.
- Appendix B describes how Forest Service personnel expect to interact with a collaborative stakeholder group.

Alternatives Considered but Eliminated from Detailed Study

Federal agencies are required by the National Environmental Policy Act to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Public comments received in response to the proposed action provided suggestions for alternative methods for achieving the purpose and need for this plan amendment. In some cases, the public provided complete alternatives that included many or most of the components described in the previous section. In some cases, only one or a few management suggestions that could be considered as components of alternatives were provided. Suggestions were either integrated into one of the action alternatives, would be analyzed as part of the no-action alternative, or are listed here, by categories, with the reasons for not pursuing a detailed analysis. In the sections below, bold text indicates language or concepts suggested by a commenter.

Size and Distribution of Prairie Dog Colonies

This set of suggestions includes alternative ways of managing for the size and distribution of colonies on the national grassland.

- **RCOWS[16] Alternative.** One group of commenters suggested an alternative that would allow 3,500 acres of prairie dogs on reclaimed coal mines in the southern and west half of the national grassland, 1,500 acres on the Fiddleback east pasture, and 4,400 acres on the 4W Ranch, with eradication of any colonies outside those designated areas. The interdisciplinary team did not analyze this alternative because it relies heavily on prairie dog colonies on lands outside of Forest Service ownership or under coal lease to meet acreage targets for persistence of at-risk species. Furthermore, the area allowed for prairie dog occupation would be constrained, with no guarantee that prairie dog populations would grow to occupy those areas. Finally, a policy of eradication of all colonies that occur elsewhere on the Thunder Basin National Grassland would be contrary to goal 1b of the grassland plan— "Provide ecological conditions to sustain viable populations of native and desired nonnative species and to achieve objectives for management indicator species"—and several related objectives related to management of at-risk species. Management constraints, such as the presence of at-risk plant and animal species or funding limitations, may prevent the eradication of colonies elsewhere on the national grassland. Forest Service personnel must provide for viability of at-risk species within the inherent capability of the plan area. While State and private lands that maintain prairie dog colonies through candidate conservation agreements with assurances should be considered in an analysis of viability or persistence for at-risk species, they cannot be relied upon in large proportion to provide necessary ecological conditions to ensure viability of at-risk species in the plan area.
- **Include multiple 3.67 management areas.** Commenters suggested the best approach to prairie dog management could include multiple short-stature vegetation emphasis areas. The interdisciplinary team discussed this alternative in office and field meetings and determined very few areas of contiguous NFS lands with favorable habitat for prairie dogs exist outside the current management area 3.63. Based on past experiences drawing boundaries for category 2, 3, and 4 areas in the 2009 and in the 2015 Black-Tailed Prairie Dog Conservation Assessment and Management Strategy, few options exist in which to apply the short-stature vegetation emphasis without creating encroachment concerns. The concept is somewhat applied in the Prairie Dog Emphasis alternative, which proposes to keep four category 2 areas for prairie dog management.
- **Leave management area 3.63 and current management but modify strategy to reflect good-neighbor policy.** The interdisciplinary team used this suggestion to develop the Prairie Dog Emphasis Alternative, which maintains most the of the current grassland plan direction and integrates content from the 2015 Black-Tailed Prairie Dog Conservation Assessment and Management Strategy but adds boundary management zones. The Prairie Dog Emphasis Alternative, however, does propose to change Management Area 3.63 – Black-footed Ferret Reintroduction Habitat to Management Area 3.67 – Prairie Dog Emphasis. The option to keep management area 3.63 is still in the no-action alternative.

[16] RCOWS – Rochelle Community Organization Working for Sustainability

- **No more than 2 percent of any allotment may contain prairie dogs.** The interdisciplinary team briefly analyzed this suggestion and determined it would be unlikely to provide for persistence of at-risk species and would place administrative and management burdens on the agency. Limitations of habitat suitability and location of colonies would make distribution across allotments to a maximum of 2 percent per allotment extremely difficult. Remaining colonies would likely not have the desired level of connectivity to support at-risk species. The interdisciplinary team tried to incorporate a larger maximum percentage of allotments to be occupied by prairie dogs (for example, 20 percent) into an action alternative but encountered similar limitations. Colony locations and suitability of habitat would increase the implementation complexity to a degree that would be infeasible.
- **No targets, emphasize habitat availability.** Commenters suggested eliminating the concept of target acres or ranges and replacing it with an emphasis on providing the ecological conditions necessary for at-risk species habitat. This concept is generally consistent with the 2012 Planning Rule but, in practice, would decrease the management constraints to a level that would make implementation unpredictable and inconsistent, thus leading to an inability to accurately examine persistence of at-risk species. The interdisciplinary team developed plan components that address ecosystem integrity and ecosystem diversity, as well as species-specific plan components for each alternative analyzed in detail.
- **Change to a 5,000-acre minimum.** The interdisciplinary team did not analyze this suggestion in detail because preliminary analysis shows 5,000 acres of prairie dog habitat would not be sufficient to ensure persistence of at-risk species. Insufficient information is available to determine the exact size and distribution of prairie dog colonies needed to ensure viability for a variety of species on the Thunder Basin National Grassland. However, the wildlife analysis report and an assessment of potential species of conservation concern show that mountain plover is the species most susceptible to changes in total colony area and that providing sufficient habitat for mountain plover would concurrently provide sufficient habitat for all other prairie dog-associated species. The best available scientific information, much of which was collected on the Thunder Basin National Grassland, shows 10,000 acres of colonies is the lower limit likely to adequately provide for the long-term persistence of the mountain plover population on the national grassland.
- **If less than 7,500 acres but impacting health, safety, land values, agricultural production, or facilities, management will be considered.** The interdisciplinary team included several exceptions to the 10,000-acre target to allow management flexibility, including boundary management zones and residence buffers, density control, and use of satellite colonies to protect health, safety, land values, agriculture production, and facilities. Ten thousand acres of prairie dog colonies, or a minimum of 7,500 acres of prairie dog colonies during times of colony growth, reflects our best understanding of what is necessary for persistence of associated species.
- **Change 36 CFR 219.9(b)(2)(ii) to allow counting prairie dogs on private lands.** Forest Service personnel must provide for viability of at-risk species within the inherent capability of the plan area. While State and private lands, particularly those that maintain prairie dog colonies through candidate conservation agreements with assurances, should be considered in an analysis of viability or persistence for at-risk species, they cannot be relied upon in large proportion to provide necessary ecological conditions to ensure viability of at-risk species in the plan area. A change to the regulations is outside the scope of this project.

- **Maximum of 1,000 acres per colony with emphasis on 100 to 400 acres.** The proposed action suggested colonies would be managed to a preferred sized based on preferences of mountain plover. Similar language exists as a guideline in the grassland-wide alternative. The interdisciplinary team determined that management constraints, such as the presence of at-risk plant and animal species; amount, location, and distribution of colonies; and funding limitations would prevent consistent management of all colonies to this size. Furthermore, constraining colony size to these parameters could severely limit adaptability during implementation and could affect the Forest Service's ability to respond appropriately in certain situations

Buffers and Boundary Management

- **Good Neighbor Alternative.** This alternative suggested by the Association of National Grasslands emphasizes boundary management zones with specific management requirements. These were considered by the interdisciplinary team, and several were incorporated into action alternatives, as described below:
- **Half-mile boundary management zone up to 1 mile:** A ½-mile boundary was not considered due to limitations of land ownership patterns, but a temporary boundary management zone that extends up to ¾ mile is included in the proposed action and one that extents up to 1 mile is included in the grassland-wide alternative. When applied to proposed management area 3.67 in the proposed action, a ½ mile buffer decreases the total acreage and creates even more isolated patches of areas available for prairie dog occupation that would increase management complexity (figure 15).
- **Shooting and poisoning allowed in boundary management zone.** In the proposed action and the prairie dog emphasis alternative, recreational shooting is not allowed in the boundary management zone. The recreational shooting closure would apply to the entire management area to ensure species protection and effective implementation of closures. Poisoning is allowed in the boundary management zone in all action alternatives.
- **No triggers for boundary management zone control.** There are no triggers required for boundary management zone control in any action alternative.
- **Allow rodenticides for all timeframes approved on label.** Timeframes for application are more restrictive than most labels to ensure protections of wildlife species, including protection required by the Migratory Bird Treaty Act.
- **No burning or mowing in boundary management zone.** These restrictions are not specifically applied to the boundary management zone; however, such management actions would not be prioritized since colonies in the boundary management zone would not count toward acreage targets. Proposed plan components related to boundary management are consistent with this request and state, "Within the boundary management zones, control of prairie dogs using rodenticides will be prioritized to reduce impacts to surrounding landowners. All other lethal and nonlethal control tools not otherwise restricted in this plan are also available in the boundary management zones at any time."

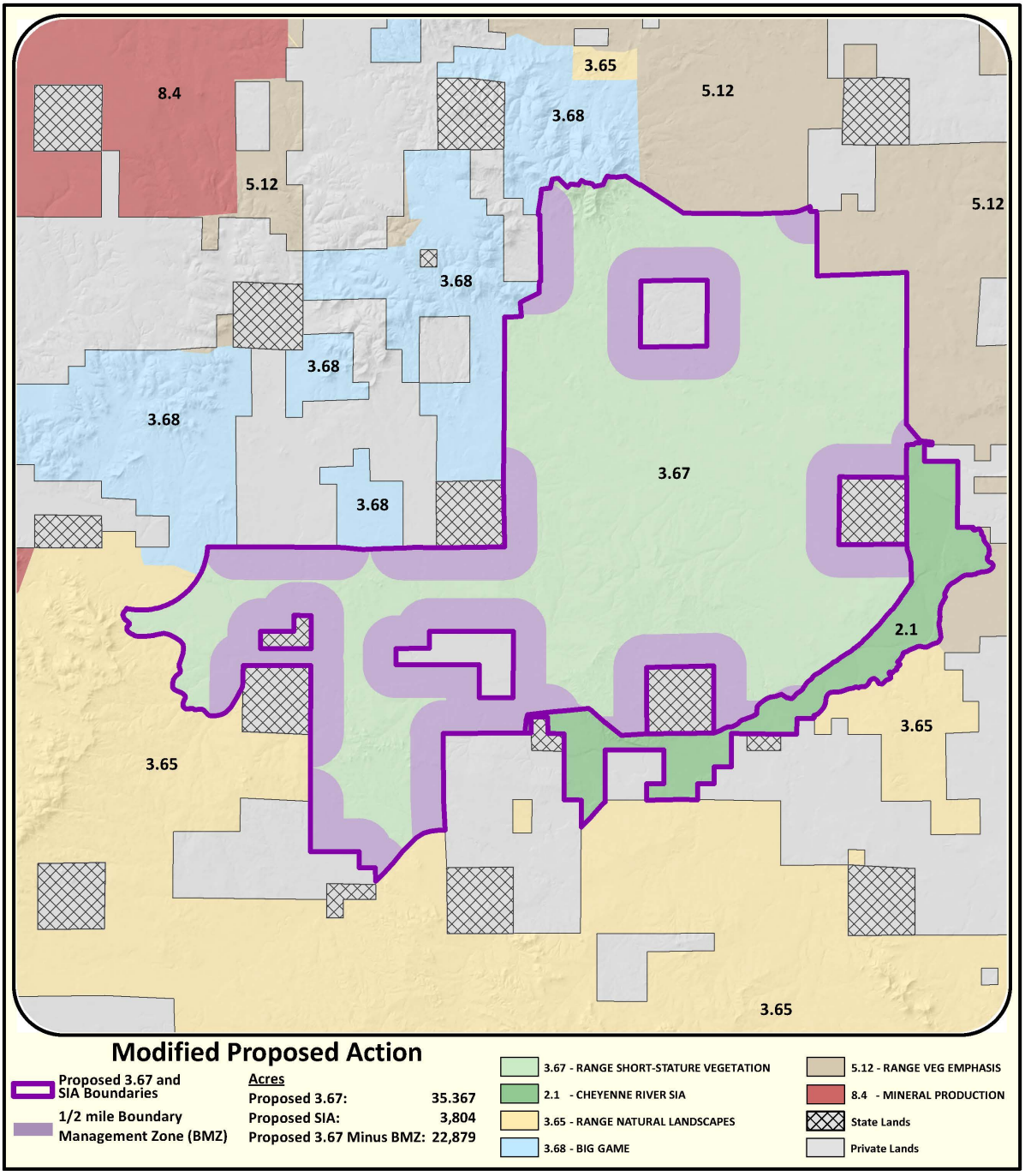

Figure 15. Demonstration of 1/2 mile boundary management zone for management area 3.67 in the proposed action.

- **Soil and vegetation monitoring based on similarity index.** Similarity index is a reflection of past land use and environmental conditions and is used to indicate how similar the present plant community is to the reference plant community for a particular site. A detailed species composition list, including pounds per acre by species, needs to be developed for any other states or plant communities that are considered desired plant communities before a similarity index can be calculated. The ecological site descriptions in Major Land Resource Area (MLRA) 58B currently only have a species composition list for the reference plant community. Thus, any calculations outside of reference are unavailable at this time. Other considerations in calculating similarity index include percent grazed, percent growth for cool-season and warm-season grasses, and percent of normal production by reviewing precipitation data. Experience using similarity index as a management trigger for other purposes and in other locations has demonstrated that it would be inappropriate to apply it exclusively to guide prairie dog management.
- **Count prairie dog acres that occur in the boundary management zone.** The interdisciplinary team did not consider this option because colonies in the boundary management zone may be scheduled for eradication and would not be managed for conservation.

Control Tools and Rodenticide Use

- Include provisions prohibiting use of poisons on native wildlife; at a minimum, exhaust nonlethal methods before pursuing lethal. Some of these concepts are included in the no-action alternative. Complete prohibition on use of poisons would not meet the purpose and need for the project because of limitations in the cost and efficiency of controlling prairie dogs with nonlethal techniques.
- **Use translocation as primary tool.** Reliance on translocation as the primary tool for prairie dog control would not meet the purpose and need for the project because of limitations in the cost and efficiency of controlling prairie dogs with this technique. Translocation is considered as a tool for both conservation and control in all alternatives.

Conservation Tools

- **Add no surface occupancy stipulation to large colonies and ½-mile buffer.** Timing and controlled surface use stipulations exist for management area 3.63 and are proposed for management area 3.67; timing and controlled surface use stipulations also exist for areas with mountain plover or black-footed ferret. A no surface occupancy stipulation is outside the scope of this analysis and is not needed to meet the purpose and need of the plan amendment.
- **Use land exchanges to consolidate NFS land and create opportunities for prairie dog conservation.** Land exchanges will continue to be pursued where feasible under all alternatives.
- **Include preventative approach to weeds.** Weed management, beyond desired condition descriptions, is outside the scope of this plan amendment.
- **Restore beavers to permanently flowing streams**. Restoration of beavers is outside the scope of this plan amendment.

Black-Footed Ferret

- **Remove all black-footed ferret references.** While reintroduction of black-footed ferret is de-emphasized in all action alternatives, Forest Service personnel did not consider removing all references to the ferret because of the Forest Service's responsibilities under the Endangered Species Act.

Grazing Management

- **Close the Thunder Basin National Grassland to livestock grazing.** A livestock grazing closure is outside the scope of this plan amendment.
- **Reintroduce wild bison.** Reintroduction of wild bison is outside the scope of this plan amendment.
- **Change allotment boundaries so not all is grazed.** Allotment boundary relocation is outside the scope of this plan amendment. The grassland plan requires that 1 to 10 percent of the rangeland acres are rested each year.

Incomplete and Unavailable Information

The following information that would be informative to this draft environmental impact statement was incomplete or unavailable at the time of publication:

- Prairie dog colony mapping information: Forest Service personnel are currently working with partners to produce official maps of prairie dog and associated species occupancy on the Thunder Basin National Grassland for calendar year 2019. Because mapping was incomplete at the time of analysis, mapping information from 2018 was used as the best available information for this analysis.
- Monitoring report: The first biennial monitoring report since the 2016 monitoring transition is in progress and will consider much of the same information provided in this analysis regarding status of grassland vegetation, prairie dog population and habitat availability, prairie dog occupancy, climate change and stressors, progress toward desired conditions, and productivity of the land. The best available information was used in chapter 3 of this environmental impact statement to address these topics.
- Ecological site descriptions for MLRA 58B, which includes the Thunder Basin National Grassland, are being updated at the time of this analysis, therefore state-and-transition models and documented dynamics of these sites, as referenced in the analysis of rangeland resources, may change.

Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative. Information in the tables is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives.

Table 3. Comparison of the major components of the alternatives. This table repeats information presented in the sections above

Component	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Grassland-wide	Alternative 4 Prairie Dog Emphasis
Management area 3.63 or 3.67	Management Area 3.63 – Black-Footed Ferret Reintroduction Habitat is approximately 51,000 acres in size, and the Cheyenne River Zoological Special Interest Area is approximately 5,900 acres (figure 6).	Management Area 3.63 – Black-Footed Ferret Reintroduction Habitat would be changed to Management Area 3.67 – Rangelands with Short-Stature Vegetation Emphasis. Management area size would change from approximately 51,000 to approximately 35,000 acres (figure 8). Cheyenne River Special Interest Area would be redrawn to follow the Cheyenne River along the southeast border of 3.67 (figure 6). Special interest area management direction would be updated to reflect emphasis on riparian habitat. Special interest area size would change from approximately 5,900 to approximately 3,800 acres.	Management Area 3.63 – Black-Footed Ferret Reintroduction Habitat would be changed to Management Area 3.67 – Rangelands with Short-Stature Vegetation Emphasis. Management area size would change from approximately 51,000 to approximately 29,000 acres (figure 11). Cheyenne River Special Interest Area would be redrawn to follow the Cheyenne River along the southeast border of 3.67 and Antelope Creek along the southwest border of management area 3.67 (figure 11). Special interest area management direction would be updated to reflect emphasis on riparian habitat. Special interest area size would change from approximately 5,900 to approximately 5,700 acres.	Management Area 3.63 – Black-Footed Ferret Reintroduction Habitat would be changed to Management Area 3.67 – Prairie Dog Emphasis Area. Management Area 3.67 and Cheyenne River Zoological Special Interest Area boundaries would remain the same as current (figure 13).

Component	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Grassland-wide	Alternative 4 Prairie Dog Emphasis
Prairie dog colony acre target and range and distribution	Prairie dog colonies and targets managed based on 2015 management strategy categories: Category 1: 18,000 acres Category 2: 9,000 acres Category 3: 6,000 acres	Prairie dog colonies would be managed toward a target of 10,000 acres within management area 3.67. No complexes would be required or designated in standards or guidelines, but desired conditions for management area 3.67 would describe that within management area 3.67, colonies within approximately 4.5 miles (7 kilometers) of other colonies are maintained, when possible, to develop colony complexes.	Prairie dog colonies across the grassland would be managed within a range of 10,000 to 15,000 acres. Colonies located anywhere on NFS lands on the national grassland would count toward acre range. One 1,500-acre complex would be required and managed for in management area 3.67, and a guideline would direct management for colonies of 200 to 500 acres across the grassland to provide optimal nesting habitat for mountain plover.	Prairie dog colonies and targets managed based on 2015 management strategy categories: Category 1 would remain the same—18,000-acre target. Category 2 areas would be modified to remove Highway 450 and Miller Hills areas and add a Spring Creek area, with a 9,000-acre total target (figure 6). Category 3 targets would be removed. Management area 3.67 would be managed for two 4,500-acre complexes.
Boundary management zone	No boundary management zone, but may allow rodenticide use if colony is within ½ mile of boundary in the category 1 area, under certain circumstances.	¼-mile boundary management zone in management area 3.67. A temporary ¾-mile boundary management zone may be granted under special circumstances. Rodenticide use allowed in boundary management zone regardless of colony acres.	¼-mile grasslandwide. A temporary 1-mile boundary management zone may be granted under special circumstances. Rodenticide use allowed in boundary management zone regardless of colony acres.	¼- mile boundary management zone for category 1; 1/8-mile boundary management zone for category 2. Rodenticide use allowed in boundary management zone regardless of colony acres.

Component	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Grassland-wide	Alternative 4 Prairie Dog Emphasis
Thresholds for rodenticide use	Many conditions required for use of rodenticides in category 1 and 2 areas, including encroachment, threats to public health, and damage to facilities. See decision screens in the 2015 Black-tailed Prairie Dog Conservation Assessment and Management Strategy.	If the district ranger determines lethal control in management area 3.67 is warranted, and colony acres are below the 10,000-acre target, satellite acres can be identified. If management area 3.67 acres and satellite acres total more than 7,500, interior rodenticide use in management area 3.67 can be allowed down to a 7,500 acre minimum. Rodenticides may be used to maintain satellite colonies at designated size.	When acreage is below 10,000 acres grasslandwide, rodenticide use only allowed in boundary management zone or for density control.	Unlike the current strategy, when target acres are met, by category, lethal control would be allowed within that category to remain at target.
Approved rodenticides	All forms of zinc phosphide approved for use in WY. Only allowed in category 1 area within ½ mile of boundary if acre target met and nonlethal options tried. Otherwise conditional based on decision screens.	All forms of zinc phosphide approved for use in WY. Management area 3.67 must have at least 7,500 acres of colonies (within management area 3.67 or in designated satellite colonies) for use outside the boundary management zone, unless used for density control. Anticoagulants and fumigants prohibited.	All forms of zinc phosphide approved for use in WY. Must have at least 10,000 acres of colonies for use the outside boundary management zone, unless used for density control. Anticoagulants and fumigants allowed in the boundary management zone only after 3 applications of zinc phosphide prove ineffective.	All forms of zinc phosphide approved for use in WY. Must meet acre targets in category 1 and 2 areas before using outside the boundary management zone. Anticoagulants and fumigants prohibited.
Recreational shooting	Year-round recreational shooting prohibition in management area 3.63 and category 1; conditional restrictions in category 2 areas.	Seasonal recreational shooting restriction (no recreational shooting February 1 to August 15) in management area 3.67, including the boundary management zone and any designated satellite acres. No restrictions on shooting of prairie dogs on rest of grassland.	No restrictions on shooting of prairie dogs	Year-round recreational shooting prohibition in management area 3.67 and category 1. Year-round prohibition in category 2 until acre target met, then seasonal restrictions (no shooting February 1 to August 15) in category 2. No restrictions on shooting of prairie dogs on rest of grassland.

Component	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Grassland-wide	Alternative 4 Prairie Dog Emphasis
Drought plan	No specific management changes under drought conditions.	To mitigate prairie dog colony expansion during drought conditions, control tools may be used in active prairie dog colonies to work toward a revised target of 7,500 acres in management area 3.67 and satellite colonies combined.	To mitigate prairie dog colony expansion during drought conditions, control tools may be used in active prairie dog colonies to work toward a target of 10,000 acres.	No specific management changes under drought conditions.
Plague management	Plague control tools may be used in active prairie dog colonies.	Plague control tools may be used in active prairie dog colonies.	Plague control tools may be used in active prairie dog colonies.	Plague control tools may be used in active prairie dog colonies.
Density control	Many restrictions on rodenticide use for density control. See decision screens in the 2015 Black-tailed Prairie Dog Conservation Assessment and Management Strategy.	Density control (for example, using rodenticide, translocation, collapsing burrows) may be used to maintain desired vegetation conditions. Desired vegetation structure and composition may vary by ecological site or colony. When below 7,500 acres in management area 3.67 and satellite colonies, treat no more than 50 percent of the area of any colony. Where density control occurs, pretreatment data must be collected and monitoring data must be collected for a minimum of 2 years after treatment.	Density control (for example, using rodenticide, translocation, collapsing burrows) may be used to maintain desired vegetation conditions. Desired vegetation structure and composition may vary by ecological site or colony. When below 10,000 acres, treat no more than 50 percent of the area of any colony. Where density control occurs, pretreatment data must be collected and monitoring data must be collected for a minimum of 2 years after treatment.	No lethal density control when below targets in Categories 1 and 2. Otherwise no restrictions on how rodenticides/lethal control are used.
Strategy and collaborative working group	The 2015 Prairie Dog Conservation Assessment and Management Strategy would remain in effect, with a collaborative stakeholder group in place.	The grassland plan would no longer refer to a separate prairie dog management strategy. A collaborative stakeholder group would provide management recommendations to Forest Service staff.	The grassland plan would no longer refer to a separate prairie dog management strategy. A collaborative stakeholder group would provide management recommendations to Forest Service staff.	Components of the 2015 Prairie Dog Conservation Assessment and Management Strategy would be integrated into the grassland plan, and there would no longer be a separate strategy. A collaborative stakeholder group would provide management recommendations to Forest Service staff.

Table 4. Comparison of effects of alternatives related to the purpose and need for the project

Purpose and Need	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Grassland-wide	Alternative 4 Prairie Dog Emphasis
Moderate attention given to conservation of prairie dogs	Does not meet purpose	Meets purpose	Meets purpose	Somewhat meets purpose
Increase Forest Service responsiveness	Does not meet purpose	Meets purpose	Meets purpose	Somewhat meets purpose
Minimize prairie dog encroachment onto non-Federal lands	Does not meet purpose	Meets purpose	Meets purpose	Meets purpose
Reduce conflicts related to prairie dog occupancy and livestock grazing	Does not meet purpose	Meets purpose	Meets purpose	Somewhat meets purpose
Ensure continued conservation of at-risk species	Meets purpose	Meets purpose	Meets purpose	Meets purpose
Foster social and biological conditions that do not preclude black-footed ferret reintroduction	Somewhat meets purpose	Meets purpose	Somewhat meets purpose: Use of anticoagulants would decrease likelihood of allocating ferrets for reintroduction	Somewhat meets purpose
Refocus management in management area 3.67 to de-emphasize black-footed ferret reintroduction	Does not meet need	Meets need	Meets need	Meets need
Reevaluate boundaries of management areas 3.63 and 3.67 to be more conducive to prairie dog management	Meets need	Meets need	Meets need	Meets need
Increase the availability of lethal prairie dog control tools	Does not meet need	Meets need	Meets need	Somewhat meets need
Enhance engagement with partners	Meets need	Meets need	Meets need	Meets need

Table 5. Comparison of effects of alternatives related to the issues raised during the scoping period

Issue	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Grassland-wide	Alternative 4 Prairie Dog Emphasis
Ensure viability of sensitive species and potential species of conservation concern	Manages for greatest extent of prairie dog colonies (33,000 acres) and provides adequate extent of habitat so that management "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" for all at-risk species analyzed.	Manages for a lower acreage of prairie dog colonies (10,000 acres) than no action, but provides adequate extent of habitat so that management "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" for all at-risk species analyzed.	Manages for a lower acreage of prairie dog colonies (10,000 to 15,000 acres) than no action, but provides adequate extent so that management "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" for all at-risk species analyzed.	Manages for a slightly lower acreage of prairie dog colonies (27,000 acres) than no action and a greater acreage than the proposed action and grassland-wide alternatives, and provides adequate extent of habitat so that management "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" for all at-risk species analyzed.
Contributions to local economies	The Thunder Basin National Grassland would continue to provide opportunities for livestock grazing that support employment and labor income in communities in the analysis area. Local economic gains from recreational shooting are limited by year-round shooting restrictions in management area 3.63.	The Thunder Basin National Grassland would continue to provide opportunities for livestock grazing that support employment and labor income in communities in the analysis area. Local economic gains from recreational shooting with seasonal shooting restrictions in management area 3.67 may be greater than no action and prairie dog emphasis alternatives but less than the grassland-wide alternative.	The Thunder Basin National Grassland would continue to provide opportunities for livestock grazing that support employment and labor income in communities in the analysis area. Local economic gains from recreational shooting with no shooting restrictions in management area 3.67 may be greater than all other alternatives.	The Thunder Basin National Grassland would continue to provide opportunities for livestock grazing that support employment and labor income in communities in the analysis area. Local economic gains from recreational shooting are limited by year-round shooting restrictions in management area 3.67.

Issue	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Grassland-wide	Alternative 4 Prairie Dog Emphasis
Impacts to private land values and facilities	Some lands and facilities protected from prairie dog encroachment with 1-mile residence buffers, but boundary management zones are not in place along Federal boundaries with state and private lands.	Some lands and facilities protected from prairie dog encroachment with 1-mile residence buffers, and boundary management zones are intended to prevent encroachment along Federal boundaries with state and private lands adjacent to management area 3.67.	Some lands and facilities protected from prairie dog encroachment with 1-mile residence buffers, and boundary management zones are intended to prevent encroachment along Federal boundaries with state and private lands.	Some lands and facilities protected from prairie dog encroachment with 1-mile residence buffers, and boundary management zones are intended to prevent encroachment along Federal boundaries with state and private lands adjacent to management area 3.67, category 1 areas, and category 2 areas.
Exposure to plague	1-mile residence buffers are in place for human health, but boundary management zones are not in place.	1-mile residence buffers are in place for human health grasslandwide, and ¼ mile boundary management zones are in place around management area 3.67	1-mile residence buffers are in place for human health grasslandwide, and ¼ mile boundary management zones are in place grasslandwide	1-mile residence buffers are in place for human health grasslandwide, ¼ mile boundary management zones are in place around category 1 areas, and 1/8 mile boundary management zones are in place around category 2 areas.
Impacts of recreational shooting on target and nontarget species	Impacts are unlikely due to shooting prohibitions and restrictions.	Impacts are more likely than the no action or prairie dog emphasis alternative, but less likely than the grassland-wide alternative due to seasonal shooting restrictions in management area 3.67. When and where allowed, recreational shooting may directly kill species other than prairie dogs or lead to lead poisoning of nontarget species.	Impacts are more likely than other alternatives. Recreational shooting may directly kill species other than prairie dogs or lead to lead poisoning of nontarget species.	Impacts are unlikely due to shooting prohibitions and restrictions.

Issue	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Grassland-wide	Alternative 4 Prairie Dog Emphasis
Recreational shooting opportunities	Fewer opportunities than the proposed action and grassland-wide alternatives due to year-round shooting restrictions in management area 3.67 and category 1 and seasonal or year-round shooting restrictions in category 2 areas.	More opportunities than the no action or prairie dog emphasis alternatives, but fewer opportunities than the grassland-wide alternative due to seasonal shooting restrictions in management area 3.67.	More opportunities than all other alternatives due to no shooting restrictions.	Fewer opportunities than the proposed action and grassland-wide alternatives due to year-round shooting prohibitions in category 1, which may provide the best opportunities for shooting, and seasonal shooting restrictions in category 2, which may provide other opportunities for recreational shooting.
Impacts of rodenticides on nontarget species	Less likely to impact nontarget species than any action alternative due to restricted use of rodenticides.	More likely to impact nontarget species than the no action or prairie dog emphasis alternatives because zinc phosphide would be allowed in boundary management zones and for density control, and on interior colonies with a lower colony acreage threshold for use. Less likely to impact nontarget species than the grassland-wide alternative.	More likely than other alternatives to impact nontarget species because anticoagulants may be used in the boundary management zone after 3 applications of zinc phosphide prove ineffective.	Less likely to impact nontarget species than the other action alternatives because zinc phosphide would be allowed in boundary management zones, and in interior colonies with higher colony acreage thresholds for use.
Effectiveness of rodenticide treatments	Less effective than other alternatives due to limits on where and when use is allowed.	Generally effective. One application of zinc phosphide is generally 75 to 95% effective; repeated applications on the same location can reduce effectiveness over time (for example, bait shyness).	Most effective since anticoagulants and fumigants are allowed in the boundary management zone after 3 applications of zinc phosphide prove ineffective.	Generally effective. One application of zinc phosphide is generally 75 to 95% effective; repeated applications on the same location can reduce effectiveness over time (or example, bait shyness).

Chapter 3. Affected Environment and Environmental Consequences

Introduction

This chapter provides a description of the affected environment for physical, biological, and socioeconomic resources and a description of effects that may result from implementation of each alternative. Effects analyses are limited to issues raised internally or during the public scoping period or to analysis required by law, regulation, or policy. This section begins with resources for which fairly minor issues were raised (rare plants, cottonwood recruitment, soils, fire management, and minerals), then provides detailed analyses for resources which had multiple or complex issues raised (rangeland vegetation and livestock grazing, socioeconomics, wildlife, and rodenticides).

Framing the Analysis

Biophysical Environment of the Thunder Basin National Grassland

The Thunder Basin National Grassland is located in northeastern Wyoming and encompasses approximately 553,000 acres of NFS land in Campbell, Converse, Crook, Niobrara, and Weston counties. It is heavily interspersed with privately owned and State-managed lands, together creating a grassland-shrubland ecosystem approximately 1.8 million acres in extent. It spans an ecotone between mixed-grass prairie, shortgrass steppe, and sagebrush steppe (figure 16) with topography of flats plains, steep but low hills, and occasional badlands (Haufler et al. 2008). Within this ecotone, the vegetation communities consist primarily of Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and a mixed-grass prairie of the wheatgrass-needlegrass association (USDA Forest Service 2015a).

Figure 16. The Thunder Basin National Grassland spans an ecotone between mixed-grass prairie, shortgrass steppe, and sagebrush steppe. Photograph by U.S. Forest Service.

Average annual precipitation on the Thunder Basin National Grassland ranges from approximately 10 to 14 inches (25 to 35 centimeters) per year, and most precipitation falls during the spring and summer months. Average monthly temperature ranges from 23 degrees Fahrenheit (−5 degrees Celsius) in December to 72 Fahrenheit (22 degrees Celsius) in July (Porensky et al. 2018). Like other areas in the northern Great Plains, the Thunder Basin National Grassland is susceptible to droughts, which can be short or long in duration and can have severe impacts on water availability and vegetation resources (Frankson et al. 2017).

Climate in the Northern Great Plains is expected to become gradually and consistently warmer in the next 20 to 30 years, with average temperatures increasing by 2 to 4 degrees Fahrenheit by 2050 (Conant et al. 2018). A modest increase in spring rainfall is expected, and warmer temperatures are likely to cause more precipitation to fall as rain instead of snow, to increase the snow line, and to reduce the annual snowpack, particularly at lower elevations (Frankson et al. 2017). In addition to predicted changes in the average temperature and precipitation of the area, extreme events are predicted to become more frequent and more severe (Frankson et al. 2017, Conant et al. 2018). For example, predicted heavier spring precipitation, combined with a shift from snow to rain, could increase the potential for flooding. Higher temperatures are expected to result in an increase in the occurrence of both drought and heat waves. Even with increases in precipitation, warmer temperatures and a longer growing season are expected to increase evaporative demand, leading to more frequent and severe droughts (Frankson et al. 2017, Conant et al. 2018). These changes could have impacts, perceived as both positive and negative, for the ecosystems on the Thunder Basin National Grassland and the people who live and work there.

Proposed Management of Short-Stature Vegetation

In the proposed action and the grassland-wide alternative, management area 3.67 is designated as "rangelands with short-stature vegetation emphasis." A proposed desired condition plan component is included in management area direction for each of these alternatives to describe that vegetation would be managed to provide a mosaic of native plant communities, with an emphasis on short-stature herbaceous communities. While the entire management area is not intended to be in short-stature vegetation, short-stature vegetation would be emphasized more in this management area than in others. In the 2002 grassland plan (the no-action alternative) and the prairie dog emphasis alternative, similar conditions are described as objectives with higher percentages of vegetation in early seral stages and low structural stages.

Defining Short-Stature Vegetation

Short-stature vegetation typically reaches heights of less than 6 inches (15 centimeters), either due to species composition or due to natural or managed disturbance of taller vegetation. Forest Service personnel expect some short-stature vegetation would be achieved in management area 3.67 or 3.63 by managing for plant species and communities that naturally are short in stature, such as those included in the proposed desired condition statement: grasses such as blue grama (*Bouteloua gracilis*), buffalograss (*Bouteloua dactyloides*), western wheatgrass (*Pascopyrum smithii*), sand dropseed (*Sporobolus cryptandrus*), sixweeks fescue (*Vulpia octoflora*), and marsh muhly (*Muhlenbergia racemosa*); sedges (*Carex* spp.); forbs such as scarlet globemallow (*Sphaeralcea coccinea*) and woolly plantain (*Plantago patagonica*); and prostrate shrub species such as birdfoot sagebrush (*Artemisia pedatifida*) and plains pricklypear (*Opuntia polyacantha*).

Short-stature vegetation may also be achieved through natural or managed disturbance of taller vegetation through activities such as livestock grazing, prairie dog colonization, mowing, and wildfire or prescribed fire. Short-stature vegetation and bare ground are emphasized in management area 3.67 or 3.63 due to the suitability of soils and existing plant communities and the historic occupation by prairie dogs.

Extent of Short-Stature Vegetation and Prairie Dog Colonies for At-Risk Species

Short-stature vegetation and a component of bare ground are important habitat for some at-risk species on the Thunder Basin National Grassland, including black-tailed prairie dogs, mountain plover (figure 17), McCown's longspur, and burrowing owl (figure 18). Some at-risk species—burrowing owl and ferruginous hawk, for example—also rely on habitat attributes created exclusively by prairie dogs, such as prairie dog burrows, or on prairie dogs themselves. Future reintroduction of the black-footed ferret would also rely on the presence of prairie dog colonies. Therefore, the proposed action and alternatives include target acres for prairie dog colony extent on NFS lands on the Thunder Basin National Grassland, rather than only emphasizing ecological conditions with the presence of short-stature vegetation.

Figure 17. Mountain plover on the Thunder Basin National Grassland. Photograph by Courtney Duchardt

Figure 18. Burrowing owls on a prairie dog mound on the Thunder Basin National Grassland. Photograph by U.S. Forest Service

Because of the complex biology of prairie dog-associated species, insufficient information is available to determine the exact size and distribution of prairie dog colonies needed to ensure viability for those species in the planning area. However, the wildlife analysis shows mountain plover is the species most susceptible to changes in total colony area and providing sufficient habitat for mountain plover would concurrently provide sufficient habitat for all other prairie-dog-associated species. The best available scientific information, much of which was collected on the Thunder Basin National Grassland, shows 10,000 acres of colonies is the lower limit likely to adequately provide for the long-term persistence of the mountain plover population on the Thunder Basin National Grassland. This number of acres is also conducive to future black-footed ferret reintroduction. An additional allowance for temporary management down to 7,500 acres in special circumstances, as described in the proposed action, is unlikely to compromise species viability, given the expectation that prairie dog colony management will be directed toward the 10,000-acre target within a reasonable time after prairie dog control occurs.

A slightly conservative approach to habitat retention is justified because available information is insufficient to calculate an exact minimum required prairie dog colony acreage that would provide for the viability of mountain plover. Lower targets, if proposed, could compromise the viability of mountain plover, based on local research, including the very low densities at which the bird nests. The overall finding that a minimum of 7,500 to 10,000 acres of prairie dog colonies would be adequate to provide for viability is based on the following quantitative and qualitative evidence.

Quantitative Evidence

Based on the mountain plover survey data available for the national grassland, an estimated average density of 0.8 to 2.5 birds per 100 acre could be expected on prairie dog colonies, with few to no birds occurring outside prairie dog colonies (Duchart et al. 2018). At 10,000 acres of colonies, this expected bird density yields approximately 80 to 250 birds; at 7,500 acres of colonies, this yields approximately 60 to 190 birds. Concepts from conservation biology suggest these estimates may be sufficient to sustain a viable population of plover (Lehmkuhl 1984). In addition, because mountain plover is a migratory bird with limited fidelity to specific breeding grounds, individual birds that mix at wintering grounds are likely to contribute to the genetic health of the Thunder Basin Grassland population (Oyler-McCance et al. 2008).

Qualitative Evidence

- The mountain plover population on the national grassland has persisted through two prior landscape-scale sylvatic plague epizootics and regular rodenticide use since 2001. Observed plover abundance has contracted and expanded with fluctuations in total prairie dog colony area, yet plover have remained present on the landscape.
- The proposed amendment includes provisions for the use of insecticides and vaccinations to prevent sylvatic plague epizootics among prairie dog colonies and minimize the potential for rapid and substantial declines in available habitat.
- The proposed amendment aims to stabilize prairie dog populations around a target acreage to the extent possible. This will reduce the negative effects of the boom-and-bust cycle that can reduce the quality of mountain plover habitat at both extreme lows and extreme highs in prairie dog colony area.
- Adjacent private, State, and other Federal lands across the landscape, including lands enrolled in Candidate Conservation Agreements with Assurances, likely contain significant area of prairie dog colonies, contributing to the resilience of both prairie dog and mountain plover populations on the national grassland. While Forest Service personnel cannot rely on adjacent lands to provide for the viability of the mountain plover population on the national grassland, plover on adjacent lands will be additive to the plover population on NFS lands.

Managing Toward a Target Extent for Prairie Dog Colonies

In the proposed action, 10,000 acres is set as a management target for the extent of prairie dog colonies. Similarly, the grassland-wide alternative includes a target range of 10,000 to 15,000 acres of prairie dog colonies. Prairie dog colonies are not expected to remain stable; even under active management, fluctuations of colony acreage will occur while managing toward the acreage targets. In the current condition, for example, an estimated 625 acres of prairie dog colonies exist on the Thunder Basin National Grassland. Under any alternative, Forest Service personnel would work to conserve these colonies using plague control tools such as deltamethrin and expand prairie dog occupancy on NFS lands toward the target acreage using tools such as translocation.

During times of colony growth, such as during drought conditions, Forest Service personnel may initiate lethal or nonlethal control activities that reduce colony acreages below the management target in anticipation of continued colony expansion. When colonies exceed 10,000 acres, Forest Service personnel will work with agency partners and members of the collaborative stakeholder group to identify strategic locations for lethal and nonlethal control activities that will keep acreages as close to 10,000 as possible. This could include eradication of colonies in the interior of management area 3.67.

Prairie dog colonies are mapped and monitored on an annual basis by Thunder Basin National Grassland staff and with agreements with partner agencies and organizations. All partners have adopted a consistent protocol for mapping methods that is included in appendix B.

Future Considerations for Conservation and Control Tools

The decision associated with this analysis will determine which conservation and control tools, including rodenticides and insecticides, are approved for use for prairie dog management on the Thunder Basin National Grassland and when and where they can be applied. Further site-specific analysis of application of any of these tools will not be required.

The decision will not restrict use of tools for plague management or prairie dog control that may be developed in the future. When a new tool becomes available, the responsible official may initiate a National Environmental Policy Act "Section 18" review or a supplemental information report (Forest Service Handbook 1909.15, chapter 10, section 18.1), to determine if use of the tool requires additional analysis and a new decision. If the responsible official determines no new analysis is required and use of the tool is consistent and within the scope of the decision document for this project, then the tool may be used.

Analysis of Resources with Few Issues Raised

Rare Plants

This section provides a brief summary of effects related to rare plants on the Thunder Basin National Grassland. No issues were raised related to rare plants during the comment period; however plant species that are listed as threatened, endangered, or sensitive and those that meet the criteria for potential species of conservation concern (Forest Service Handbook 1909.12, chapter 20, section 12.52d) were evaluated for potential impacts. For more information about the analyses and determinations for rare plants, see the "Biological Evaluation of Plant Species and Potential Plant Species of Conservation Concern" posted on the project website at [https://www.fs.usda.gov/project/?project=55479].

The following threatened, endangered, or sensitive plant species were analyzed: Ute ladies'-tresses (*Spiranthes diluvialis;* threatened), Barr's milkvetch (*Astragalus barrii;* sensitive and meets criteria for potential species of conservation concern), and common twinpod (*Physaria didymocarpa* var. *lanata;* sensitive)). Fifteen addition plant species were evaluated and thirteen (plus Barr's milketch) were found that meet the criteria for potential species of conservation concern.

Once evaluated, 6 of these species were found to have the potential for substantial adverse impacts or substantially lessened protection a result of the plan amendment (indicated with an *):

- Barr's milkvetch, *Astragalus barrii**
- smooth goosefoot, *Chenopoidum subglabrum**
- Watson's goosefoot, *Chenopodium watsonii**
- Texas toadflax, *Nuttallantus texanus**
- rosy palafox, *Palafoxia rosea**
- narrowleaf pectis, *Pectis angustifolia* var. *angustifolia*
- sunbright, *Phermeranthus parviflorus**
- prairie threeawn, *Aristida oligantha*
- cream milkvetch, *Astragalus racemosus* var. *racemosus*
- Sartwell's sedge, *Carex sartwellii*
- whorled milkwort, *Polygala verticillata*
- viscid tansyaster, *Rayjacksonia annua*
- narrowleaf blue-eyed grass, *Sisyrinchium angustifolium*
- composite dropseed, *Sporobolus compositus* var. *compositus*

Two additional species—verrucose seapurslane (*Sesuvium verrucosum)* and short woollyheads (*Psilocarphus brevissimus)*—were evaluated and found to not meet the criteria as potential species of conservation concern.

Since Ute ladies'-tresses does not occur in the project area, no effects to this species are expected as a result of any of the proposed alternatives. In addition, wetland and riparian habitats (such as those that could support Ute ladies'-tresses) are unlikely to be affected by the expansion or contraction of prairie dog colonies or changes to the management of prairie dogs.

Since Barr's milkvetch is thought to co-occur with prairie dogs in mutually exclusive habitat patches and remain relatively unaffected by prairie dog activities, none of the management alternatives are expected to have any direct, indirect, or cumulative impacts on this species. Common twinpod is not known to occur in the project area, but effects to suitable but unoccupied habitat were analyzed. Since this species occupies soils and topographical features not used by prairie dogs, none of the management alternatives are expected to have any direct, indirect, or cumulative effects on this species. Therefore, the biological determinations under all alternatives for both species are ***no effect***

The six plant species that meet the criteria for potential species of conservation concern and that have the potential to be impacted by the plan amendment were analyzed in greater detail to determine if potential impacts or lessened protections could be considered substantial. There was no scientific evidence that any of the plant species are dependent on prairie dogs for creation and maintenance of suitable habitat or that any are particularly vulnerable to herbivory by prairie dogs. Co-occurrence of many of the plant species with prairie dogs was determined to be incidental. Other plants that share habitat requirements with prairie dogs (such as soil type) also occur, often with greater abundance, outside historically occupied colonies. Although impacts to individuals are possible, the management alternatives are not expected to adversely impact the viability or long-term persistence of any of the analyzed plant species. Therefore, the 2020 plan amendment will not cause substantial adverse impacts to or substantially lessen protections for any potential plant species of conservation concern in the plan area.

Cottonwood Recruitment

Commenters expressed concern about maintaining cottonwood gallery woodlands found along rivers and streams on the Thunder Basin National Grassland. These concerns are relevant to the plan amendment because the Cheyenne River Special Interest Area overlaps with management area 3.63 in the current plan. Proposed changes to the plan (chapter 2 and appendix A) include changes to the location, extent, and description of the area to focus more on riparian habitats.

The Cheyenne River in the southern part of the project area (figure 19) has experienced a lack of plains cottonwood (*Populus deltoides* var. *occidentalis)* recruitment in the last century and possibly longer (Scott and Miller 2017). Changes to stream flow and stream morphology caused by human activities such as water diversion, damming, alteration of stream flows, and groundwater pumping are widely recognized as a primary driver of cottonwood decline in most systems (Williams and Cooper 2005, Patten 1998, Busch and Smith 1995). No research has been done on the cottonwood galleries of Cheyenne River or Antelope Creek on the Thunder Basin National Grassland, but lack of successful recruitment and establishment of young cottonwoods is likely related to a number of factors: groundwater pumping to lower water tables for mineral (coal) development, groundwater pumping for other uses such as stock tanks and municipal use, upstream water diversion, livestock grazing, herbivory from native ungulates, increased soil salinity, and nonnative species invasion (Bhattacharjee et al. 2009, Patten 1998, Busch and Smith 1995).

Figure 19. Cottonwood galleries on the Cheyenne River

Factors affecting successful cottonwood reproduction are complex, interrelated, and in the case of the Thunder Basin, poorly understood. However, it is unlikely a reduction in livestock grazing would result in increased cottonwood recruitment due to ongoing land uses that have altered the hydrogeomorphic condition of the riparian systems and resulted in dewatering and salinification.

There are no in-channel dams or reservoirs on National Forest System lands in the Cheyenne River or Antelope Creek. Due to the emphasis on riparian condition and wildlife habitat (under all four alternatives) in the Cheyenne River Special Interest Area, development in the river channel is not likely to be approved on National Forest System lands. In addition, the majority of upstream water diversions and groundwater pumping are not on National Forest System lands and all are operating under existing water rights and state-issued permits. Addressing the underlying hydrogeomorphic modifications that have contributed to lack of cottonwood recruitment over the last century is outside the scope of this project and often not within Forest Service authority.

Soils

Commenters expressed concern about soil loss resulting from prairie dog occupation. Analysis related to ecological sites (areas delineated in part based on soils and plant communities) and site productivity are included in the rangeland vegetation analysis. This brief analysis addresses only direct impacts to soils, including soil erosion and loss.

Erosion is defined as "the wearing away of the land surface by running water, waves, or moving ice and wind, or by such processes as mass wasting and corrosion (solution and other chemical processes). The term geological erosion refers to natural erosion processes occurring over long (geologic) time spans. Accelerated erosion generically refers to erosion that exceeds what is presumed or estimated to be naturally occurring levels and which is a direct result of human activities (for example, cultivation and logging)" (USDA and Iowa State University 2018).

Soils found throughout the Thunder Basin National Grassland and the associated mixed grass and shrub vegetation conditions provide suitable habitat for black-tailed prairie dogs. Prairie dog colonies are found on a variety of soils (Reading and Matchett 1997), but prairie dogs prefer deep and moderately well to well-drained soils on gentle slopes. They avoid soils that are frequently flooded or excessively sandy because these soils do not support burrow systems. Most soils in management area 3.63 and proposed management area 3.67, as well as the Cheyenne River Zoological Special Interest Area, represent suitable prairie dog habitat. Prairie dogs also select soils that have been previously disturbed (Knowles 1986, Licht and Sanchez 1993). In the past, this disturbance was found in areas heavily impacted by bison and other large native herbivores (Forrest 2005, Miller et al. 2007). More recently, these areas of disturbance have been associated with homesteading, recreation, mineral and gas development, and agricultural practices.

Soil erosion occurs on the Thunder Basin National Grassland in areas both colonized and uncolonized by prairie dogs. Vegetation on prairie dog colonies is characterized by grazing-tolerant grasses, annual forbs, high percentages of bare ground and high species diversity (Archer et al. 1987). Soil erosion could be attributed to prairie dog occupancy, but prairie dogs are only one of many factors contributing to landscape and vegetation condition (Hansen and Gold 1977, Whicker and Detling 1988, Miller et al. 2007). Quantifying and comparing soil erosion rates on and off prairie dog colonies has proven difficult because vegetation conditions within and among prairie dog colonies are highly variable based on size and age of colony, plague events, drought, livestock grazing practices, and other variables (USDA Forest Service 2005), and the most likely cause of erosion is wind scouring and water. No published or unpublished references documenting and quantifying comparative erosion rates on and off prairie dog colonies are available, and we cannot, at this time, attribute accelerated erosion above native rates to prairie dog colonies on the Thunder Basin National Grassland.

Fire Management

No issues were raised related to prescribed fire or wildfire during the comment period. However, interdisciplinary team members documented effects of proposed changes to the grassland plan on the prescribed fire program for the Thunder Basin National Grassland.

Since completion of the last grassland plan amendment in 2009, grassland personnel have implemented 10 prescribed fires in or adjacent to management area 3.63, burning a total of approximately 12,200 acres. These fires were intended to enhance mountain plover and prairie dog habitat, reintroduce fire to the ecosystem, and reduce the amount of hazard fuels accumulation including decadent and residual plant material. Prescribed fire activity ceased in 2015 due to heightened concerns for sage grouse and their habitat (USDA Forest Service 2015c). However, the plan direction for sage-grouse conservation does not restrict prescribed fire as a management tool to achieve desired conditions for shortgrass prairie ecosystems.

The proposed changes to the grassland plan include removal of a standard that states, "Prescribe burn selected large flats (a section or more in size) to evaluate the effectiveness of burns in attracting and inventorying mountain plover. Prescribed burns should be timed to provide large blackened areas in the spring." This change would not eliminate or reduce applicability of prescribed fire as a tool for management in any of the action alternatives.

If prescribed fire is proposed as a tool to manage prairie dogs or associated species during implementation of any of the action alternatives, input from a third-party collaborative stakeholder group would help to identify the timing and location of proposed fires and would be used to gain insight from other local stakeholders. If wildfire occurs in areas managed for prairie dog habitat, proposed changes to prairie dog management would have no effect on wildfire suppression operations tactics or strategies. Human health and safety and protection of property would continue to be priorities for fire suppression.

Minerals

No issues have been raised related to mineral resources for this plan amendment project. However, some stakeholders inquired about the status of oil and gas development in proposed management area 3.67. The following map shows the location of oil and gas development in proposed management area 3.67 as described in the proposed action (figure 20).

All alternatives considered would have no impact to the minerals program. Changes to the availability of leasing and development are not a part of the proposed action or any action alternatives, and leasing and development would continue as previously analyzed in the plan. Oil and gas development occurs across the grassland where permitted. Existing development would continue forward under their current permit's conditions or lease stipulations. Proposed changes to stipulations are consistent among all action alternatives. Timing stipulations and controlled surface use stipulations currently exist for management area 3.63 and areas where mountain plover or black-footed ferret are present, and those stipulations are proposed to remain in place. For newly proposed development and leasing actions, standards, guidelines and stipulations in the permit would be updated consistent with the record of decision for the plan amendment. Coal mines exist west of the proposed 3.67 planning area and are expanding west and north. Due to quality of coal east of the existing mines, development is not expected to move east. Should an oil and gas operator propose to change their surface operations or propose new development or leases, the new standards, guidelines, and stipulations would be applied.

Language within the stipulations is proposed for amendment consistent with other plan components for each alternative. Stipulations are included as part of the proposed changes to grassland plan direction at the end of appendix A.

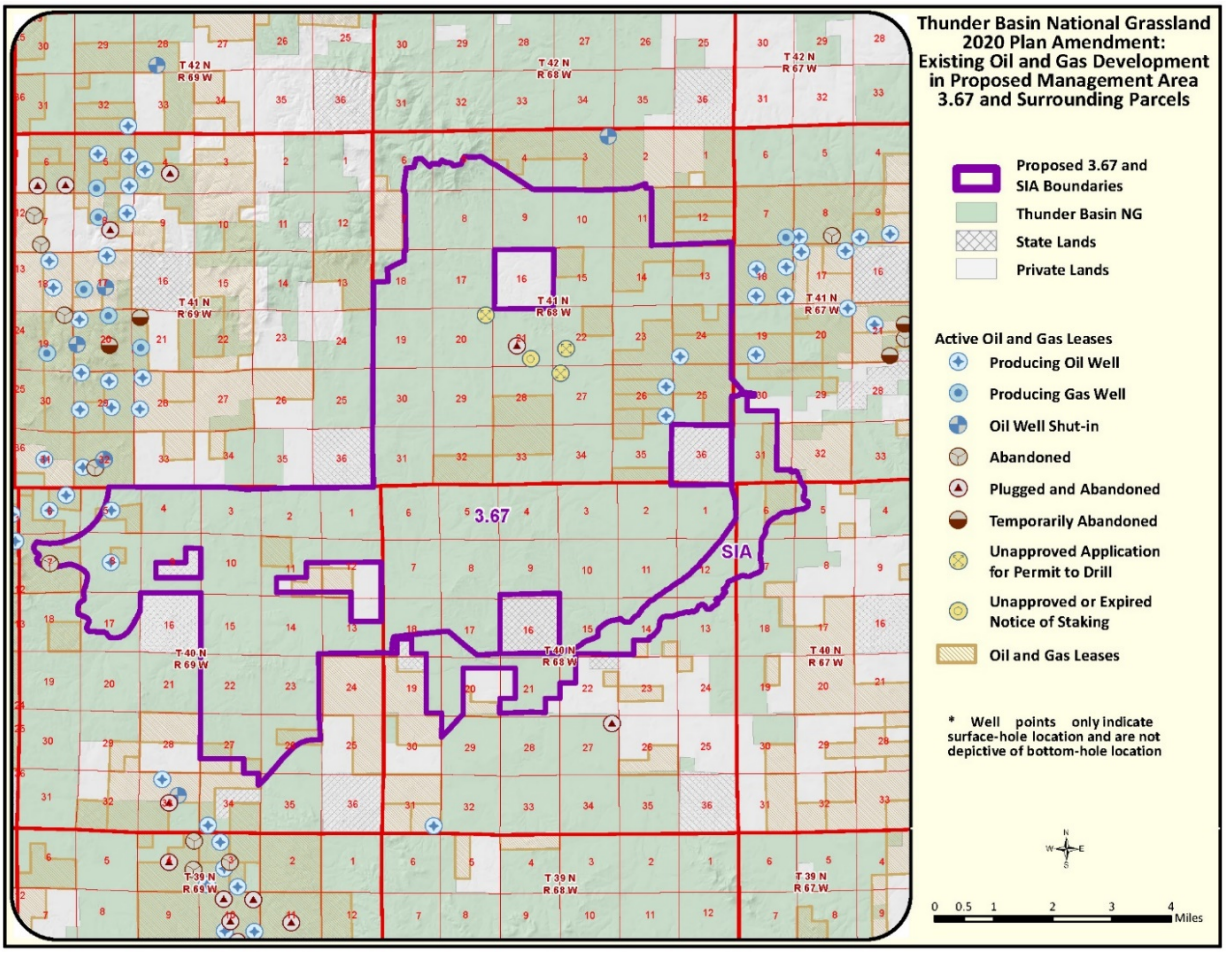

Figure 20. Existing oil and gas development in proposed management area 3.67 as described by the proposed action

Analysis of Rangeland Vegetation and Livestock Grazing

Rangeland vegetation management and livestock grazing are topics driving the proposed plan amendment. One of the primary purposes of the proposed amendment is to reduce resource conflicts related to prairie dog occupancy and livestock grazing, and one of the major issues raised by commenters is the availability of forage for permitted livestock in relation to prairie dog occupancy. An extensive analysis of effects under each action alternative was completed to address these topics.

Introduction

This analysis focuses on describing if and how the four alternatives will meet the purpose and need for the project with regard to rangeland management and if and how the four alternatives address issues related to rangeland management raised by interested parties during the scoping period. Issues described in chapter 1 that pertain to this analysis are:

- Management actions that increase or decrease prairie dog colony size, distribution, or density could change forage availability for livestock production on Federal land.
- Encroachment of prairie dogs onto private and state lands could impact forage availability for livestock production on private and state land.

In addition, comments provided during the public scoping period that are addressed in this analysis are:

- Livestock management such as timing, intensity, and duration is underutilized to enhance desired conditions.
- The focus in management area 3.63 or 3.67 should be short-stature vegetation. It should be monitored using a grasslandwide similarity index, and it should be managed to fully protect the soil, range, and vegetative cover.
- The effects of domesticated livestock as an ecosystem stressor and driver for the grassland's dominant terrestrial ecosystem need to be addressed.
- The current state of knowledge on competition and coexistence between cattle and prairie dogs needs to be addressed.

Effects Summary

Rangeland vegetation and livestock management would be affected by the extent of prairie dog colonies in all four alternatives. The no-action and prairie dog emphasis alternatives would result in the greatest potential occupancy by prairie dogs and the largest negative effects on forage availability and authorized use due to the higher target acreages for prairie dog occupancy. The proposed action and grassland-wide alternatives would have proportionally reduced negative impacts. Use of density control in the proposed action and grassland-wide alternatives when prairie dog colony extents are below proposed target acreages may result in decreased impacts to grazing management depending on past and previous management, age of prairie dog colony, ecological sites, and climatic conditions. Use of boundary management zones for prairie dog control would decrease impacts to forage availability on adjacent private and state properties under all action alternatives.

At target acreages, and depending on colony distribution, availability of forage on Federal allotments could cause grazing association members to change grazing management, perhaps by grazing for longer periods on their private properties, finding and securing other private pasture and rangeland leases during summer months, or purchasing more hay and grains to replace forage in winter, early spring, or late fall. While individual replacement costs would depend on ranch-level decisions to mitigate forage availability, additional range or supplemental feed would likely be purchased at prices higher than the cost of grazing on Federal allotments.

Livestock production from the national grasslands is very important to local agricultural families with national grassland grazing permits. Many grazing permittees have an interdependent relationship with the national grasslands. Therefore, any increase or decrease in forage for permitted livestock on the national grasslands may cause adjustments in herd size or other ranch operations.

Methodology

Tools for Rangeland Vegetation Analysis

Ecological Sites

Ecological site descriptions and state-and-transition models were used to analyze plant community differences among alternatives with varying levels of prairie dog occupancy on the Thunder Basin National Grassland. Using geographic information systems, mapped prairie dog colonies from 2016 to 2017 were examined in relation to the ecological sites present in management area 3.63, proposed management area 3.67, and prairie dog management categories 1 and 2 from the 2015 Black-tailed Prairie Dog Conservation Assessment and Management Strategy. Changes in plant community composition resulting from the transitions from one state to another within an ecological site due to cattle and prairie dog herbivory were used to estimate differences in plant production on each ecological site. For this analysis, the "representative value"[17] for production of each ecological site's reference plant community was compared to the representative value for production of the vegetative state expected from long-term prairie dog occupation, commonly the "increased bare ground" state or plant community with short-stature vegetation based on target acres for prairie dog occupancy. The reference state and increased bare ground state were chosen for analysis purposes to estimate differences in forage availability among alternatives.

The reference state for each ecological site describes plant community composition based on the natural range of variability for the site, which includes the frequency and intensity of natural disturbance events that would have occurred on an ecological site prior to European influence (around 1600) upon that ecological site (Winthers et al. 2005). Disturbance events include insect outbreaks, wildfire, native wildlife (herbivory, burrowing, etc.), indigenous human activity, and weather cycles and extremes (including droughts and unusual wet periods, temperatures, and snow and wind events). The natural range of variability does not include the presence of nonnative plant or animal species, accelerated erosion, soil organic matter loss, changes in nutrient availability, or soil structure degradation outside of the range associated with natural disturbance regimes (Pellant et al. 2018). Use of the reference state for comparative purposes has some limitations. For example, the percentage of a site occupied by prairie dogs in reference condition is not explicitly described in the ecological site description because prairie dogs are considered a native wildlife species and therefore included in the natural range of variability. Also, the extent of the project area currently in reference condition or increased bare ground state is unknown, and it may not be possible or desirable to manage for the reference state in some ecological sites.

[17] The representative value is the total annual production expected for a "normal" growing 1 year. It represents the modal concept of the growing conditions for the ecological site that includes a combination of precipitation timing and amount and temperature ranges that characterize the ecological site.

Thus, estimates of forage production for the reference state are not expected to equal the productivity of any specific site on the Thunder Basin National Grassland, even those unoccupied by prairie dogs. In many cases, the representative value for forage production may exceed the current condition or the desired condition for grassland management. The reference plant community is the baseline for this analysis so forage availability can be compared consistently among alternatives.

The increased bare ground state represents a state resulting from heavy continuous grazing with overstocking; long-term continuous grazing without adequate recovery; frequent and severe utilization; and fire, brush management, or both with long-term continuous grazing without adequate recovery. In this analysis, it is being used to represent prairie dog occupation for each alternative. Use of the increased bare ground state representative value for forage production represents a low end for forage production on prairie dog colonies because not all colonies will exist with long-term occupation due to management actions and plague events, and not all colonies will result in an increased bare ground state. The increased bare ground state representative value is used for this analysis so forage availability can be compared consistently among alternatives.

Tools for Livestock Grazing Management Analysis

The livestock grazing management analysis describes the potential effects of existing and proposed prairie dog management activities on livestock operations, including forage production, authorized use, season of use, grazing systems, and structural range improvements. This analysis relies on the information in ecological site descriptions for representative values of forage production and draws conclusions about the potential effects to animal unit months (AUMs) available to livestock producers that use allotments on the Thunder Basin National Grassland. The analysis is based on methods from the Natural Resources Conservation Service (Sedivec and Printz 2012).

None of the action alternatives propose any changes to the grazing permits held by the three grazing associations on the Thunder Basin National Grassland. Permitted head months or AUMs will not change as a result of this amendment, and authorized use will continue to be discussed each year when Forest Service and grazing association personnel work cooperatively to develop annual operating instructions or allotment worksheets. Any substantial modification to livestock grazing management will be addressed through the adaptive management process described in allotment management plans and not through this plan amendment process. Any potential change in number of head of livestock refers only to the number of livestock authorized or actually grazed annually, which may be affected by drought, the extent of prairie dog colonies, and other activities and stressors that can affect competition for forage and forage availability.

Information Sources

This analysis relies on Natural Resources Conservation Service soil survey information and ecological site descriptions (USDA Natural Resources Conservation Service 2019), as well as Forest Service geographic information system (GIS) range allotment layers and prairie dog mapping and monitoring shapefiles. Forest Service personnel consider these data sources and ecological site descriptions the best available scientific information at this time.

Incomplete and Unavailable Information

Ecological site descriptions for MLRA 58B, which includes the Thunder Basin National Grassland, are being updated at the time of this analysis; therefore, state-and-transition models and documented dynamics of these sites may change. For this analysis, it is assumed ecological sites within MLRA 58B will have a similar vegetation response to the following disturbances and transition pathways described within the state-and-transition models after updates have been completed: heavy continuous grazing with overstocking; long-term continuous grazing without adequate recovery; frequent and severe utilization; and fire, brush management, or both with long-term continuous grazing without adequate recovery. This analysis used the representative value of production for the reference state as a baseline and the representative value of production for the vegetative state expected from disturbance pathways that represent long-term prairie dog occupation in MLRA 58B to evaluate differences in plant production by ecological site.

Spatial and Temporal Context for Effects Analysis

Monitoring information from the 2018 field season shows prairie dogs currently occupy approximately 625 acres on NFS land in the Thunder Basin National Grassland, less than 1 percent of NFS land within the administrative boundary of national grassland. Historic levels have been as high as approximately 9 percent of NFS land, with the maximum documented extent occurring in 2016 and 2017; however, not all of the NFS land within the administrative boundary was surveyed during this time period.

The spatial boundaries for analyzing the direct and indirect effects to ecological sites and their plant communities are NFS land within the administrative boundary of the Thunder Basin National Grassland. The spatial boundaries for analyzing the direct and indirect effects to livestock grazing management are the grazing allotments on NFS land within the administrative boundary of the national grassland. The temporal boundary for this analysis is the life of this plan.

The administrative boundary of the Thunder Basin National Grassland serves as the area of analysis for cumulative effects because effects of other past, present, and foreseeable activities would interact with effects of the proposed grassland plan amendment only within the project area.

Affected Environment

Rangeland Ecology

The Thunder Basin National Grassland lies within MLRA 58B, Northern Rolling High Plains, Southern Part. As described by the Natural Resources Conservation Service (2006),

> "MLRA 58B supports grassland vegetation. Rhizomatous wheatgrasses, needle and thread, green needlegrass, and blue grama are the dominant species on deep soils. Rhizomatous wheatgrasses, bluebunch wheatgrass, needle and thread, and Indian ricegrass are the major species on hills and ridges indicative of shallow soils. Basin wildrye, green needlegrass, rhizomatous wheatgrasses, and shrubs are dominant along the bottom lands and streams. Big sagebrush being the dominant shrub."

Grasslands are inherently heterogeneous, in that composition, productivity, and diversity are highly variable across multiple scales (Ludwig and Tongway 1995; Patten and Ellis 1995; Fuhlendorf and Smeins 1999). This heterogeneity results in part from differential timing of disturbances and corresponding vegetation responses (Fuhlendorf and Smeins 1998).

The natural range of variability for ecological sites on the Thunder Basin National Grassland includes disturbance events such as insect outbreaks, wildfire, impacts from native wildlife, and weather cycles and extremes such as droughts, major rain and snow events, and extreme temperatures. While native bison (*Bison bison*) are not present on the Thunder Basin National Grassland, both cattle grazing and prairie dog occupation, among other impacts from herbivores, serve as stressors and drivers in the grassland ecosystem. Fire also plays a key role in the grassland ecosystem and can pair with grazing to create landscape heterogeneity.

The impact of disturbance on the mammal community and the role of mammals in creating disturbance are both intrinsic to the prairie ecosystem (Knopf 1996). Prairie mammals were adapted to tolerate disturbances and variable conditions on the Northern Great Plains; many larger mammals were somewhat migratory, and the reproductive capability and rapid dispersal of small mammals allowed them to quickly colonize and populate new patches of habitat (Knopf 1996). The attraction of grazing animals to recently burned areas and avoidance of unburned areas suggests that, from an evolutionary perspective, fire and grazing were coupled disturbance processes that promote unique vegetation conditions and habitats (Fuhlendorf et al. 2009, Fuhlendorf et al. 2010). The persistence of grazing mammals benefits some species by providing open habitat or by encouraging fresh growth of vegetation and reducing standing dead litter (Knopf 1996).

Given the current fragmented status of the Great Plains grasslands, recovery or conservation of historical patterns of landscape variability and heterogeneity is unlikely, primarily because of the vast spatial scales at which these occurred (Fuhlendorf et al. 2010). In the absence of bison, livestock provide some beneficial disturbance. The removal of livestock grazing for an extended period (10 years or more) has been shown to result in plant communities with excessive litter levels that tend to be invaded by nonnative grasses such as Kentucky bluegrass, crested wheatgrass, and smooth brome (USDA Natural Resources Conservation Service 2012). On the Thunder Basin National Grassland, some areas have become invaded typically by cheatgrass with extended periods of nonuse (G. Proctor person. comm. 2018).

Rangeland Vegetation

Fourteen different ecological sites occur on the Thunder Basin National Grassland in management area 3.63, proposed management area 3.67, and prairie dog management categories 1 and 2 from the Black-Tailed Prairie Dog Conservation Assessment and Management Strategy. Prairie dogs are present on approximately 625 acres of the grassland at the time of this analysis due to a plague event that began in 2017. To estimate the occupation of prairie dogs on certain ecological sites, data from 2016 and 2017, gathered at the height of prairie dog extent, was used to understand the ecological sites on which prairie dogs are likely to occur.

The reference plant community is the baseline for analysis. Generally, reference plant communities found on ecological sites within the project area contain primarily mid-stature grass species such as western wheatgrass, green needlegrass, or needle and thread. The reference plant communities would have occupied these sites under historic disturbance regimes. Plant community phases within the reference state would be expected to have the highest ecological function in terms of hydrology, species diversity, and nutrient cycling (Sedivec and Printz 2012).

Table 6 displays the acres of different ecological sites on the Thunder Basin National Grassland and the percent of ecological sites occupied by prairie dogs in 2016 and 2017 within and around management area 3.63. Table 7 shows the reference plant communities for those sites occupied by more than 1 percent of prairie dogs mapped in 2016 and 2017.

Table 6. Ecological sites, acreages, and prairie dog occupancy in 2016/2017 on the Thunder Basin National Grassland within MLRA 58B in the 10 to 14" precipitation zone (Thunder Basin and Inyan Kara Grazing Associations) and 15 to 17" precipitation zone (Spring Creek Grazing Association)

Ecological Site	Acres in 10 to 14" Precipitation Zone	Acres in 15 to 17" Precipitation Zone	Prairie Dog Acres Inventoried 2016 and 2017 in 10 to14" Precipitation Zone	% of Total Prairie Dog Acres Inventoried 2016 and 2017 in 10 to 14" Precipitation Zone
Clayey	37,885	664	4,408	17
Clayey Overflow	3,064	NA	152	1
Dense Clay	241	NA	0	0
Loamy	157,267	25,099	8,813	35
Lowland	7,719	947	899	4
Overflow	4,058	NA	12	<1
Saline Lowland	1,093	NA	0	0
Saline Upland	25,548	4	3,364	13
Sands	1,841	NA	234	<1
Sandy	23,955	12,350	4,656	2
Shallow Clayey	60,204	4,081	16	<1
Shallow Loamy	129,728	799	6,875	27
Shallow Sandy	15,677	29	209	<1
Very Shallow	1,968	NA	0	0

Table 7. Ecological sites and reference plant communities for ecological sites occupied by more than 1% of prairie dog colonies in and around management area 3.63 in 2016 and 2017

Ecological Site	Reference Plant Community
Clayey	1.1 Rhizomatous wheatgrasses/ green needlegrass, winterfat, big sagebrush 10 to 15 percent canopy
Loamy	1.1 Rhizomatous wheatgrass/needle and thread/big sagebrush 5 to 10 percent canopy
Lowland	1.1 Green needlegrass/western wheatgrass/cottonwood (mixed age class)
Saline upland	1.1 Western wheatgrass/alkali sacaton/Gardners saltbush
Sandy	1.1 Needle and thread/prairie sandreed/silver sagebrush
Shallow Loamy	1.1 Western wheatgrass/Bluebunch wheatgrass - needle and thread/little bluestem

Vegetation Monitoring

Several methods for monitoring changes in rangeland vegetation have been developed and refined over the last two decades. These include use of a similarity index and rangeland health assessments to evaluate current status and trends of plant communities and ecological processes. During the scoping period, commenters suggested methods for vegetation monitoring and inquired about their use. The methods described below are not used for the effects analysis but may be used as part of rangeland monitoring.

Similarity index is the percentage of a specific vegetation state plant community that is present on a site (USDA Natural Resources Conservation Service 2003) in relation to the potential reference plant community for the site based on kind, proportion, and amounts of plants present. It estimates current productivity and diversity relative to that of the reference plant community (Sedivec and Printz 2012). Similarity index is multifactorial and cannot be exclusively applied to guide prairie dog management or set a predetermined, acceptable percent deviation from the reference state on all ecological sites on the grassland.

Another monitoring and assessment tool developed for use by land managers and technical specialists is in the guide "Interpreting Indicators of Rangeland Health"[18] (USDA Natural Resources Conservation Service 2005). This tool includes 17 indicators of rangeland health and requires a good understanding of ecological processes, vegetation, and soils for each site to which it is applied. It is a useful tool to improve communication among diverse groups to discuss fundamental ecological concepts. This rangeland health assessment is intended to look at how well ecological processes on a site are functioning. The protocol is designed to provide a preliminary evaluation of the current status of soil or site stability, hydrologic function, and biotic integrity at the ecological site level within the natural range of variability of the reference state (Pellant et al. 2018).

Similarity index, trend data from other rangeland monitoring techniques, or rangeland health assessments evaluate an ecological site from different perspectives. They are not necessarily correlated, and no single method or measurement should stand alone to assess effects of prairie dogs on vegetation composition and rangeland health or guide management to achieve desired conditions.

Livestock Grazing Management

Livestock grazing on the Thunder Basin National Grassland is permitted through 10-year grazing agreements held by three different grazing associations: Thunder Basin, Inyan Kara, and Spring Creek. The grazing association is the "permittee", and the association is issued a grazing permit to graze livestock on NFS land. The association, in turn, issues 10-year permits to its members to graze their livestock on one or more of the grazing allotments.

Grazing allotments within the Thunder Basin National Grassland range in size from approximately 109 acres to 70,591 acres, with an average of approximately 6,372 acres in size. Currently, 120,800 head months are permitted across the grassland. The Thunder Basin Grazing Association encompasses 71 active grazing allotments with 71,500 permitted head months,[19] grazed by 57 association members. The Inyan Kara Grazing Association encompasses 95 active grazing allotments with 35,500 permitted AUMs, grazed by livestock owned by 88 association members. The Spring Creek Grazing Association encompasses 15 active grazing allotments with 13,800 permitted AUMs, grazed by livestock owned by 14 association members. Table 8 displays the current permitted AUMs and average authorized AUMs. Authorized stocking is adjusted annually, as needed, to account for the effect of natural processes (for example, droughts, wildfires, hail, prairie dogs, and grasshoppers) on forage availability and resource conditions.

[18] Interpreting Indicators of Rangeland Health:
https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1043944.pdf

[19] For this analysis, one head month will be compared equivalent to one animal unit month. Head months are used by Forest Service staff for permitting and billing purposes.

Table 8. Permitted AUMs and average actual use AUMs by grazing association from 2008 to 2018

Grazing Association	Permitted AUMs or Head Months	Actual Use AUMs or Head Months (Average 2008 to 2018)
Thunder Basin	71,500	54,909
Inyan Kara	35,500	33,630
Spring Creek	13,800	13,800

Across the Thunder Basin National Grassland, each grazing allotment has an allotment management plan for livestock grazing management. Authorized use and grazing management adjustments are discussed each spring at the allotment level as Forest Service and grazing association staff work cooperatively to develop the annual operating instructions or allotment worksheets to identify the authorized number of cattle and the grazing schedule for that year. Effects of prairie dog activity at the allotment level are highly variable and dependent on the overall size of the individual allotments in comparison with acres of prairie dog colonies present and the percentage of that allotment that is NFS land.

Figure 21. Cattle on a prairie dog colony on Thunder Basin National Grassland. Photograph by Dave Pellatz

Competition between livestock and prairie dogs has long been a concern of livestock operators. Direct forage competition has been estimated by numerous studies, and several studies have attempted to estimate how many prairie dogs or what extent of prairie dogs are equivalent to one cow or one animal unit month. Varying densities of prairie dogs, ecological site characteristics, and levels of predation and disease make these estimates difficult. Though colony density can vary widely, both seasonally and within and among colonies, Hoogland (2006) estimates average black-tailed prairie dog colony density before the first emergence of juveniles at 25 adults and yearlings per hectare (1 hectare is approximately 2.5 acres); colony density approximately doubles when juveniles first appear aboveground in May and June.

A Colorado study (Johnson and Collinge 2004) found prairie dog colony density ranged from 32 to 120 prairie dogs per hectare, and that burrow density ranged from 100 to 674 burrows per hectare. Additionally, the density of active burrows has been found to be higher in areas heavily grazed by livestock (May 2003). Hygnstrom and Virchow (1994) documented:

> "Annual dietary overlap has been estimated from 64 percent to 90 percent. One prairie dog eats about 8 pounds (17.6 kilograms) of forage per month during the summer. At a population density of 25 prairie dogs per acre (60 per hectare) and dietary overlap of 75 percent, it takes 6 acres (2.4 hectares) of prairie dogs to equal 1 animal unit month".

Other studies found dietary overlap to be up to 60 percent in the mid-grass prairie (Hansen and Gold 1977; Uresk 1984) and estimated that 335 prairie dogs consume the same forage as a 1,000-pound cow with calf (Connell et al. 2019). Due to the large number of variables in any dietary overlap equation, this analysis does not address variations in density when estimating forage availability changes. Instead, this analysis focuses on plant community changes and uses the herbage production values found in differing ecological site descriptions to estimate changes in available forage and thus, available AUMs.

Tools for Livestock Management

Livestock management tools can be used either to discourage or encourage prairie dog colony expansion. These tools are currently available for use and would continue to be available under any of the alternatives. Some tools that may be most effective in holistically managing livestock with prairie dogs are prescribed grazing, changes to grazing rotations, vegetation and visual barriers, and use of range improvements. Although this is not an exhaustive list, these common practices are described here.

Prescribed Grazing and Changes to Grazing Rotations

Prescribed grazing focuses on managing grazing intensity, duration, and season of use. Grazing activities to expand prairie dog colonies would focus on increasing the grazing intensity on the site. Increased grazing intensity would accelerate the state-and-transition pathway to create habitat more appealing to prairie dogs. Frequent and severe defoliation is the key component, as prairie dogs prefer areas with low vegetation structure to facilitate greater detection of predators (Hoogland 2006). Prescribed livestock grazing can be used as a tool to manipulate vegetation structure to induce prairie dogs to migrate into desired areas of colonization. A variety of practices could be used to entice livestock to the area: adjustments to season of use, modifying the grazing rotations, fencing, additional watering facilities, salt licks, herding, etc.

Many of the same types of prescribed grazing practices can be used to discourage prairie dog expansion (for example, grazing intensity, season of use, and herding). Grazing activities to deter expansion of prairie dog colonies would focus on increasing the vertical cover and density of vegetation. This would occur by either altering timing of grazing or reducing overall utilization of the area. These activities would be closely tied to the restoration activities identified in the state-and-transition model. Prescribed grazing that provides rest or deferment for areas of a pasture during the growing season could allow vegetation to recover and deter expansion (Hygnstrom and Virchow 1994). Studies have found that after a few years of successive deferment during the growing season, black-tailed prairie dog populations decline because cattle are not present to reduce plants to heights suitable for prairie dogs (May 2003).

Herding could be used to push cattle away from areas of prairie dog colonies and would be effective in larger grazing allotments. Lastly, fencing can allow rest or deferment from grazing pressure. Any use of deferment or rest to facilitate vegetation recovery would also have to consider other grazing pressure.

Vegetation Barriers and Visual Barriers

Terrall (2006) and Gray (2009) demonstrated vegetation barriers can be effective in minimizing expansion. The length and width of the fenced vegetation barriers vary depending on the size of the colony, topography, and other factors. The success of vegetation barriers also is dependent upon the site's capability to support taller vegetation. Vegetation barriers can be used independently or in combination with lethal treatment or other management.

The use of fenced vegetation barriers would accelerate the establishment of a vegetation buffer. Excluding livestock grazing could also accelerate the recovery time of the plant communities previously inhabited by prairie dogs (Hygnstrom and Virchow 1994). Once the vegetation barrier has become established, the fence may be removed. Monitoring of colonies, vegetation, and barrier effectiveness will indicate when removal or additional management is needed. If fenced vegetation barriers are left idle for a long period, effects of the barrier areas could result in a negative shift in vegetation communities.

Visual barriers involve placing a barrier on the side of a prairie dog colony to divert expansion. The barrier blocks the view of colony residents and discourages expansion past the barrier. These barriers would have no impact on vegetation conditions, although they may impact the movement of livestock in the area. Hygnstrom and Virchow (1994) found visual barriers were inconsistent in reducing expansion and reinvasion rates of prairie dogs in Nebraska. Current work on the Thunder Basin with vegetation barriers and their efficacy may inform future management.

Use of Range Improvements

A variety of range improvements or management practices could be used to alter livestock distribution, drawing livestock to or away from an area. This might include use of fencing, watering facilities, salt licks, etc. For example, new livestock watering facilities could be developed to encourage expansion in an area. The creation of cattle point attractants (water tanks and supplemental feed sites) close to prairie dog colonies (0.1 to 2.6 kilometers; 328 feet to 1.6 miles) may promote expansion or establishment of new colonies (Licht and Sanchez 1993). Fencing can be used to control livestock grazing in specific areas with the purpose of allowing the development of a vegetation barrier that will minimize or slow prairie dog expansion. On the other hand, relocating or adding watering facilities and salt licks away from colonies can help manage prairie dog activities by controlling where livestock gather (Hygnstrom and Virchow 1994) or may help with animal distribution and reduce competition in certain areas.

Environmental Consequences

Effects Common to All Alternatives

Many of the effects described for rangeland vegetation and livestock management are common to all alternatives, though effects will vary in degree depending on prairie dog occupancy. Effects common to all alternatives are described first, then details are provided under each alternative heading. Alternatives, including components of alternatives relevant to rangeland management, are described in chapter 2.

Effects to Rangeland Vegetation

For decades, managers and researchers have tried to improve their understanding of the interactions among prairie dogs, livestock, and other natural processes and their individual and combined effects on rangeland vegetation. Although it is known prairie dog activity can have a substantial effect on plant community composition and function (Field et al. 2015), a huge variety of site-specific scenarios exist, making it difficult to associate consistent cause and effect relationships across ecological sites. This analysis explores some interactions among plant communities and herbivory, as well as the outcomes associated with short-term and long-term occupation of grassland ecosystems by prairie dogs.

A diverse mosaic of grassland vegetation occurs across the Thunder Basin National Grassland, with differences in plant community composition, distribution, and structure that varies depending on ecological site and ecological conditions, including disturbance processes. On higher productivity sites, taller vegetation may occur and more biomass volume may be produced, and on lower productivity sites, shorter vegetation and higher percentages of bare ground are common. Natural and human-caused disturbances can influence the composition, distribution, and structure of grassland vegetation. For example, shorter vegetation may occur on high productivity sites as a result of fire, livestock grazing, drought, prairie dog herbivory, or other disturbances.

When individual prairie dogs disperse or colonies expand, prairie dogs generally do not pick sites with taller and denser vegetation, as it prevents them from seeing encroaching predators. This was demonstrated in a study in South Dakota, which found prairie dogs did not occur in areas of the study pasture at or near climax vegetation; instead they inhabited areas of the pasture in earlier successional stages (Uresk and Paulson 1988). When a plant community is adversely impacted, a decline in vegetative vigor and composition is expected, giving prairie dogs opportunity to inhabit the site. Cattle grazing can increase prairie dog density and extent by creating short-statured vegetation (Field et al. 2015) and can maintain the extent of prairie dog colonies during periods of above-normal precipitation. Prairie dogs also often establish towns in areas where livestock congregate, such as at watering sites or old homesteads (Hygnstrom and Virchow 1994). On the Thunder Basin, managers have observed prairie dogs moving into areas of less vigorous vegetation following heavy grazing, prescribed fire, and other disturbances such as pipeline installations.

Once established, prairie dogs can alter vegetation structure (Uresk 1987, Winter et al. 2002) through continuous and intense disturbance by grazing, clipping, and burrowing activities. The clipping and foraging habits create a habitat of bare ground and short, sparse vegetation, both between burrows and at the burrow entrances, where vegetation is repeatedly grazed and clipped close to the ground. Depending on ecological site and conditions, this activity has varying impacts to the plant community. Augustine and Springer (2013) found prairie dogs in northern mixed-grass prairie reduced herbaceous biomass of commonly grazed species by 63 to 94 percent. Prairie dogs in shortgrass prairie had variable effects, with one study area showing no significant difference from reference. On the Thunder Basin National Grassland, Connell et al. (2019) found herbaceous biomass was not statistically different between sites with and without prairie dogs and remained highly variable throughout the study due to site and precipitation variability.

Prairie dogs can also alter species composition. Vegetation on prairie dog towns is characterized by grazing-tolerant grasses, annual forbs, high percentages of bare ground and high species diversity (Archer et al. 1987). Repeated clipping by prairie dogs favors some forb species, as well as growth of short-grass species more resistant to constant grazing, such as blue grama (May 2003).

In a mixed-grass prairie in northern Montana, Johnson-Nistler and others (2004) found prairie dog colonies had increased the presence of warm-season grasses, forbs, and dwarf shrubs, while off-colony sites were dominated by cool-season grasses. Over time, grasses favorable to livestock, such as western wheatgrass and green needlegrass, decrease, and short-stature grasses, such as blue grama and threadleaf sedge, become more established. Ultimately, prairie dog colonies cause increases in bare ground and in grasses and forbs that are undesirable for livestock (Archer et al. 1987).

While prairie dogs change the amount and type of vegetation, their clipping and foraging activities can improve the nutritional qualities of the forage present (Agnew et al. 1986, Archer et al. 1987). Research suggests forage on active prairie dog colonies may be higher quality, which can offset the forage quantity requirements of other herbivores such as livestock (Sierra-Corona et al. 2015; Connell et al. 2019). Vegetation on prairie dog colonies may have higher plant species diversity and increased crude protein, as vegetation is maintained in an early stage of development (Uresk 1987). However, due to the short stature of the remaining vegetation, less of this higher-quality forage may be actually available for livestock consumption (May 2003). Furthermore, dietary requirements of livestock (for example, amount of roughage needed per day), dietary preferences of livestock (grasses versus forbs), and the temporal aspect of livestock grazing (season of use), must be factored into any conclusions regarding this relationship. A short-term increase in forage quality on colonies typically coincides with a decrease in forage quantity on the same site.

Prairie dogs are not solely responsible for changes in vegetation, as their activities are known to modify the grazing patterns of other herbivores (Archer et al. 1987). Studies in northwestern Mexico demonstrated both bison and cattle use prairie dog colonies (Sierra-Corona 2015). Guenther and Detling (2003) found cattle use of prairie dog colonies to be fairly random, although cattle exhibited a slight selection for prairie dog colonies during early summer and slight avoidance during late summer. This is assumed to be attributed to higher nutritional content of vegetation in the early summer and a lower preference in the late summer due to less availability. The attraction of highly palatable forage may alter livestock distribution within an allotment by creating areas of over utilization, potentially resulting in modifications to the existing grazing system. The season of use on the allotment may determine whether this may be a concern. Findings on the Thunder Basin suggest the preferential grazing on prairie dogs colonies that have increased forage quality might facilitate beneficial foraging characteristics during times of above-average spring precipitation, allowing livestock to meet both biomass and nutritional requirements (Connell et al. 2019). Conversely, periods of below-average precipitation can eliminate the beneficial effects of increased forage quality by having less vegetation available. This would limit the instantaneous intake of forage required for livestock, and livestock may need to spend additional time foraging in areas without prairie dogs to compensate for the biomass reduction. (Vermeire et al. 2004, Augustine and Springer 2013).

Plant communities change as prairie dog colonies become more established through time and as population density grows and forage needs increase. In areas recently colonized (less than 10 years), there may be little difference in species composition and production, whereas repeated heavy grazing on older colonies often results in lower overall plant productivity and change in species composition (Johnson and Collinge 2004). Removal of prairie dogs following short-term prairie dog occupation may allow the community to shift back toward the reference plant community, as long as a disturbance threshold has not been crossed (figure 22). Vegetation responses vary widely depending on ecological site, past management, water availability, and other factors.

Figure 22. Vegetation recovery following loss or removal of a prairie dog colony can vary. The top two sets of photographs are from the Rosecrans allotment, the bottom photographs are from the Rothleutner allotment. Photos on the left show vegetation conditions during prairie dog occupancy in 2017. Photographs on the left show vegetation conditions in 2018 following the plague event and loss of prairie dogs. Photographs by Dave Pellatz.

For this analysis, it is assumed prairie dogs colonies will increase in extent from the 625 acres mapped in 2018 and will occupy ecological sites in similar proportions to those observed in 2016 and 2017. Transition pathways included in ecological site description state-and-transition models that capture effects of prairie dog disturbance are heavy continuous grazing with overstocking; long-term continuous grazing without adequate recovery; frequent and severe utilization; and fire, brush management, or both with long-term continuous grazing without adequate recovery during the growing season. For ecological sites occupied by more than 1 percent of the prairie dog population in 2016 and 2017, these transition pathways typically result in increased bare ground and decreased production in plant species most commonly utilized by livestock.

Table 9 displays the predicted plant community change resulting from prairie dog herbivory. The reference state is represented on the far left side of the table, while the plant community that is expected to occur with long-term continuous season long grazing or clipping by prairie dogs is on the far right side. This analysis assumes that under heavy and continuous grazing and clipping by prairie dogs, other herbivory, or both, plant communities dominated by shortgrass species, forbs, and annuals will eventually occupy the site.

In the loamy ecological site description state-and-transition model, a transition is initiated as a result of frequent and severe utilization during the growing season of cool-season grasses. Continued long-term occupation by prairie dogs will result in a transition to the blue grama sod or blue grama sod/plains pricklypear/bare ground state. Significant economic inputs, management, and time may be required to move these plant communities toward a more productive stable plant community. The pathway toward the reference plant community is highly variable, depending upon availability and diversity of a viable seed bank of higher successional species within the existing plant community and neighboring plant communities. These plant communities can be altered to improve the production capability, but management changes would be needed to maintain the new plant community (USDA Natural Resources Conservation Service 2001).

It is important to recognize the transitional pathways and resulting plant communities are not linear and they are represented in table format for ease of readability. Additional plant community phases within an ecological site may also be present but are not represented in table 9. Other factors also contribute to the rate at which the plant community changes occur, for example, livestock grazing management, climate conditions, and prescribed fire or wildfire.

Table 9. Ecological site and predicted plant community change with heavy continuous grazing with overstocking; long-term continuous grazing without adequate recovery; frequent and severe utilization; and fire, brush management, or both with long-term continuous grazing

Ecological Site	Reference Plant Community	State within the Ecological Site	State within the Ecological Site	Departure from Reference
Clayey	1.1 Rhizomatous wheatgrasses/ green needlegrass, winterfat, big sagebrush 10 to 15 percent canopy	2.0 Sod-bound state	3.0 Native disturbed state	4.0 Increased bare ground state
Loamy	1.1 Rhizomatous wheatgrass/needle and thread/big sagebrush 5 to 10 percent canopy	2.0 Sod-bound state	3.0 Native disturbed state	4.0 Increased bare ground state
Lowland	1.1 Rhizomatous wheatgrass/green needlegrass/cottonwood	2.0 Sod-bound state	Not applicable	3.0 Increased bare ground state
Saline upland	1.1 Western wheatgrass/alkali sacaton/Gardner's saltbush	Not applicable	Not applicable	2.0 Eroded state
Sandy	1.1 Needle and thread/prairie sandreed/silver sagebrush	2.0 Sod-bound state	Not applicable	3.0 Increased bare ground state
Shallow loamy	1.1 Bluebunch wheatgrass/western wheatgrass	2.0 Sod-bound state	Not applicable	3.0 Eroded state

Under long-term prairie dog occupancy, characterized by severe and frequent utilization, significant changes in plant community composition (increased areas of bare soil, forbs, and dwarf shrubs) and reduced cover and productivity of perennial grasses is exhibited (Coppock et al. 1983; Archer et al. 1987; Detling 1998). When prairie dogs are removed after long-term colonization, the reversibility of plant community composition and productivity can be slow, with little to no change in vegetation composition for the first 2 to 3 years after removal (Krueger 1986; Cid et al. 1991, Fahnstock and Detling 2002). Uresk (1985) did not observe increased production of forbs or grasses 4 years after prairie dog removal in a South Dakota rangeland also grazed by cattle. In contrast, Augustine and others (2008), found prairie dogs function as an intense but noncontinuous disturbance due to plague, which may diminish long-term effects on grassland productivity and species composition. Other factors—precipitation patterns; concurrent livestock grazing practices; the degree of soil loss and degradation; and the presence or lack of mixed-grass species such as western wheatgrass, needle and thread, and green needlegrass—will directly affect the resiliency and overall ability of that ecological site to produce vegetation found in the reference state (Johnson and Collinge 2004). Once a plant community transitions from one state to another and crosses a threshold, it may be difficult to revert back toward the reference state. When a threshold is crossed, major management changes and monetary investments may be required for restoration (Sedivec and Printz 2012), and plant community shifts are not often linear, making them difficult to predict.

Effects to Livestock Grazing

Prairie dogs have the potential to negatively affect cattle weight gains, although the effect is highly variable depending on colony scale, spatial overlap of colonies with pastures, instantaneous intake rate of the ruminant, site-specific grass species, soil type, and spring precipitation (Derner et al. 2006, Augustine and Springer 2013). A recent study on the Standing Rock Sioux Reservation focused on the effects of prairie dogs on three ecological sites: loamy, shallow loamy, and thin claypan. The study concluded that regardless of the inherent productive capacity of an ecological site, prairie dog occupation reduced the standing crop across the three ecological sites to similar levels. Therefore, the amount of forage lost as a result of prairie dog activity is much greater on the more productive sites than less productive sites (Hendrickson et al. 2016). Temporary changes to forage quantity rarely have lasting impacts on livestock production; however, a long-term plant community shift to a forb/bare ground-dominated site with decreased overall grass production could have lasting impacts, as described in the ecological site descriptions for the Thunder Basin National Grassland. For livestock production, regardless of ecological site or occupation of prairie dogs, limited forage availability negates forage quality when thresholds have been crossed on a given ecological site.

For this effects analysis, ecological site descriptions and state-and-transition models were used to analyze the predicted plant community changes due to prairie dog colony occupancy on the Thunder Basin National Grassland. Then, the representative value for herbage production of the ecological site's reference plant community was compared to the representative value of production for the vegetation state expected from long-term prairie dog occupation. Herbage production is expected to decrease with the shift in species composition from long-term prairie dog occupation (Johnson and Collinge 2004). Expected differences in herbage production between the reference state and a state following frequent and severe defoliation vary by ecological site, and range from 175 to 1,400 pounds per acre on sites used for this analysis (USDA Natural Resources Conservation Service 2001). Table 10 displays the representative values of herbage production for reference states and disturbed states for ecological site descriptions that had more than 1 percent of the prairie dogs mapped in 2016 and 2017 and the estimated difference in herbage production per acre.

These estimates were carried forward for estimates of forage availability for each alternative. Actual impacts will vary by colony, with differences depending on the prairie dog density and the age of the colony regarding changes in species composition as well as with past and present livestock grazing management and climatic conditions.

Table 10. Difference in herbage production between reference state and disturbed state for ecological site descriptions with prairie dog colonies mapped in 2016 and 2017

Ecological Site	Production RV for Reference Vegetation State (lbs/acre)	Production RV for Vegetation State Following Frequent and Severe Defoliation (lbs/acre)	Estimated Difference in Herbage Production (lbs/acre)
Clayey	1,100	400	700
Loamy	1,200	500	700
Lowland	2,300	900	1,400
Saline Upland	500	325	175
Sandy	1,200	650	550
Shallow Loamy	900	600	300

lbs/acre = pounds per acre; RV = representative value

In addition to affecting cattle weight gains, a change in forage availability has the potential to impact authorized AUMs for any given year or could lead to voluntary reductions in stocking. This analysis calculated the impacts to available AUMs for livestock grazing based on predicted differences in available forage (table 10) as a result of differences in productivity and forage consumption across projected future extent of prairie dog colonies. It is assumed plant community states resulting from prairie dog occupancy (typically increased bare ground or low production states) have a representative species composition component that is available for livestock forage, and livestock grazing will continue on all ecological sites regardless of species composition.

AUMs were calculated following standard Natural Resources Conservation Service protocols (Sedivec and Printz 2012). Calculations assumed a harvest efficiency of 25 percent, one animal unit is equivalent to one mature cow of approximately 1,000 pounds with a calf up to six months of age, and one animal unit consumes 913 pounds of air-dry forage in one month. For this analysis, one head month will be compared equivalent to one AUM. Head months are used by Forest Service staff for permitting and billing purposes only.

Past, Present, and Reasonably Foreseeable Activities and Stressors Relevant to Cumulative Effects Analysis

Past, ongoing, and reasonably foreseeable activities in the project area that are relevant to the effects to the rangeland vegetation and livestock grazing management are:

- Coal mining and gas and oil development and the related infrastructure lead to loss of native soils and vegetation, available forage, and introduction of noxious weeds. The related disturbance associated with these developments also leads to an increase in the nonnative, invasive grasses. As the nonnative grasses and noxious weeds increase, vegetative states could shift to the native-invaded or invaded vegetative state.

- Recreation activities, such as sightseeing, hiking, cross country skiing, camping, snowmobiling, hunting, and fishing, are ongoing and expected to increase over the next 10 years. Recreation can lead to a loss in forage if there is an abundance of off-road travel. Recreation can also lead to an increase in disturbance of the rangeland vegetation, resulting in the effects described for gas and oil development. Recreation can affect livestock management as gates are inadvertently left open by recreationists, making it difficult to keep cattle in the authorized areas.
- Recreational prairie dog shooting has the potential for collateral damage to rangeland infrastructure such as stock tanks and, although rare, loss of livestock. The current amount of recreational shooting on the Thunder Basin National Grassland is unknown.
- Treatment of noxious and invasive weeds will continue as authorized in the invasive plant environmental impact statement for the Medicine Bow – Routt National Forests and Thunder Basin National Grassland (USDA Forest Service 2015b). Treatment of noxious weeds will help maintain or improve the existing vegetation.

In addition, weather and climate can affect forage production and authorized grazing:

- Periodic drought results in reduced plant productivity and accelerated expansion and establishment of prairie dog colonies. The reduction in the amount of forage and water available can make livestock management difficult, with operators needing to remove cattle from the National Forest System lands or make changes to planned grazing systems.
- Projected warmer and generally wetter conditions and elevated atmospheric carbon dioxide are anticipated to enhance soil water availability, net primary productivity, and crop production (Ko et al., 2012). However, forage quality may decline (Augustine et al 2018).
- Although some predict livestock production and efficiency of production will increase due to greater net primary productivity and longer growing seasons (CCSP 2008, Polley et al. 2013), livestock producers will continue to deal with risks associated with longer, hotter growing seasons that include an earlier arrival of spring, an increased frequency of extreme weather events (droughts, heat waves, downpours), and altered distribution of seasonal precipitation. As a result, livestock producers are vulnerable to the following (Derner et al. 2015):
    - reductions in livestock performance due to higher temperatures
    - water quality issues with confined feeding operations due to predicted increases in downpours
    - increases in nonnative invasive plants
    - greater occurrence of summer wildfires
    - soil erosion from wind or water on lands with low plant cover
    - reduced forage due to higher incidence of drought
    - greater pest abundance on livestock
    - enhanced woody plant expansion

Alternative 1 – No Action

The National Environmental Policy Act (NEPA) and National Forest Management Act (NFMA) require an analysis of the no-action alternative to assess baseline environmental impacts for comparison with action alternatives. For this project, the no-action alternative includes continued implementation of prairie dog management direction in the amended 2002 grassland plan, and the 2015 Black-tailed Prairie Dog Conservation Assessment and Management Strategy. These describe targets for prairie dog occupancy of 33,000, distributed in category 1 areas, category 2 areas, and on the rest of the grassland. These targets do not serve as upper limits to prairie dog occupancy, and expansion of prairie dog colonies may continue when targets are reached, as occurred in 2016 and 2017. Boundary management zones are not in place, and use of rodenticides to control prairie dogs is only allowed under certain circumstances. Recreational shooting is generally not allowed in category 1 and 2 areas, and lethal density control is not allowed in category 1 and 2 areas.

Under current management, resource conflicts related to prairie dog occupancy and livestock grazing would likely continue, and as prairie dog colonies increase in extent from the current 625 acres to target acres, conflicts would likely intensify. Encroachment would likely continue onto adjacent private and State lands, affecting forage availability on those lands as well as on Federal lands. Although AUMs have not previously been adjusted on the term grazing permit by Forest Service staff due to prairie dog occupancy, actual use has been lower than permitted AUMs in the past and may be lower again in the future. Increases in the extent of prairie dogs could result in adjustments to authorized use or changes in management activities. Table 10 displays the estimated differences in available forage if current management continues and prairie dogs expand to target acreages. Table 11 shows the estimated differences in available forage and AUMs if current management continues and prairie dogs expand to target acres, and includes estimates that consider a 25 percent harvest efficiency for livestock grazing. The harvest efficiency is the percentage of forage actually ingested by animals from the total amount of forage produced (USDA Natural Resources Conservation Service 2003).

Table 11. Resource indicators and measures for the no-action alternative

Resource Element	Indicator or Measure	Value
Rangeland vegetation	Target acres occupied by prairie dogs that would transition away from the vegetation reference state	33,000 acres
Livestock grazing management	Estimated decrease in herbage production on occupied acres compared to reference	11,977,191 to 15,969,587 pounds
Livestock grazing management	Estimated difference in available AUMs	13,119 to 17,491 AUMs

Alternative 2 – Proposed Action

The proposed action proposes a new management area 3.67, managed in part for a target of 10,000 acres of prairie dog colonies. Management would emphasize maintaining prairie dog colony extent at or near 10,000 acres. Boundary management zones of ¼ mile would be in place, and use of rodenticides to control prairie dogs would be allowed within the boundary management zone at any time, and in interior colonies when acreages exceed 7,500 in management area 3.67 and any identified satellite colonies. Recreational shooting of prairie dogs would be seasonally restricted in management area 3.67 but allowed on the rest of the grassland.

To mitigate prairie dog expansion during drought conditions, a temporary target of 7,500 acres may be used. Density control may be used to maintain desired vegetation conditions, which will vary by ecological site and colony. When below 7,500 acres in management area 3.67 or satellite colonies, no more than 50 percent of any colony may be treated for density.

Direct and Indirect Effects

Rangeland Vegetation

Vegetation communities currently impacted by prairie dogs would continue to transition toward or remain in the vegetation state expected from long-term prairie dog use (table 9). Over time, expansion of prairie dogs is expected, but it is difficult to determine where and when this will occur, as it will likely be variable by colony. Any newly colonized areas would also transition toward the vegetative state expected from long-term prairie dog use.

Livestock Grazing Management

Existing conflicts with livestock grazing management activities will continue, but boundary management zones will prevent prairie dogs from Federal lands impacting forage production on adjacent non-Federal lands. As prairie dog acres increase, the effects to authorized use and livestock management will increase. Increases in prairie dog populations or colony extent could result in adjustments to authorized use or changes in management activities, depending on management objectives and where expansion occurs. Each allotment would be affected differently according to the overall size of the allotment in comparison with acres of prairie dogs. A reduction or adjustment in grazing management could occur depending on the extent of expansion within the allotment and desired conditions.

Table 12 shows the estimated differences in available forage and AUMs if current management continues and prairie dogs expand to target acres, and includes estimates that consider a 25 percent harvest efficiency for livestock grazing.

Livestock grazing rotations will need to be coordinated with lethal treatment activities, as livestock may need to be temporarily rotated or removed from the pasture during the treatment depending on product used. The use of rodenticide will follow the product label, standards and guidelines, and other applicable rules and regulations.

Table 12. Resource indicators and measures for the proposed action

Resource Element	Indicator or Measure	Value
Rangeland vegetation	Target acres occupied by prairie dogs that would transition away from the vegetation reference state	10,000 acres
Livestock grazing management	Estimated decrease in herbage production on occupied acres compared to reference	2,722,089 to 4,839,270 pounds
Livestock grazing management	Estimated difference in available AUMs	2,981 to 5,300 AUMs

Cumulative Effects – Proposed Action

Rangeland Vegetation

Overall, the proposed action would have reduced impacts to rangeland vegetation and overall departure of rangeland health per the 17 indicators of rangeland health when compared to the no-action alternative. When combined with the effects from other present and foreseeable future activities, as discussed above, the proposed action could add incrementally to the increases of undesirable species or expedite the transition between vegetation states.

Livestock Grazing Management

The proposed action alternative would have reduced impacts to grazing management and authorized use, when compared to the impacts in the no-action alternative. The effects from other present and foreseeable future activities and stressors discussed above could add incrementally to further reduce the amount of forage available to grazing livestock in the analysis area.

Alternative 3 – Grassland-Wide Alternative

The grassland-wide alternative proposes a new management area 3.67, managed in part for prairie dog colonies. At least one prairie dog complex of 1,500 acres would be present in management area 3.67, and a total of 10,000 to 15,000 acres of prairie dog colonies would be managed for across the Thunder Basin National Grassland. Boundary management zones of ¼ mile would be in place, and use of rodenticides to control prairie dogs would be allowed within the boundary management zone at any time and in interior colonies when acreages exceed 10,000 acres. Recreational shooting of prairie dogs would be allowed anywhere on the Thunder Basin. To mitigate prairie dog expansion during drought conditions, prairie dog colonies could be managed toward the lower limit of the target range. Density control may be used to maintain desired vegetation conditions, which will vary by ecological site and colony. When below 10,000 acres of colonies, no more than 50 percent of any colony may be treated for density. In contrast to alternative 2, this alternative would allow use of anticoagulants and fumigants in boundary management zones after 3 applications of zinc phosphide.

Direct and Indirect Effects - Alternative 3

The direct and indirect effects to rangeland vegetation and livestock grazing of alternative 3 would be similar to alternative 2. The most appreciable difference is the increase in target acres for prairie dogs with a range of 10,000 to 15,000 acres and subsequent adjustment in forage availability (table 13) and increased departure of the 17 indicators of rangeland health evaluations by increasing to 15,000 acres. Depending on where colonies develop and expand, this alternative could also impact more allotments and pastures across Thunder Basin National Grassland, since colonies anywhere on NFS lands can count toward the acreage target.

Table 13. Resource indicators and measures for grassland-wide alternative

Resource Element	Indicator or Measure	Value
Rangeland vegetation	Target acres occupied by prairie dogs that would transition away from the vegetation reference state	10,000 to 15,000 acres
Livestock grazing management	Estimated decrease in herbage production on occupied acres compared to reference	3,629,452 to 7,258,903 pounds
Livestock grazing management	Estimated difference in available AUMs	3,976 to 7,950 AUMs

Cumulative Effects – Alternative 3

Cumulative effects would be similar to alternative 2.

Alternative 4 – Prairie Dog Emphasis

The prairie dog emphasis alternative proposes to keep the boundaries of existing management area 3.63 but assign it to a new management prescription. It also would include the current category 1 area for prairie dog management and a revised version of category 2 areas for prairie dog management, as described in chapter 2. In the new management area 3.67, prairie dog colonies would be managed for at least two 4,500-acre complexes, and the category 1 area would be managed toward a target of 18,000 acres. Category 2 areas would be managed for a target of 9,000 acres. Boundary management zones of ¼ mile would be in place in management area 3.67 and category 1 areas, and boundary management zones of 1/8 mile would be in place for category 2 areas. Use of rodenticides to control prairie dogs would be allowed within the boundary management zone at any time, and in interior colonies when acreages exceed the targets, by category. Recreational shooting would not be allowed in category 1 and would be either prohibited or seasonally restricted in category 2, depending on colony acres. Lethal density management would not be allowed in category 1 and 2 areas when colonies have not met target acreages, and no change in management would be proposed under drought conditions.

Direct and Indirect Effects - Alternative 4

The direct and indirect effects to rangeland vegetation and livestock grazing of alternative 4 would be similar to alternative 1. The most appreciable difference between these and other alternatives is the substantially higher target acres for prairie dogs with a target of 27,000 acres, nearly three times that of alternative 2, and the subsequent adjustment in forage availability (table 14) and departure of elements within the 17 indicators of rangeland health. Furthermore, potential indirect effects may include reduced livestock weight gains and associated socioeconomic impacts, and overall animal health. In addition, there would be no specific management changes under drought condition, nor would density control be allowed.

Cumulative Effects – Alternative 4

Cumulative effects would be similar to alternative 2, with adjustments to available AUMs.

Table 14. Resource indicators and measures for prairie dog emphasis alternative

Resource Element	Indicator or Measure	Value
Rangeland vegetation	Target acres occupied by prairie dogs that would transition away from the vegetation reference state	27,000 acres
Livestock grazing management	Estimated decrease in herbage production on occupied acres compared to reference	9,799,519 to 13,066,026 pounds
Livestock grazing management	Estimated difference in available AUMs	10,733 to 14,311 AUMs

Summary

The following tables summarize the information presented above for each alternative. The tables display a loss of available forage, calculated as the difference in estimated forage production for an increased bare ground state associated with target acres for prairie dog occupancy compared to the estimated forage production in the same area in reference state. Although forage is presented as a decrease in availability from the reference state, all alternatives would have more forage available than what is estimated for the no-action alternative (table 15 and table 16). The difference is directly proportional to the target acres for prairie dog occupancy. For example, the decrease in forage availability for the proposed action is only 4,839,270 pounds, while the decrease for the no-action alternative is more than three times that amount, 15,969,587 pounds (table 15). The estimates in table 16 include a 25 percent harvest efficiency for livestock grazing.

Table 15. Estimated decrease in pounds of available forage as a result of prairie dog occupation, as compared to the reference state, for target acres of prairie dogs under each alternative

Ecological Site	No action target: 33,000 acres	Alt 2 Drought target: 7,500 acres	Alt 2 target and Alt 3 low end of range: 10,000 acres	Alt 3 upper end of range: 15,000 acres	Alt 4 target: 27,000 acres
Clayey	2,571,293	584,385	779,180	1,168,770	2,103,785
Loamy	7,997,401	1,817,591	2,423,455	3,635,182	6,543,328
Lowland	1,631,635	370,826	494,435	741,652	1,334,974
Saline Upland	763,144	173,442	231,256	346,884	624,391
Sandy	332,158	75,491	100,654	150,981	271,766
Shallow Loamy	2,673,956	607,717	810,290	1,215,434	2,187,782
Total	15,969,587	3,629,452	4,839,270	7,258,903	13,066,026

Table 16. Estimated decrease in pounds of available forage as a result of prairie dog occupation, as compared to the reference state, for target acres of prairie dogs under each alternative, including a 25 percent harvest efficiency

Ecological Site	No action target: 33,000 acres	Alt 2 Drought target: 7,500 acres	Alt 2 target and Alt 3 low end of range: 10,000 acres	Alt 3 upper end of range: 15,000 acres	Alt 4 target: 27,000 acres
Clayey	1,928,470	438,289	584,385	876,577	1,577,839
Loamy	5,998,051	1,363,193	1,817,591	2,726,387	4,907,496
Lowland	1,223,726	278,120	370,826	556,239	1,001,231
Saline Upland	572,358	130,081	173,442	260,163	468,293
Sandy	249,119	56,618	75,491	113,236	203,824
Shallow Loamy	2,005,467	455,788	607,717	911,576	1,640,836
Total	11,977,191	2,722,089	3,629,452	5,444,178	9,799,519

For each alternative, estimated decreases in forage production were converted to estimated decreases in AUMs, with the assumption that one animal unit consumes 913 pounds of air-dry forage in one month (table 17 and table 18). Permitted head months or AUMs will not change as a result of this amendment. Any potential change in number of head of livestock or AUMs refers only to the number of livestock authorized or actually grazed annually, which may be affected by drought, the extent of prairie dog colonies, and other activities and stressors that can affect competition for forage and forage availability.

Table 17. Estimated difference in available AUMs based on decrease in forage by ecological site in MLRA 58B, 10- to 14-inch precipitation zone. This table can be paired with table 15.

Ecological Site	No action target: 33,000 acres (AUMs)	Alt 2 Drought target: 7,500 acres (AUMs)	Alt 2 target and Alt 3 low end of range: 10,000 acres (AUMs)	Alt 3 upper end of range: 15,000 acres (AUMs)	Alt 4 target: 27,000 acres (AUMs)
Clayey	2,816	640	853	1,280	2,304
Loamy	8,759	1,991	2,654	3,982	7,167
Lowland	1,787	406	542	812	1,462
Saline Upland	836	190	253	380	684
Sandy	364	83	110	165	298
Shallow Loamy	2,929	666	888	1,331	2,396
Total AUMs	17,491	3,976	5,300	7,950	14,311

Table 18. Estimated difference in available AUMs by ecological site in MLRA 58B, 10- to 14-inch precipitation zone, including a 25 percent harvest efficiency for livestock grazing. This table can be paired with table 16.

Ecological Site	No action target: 33,000 acres	Alt 2 Drought target: 7,500 acres	Alt 2 target and Alt 3 low end of range: 10,000 acres	Alt 3 upper end of range: 15,000 acres	Alt 4 target: 27,000 acres
Clayey	2,112	480	640	960	1,728
Loamy	6,570	1,493	1,991	2,986	5,375
Lowland	1,340	305	406	609	1,097
Saline Upland	627	142	190	285	513
Sandy	273	62	83	124	223
Shallow Loamy	2,197	499	666	998	1,797
Total	13,119	2981	3,976	5,962	10,733

Analysis of Socioeconomic Resources

Several concerns related to socioeconomics were raised during the scoping period. These include the impacts of prairie dog occupation and the proposed plan amendment to jobs and income, land values and facilities, human health and safety, and recreational opportunities, as well as costs and availability of funds for implementing prairie dog management. An analysis of effects under each alternative was completed to address these topics.

Introduction

This section describes the analysis of the social and economic conditions and consequences of proposed activities and focuses on the social and economic issues raised during scoping. The socioeconomic analysis area is the area where social and economic impacts are likely to occur from changes in prairie dog management proposed under the alternatives. It is comprised of Campbell, Converse, Crook, Natrona, Niobrara, and Weston counties in eastern Wyoming. Management area 3.63 and proposed management area 3.67 include parts of Converse and Weston counties and border Campbell and Niobrara counties. Large portions of the Thunder Basin National Grassland outside management area 3.63 also fall within these four counties. The majority of the grazing permittees operating on the grassland live in these counties, and some live in Crook County. Any changes to their behaviors resulting from the plan amendment could affect the economic activity in the area. Natrona County is included in the analysis area because ranching supplies could come from Casper.

Effects Summary

For each alternative, effects were grouped as related to grazing, costs of implementation, employment and labor income, and social values.

For all alternatives, there will continue to be 120,800 permitted AUMs in the planning area permitted through three grazing associations. Assuming full use of the existing permitted AUMs, this level of grazing activity contributes 204 jobs and $5.6 million in labor income to the economic analysis area on an annual basis (IMPLAN 2017). In the past ten years, 2016 and 2017 had the highest recorded extent of black-tailed prairie dog colonies on the Thunder Basin National Grassland. During this time, grazing permittees made different choices about use of permitted AUMs, and some did not change their use of AUMs. However, cumulative effects of prairie dog management, combined with other activities and stressors such as drought, may require adjustments in herd size, supplemental feed, additional pastures, or other changes to ranch operations, which can have economic impacts at the scale of individual ranch operations, communities, or counties.

Conflicts related to prairie dog management would be expected to be less common under any of the action alternatives compared to the no-action alternative because of the use of boundary management zones. Lower acreage targets under the proposed action and the grassland-wide alternatives are also expected to decrease conflicts compared to the no-action alternative. Costs associated with minimizing encroachment are expected to be similar among the action alternatives, although management priorities may differ among alternatives based on where control and conservation activities are likely to occur. Social values associated with livestock grazing and recreational shooting are likely to be most aligned with the proposed action or grassland-wide alternatives, which have lower acreage targets, while social values associated with native ecosystem function and biodiversity are likely to be most aligned with the prairie dog emphasis or no-action alternatives, which have higher acreage targets.

Affected Environment

Population

The economic analysis area counties (Campbell, Converse, Crook, Natrona, Niobrara, and Weston) are home to approximately 160,000 people, which is approximately 27 percent of Wyoming's population (U.S. Census Bureau 2018). Wyoming's population grew 7 percent between 2010 and 2017 (U.S. Census Bureau 2018). Converse, Weston, and Niobrara Counties grew more slowly over this period (5.7, 0.7, and 2 percent, respectively). Campbell, Crook, and Natrona County populations grew at a greater rate than the state average (11.4, 8.7, and 10.2 percent, respectively) (U.S. Census Bureau 2018).

Livestock Grazing

Livestock production in the project area contributes jobs and income to the local economy. Of 106,000 total jobs in the analysis area, 2,200 (2.1 percent) were in the beef cattle ranching and farming industry. This industry is the tenth largest industry by employment in the area (IMPLAN 2017). The beef cattle ranching and farming industry is part of the agriculture, forestry, fish, and hunting sectors in the figure below, which makes up three percent of total employment in the analysis area (figure 23). Although this industry sector is a small percentage of total employment in the area, any changes to forage for livestock production could have concentrated impacts to those local communities that rely on the jobs and income from grazing activities.

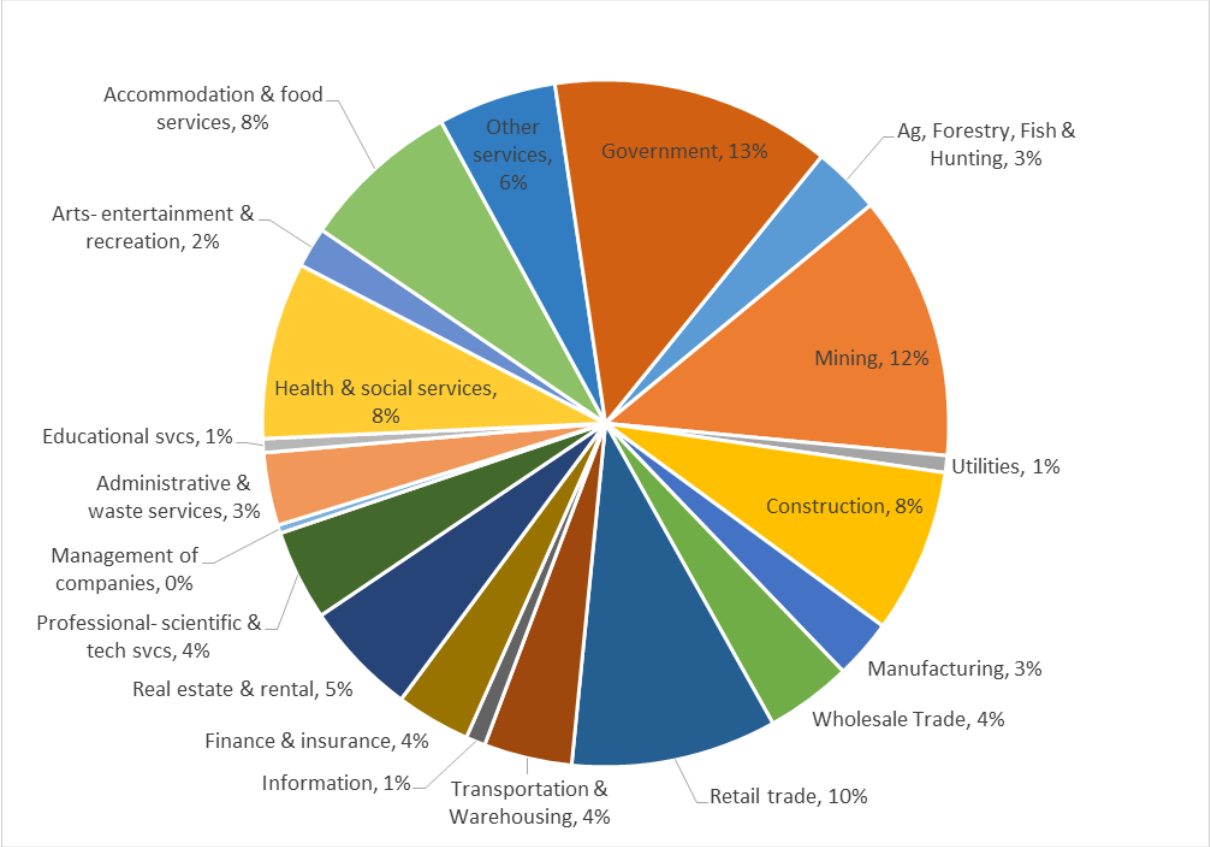

Figure 23. Employment by sector in the socioeconomic analysis area (IMPLAN 2017).

Currently, there are 120,800 permitted AUMs in the planning area permitted through three grazing associations. Assuming full use of the existing permitted animal unit months, this level of grazing activity contributes 204 jobs and $5.6 million in labor income to the economic analysis area on an annual basis (IMPLAN 2017). Economic contributions are likely less than this because actual use by the Thunder Basin Grazing Association has historically been less than the permitted use (table 8).

Costs of Prairie Dog Management

The Forest Service incurs costs from prairie dog management associated with rodenticide application, translocation, plague management, monitoring, vegetation management, and other forms of conservation and control. In the past 5 years, Forest Service staff spent an annual average of $29,300 on prairie dog rodenticide treatments through direct contracts and agreements (table 19).

Table 19. Forest Service costs for prairie dog rodenticide treatment, 2014 to 2018

Fiscal Year	Acres Treated with Zinc Phosphide	Forest Service Cost
2014	940	$20,000
2015	1,384	$46,690
2016	1,677	$39,150
2017	2,239	$30,896
2018	507	$9,740

When translocation is used as a management tool, translocation costs are greater per acre than rodenticide treatments. The Thunder Basin National Grassland spent $45,000 in 2010 to translocate 120 acres of prairie dogs and $35,000 in 2011 to translocate 166 acres of prairie dogs. Application of deltamethrin for plague management is also an annual cost. Area dusted with deltamethrin over the past 5 years on the Thunder Basin National Grassland has varied from 0 to 2,400 acres. Forest Service staff and seasonal employees partner with other organizations each year to map and monitor colonies. Costs for this activity vary depending on the size of the mapped area and specific monitoring objectives. Other potential costs include prairie dog management using vegetation barriers, fencing, or prescribed fire. These other costs vary widely annually depending on the degree to which each management tool is used. For example, Forest Service personnel have not used prescribed fire to enhance prairie dog habitat on the Thunder Basin National Grassland since 2015.

Neighboring Communities

The socioeconomic analysis area includes a mix of land ownership. In the six-county analysis area, about 70 percent of the land is private and 21 percent is Federal. Six percent of the analysis area is NFS land (U.S. Geological Survey 2018). The remainder of the land is State, tribal, city, and county land. Due to the mix of landownership, activities on NFS land, including wildlife management, can have impacts to neighboring communities. During scoping, neighboring State and private landowners expressed concerns regarding the potential for encroaching prairie dogs to impact facilities and decrease land values, the cost of controlling prairie dog colonies that originate on Federal land, and possible reductions in forage availability.

At this time, boundary management zones to reduce impacts from prairie dogs on surrounding landowners are not in place, but lethal prairie dog control is allowed within 1 mile of residences and where there is damage to public and private facilities, regardless of management area or prairie dog management category. Lethal control is also allowed in many circumstances when acreage targets have been met. Thus, some but not all concerns have been addressed through time. Prairie dogs have been known to impact facilities such as stock dams, horse corrals, and cemeteries. On the Thunder Basin National Grassland, most of these facilities are on neighboring lands and not on NFS land. Unit costs associated with prairie dog management on State and private lands are similar to unit costs on NFS land (see the "Economic Costs" section).

Land values can change, both positively and negatively, based on a number of variables including environmental factors that impact productivity of the land. Average pasture values (the value of lands that are normally grazed by livestock) in Wyoming have remained steady over the past few years (table 20).

Table 20. Average pasture value per acre for Wyoming

Year	Average value per acre
2014	$490
2015	$510
2016	$510
2017	$510
2018	$510

Source USDA 2018

Public Health and Safety

Some commenters are concerned about the public health impacts associated with prairie dogs and sylvatic plague on the Thunder Basin National Grassland. Prairie dogs can carry sylvatic plague (*Yersinia pestis*). If transmitted to a human, plague can present as bubonic (of the lymph nodes), septicemic (of the skin and other tissues), or pneumonic (of the lungs) (Wyoming Department of Health 2019). However, plague is very rare in humans, and if precautions are taken, the probability of an individual contracting plague, even in an active plague area, is quite low. The Wyoming Department of Health provides data on plague and confirms "Human plague is rare in Wyoming with 6 cases reported since 1978." From 2013 to 2017, there were no reported cases of plague in Wyoming (Wyoming Department of Health 2017). When plague is active on the Thunder Basin National Grassland, Forest Service personnel work with the Wyoming Department of Health and Centers for Disease Control staff to post warnings and offer safety information to grassland visitors.

Safety of humans and livestock is another concern related to prairie dog management. Commenters raised the issue that burrows in prairie dog colonies create safety hazards for permittees, workers, visitors, and livestock. Very few safety issues have been reported to the Thunder Basin National Grassland personnel. Of greatest concern is the risk of horses stepping in burrow holes, especially when moving quickly and when carrying a rider. This risk can increase in abandoned prairie dog colonies or following a plague event when taller vegetation may conceal inactive burrows.

Recreational Shooting

The project area has been popular for recreational shooting of prairie dogs. However, shooting prohibitions in management area 3.63, where prairie dogs are most abundant, limits recreational shooting opportunities. Year-round prohibitions or seasonal restrictions on recreational shooting remove recreational opportunities and may impact associated economic contributions to surrounding communities.

In 2017, the commercial hunting and trapping industry in the analysis area supported 44 jobs (0.04 percent of total employment in analysis area) (IMPLAN 2017). Recreation activity also generates jobs and income in other sectors, such as retail, food, gas, and lodging (figure 23). Hunting outfitters in the area offer guided hunting experiences for prairie dogs, with 2019 prices ranging from $400 to $700 per person per day. The current amount of recreational shooting on the Thunder Basin National Grassland is unknown, so we cannot estimate the economic contributions from recreational shooting. National visitor use monitoring information is not gathered on national grasslands, so we used National visitor use monitoring data from the Medicine Bow National Forest as a proxy for recreation use on the grassland. Seven percent of survey respondents indicated hunting was the main activity they participated in during their visit to the Medicine Bow National Forest. The average total trip spending per party for all activities was $197 (USDA Forest Service 2013).

Social Values and Ecosystem Services

National forests and grasslands provide goods and services vital to human health and livelihood, called ecosystem services. These services hold value and provide benefits to adjacent communities and visitors to NFS land. Healthy grasslands provide numerous ecosystem services, including clean water and air, biodiversity, and forage for grazing. Ecosystem services provided by prairie dog colonies include improved water infiltration, nutrient cycling, recreational sight-seeing opportunities, and native ecosystems and biodiversity (OMeilia et al. 1982). In contrast, ecosystem services improved by the control of prairie dogs may include forage production for livestock and recreational shooting opportunities.

There are conflicting social and economic values for the resources and ecosystem services provided on the Thunder Basin National Grassland, although none are mutually exclusive. In many cases, stakeholders wish to balance forage production for livestock and wildlife, while maintaining the ability for local ranches to thrive.

Many stakeholders value forage production for livestock production and associated social values and ecosystem services. These individuals are concerned that changes to forage availability could impact income and jobs associated with ranching activities. Management actions that would conserve prairie dog populations could negatively impact these values. Recreational shooters value prairie dogs on the landscape for recreational opportunities, and plan direction that limits this activity may negatively impact this value.

Many stakeholders place value on biodiversity, native ecosystem function, and associated ecosystem services. These individuals value the diversity of native wildlife populations on the landscape, including prairie dogs, black-footed ferrets, and other associated species. The endangered black-footed ferret depends on prairie dog colonies for survival, and limits to prairie dog colony extent can negatively impact recovery efforts.

While ferrets have not yet been reintroduced in the project area, their future presence, as well as the presence of other wildlife, could contribute to the local economy if people visit the area for wildlife viewing. In addition, some stakeholders believe in the intrinsic value of all animals and therefore oppose killing prairie dogs. Management actions to reduce prairie dog populations could negatively impact these values.

Environmental Justice

In 1994, President Clinton issued Executive Order 12898. This order directs Federal agencies to consider the human health and environmental conditions in minority and low-income communities. The purpose of Executive Order 12898 is to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects on minority and low-income populations (Office of the President 1994).

Environmental justice is the fair treatment and meaningful involvement of people of all races, cultures, and incomes, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. The goal of environmental justice is for Federal agency decision-makers to identify impacts that are disproportionately high and adverse with respect to minority and low-income populations and identify alternatives that will avoid or mitigate those impacts.

Based on the minority status and poverty data presented below, there are no counties in the analysis area that differ substantially from Wyoming, therefore the counties are not considered for environmental justice issues. According to U.S. Census Bureau from 2018, analysis area counties do not differ substantially in their racial and ethnic composition compared to the state of Wyoming (table 21). The table shows the percentage of residents who self-identify in each of the racial and ethnic categories (note: Hispanic/Latino is an ethnicity, not a race).

Table 21. Percent of population by race and ethnicity, average from 2013-2017

Location	White	Black or African American	American Indian and Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Some Other Race	Two or More Races	Hispanic or Latino
Campbell County	87.7	0.3	0.8	0.5	0	0	2.3	8.4
Converse County	91.3	0	0.1	0	0	0	0.8	7.8
Crook County	94.5	0.2	1.4	0.3	0	0	1.3	2.3
Natrona County	87.0	1.2	0.6	0.8	0	0	2.1	8.2
Niobrara County	89.0	0.1	4.1	0.7	0	0	1.7	4.3
Weston County	91.6	0.5	0.1	4.3	0	0	2.1	1.4
Wyoming	84.3	1.0	2.1	0.8	0.1	0	2.0	9.7

Source: U.S. Census Bureau, 2018

Table 22 displays the share of people living in poverty in each analysis area county, with the poverty rate of Wyoming presented for comparison. Niobrara and Weston Counties have slightly greater reported shares of people living in poverty than the state overall; however, these values are not significantly greater than the poverty rate for the state.

Table 22. Percent of people living in poverty, average from 2013 to 2017

Location	People below Poverty Rate (%)
Campbell County	9.4
Converse County	8.0
Crook County	5.1
Natrona County	9.9
Niobrara County	14.9
Weston County	14.4
Wyoming	11.1

Source: U.S. Census Bureau, 2018

Methodology and Assumptions

This analysis addresses implementation of Thunder Basin National Grassland prairie dog management in Campbell, Converse, Crook, Natrona, Niobrara, and Weston Counties in Wyoming. Unless otherwise indicated, all estimates of economic and social consequences are based only on implementation of the plan amendment.

Economic Costs

Unit costs for labor and treatment of prairie dog colonies are the same across all alternatives (table 23). The frequency and degree to which different treatments are used under each alternative will vary, and the exact number of units per treatment option under each alternative is unknown (for example, number of acres using rodenticides). Treatment effectiveness is assumed to be consistent across the alternatives.

For each alternative, costs will depend on where the prairie dogs colonize and whether colonies are managed for conservation or control. Costs for control will depend largely on target colony area, maintenance of a boundary management zone, and total size of areas where lethal and nonlethal control are allowed. It is possible implementation of alternatives with lower acreage targets for prairie dog occupancy would lead to more immediate achievement of the target and thus more immediate implementation of control work and assumption of related control costs. It is also possible that as target area increases, the greater extent of prairie dog colonies will cause management to become more difficult, and costs could increase exponentially instead of linearly. If a boundary management zone is established and actively managed while prairie dog colony extent is low, this could keep costs for maintaining the boundary management zone relatively low in subsequent years.

Current commonly used rodenticides in Wyoming include aluminum phosphide fumigant tablets, carbon and sodium nitrate gas cartridges, and grain baits infused with zinc phosphide or the anticoagulants chlorophacinone or diphacinone. These rodenticides generally cause in the range of 75 to 95 percent mortality within a colony (Uresk et al. 1986, Hyngstrom et al. 1998, Forrest and Luchsinger 2006). Vegetation barriers and translocation cost more and are not as effective at preventing colony expansion as rodenticides, but these nonlethal options may more effectively conserve native wildlife.

Table 23. Treatment options and costs

Management Activity	Cost per unit	Labor cost	How often to repeat treatment?
Vegetation barrier	$16,000/mile [a]	$10,000	Variable
Translocation [b]	$200/acre [c]	Included in cost per unit	Variable
Plague dusting	$27.50/acre [d]	Included in cost per unit	Annually
Zinc phosphide prairie dog bait	$1.65/acre [e]	$15/acre [f]	Annually
ZP Rodent Oat Bait AG	$4.7/acre [g]	$15/acre	Annually
Prozap Zinc Phosphide Oat Bait	$2.40/acre [h]	$15/acre	Annually
Rozol PD bait (anticoagulant)	$13.25/acre [i]	$35/acre for treatment and monitoring [j]	Variable
Kaput -D Prairie Dog Bait (anticoagulant)	$9.50/acre [k]	$35/acre for treatment and monitoring	Variable
Fumitoxon tablets (fumigant)	$12.8/acre [l]	NA	Variable
Gas cartridge (fumigant)	$87/acre [m]	NA	Variable

[a] Cost based on average estimates from two past projects in 2018 by the Prairie Dog Coalition and Defenders of Wildlife for vegetation barriers on the Thunder Basin National Grassland. Labor cost is based on rate of $125 per hour and 80 hours.

[b] Translocation is trapping and relocating prairie dogs.

[c] Cost based on 2011 labor and supplies during 2011 field season from "2012 Anticipated Budget – Prairie Dog Management Thunder Basin" report, dated January 2011.

[d] The total cost per acre (labor, chemical, project management) to use either Delta Dust or Fipronil for plague mitigation was about $25 to $30 per acre in 2019 on the Nebraska National Forests and Grasslands, Wall Ranger District, South Dakota.

[e] Cost from South Dakota/Wheatland County Store and assumes average coverage of 50 pound bag is 33.3 acres.

[f] Labor cost from South Dakota Department of Agriculture based on information from a commercial applicator and ranges from $12 to $18 per acre.

[g] Cost from Van Diest and assumes average coverage of 12 acres per 40 pound bag pre-bait oats and 33 pound bag of oats.

[h] Cost from Nutrien Ag and assumes average coverage of 33.3 acres per 40 pound bag pre-bait oats and 50 pound bucket of oats.

[i] Cost from Van Diest and assumes average coverage of 10 acres per 50 pound bag.

[j] Labor cost from South Dakota Department of Agriculture based on information from a commercial applicator.

[k] Cost from Van Diest and assumes average coverage of 50 pound bag is 10 acres.

[l] Cost is from Van Diest and assumes 500 tablet container has average coverage of 3.12 acres.

[m] Cost from USDA - Wildlife Services and assumes average coverage of 1.25 acres for one cartridge case.

Social Values

The social analysis attempts to explain the values, beliefs, and attitudes of the local communities with anticipated effects from the plan amendment. The scoping comments provided insight into the values, beliefs, and attitudes of the area residents and surrounding communities. Although all of the values, beliefs, and attitudes are not captured in this analysis, the information received through public comments is the best data available.

- **Values** are "relatively general, yet enduring, conceptions of what is good or bad, right or wrong, desirable or undesirable."
- **Beliefs** are "judgments about what is true or false – judgments about what attributes are linked to a given object. Beliefs can also link actions to effects."
- **Attitudes** are "tendencies to react favorably or unfavorably to a situation, individual, object, or concept. They arise in part from a person's values and beliefs regarding the attitude object" (Allen et al. 2009).

Social impacts use the baseline social conditions presented in the "Affected Environment" section to discern the primary values the Thunder Basin National Grassland provides to area residents and visitors. Social effects are based on the interaction of the identified values with estimated changes to resource availability and uses.

Environmental Consequences

This report evaluates the social and economic consequences of four alternatives – the no-action alternative, proposed action, grassland-wide alternative, and prairie dog emphasis alternative.

Effects Common to All Action Alternatives

Grazing

For all alternatives, there will continue to be 120,800 permitted AUMs in the planning area permitted through three grazing associations. Permitted AUMs will not change as a result of this plan amendment. Assuming full use of the existing permitted AUMs, this level of grazing activity contributes 204 jobs and $5.6 million in labor income to the economic analysis area on an annual basis (IMPLAN 2017). Increases in the extent of prairie dogs, in combination with other events, could result in adjustments to authorized use or changes to actual use of AUMs or ranch-level management activities. Economic contributions may be lower than this estimate if actual AUM use by the Thunder Basin Grazing Association continues to be lower than permitted AUMs (table 8).

Costs

Costs for rodenticide use and other forms of prairie dog control will depend largely on the location of prairie dog colonies each year, target area for colonies, maintenance of a boundary management zone, and total size of areas where lethal and nonlethal control are allowed. Forest Service personnel will continue to make prairie dog control within 1 mile of residences the highest priority under each alternative.

The responsible official and staff will work internally and with local stakeholders to determine other priorities on an annual basis, which are likely to include treatment of colonies in the boundary management zones, treatment of colonies that are causing infrastructure damage based on reports from landowners, density control where requested and approved, and other locations outside the boundary management zones where targets do not apply or when target acres are reached. Although managed differently under each alternative, costs associated with prairie dog control are expected to be limited by available funding each fiscal year and thus be approximately the same across the alternatives.

Costs associated with sylvatic plague management are expected to be the same under all alternatives. Although a comprehensive plague management plan is not in place at this time, Forest Service personnel anticipate applying deltamethrin to some or all colonies in management area 3.63 or 3.67 under all alternatives.

Costs associated with mapping and monitoring would be associated with the target acreage for each alternative. When total colony extent is high, mapping may be less expensive, as it would require less effort to map known colonies up to the target acreage. When total colony extent is low and locations are unknown, costs may be higher as surveys are completed either across management area 3.63 or 3.67 or across the entire grassland until known colonies that meet the target acreage or all known colonies are mapped.

Costs associated with prairie dog management (whether they are incurred by the Forest Service or neighboring land owners) result in job and income contributions to the analysis area. For example, the purchase and application of rodenticides could contribute jobs to the chemical manufacturing sector. Though the economic impacts from the costs are likely minimal given that annual Forest Service spending on Thunder Basin prairie dog management has been less than $40,000 over the past few years (table 19), the impacts could have a greater importance in small communities.

Employment and Labor Income

In the past ten years, 2016 and 2017 had the highest recorded extent of black-tailed prairie dog colonies on the Thunder Basin National Grassland. Grazing permittees made different choices during this time with regard to use of permitted AUMs, and some did not change their use of AUMs. However, cumulative effects of prairie dog management combined with other activities and stressors such as drought may require adjustments in herd size, supplemental feed, additional pastures, or other changes to ranch operations, which can have economic impacts at the scale of individual ranch operations, communities, or counties. It is expected any differences in forage availability and associated AUMs among alternatives would have minimal impacts to jobs and labor income.

Human Health

While there is a public perception a higher population of prairie dogs increases the risk of humans contracting plague, transmission of the disease to humans has been historically low (see “Affected Environment” section). Plague control tools may be used in active prairie dog colonies under all alternatives, so the risk of plague transmission to humans is expected to be the same across all alternatives. Additionally, all alternatives would actively control prairie dogs within 1 mile of residences, and all action alternatives have a boundary management zone that would minimize exposure of humans and domestic animals to plague events occurring in prairie dog colonies on NFS lands.

Environmental Justice

There is not a meaningfully greater proportion of minority and low income communities at the county level for the analysis area compared to the state of Wyoming. Therefore, effects from the alternatives are not expected to disproportionately affect low income and minority communities.

Alternative 1 – No Action

For this project, the no-action alternative is continued implementation of prairie dog management direction in the amended 2002 grassland plan and the 2015 Black-Tailed Prairie Dog Conservation Assessment and Management Strategy. These describe targets for prairie dog occupancy of 33,000 acres, distributed in category 1 areas, category 2 areas, and on the rest of the national grassland. These targets do not serve as upper limits to prairie dog occupancy, and expansion of prairie dog colonies may continue when targets are reached, as occurred in 2016 and 2017.

Boundary management zones are not in place, and use of rodenticides for removal of prairie dog colonies or lethal density control is only allowed under certain circumstances. Nonlethal options must be tried prior to the use of rodenticides. Recreational shooting is generally not allowed in category 1 and 2 areas.

Grazing

Under alternative 1, permitted AUMs would remain at the current level of 120,800 AUMs. Prairie dogs would be allowed to occupy 33,000 acres of the grassland or more, and conflicts related to prairie dogs and livestock grazing use would be expected to increase as prairie dog occupancy expands toward the target acreages and beyond. Impacts to grazing would primarily be to ranching operations that use allotments in management area 3.63, category 1, and category 2 areas, a total of 16 allotments, though other operations and allotments may be impacted where prairie dog colonies contribute to category 3 targets on the rest of the grassland.

Costs

Costs for implementation of alternative 1 could include rodenticide application, translocation, plague management, vegetation management, enforcement of recreational shooting restrictions, and monitoring. Since this alternative has the highest acreage target for prairie dog colonies, control costs are expected to be lower than other alternatives during early years of implementation as current occupancy begins to expand toward target acreages. When control occurs, more costly nonlethal options (vegetation barriers and translocation) must be tried first. Nonlethal control costs would be more expensive under alternative 1 than under the action alternatives. When targets are met and control occurs, control may be more difficult and result in higher costs for rodenticide application than other alternatives because prairie dog colonies would be more extensive. Mapping costs for alternative 1 would likely be the highest of all alternatives, as mapping efforts must assign all colonies to a category and identify up to 33,000 acres of prairie dog colonies to assess progress toward and beyond colony area targets across the grassland. Enforcement of recreational shooting restrictions may also have some associated costs, such as with the installation of signage. Costs associated with enforcement of recreational shooting restrictions under alternative 1 would be similar to alternatives 2 and 4, which also have large restricted areas, but higher than alternative 3, which does not have any default shooting restrictions.

Employment and Labor Income

The Thunder Basin National Grassland would continue to provide opportunities for livestock grazing that support employment and labor income in communities in the analysis area, and grazing-related sectors would remain a part of the analysis area's economy. The year-round shooting prohibition in management area 3.63 would continue to limit job and income contributions from recreational shooting activities in management area 3.63, but this would have a minimal impact on the area economy.

Social Values

Because alternative 1 has no boundary management zone, encroachment onto neighboring lands would be most likely highest under this alternative, and encroachment could have negative effects on neighboring facilities, treatment costs, and forage availability. With the highest target extent for prairie dog colonies, social values that may conflict with prairie dog occupancy, such as livestock grazing, would be negatively impacted by the no-action alternative. Because this alternative has the highest target for prairie dog colony extent, social values related to native ecosystem function and biodiversity, such as ferret recovery and thriving populations of prairie dogs and other associated species, would be positively impacted.

Alternative 2 – Proposed Action

The proposed action proposes a new management area 3.67 managed in part for a target of 10,000 acres of prairie dog colonies. Management would emphasize maintaining prairie dog colony extent at or near 10,000 acres. Boundary management zones of ¼ mile would be in place in management area 3.67, and use of rodenticides to control prairie dogs would be allowed within the boundary management zone at any time and in interior colonies when acreages exceed 7,500 in management area 3.67 and any identified satellite colonies. All forms of zinc phosphide would be approved for use; however, anticoagulants and fumigants would be prohibited. Recreational shooting of prairie dogs would be seasonally restricted in management area 3.67 but allowed on the rest of the grassland. Density control could be used to maintain desired vegetation conditions, which would vary by ecological site and colony. When below 7,500 acres in management area 3.67 or satellite colonies, no more than 50 percent of any colony would be treated for density. Treatment could occur outside of management area 3.67 at any time except in designated satellite colonies.

Grazing

Under alternative 2, permitted AUMs would remain at the current level of 120,800 AUMs. With a lower acreage target for prairie dog colonies and a boundary management zone in place, conflicts related to prairie dogs and livestock grazing use would be expected to be lower than in other alternatives as colonies are managed toward the target acreage. Impacts to grazing would be primarily to ranching operations that use allotments in proposed management area 3.67, which includes portions of seven grazing allotments, though other operations and allotments may be impacted where satellite colonies are temporarily designated. Though fewer allotments would be impacted by colony area targets than under the grassland-wide alternative, impacts could be more concentrated on those allotments.

Costs

Costs for implementation of alternative 2 could include rodenticide application, translocation, plague management, vegetation management, enforcement of recreational shooting restrictions, and monitoring. With a lower acreage target and the allowance for density control, control treatment and costs could occur sooner than would occur under the other action alternatives.

Use of zinc phosphide would be the primary control option, which is generally less expensive per unit than translocation or use of anticoagulants and fumigants. Nonlethal control tools such as vegetation barriers and translocation would be used less often under alternative 2 than in alternatives 1 or 4. Mapping costs for alternative 2 would likely be the lowest of all alternatives, as mapping efforts must identify up to 10,000 acres of prairie dog colonies to assess progress toward colony acreage targets, and most mapping and monitoring would be concentrated in management area 3.67.

Enforcement of recreational shooting restrictions may also have some associated costs, such as the installation of signage. The location of enforcement would be variable when satellite colonies are designated. Costs associated with enforcement of recreational shooting restrictions under alternative 2 would be similar to alternatives 1 and 4, which also have large restricted areas, but higher than alternative 3, which does not have any default shooting restrictions.

Immediate management costs would be low. According to 2018 mapping data, 4 acres in the proposed alternative 2 boundary management zone were colonized by prairie dogs. The total cost to treat 4 acres using zinc phosphide would be about $72. Some other encroachment issues could occur outside of management area 3.67 and would incur some additional control costs.

Employment and Labor Income

The Thunder Basin National Grassland would continue to provide opportunities for livestock grazing that support employment and labor income in communities in the analysis area, and grazing-related sectors would remain a part of the analysis area's economy. Seasonal restrictions on recreational shooting in management area 3.67 could increase the economic contributions from the recreation activity compared to alternatives 1 or 4, though to a lesser extent than alternative 3. Although any potential changes in employment and labor income associated with the project would not be expected to have a major effect on employment and labor income for the area overall, small communities could be dependent on economic contributions from Forest Service activities.

Social Values

Encroachment issues related to implementation of alternative 2, such as effects on neighboring facilities, treatment costs, and forage availability, are expected to be similar to what would occur under the other action alternatives and less than what would occur under alternative 1. With the lowest target extent for prairie dog colonies, social values that may conflict with prairie dog conservation, such as livestock grazing, would be positively impacted. Social values related to native ecosystem function and biodiversity, such as ferret recovery and thriving populations of prairie dogs and other associated species, would be negatively impacted compared to alternatives 1 and 4. Social values related to recreational shooting would be positively impacted compared to alternative 1 but to a lesser degree than alternative 3 because of the seasonal restrictions.

Alternative 3 – Grassland-Wide

The grassland-wide alternative proposes a new management area 3.67 managed in part for prairie dog colonies. At least one prairie dog complex of 1,500 acres would be present in management area 3.67, and a total of 10,000 to 15,000 acres of prairie dog colonies would be managed across the Thunder Basin National Grassland. Boundary management zones of ¼ mile would be in place across the grassland, and use of rodenticides to control prairie dogs would be allowed within the boundary management zone at any time and in interior colonies when total colony area exceeds 10,000 acres.

Recreational shooting of prairie dogs would be allowed in colonies anywhere on the national grassland. Density control could be used to maintain desired vegetation conditions in colonies, which would vary by ecological site and colony. When below 10,000 acres of colonies, no more than 50 percent of any colony could be treated for density. In contrast to alternative 2, this alternative would allow use of anticoagulants and fumigants in boundary management zones after 3 consecutive applications of zinc phosphide fails to achieve desired results.

Grazing

Under alternative 3, permitted AUMs would remain at the current level of 120,800 AUMs. With a target range of 10,000 to 15,000 acres of prairie dog colonies, conflicts related to prairie dog occupancy and livestock grazing use would be expected to be lower than under alternatives 1 or 4. Conflicts may be higher under this alternative than under alternative 2 because prairie dog colonies may be conserved anywhere outside of boundary management zones, rather than primarily in management area 3.67, and impacts to grazing could occur for any ranching operation or allotment on NFS land. However, impacts may be better distributed away from the small number of allotments that overlap management area 3.67

Costs

Costs for implementation of alternative 3 could include rodenticide application, translocation, plague management, vegetation management, and monitoring. With a lower colony area target and the allowance for density control, costs associated with control could occur sooner than under alternatives 1 and 4. Use of zinc phosphide would be the primary control tool, although use of anticoagulants and fumigants in the boundary management zone would be permitted if zinc phosphide proves ineffective after three consecutive applications. Nonlethal control tools such as vegetation barriers and translocation would be used less often under alternative 3 than in alternatives 1 or 4. Mapping costs for alternative 3 would be higher than alternative 2 but lower than alternatives 1 and 4, as mapping efforts would identify up to 15,000 acres of prairie dog colonies to assess progress toward colony acreage targets. Alternative 3 could also incur more costs relative to other alternatives because of the increased complexity of spreading mapping efforts across the entire Thunder Basin National Grassland rather than concentrating efforts in a single management area. Logistics could include travel to more distant field locations and coordination costs associated with locating conservation efforts. Because there are no default restrictions on recreational shooting of prairie dogs, costs related to management of recreational shooting in colonies would be minimized.

Immediate management costs would be relatively low. According to 2018 mapping data, 54 acres in the proposed alternative 3 boundary management zone were occupied by prairie dogs. The total cost to treat 54 acres would be about $972 using zinc phosphide and $2,505 using an anticoagulant.

Employment and Labor Income

The Thunder Basin National Grassland would continue to provide opportunities for livestock grazing that support employment and labor income in communities in the analysis area, and grazing-related sectors would remain a part of the analysis area’s economy. With no shooting restrictions, alternative 3 may have a positive impact on jobs and income related to recreational shooting activities. Although any potential changes in employment and labor income associated with the project would not be expected to have a major effect on employment and labor income for the area overall, small communities could be dependent on economic contributions from Forest Service activities.

Social Values

Encroachment issues related to implementation of alternative 3, such as effects on neighboring facilities, treatment costs, and forage availability, would be expected to be similar to what would occur under the other action alternatives and less than what would occur under alternative 1. With target extent for prairie dog colonies lower than under alternatives 1 and 4, social values that may conflict with prairie dogs, such as livestock grazing, would be positively impacted compared to alternatives 1 and 4. Social values related to native ecosystem function and biodiversity, such as ferret recovery and thriving populations of prairie dogs and other associated species, would be negatively impacted compared to alternatives 1 and 4. Social values related to recreational shooting would be positively impacted compared to all other alternatives.

Alternative 4 – Prairie Dog Emphasis

The prairie dog emphasis alternative proposes to keep the boundaries of the existing management area 3.63, but assign a new management prescription to it. It also would keep the current category 1 area for prairie dog management and a revised version of category 2 areas, as described in chapter 2. In the new management area 3.67, prairie dog colonies would be managed for at least two 4,500 acre complexes, and the category 1 area would be managed toward a target of 18,000 acres. Category 2 areas would be managed for a combined target of 9,000 acres. Boundary management zones of ¼ mile would be in place in management area 3.67 and category 1 areas, and boundary management zones of 1/8 mile would be in place for category 2 areas. Use of rodenticides to control prairie dogs would be allowed within the boundary management zone at any time and in interior colonies when total colony area exceed the targets, by category. All forms of zinc phosphide would be approved for use. Anticoagulants and fumigants would be prohibited. Recreational shooting would not be allowed in category 1 and would be either prohibited or seasonally restricted in category 2, depending on whether total colony area has met the target. Lethal density control would not be allowed in category 1 and 2 areas when colony acreages are below targets.

Grazing

Under alternative 4, permitted AUMs would remain at the current level of 120,800 AUMs. Conflicts related to prairie dog occupancy and livestock grazing use would be expected to be higher than what would occur under alternatives 2 and 3 because alternative 4 has higher colony area targets. Conflicts would be expected to be lower than what would occur under alternative 1 because alternative 4 includes the use of boundary management zones. Impacts to grazing would primarily affect ranching operations that use allotments in the proposed management area 3.67, category 1, and revised category 2 areas, totaling 17 allotments.

Costs

Costs for implementation of alternative 4 could include rodenticide application, translocation, plague management, vegetation management, enforcement of recreational shooting restrictions, and monitoring. With a higher colony area target and no allowance for density control when targets have not been met, costs of prairie dog control could be deferred compared to the other action alternatives. However, boundary management zones would be in place and need to be maintained, and control costs would be more immediate than under alternative 1. Use of zinc phosphide would be the primary control tool and would be generally less expensive per unit than translocation or use of anticoagulants and fumigants. Translocation is encouraged as a management tool and could result in higher management costs than would occur under alternatives 2 or 3. Mapping costs for alternative 4 would be lower than alternative 1 but higher than the other action alternatives, as mapping efforts would identify up to 18,000 acres of prairie dog colonies to assess progress toward colony acreage targets.

Enforcement of recreational shooting restrictions may also have some associated costs, such as with the installation of signage. Costs associated with enforcement of recreational shooting restrictions under alternative 4 would be similar to alternatives 1 and 2, which also have large restricted areas, but higher than alternative 3, which does not have any default shooting restrictions.

Immediate management costs would be low. According to 2018 mapping data, 14 acres in the proposed alternative 4 boundary management zones were occupied by prairie dogs. The total cost to treat 14 acres would be about $252 using zinc phosphide and $2,800 using translocation. Other immediate encroachment issues could occur outside of category 1 and 2 areas, incurring some additional control costs.

Employment and Labor Income

The Thunder Basin National Grassland would continue to provide opportunities for livestock grazing that support employment and labor income in communities in the analysis area, and grazing-related sectors would remain a part of the analysis area's economy. Shooting restrictions in category 1 and 2 areas would maintain similar impacts to alternative 1. Although any potential changes in employment and labor income associated with the project would not be expected to have a major effect on employment and labor income for the area overall, small communities could be dependent on economic contributions from Forest Service activities.

Social Values

Encroachment issues related to implementation of alternative 4, such as effects on neighboring facilities, treatment costs, and forage availability, are expected to be similar to what would occur under the other action alternatives and less than what would occur under alternative 1. With target extent for prairie dog colonies lower than alternative 1 but higher than the other action alternatives, social values that may conflict with prairie dog conservation, such as livestock grazing, would be positively impacted compared to alternative 1 but negatively impacted compared to the other action alternatives. Social values related to native ecosystem function and biodiversity, such as ferret recovery and thriving populations of prairie dogs and other associated species, could be somewhat negatively impacted compared to alternative 1 but would be positively impacted compared to the other action alternatives. Social values related to recreational shooting would be maintained similar to alternative 1 but would be negatively impacted compared to the other action alternatives.

Cumulative Effects Analysis

Past, ongoing, and reasonably foreseeable activities in the analysis area that are relevant to the effects on social and economic conditions are coal mining, gas and oil development, and recreation activities. The effects from these and other activities could incrementally reduce the amount of forage available to livestock in the analysis area.

In addition to differences in forage availability under this plan amendment, other stressors on the land could create cumulative impacts to the economic contributions from livestock grazing and further impact the economic viability of ranching. For example, drought, invasive species, climate change, changes in land values, and market fluctuations in beef prices create economic uncertainty.

Cumulative effects of prairie dog management combined with other activities and stressors may require adjustments in herd size, supplemental feed, additional pastures, or other changes to ranch operations, which can have economic impacts at the scale of individual ranch operations, communities, or counties.

Analysis of Wildlife Resources

Wildlife management is a topic driving the proposed plan amendment. Some of the primary purposes of the proposed amendment are to reduce resource conflicts related to prairie dog occupancy and livestock grazing, to ensure continued conservation of at-risk species, and to support ecological conditions that do not preclude reintroduction of the black-footed ferret. Some of the major issues raised by commenters are viability of sensitive species and potential species of conservation concern, black-footed ferret recovery, and impacts of rodenticides and recreational shooting on wildlife. An extensive analysis of effects under each action alternative was completed to address these topics.

Introduction

Effects to wildlife species as a result of the proposed plan amendment are formally evaluated in a biological assessment, a biological evaluation, and a potential species of conservation concern analysis, which are a separate documents posted to the project web site. Evaluations for potential species of conservation concern were also completed to support this plan amendment and are posted to the project website.

The biological assessment includes analysis information for threatened and endangered species including the black-footed ferret and northern long-eared bat. A summary of effects related to reintroduction of the black-footed ferret is included below. The biological evaluation and potential species of conservation concern analysis include information on sensitive species and potential species of conservation concern including their range, distribution, and abundance; life history and habitat; and rangewide population trends and threats that are not presented in this document. In addition, the biological evaluation and potential species of conservation concern analysis contain detailed documentation of rationale leading to effects determinations for each alternative and each species.

Effects Summary

The following is a brief summary of species that were reviewed for analysis and determinations of impacts to those species (table 24). The effects analysis sections below include more information on effects determinations and rationale.

Table 24. Summary of effects for endangered species, Forest Service sensitive species, and potential species of conservation concern (SCC)

Class	Common Name	Status	Determination
Amphibian	Northern leopard frog	Sensitive	No impact
Bird	Bald eagle	Potential SCC	No substantial adverse impacts or substantially lessened protections as a result of the plan amendment
Bird	Brewer's sparrow	Sensitive; Potential SCC	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; No substantial adverse impacts or substantially lessened protections as a result of the plan amendment
Bird	Burrowing owl	Sensitive; Potential SCC	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; No substantial adverse impacts or substantially lessened protections as a result of the plan amendment

Class	Common Name	Status	Determination
Bird	California gull	Potential SCC	No substantial adverse impacts or substantially lessened protections as a result of the plan amendment
Bird	Chestnut-collared longspur	Sensitive; Potential SCC	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; No substantial adverse impacts or substantially lessened protections as a result of the plan amendment
Bird	Dickcissel	Potential SCC	No substantial adverse impacts or substantially lessened protections as a result of the plan amendment
Bird	Ferruginous hawk	Sensitive; Potential SCC	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; No substantial adverse impacts or substantially lessened protections as a result of the plan amendment
Bird	Flammulated owl	Sensitive	No impact
Bird	Golden eagle	Potential SCC	No substantial adverse impacts or substantially lessened protections as a result of the plan amendment
Bird	Grasshopper sparrow	Sensitive; Potential SCC	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; No substantial adverse impacts or substantially lessened protections as a result of the plan amendment
Bird	Greater sage-grouse	Sensitive; Potential SCC	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; No substantial adverse impacts or substantially lessened protections as a result of the plan amendment
Bird	Lewis's woodpecker	Sensitive	No impact
Bird	Loggerhead shrike	Sensitive	No impact
Bird	Long-billed curlew	Sensitive; Potential SCC	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; No substantial adverse impacts or substantially lessened protections as a result of the plan amendment
Bird	McCown's longspur	Sensitive; Potential SCC	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; No substantial adverse impacts or substantially lessened protections as a result of the plan amendment
Bird	Merlin	Potential SCC	No substantial adverse impacts or substantially lessened protections as a result of the plan amendment
Bird	Mountain plover	Sensitive; Potential SCC	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; No substantial adverse impacts or substantially lessened protections as a result of the plan amendment
Bird	Northern goshawk	Sensitive	No impact

Class	Common Name	Status	Determination
Bird	Northern harrier	Sensitive; Potential SCC	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; No substantial adverse impacts or substantially lessened protections as a result of the plan amendment
Bird	Olive-sided flycatcher	Sensitive	No impact
Bird	Peregrine falcon	Potential SCC	No substantial adverse impacts or substantially lessened protections as a result of the plan amendment
Bird	Ring-billed gull	Potential SCC	No substantial adverse impacts or substantially lessened protections as a result of the plan amendment
Bird	Sagebrush sparrow	Sensitive; Potential SCC	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; No substantial adverse impacts or substantially lessened protections as a result of the plan amendment
Bird	Sage thrasher	Potential SCC	No substantial adverse impacts or substantially lessened protections as a result of the plan amendment
Bird	Short-eared owl	Potential SCC	No substantial adverse impacts or substantially lessened protections as a result of the plan amendment
Bird	Swainson’s hawk	Potential SCC	No substantial adverse impacts or substantially lessened protections as a result of the plan amendment
Bird	Upland sandpiper	Potential SCC	No substantial adverse impacts or substantially lessened protections as a result of the plan amendment
Fish	Finescale dace	Sensitive	No impact
Fish	Flathead chub	Sensitive	No impact
Fish	Mountain sucker	Sensitive	No impact
Fish	Plains minnow	Sensitive	No impact
Fish	Plains topminnow	Sensitive	No impact
Fish	Sturgeon chub	Sensitive	No impact
Invertebrate	Monarch butterfly	Sensitive	No impact
Invertebrate	Ottoe skipper	Sensitive	No impact
Invertebrate	Regal fritillary	Sensitive	No impact
Invertebrate	Western bumblebee	Sensitive	No impact
Mammal	Black-footed ferret	Endangered	No impact
Mammal	Black-tailed prairie dog	Sensitive; Potential SCC	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; No substantial adverse impacts or substantially lessened protections as a result of the plan amendment
Mammal	Fringed myotis	Sensitive	No impact
Mammal	Hoary bat	Sensitive	No impact
Mammal	Northern long-eared bat	Threatened	No impact

Class	Common Name	Status	Determination
Mammal	Rocky Mountain bighorn sheep	Sensitive	No impact
Mammal	Swift fox	Sensitive; Potential SCC	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; No substantial adverse impacts or substantially lessened protections as a result of the plan amendment
Mammal	Thirteen-lined ground squirrel	Potential SCC	No substantial adverse impacts or substantially lessened protections as a result of the plan amendment
Mammal	Townsend's big-eared bat	Sensitive	No impact
Reptile	Plains hog-nosed snake	Potential SCC	No substantial adverse impacts or substantially lessened protections as a result of the plan amendment
Reptile	Prairie rattlesnake	Potential SCC	No substantial adverse impacts or substantially lessened protections as a result of the plan amendment

Methodology

The following resource indicators (table 25) were used to characterize the status of wildlife habitat availability and suitability and assess their response to potential stressors introduced by the proposed action and alternatives.

Table 25. Resource indicators and measures for the wildlife analysis

Resource Element	Resource Indicator	Measure	Addresses Purpose and Need or Key Issue?
Wildlife habitat availability	Quantitative: Changes in species habitat. Specifically changes in patch size, contiguity, structure and quality, which affect overall species persistence and viability	Acres of habitat impacted or altered by proposed activities	Yes
Wildlife habitat suitability	Qualitative: Discussion of species' response to proposed activities based on best available information and science	Anticipated level of risk for injury or direct mortality to individuals	Yes

Analysis Area

The analysis area includes the full Thunder Basin National Grassland. For many sensitive species, the analysis of direct, indirect, and cumulative effects focuses within proposed management area 3.67, as described by the proposed action. This area is referred to as the "proposed action area." It is large enough to be representative of the effects of natural events (fire, drought, etc.) and management activities that occur on the planning unit, across the landscape. In addition, the area is sufficiently large enough to evaluate the habitat for all species addressed.

Considerations for Determination of Effects

Under 36 CFR 219.9(b)(1), the responsible official must determine whether the plan components required by 36 CFR 219.9(a) provide the ecological conditions necessary to "contribute to the

recovery of federally listed threatened and endangered species, conserve proposed and candidate species, and maintain a viable population of each species of conservation concern within the plan area."

A viable population is defined in the 2012 Planning Rule as a "population of a species that continues to persist over the long term with sufficient distribution to be resilient and adaptable to stressors and likely future environments". The Planning Rule also addresses the meaning of the word "population" for planning purposes, explaining: "the individuals of a species of conservation concern that exist in the plan area will be considered to be members of one population of that species."

Whether there is sufficient distribution of a species should be considered in the context of the species' natural history and historical distribution and on the potential distribution of the habitat within the plan area, recognizing that habitat and population distribution are dynamic over time. Sufficient distribution also implies a distribution that permits individuals to interact within the plan area within the constraints of the species' natural history. Sufficient distribution implies that ecological conditions are provided to support redundancy in numbers such that losing one or some without replacement will still support a viable population. It should not be expected that management of NFS land would provide broadly or evenly distributed habitat throughout a plan area for all species. Furthermore, as long as there is enough habitat in the plan area to maintain a viable population, there is no requirement that habitat to maintain all known individuals or the maximum possible number of individuals of a species must be available in the plan area (Forest Service Handbook 1909.12, section 23.13c(1)(d)).

Best available scientific information does not show an exact population number or size to define or determine viability of the species. Instead, it shows information on range distribution and density variability within the range that can help determine whether proposed actions may impact sufficient distribution. The action alternatives were all designed to meet the purpose and need for the project, and in many cases, boundary changes and prairie dog management actions proposed by the alternatives do not show a noticeable difference in limiting sufficient distribution or viability of the species.

Effects Analysis–Federally Listed Species

This section presents the determination of effects of all alternatives on federally listed species (endangered, threatened, and proposed). A biological assessment was prepared to formally document the effects of the proposed action; it is filed in the project record.

Species Considered for Analysis

Federally listed species addressed in this report are from the most recent list received from the U.S. Fish and Wildlife Service (U.S. Fish and Wildlife Service; June 2019 and September 2019), along with the Region 2 threatened, endangered, proposed and sensitive (TEPS) species list.

Table 26 describes the listing status for each species, habitat presence in the project area, and whether the species was be carried forward for analysis. If the analysis area is outside of a species' range, or if a species does not occur in the planning unit, the species was eliminated from further analysis. If habitat is present in the analysis area or a species is known or suspected to occur in the analysis area, the species was carried forward for analysis. There is no designated critical habitat for any federally listed species on the Thunder Basin National Grassland.

Table 26. U.S. Fish and Wildlife Service threatened, endangered, and proposed species list for the Thunder Basin National Grassland

Common Name (*Latin Name*)	Status	Recognized on U.S. FWS Species List for the Thunder Basin NG?[a]	Recognized on the Region 2 Threatened, Endangered, or Proposed Species List?	Known or Suspected To Be Present?	Suitable Habitat Present?	Designated Critical Habitat Present Or Could Be Affected?	Rationale to carry forward for analysis or not
Black-footed ferret (*Mustela nigripes*)	Endangered; Experimental Population, Non-essential	No	Yes	No	Yes	No	Species will be carried forward for analysis due to dependency on prairie dogs, even though the species does not occur on the planning unit.
Least tern (*Sternula antillarum*) Interior pop	Endangered	No	Yes	No	No	No	No analysis needed based on: Analysis area is outside the species' range or the species does not occur on the planning unit and the project does not affect downstream water depletions.
Piping plover *(Charadrius melodus)* Northern Great Plains population	Endangered	No	Yes	No	No	No	No analysis needed based on: Analysis area is outside the species' range or the species does not occur on the planning unit and the project does not affect downstream water depletions.
Whooping crane (*Grus americana*)	Endangered	No	Yes	No	No	No	No analysis needed based on: Analysis area is outside the species' range or the species does not occur on the planning unit and the project does not affect downstream water depletions.
Northern long-eared bat (*Myotis septentrionalis*)	Threatened	Yes	Yes	Yes	Yes	No	Species will be carried forward for analysis due to habitat present in the planning area or is known to occur in the planning area.

Black-Footed Ferret

A full analysis of the black-footed ferret is included in the biological assessment and the biological evaluation. This section only provides rationale for the effects determination and addresses the issue of black-footed ferret reintroduction.

Effects Determination and Rationale

Black-footed ferrets are not known or expected to inhabit the Thunder Basin National Grassland. Neither wild ferrets, nor any individuals from a nonessential experimental population are present. In addition, no critical habitat is designated. Because it has been determined by the U.S. Fish and Wildlife Service that the likelihood of identifying wild ferrets in Wyoming outside of those resulting from reintroductions is minimal (U.S. Fish and Wildlife Service 2013), implementation of the Thunder Basin National Grassland 2020 plan amendment, would have no effect on the extirpated, non-experimental populations of black-footed ferret.

Effects to Reintroduction of Black-Footed Ferret

Reintroduction of the black-footed ferret was analyzed to address issues raised during the public scoping period, requirements of the 2012 Planning Rule, and Forest Service responsibilities under the Endangered Species Act. Alternatives were designed to meet the purpose and need for the project, including to not preclude reintroduction of the black-footed ferret. The best available data indicate the reintroduction of black-footed ferrets to Wyoming is biologically feasible and will promote conservation and recovery of the species.

As the lead agency for reintroduction efforts in Wyoming, the Wyoming Game and Fish Department leads the Black-Footed Ferret Working Group, which has developed the black-footed ferret reintroduction site prioritization matrix (Wyoming Game and Fish Department 2018). This prioritization matrix allows members to evaluate a number of different criteria related to the biological and social context for reintroduction in order to prioritize new areas for reintroduction. Only sites that meet the 6 requirements for reintroduction may be evaluated further for prioritization based on 10 ranking criteria. Ranking criteria would then be used to select the highest priority site for reintroduction activities. Not all criteria need to be met for a site to be considered for reintroduction.

This analysis compares the responsiveness of each alternative to the requirements for reintroduction established by the Wyoming Game and Fish Department. Neither the proposed action nor the prairie dog emphasis alternative include any management components that would preclude reintroduction. The no-action alternative does not meet the requirement for having resources in place to conduct boundary control efforts. The grassland-wide alternative includes the use of anticoagulant rodenticides in the boundary management zone, which may make the site a low priority for allocation of ferrets and may need to cease before officially designating the area as a reintroduction site.

Alternative 1 – No Action

- Effects summary: Lack of a boundary management zone and effective boundary control would likely preclude the reintroduction of ferrets, should the species be considered for reintroduction on the Thunder Basin National Grassland.
- Requirement 1, minimum prairie dog acreage: With a target of 33,000 acres of prairie dog colonies, meets the minimum requirement (1,500 acres of black-tailed prairie dogs) for the site to be considered for reintroduction of ferrets.

- Requirement 2, capacity to fulfill allocation of ferrets: To be determined based on availability of captive ferrets, then prioritized based on ranking criteria.
- Requirement 3, support of landowners within reintroduction site: One purpose of the plan amendment is to reduce resource conflicts related to prairie dog occupancy and livestock grazing. Current conditions do not indicate local landowner support.
- Requirement 4, resources in place to conduct boundary control efforts: No boundary management zones, and boundary control has not been effective during population expansions.
- Requirement 5, community support: One purpose of the plan amendment is to reduce resource conflicts related to prairie dog occupancy and livestock grazing. Current conditions do not indicate community support.
- Requirement 6, compatible land management practices: Other land management practices are compatible with reintroduction.

Alternative 2 – Proposed Action

- Effects summary: The elements of this alternative meet the requirements for reintroduction and do not preclude the reintroduction of ferrets, should the species be considered for reintroduction on the Thunder Basin National Grassland
- Requirement 1, minimum prairie dog acreage: With a target of 10,000 acres of prairie dog colonies, meets the minimum requirement (1,500 acres of black-tailed prairie dogs) for the site to be considered for reintroduction of ferrets.
- Requirement 2, capacity to fulfill allocation of ferrets: To be determined based on availability of captive ferrets, then prioritized based on ranking criteria.
- Requirement 3, support of landowners within reintroduction site: To be determined following implementation of the plan amendment. The proposed action was designed to address concerns from local landowners.
- Requirement 4, resources in place to conduct boundary control efforts: Boundary management zones would be established and resources would be allocated to control efforts.
- Requirement 5, community support: To be determined following implementation of the plan amendment. The proposed action was designed in part to improve community support.
- Requirement 6, compatible land management practices: Other land management practices are compatible with reintroduction.

Alternative 3 – Grassland-Wide Alternative

- Effects summary: The elements of this alternative meet the requirements for reintroduction and do not preclude the reintroduction of ferrets, should the species be considered for reintroduction on the Thunder Basin National Grassland. However, use of anticoagulants in the boundary management zone would make the site a low priority for allocation of ferrets.
- Requirement 1, minimum prairie dog acreage: With a target range of 10,000 to 15,000 acres of prairie dog colonies, meets the minimum requirement (1,500 acres of black-tailed prairie dogs) for the site to be considered for reintroduction of ferrets.
- Requirement 2, capacity to fulfill allocation of ferrets: To be determined based on availability of captive ferrets, then prioritized based on ranking criteria. Use of anticoagulants in the boundary management zone would make the site a low priority for allocation of ferrets.

- Requirement 3, support of landowners within reintroduction site: To be determined following implementation of the plan amendment. The grassland-wide alternative was designed in part to reduce impacts to any given individual permittee, and thus, could improve support of local landowners.
- Requirement 4, resources in place to conduct boundary control efforts: Boundary management zones would be established and resources would be allocated to control efforts.
- Requirement 5, community support: To be determined following implementation of the plan amendment. The grassland-wide alternative was designed in part to reduce impacts to any given individual permittee, and thus, could improve community support.
- Requirement 6, compatible land management practices: Other land management practices are compatible with reintroduction, but use of anticoagulant rodenticides may need cease to before reintroduction in conformance with EPA regulations.

Alternative 4 – Prairie Dog Emphasis Alternative

- Effects summary: The elements of this alternative do not preclude the reintroduction of ferrets should the species be considered for reintroduction on the Thunder Basin National Grassland.
- Requirement 1, minimum prairie dog acreage: Meets the minimum requirement (1,500 active acres of black-tailed prairie dogs) for a site to be considered for reintroduction of ferrets.
- Requirement 2, capacity to fulfill allocation of ferrets: To be determined based on availability of captive ferrets, then prioritized based on ranking criteria.
- Requirement 3, support of landowners within reintroduction site: To be determined following implementation of the plan amendment. The prairie dog emphasis alternative was designed to address concerns from local landowners.
- Requirement 4, resources in place to conduct boundary control efforts: Boundary management zones would be established and resources would be allocated to control efforts.
- Requirement 5, community support: To be determined following implementation of the plan amendment. The prairie dog emphasis alternative was designed in part to improve community support.
- Requirement 6, compatible land management practices: Other land management practices are compatible with reintroduction.

Northern Long-Eared Bat (*Myotis septentrionalis*)

- A full analysis of the northern long-eared bat is included in the biological assessment and the biological evaluation. This section only provides rationale for the effects determination.

Effects Determination and Rationale

- The proposed action would not introduce management activities in northern long-eared bat habitat, and would have ***no effect*** on northern long-eared bat.

Effects Analysis–Forest Service Sensitive Species

The following information includes Forest Service Region 2 sensitive species or their habitats that are located on or near the Thunder Basin National Grassland in, adjacent to, or downstream of the analysis area and that could potentially be impacted by proposed plan amendment. A pre-field review was conducted using available information to assemble occurrence records and describe habitat needs and ecological requirements needed to complete the analysis. Sources of information included Forest Service records and files, state databases, state wildlife agency information, and published research.

Sensitive species reviewed for this analysis were designated by the regional forester due to concerns regarding population status, trend, and habitat conditions, and for which population viability is a concern, as evidence by the following:

- significant current or predicted downward trends in population numbers or density
- significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution

These species (table 27) were then considered for analysis based on five criteria listed below. The criteria were used to identify species that would experience "no impact" from the implementation of a plan amendment and could, therefore, be eliminated from detailed analysis. These numerical categories below are referred to in table 27:

1. Analysis area is outside the species' range.
2. Potential habitat for the species does not exist within the proposed action area.
3. The type or intensity of the activity in the proposed action is expected to have no impact/effect on these species or their habitat or proposed activities do not take place in potential or occupied habitat.
4. Individual animals may be: accidental, dispersing, migrating, happenstance, vagrant, nomadic or opportunistic visitors to the habitat(s) impacted by the proposal; however, no affiliation or dependence on these habitat(s) has been shown.
5. The associated conservation design of the proposed action eliminates any potential for impact on the species.

For those species carried forward for detailed analysis, a summary of rationale for the effects determination is provided in the section following table 27. For these species, the biological evaluation contains detailed information about species life history, occurrence on the Thunder Basin National Grassland, environmental consequences of alternatives, and rationale for effects determinations. Please refer to the biological evaluation.

Table 27. Forest Service sensitive species list for the Thunder Basin National Grassland and occurrence in the analysis area

Class	Common Name (*Latin Name*)	Habitat Features	Status on Regional Forester's Sensitive Species List	Known or Potential Occupancy or Habitat Present in the Analysis Area?	Rationale for Effects Analysis	Determination
Amphibian	Northern leopard frog (*Lithobates pipiens*)	In or near permanent water features and riparian areas in the plains, foothills, and montane zones	Known	Potential habitat is present in the proposed action area, but not where activities are proposed. Known observations in the proposed action area.	No analysis needed based on: Criterion #3 - The type or intensity of the activity in the proposed action is expected to have no impact or effect on these species or their habitat or proposed activities do not take place in potential or occupied habitat.	No impact
Bird	Brewer's sparrow (*Spizella breweri*)	Sagebrush obligate species	Known	Habitat is present in proposed action area. Known observations in the proposed action area.	Analysis required. Proposed activities may impact species, their habitat, or both.	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

Class	Common Name (*Latin Name*)	Habitat Features	Status on Regional Forester's Sensitive Species List	Known or Potential Occupancy or Habitat Present in the Analysis Area?	Rationale for Effects Analysis	Determination
Bird	Burrowing owl (*Athene cunicularia*)	Open terrain such as grasslands, prairies, shrub-steppe, and deserts, preferring well-draining or gently sloping areas with low vegetation and a high percentage of bare ground, where active and inactive prairie dog colonies exist, due to dependence on previously excavated by mammals to provide nesting and forage habitat.	Known	Habitat is present in the proposed action area. Known observations in the proposed action area.	Analysis required. Proposed activities may impact species, their habitat, or both.	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
Bird	Chestnut-collared longspur (*Calcarius ornatus*)	Open tracts of shortgrass and mixed-grass prairie; may use prairie dog colonies as habitat	Known	Habitat is present in the proposed action area. Known observations in the proposed action area.	Analysis required. Proposed activities may impact species, their habitat, or both.	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

Class	Common Name (*Latin Name*)	Habitat Features	Status on Regional Forester's Sensitive Species List	Known or Potential Occupancy or Habitat Present in the Analysis Area?	Rationale for Effects Analysis	Determination
Bird	Ferruginous hawk (*Buteo regalis*)	Open lower-elevation grassland, shrub-steppe, and desert habitats and tends to avoid croplands, forests, and narrow canyons; in winter, concentrates in grasslands where prairie dog colonies exist	Known	Habitat is present in the proposed action area. Known observations in the proposed action area.	Analysis required. Proposed activities may impact species, their habitat, or both.	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
Bird	Flammulated owl (*Psiloscops flammeolus*)	Open, dry, mature and old-growth conifer forest often found on south or east facing slopes, with an oak or aspen component, herbaceous or grass understory, and pockets of dense brushy understory	Suspected	No potential habitat is present in the proposed action area. No known observations in the proposed action area.	No analysis needed based on: Criterion #2 - Potential habitat for the species does not exist within the proposed action area.	No impact
Bird	Grasshopper sparrow (*Ammodramus savannarum*)	Broad array of open grassland habitat types, including prairie dog colonies	Known	Habitat is present in the proposed action area. Known observations in the proposed action area.	Analysis required. Proposed activities may impact species, their habitat, or both.	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
Bird	Greater sage-grouse (*Centrocercus urophasianus*)	Sagebrush obligate species that depends on large areas of contiguous sagebrush	Known	Habitat is present in the proposed action area. Known observations in the proposed action area.	Analysis required. Proposed activities may impact species, their habitat, or both.	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

Class	Common Name (*Latin Name*)	Habitat Features	Status on Regional Forester's Sensitive Species List	Known or Potential Occupancy or Habitat Present in the Analysis Area?	Rationale for Effects Analysis	Determination
Bird	Lewis's woodpecker (*Melanerpes lewis*)	Commonly found in forests dominated by Ponderosa Pine, open riparian woodland dominated by cottonwood	Known	Habitat is present in proposed action area but not where activities are proposed. No known observations in the proposed action area.	No analysis needed based on: Criterion #3 - The type or intensity of the activity in the proposed action is expected to have no impact or effect on these species or their habitat or proposed activities do not take place in potential or occupied habitat.	No impact
Bird	Loggerhead shrike (*Lanius ludovicianus*)	Open habitats with short vegetation, especially hay fields and pastures	Known	Habitat is present in proposed action area but not where activities are proposed. Known observations in the proposed action area.	No analysis needed based on: Criterion #3 - The type or intensity of the activity in the proposed action is expected to have no impact or effect on these species or their habitat or proposed activities do not take place in potential or occupied habitat.	No impact

Class	Common Name (*Latin Name*)	Habitat Features	Status on Regional Forester's Sensitive Species List	Known or Potential Occupancy or Habitat Present in the Analysis Area?	Rationale for Effects Analysis	Determination
Bird	Long-billed curlew (*Numenius americanus*)	Breading habitat comprised of sparsely-vegetated shortgrass or mixed-grass prairie environments, often dominated by Wire Grass and Mountain Timothy, with low vegetation (less than or equal to 10 to 30 cm) and topography that is flat or gently sloping; winter habitat comprised of coastal estuaries, mudflats, salt marshes, wetlands, flooded fields, agricultural fields and pastures, and a variety of manmade waterbodies	Known	Habitat is present in the proposed action area. Known observations in the proposed action area.	Analysis required. Proposed activities may impact species, their habitat, or both.	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

Class	Common Name (*Latin Name*)	Habitat Features	Status on Regional Forester's Sensitive Species List	Known or Potential Occupancy or Habitat Present in the Analysis Area?	Rationale for Effects Analysis	Determination
Bird	McCown's longspur (*Rhynchophanes mccownii*)	Large tracts of open, semi-arid, shortgrass prairie and heavily-grazed mixed-grass rangeland with low and sparse vegetation, extensive bare ground, and little ground litter, including prairie dog colonies	Known	Habitat is present in the proposed action area. Known observations in the proposed action area.	Analysis required. Proposed activities may impact species, their habitat, or both.	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
Bird	Mountain plover (*Charadrius montanus*)	Open terrain such as grasslands, prairies, shrub-steppe, and deserts, preferring well-draining or gently sloping areas with low vegetation and a high percentage of bare ground, and in some parts of range, where active and inactive prairie dog colonies exist	Known	Habitat is present in the proposed action area. Known observations in the proposed action area.	Analysis required. Proposed activities may impact species, their habitat, or both.	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
Bird	Northern goshawk (*Accipiter gentilis*)	Mature montane coniferous forests	Known	No potential habitat is present in the proposed action area. No known observations in the proposed action area.	No analysis needed based on: Criterion #2 - Potential habitat for the species does not exist within the proposed action area.	No impact

Class	Common Name (*Latin Name*)	Habitat Features	Status on Regional Forester's Sensitive Species List	Known or Potential Occupancy or Habitat Present in the Analysis Area?	Rationale for Effects Analysis	Determination
Bird	Northern harrier (*Circus hudsonius*)	Open wetlands, including marshy meadows; wet, lightly grazed pastures; old fields; freshwater and brackish marshes, and tundra; also dry uplands, including upland prairies, mesic grasslands, drained marshlands, croplands, cold desert shrub-steppe, and riparian woodland	Known	Potential habitat is present in proposed action area. Known observations in the proposed action area.	Analysis required. Proposed activities may impact species, their habitat, or both.	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
Bird	Olive-sided flycatcher (*Contopus cooperi*)	Montane and northern coniferous forests	Known	No potential habitat is present in the proposed action area a. No known observations in the proposed action area.	No analysis needed based on: Criterion #2 - Potential habitat for the species does not exist within the proposed action area.	No impact
Bird	Sagebrush sparrow (*Artemisiospiza nevadensis*)	Sagebrush-obligate species that breeds preferentially in arid shrub lands dominated by big sagebrush	Known	Habitat is present in proposed action area. Known observations in the proposed action area.	Analysis required. Proposed activities may impact species, their habitat, or both.	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

Class	Common Name (*Latin Name*)	Habitat Features	Status on Regional Forester's Sensitive Species List	Known or Potential Occupancy or Habitat Present in the Analysis Area?	Rationale for Effects Analysis	Determination
Fish	Finescale dace (*Phoxinus neogaeus*)	Slow or stagnant water with abundant vegetation or other cover	Suspected	No potential habitat is present in the proposed action area. No known observations in the proposed action area.	No analysis needed based on: Criterion #2 - Potential habitat for the species does not exist within the proposed action area.	No impact
Fish	Flathead chub (*Platygobio gracilis)*	Main channels of sandy, turbid streams with small substrates, deep water, and woody debris	Known	No potential habitat is present in the proposed action area. No known observations in the proposed action area.	No analysis needed based on: Criterion #2 - Potential habitat for the species does not exist within the proposed action area.	No impact
Fish	Mountain sucker (*Catostomus platyrhynchus*)	Clear, cold creeks and small to medium rivers with clear rubble, gravel or sand substrate; rarely found in lakes	Known	No potential habitat is present in the proposed action area. No known observations in the proposed action area.	No analysis needed based on: Criterion #2 - Potential habitat for the species does not exist within the proposed action area.	No impact
Fish	Plains minnow (*Hybognathus placitus*)	Large, turbid, prairie streams and rivers, slow water and side pool habitat	Known	No potential habitat is present in the proposed action area. No known observations in the proposed action area.	No analysis needed based on: Criterion #2 - Potential habitat for the species does not exist within the proposed action area.	No impact
Fish	Plains topminnow (*Fundulus sciadicus*)	Shallow, slow water in clear streams with heavy vegetation	Suspected	No potential habitat is present in the proposed action area. No known observations in the proposed action area.	No analysis needed based on: Criterion #2 - Potential habitat for the species does not exist within the proposed action area.	No impact

Class	Common Name (*Latin Name*)	Habitat Features	Status on Regional Forester's Sensitive Species List	Known or Potential Occupancy or Habitat Present in the Analysis Area?	Rationale for Effects Analysis	Determination
Fish	Sturgeon chub (*Macrhybopsis gelida*)	Mainstem dwellers and are rarely found in tributary streams, associated with hard substrates and relatively shallow, high current velocity habitats	Known	No potential habitat is present in the proposed action area. No known observations in the proposed action area.	No analysis needed based on: Criterion #2 - Potential habitat for the species does not exist within the proposed action area.	No impact
Insect	Monarch butterfly (*Danaus plexippus*)	Open habitats including fields, meadows, weedy areas, marshes, and roadsides	Suspected	Potential habitat is present in the proposed action area. No known observations in the proposed action area.	No analysis needed based on: Criterion #3 - The type or intensity of the activity in the proposed action is expected to have no impact or effect on these species or their habitat or proposed activities do not take place in potential or occupied habitat.	No impact
Insect	Ottoe skipper (*Hesperia ottoe*)	Native tall-grass prairie	Suspected	Potential habitat is present in the proposed action area. No known observations in the proposed action area.	No analysis needed based on: Criterion #3 - The type or intensity of the activity in the proposed action is expected to have no impact or effect on these species or their habitat or proposed activities do not take place in potential or occupied habitat.	No impact

Class	Common Name (*Latin Name*)	Habitat Features	Status on Regional Forester's Sensitive Species List	Known or Potential Occupancy or Habitat Present in the Analysis Area?	Rationale for Effects Analysis	Determination
Insect	Regal fritillary (*Speyeria idalia*)	Tall-grass prairie and other open sites including damp meadows, marshes, wet fields, and mountain pastures	Suspected	Potential habitat is present in the proposed action area. No known observations in the proposed action area.	No analysis needed based on: Criterion #3 - The type or intensity of the activity in the proposed action is expected to have no impact or effect on these species or their habitat or proposed activities do not take place in potential or occupied habitat.	No impact
Insect	Western bumblebee (*Bombus occidentalis*)	Bumble bees inhabit a wide variety of natural, agricultural, urban, and rural habitats, although species richness tends to peak in flower-rich meadows of forests and subalpine zones	Known	Potential habitat is present in the proposed action area. No known observations in the proposed action area.	No analysis needed based on: Criterion #3 - The type or intensity of the activity in the proposed action is expected to have no impact or effect on these species or their habitat or proposed activities do not take place in potential or occupied habitat.	No impact
Mammal	Black-tailed prairie dog (*Cynomys ludovicianus*)	Short-statured grassland and bare ground; flat areas with short vegetation and few visual barriers	Known	Habitat is present in the proposed action area. Known observations in the proposed action area.	Analysis required. Proposed activities may impact species, their habitat, or both.	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

Class	Common Name (*Latin Name*)	Habitat Features	Status on Regional Forester's Sensitive Species List	Known or Potential Occupancy or Habitat Present in the Analysis Area?	Rationale for Effects Analysis	Determination
Mammal	Fringed myotis (*Myotis thysanodes*)	Forested habitats, both deciduous and coniferous; trees, snags, caves, rocks, cliffs; grasslands, deserts, and shrub lands	Known	Potential habitat is present in the proposed action area. No known observations in the proposed action area.	No analysis needed based on: Criterion #3 - The type or intensity of the activity in the proposed action is expected to have no impact or effect on these species or their habitat or proposed activities do not take place in potential or occupied habitat.	No impact
Mammal	Hoary bat (*Lasiurus cinereus*)	Forested habitats, both deciduous and coniferous; trees, snags, caves, rocks, cliffs; grasslands, deserts, and shrub lands	Known	Potential habitat is present in the proposed action area. No known observations in the proposed action area.	No analysis needed based on: Criterion #3 - The type or intensity of the activity in the proposed action is expected to have no impact or effect on these species or their habitat or proposed activities do not take place in potential or occupied habitat.	No impact
Mammal	Rocky Mountain bighorn sheep (*Ovis canadensis*)	High visibility habitats near rocky escape terrain that allow efficient foraging, enhanced detection of predators, and opportunities to evade them	Known	No potential habitat is present in the proposed action area. No known observations in the proposed action area.	No analysis needed based on: Criterion #2 - Potential habitat for the species does not exist within the proposed action area.	No impact

Class	Common Name (*Latin Name*)	Habitat Features	Status on Regional Forester's Sensitive Species List	Known or Potential Occupancy or Habitat Present in the Analysis Area?	Rationale for Effects Analysis	Determination
Mammal	Swift fox (*Vulpes velox*)	Short-grass and mid-grass prairies with flat or gently sloping topography; utilizes previously excavated burrows by other mammals for denning habitat	Known	Habitat is present in the proposed action area. Known observations in the proposed action area.	Analysis required. Proposed activities may impact species, their habitat, or both.	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
Mammal	Townsend's big-eared bat (*Corynorhinus townsendii*)	Forested habitats and abandoned buildings; trees, snags, buildings, caves, rocks, cliffs and bridges; xeric to mesic upland habitats ranging from shrub lands to woodlands to montane forests	Known	Potential habitat is present in the proposed action area. No known observations in the proposed action area.	No analysis needed based on: Criterion #3 - The type or intensity of the activity in the proposed action is expected to have no impact or effect on these species or their habitat or proposed activities do not take place in potential or occupied habitat.	No impact

Summary of Rationale for Sensitive Species Effects Determinations

All of the sensitive species listed below have a determination of "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." A summary of the rationale for the determination is provided below. Detailed analysis of effects are documented in the biological evaluation.

Brewer's Sparrow (Spizella breweri)

- Breeds and nests in undisturbed sagebrush. Extreme growth of prairie dog colonies could cause a small reduction in total available habitat (all observed historical prairie dog occupancy is approximately 8 percent of greater sage-grouse core on the Thunder Basin National Grassland; targets are far lower than this proportion and not all core is suitable habitat).
- Brewer's sparrow do not forage in prairie dog colonies. Very minimal chance that individuals occupying prairie dog colonies could consume rodenticides and experience nontarget poisoning.
- Brewer's sparrow do not occupy prairie dog colonies. Recreational shooting poses little risk.

Burrowing Owl (Athene cunicularia)

- Burrowing owls depend on prairie dog burrows (active or within the last few years), specifically on the Thunder Basin National Grassland for nesting and foraging habitat. Burrowing owls also depend on prairie dogs for predator detection, since the species will sound an alert call when a predator is near. As a result, managing for active prairie dog colonies is needed to ensure habitat is available for burrowing owls.
- Burrowing owl nesting density can vary greatly across the species range. The species can also be semi-colonial or nest in clusters throughout its range. On black-tailed prairie dog colonies in mixed-grass prairie, burrowing owl density has been observed to range up to an extreme of 12.1 owls per acre on small prairie dog colonies, with average densities on the order of 0.1 to 2.3 owls per acre on all colonies (Desmond and Savidge 1996). All alternatives are expected to provide for sufficient distribution of the species.
- Boundary management is expected to have minimal effects on the overall habitat available for burrowing owls. All alternatives are expected to provide for sufficient distribution of the species.
- All alternatives would manage for colony sizes greater than 80 acres and are expected to provide for sufficient distribution of the species. Desmond and Savidge (1996) found that burrowing owls typically nest at higher densities on smaller prairie dog colonies but nest in clusters within colonies larger than approximately 86 acres, though still at somewhat lower densities than in the smaller colonies.
- Plan components require the evaluation of rodenticide use and to consider effects on known or suspected associated species to reduce potential negative effects.
- No substantive effect (secondary poisoning) from zinc phosphide. Effects from use of anticoagulants would occur, but only in limited circumstances and limited area in boundary management zones. It is expected effects would be minimal, and the number of individuals impacted would be low.
- Recreational shooting poses a risk and alternative 3 would have a higher potential for loss of individuals because shooting is not restricted in proposed management area 3.67. In the remaining alternatives, shooting restrictions (especially during the breeding season) are expected to substantively decrease direct mortality.

Chestnut-Collared Longspur (Calcarius ornatus)

- This species does not depend on size, distribution, or extent of colonies for nesting or breeding habitat, but may nest in prairie dog colonies. This species uses disturbed mixed-grass prairie for breeding in general. Overall, somewhat uncommon on Thunder Basin National Grassland and distributed across plan area but with few observations in management area 3.63 or proposed management area 3.67.
- Population has not been observed to track fluctuations in prairie dog total colony extent on the Thunder Basin National Grassland (during plague epizootics).
- Those individuals that may occupy prairie dog colonies could consume rodenticide bait and experience nontargeted poisoning, but seasonal restrictions may help. There is a small potential for overlap of rodenticide use and when this species occupies the grassland. Very late departures of individuals may result in occupancy of colonies during lethal control activities.
- Recreational shooting poses little to no risk. The species is very small and likely to flush easily with presence of humans and associated disturbance.

Ferruginous Hawk (Buteo regalis)

- Acreage targets provide a substantial prey base next to known nest locations or territories.
- Ferruginous hawk do not exclusively depend on prairie dogs as prey base. The species is considered a generalist that feeds on rodents and jackrabbits and will scavenge opportunistically.
- The project does not affect or remove potential nest areas.
- No substantive effect (secondary poisoning) from zinc phosphide are expected in alternatives 1, 2, and 4. Alternative 3 does use anticoagulants after 3 consecutive years of zinc phosphide poisoning (in a specific area), if it proves ineffective.
- Mortality to ferruginous hawks from anticoagulant use in alternative 3 would result in the potential for secondary poisoning; however effects are considered localized and to a few individuals only.
- Recreational shooting would have a lower impact on ferruginous hawks in alternatives 1, 2, and 4 because the shooting restriction is applied during most of the season when they are present. Effects to individuals may still occur in late August and September when shooting is permitted. In alternative 3, there is higher potential for loss of individuals because shooting is not restricted in management area 3.67 at any time. In addition, ferruginous hawks may ingest lead shot from prairie dog carcasses leading to secondary poisoning.

Grasshopper Sparrow (Ammodramus savannarum)

- This species uses large tracts of undisturbed mixed-grass prairie. Growth of prairie dog colonies could cause a reduction in total available habitat. Locally, population has been observed to track large fluctuations in the area of prairie dog colonies (surveys specific to management area 3.63). However, acreage targets in alternatives will limit this potential.
- Grasshopper sparrow are typically do not forage in prairie dog habitat. However, there is a possibility of nontargeted poisoning from rodenticide use.
- Recreational shooting poses little to no risk. The species is very small and likely to flush easily with presence of humans and associated disturbance.

Greater Sage-Grouse (Centrocercus urophasianus)

- One third of management area 3.67 is designated as greater sage-grouse priority habitat management area in the grassland plan. There are four active leks currently in management area 3.63; however, plan direction does not conflict with the greater sage-grouse amendment because it includes the following:

  > "Priority, connectivity, and general habitat management areas may contain non-habitat. Management direction would not apply to those areas of non-habitat if the proposed activity in non-habitat does not preclude effective sage-grouse use of adjacent habitats."

- Change in the size, distribution, and total extent of prairie dog colonies has not been shown to have a measurable effect on greater sage-grouse populations on the Thunder Basin National Grassland. The total observed extent of prairie dog colonies on the Thunder Basin National Grassland from all years totals less than eight percent of the area of greater sage-grouse priority habitat management area, and the extent of prairie dog colonies is typically much less than six percent of the greater sage-grouse priority habitat management area in any one year. Acreage targets in alternatives are far less than these extreme levels. Acreage targets in the action alternatives could result in expansion of sagebrush habitat over the long-term, relative to the no action.
- An additional potential effect of changes in prairie dog management could be increased predation on greater sage-grouse by large mammalian and avian predators that typically use the resident prairie dog population as their primary prey base. The impacts of serving as an alternative prey base, however, are likely minimal due to the historical long-term presence of these predators in the plan area and the availability of other small mammals as alternative prey bases.
- Some small colonies may serve as leks, but loss of prairie dog colonies would minimally affect lek availability because they represent a very small proportion of the total number of leks. In 2018, no leks were in active prairie dog colonies. [Based on Wyoming Game and Fish Department data, leks in management area 3.63 do not overlap 2016/2017 colony extent.]
- Shooting poses little risk because greater sage-grouse do not often occupy prairie dog colonies. Seasonal restrictions apply during lekking in alternatives 1, 2, and 4, which may indirectly benefit the species.
- Rodenticides pose little risk because greater sage-grouse do not often occupy prairie dog colonies. Seasonal restrictions to rodenticide application apply during lekking, which may indirectly benefit the species.

Long-Billed Curlew (Numenius americanus)

- This species is a very uncommon breeder on the Thunder Basin National Grassland. May nest in prairie dog colonies but uses mixed-grass prairie subject to prairie dog herbivory or fire for breeding in general.
- Population has not been observed to track fluctuations in prairie dog total colony extent on the Thunder Basin National Grassland (during epizootics).
- Insectivorous and very unlikely to consume grain-bait rodenticides. Seasonal restrictions on rodenticide use should decrease the opportunity to consume grain baits.

- Deltamethrin used for plague control could result in some impacts to prey base, but effects would be very localized and short term because adjacent insect populations could repopulate dusted colonies.
- Recreational shooting poses some risk to those individuals that occupy prairie dog colonies.

McCown's Longspur (Rhynchophanes mccownii)

- May depend on size, distribution, extent of colonies for nesting, breeding habitat. May also breed in naturally shorter vegetation to the southern extent of the Thunder Basin National Grassland. Overall, somewhat uncommon on Thunder Basin National Grassland and distributed across plan area but with few observations in management area 3.63. Outside boundary management zones, presence will be considered before use of lethal control. Acreage targets will provide breeding habitat conditions theoretically sufficient to support population, despite distribution concentrating in management area 3.63 or proposed management area 3.67.
- Low numbers historically and sparsely distributed across Thunder Basin National Grassland, but population has persisted despite concentration of prairie dogs in management area 3.63 and despite plague epizootics. Population has not been observed to track fluctuations in prairie dog total colony extent on the Thunder Basin National Grassland (during epizootics).
- Could consume rodenticides and experience nontarget poisoning, but seasonal restrictions may help. Small potential for overlap. Very late departures may occupy colonies during lethal control activities.
- Recreational shooting poses little to no risk. Very small and likely to flush with presence of humans or gunshots.

Mountain Plover (Charadrius montanus)

- The alternatives would amend the management plan in a way that retains a persistent amount and distribution of prairie dog colonies such that they will continue to provide for the needs of mountain plover.
- The alternatives would manage and maintain active prairie dog colonies at a level which is politically and biologically sustainable, and less likely to trend towards a boom-and-bust cycle unfavorable to prairie-dog-dependent species including mountain plover.
- Plover have persisted through two previous plague outbreaks and concurrent lethal control measures.
- The proposed action provides sufficient distribution on the grassland and within the range of the species. At 10,000 acres of colonies, the expected bird density would maintain approximately 80 to 250 birds, and at 7,500 acres of colonies, the expected bird density would maintain approximately 60 to 190 birds.
- Adjacent private lands are expected to provide support and resiliency to plover populations that occur on NFS land, especially considering the pattern of mixed ownership across Thunder Basin National Grassland.
- Habitat (mostly within the management area 3.63) is located among consolidated NFS grasslands, and outside boundary management zones. Thus, Forest Service personnel have taken reasonable measures to ensure proposed management actions would retain adequate habitat, can be implemented, and can be achieved with limited conflicts with other resource and management objectives.

Northern Harrier (Circus hudsonius)

- Uses dense vegetated areas, open, wet marshy areas (probably mostly sagebrush, woody draws, riparian areas on the Thunder Basin National Grassland); no association with prairie dog colonies for nesting and foraging behavior is uncommon.
- No substantive effects (secondary poisoning) from zinc phosphide are expected in alternatives 1, 2, and 4. Alternative 3 does use anticoagulants after 3 consecutive years of zinc phosphide poisoning (in a specific area), if it proves ineffective.
- Mortality to individuals from anticoagulants could occur from secondary poisoning; however, those effects would only occur in small areas and to a few individuals. Anticoagulant use would be uncommon, occur only after three years of zinc phosphide use in an area, and is not likely to occur across the national grassland at any given time. Therefore, it is expected mortality could occur to a few individuals in alternative 3 during any given application but would but would not apply to the larger population across the grasslands.
- There is potential for shooting other animals in the vicinity of prairie dog colonies, and individual northern harriers could occasionally be shot. Effects would be localized and very infrequent. No pertinent difference among alternatives.
- Use of lead ammunition for recreational shooting in prairie dog colonies could cause lead poisoning to individuals, but effects would be localized. No pertinent difference among alternatives.

Sagebrush Sparrow (Artemisiospiza nevadensis)

- Breeds and nests in undisturbed sagebrush. Extreme growth of prairie dog colonies could cause a small reduction in total available habitat (all observed historical prairie dog occupancy is approximately 8 percent of greater sage-grouse core on the Thunder Basin National Grassland; targets are far lower than this proportion and not all core is suitable habitat).
- Sagebrush sparrow do not forage in prairie dog colonies. Very minimal chance individuals occupying prairie dog colonies could consume rodenticides and experience nontarget poisoning.
- Sagebrush sparrow do not occupy prairie dog colonies. Recreational shooting poses little risk.

Black-Tailed Prairie Dog (Cynomys ludovicianus)

- Based on historical evidence, the prairie dog colony acreage targets would represent a viable long-term population. Since 2001, total prairie dog colonies have varied between 1,000 acres to over 50,000 acres and continue to persist in and around management area 3.63.
- Use of plague management tools, such as application of deltamethrin, would occur and is encouraged to arrive at and maintain target acreages.
- A stable target acreage of prairie dog colonies fosters social support to keep prairie dogs abundant on the landscape and minimizes conflict between competing uses. Recommendations from the stakeholder collaborative are considered and would be considered moving forward.
- Vegetation management tools and translocation are available tools encouraged for use to expand prairie dog colonies when necessary to move toward targets.

- Habitat (mostly within management area 3.63) is located among consolidated NFS grasslands, and outside boundary management zones. Thus, Forest Service personnel have taken reasonable measures to ensure proposed management actions would retain adequate habitat, can be implemented, and can be achieved with limited conflicts with other resource and management objectives
- Prairie dog habitat would be managed to encourage movement between adjacent colonies, thus enhancing genetic exchange and colony resiliency.
- The U.S. Fish and Wildlife Service decision not to list prairie dogs was largely based on the ability of prairie dogs to reproduce prolifically and rebound rapidly after plague events.
- Adjacent private and State lands are expected to continue to have numerous prairie dog colonies. These colonies provide support and resiliency to those occurring on NFS land, especially considering the pattern of mixed ownership across the Thunder Basin National Grassland.

Swift Fox (Vulpes velox)

- Swift fox often den in and around prairie dog colonies on the Thunder Basin National Grassland but will den elsewhere and prey on a diversity of small vertebrates. Swift fox prefer short-stature vegetation around dens but don't rely exclusively on prairie dogs for habitat. They can dig their own dens.
- Acreage targets in action alternatives will reduce overall prey availability relative to the no-action alternative, but swift fox do not rely solely on prairie dogs as prey. While population numbers have been observed to follow fluctuations in prairie dog colony extent, acreage targets would provide a sufficient prey base for the swift fox population. The swift fox population has rebounded and persisted through two previous landscape-wide epizootics.
- Plague control methods can be used at any time in any colony. Deltamethrin has regularly been used in the past, and plague control may benefit swift fox by reducing the probability of landscape-wide prairie dog population collapse.
- No substantive effects (secondary poisoning) from zinc phosphide are expected in alternatives 1, 2, and 4. Alternative 3 does use anticoagulants after 3 consecutive years of zinc phosphide poisoning (in a specific area), if zinc phosphide proves ineffective. Mortality to swift fox may occur from secondary poisoning; however, those effects would only occur in small areas and to a few individuals.
- Recreational shooting would have less of an effect on swift fox in alternatives 1, 2, and 4 because there is a seasonal shooting restriction. Effects to individuals may still occur outside the seasonal restriction. In the grassland-wide alternative, there is higher potential for loss of individuals because shooting is not restricted in propose management area 3.67 at any time. In addition, swift fox may ingest lead shot from prairie dog carcasses, leading to secondary poisoning.

Effects Analysis–Potential Species of Conservation Concern

Potential species of conservation concern are species that are native to and known to occur in the plan area and that fit one of more of the categories listed in the Forest Service Handbook for Land Management Planning (Forest Service Handbook 1909.12 Chapter 10, Section 10, 12.52d), such as having a conservation status of concern. Databases of observation records and relevant conservation status lists were consulted to determine whether to consider species as potential species of conservation concern.

This initial filter yielded 82 animal species to be considered. We then eliminated more than half from further evaluation because they had no habitat or prey-based relationship with prairie dog colonies or short-stature vegetation ecosystems. For the remaining 31 animal species, we researched and compiled species evaluations to determine if they may be subject to some degree of adverse impacts or lessened protections as a result of changes in the management of prairie dog colonies, or if we needed further information to make that conclusion. The 27 animal species found to have the potential for substantial adverse impacts or substantially lessened protections as a result of the plan amendment were brought forward for detailed analysis.

The focus of this analysis is to determine if adverse impacts or lessened protections for each species rise to the level of "substantial" (36 CFR 219.13(b)(6)). For this plan amendment, a substantial adverse impact is an impact that causes the viability of the species on the Thunder Basin National Grassland to be lost. Similarly, a substantially lessened protection would result if the plan amendment removes or lessens a protection necessary to maintain a viable population of that species on the Thunder Basin National Grassland. Isolated impacts or mortality among individuals of a species are not considered substantial unless viability across the plan area would be lost.

For those species carried forward for detailed analysis, the biological evaluation and potential species of conservation concern analysis contains detailed information about species life history, occurrence on the Thunder Basin National Grassland, environmental consequences of alternatives, and rationale for effects determinations.

Summary of Rationale for Potential Species of Conservation Concern

The potential species of conservation concern listed below have a determination of "No substantial adverse impacts or substantially lessened protections as a result of the plan amendment." A summary of those species' habitat features and rationale for the effects determination is provided below. Detailed analysis of effects are documented in the biological evaluation. The following species of conservation concern are also sensitive species and are discussed in that section:

- Brewer's sparrow (*Spizella breweri*)
- Burrowing owl (*Athene cunicularia*)
- Chestnut-collared longspur (*Calcarius ornatus*)
- Ferruginous hawk (*Buteo regalis*)
- Grasshopper sparrow (*Ammodramus savannarum*)
- Greater sage-grouse (*Centrocercus urophasianus*)
- Long-billed curlew (*Numenius americanus*)
- McCown's longspur (*Rhynchophanes mccownii*)
- Mountain plover *(Charadrius montanus)*
- Northern harrier *(Circus hudsonius)*
- Sagebrush sparrow *(Artemisiospiza nevadensis)*
- Black-tailed prairie dog *(Cynomys ludovicianus)*
- Swift fox *(Vulpes velox)*

Bald Eagle (Haliaeetus leucocephalus)

Habitat Features

- Nests in forested areas adjacent to rivers and large bodies of water, although a small number are found nesting along smaller drainages and lakes; opportunistic forager and will take waterfowl and other birds, small and mid-sized mammals, and carrion.

Summary of Rationale for Effects Determination

The rationale is based on the availability of foraging and nesting habitat in and adjacent to the analysis area, along with sufficient distribution of habitat within the species' range and the following:

- Nests in tall trees near water and a very uncommon breeder on Thunder Basin National Grassland. Several winter roosts on the Thunder Basin. Roosts and nests would not be affected by prairie dog colony expansion or contraction. Not dependent on prairie dog colonies for habitat or prey.
- No substantive effect (secondary poisoning) from zinc phosphide are expected in alternatives 1, 2, 4. Alternative 3 does use anticoagulants after 3 consecutive years of zinc phosphide poisoning (in a specific area), if it proves ineffective.
- Mortality to individuals from anticoagulants could occur from secondary poisoning; however, those effects would only occur in small areas and to a few individuals. Anticoagulant use would be uncommon, occur only after three years of zinc phosphide use in an area, and is not likely to occur across the national grassland at any given time. Therefore, it is expected mortality could occur to a few individuals in alternative 3 during any given application but would not apply to the larger population across the Thunder Basin.
- There is potential for shooting other animals in the vicinity of prairie dog colonies, and individual bald eagles could occasionally be shot. Effects would be localized and very infrequent. No pertinent difference between these alternatives.
- Use of lead ammunition for recreational shooting in prairie dog colonies could cause lead poisoning to individuals, but effects would be localized. No pertinent difference between these alternatives.

California Gull (Larus californicus)

Habitat Features

- Shorebird generalist. Will inhabit a variety of conditions near water.

Summary of Rationale for Effects Determination

The rationale is based on the availability of foraging and nesting habitat in and adjacent to the analysis area, along with sufficient distribution of habitat within the species' range and the following:

- Very infrequent inhabitant of the Thunder Basin National Grassland and not associated with prairie dog habitat. Likely breeds on reservoirs in the vicinity. May forage during breeding season or migrate through the national grassland.
- Could occasionally scavenge on prairie dog colonies and is a very opportunistic forager. No substantive effect (secondary poisoning) from zinc phosphide are expected in alternatives 1, 2, and 4.

- Mortality from anticoagulants in alternative 3 occur from secondary poisoning; however, those effects would only occur in small areas and to a few individuals. Anticoagulant use would be uncommon, occur only after three years of zinc phosphide use in an area and is not likely to occur across the national grassland at any given time. Therefore, it is expected mortality could occur to a few individuals in alternative 3 during any given application but would not apply to the larger population across the grasslands.
- There is potential for shooting other animals in the vicinity of prairie dog colonies, and individual California gulls could occasionally be shot. Effects would be localized and very infrequent. No pertinent difference between these alternatives.
- Use of lead ammunition for recreational shooting in prairie dog colonies could cause lead poisoning to individuals, but effects would be localized. No pertinent difference between these alternatives.

Dickcissel (Spiza americana)

Habitat Features

- Grassland obligate species that breeds primarily in open prairie grasslands

Summary of Rationale for Effects Determination

The rationale is based on the availability of foraging and nesting habitat in and adjacent to the analysis area, along with sufficient distribution of habitat within the species' range and the following:

- Uses medium to tall grasses and other dense vegetation for breeding and nesting. The Thunder Basin National Grassland is at breeding range edge. Growth of prairie dog colonies could cause a reduction in total available habitat; however, species is somewhat adaptable to disturbances and local changes in vegetation structure/tall and mixed-grass availability. Acreage targets in alternatives may limit potential for loss of habitat due to prairie dog colony growth.
- It is very unlikely for Dickcissel to forage in prairie dog colonies. Very minimal chance that individuals occupying prairie dog colonies could consume rodenticides and experience nontarget poisoning.
- Dickcissel are very unlikely to occupy prairie dog colonies. Recreational shooting poses little risk.

Golden Eagle (Aquila chrysaetos)

Habitat Features

- Nest in trees, and nests are especially concentrated in cottonwood galleries along riparian corridors; opportunistic forager for fish, other birds and mammals, including prairie dogs.

Summary of Rationale for Effects Determination

The rationale is based on the availability of foraging and nesting habitat in and adjacent to the analysis area, along with sufficient distribution of habitat within the species' range and the following:

- Golden eagle can rely on prairie dogs considerable as a prey source. As a result, any reductions in prairie dog numbers could impact golden eagles and associated forage base.
- No substantive effect (secondary poisoning) from zinc phosphide are expected in alternatives 1, 2, and 4. Alternative 3 does use anticoagulants after 3 consecutive years of zinc phosphide poisoning (in a specific area), if it proves ineffective.

- Mortality from anticoagulants in alternative 3 occur from secondary poisoning; however, those effects would only occur in small areas and to a few individuals. Anticoagulant use would be uncommon, occur only after three years of zinc phosphide use in an area, and is not likely to occur across the national grassland at any given time. Therefore, it is expected mortality could occur to a few individuals in alternative 3 during any given application but would not apply to the larger population across the grasslands.
- There is potential for shooting other animals in the vicinity of prairie dog colonies and individual golden eagles could occasionally be shot. Effects would be localized and very infrequent. No pertinent difference between these alternatives.
- Use of lead ammunition for recreational shooting in prairie dog colonies could cause lead poisoning to individuals, but effects would be localized. No pertinent difference between these alternatives.

Merlin (Falco columbarius)

Habitat Features

- Typically associated with woody draws, rocky outcrops, and cliff habitat.

Summary of Rationale for Effects Determination

The rationale is based on the availability of foraging and nesting habitat in and adjacent to the analysis area, along with sufficient distribution of habitat within the species' range and the following:

- Likely nests in woody draws, riparian areas, cliffs, and rocky outcrops and is not associated with prairie dog colonies for habitat.
- Usually an aerial hunter and very infrequent scavenger. No substantive effect (secondary poisoning) from zinc phosphide are expected in alternatives 1, 2, and 4. Alternative 3 does use anticoagulants after 3 consecutive years of zinc phosphide poisoning (in a specific area), if it proves ineffective. Mortality to merlin from anticoagulants could very infrequently occur from secondary poisoning to the rare individual that scavenges a dead or dying prairie dog; however, those effects would only occur in small areas and to a few individuals. Anticoagulant use would be uncommon, occur only after three years of zinc phosphide use in an area, and is not likely to occur across the national grassland at any given time. Therefore, it is expected mortality could occur to a few individuals in alternative 3 during any given application but would not apply to the larger population across the grasslands.
- There is potential for shooting other animals in the vicinity of prairie dog colonies, and merlin could occasionally be shot. Effects would be localized and very infrequent. No pertinent difference between these alternatives.
- Use of lead ammunition for recreational shooting in prairie dog colonies could cause lead poisoning to individuals, but effects would be localized and extremely infrequent because merlin don't often scavenge. No pertinent difference between these alternatives.

Peregrine Falcon (Falco peregrinus)

Habitat Features

- Typically associated with wetlands, marshes, or thicker vegetation in open habitats.

Summary of Rationale for Effects Determination

The rationale is based on the availability of foraging and nesting habitat in and adjacent to the analysis area, along with sufficient distribution of habitat within the species' range and the following:

- Likely nests in woody draws, cliffs, rocky outcrops and not associated with prairie dog colonies for habitat.
- An aerial hunter and very infrequent scavenger. No substantive effect (secondary poisoning) from zinc phosphide are expected in alternatives 1, 2, and 4. Alternative 3 does use anticoagulants after 3 consecutive years of zinc phosphide poisoning (in a specific area), if it proves ineffective. Mortality to peregrine falcon from anticoagulants could very infrequently occur from secondary poisoning to the rare individual that scavenges a dead or dying prairie dog; however, those effects would only occur in small areas and to a few individuals. Anticoagulant use would be uncommon, occur only after three years of zinc phosphide use in an area, and is not likely to occur across the national grassland at any given time. Therefore, it is expected mortality could occur to a few individuals in alternative 3 during any given application but would not apply to the larger population across the grasslands.
- There is potential for shooting other animals in the vicinity of prairie dog colonies, and individual falcons could occasionally be shot. Effects would be localized and very infrequent. No pertinent difference between these alternatives.
- Use of lead ammunition for recreational shooting in prairie dog colonies could cause lead poisoning to individuals, but effects would be localized and extremely infrequent because peregrine falcon do not often scavenge. No pertinent difference between these alternatives.

Ring-Billed Gull (Larus delawarensis)

Habitat Features

- Shorebird generalist. Will inhabit a variety of conditions near water.

Summary of Rationale for Effects Determination

The rationale is based on the availability of foraging and nesting habitat in and adjacent to the analysis area, along with sufficient distribution of habitat within the species' range and the following:

- Very infrequent inhabitant of the Thunder Basin National Grassland and not associated with prairie dog habitat. Likely breeds on reservoirs in the vicinity. May forage during breeding season or migrate through Thunder Basin National Grassland.
- Could occasionally scavenge on prairie dog colonies and is a very opportunistic forager. No substantive effect (secondary poisoning) from zinc phosphide are expected in alternatives 1, 2, and 4.

- Mortality from anticoagulants in alternative 3 occur from secondary poisoning; however, those effects would only occur in small areas and to a few individuals. Anticoagulant use would be uncommon, occur only after three years of zinc phosphide use in an area, and is not likely to occur across the national grassland at any given time. Therefore, it is expected mortality could occur to a few individuals in alternative 3 during any given application, but would not apply to the larger population across the grasslands.
- There is potential for shooting other animals in the vicinity of prairie dog colonies and individual gulls could occasionally be shot. Effects would be localized and very infrequent. No pertinent difference between these alternatives.
- Use of lead ammunition for recreational shooting in prairie dog colonies could cause lead poisoning to individuals, but effects would be localized. No pertinent difference between these alternatives.

Sage Thrasher (Oreoscoptes montanus)

Habitat Features

- Sagebrush-obligate species that breeds preferentially in arid shrub lands dominated by big sagebrush.

Summary of Rationale for Effects Determination

The rationale is based on the availability of foraging and nesting habitat in and adjacent to the analysis area, along with sufficient distribution of habitat within the species' range and the following:

- Breeds and nests undisturbed sagebrush. Extreme growth of prairie dog colonies could cause a small reduction in total available habitat (all observed historical prairie dog occupancy is approximately 8 percent of greater sage-grouse core on the Thunder Basin National Grassland; targets are far lower than this proportion and not all core is suitable habitat).
- Sage thrasher do not forage in prairie dog colonies. Very minimal chance that individuals occupying prairie dog colonies could consume rodenticides and experience nontarget poisoning.
- Sage thrasher do not occupy prairie dog colonies. Recreational shooting poses little risk.

Short-Eared Owl (Asio flammeus)

Habitat Features

Open habitat including: intermountain, prairie, and coastal grasslands, sagebrush steppe, marshes, arctic tundra, and shrub-steppe plateaus.

Summary of Rationale for Effects Determination

The rationale is based on the availability of foraging and nesting habitat in and adjacent to the analysis area, along with sufficient distribution of habitat within the species' range and the following:

- Short-eared owl do not rely on prairie dogs as a prey source. As a result, any reductions in prairie dog numbers is not expected to impact forage base.
- No substantive effect (secondary poisoning) from zinc phosphide are expected in alternatives 1, 2, and 4. Alternative 3 does use anticoagulants after 3 consecutive years of zinc phosphide poisoning (in a specific area), if it proves ineffective.

- Mortality from anticoagulants in alternative 3 occur from secondary poisoning; however, those effects would only occur in small areas and to a few individuals. Anticoagulant use would be uncommon, occur only after three years of zinc phosphide use in an area, and is not likely to occur across the national grassland at any given time. Therefore, it is expected mortality could occur to a few individuals in alternative 3 during any given application but would not apply to the larger population across the grasslands.
- There is potential for shooting other animals in the vicinity of prairie dog colonies and individual owls could occasionally be shot. Effects would be localized and very infrequent. No pertinent difference between these alternatives.
- Use of lead ammunition for recreational shooting in prairie dog colonies could cause lead poisoning to individuals, but effects would be localized. No pertinent difference between these alternatives.

Swainson's Hawk (Buteo swainsoni)

Habitat Features

Open grasslands, shrub-steppe, and prairies, as well as agricultural areas where crop height does not greatly exceed that of native grasses.

Summary of Rationale for Effects Determination

The rationale is based on the availability of foraging and nesting habitat in and adjacent to the analysis area, along with sufficient distribution of habitat within the species' range and the following:

- Swainson's hawk do not rely on prairie dogs as a prey source. As a result, any reductions in prairie dog numbers is not expected to impact forage base.
- No substantive effect (secondary poisoning) from zinc phosphide are expected in alternatives 1, 2, and 4. Alternative 3 does use anticoagulants after 3 consecutive years of zinc phosphide poisoning (in a specific area), if it proves ineffective.
- Mortality from anticoagulants in alternative 3 occur from secondary poisoning; however, those effects would only occur in small areas and to a few individuals. Anticoagulant use would be uncommon, occur only after three years of zinc phosphide use in an area, and is not likely to occur across the national grassland at any given time. Therefore, it is expected mortality could occur to a few individuals in alternative 3 during any given application but would not apply to the larger population across the grasslands.
- There is potential for shooting other animals in the vicinity of prairie dog colonies and individual hawks could occasionally be shot. Effects would be localized and very infrequent. No pertinent difference between these alternatives.
- Use of lead ammunition for recreational shooting in prairie dog colonies could cause lead poisoning to individuals, but effects would be localized. No pertinent difference between these alternatives.

Upland Sandpiper (Bartramia longicauda)

Habitat Features

Open grasslands, moderately tall, dense vegetation for nest concealment

Summary of Rationale for Effects Determination

The rationale is based on the availability of foraging and nesting habitat in and adjacent to the analysis area, along with sufficient distribution of habitat within the species' range and the following:

- Common breeder on the Thunder Basin National Grassland. May often forage in or near prairie dog colonies, but no local dependency has been observed. Population has not been observed to track fluctuations in prairie dog total colony extent on the Thunder Basin National Grassland (during epizootics).
- Insectivorous and very unlikely to consume grain-bait rodenticides. Seasonal restrictions on rodenticide use should cause only very small opportunity to consume grain baits.
- Deltamethrin used for plague control could result in some impacts to prey base, but effects would be very localized and short term because adjacent insect populations could repopulate dusted colonies.
- Recreational shooting poses some risk to individuals occupying prairie dog colonies.

Thirteen-Lined Ground Squirrel (Ictidomys tridecemlineatus)

Habitat Features

- Open areas with short grass and well-drained loamy or sandy soils for burrows

Summary of Rationale for Effects Determination

The rationale is based on the availability of foraging and denning habitat in and adjacent to the analysis area, along with sufficient distribution of habitat within the species' range and the following:

- Thirteen-lined ground squirrels are prairie and grassland generalists but will occupy prairie dog habitat. As a result, the species could be affected by some forms of lethal prairie dog control, including recreational shooting (shooting, fumigants, burrow collapsing, etc.). However, populations are large and widespread, and effects to population would be localized.
- Could incur risk of secondary poisoning from anticoagulants and fumigants or eat poisoned grain-bait rodenticides.
- Recreational shooting could cause some occasional morality to individuals. Though likely very infrequent, individuals could get lead poisoning by consuming shot prairie dogs. However, populations are large and widespread, and effects to population would be localized.

Plains Hog-Nosed Snake (Heterodon nasicus)

Habitat Features

- Grasslands with sandy or gravelly areas for burrowing; however, open brush land and woodland, farmlands, canyon bottoms, scrub brush, and floodplains

Summary of Rationale for Effects Determination

The rationale is based on the availability of habitat in and adjacent to the analysis area, along with sufficient distribution of habitat within the species' range and the following:

- Prefers grassland habitat with loose soils for burrowing, often with access to water where preferred amphibian prey are located. Not associated with prairie dog colonies for habitat.
- Could eat poisoned prairie dogs, incurring risk of secondary poisoning from anticoagulants. Effects of anticoagulants on reptiles are not well-known but could include interference with thermoregulation. Rodenticides pose minimal secondary poisoning risk. However, populations are large and widespread, and effects to population would be localized.
- Recreational shooting could cause some occasional morality to individuals. Though likely very infrequent, individuals could get lead poisoning by consuming shot prairie dogs. However, populations are large and widespread, and effects to population would be localized.

Prairie Rattlesnake (Crotalus viridis)

Habitat Features

- Plains, foothills, scarp woodlands, and granite or limestone outcrops; including prairie dog colonies

Summary of Rationale for Effects Determination

The rationale is based on the availability of habitat in and adjacent to the analysis area, along with sufficient distribution of habitat within the species' range and the following:

- Prairie rattlesnakes are prairie and grassland generalists but will occupy prairie dog habitat. As a result, the species could be affected by some forms of lethal prairie dog control, including recreational shooting (shooting, fumigants, burrow collapsing, etc.). However, populations are large and widespread, and effects to population would be localized.
- Could eat poisoned prairie dogs, incurring risk of secondary poisoning from anticoagulants. Effects of anticoagulants on reptiles are not well-known but could include interference with thermoregulation. Rodenticides pose minimal secondary poisoning risk. However, populations are large and widespread, and effects to population would be localized.
- Recreational shooting could cause some occasional morality to individuals. Though likely very infrequent, individuals could get lead poisoning by consuming shot prairie dogs. However, populations are large and widespread and effects to population would be localized.

Analysis of Effects of Rodenticides and Insecticides to Human Health

Use of rodenticides as a tool to manage and control prairie dog colonies and use of insecticides to manage sylvatic plague vectors are included in all alternatives considered in this analysis. Forest Service regulations (Forest Service Manual 2109.16.3) require an environmental analysis, including an analysis of risks to human health, be completed when considering use of new pesticides on NFS land. This analysis presents information from existing documentation of human health risks related to chemicals proposed for use under any of the alternatives. Effects related to wildlife, including effects to nontarget species, are included in the biological assessment, biological evaluation, and potential species of conservation concern analysis.

Introduction

This analysis reviews the various rodenticide and insecticide products available for this planning effort. All products reviewed have been approved by the Environmental Protection Agency (EPA) and have approved labels for use in Wyoming. Risk assessments have been completed by either the EPA, Animal Plant Health Inspection Service (APHIS) or by Syracuse Environmental Research Associates, Inc. If other products developed for the same use are approved for use in Wyoming, Forest Service staff may pursue an environmental analysis sufficiency review or supplemental information report (Forest Service Handbook 1909.15 chapter 10, section 18) to determine if this analysis adequately analyzes the impacts of those products and if they can be approved for use on the Thunder Basin National Grassland.

The following discussion describes the brand name and active ingredients for the rodenticides being considered for use. Applicable label restrictions are included in the project record, are publicly available on the internet, and were referenced as part of this analysis. Label restrictions on pesticides are developed to mitigate, reduce, or eliminate potential risks to humans and the environment. Analysis of pesticide use in this analysis assumes the product label directions will be followed during handling and application. The rodenticides are divided into three categories: non-anticoagulants, anticoagulants, and fumigants. One insecticide is included in the analysis.

In evaluating effects to human health, the magnitude of a dose that is hazardous to health depends on whether a single dose is encountered all at once (acute exposure), multiple doses are encountered over longer periods (chronic exposure), or doses or exposures are regularly repeated over periods ranging from several days to months (sub-chronic). EPA personnel develop reference doses, which are estimates of a daily dose a human can receive over a 70-year life span without an appreciable risk of deleterious effects.

Effects Summary

APHIS personnel evaluated the human health and ecological risk of zinc phosphide under various use patterns (APHIS 2017c). The risk to human health, including workers who would mix and apply zinc phosphide, was found to be low based on conservative assumptions of exposure and toxicity. The low risk to workers was determined based on label requirements regarding the use of the appropriate personnel protective equipment designed to reduce exposure.

Under normal and anticipated circumstances, the use of the anticoagulants Rozol and Kaput-D Prairie Dog Bait in below-ground applications for the control of the black-tailed prairie dog should pose minimal risks to workers and members of the general public (SERA 2015). EPA personnel determined these products will not pose unreasonable risks or adverse effects to humans or the environment (EPA 1998a, b, and c).

APHIS personnel evaluated the human health and ecological risk of aluminum phosphide (a fumigant) for rodent control (APHIS 2017a). Aluminum phosphide reacts with moisture in the atmosphere to produce phosphine gas, which is the substance that is active as a pesticide (EPA 1998a). Although phosphine gas is toxic to humans, the risk to human health is low because inhalation exposure is slight for underground applications (APHIS 2017a). The EPA only considered dietary exposure from food because drinking water exposure is not expected, and there is only a limited residential use at the present time. Exposure assessments do not indicate a concern for potential dietary risk because residues of phosphine are not expected in food or drinking water. Phosphine gas will dissipate rapidly into the atmosphere which makes residues on treated commodities very unlikely. Additionally, aluminum phosphide may not be directly mixed with foods, feed, or raw agricultural products which may be used directly as foods. Residues are not expected to be found in meat, milk, poultry, or eggs.

Risks associated with the registered uses of potassium and sodium nitrates (gas cartridge fumigants) are believed to be negligible. This is due to the limited exposure potential to humans—any human exposure from the intended use of these products is limited to applicators. Exposure is minimal for several reasons. These products are cartridges, similar to flares, in which the ingredients are totally encased. Unlike many pesticide products, there is little opportunity for splashing, spillage, inhalation, or dermal contact with spray or dust particles. Once ignited, these devices produce noxious gases which are directed into the pest burrow, which is sealed or covered. Inhalation exposure to the applicator should therefore be negligible. EPA staff believe the active ingredient, sodium nitrate, as registered for use in products evaluated, does not present any unreasonable adverse effects to humans (EPA 1991, 2015). An analysis conducted by APHIS staff stated similar findings; gas cartridges pose low risk to human health and the environment because of the use pattern and the environmental fate of the cartridge formulation and byproducts (APHIS 2017b).

Risks associated with the registered uses of deltamethrin are negligible. This is due to the limited exposure potential to humans. Any human exposure from the intended use of these products is limited to applicators. Exposure is minimal due to repackaging of all wettable powder formulations into water soluble packages, requiring applicators who are fogging with handheld equipment indoors to wear a dust-mist respirator and the prohibition of power dusters as an application method. There are post-applications risks when using metered release devices; however, it is believed this risk is lower because the occupational areas generally have greater ventilation capacity (EPA 2006).

Non-Anticoagulants: Zinc-Phosphide-Based Treatments

Zinc phosphide is an inorganic compound; human toxicity results from phosphine gas created by the reaction of the active ingredient with water and acid in the stomach (APHIS 2017c). Death can occur within a few hours of ingestion.

Alternatives Proposing Zinc Phosphide Rodenticide

The use of zinc phosphide would be allowed in all alternatives, with certain requirements before use (table 3).

The following zinc phosphide products are available for use in Wyoming:

- Zinc Phosphide Prairie Dog Bait
  - EPA registration number: 13808-6
- ZP Rodent Oat Bait Ag
  - EPA registration number: 12455-102
  - Special Local Need (SLN) number: WY-18-0002
  - SLN is valid until April 30th, 2022 or until otherwise amended, withdrawn, cancelled, or suspended
- Prozap Zinc Phosphide Oat Bait
  - EPA registration number: 61282-14
  - SLN number: WY-020003
  - SLN is valid until April 30th, 2022 or until otherwise amended, withdrawn, cancelled, or suspended

Effects to Human Health and Safety

APHIS staff evaluated the human health and ecological risk of zinc phosphide under various use patterns (APHIS 2017c). The risk to human health, including workers who would mix and apply zinc phosphide, was found to be low based on conservative assumptions of exposure and toxicity. The low risk to workers was determined based on label requirements for appropriate personnel protective equipment designed to reduce exposure.

The reregistration document (EPA 1998c) states "The Agency has determined that acute or chronic dietary exposure associated with the use of zinc phosphide is unlikely. Of those commodities designated as food uses for zinc phosphide, only three were found to have detectable residues after application (grasses, sugar beets, sugarcane). Since these three crops are not direct human food items, no acute or chronic dietary consumption of zinc phosphide is expected. Also, zinc phosphide will not concentrate during the processing of any commodity because the act of processing will not allow for unreacted zinc phosphide to remain in or on processed food items. No drinking water risk assessment was performed for zinc phosphide because no residues are expected in either ground or surface water. Exposure, other than accidental ingestion, is not expected."

Acute toxicity studies for zinc phosphide resulted in a category 1 rating. Category 1 pesticides are highly toxic and severely irritating (EPA 1998c). While zinc phosphide is highly toxic, the reregistration of this product was approved because the benefits of the use of this pesticide outweighs the risks when used according to label instructions (EPA 1998c). Reading and following label instructions is the best way to insure personal safety.

Although zinc phosphide is registered for use on food crops, it is not applied to food so much as in areas near food, such as prairie dog towns within rangelands. No chronic toxicity or carcinogenicity studies were required because chronic exposure to zinc phosphide or its byproducts is expected to be negligible (EPA 1998c). Residues of this pesticide are expected to be negligible as the product decomposes to zinc and phosphorus, which are natural components of soil (EPA 1998c) and which may be utilized by plants.

Residues of zinc phosphide were detected on grasses (EPA 1998c). However, because grass is not directly eaten by humans and is rather food for livestock, EPA staff did not expect secondary residues in meat, milk, poultry, or eggs because "residues of zinc phosphide ingested by livestock would be immediately converted to phosphine and metabolized to naturally occurring phosphorous compounds" (EPA 1998c). The label for the product ZP Rodent Bait AG (EPA 12455-102) states animals should not be grazed in the treated area.

Carcinogenicity, Mutagenicity

According to EPA staff, zinc phosphide is not considered a carcinogen or mutagen because "chronic exposure is expected to be negligible" (EPA 1998c)

Dietary Exposure from Drinking Water

According to the EPA reregistration document, zinc phosphide degrades rapidly to phosphine and zinc ions, both of which attach strongly to soil and are common nutrients in soil. Zinc phosphide and its degradation products appear to have a low potential for groundwater and surface water contamination. Therefore, dietary exposure is not expected from either groundwater-fed or surface-water-fed drinking water (EPA 1998c).

Environmental Fate

In moist soils, zinc phosphide rapidly degrades to phosphine, which attaches to soil and oxidizes to phosphate ions and phosphorus (EPA 1998c). On dried soil, zinc phosphide appears to be moderately persistent; half-lives may be greater than one month (EPA 1998c). Zinc phosphide is expected to have a low potential for remaining in soil and water environments to cause groundwater or surface water contamination or create bioaccumulation hazards (EPA 1998c). Under normal conditions, bait formulations may be moderately persistent. Zinc phosphide degrades to volatile phosphine and zinc ions. Zinc ions and dissolved phosphorus readily attach onto soil, are common nutrients in soil, and are relatively immobile (EPA 1998c).

While the use of zinc phosphide to control rodents has risks to human health, EPA determined that re-registration of zinc phosphide was warranted because of the benefits of product use to reduce disease transmission from populations of rodents to humans. According to the zinc phosphide reregistration document, diseases vectored by rodents include plague, Rickettsial diseases such as murine typhus, and many others.

Anticoagulants

Chlorophacinone and diphacinone are anticoagulant rodenticides registered for the control of several rodent pests including various species of rats, mice, voles, squirrels, rabbits, muskrat, chipmunks, gophers, and prairie dogs. Based on Forest Service direction, the current risk assessments focused on the control of the black-tailed prairie dog (*Cynomys ludovicianus*) using Rozol and Kaput-D prairie dog baits.

Anticoagulant rodenticides disrupt normal blood-clotting mechanisms and induce capillary damage (Pelfrene 1991). Death results from hemorrhage. Anticoagulants are typically grouped into first-generation and second-generation compounds. Second-generation anticoagulants tend to be more acutely toxic. They generally provide a lethal dose after a single feeding, although death is usually delayed 5 to 10 days as animals continue feeding. First-generation compounds are less acutely toxic and more rapidly metabolized, excreted, or both. Generally they must be ingested for several days to provide a dose lethal to most individuals (Erickson and Urban 2004). Diphacinone and chlorophacinone may kill some animals in a single feeding, but multiple feedings are generally needed for sufficient population control (Timm 1994).

Alternative Proposing Anticoagulants

The grassland-wide alternative is the only alternative allowing use of anticoagulants. They may be used only in boundary management zones and only after three consecutive applications of zinc phosphide prove ineffective. Anticoagulant rodenticides may be used only if applied by a Forest-Service-approved contractor (through direct contract or agreement) or Forest Service staff to ensure compliance with label restrictions that include extensive post-application monitoring requirements.

Effects to Human Health and Safety

Under normal and anticipated circumstances, the use of Rozol and Kaput-D Prairie Dog Bait in below-ground applications for the control of the black-tailed prairie dog should pose minimal risks to workers and members of the general public (SERA 2015). The EPA reregistration eligibility decision rodenticide cluster (1998c) determined these products will not pose unreasonable risks or adverse effects to humans or the environment.

No cases of human chlorophacinone poisoning in the United States were identified in the available literature. Staff in EPA's Environmental Fate and Effects Division specifically reviewed incident reports of poisonings associated with chlorophacinone and other rodenticides (EPA 2001). While poisonings of domestic animals or wildlife are reported, no human poisoning associated with chlorophacinone were identified in the EPA review. It is possible the limitations on the distribution and use of chlorophacinone in the United States accounts, at least in part, for the lack of reports of human poisonings in the United States (SERA 2015).

Chlorophacinone and diphacinone are both non-food use pesticides. Therefore, it is unlikely there will be any exposure to food sources or to residues in groundwater or surface water contamination (EPA 1998b).

EPA personnel have determined there is a potential exposure to applicators or other handlers during typical use patterns associated with chlorophacinone. Specifically, EPA is concerned about potential dermal and inhalation exposures to handlers during the mixing of concentrate into baits and loading and application of chlorophacinone.

Because the vapor pressure of chlorophacinone is low, the potential for exposure resulting from inhalation of chlorophacinone vapors is not a significant concern. However, if fine particles become airborne during the handling of chlorophacinone baits, individuals may inhale these particles. Because these particles could potentially be ingested, such exposure would contribute to the individuals risk resulting from accidental ingestion or oral exposure (EPA 1998b).

EPA currently has no data on occupational or residential exposures to diphacinone, so there is no way to calculate daily doses. EPA has risk concerns for persons exposed to diphacinone in both occupational and residential scenarios. These concerns are based on (1) very high acute toxicity; (2) potentially high dermal absorption values; (3) an absence of exposure data for all exposure scenarios considered; and (4) a relatively high number of incidents associated with diphacinone use as compared to non-anticoagulant pesticides (EPA 1998b).

EPA recommends all labels for occupational-use products require commercial handlers to wear gloves while handling diphacinone formulations not contained in tamper-resistant bait stations or in place packs. This would reduce dermal exposure to diphacinone and diminish the potential oral exposure that could result from hand-to-mouth transfer.

In addition, EPA recommends occupational handlers (commercial applicators) wear protective eyewear and a dust or mist respirator when handling diphacinone powder or other nonparaffinized diphacinone formulation, such as meal or grain-based baits, unless those formulations are contained in tamper-resistant bait stations or place packs. The respirator would reduce the possibility of inhalation and ingestion of dusts resulting from the pouring and application of these products, and the eyewear would reduce the potential ocular exposure that could result from contact with such dusts.

For both Kaput (EPA 72500-22) and Rozol (EPA 7173-286), label instructions state livestock cannot be allowed to graze treated areas for 14 days after treatment and until no bait is found above ground.

Carcinogenicity, Mutagenicity

Given the exclusively non-food uses of cholorophacinone, no carcinogenicity studies were required (EPA 1998b).

Dietary Exposure from Drinking Water

Chlorophacinone is expected to bind very tightly with soil. Most of the chemical is expected to remain in the top soil layers, and its potential to reach groundwater is very low. Surface water contamination may occur in less-permeable areas and in areas near water bodies. The mechanism for chlorophacinone to reach surface waters would likely be by adhering to eroding soil particles rather than dissolution in runoff water. Because of its high adsorption coefficient, most chlorophacinone would be in the suspended and bottom sediments instead of in the water column (EPA 1998b).

Diphacinone is expected to be bound very tightly with soil in the field. Most of the chemical would remain in the top soil layers and its potential to reach ground water is very low. Surface water contamination may occur in less-permeable areas and in areas near water bodies. The mechanism for diphacinone to reach surface waters would likely be by adhering to eroding soil particles rather than dissolution in runoff water. Most diphacinone is expected to be in the suspended and bottom sediments instead of in the water column (EPA 1998b).

Environmental Fate

Chlorophacinone appears to be very immobile and readily degradable in the environment. It has the following characteristics (EPA 1998b):

- low water solubility
- does not breakdown due to reaction with water at pH 5, 7, and 9
- very susceptible to breaking down in the presence of light when in water (half-life of 37 minutes at pH 7)
- moderately susceptible to decomposition from sunlight on soil (half-life of 4 days)
- moderately degradable in a sandy clay loam soil under aerobic conditions (half-lives of 21-45 days)
- expected to be very immobile in soil
- volatilizes slowly from water and soil
- does not accumulate in fish at a significant level

Diphacinone appears to be relatively immobile and moderately degradable. It has the following characteristics (EPA 1998b):

- low water solubility
- does not breakdown due to reaction with water at pH 7 and 9 but susceptible to breaking down due to reaction with water at pH 5 (half-life of 44 days)
- moderately degradable in a sandy loam soil under aerobic conditions (half-lives of 28 to 32 days)
- expected to be immobile in soil
- volatilizes slowly from water and soil
- does not accumulate in fish at a significant level

Fumigants (Aluminum Phosphide)

Aluminum phosphide is registered for outdoor fumigation of burrows to control rodents and moles in nondomestic areas, noncropland, and agricultural areas. Aluminum phosphide acts as broad-spectrum insecticide and as a rodenticide for controlling small mammalian pests. Aluminum phosphide is formulated as pellets, tablets, impregnated materials, and dusts. Aluminum phosphide reacts with the moisture in the atmosphere to produce phosphine gas which is the substance that is active as a pesticide (EPA 1998a).

The following aluminum phosphide products are available for use in Wyoming:

- Phostoxin tablets and pellets
    - EPA registration number: 72959-4 (tablets)
    - EPA registration number: 72959-5 (pellets)

Alternatives Proposing Fumigants

Only the grassland-wide alternative allows use of fumigants. The grassland-wide alternative allows use of fumigants only in boundary management zones and after three applications of zinc phosphide prove ineffective.

Effects to Human Health and Safety

APHIS staff evaluated the human health and ecological risk of aluminum phosphide for rodent control. Although phosphine gas is toxic to humans, the risk to human health is low because inhalation exposure is slight for the underground applications (APHIS 2017a). Phosphine gas will dissipate rapidly into the atmosphere, which makes residues unlikely.

Length and Route of Exposure; Toxicity

Phosphine gas produced from aluminum phosphide was tested for acute toxicity through inhalation exposure. No significant exposure to phosphine gas was expected via the oral or dermal routes. Dermal contact with aluminum phosphide pellets or tablets is unlikely because the label requires applicators to wear dry cotton gloves, which prevents hands from contacting the formulation and prevents hand moisture from reacting with the product. Exposure assessments do not indicate a concern for potential dietary risk because residues of phosphine are not expected in food or drinking water.

Carcinogenicity, Mutagenicity

Since chronic dietary exposure and risk associated with the use of aluminum phosphide are negligible, no risk of cancer is expected from the use of these pesticides.

Dietary Exposure from Drinking Water

Aluminum phosphide is expected to degrade rapidly in the environment to aluminum hydroxide and phosphine. EPA staff determined phosphine gas will degrade in days and has a low exposure potential for contaminating groundwater and surface water. Therefore, they concluded a dietary exposure assessment from drinking water is not necessary.

While it is conceivable some proportion of phosphine could reach groundwater through macropore flow-like processes, EPA personnel could not estimate with any degree of certainty the concentration that would occur in groundwater, and they do not believe it would be a concern due to the low potential for exposure (EPA 1998a).

Environmental Fate

As previously mentioned, aluminum phosphide degrades to aluminum hydroxide and phosphine. Phosphine in the atmosphere is rapidly degraded (World Health Organization 1988). The half-life in air is approximately five hours. The half-life in the absence of light is approximately 28 hours.

It appears phosphine will degrade in days and is at low risk for contaminating ground or surface waters. Phosphine near soil surface is expected to diffuse into the atmosphere and be degraded in the sunlight. Phosphine trapped beneath the soil surface will bind to soil, inhibiting movement, and be oxidized to phosphates which are common in the natural environment. Therefore, aluminum phosphide and its residues do not appear to be persistent or remain mobile under most environmental conditions.

Fumigants (Sodium Nitrate – Gas Cartridges)

Gas cartridges are ready-to-use cartridges, formulated with sulfur and carbon, and designed to be ignited and placed in a pest burrow. Sodium and potassium nitrate have been used as pesticides in the United States since the 1940s. A reregistration eligibility decision was signed for sodium and potassium nitrate in September 1991 and an interim registration review decision was signed in September 2015.

The following sodium nitrate products are available for use in Wyoming:

- Gas cartridges
    - EPA registration number: 56228-02

Alternatives Proposing Fumigants

Only the grassland-wide alternative allows use of fumigants. The grassland-wide alternative allows application of fumigants only in boundary management zones and only after three applications of zinc phosphide prove ineffective.

Effects to Human Health and Safety

Risks associated with the registered uses of potassium and sodium nitrates are believed to be negligible; any human exposure from the intended use of these products is limited to applicators. Exposure is minimal for several reasons: these products are cartridges, similar to flares, in which the ingredients are totally encased; unlike many pesticide products, there is little opportunity for splashing, spillage, inhalation, or dermal contact with spray or dust particles; and once ignited, these devices produce noxious gases which are directed into the pest burrow, which is sealed or covered. Inhalation exposure to the applicator should therefore be negligible. EPA staff (1991, 2015) believe the pesticide active ingredient sodium nitrate, as registered for use in products evaluated, does not present any unreasonable adverse effects to humans. An analysis conducted by APHIS staff (2017b) stated similar findings—gas cartridges pose low risk to human health and the environment because of the use pattern and the environmental fate of the cartridge formulation and byproducts.

Length and Route of Exposure; Toxicity

As noted above, human exposure from the intended use of these products is limited to applicators and gas cartridges are not used near occupied structures. Human exposure is limited because the gas cartridges are prepackaged and completely encased. In addition, combustion occurs below ground in an enclosed burrow or den, removing the applicator's exposure.

Accidental exposure may occur if the cartridge opens and some of the contents spill on the skin or close to the applicator's face, causing irritation to the eyes and airway passages (ATSDR 2017). Acute toxicity studies indicate sodium nitrate may cause eye irritation, pose a low oral toxicity hazard, low-level dermal effects, and slight dermal irritation (APHIS 2017b). No information was located regarding health effects in humans or animals following acute-duration dermal exposure to nitrate or nitrite. Information regarding the effects of acute-duration dermal exposure to nitrate or nitrite is not considered necessary because the general population is not likely to be dermally exposed to nitrate or nitrite concentrations at levels that might cause adverse health effects (ATSDR 2017). The general population is also not likely to be exposed to airborne nitrate or nitrite concentrations at levels that might cause adverse health effects (ATSDR 2017).

Carcinogenicity, Mutagenicity

Evaluation of available animal data by International Agency for Research on Cancer staff resulted in the determination there is inadequate evidence for the carcinogenicity of nitrate (ATSDR 2017). Studies have also shown technical grade sodium nitrate is not a carcinogen or a teratogen (a substance that can cause birth defects) (OECD 2007).

Dietary Exposure from Drinking Water

Based on available human data, the International Agency for Research on Cancer staff determined there is inadequate evidence for the carcinogenicity of nitrate in food or drinking water (ATSDR 2017). APHIS staff (2017b) stated similar results—sodium nitrate will not have any effects, and the use of gas cartridges is unlikely to contribute sodium nitrate in quantities that would cause water supplies to exceed the human health drinking water standard.

Environmental Fate

Sodium nitrate is a naturally occurring substance, is not volatile, and remains as a particulate in the soil (APHIS 2017b). These products decompose at high temperature, resulting in simple organic and inorganic compounds, mostly in the form of gases which eventually diffuse through burrow openings or into the soil (EPA 2015). Sodium nitrate is highly soluble in water; however, its persistence is low because microbes in the soil degrade it (APHIS 2017b). Exposure to the environment is limited and localized rather than widespread or broadcast.

Other Required Disclosures

The National Environmental Policy Act at 40 CFR 1502.25(a) directs that "to the fullest extent possible, agencies shall prepare final environmental impact statements concurrently with and integrated with … other environmental review laws and executive orders."

Short-Term Uses and Long-Term Productivity

The National Environmental Policy Act requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). As declared by Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which humans and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA section 101).

Action alternatives developed for this plan amendment project would generally decrease the target acreages of habitat for species that use or rely on short-stature vegetation, including prairie dogs. Actions associated with implementation of the plan amendment would have short-term impacts to those species but are not expected to lead to a loss of viability in the planning area or range-wide. Because no habitat is proposed for conversion to other land uses, the habitat would be available to species with different habitat requirements and may be made available again as short-stature vegetation if management actions change in the long term. Implementation of a plan amendment is expected to have short- and long-term neutral or positive effects on rangeland resources, livestock grazing, and socioeconomic issues.

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time, such as the temporary loss of timber productivity in forested areas that are kept clear for use as power line rights-of-way or roads. The interdisciplinary team does not anticipate any irreversible or irretrievable commitments of resources as a result of implementing any of the alternatives.

Unavoidable Adverse Effects

Direct, indirect, and cumulative effects are described in detail in chapter 3. Adverse effects to prairie dogs and species that depend on prairie dog colonies for habitat are expected under the action alternatives. However, these effects are not expected to lead to loss of viability for any species in the plan area or range-wide. To the extent possible, while meeting the purpose and need for the project, these effects are avoided or offset through development of ecosystem and species-specific plan components. Adverse effects may also be expected to uses such as livestock grazing in areas identified for colony conservation and managed to provide short-stature vegetation for prairie dogs and colony-dependent species. Due to the variable nature of colonies, the ability to control prairie dogs in all action alternatives, and the presence of plague in the system, long-term impacts to livestock grazing are not expected to be highly variable.

Laws, Regulations, and Policies Related to the Analysis

Federal Law and Regulations

- Bankhead Jones Farm Tenant Act of July 22, 1937, (7 U.S.C. sections 1000 et seq, as amended). This act directs the Secretary of Agriculture to develop a program of land conservation and land use to correct maladjustment in land use and thus assist in controlling soil erosion, mitigating floods, preventing impairments of dams and reservoirs, conserving surface and subsurface moisture, protecting watersheds of navigable streams, and protecting the public lands, health, safety, and welfare. Land Utilization Project lands, now largely included in national grasslands and national forests, were acquired under this act prior to the repeal of the land acquisition authority Act of October 23, 1962.
    - The Bankhead-Jones Farm Tenant Act of 1937 (Public Law 75-210) is an act “To create the Farmers’ Home Corporation, to promote secure occupancy of farms and farm homes, to correct the economic instability resulting from some present forms of farm tenancy, and for other purposes.”

- Management direction for the administration of National Forest System lands under Title III of the Bankhead-Jones Farm Tenant Act, 36 CFR section 213(b) states "the National Grasslands shall be a part of the National Forest system and permanently held by the Department of Agriculture for administration under the provisions and purposes of title III of the Bankhead-Jones Farm Tenant Act." Further, the Bankhead-Jones Farm Tenant Act provides:

  > "The Secretary [of Agriculture] is authorized and directed to develop a program of land conservation and land utilization, in order thereby to correct maladjustments in land use and thus assist in controlling soil erosion, reforestation, preserving natural resources, protecting fish and wildlife, developing and protecting recreation facilities, mitigating floods, preventing impairment of dams and reservoirs, developing energy resources, conserving surface and subsurface moisture, protecting the watershed of navigable streams, and protecting the public lands, health, safety, and welfare, but not to build industrial parks or establish private industrial or commercial enterprises" (Section 31,Title III, Bankhead-Jones Farm Tenant Act of 1937, as amended in 1962, 1966, and 1981)."

- Section 213(d) states "the resources shall be managed so as to maintain and improve soil and vegetative cover, and to demonstrate sound and practical principles of land use for the areas in which they are located." Section 213.3 addresses protection, occupancy, use, administration, and exercise of reservations. This section basically states the rules found in 36 CFR section 213 govern the management of these lands. Section 213.4 addresses prior rules and regulations. It states "Except as provided in section 213.3, the rules and regulations heretofore issued for land utilization projects are hereby superseded as to all such projects administered by the Forest Service, but not as to such projects administered by other agencies."

- 36 CFR section 213(b), states "the National Grasslands shall be a part of the National Forest system and permanently held by the Department of Agriculture for administration under the provisions and purposes of Title III of the Bankhead-Jones Farm Tenant Act.

- Section 19 (209) of the 1950 Granger Thye Act states that grazing permits (including grazing agreements) and livestock use permits convey no right, title, or interest held by the United States in any lands or resources.
- 36CFR 222.3(a) states that unless otherwise specified by the Chief of the Forest Service, all grazing and livestock use on National Forest System lands must be authorized by a grazing or livestock use permit.
- 36 CFR 222.3 (c) (1) authorizes the Forest Service to use grazing agreements as a type of grazing permit. A grazing agreement is a type of grazing permit that authorizes eligible grazing associations organized under state laws of incorporation and/or cooperatives to make a specified amount of grazing use on National Forest System lands for a period of 10 years.
- Multiple-Use Sustained-Yield Act of 1960 [As amended through December 31, 1996, Public Law 104-333] is policy that the national forests are established and shall be administered for outdoor recreation, range, timber, watershed, and wildlife and fish purposes. The purposes of this act are declared to be supplemental to, but not in derogation of, the purposes for which the national forests were established as set forth in the act of June 4, 1897 (16 U.S.C. 475).

  - The Multiple-Use Sustained Yield Act of 1960 (74 Stat. 215: 16 U.S.C. 528-531) requires that economic impacts are considered when establishing management plans or decisions that may affect the management of renewable forest and rangeland resources. This report meets the requirements of this law by addressing the economic impacts of the project on the local economy.

- Forest and Rangeland Renewable Resources Planning Act of 1974 guides management of the Nation's renewable resources from public and private forests and rangelands.

  > SEC. 11. [16 U.S.C 1609] (a) National Forest System Defined: The "National Forest System" shall include all national forest lands serviced or withdrawn from the public domain of the United States, all national forest lands acquired through purchase, exchange, donation, or other means, the national grasslands and land utilization projects administered under title III of the Bankhead-Jones Farm Tenant Act (50 Stat. 525, 7 U.S.C. 1010-1012), and other lands, waters, or interests therein which are administered by the Forest Service or are designated for administration through the Forest Service as a part of the system.

- National Forest Management Act (NFMA) of 1976 directs the Forest Service to "provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives."

  - National Forest Management Act (NFMA) of 1976 (16 U.S.C. 1600) and regulations require that the economic impacts of decisions or plans affecting the management of renewable resources are analyzed and that economic stability of communities whose economies are dependent on materials from national forest lands are considered. This analysis meets the requirements of the NFMA by specifically considering the economic impacts of the implementation of the project and its impacts on local communities and minority populations.

  - National Forest Management Act (NFMA) regulations define a viable population as one that "continues to persist over the long term with sufficient distribution to be resilient and adaptable to stressors and likely future events" (36 CFR section 219.19 [2012]). Forest Service manual direction provides additional guidance for proposed and listed threatened and endangered species. It also requires that Forest Service personnel identify and prescribe measures to prevent adverse modifications or destruction of critical habitat and other habitats essential for the conservation of endangered, threatened, and proposed species (Forest Service Manual 2670.31 (6)). Forest Service Manual 2600 –Wildlife, fish and sensitive plant habitat management, chapter 2670 – threatened, endangered, and sensitive plants and animals provides directions on conducting a biological evaluation and what type of information should be provided within this document. The objectives of biological evaluations are 1) to ensure Forest Service actions do not contribute to loss of viability of any native or desired nonnative plant or animal species or trends toward Federal listing of any species; 2) to comply with the requirements of the Endangered Species Act that actions of Federal agencies not jeopardize or adversely modify critical habitat of federally listed species; and 3) to provide a process and standard to ensure threatened, endangered, proposed, and sensitive species receive full consideration in the decision-making process (2672.41).

- The Endangered Species Act requires Forest Service personnel to manage for the recovery of threatened and endangered species and the ecosystems, upon which they depend. National forest personnel are also required to consult with the U.S. Fish and Wildlife Service personnel if a proposed activity may affect the population or habitat of a listed species. A separate biological assessment has been developed for consultation with the U.S. Fish and Wildlife Service.

- The Migratory Bird Treaty Act established an international framework for the protection and conservation of migratory birds. This act makes it illegal, unless permitted by regulations, to "pursue, hunt, take, capture, purchase, deliver for shipment, ship, cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird." Within the National Environmental Policy Act process, effects of proposed actions on migratory birds will be evaluated and actions will consider approaches to identify and minimize take (USDA Forest Service 2008). To comply with the act, Thunder Basin National Grassland personnel have used Executive Order 13186 (2001) and the memorandum of understanding with U.S. Fish and Wildlife Service signed in 2009 pursuant to the Executive Order 13186.
- Bald and Golden Eagle Protection Act (Eagle Act). The Eagle Act, originally passed in 1940, prohibits the take, possession, sale, purchase, barter, offer to sell, purchase, or barter, transport, export, or import, of any bald or golden eagle, alive or dead, including any part, nest, or egg, unless allowed by permit (16 U.S.C 668(a); 50 CFR 22). "Take" is defined as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb" a bald or golden eagle. The term "disturb" under the Eagle Act means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior. The U.S. Fish and Wildlife Service staff recently revised the regulations for eagle non-purposeful take permits and eagle nest take permits (Federal Register 81:91494-91553; 16 December 2016) under the Eagle Act (50 CFR 22.26). The regulations provide for individual and programmatic permits that are consistent with the goal of stable or increasing eagle breeding populations
- Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), (7 U.S.C. s/s 136 et seq.): Describes pesticide regulations and requirements related to hazardous material use and worker protection standards for employees in the planning and application of pesticides.
- EPA Worker Protection Standard (40 CFR 170) is designed to protect works from potential adverse effects of pesticides.
- Pesticide Use Management and Coordination Policy (Forest Service Manual 2150): Provides agency policy and guidance on the use of pesticides as part of an integrated pest management approach. Additional guidance is provided in the Pesticide Use Management Handbook (Forest Service Handbook 2109).
- Safety standards for pesticide use are set by the Environmental Protection Agency (EPA), Occupational Health and Safety Administration, Code of Federal Regulations (40 CFR part 170), and individual states. In addition, several sections of the Forest Service Manual 1994 provide guidance on the safe handling and application of pesticides.
- Forest Service Manual 2109.16.3 states the requirement for pesticide risk assessment and defines it as "another method of helping to ensure safety in pesticide use". Risk analysis is used to quantitatively evaluate the probability that a given pesticide use might impose harm on humans or other species in the environment.

- The Animal Damage Control Act of March 2, 1931, as amended, (7 U.S.C. 426-426c) authorizes the Secretary of Agriculture to provide animal damage management services, to maintain technical expertise for evaluating and recommending animal damage management techniques, and to perform animal damage research. The secretary has delegated this authority to the Animal and Plant Health Inspection Service (APHIS) and the animal damage control program in APHIS is specifically responsible for animal damage management activities.
    - The Forest Service and the APHIS animal damage control program, along with the states, cooperate under the Animal Damage Control Act of 1931, as amended, to manage animal damage on National Forest System lands. These activities include actions to provide wildlife damage management through direct control and technical assistance to achieve desired management objectives.
- The Civil Rights Act of 1964 provides for nondiscrimination in voting, public accommodations, public facilities, public education, federally assisted programs, and equal employment opportunity. Title VI of the Act, Nondiscrimination in Federally Assisted Programs, as amended (42 U.S.C. 2000d through 2000d-6) prohibits discrimination based on race, color, or national origin.

Executive Orders

Executive Order 12898 directs Federal agencies to identify and address any adverse human health and environmental effects of agency programs that disproportionately impact minority and low-income populations.

Other Guidance

Additional direction comes from the U.S. Department of Agriculture, Deputy Under Secretary for Natural Resources and Environment, David Tenny, who conducted a discretionary review (2004) (36 CFR 217) of the appeal decisions regarding appeals of the grasslands plan record of decision (2002), and documented his review decision in a letter to then Forest Service Chief, Dale Bosworth dated May 5, 2004. Mr. Tenny affirmed the Forest Service appeal decisions with instructions. In part, his letter stated the following:

> "As the FS implements the revised LRMP [for the Dakota Prairie Grasslands, Nebraska National Forest, and Thunder Basin National Grassland], I am directing you [Bosworth] to ensure that local land managers work together with state and county officials and local landowners to aggressively implement the spirit and intent of the good neighbor policy. Specifically, I am instructing the FS to work with local interests and landowners to use the full suite of management tools available to them to reduce the potential for prairie dog colonies to expand onto adjacent non-federal lands. This aggressive application of the good neighbor policy should involve other governmental and local interests, as appropriate, and be done in conjunction with state prairie dog management plans."

Chapter 4. Administrative Material

Project Interdisciplinary Team Members

The following Forest Service and cooperating agency personnel were directly involved in preparation of this draft environmental impact statement through membership on the project interdisciplinary team.

Name	Title, Affiliation	Responsibility
Monique Nelson	Environmental coordinator and ecologist, Thunder Basin National Grassland	Project manager and interdisciplinary team leader. Responsible for overall project management, document preparation, interdisciplinary team and public meeting preparation and facilitation. Primary project contact
Chad Prosser	Rangeland management specialist, Thunder Basin National Grassland	Subject matter expert for range, botany, and vegetation. Primary responsibility for proposed action development, resource analyses for rangeland resources and rodenticide use
Katie Haynes	Botanist and ecologist, Medicine Bow-Routt National Forests and Thunder Basin National Grassland	Provide expertise related to botany. Lead for preparation of species of conservation concern evaluations for plant species. Primary responsibility for botany biological assessment and biological evaluation
Tait Rutherford	Planning specialist, Medicine Bow-Routt National Forests and Thunder Basin National Grassland	Provide expertise related to wildlife resources and the National Environmental Policy Act. Primary responsibility for proposed action development. Review and approve species of conservation concern evaluations for wildlife.
Tiffany Young	Wildlife and fisheries biologist, U.S. Forest Service Enterprise Program	Primary responsibility for wildlife and fisheries biological assessment and biological evaluation. Enterprise lead for preparation of species of conservation concern evaluations
Kristen Waltz	Social scientist, U.S. Forest Service Enterprise Program	Primary responsibility for analysis of social and economic issues
Kyle Schumacher	Lands and minerals program manager, Thunder Basin National Grassland	Primary responsibility for analysis of issues related to geology and minerals, including oil and gas leasing
Michelle Hawks	Geographic information systems specialist, U.S. Forest Service Enterprise Program	Primary responsibility for compilation of GIS resources, cartography and map making, compilation of tables and figures for presentation in analysis
Aaron Voos	Public affairs specialist, Medicine Bow-Routt National Forests and Thunder Basin National Grassland	Responsible for developing and implementing public participation and communication plans with project manager. Write press releases, share project updates with stakeholders, communicate with congressional staffs, provide expertise for outreach and communication
Steve Kozlowski	Wildlife program manager, Medicine Bow-Routt National Forests and Thunder Basin National Grassland	Provide expertise related to wildlife. Participate in proposed action development. Review and approve species of conservation concern evaluations for wildlife
Tim Byer	Wildlife biologist, Thunder Basin National Grassland	Provide expertise related to wildlife
Geri Proctor	Range program manager, Medicine Bow-Routt National Forests and Thunder Basin National Grassland	Provide expertise related to range management and rodenticide use

Name	Title, Affiliation	Responsibility
Tani Randolff	Archaeologist, Thunder Basin National Grassland	Primary responsibility for analysis of cultural resources, consultation with the State Historic Preservation Office, tribal consultation
Shay Rogge	Fire management officer, Thunder Basin National Grassland	Primary responsibility for analysis of issues related to wildfire and prescribed fire
Zac Fisher	Soil scientist, Medicine Bow-Routt National Forests and Thunder Basin National Grassland	Primary responsibility for analysis of issues related to hydrology and soils
Jessica Rubado	Planning specialist, U.S. Forest Service Enterprise Program	Provide expertise and review of content to ensure compliance with 2012 Planning Rule and other requirements
Joe Budd	Policy advisor, Wyoming Department of Agriculture and Wyoming Governor's Office	Provide expertise related to range and livestock management
Amanda Withroder	Habitat Protection Program biologist, Wyoming Game and Fish Department	Provide expertise related to wildlife management of prairie dogs and associated species
Dru Bower	Tri-County Commissioners representative	Provide expertise related to local government, community development, social and economic factors
Beth Waterston	Project record and electronic management of NEPA specialist, U.S. Forest Service Enterprise Program	Primary responsibility for scoping and draft environmental impact statement mailing lists, public comment period content analysis, and web portal development
Casey Campbell	Project record support, Medicine Bow-Routt National Forests and Thunder Basin National Grassland	Assist with project record keeping, notes, and document compilation
Rob Robertson	District ranger, Thunder Basin National Grassland	Responsible for project oversight, general management considerations
Russ Bacon	Forest supervisor, Medicine Bow-Routt National Forests and Thunder Basin National Grassland	Responsible official for decision making on this project. Project oversight, general management considerations

Many other U.S. Forest Service professionals were consulted with during preparation of this draft environmental impact statement. In particular, the team would like to thank Todd Neel for his expertise related to pesticide and rodenticide effects analysis.

Collaborators and Stakeholders

Thunder Basin Working Group

Members of the Thunder Basin Working Group contributed considerable time and expertise in development of recommendations for this plan amendment. Their contributions are displayed in the recommendations provided to this planning team in December 2018, available on the project website. Working group members included representatives of the following agencies and organizations:

- Arch Coal
- Campbell County Commissioners
- Campbell County Conservation District
- Campbell County Weed and Pest

- Campbell, Converse, Weston Counties
- Colorado State University
- Congresswoman Liz Cheneys Office
- Converse County Commissioners
- Converse County Conservation District
- Converse County Weed and Pest
- Defenders of Wildlife
- Farm Bureau - Converse County
- Farm Bureau - Wyoming
- Fiddleback Ranch
- Wyoming Governors Office
- Great Plains Wildlife Consulting, Inc
- Inyan Kara Grazing Assoc.
- Niobrara County Commissioner
- Wyoming Office of State Lands and Investments
- Peabody Energy
- Prairie Dog Coalition/Humane Society of the United States
- Precision Wildlife Resources
- 4W Ranch
- Rochelle Community Organizing for Working Sustainability
- Senator John Barrassos Office
- Senator Enzis Office
- Spring Creek Grazing Association
- Thunder Basin Grassland Prairie Ecosystem Association
- Thunder Basin Grazing Association
- University of Wyoming
- USDA Agricultural Research Service
- U.S. Fish and Wildlife Service, Wyoming Field Office
- Wyoming County Commissioners' Association
- Wyoming Department of Agriculture
- Weston County Commissioners
- Weston County Weed and Pest
- Wyoming Game and Fish Department
- World Wildlife Fund
- Wyoming Mining Association

Cooperating Agencies

Formal cooperating agencies have been identified for this project and the relationships have been formalized in memoranda of understanding. Cooperating agency representatives were involved in the Thunder Basin Working Group, were consulted with during preparation of the proposed action and draft environmental impact statement, and provided a preliminary review of this draft environmental impact statement.

- U.S. Fish and Wildlife Service, Wyoming Field Office
- Natural Resources Conservation Service, Wyoming State Office
- Wyoming Department of Agriculture
- Wyoming Game and Fish Department
- Wyoming State Office of Lands and Investments
- Wyoming Weed and Pest Council
- Campbell County, WY
- Campbell County Conservation District
- Campbell County Weed and Pest District
- Converse County, WY
- Converse County Conservation District
- Converse County Weed and Pest District
- Weston County, WY
- Weston County Natural Resource District

- West County Weed and Pest District
- Niobrara County, WY
- Niobrara County Conservation District
- Niobrara County Weed and Pest District
- Crook County, WY
- Crook County Conservation District
- Crook County Weed and Pest District

Tribes

Formal consultation was initiated with the 18 tribal entities listed below in April 2019, and scoping information was provided. No tribes have provided formal comments in advance of release of the draft environmental impact statement.

- Cheyenne and Arapaho Tribes of Oklahoma
- Ft. Peck Assiniboine and Sioux Tribes
- Three Affiliated Tribes – Mandan, Hidatsa, and Arikara Nation
- Cheyenne River Sioux Tribe
- Oglala Sioux Tribe
- Yankton Sioux Tribe
- Chippewa Cree Tribe at Rocky Boys
- Northern Cheyenne Tribe
- Standing Rock Sioux Tribe
- Crow Creek Sioux Tribe
- Rosebud Sioux Tribe
- Eastern Shoshone Tribe of the Wind River Reservation
- Crow Nation
- Santee Sioux Tribe of Nebraska
- Spirit Lake Tribe of Fort Totten
- Lower Brule Sioux Tribe
- Sisseton-Wahpeton Oyate Tribes
- Northern Arapaho Tribes

Scoping Period Commenters

More than 500 individuals and organizations offered comments during the scoping period for this project, representing state and local governments, ranching interests, individuals, and groups with expertise in wildlife management and black-footed ferret reintroduction, and environmental organizations. Names of specific commenters are included in the project record.

Distribution of the Draft Environmental Impact Statement

This draft environmental impact statement is distributed to inform the public, agencies, other governments, and organizations about the considerations, impacts, and tradeoffs associated with amending the grassland plan and implementing changes to prairie dog management.

Whenever possible, the draft environmental impact statement has been distributed electronically to expedite delivery and reduce waste. Digital files are posted and available to the general public on the project information webpage: https://www.fs.usda.gov/project/?project=55479.

Notice of the availability of the draft environmental impact statement has been distributed to individuals who specifically requested notification, submitted comments during the scoping comment period, or otherwise contributed to the project. These include Federal congressional representatives; Federal, State, and local agencies, including cooperating agencies; grazing associations and association members; members of the Thunder Basin Working Group; nongovernmental organizations; and other interested individuals, totaling more than 850 contacts.

In accord with the memorandum of understanding between the Office of the Governor, State of Wyoming, and the Rocky Mountain Region of the U.S. Forest Service (USDA Forest Service 2016c), notice of this draft environmental impact statement has been sent to the following contacts in the Governor's office and State agencies:

- Office of Governor Mark Gordon
- Wyoming Department of Agriculture
- Wyoming Department of Environmental Quality - Administration
- Wyoming Department of Environmental Quality - Air Quality
- Wyoming Department of Environmental Quality - Land Quality
- Wyoming Department of Environmental Quality - Water Quality
- Wyoming Department of Revenue
- Wyoming Department of Transportation
- Wyoming Game and Fish Department Wyoming Livestock Board
- Wyoming Office of State Lands and Investments
- Wyoming Office of Tourism
- Wyoming State Engineers Office
- Wyoming State Forestry Division
- Wyoming State Historic Preservation Office
- Wyoming State Parks, Historic Sites and Trails
- Wyoming Water Development Commission

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