



United States Department of Agriculture

Thunder Basin National Grassland 2020 Plan Amendment Final Environmental Impact Statement



Forest Service

Thunder Basin National Grassland

May 2020

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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
Final 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

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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 final 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 35,000-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 29,000-acre management area in the center of the grassland, (4) a prairie dog emphasis alternative that would conserve 27,000 acres of prairie dog colonies in 5 management areas totaling 68,000 acres on the national grassland, and (5) the preferred alternative to conserve 10,000 acres of prairie dog colonies within a 42,000-acre management area in the center of the 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 object: Scoping comments were accepted for 30 days in April and May 2019. Comments on the draft environmental impact statement were accepted for 90 days from October 2019 to January 2020.

This final environmental impact statement and the draft record of decision are subject to the predecisional administrative review (“objection”) process pursuant to 36 CFR Part 219.¹ The objection process provides an opportunity for members of the public who have participated in the planning process to have any unresolved concerns reviewed by the Forest Service prior to a final decision by the Responsible Official. Only those who provided substantive formal comments during the scoping period or 90-day comment period are eligible to file an objection. Comments are considered substantive formal comments when they are within the scope of the proposal, are specific to the proposal, have a direct relationship to the proposal, and include supporting reasons for the Responsible Official to consider. Objections must be

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>

based on previously submitted substantive formal comments attributed to the objector unless the objection concerns an issue that arose after the opportunities for formal comment. Objections received in response to the notice, including names and addresses of those who object, will be considered part of the public record and will be available for public inspection.

Objections must be filed online (preferred), by mail, or by fax with the Objection Reviewing Officer. Carrier and hand delivery are not an option due to limited availability of staff to receive mail at the office during the Covid-19 pandemic.

Electronic submissions must be submitted in a format (Word, PDF, or Rich Text) that is readable and searchable with optical character recognition software. The submission should include a subject line stating: "Objection for the Thunder Basin National Grassland 2020 Plan Amendment."

- Submit online via the Comment and Analysis Response Application (CARA) objection web form available at: <https://cara.ecosystem-management.org/Public/CommentInput?Project=55479>.
- Mail to: USDA Forest Service Rocky Mountain Region
Attn: Objection Reviewing Officer
P.O. Box 18980
Golden, CO 80402
- Fax to: 303-275-5134

Individuals who need to use telecommunication devices for the deaf (TDD) to transmit objections may call the Federal Information Relay Service (FIRS) at 1-800-877-8339 between 8:00 a.m. and 8:00 p.m., Eastern Daylight Time, Monday through Friday.

Objections, including attachments, must be filed within the 60-day objection filing period. The first day of the objection filing period is the day after publication of the notice of opportunity to object in the *Laramie Boomerang*, the newspaper of record. Objections or attachments received after the 60-day objection period will not be considered. The publication date in the *Laramie Boomerang* is the exclusive means for calculating the time to file an objection. Those wishing to object to this land management plan amendment should not rely upon dates or timeframe information provided by any other source.

An objection must include the following (36 CFR 219.54(c)):

- (1) The objector's name and address along with a telephone number or email address if available. In cases where no identifiable name is attached to an objection, the Forest Service will attempt to verify the identity of the objector to confirm objection eligibility;
- (2) Signature or other verification of authorship upon request (a scanned signature for electronic mail may be filed with the objection);
- (3) Identification of the lead objector, when multiple names are listed on an objection. The Forest Service will communicate to all parties to an objection through the lead objector. Verification of the identity of the lead objector must also be provided if requested;
- (4) The name of the plan, plan amendment, or plan revision being objected to, and the name and title of the Responsible Official;
- (5) A statement of the issues and/or parts of the plan, plan amendment, or plan revision to which the objection applies;

- (6) A concise statement explaining the objection and suggesting how the draft plan decision may be improved. If the objector believes that the plan, plan amendment, or plan revision is inconsistent with law, regulation, or policy, an explanation should be included;
- (7) A statement that demonstrates the link between the objector's prior substantive formal comments and the content of the objection, unless the objection concerns an issue that arose after the opportunities for formal comment; and
- (8) All documents referenced in the objection (a bibliography is not sufficient), except that the following need not be provided:
 - a. All or any part of a Federal law or regulation,
 - b. Forest Service Directive System documents and land management plans or other published Forest Service documents,
 - c. Documents referenced by the Forest Service in the planning documentation related to the proposal subject to objection, and
 - d. Formal comments previously provided to the Forest Service by the objector during the proposed plan, plan amendment, or plan revision comment period.

Prior to the issuance of the reviewing officer's written response, either the reviewing officer or the objector may request to meet to discuss issues raised in the objection and their potential resolution. Interested persons who wish to participate in meetings to discuss issues raised by objectors must have previously submitted substantive formal comments related to the objection issues. Interested persons must file a request to participate as an interested person within 10 days after a legal notice of objections received has been published. Requests must be sent to the same email or address identified for filing objections, above, and the interested person must identify the specific issues they have interest in discussing. During the objection meeting, interested persons will be able to participate in discussions related to issues on the agenda that they have listed in their request to be an interested person.

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

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

Summary

Challenges related to prairie dog management and the potential reintroduction of black-footed ferret have existed since completion of the 2002 grassland plan (USDA Forest Service 2002). 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.

The final environmental impact statement contrasts a no-action and four 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.

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; and
- 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 were sent 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 scoping comments and concerns, the interdisciplinary team developed three action alternatives as well as a no-action alternative that were analyzed in detail in the draft environmental impact statement. During the 90-day comment period on the draft environmental impact statement, the Forest Service received about 275 comment letters, with about 50 unique and substantive comments. Although no new issues were raised, commenters provided detailed suggestions on how to improve the analysis and recommendations for new alternatives. The interdisciplinary team developed alternative 5—the preferred alternative—in response to those comments. 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; 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; and the preferred alternative that combines aspects of the action alternatives into the management alternative that the agency staff considers most likely to be successfully implemented.

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 objectives 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 prairie dog colony acreage objective of 33,000 acres.

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 prairie dog colony acreage objective 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 prairie dog colony acreage objective 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 grassland-wide, 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 be 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 prairie dog colony acreage objective 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.

Alternative 5 – Preferred Alternative: Management Area 3.63 – Black-Footed Ferret Reintroduction would be changed to Management Area 3.67 – Short-Stature Vegetation Emphasis and boundaries revised. Prairie dog colonies would be managed toward a prairie dog colony acreage objective 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 fumigants, and there would be a seasonal recreational shooting restriction in management area 3.67.

Action alternatives developed for this plan amendment project would generally decrease the objective for acres of habitat provided 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 and comment periods or to analysis required by law, regulation, or policy. Table 1 summarizes the effects of alternatives related to the issues raised identified for analysis.

The responsible official will review the preferred alternative, 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 preferred alternative; whether to implement a plan amendment to change prairie dog management as described in a different alternative; whether to implement a combination of alternatives analyzed in detail; whether to adopt amended grassland-wide, 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 identified for analysis

Issue	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Grassland-wide	Alternative 4 Prairie Dog Emphasis	Alternative 5 Preferred Alternative
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. 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.

Summary

Issue	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Grassland-wide	Alternative 4 Prairie Dog Emphasis	Alternative 5 Preferred Alternative
Contributions to black-footed ferret recovery	Management area 3.63 is managed for 18,000 acres or more of prairie dog colonies, expected to be enough acreage to support at least 100 breeding adult ferrets. Boundary management has had limited success, and lack of social acceptance for reintroduction and recurrence of sylvatic plague have prevented reintroduction efforts since 2002.	Management area 3.67 is managed for 10,000 acres of prairie dog colonies, expected to be enough acreage to support at least 30 breeding adult ferrets. Lower prairie dog colony acreage objectives and explicit boundary management are intended to meet minimum requirements for reintroduction in Wyoming.	The grassland is managed for 10,000 to 15,000 acres of prairie dog colonies, expected to be enough acreage to support at least 100 breeding adult ferrets. However, the colonies may not be in close enough proximity to provide ideal reintroduction areas. Use of anticoagulants is not consistent with reintroduction area management. Lower prairie dog colony acreage objectives and explicit boundary management are intended to meet minimum requirements for reintroduction in Wyoming.	Management area 3.67 is managed for 18,000 acres or more of prairie dog colonies, expected to be enough acreage to support at least 100 adult ferrets. Explicit boundary management may decrease conflicts even while maintaining higher prairie dog colony acreage objectives.	Management area 3.67 is managed for 10,000 acres of prairie dog colonies, expected to be enough acreage to support at least 30 adult ferrets. Lower prairie dog colony acreage objective and explicit boundary management are intended to meet minimum requirements for reintroduction in Wyoming. An integrated approach to plague management is required in management area 3.67 to reduce impacts from sylvatic plague.

Issue	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Grassland-wide	Alternative 4 Prairie Dog Emphasis	Alternative 5 Preferred Alternative
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.	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.
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.	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.

Issue	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Grassland-wide	Alternative 4 Prairie Dog Emphasis	Alternative 5 Preferred Alternative
Human exposure to plague	1-mile residence buffers are in place for human health grassland-wide, but boundary management zones are not in place.	1-mile residence buffers are in place for human health grassland-wide, and ¼-mile boundary management zones are in place around management area 3.67.	1-mile residence buffers are in place for human health grassland-wide, and ¼-mile boundary management zones are in place grassland-wide.	1-mile residence buffers are in place for human health grassland-wide, 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.	1-mile residence buffers are in place for human health grassland-wide, and ¼-mile boundary management zones are in place around management area 3.67.
Impacts of recreational shooting on target and nontarget species	Impacts are unlikely due to shooting prohibitions and restrictions.	Impacts are more likely than no action or the 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.	Impacts are more likely than no action or the 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.

Issue	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Grassland-wide	Alternative 4 Prairie Dog Emphasis	Alternative 5 Preferred Alternative
Recreational shooting opportunities	Fewer opportunities than the proposed action and grassland-wide alternatives due to year-round shooting prohibitions in management area 3.67 and 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.	More opportunities than no action or the prairie dog emphasis alternative, 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 management area 3.67 and 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.	More opportunities than no action or the prairie dog emphasis alternative, but fewer opportunities than the grassland-wide alternative due to seasonal shooting restrictions in management area 3.67.
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 no action or the prairie dog emphasis alternative, 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 three applications of zinc phosphide.	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.	More likely to impact nontarget species than no action or the prairie dog emphasis alternative 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. Fumigants also allowed in the 1-mile residence buffer and within ¼ mile of State and private lands after two applications of zinc phosphide. Less likely to impact nontarget species than the grassland-wide alternative.

Summary

Issue	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Grassland-wide	Alternative 4 Prairie Dog Emphasis	Alternative 5 Preferred Alternative
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 percent effective; repeated applications on the same location can reduce effectiveness over time (for example, bait shyness ²).	Most effective since anticoagulants and fumigants are allowed in the boundary management zone after three applications of zinc phosphide.	Generally effective. One application of zinc phosphide is generally 75 to 95 percent effective; repeated applications on the same location can reduce effectiveness over time (or example, bait shyness).	Generally effective. One application of zinc phosphide is generally 75 to 95 percent effective; repeated applications on the same location can reduce effectiveness over time (for example, bait shyness). Fumigants may be used after two applications of zinc phosphide to increase effectiveness of treatments in the 1-mile residence buffer and within ¼ mile of non-Federal land.

² Bait shyness (or poison aversion) -- avoidance of a toxic substance by an animal that has previously ingested the substance.

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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 final environmental impact statement in compliance with the National Environmental Policy Act and other relevant Federal and State laws and regulations. The final 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.³ 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 concluded in January 2020. The responsible official for this project is Russell M. 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. Details on how to file an objection follow the abstract at the beginning of this document.

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 Preferred Alternative:** 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 issues raised by partners, stakeholders, and the public. This section also provides a summary table of the environmental consequences associated with each alternative.
- **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

³ 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>

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 final environmental impact statement.
- **Appendices:** The appendices provide more detailed information to support the analyses presented in the final environmental impact statement. Appendix A provides proposed plan components for each alternative, appendix B provides proposed management approaches, appendix C is the response to comments, appendix D is the biological evaluation for plants, appendix E is the biological evaluation for animals, and appendix F documents a consistency review of county land use plans.

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 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, Colorado; the Medicine Bow-Routt National Forests and Thunder Basin National Grassland, based in Laramie, Wyoming; and the Douglas Ranger District, based in Douglas, Wyoming.

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 National Grassland 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 National Forest System 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 1960,⁴ and in the case of the national grasslands, the Bankhead Jones Farm Tenant Act of 1937,⁵ as amended.⁶ Most specific to the purposes of this environmental analysis, the substantive requirements of National Forest System land management planning regulations⁷ (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 CFR 219.10).

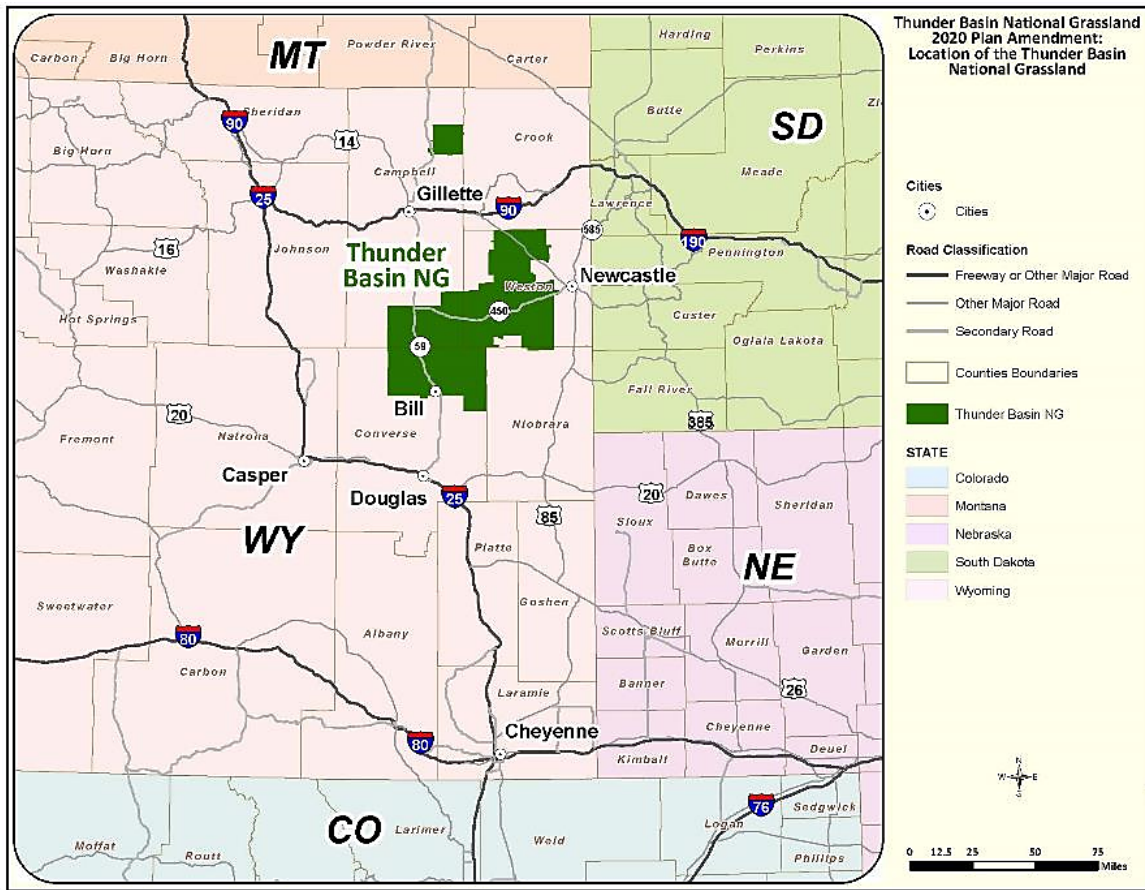


Figure 1. Location of the Thunder Basin National Grassland in Wyoming

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

⁴ As amended through December 31, 1996, Public Law 104-333

⁵ 7 U.S. Code section 1000 et seq.

⁶ “National Grasslands Management: A Primer” provides an 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

⁷ 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>

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 disproportionately large relative to their abundance (Hoogland 2006). 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.⁸ 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.

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 2015.⁹

⁸ U.S. Fish and Wildlife Service 12-month [Finding on a Petition to List the Black-tailed Prairie Dog](https://www.fws.gov/mountain-prairie/es/species/mammals/btprairiedog/74FR63343.pdf) as Threatened or Endangered: <https://www.fws.gov/mountain-prairie/es/species/mammals/btprairiedog/74FR63343.pdf>.

⁹The Thunder Basin National Grassland land and resource management plan and associated documents, including the final environmental impact statement, record of decision, amendments, and the Thunder Basin National Grassland Black-Tailed

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, as well as their impacts on the landscape, are critical considerations.

Despite their ecological significance, 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)) as well as a species of greatest conservation need. 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 to horses, cattle, or humans, and prairie dogs can pose a risk for transmission of plague-causing bacteria 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 from 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. Between 2012 and 2017, when prairie dog colonies in management area 3.63 increased from nearly 11,000 acres to more than 31,500 acres, there were consistent problems with prairie dog encroachment onto private and State lands and associated concerns.

Prairie Dog Conservation Assessment and Management Strategy, are available on the [national forest planning website: https://www.fs.usda.gov/detail/mbr/landmanagement/planning/](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 National Forest System lands on the TBNG ^{a,b,c}	Total recorded acres on National Forest System, State, and private lands on the TBNG ^{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
2019	1,065	2,438	3,578

^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 were collected in surveys conducted by Forest Service personnel. Data for 2016–2018 were 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 to gauge the full extent of colonies immediately before the plague event.

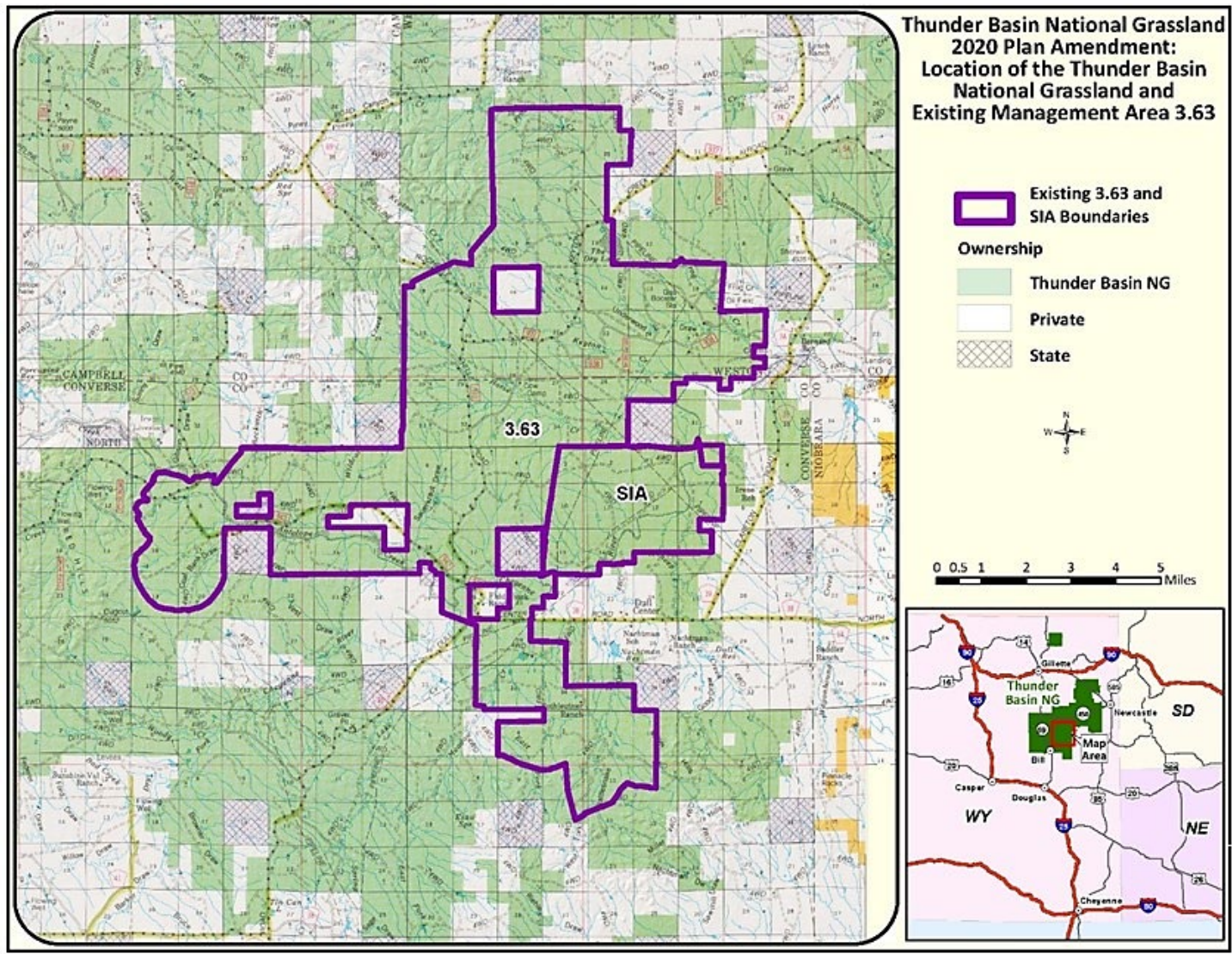


Figure 3. Location of Management Area 3.63 – Black-Footed Ferret Reintroduction Habitat on the Thunder Basin National Grassland

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 near Meeteetse, Wyoming, by 1981, 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 U.S. Fish and Wildlife Service listed the black-footed ferret as endangered in 1967, and it remains in endangered status today.



Figure 4. Black-footed ferret. Photograph by Michael Lockhart, U.S. 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 (USDA Forest Service 2002), 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 National Forest System 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. This is consistent with the emphasis on Federal lands needed to conserve prairie dogs and recover black-footed ferret (Sidle et al. 2006); 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.¹⁰ In 2018, U.S. Fish and Wildlife Service personnel also formally passed leadership of ferret reintroduction to the Wyoming Game and Fish Department, which has played a lead role in reintroduction in the state since ferrets were rediscovered in Meteetsee in 1981. The Wyoming Game and Fish Department finalized a black-footed ferret management plan in 2018¹¹ based on the U.S. Fish and Wildlife Service black-footed ferret recovery plan¹² that includes the following population objectives to contribute toward recovering 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 dog colonies 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.

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) to evaluate and prioritize 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 populations,
- stakeholder support of reintroduction activities, with particular emphasis on local communities and landowners, including adjacent landowners, permittees, and lessees.

¹⁰ 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>

¹¹ Wyoming Black-Footed Ferret Management Plan: https://wgfd.wyo.gov/WGFD/media/content/PDF/Wildlife/Nongame/Wyoming-BFF-Management-Plan_11-14-2018.pdf

¹² 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. No reintroduction efforts have occurred on the Thunder Basin National Grassland, and none are being planned at this time.

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 agency-wide directives for land management planning in 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.¹³ Several excerpts of pertinent requirements of the amended 2012 Planning Rule are included below. This listing is not intended to be comprehensive, but serves to clarify comments and questions raised during public comment periods. The record of decision for this project provides further detail on how the plan amendment complies with procedural and substantive requirements of the 2012 Planning Rule.

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 “Purpose and Need for Action” section under “Changed Conditions.” It is based on other documentation of new information, changed conditions, and changed circumstances.

¹³ 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)(4)).
 - ◆ 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 2012 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, prairie dog colony acreage objectives, and restrictions on rodenticide use and recreational shooting. Examples of species-specific plan components are specific colony sizes or timing restrictions 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 evaluations of plant and animal species and plant and animal potential species of conservation concern reports (appendices D and E).
- 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 identifying any potential substantial adverse impacts or substantially lessened protections during the analysis associated with the proposed plan amendment. Effects to this preliminary list of potential species of conservation concern are disclosed in the potential species of conservation concern reports (appendices D and E) 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 commenters recommended during the scoping period and draft environmental impacts statement comment periods. 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 used 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 the biological evaluations and the final environmental impact statement. Literature cited may also include scientific information that is discussed 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 and potential species of conservation concern reports for plant and animal species (appendices D and E).

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 using a series of decision screens. 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 a 2015 update to the strategy and the associated decision screens, prairie dog colonies on and around the national grassland began to expand significantly. The population expansion continued into 2016 and 2017, perhaps due to regional and localized drought conditions (Wang et al. 2019), exceeding anything seen in recent history. Mapping efforts during these years showed prairie dog colonies expanded to more than 48,000 acres on National Forest System 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. The strategy states that management direction contained in the strategy should be reviewed when colonies exceed 35,000 acres on Federal land grassland-wide.

The initial use of nonlethal prairie dog control methods in management area 3.63, as directed in the strategy, proved inefficient and costly, and implementation of the strategy was unsuccessful in addressing encroachment onto private and State lands. Use of some key prairie dog management tools such as translocation and prescribed burning has been halted over the past decade because of local social resistance to them. In addition, contradictions between the strategy and the decision screens regarding thresholds for the use of rodenticides to address encroachment led to partial inconsistencies between management direction and implementation. A description of implementation activities and associated costs since the 2009 amendment is included in the socio-economic analysis in chapter 3.

The colony acreages of 2017 triggered the need to review the 2015 Prairie Dog Conservation Assessment and Management Strategy. Though the Forest Service worked with collaborators to further refine and update the decision screens in 2017, 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 eliminate inflexibility and contradictions in the plan, strategy, and decision screens to improve boundary management to minimize prairie dog encroachment onto non-Federal lands. Providing a wider array of management options to respond to changing conditions and stabilize colony area could allow more flexible and 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. At that time, the Forest Service elected not to use plague mitigation tools such as deltamethrin on the grassland. The plague event further emphasized 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 informed 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; and
- 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.

Preferred Alternative

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 was modified following the scoping process as part of the iterative nature of the National Environmental Policy Act and grassland planning process, and was analyzed in full in the draft environmental impact statement. Following public comment on the draft environmental impact statement, the Forest Service staff developed alternative 5, the preferred alternative. Although it is more similar to the proposed action than other alternatives, the preferred alternative incorporates components from other alternatives analyzed in the draft. Major elements of the preferred alternative include:

1. Change existing Management Area 3.63 – Black-Footed Ferret Reintroduction Habitat to a new Management Area 3.67 – Short-Stature Vegetation Emphasis.
2. Change the boundaries for management area 3.67 to make the area approximately 42,000 acres in size; 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 ¼-mile boundary management zone along boundaries with private or State property in management area 3.67.

5. 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 prairie dog colony acreage objective of 10,000 acres in management area 3.67 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 preferred alternative, 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 preferred alternative,
- whether to implement a plan amendment to change prairie dog management as described in another action alternative,
- whether to implement a combination of alternatives analyzed in detail,
- whether to adopt amended grassland-wide, geographic area, and management area direction consistent with the selected alternative(s), or
- 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, Wyoming, to reach other local stakeholders on May 6, 2019; and hosted 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 public meeting, and approximately 15 were present on the webinar.

Approximately 500 comment letters were received during the public scoping period, with about 40 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.

The notice of availability for the draft environmental impact statement was published in the Federal Register on October 11, 2019. The notice of availability initiated a 90-day public comment period on the draft environmental impact statement that concluded on January 9, 2020. Forest Service personnel sent approximately 300 letters and 400 emails announcing the public comment period and availability of the draft 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 also sent formal consultation letters to 18 Native American Tribes.

Agency personnel presented findings from the draft environmental impact statement to members of the Thunder Basin Working group on November 20, 2019; hosted a public meeting at the Converse County Library in Douglas, Wyoming, to reach other local stakeholders on that same evening; and hosted a webinar to reach a broader audience of stakeholders on November 21, 2019. Approximately 50 people were present at the working group meeting, approximately 7 were present at the public meeting, and 11 were present on the webinar.

Approximately 275 comment letters were received during the 90-day public comment period, with about 50 unique and substantive comments. Commenters again 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. The nongovernmental organization Defenders of Wildlife also provided a petition signed by more than 12,000 individuals opposed to the plan amendment. No new issues were raised during the comment period, but commenters provided detailed suggestions for how to improve the analysis and many provided suggestions for a new alternative.

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 and public comment 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 project's purpose and need (40 CFR 1500.2(e)).

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
 - a. 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.
 - b. 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.
 - c. 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
 - a. 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.
 - b. 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.
 - c. Social issues surrounding black-footed ferret recovery efforts could decrease the likelihood or success of future reintroduction.
3. Forage for permitted livestock
 - a. Management actions that increase or decrease prairie dog colony size, distribution, or density could change forage availability for livestock production on National Forest System land.
 - b. Encroachment of prairie dogs onto private and State lands could impact forage availability for livestock production on private and State land.
4. Economic concerns
 - a. Changes to forage availability could impact income and jobs associated with ranching activities.
 - b. Encroachment of prairie dogs onto private lands could decrease land values and impact facilities.
5. Health and safety concerns
 - a. Existence of plague among wildlife populations on the Thunder Basin National Grassland could pose a risk to human health.
 - b. Burrows in prairie dog colonies could create safety hazards for permittees, workers, visitors, and livestock on National Forest System land and where encroachment has occurred on State and private lands.
6. Recreational shooting
 - a. Prohibitions on shooting may eliminate a tool for controlling prairie dog populations.
 - b. Prohibitions on shooting could reduce recreational opportunities and associated economic benefits for surrounding communities.
 - c. 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. A boundary management zone of ¼ mile may not be adequate to prevent encroachment onto private and State lands.

8. Use of rodenticides
 - a. Rodenticides used to kill prairie dogs could poison and kill other, nontarget wildlife species.
 - b. Restrictions on rodenticide use could make control of prairie dogs ineffective.
9. Cost of implementing the plan amendment
 - a. 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
 - a. More aggressive implementation of the current plan could reduce conflicts and the need for a plan amendment.
11. Laws, regulations, and policies
 - a. 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.
 - b. Forest Service may not be fulfilling its role regarding recovery of species listed under the Endangered Species Act.
 - c. Forest Service may not have legal authority to manage national grasslands for multiple uses.
 - d. Forest Service may not be appropriately addressing detrimental environmental impacts from prairie dog occupancy, including soil erosion.
12. Candidate conservation agreements
 - a. 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
 - a. Occupancy of greater sage-grouse habitat management areas by both prairie dogs and greater sage-grouse could create management conflicts.
14. Collaborative stakeholder group
 - a. If the collaborative stakeholder group is poorly organized, unbalanced in membership, or cannot produce consensus recommendations, 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.¹⁴

Prairie Dog Colony Inventory and Mapping

Inventory and mapping 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. Inventory and mapping efforts will continue into the future, as described 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 among 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 2016.¹⁵ 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 available.

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 Thunder Basin grassland restoration and prairie dog management: <https://www.fs.usda.gov/goto/MBRTB/PrairieDogs>

¹⁵ Medicine Bow-Routt National Forests and Thunder Basin National Grassland [2016 Monitoring Transition](https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd500641.pdf) 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 versus 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. Measurable 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 more than 100 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 Preferred Alternative

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, prairie dog colony acreage objectives 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 four action alternatives in response to issues raised by the public and pursued analysis of five alternatives: the no-action alternative, the proposed action, the grassland-wide alternative, the prairie dog emphasis alternative, and the preferred alternative. Major elements of each alternative related to prairie dog management are presented in this section to describe the types of management changes being proposed. **These major elements 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, setting priorities for prairie dog control, sylvatic plague management, density control, drought management, use of satellite colonies (proposed action only), and inventory and mapping 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 elements 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 retain its current location and size (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 retain its current location and size (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 Objectives and Distribution

- Prairie dog colonies and acreage objectives would be managed based on the categories described in the 2015 Black-Tailed Prairie Dog Conservation Assessment and Management Strategy. These do not represent upper limits, and colonies may continue to grow after objectives 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. See below for explanation of rodenticide use within ½ mile of non-Federal land.

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. Nonlethal 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

- The plague mitigation tool deltamethrin (“Delta Dust”), an insecticide used to control fleas that are a vector for sylvatic plague, may be used in prairie dog colonies across the grassland.

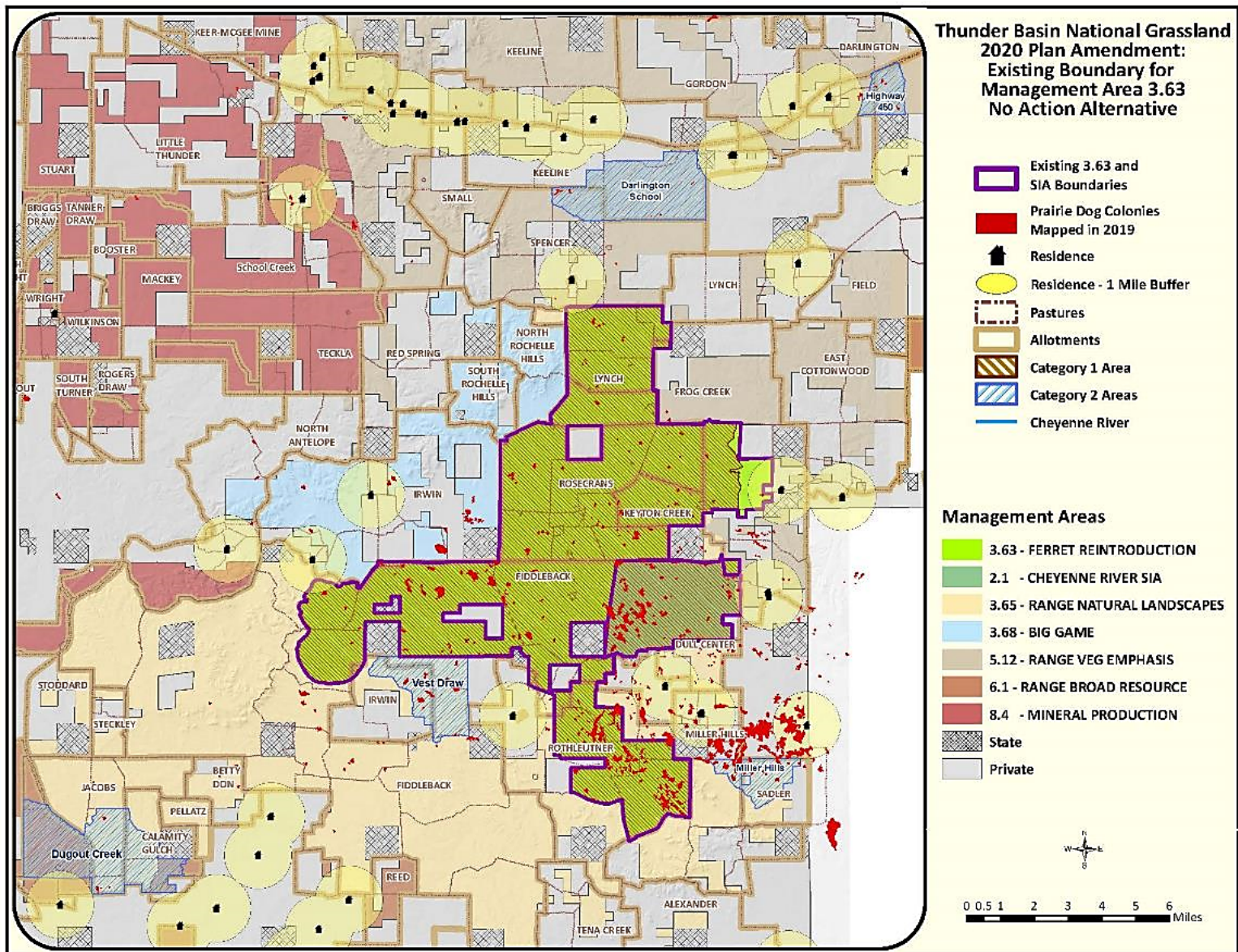


Figure 6. Delineation of management area 3.63, the Cheyenne River Zoological Special Interest Area, and category 1 and category 2 areas in the no-action alternative, with allotment boundaries

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 objectives are met. Nonlethal 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.



Figure 7. Translocation of prairie dogs is one form of nonlethal 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 acreage objectives. Photograph by U.S. 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 it was modified for the draft environmental impact statement in response to public comments. The most substantial change to the proposed action was the addition of seasonal shooting restrictions in management area 3.67. For comparative purposes with other alternatives, major elements 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 southeastern border of management area 3.67 (figure 8). 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.

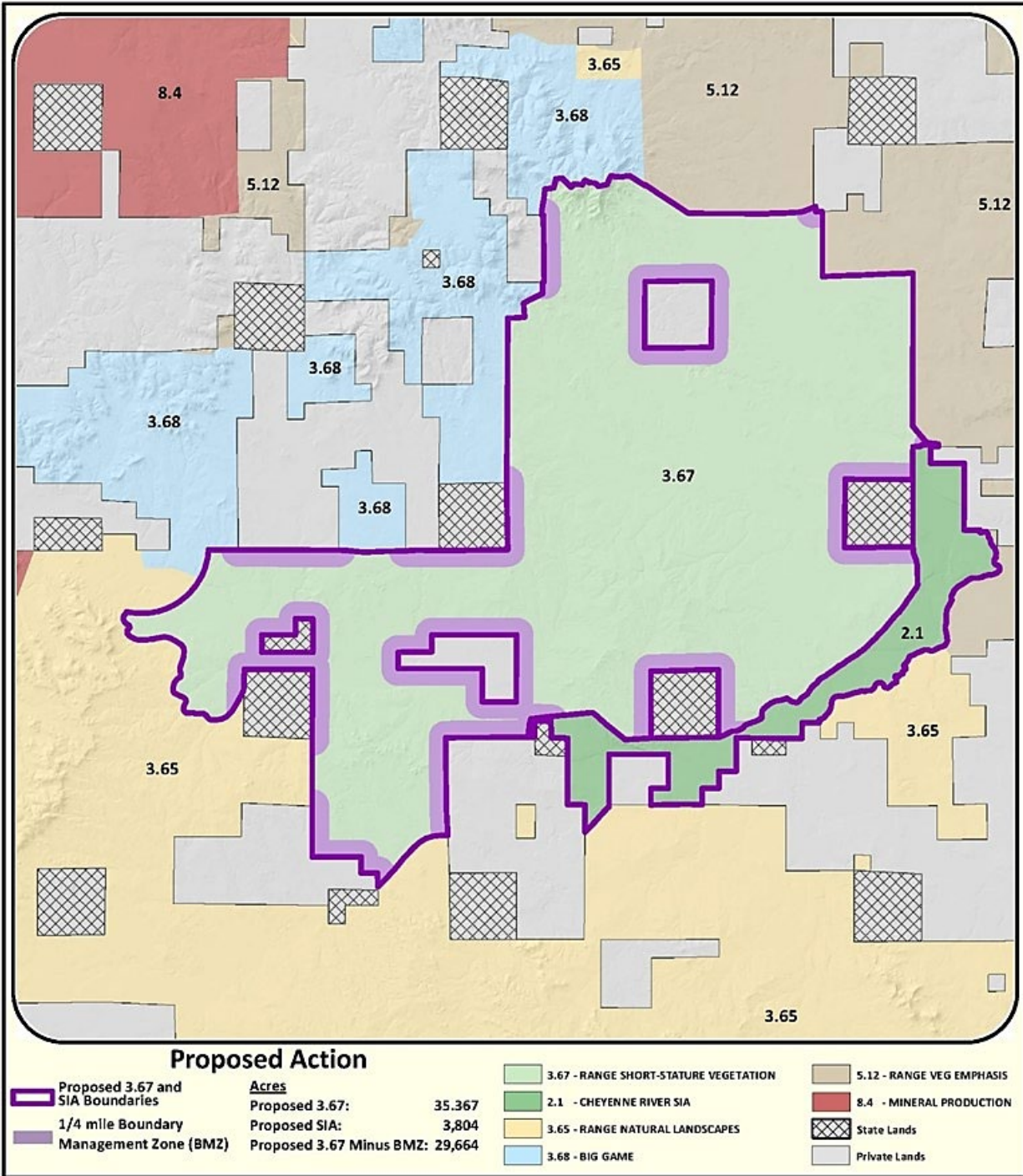


Figure 8. Delineation of management area 3.67 and the Cheyenne River Special Interest Area in the proposed action, showing boundary management zones

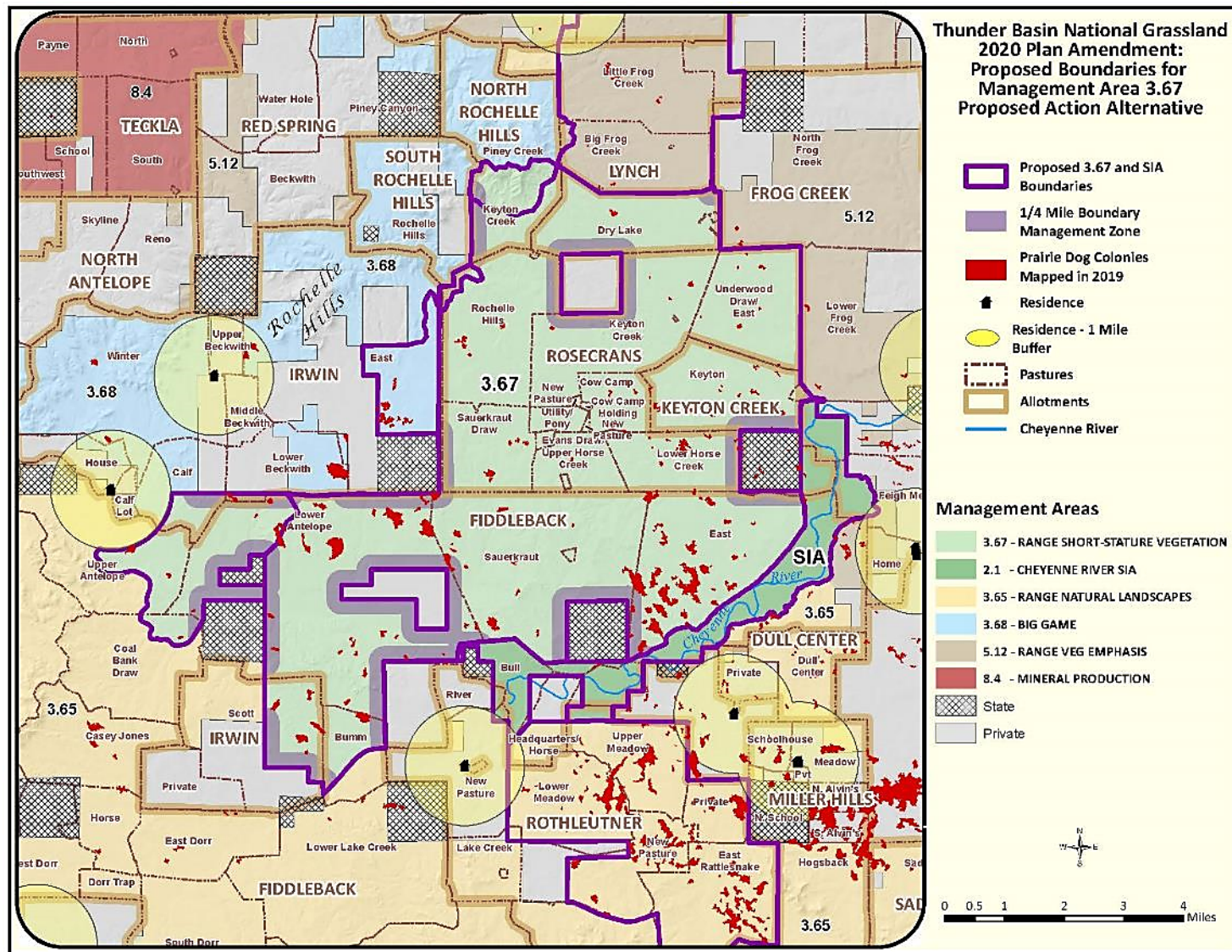


Figure 9. Delineation of management area 3.67 and the Cheyenne River Special Interest Area in the proposed action, with allotment and pasture boundaries

Prairie Dog Colony Acreage Objectives and Distribution

- Prairie dog colonies within management area 3.67 would be managed toward an objective 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 objective.
- 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.
- An objective 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 expansion 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 objective.
- Where persistent or imminent prairie dog colony encroachment occurs within management area 3.67, a temporary $\frac{3}{4}$ -mile boundary management zone could be used to prevent encroachment. Forest Service personnel would consider requests in the context of acreage objectives, 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 colonies¹⁶ 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 shyness, 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 objective of 7,500 acres.

Plague Management

- Plague mitigation tools including deltamethrin (“Delta Dust”) and fipronil, insecticides used to control fleas that are a vector for sylvatic plague (figure 10), may be used in prairie dog colonies across the grassland.
- Appendix B describes considerations for plague management.

¹⁶ 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 objectives 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 U.S. 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 2 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 and the strategy would be rescinded.
- Forest Service personnel would work actively with and accept input on prairie dog management and monitoring from a third-party collaborative stakeholder group. The responsible official would share relevant information with the group and be responsive to information presented by the group. The collaborative stakeholder group would not be a Federal Advisory Committee.
- 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 objective. Several commenters encouraged the analysis of a grassland-wide alternative. For comparative purposes with other alternatives, major elements 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 southeastern border of management area 3.67 and Antelope Creek along the southwestern border of management area 3.67 (figure 11). 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 across the entire grassland 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 objective.
- Where persistent or imminent prairie dog colony encroachment occurs, a temporary 1-mile boundary management zone could be used to prevent encroachment. Forest Service personnel would consider requests in the context of acreage objectives, 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.

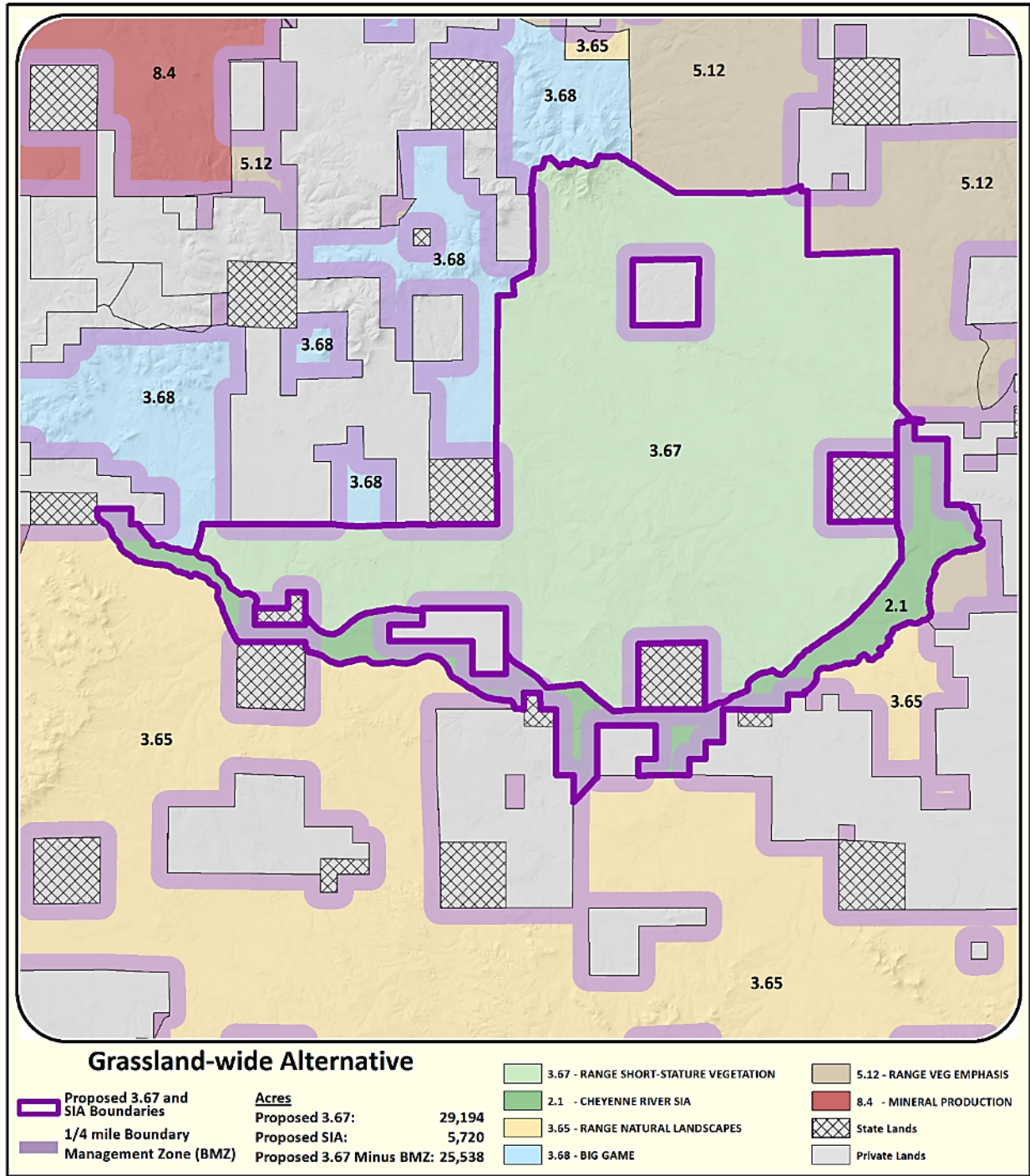


Figure 11. Delineation of management area 3.67 and the Cheyenne River Special Interest Area in the grassland-wide alternative, showing boundary management zones

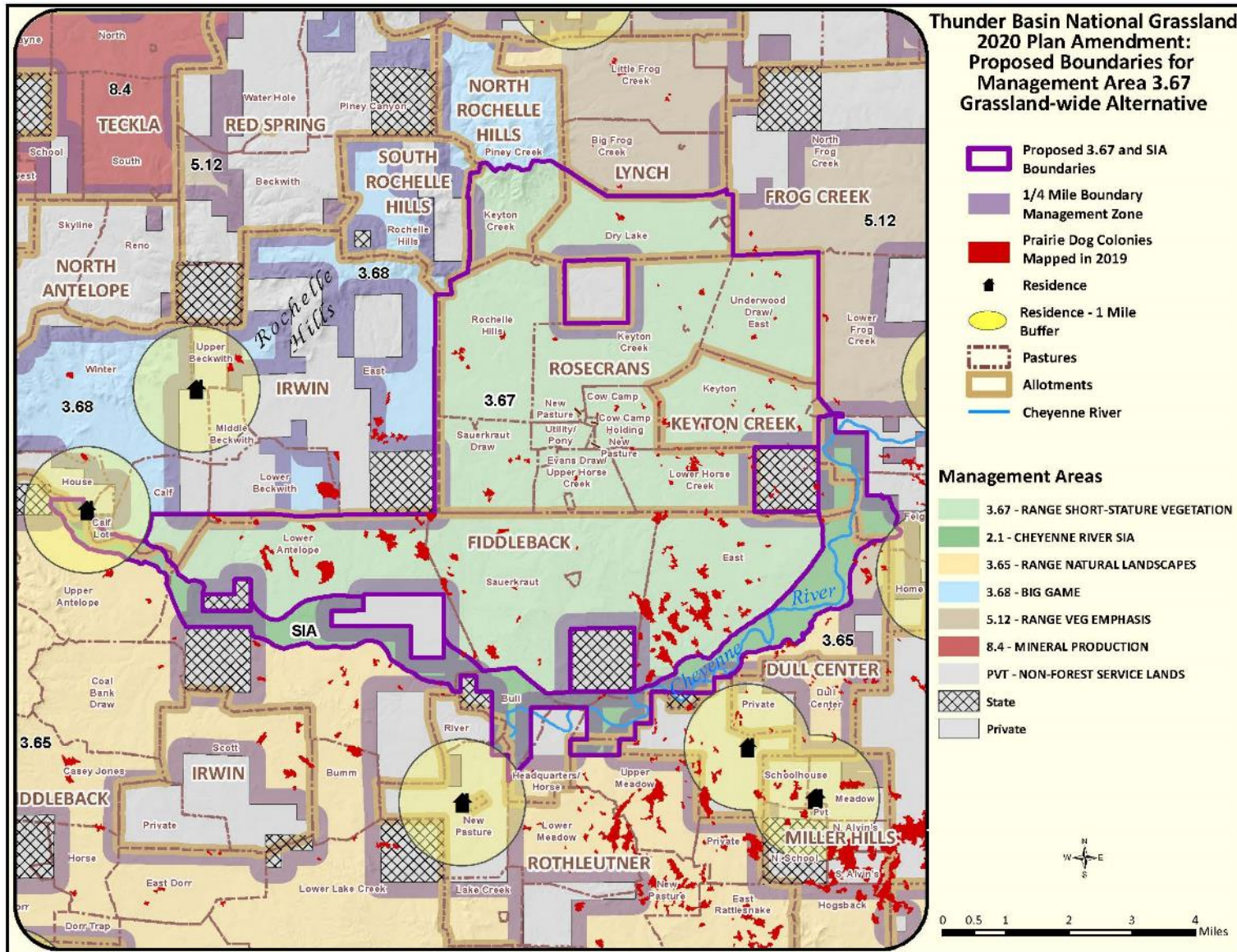


Figure 12. Delineation of management area 3.67 and the Cheyenne River Special Interest Area in the grassland-wide alternative, with allotment and pasture boundaries

Prairie Dog Colony Acreage Objectives and Distribution

- Prairie dog colonies would be managed toward an objective of 10,000 to 15,000 acres across the Thunder Basin National Grassland. To work toward acreage objectives, 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.
- An objective 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 shyness, 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 and on other National Forest System land 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 objective range (10,000 acres) across the Thunder Basin National Grassland.

Plague Management

- Plague mitigation tools including deltamethrin (“Delta Dust”) and fipronil, insecticides used to control fleas that are a vector for sylvatic plague, may be used in prairie dog colonies across the grassland.
- Appendix B describes 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 2 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 the 2015 Black-tailed Prairie Dog Conservation Assessment and Management Strategy and the strategy would be rescinded.
- Forest Service personnel would work actively with and accept input on prairie dog management and monitoring from a third-party collaborative stakeholder group. The responsible official would share relevant information with the group and be responsive to information presented by the group. The collaborative stakeholder group would not be a Federal Advisory Committee.
- 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 elements 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 retain its current location and size (approximately 51,000 acres) (figure 13).
- The Cheyenne River Zoological Special Interest Area would keep its current management area prescription and would retain 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).

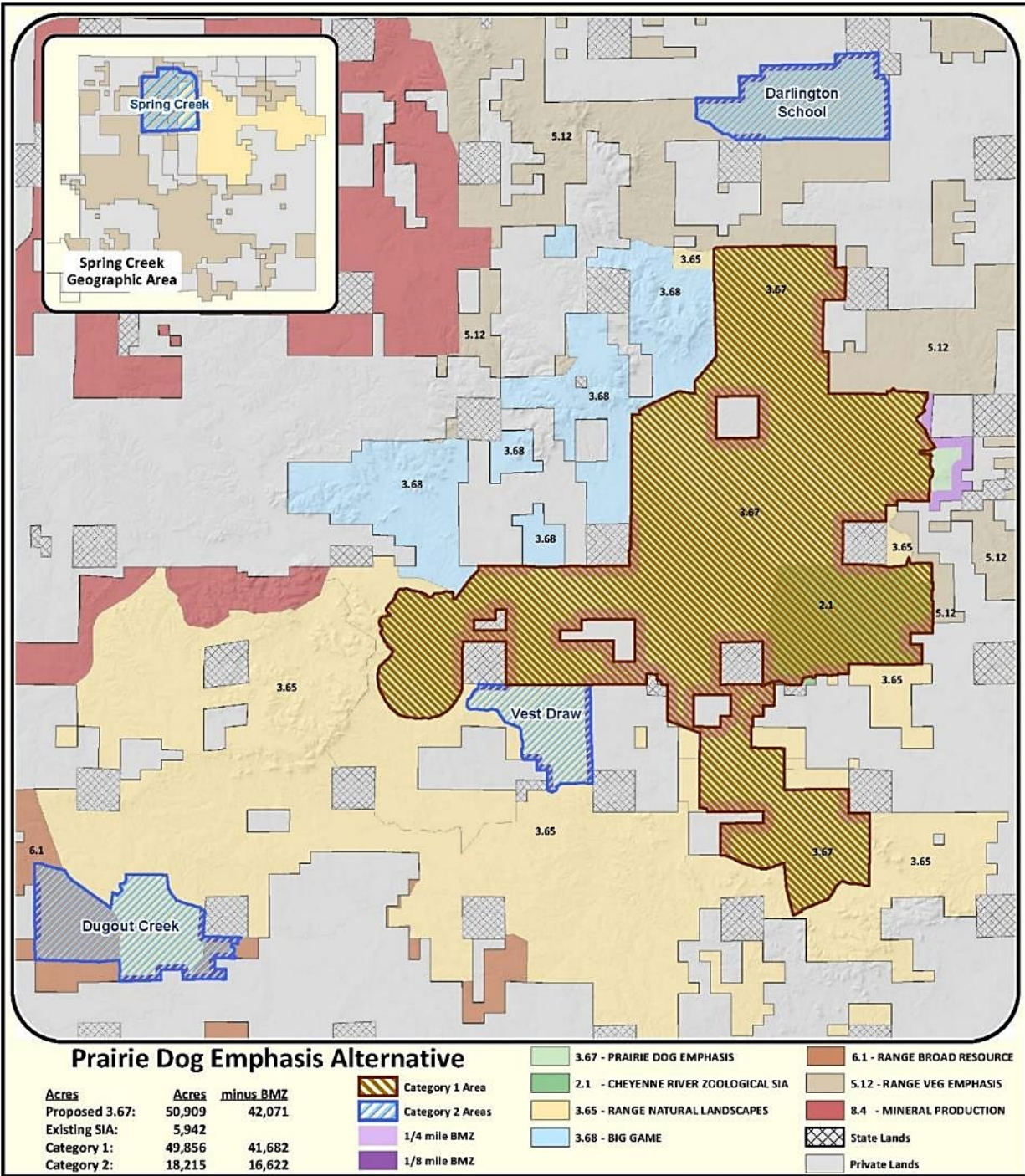


Figure 13. Delineation of management area 3.67, the Cheyenne River Zoological Special Interest Area, category 1, and category 2 areas in the prairie dog emphasis alternative, showing boundary management zones

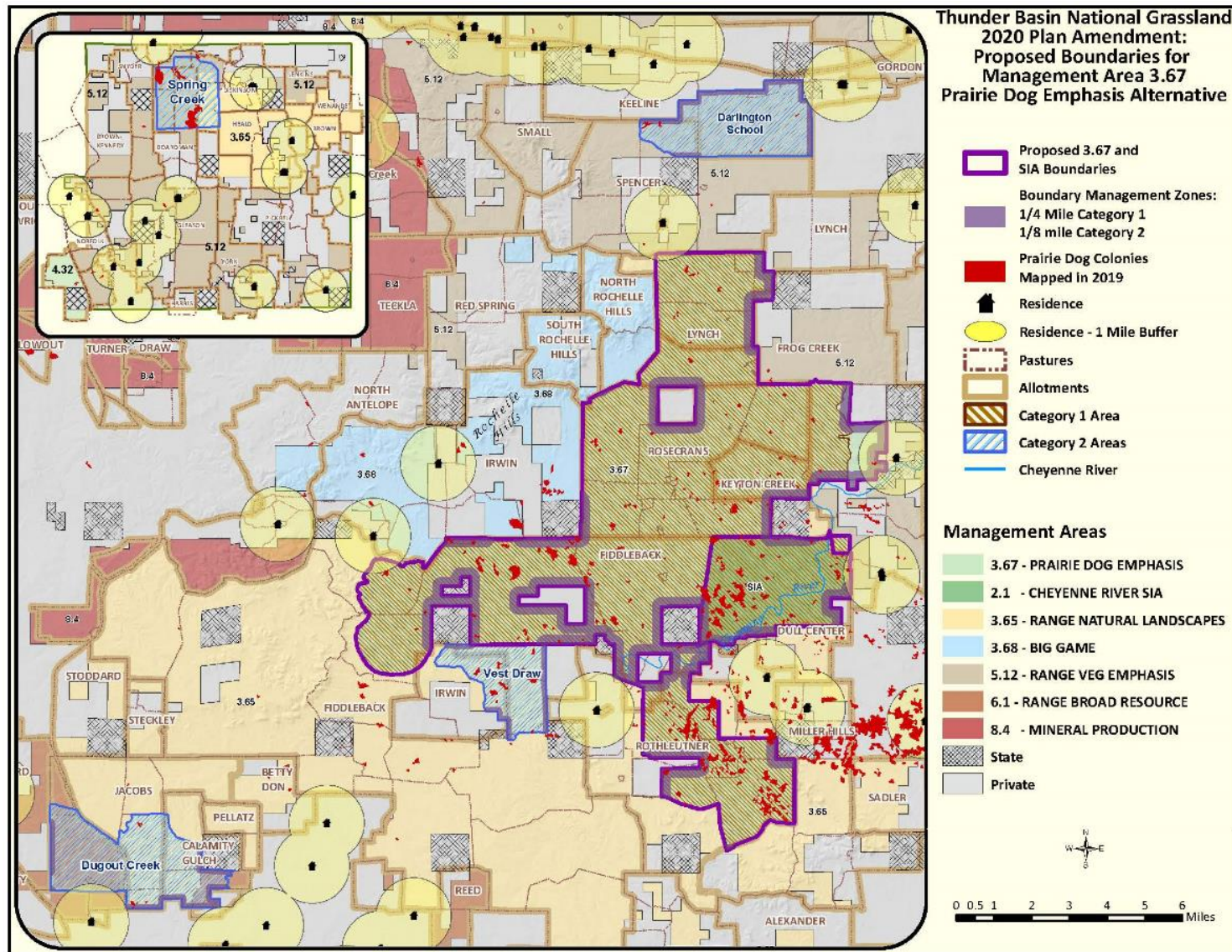


Figure 14. Delineation of management area 3.67, the Cheyenne River Zoological Special Interest Area, category 1, and category 2 areas in the prairie dog emphasis alternative, with allotment boundaries

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 objectives for categories 1 and 2.

Prairie Dog Colony Acreage Objectives and Distribution

- Prairie dog colonies would be managed toward an objective of 18,000 acres in category 1 and 9,000 acres in all four category 2 areas combined.
- Category 3 acreage objectives 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 shyness, 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 mitigation tools including deltamethrin (“Delta Dust”) and fipronil, insecticides used to control fleas that are a vector for sylvatic plague, may be used in prairie dog colonies across the grassland.
- Appendix B describes 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 acreage objectives. Nonlethal forms of density control are allowed at any time in categories 1 and 2 at the discretion of the responsible official. All lethal and nonlethal 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 and the strategy would be rescinded.
- Forest Service personnel would work actively with and accept input on prairie dog management and monitoring from a third-party collaborative stakeholder group. The responsible official would share relevant information with the group and be responsive to information presented by the group. The collaborative stakeholder group would not be a Federal Advisory Committee.
- Appendix B describes how Forest Service personnel expect to interact with a collaborative stakeholder group.

Alternative 5 - The Preferred Alternative

The preferred alternative is most similar to the proposed action, but incorporates components from other action alternatives in a manner that the Forest Service considered most responsive to a variety of public comments and most likely to lead to successful implementation. The most substantial differences between the preferred alternative and the proposed action are the difference in size and delineation of management area 3.67, the elimination of the satellite colony concept, and allowance for use of fumigants. For comparative purposes with other alternatives, major elements 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 –Short-Stature Vegetation Emphasis. Management area size would change from approximately 51,000 to approximately 42,000 acres (figure 8 and figure 16).
- The Cheyenne River Zoological Special Interest Area would be renamed the Cheyenne River-Antelope Creek Zoological Special Interest Area and redrawn to follow the Cheyenne River and Antelope Creek along the southeastern border of management area 3.67 (figure 15). Management direction would be updated to reflect an emphasis on riparian habitat. Special interest area size would change from approximately 5,900 to approximately 5,300 acres. Management area 3.67 direction would not apply within the special interest area.

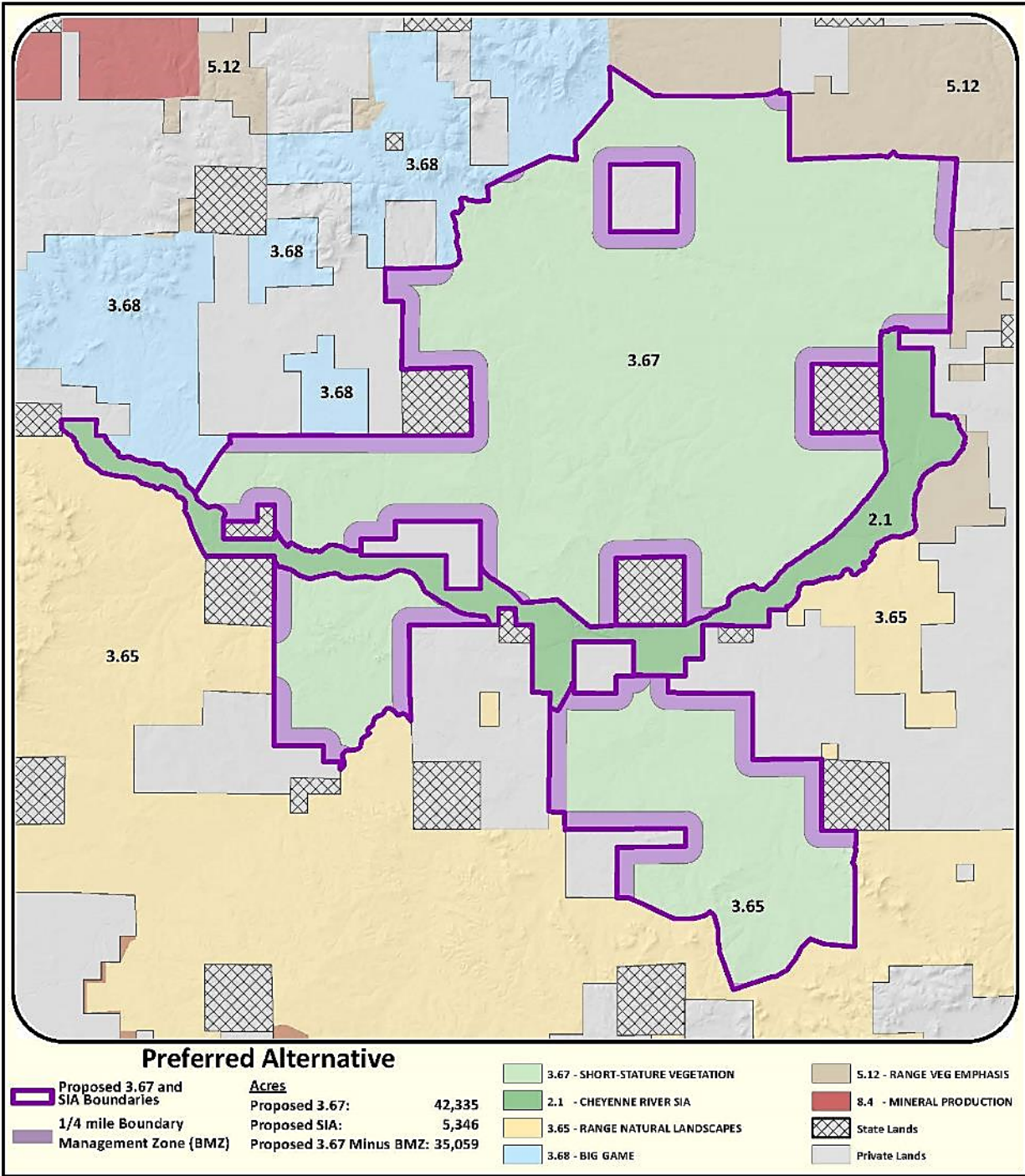


Figure 15. Delineation of management area 3.67 and the Cheyenne River Special Interest Area in the preferred alternative, showing boundary management zones

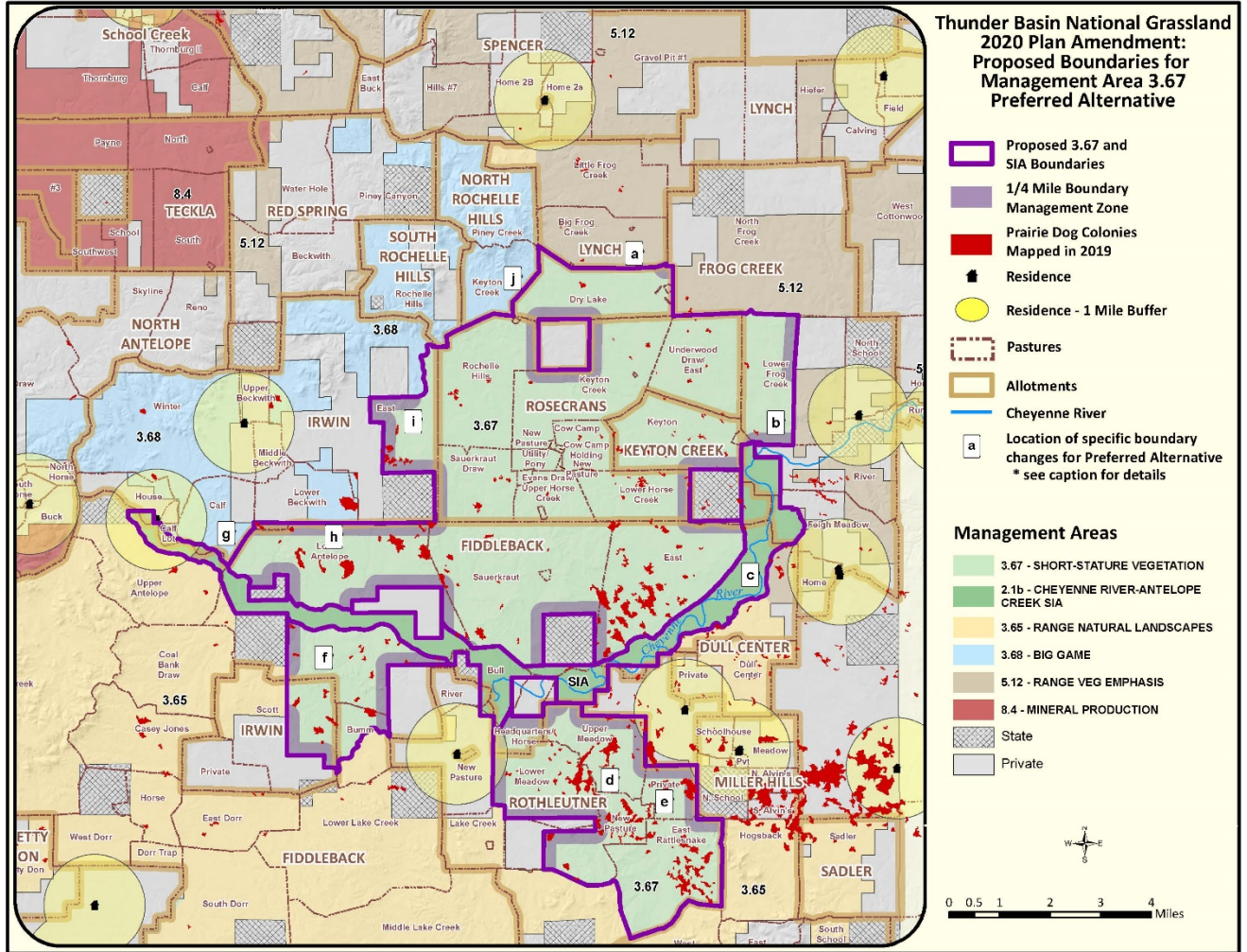


Figure 16. Delineation of management area 3.67 and the Cheyenne River Special Interest Area in the preferred alternative, with allotment and pasture boundaries.

Specific changes made to the preferred alternative compared to no action and the proposed action are highlighted on this map and include: (a) exclude the northern end at the Lynch allotment as in the proposed action to eliminate some overlap of management area 3.67 with greater sage-grouse priority habitat management areas; (b) expand the northeastern side of management area 3.67 compared to the proposed action to include some of the Lower Frog Creek pasture, but still exclude the area around the 4W property, creating a more logical boundary than the current management area 3.63; (c) delineate the Cheyenne River-Antelope Creek Zoological Special Interest Area to include Antelope Creek; (d) include the southern leg of management area 3.63 that contains parts of the Rothleutner allotment because this area historically has prairie dog colonies that can be counted toward the 10,000-acre objective and would better distribute the acreage objective across multiple allotments; (e) move management area 3.67 boundaries out to private property lines in the southern leg that contains parts of the Rothleutner allotment and include boundary management zones to more effectively reduce encroachment; (f) include the Vest Draw area as in the proposed action; (g) exclude more of the westernmost portion of the management area at the Calf pasture of the Irwin allotment to create a more logical boundary; (h) close the boundary management zones between the Lower Beckwith pasture of the Irwin allotment and the Lower Antelope pasture of the Fiddleback allotment because the gap between private property boundaries would be less than 1/2 mile; (i) add a portion of big game management area into management area 3.67 in the East pasture of the Irwin allotment to better reduce encroachment onto private property using boundary management zones; (j) exclude a portion of the Rochelle Hills in the Keyton Creek pasture of the Rochelle Hills allotment since this area does not provide prairie dog habitat.

Prairie Dog Colony Acre Objectives and Distribution

- Prairie dog colonies within management area 3.67 would be managed toward a management objective 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 objective.
- 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.
- When prairie dog colony acreage is less than 10,000 acres, colonies would be managed to allow or facilitate prairie dog colony growth to provide habitat requirements for species associated with prairie dog colonies.
- When prairie dog colony acreage is less than 7,500 acres, use of control tools would not be authorized except in boundary management zones or if approved for density control based on best available scientific information.
- When prairie dog colony acreage is greater than 10,000 acres, prairie dog control tools would be used to maintain the 10,000-acre objective to minimize resource management conflicts.

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 areas adjacent to State and private lands, Forest Service personnel would consider where adjacent landowners are engaging 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 objective.
- A temporary (i.e., 1 to 3 years) $\frac{3}{4}$ -mile boundary management zone that includes the standard $\frac{1}{4}$ -mile boundary management zone may be used at specific locations within management area 3.67 to address imminent or persistent or ongoing prairie dog encroachment if (a) it is confirmed that prairie dogs on Federal land are the source for the boundary problem, or (b) control efforts within $\frac{1}{4}$ mile of private or State property using appropriate tools for 3 consecutive years have not been successful. Before expanding a boundary management zone, the responsible official should consider the total area of prairie dog colonies relative to the 10,000-acre colony area objective, impacts to species associated with prairie dog colonies, compliance with other plan components, site-specific information, and concurrent treatment by the adjacent landowner.

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 following availability of scientific information that demonstrates that use of density control meets treatment objectives for vegetation and dispersal and colonies on which density control is applied, and colonies still provide habitat for associated species.

Approved Rodenticides

- All forms of zinc phosphide approved for use in Wyoming could be used.
- Fumigants would be approved for use in the 1-mile residence buffer, the boundary management zone, and within ¼ mile of private or State property across the grassland, after two applications of zinc phosphide.
- To avoid bait shyness, rodenticide application should not occur for more than 3 consecutive years in a given location.
- The use of anticoagulant rodenticides 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.
- There would be no recreational shooting restriction outside of management area 3.67.

Drought Plan

- During prolonged drought, to mitigate colony expansion, the total acreage of colonies in management area 3.67 may be managed toward a temporary alternate objective of 7,500 acres.
- The management approach for drought situations is described in appendix B.

Plague Management

- An integrated approach to plague management would be required to be implemented within management area 3.67 to reduce impacts from sylvatic plague, decrease the likelihood of major plague events, and help promote conservation of 10,000 acres of colonies.
- The amended plan would include an objective to develop a plague management plan within 3 years of amendment approval.
- 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) may be used for vegetation or dispersal objectives outside of management area 3.67 or within management area 3.67 when acreages are above 7,500.
- If best available scientific information indicates that density control activities will achieve site-specific vegetation and dispersal objectives and maintain habitat requirements for species associated with prairie dog colonies, density control may be authorized in management area 3.67 when colony acres are less than 7,500.
- Colonies treated for density control would count toward acreage objectives in management area 3.67.
- 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 and the strategy would be rescinded.
- Forest Service personnel would work actively with and accept input on prairie dog management and monitoring from a third-party collaborative stakeholder group. The responsible official would share relevant information with the group and be responsive to information presented by the group. The collaborative stakeholder group would not be a Federal Advisory Committee.
- 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). Comments received in response to the proposed action and draft environmental impact statement provided suggestions for alternative methods for achieving the purpose and need for this plan amendment. In some cases, commenters provided complete alternatives that included many or most of the elements described in the previous section. In some cases, only one or a few management suggestions that could be considered as elements 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.

- **RCOWS¹⁷ 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 western 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 objectives 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.
- **Prairie Dog Emphasis and Integrated Resource Management Alternative.** One commenter provided a detailed proposal for this alternative, including suggested language for desired conditions and other plan components. The elements of this proposed alternative were generally analyzed in one or more of the existing alternatives, including the preferred alternative, though not explicitly using the commenter’s language. Many of the language suggestions were not adopted because of the suggested focus on black-footed ferret reintroduction, which is not consistent with the purpose and need for the plan amendment. The suggestion for a no surface occupancy stipulation is addressed below under Conservation Tools.
- **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 National Forest System 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 grassland plan amendment 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

¹⁷ RCOWS – Rochelle Community Organization Working for Sustainability

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.

- **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 acreage objectives, emphasize habitat availability.** Commenters suggested eliminating the concept of acreage objectives 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. Furthermore, prairie dogs create and maintain the habitat that many at-risk species depend on, and other natural or human processes are unable to do. Thus, prairie dog colonies serve as a reasonable proxy for available habitat for many species. The interdisciplinary team developed plan components that address ecosystem integrity and 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 that 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 objective to allow management flexibility, including boundary management zones, residence buffers, and drought, 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 the 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.
- **Set grassland-wide acreage objective of 10,000 acres, and allow control in management area 3.67 and elsewhere on the grassland when mapping efforts show total acreage grassland-wide is at least 10,000 acres.** This suggestion set a minimum size for colonies that would count toward the acreage objective at 200 acres and set a minimum total colony acreage in management area 3.67 of 3,000 acres. Colonies outside of management area 3.67 that count toward the acreage objective would not be protected, nor would those inside management area 3.67 when acreages are above 3,000 acres total. When the total colony acreage across the grassland is less than 10,000 acres, lethal control tools would be not be used in management area 3.67 except in boundary management zones. This alternative was not analyzed in detail because the interdisciplinary team determined these minimum acreages would not provide assurances for viability of at-risk species. The Forest Service's brief analysis revealed that this suggestion assumes that colony growth would always outpace colony control, an assumption that is not supported by inventory and mapping data.

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. The intermingling of State and private lands with National Forest System lands in the grassland results in few large, continuous areas of National Forest System lands interior to boundary management zones that are wider than ¼ mile. Permanent boundary management zones wider than ¼ mile would reduce the flexibility for and practicality of managing toward prairie dog colony conservation objectives. When applied to proposed management area 3.67 in the preferred alternative, a ½-mile buffer decreases the total area and creates more isolated patches of areas available for prairie dog occupation. This fragmentation of areas available to manage for conservation of prairie dog colonies would increase management complexity (figure 17). However, the preferred alternative and the proposed action include an option to temporarily extend boundary management zones up to ¾ mile to address site-specific

persistent or ongoing prairie dog encroachment, and the grassland-wide alternative allows site-specific, temporary extension of the boundary management zones up to 1 mile.

- ◆ **Shooting and poisoning allowed in boundary management zone.** In the proposed action, prairie dog emphasis alternative, and preferred alternative, recreational shooting is not allowed in the boundary management zone. It is not considered a control activity in any of the action alternatives. Management area boundaries have been delineated to the extent possible based on visible features such as fences, roads, and streams. The recreational shooting closure would apply to the entire management area to ensure species protection and effective implementation of closures with clear boundaries for the closure order. 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 because colonies in the boundary management zone would not count toward acreage objectives. 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 prairie dog control tools not otherwise restricted in this plan are also available in the boundary management zones at any time.”
- ◆ **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 a reference plant community for a particular site. A detailed species composition list, including pounds per acre by species, needs to be developed for any states or plant communities that are considered desired plant communities before a similarity index can be calculated for comparison. The ecological site descriptions in Major Land Resource Area 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. While similarity index may serve as an informative measure of plant communities, 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. Because of the time required to collect and analyze the data, use of similarity index would not be responsive to management needs in a timely manner. Furthermore, it is unnecessary in the proposed action and preferred alternatives since there are no triggers needed to initiate control work outside of management area 3.67.
- ◆ **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 would be scheduled for eradication and would not be managed for conservation.

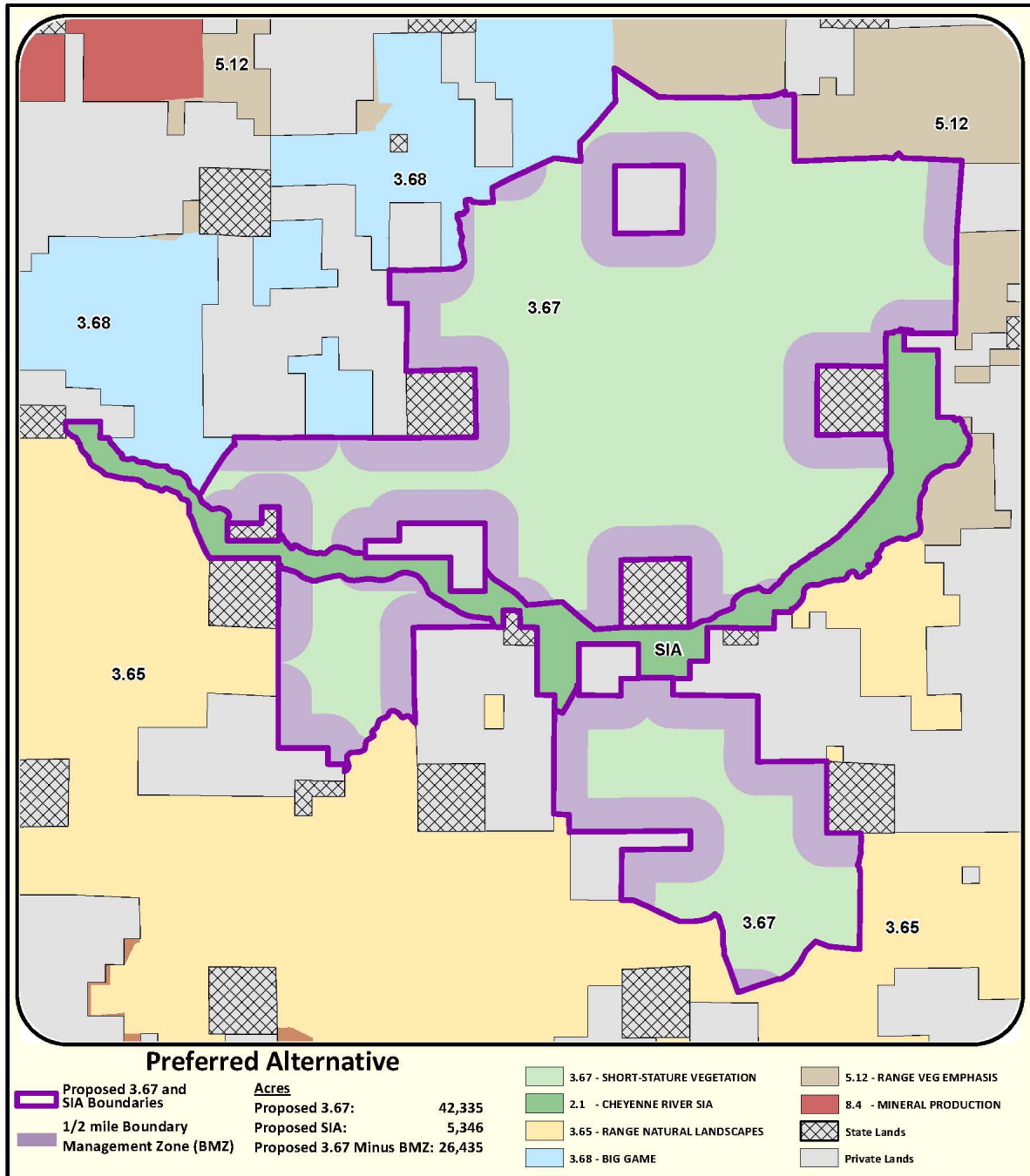


Figure 17. Demonstration of 1/2-mile boundary management zone for management area 3.67 in the preferred alternative

- Create a 1-mile buffer zone along the outside perimeter of management area 3.67 or management area 3.63.** The interdisciplinary team received a comment suggesting the creation of a 1-mile buffer around the entire outer perimeter of management area 3.67, in addition to the creation of a 1/4-mile boundary management zone within management area 3.67. The interdisciplinary team did not analyze in detail a permanent outer perimeter buffer because it would reduce flexibility in prioritizing resources for prairie dog control, especially for addressing encroachment elsewhere on the grassland. However, the preferred alternative and

the proposed action would not preclude poisoning of a de facto outer perimeter buffer as an additional priority for use of control resources, though the habitat value for associated species would have to be considered prior to poisoning in colonies in such a buffer, unless the colony were located within 1 mile of a residence, were causing damage to infrastructure, or were encroaching on non-Federal lands. During implementation of any of the action alternatives, the Forest Service would be open to recommendations from the collaborative stakeholder group regarding prioritization of resources for prairie dog control.

Control Tools and Rodenticide Use

- **Include provisions prohibiting use of poisons on native wildlife; at a minimum, exhaust nonlethal methods before pursuing lethal control.** 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 National Forest System 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.
- **Only use plague management when colonies are below 10,000 acres grassland-wide.** This suggestion was most applicable to the grassland-wide alternative. However, in the context of all alternatives, the Forest Service brief analysis found that setting upper limits on plague mitigation would not meet the intent of using plague-mitigating tools, since plague epizootics are likely to occur when prairie dog populations and colony extents are high. In many cases, this is when colonies most need plague mitigation.

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.

- **Provide 20,495 to 47,931 acres of prairie dog colonies for black-footed ferret reintroduction habitat.** This suggestion was not analyzed in detail because an increase in the acreage objective for prairie dog colonies would not meet the purpose and need for the plan amendment. Objective acreages up to 33,000 acres were analyzed in the range of alternatives.

Grazing Management

- **Decrease permitted AUMs to benefit watersheds and wildlife.** Although this suggestion was not called out explicitly in the range of alternatives, the Forest Service has the authority to decrease AUMs under any of the alternatives analyzed. Changes in AUMs were not considered as part of this plan amendment because the Forest Service has the authority to adjust AUMs according to management objectives and resource condition at any time, and an amendment to the grassland plan is not needed to do so.
- **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 final environmental impact statement was incomplete or unavailable at the time of publication:

- **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 Major Land Resource Area 58B,** which includes the Thunder Basin National Grassland, were updated and approved by Natural Resources Conservation Service at the State level in 2020; however, they are not available to the public in the EDIT database (<https://edit.jornada.nmsu.edu/>) at the time of this publication. The Natural Resources Conservation Service made ecological site descriptions available to the interdisciplinary team for use during this analysis and the descriptions are included in the project record.

Comparison of Alternatives

This section provides a summary of the major management elements of the alternatives (table 3) and the effects of implementing each alternative (table 4 and table 5). Information in the tables focuses 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 elements of the alternatives. This table repeats information presented in the sections above

Major Management Elements	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Grassland-wide	Alternative 4 Prairie Dog Emphasis	Alternative 5 Preferred Alternative
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.	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. Cheyenne River Zoological Special Interest Area would be redrawn to follow the Cheyenne River along the southeastern border of management area 3.67. 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. Cheyenne River Zoological Special Interest Area would be redrawn to follow the Cheyenne River along the southeastern border of management area 3.67 and Antelope Creek along the southwestern border of management area 3.67. 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.	Management Area 3.63 – Black-Footed Ferret Reintroduction Habitat would be changed to Management Area 3.67 – Short-Stature Vegetation Emphasis. Management area size would change from approximately 51,000 to approximately 42,000 acres. Cheyenne River Special Interest Area would be redrawn to follow the Cheyenne River and Antelope Creek along the southeastern border of management area 3.67 and renamed Cheyenne River-Antelope Creek Zoological Special Interest Area. 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 5,300 acres.

Major Management Elements	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Grassland-wide	Alternative 4 Prairie Dog Emphasis	Alternative 5 Preferred Alternative
Prairie dog colony acre objective and distribution	<p>Prairie dog colonies and acreage objectives managed based on 2015 management strategy categories:</p> <p>Category 1: 18,000 acres Category 2: 9,000 acres Category 3: 6,000 acres</p>	<p>Prairie dog colonies would be managed toward an objective of 10,000 acres within management area 3.67.</p> <p>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.</p>	<p>Prairie dog colonies across the grassland would be managed within a range of 10,000 to 15,000 acres. Colonies located anywhere on national grassland would count toward acre range.</p> <p>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 to provide optimal nesting habitat for mountain plover.</p>	<p>Prairie dog colonies and acreage objectives managed based on 2015 management strategy categories:</p> <p>Category 1 would remain the same—18,000-acre objective. Category 2 areas would be modified, but would keep the 9,000-acre total objective. Category 3 acreage objectives would be removed. Management area 3.67 would be managed for two 4,500-acre complexes.</p>	<p>Prairie dog colonies would be managed toward an acreage objective of 10,000 acres within management area 3.67.</p>
Boundary management zone	<p>No boundary management zone, but may allow rodenticide use if colony is within ½ mile of boundary, under certain circumstances.</p>	<p>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.</p>	<p>¼-mile grassland-wide. A temporary 1-mile boundary management zone may be granted under special circumstances. Rodenticide use allowed in boundary management zone regardless of colony acres.</p>	<p>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.</p>	<p>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.</p>

Major Management Elements	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Grassland-wide	Alternative 4 Prairie Dog Emphasis	Alternative 5 Preferred Alternative
Thresholds for rodenticide use	Many conditions required for use of rodenticide.	If the district ranger determines lethal control in management area 3.67 is warranted, and colony acres are below the 10,000-acre objective, 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 grassland-wide, rodenticide use allowed only in boundary management zone or for density control.	Unlike the current strategy, when acreage objectives are met, by category, lethal control would be allowed within that category to return to objective acres.	Rodenticide use and other control tools would be allowed in management area 3.67 when colony acreage is above 7,500 acres. Control tools would be allowed outside of management area 3.67 at any time. Priority for control would be for colonies within 1 mile of a residence, colonies impacting facilities, and the boundary management zone. Other control activities would be prioritized annually.
Approved rodenticides	All forms of zinc phosphide approved for use (October 1-December 31), with many conditions. Only allowed in category 1 area within ½ mile of boundary if acreage objective met and nonlethal options tried. Otherwise conditional based on decision screens.	All forms of zinc phosphide approved for use (allowed only October 1-January 31). 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 (allowed only October 1-January 31). 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 three applications of zinc phosphide.	All forms of zinc phosphide approved for use (allowed only October 1-January 31). Must meet acreage objectives in category 1 and 2 areas before using outside the boundary management zone. Anticoagulants and fumigants prohibited.	All forms of zinc phosphide approved for use (allowed only October 1-January 31). Management area 3.67 must have at least 7,500 acres of colonies. Fumigants approved for use (allowed only October 1-January 31) in boundary management zone, residence 1-mile buffer, and within ¼ mile of non-Federal land, only after two applications of zinc phosphide.
Recreational shooting	Year-round shooting prohibition in management area 3.63 and category 1; conditional restrictions in category 2 areas.	Seasonal restriction (no shooting February 1 to August 15) in management area 3.67, including the boundary management zone and any designated satellite acres. No restrictions on rest of grassland.	No restrictions for prairie dog conservation unless developed as part of complex management plan.	Year-round shooting prohibition in management area 3.67 and category 1. Year-round prohibition in category 2 until acreage objective met, then seasonal restrictions (no shooting February 1 to August 15) in category 2.	Seasonal restriction (no shooting February 1 to August 15) in management area 3.67, including the boundary management zone. No restrictions on rest of grassland.

Major Management Elements	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Grassland-wide	Alternative 4 Prairie Dog Emphasis	Alternative 5 Preferred Alternative
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 objective 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 an objective of 10,000 acres.	No specific management changes under drought conditions.	To mitigate prairie dog colony expansion during extended drought conditions, control tools may be used to work toward a temporary revised acreage objective of 7,500 acres in management area 3.67.
Plague management	Plague-mitigation tools may be used in active prairie dog colonies.	Plague-mitigation tools may be used in active prairie dog colonies.	Plague-mitigation tools may be used in active prairie dog colonies.	Plague-mitigation tools may be used in active prairie dog colonies.	A plague management plan will be developed, and an integrated approach to plague management (e.g., using tools such as deltamethrin and fipronil) will be implemented annually in management area 3.67. Plague mitigation may also be implemented outside of management area 3.67.
Density control	No density control described, but nonlethal density control could be approved.	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 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 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 density control described, but nonlethal density control could be approved.	Experimental density control activities may be authorized in colonies (a) outside of management area 3.67 or (b) in management area 3.67 if colony acreages are above 7,500. If scientific information is developed and indicates that density control achieves vegetation or dispersal objectives and maintains habitat for associated species, then density control may be authorized in management area 3.67 when acreages are below 7,500. Colonies treated for density control would count toward acreage objective.

Major Management Elements	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Grassland-wide	Alternative 4 Prairie Dog Emphasis	Alternative 5 Preferred Alternative
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 and the strategy would be rescinded. 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 and the strategy would be rescinded. 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 the strategy would be rescinded. 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 and the strategy would be rescinded. 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	Alternative 5 Preferred alternative
Moderate attention given to conservation of prairie dogs	Does not meet purpose	Meets purpose	Meets purpose	Somewhat meets purpose	Meets purpose
Increase Forest Service responsiveness	Does not meet purpose	Meets purpose	Meets purpose	Somewhat meets purpose	Meets purpose
Minimize prairie dog encroachment onto non-Federal lands	Does not meet purpose	Meets 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	Meets purpose
Ensure continued conservation of at-risk species	Meets purpose	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	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	Meets need

Purpose and need	Alternative 1 No action	Alternative 2 Proposed action	Alternative 3 Grassland-wide	Alternative 4 Prairie dog emphasis	Alternative 5 Preferred alternative
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	Meets need
Increase the availability of lethal prairie dog control tools	Does not meet need	Meets need	Meets need	Somewhat meets need	Meets need
Enhance engagement with partners	Meets need	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	Alternative 5 Preferred alternative
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. 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.

Issue	Alternative 1 No action	Alternative 2 Proposed action	Alternative 3 Grassland-wide	Alternative 4 Prairie dog emphasis	Alternative 5 Preferred alternative
Contributions to black-footed ferret recovery	Management area 3.63 is managed for 18,000 acres or more of prairie dog colonies, expected to be enough acreage to support at least 100 breeding adult ferrets. Boundary management has had limited success, and lack of social acceptance for reintroduction and recurrence of sylvatic plague have prevented reintroduction efforts since 2002.	Management area 3.67 is managed for 10,000 acres of prairie dog colonies, expected to be enough acreage to support at least 30 breeding adult ferrets. Lower prairie dog colony acreage objectives and explicit boundary management are intended to meet minimum requirements for reintroduction in Wyoming.	The grassland is managed for 10,000 to 15,000 acres of prairie dog colonies, expected to be enough acreage to support at least 100 breeding adult ferrets. However, the colonies may not be in close enough proximity to provide ideal reintroduction areas. Use of anticoagulants is not consistent with reintroduction area management. Lower prairie dog colony acreage objectives and explicit boundary management are intended to meet minimum requirements for reintroduction in Wyoming.	Management area 3.67 is managed for 18,000 acres or more of prairie dog colonies, expected to be enough acreage to support at least 100 adult ferrets. Explicit boundary management may decrease conflicts even while maintaining higher prairie dog colony acreage objectives.	Management area 3.67 is managed for 10,000 acres of prairie dog colonies, expected to be enough acreage to support at least 30 adult ferrets. Lower prairie dog colony acreage objective and explicit boundary management are intended to meet minimum requirements for reintroduction in Wyoming. An integrated approach to plague management is required in management area 3.67 to reduce impacts from sylvatic plague.

Issue	Alternative 1 No action	Alternative 2 Proposed action	Alternative 3 Grassland-wide	Alternative 4 Prairie dog emphasis	Alternative 5 Preferred alternative
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.	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.
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.	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.

Issue	Alternative 1 No action	Alternative 2 Proposed action	Alternative 3 Grassland-wide	Alternative 4 Prairie dog emphasis	Alternative 5 Preferred alternative
Human exposure to plague	1-mile residence buffers are in place for human health grassland-wide, but boundary management zones are not in place.	1-mile residence buffers are in place for human health grassland-wide, and ¼-mile boundary management zones are in place around management area 3.67.	1-mile residence buffers are in place for human health grassland-wide, and ¼-mile boundary management zones are in place grassland-wide.	1-mile residence buffers are in place for human health grassland-wide, 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.	1-mile residence buffers are in place for human health grassland-wide, and ¼-mile boundary management zones are in place around management area 3.67.
Impacts of recreational shooting on target and nontarget species	Impacts are unlikely due to shooting prohibitions and restrictions.	Impacts are more likely than no action or the 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.	Impacts are more likely than no action or the 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.
Recreational shooting opportunities	Fewer opportunities than the proposed action and grassland-wide alternatives due to year-round shooting prohibitions in management area 3.67 and 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.	More opportunities than no action or the prairie dog emphasis alternative, 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 management area 3.67 and 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.	More opportunities than no action or the prairie dog emphasis alternative, but fewer opportunities than the grassland-wide alternative due to seasonal 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	Alternative 5 Preferred alternative
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 no action or the prairie dog emphasis alternative, 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 three applications of zinc phosphide.	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.	More likely to impact nontarget species than no action or the prairie dog emphasis alternative 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. Fumigants also allowed in the 1-mile residence buffer and within ¼ mile of State and private lands after two applications of zinc phosphide. Less likely to impact nontarget species than the grassland-wide alternative.
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 percent 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 three applications of zinc phosphide.	Generally effective. One application of zinc phosphide is generally 75 to 95 percent effective; repeated applications on the same location can reduce effectiveness over time (or example, bait shyness).	Generally effective. One application of zinc phosphide is generally 75 to 95 percent effective; repeated applications on the same location can reduce effectiveness over time (for example, bait shyness). Fumigants may be used after two applications of zinc phosphide to increase effectiveness of treatments in the 1-mile residence buffer and within ¼ mile of non-Federal land.

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 implementing each alternative. Effects analyses are limited to issues raised internally or during the public scoping and comment periods and to analysis required by law, regulation, or policy. This section begins with resources for which minor issues were raised (rare plants, cottonwood recruitment, soils, fire management, and minerals), then provides detailed analyses for resources that had multiple or complex issues raised (rangeland vegetation and livestock grazing, socioeconomics, wildlife, and use of pesticides).

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 National Forest System 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 18) with topography of flat 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 18. 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).

The Thunder Basin National Grassland lies within Major Land Resource Area 58B, Northern Rolling High Plains, Southern Part. As described by the U.S. Department of Agriculture 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 [is] 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 including bison and prairie dogs, 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 colonies, among other impacts related to herbivory, serve as stressors and drivers in the grassland ecosystem. Fire has also played a key role in the grassland ecosystem and even recently, managers have paired prescribed fire with cattle grazing to create landscape heterogeneity. The Thunder Basin National Grassland had historic human-caused disturbances such as farming in the early 1900s that have also had lasting impacts to soil and plant communities.

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. As described in the Introduction, prairie dogs are keystone species with which many other grassland species are associated or upon which they are dependent. Prairie dogs have been present in the Northern Great Plains since before European settlement, and prairie dog disturbance is within the natural range of variation on the Thunder Basin National Grassland.

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,” and in the preferred alternative, it is designated as “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 19), McCown's longspur, and burrowing owl (figure 20). 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 prairie dog colony acreage objectives on National Forest System lands on the Thunder Basin National Grassland, rather than only emphasizing ecological conditions with the presence of short-stature vegetation.



Figure 19. Mountain plover on the Thunder Basin National Grassland. Photograph by Courtney Duchardt



Figure 20. Burrowing owls on a prairie dog mound on the Thunder Basin National Grassland. Photograph by U.S. Forest Service

The preferred alternative and proposed action propose a smaller total prairie dog colony area objective than the other alternatives. The 10,000-acre objective in these two alternatives was discussed initially by the Wyoming Department of Agriculture collaborative stakeholder group as a possible metric for a healthy prairie dog ecosystem. The wildlife analysis confirms that 10,000 acres approximates the minimum colony extent necessary to provide ecological conditions for prairie dog-associated species.

Insufficient information about the biology of prairie dog-associated species is available to determine the exact size and distribution of prairie dog colonies needed to ensure viability for those species. 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 grassland, shows 10,000 acres of colonies approximates the lower limit likely to adequately provide for the persistence of the mountain plover in the plan area. 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 and preferred alternative, is unlikely to compromise species viability because of the expectation that prairie dog colony management will be directed toward the 10,000-acre prairie dog colony acreage objective 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 prairie dog colony acreage objectives, if proposed, could compromise the viability of mountain plover because of the very low densities at which the bird nests, as shown by local research. The overall finding that a minimum of 7,500 to 10,000 acres of prairie dog colonies would be adequate to provide for viability of mountain plover 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 acres could be expected on prairie dog colonies, with few birds occurring outside prairie dog colonies (Duchardt 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. While these figures are consistent with generic figures presented by Lehmkuhl (1984) as thresholds for genetic drift resulting from inbreeding, population genetics are not likely a limiting factor for mountain plover. Oyler-McCance et al. (2008) showed that gene flow resulting from pair bonds created when mountain plovers form mixed flocks on wintering grounds prevents declines in genetic diversity at specific breeding locales. As a result, qualitative evidence regarding mountain plover viability was critical in evaluating the effects of a 10,000-acre colony objective and shows that an ecosystem-based approach to species conservation is appropriate for the plan area. 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 breeding 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 colony extent around the prairie dog colony acreage objective to the extent possible. This may help to mitigate 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.
- 10,000 acres of prairie dog colonies is higher than both the mean (8,397 acres) and median (3,538 acres) colony extent recorded in management area 3.63 since 2001. Colonies will continue to exist in other management areas across the grassland despite not counting toward the 10,000-acre objective. Under the preferred alternative, impacts to breeding and nesting habitat must be considered before using rodenticides in colonies outside of management area 3.67.
- Adjacent private, State, and other Federal lands across the landscape, including lands enrolled in Candidate Conservation Agreements and Candidate Conservation Agreements with

Assurances, contain significant area of prairie dog colonies and bare ground and short-stature vegetation habitat that contribute to the resilience of both prairie dog and mountain plover populations on the grassland. These colonies do not count toward the 10,000-acre objective and are not relied upon in the analysis for persistence, but will contribute to resilience.

Managing Toward an Acreage Objective for Prairie Dog Colonies

In the proposed action and preferred alternative, 10,000 acres is set as a management objective for the extent of prairie dog colonies. Similarly, the grassland-wide alternative includes an objective 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 objectives. In the current condition, for example, an estimated 2,438 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-mitigation tools such as deltamethrin and expand prairie dog occupancy on National Forest System lands toward the acreage objective 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 objective 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 removal of colonies in the interior of management area 3.67.

Prairie dog colonies are inventoried and mapped annually by Thunder Basin National Grassland staff and with agreements with partner agencies and organizations. A management approach for inventory and mapping work 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 unless it is a ground disturbing activity.

This decision will not restrict use of tools for plague management or prairie dog control that may be developed in the future. For example, a new plague vaccine or rodenticide could be approved by the Environmental Protection Agency and the Wyoming Department of Agriculture, a new method for deterring or relocating prairie dogs may be developed, or science may become available indicating that density control activities will achieve site-specific objectives and maintain habitat requirements for species associated with prairie dog colonies. 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 or 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. If the tool does require additional analysis or a new decision, the analysis can be streamlined by tiering to this final environmental impact statement.

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. Plant species 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 Report on Preliminary List of 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 additional plant species were evaluated and 13 (plus Barr’s milkvetch) were found that meet the criteria for potential species of conservation concern.

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

- Barr’s milkvetch, *Astragalus barrii**
- smooth goosefoot, *Chenopodium subglabrum**
- Watson’s goosefoot, *Chenopodium watsonii**
- Texas toadflax, *Nuttallantus texanus**
- rosy palafox, *Palafoxia rosea**
- narrowleaf pectis, *Pectis angustifolia* var. *angustifolia*
- sunbright, *Ptermeranthus 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 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 is 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 is

expected to have any direct, indirect, or cumulative effects on this species. Therefore, the biological determination under all alternatives for both sensitive species is *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 plant species that meet the criteria for potential 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 21) has experienced a lack of plains cottonwood (*Populus deltoides* var. *occidentalis*) recruitment in the last century and possibly longer (Scott and Miller 2017). This pattern can be seen across western states and often has complex causal factors that vary by site, many of which are likely being exacerbated by climate change. Where studied, hydrogeomorphic¹⁸ changes caused by human activities were found to be the primary driver of this decline. This includes changes to groundwater levels, stream flow and stream morphology caused by groundwater pumping, water diversion, damming, and alteration of stream flows (Williams and Cooper 2005, Patten 1998, Busch and Smith 1995). Reductions in in-stream flows or the regulation of flows from these human modifications reduce or eliminate natural disturbances and prevent conditions conducive to seedling establishment (Scott and Miller 2017, Braatne et al. 2007). Grazing, agriculture, increased salinity, and the introduction of non-native species also contribute to reductions in establishment and survival (Bhattacharjee et al. 2009, Patten 1998). 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 development, groundwater pumping for agriculture 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).

¹⁸ Hydrogeomorphic – Features pertaining to the interaction of water and landform.



Figure 21. 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 that simply reducing 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 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). Other factors include climate and weather, other herbivory, topography, and parent material. 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. Furthermore, prairie dogs are native species and any changes to soil condition resulting from prairie dog occupancy is considered within the natural range of variation for the Thunder Basin National Grassland.

Fire Management

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 hazardous 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, neither the plan direction for sage-grouse conservation nor the proposed plan direction under this plan amendment 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.” The removal of the specific requirements in this standard would not eliminate or reduce applicability of prescribed fire as a tool for management in any of the action alternatives. Other factors, including status of prairie dog colonies on the grassland, social acceptance for prescribed fire, and fuel and weather conditions will continue to affect the use of prescribed fire.

If prescribed fire were 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

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 developments would continue to operate 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 management area 3.67 planning area and are expanding west and north. Due to the 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. The following map shows the location of oil and gas development in proposed management area 3.67, as described in the proposed action (figure 22).

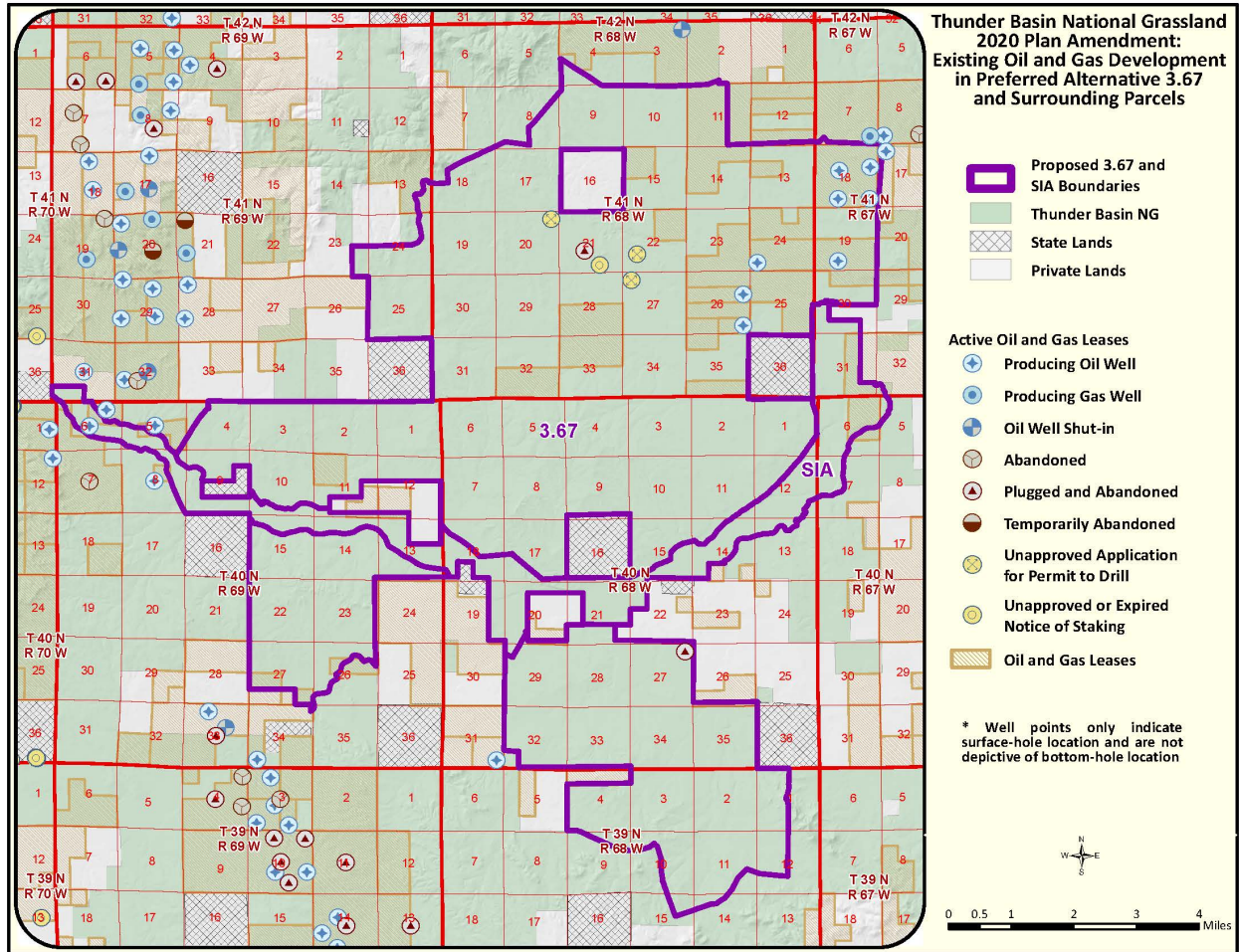


Figure 22. Existing oil and gas development in proposed management area 3.67 as described by the preferred alternative

Analysis of Rangeland Vegetation and Livestock Grazing

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 analysis of effects under each action alternative was completed to address these topics.

Introduction

This analysis focuses on describing if and how the five alternatives will meet the purpose and need for the project with regard to rangeland management, and if and how the alternatives address issues related to rangeland management raised during the scoping and comment periods. 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.

Effects Summary

Rangeland vegetation and livestock management would be affected by prairie dog colony acreage objectives in each of the five alternatives. The no-action and prairie dog emphasis alternatives would result in the greatest potential for prairie dog occupancy, and thus, the largest potential impacts to herbage production and forage availability for livestock. The grassland-wide alternative, proposed action, and preferred alternative would have proportionally reduced impacts. Use of density control in the proposed action and grassland-wide alternatives when prairie dog colony extents are below proposed acreage objectives may result in decreased impacts to herbage production, depending on previous management, age of prairie dog colony, ecological site, and climatic conditions. The same may occur in the preferred alternative if scientific information becomes available that supports the use of density control when prairie dog colony extent is below acreage objectives in management area 3.67. Use of boundary management zones for prairie dog control near state and private properties would decrease impacts to adjacent lands under all action alternatives.

Due to intermingled private and National Forest System land, grazing association members have an interdependent relationship with the national grasslands, and increases or decreases in forage availability for livestock on the national grasslands may cause adjustments in ranch operations. When availability of forage on Federal allotments is inadequate for permitted cattle, often due to a combination of events such as drought and herbivory, grazing association members may need to change grazing management. These management decisions vary among individual ranch operations and may include reducing herd size, grazing for longer periods on private properties, weaning calves earlier, culling less productive cows, removing yearlings earlier, finding and securing other private pasture and rangeland leases, using targeted grazing, or purchasing hay and grains to supplement forage. Additional range or supplemental feed would likely be purchased at prices significantly higher than the cost of grazing on Federal allotments.

Methodology

Analysis Methods

Information from ecological site descriptions and state-and-transition models was used to identify plant communities that occur on the Thunder Basin National Grassland, the communities that develop following disturbances, and their expected levels of productivity. Several scenarios were considered. Specifically, herbage production per acre for the ecological site descriptions' reference state (state 1.1) and sod-bound state (state 2) was compared to expected herbage production following disturbance events such as continuous grazing and frequent and severe defoliation. Per acre production estimates were extrapolated to the acreage objectives for prairie dog colony occupancy for each alternative to compare estimated forage availability among alternatives.

First, prairie dog colonies mapped in 2016 and 2017, and mapped ecological sites from the Natural Resources Conservation Service were examined to determine which ecological sites were occupied during that timeframe 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. Those ecological sites occupied by more than 1 percent of the total prairie dog colony extent in 2016 to 2017 were carried forward and used to project the proportion of prairie dogs likely to occur on different ecological sites as prairie dogs increase in extent from the 2,438 acres mapped in 2019. Thus, this analysis assumes that prairie dogs will occupy ecological sites in proportions similar to those observed in 2016 and 2017. Ecological sites and percent prairie dog occupancy from 2016 to 2017 are described in detail in the Affected Environment section below.

Next, the “representative values”¹⁹ for herbage production were taken from ecological site descriptions for plant communities within each ecological site. The representative value indicates the total biomass production in 1 year and the fluctuations expected during favorable (high), normal (representative value), and unfavorable (low) years (based on weather variability, such as timing and amount of precipitation). For example, the herbage production during the high-precipitation year of 2019 would be near the high value. The normal representative value was documented for the reference plant community (state 1.1) and the sod-bound state (state 2) for each ecological site. Within each ecological site, states representative of the plant communities likely to be found on prairie dog colonies and resulting from transitions or pathways likely to be caused by prairie dogs were identified (state 1, state 2 and state 4 plant communities), and their normal representative value for herbage production was documented. The per-acre production values were scaled up to the acreage objectives for prairie dog colony occupancy identified for each alternative, and a range of possible changes to herbage production under each alternative was calculated, assuming possible transitions from state 1 to state 2 or 4 and from state 2 to state 4. These values are presented in the Environmental Consequences section below.

The reference community for a given ecological site is the plant community best adapted to a local combination of unique environmental factors associated with the site. This community is considered to be in dynamic equilibrium with the environment and able to avoid displacement by the suite of natural disturbances for the area such as fire, drought, herbivory, insects, and disease. Fluctuations in plant community structure and function caused by these natural disturbances create sideboards for the natural range of variability or boundaries of a dynamic equilibrium (USDA Natural Resources Conservation Service 2020). This variability is represented in part by other plant communities described within the reference state resulting from disturbance and restoration pathways. The natural range of variability described for the reference state 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). 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).

The ecological site descriptions in place for the Thunder Basin National Grassland do not describe plant communities associated with prairie dog colonies within the reference state. Although prairie dog colony occupancy is part of the natural range of variation on these ecological sites, we had to use plant communities and disturbances described for alternative states (i.e., state 2 and state 4) to estimate herbage production. The ecological sites evaluated have the same or similar species composition as described in the desired condition in the plan components such as western wheatgrass, green needlegrass, needle and thread, and blue grama. It is expected that with the presence of prairie dog colonies, some sites will transition into different states. This is not a linear transition, but with increased prairie dog herbivory due to increased prairie dog occupancy, it can be assumed that transitions will occur. 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 defoliation; and fire, brush management, or both with long-term continuous grazing without adequate recovery during the growing season.

For each ecological site, herbage production for the baseline condition was estimated based on both the reference state (state 1.1) and the sod-bound state (state 2). The extent of the project area currently in each of these states or plant communities is unknown, so differences in forage availability were estimated for

¹⁹ The representative value is the total annual production expected for a “normal” growing 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.

both states and corresponding plant communities. Forest Service personnel recognize that it may not be possible or desirable to manage for a specific state on all ecological sites.

For each ecological site, state 2 was used to represent herbage production where a plant community change has occurred due to lower density or newer prairie dog colonies. State 4, described as the “increased bare ground state” or state with “short-stature vegetation” was used to represent herbage production on higher density or older prairie dog colonies. Forest Service personnel recognize that these are assumptions used for analysis only and that prairie dog colonization does not represent a departure from the natural range of variation or reference state.

The reference state, state 2, and state 4 were chosen for comparison purposes to estimate differences in herbage production among alternatives and to show a range of plant community responses. Not all colonies will exist with the same level of prairie dog density, length of occupancy, extent of colony, or impact to species composition due to variability across ecological sites and current ecological state present. The representative values were used for this analysis, so herbage production can be compared consistently among alternatives. However, the estimates do not account for relative forage value in relation to colony age, palatability of species present, or ability of livestock to use forage species present.

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 because 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 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.

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 inventory and mapping 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 Major Land Resource Area 58B, which includes the Thunder Basin National Grassland, were updated and approved by Natural Resources Conservation Service at the State level in 2020; however, they are not available to the public in the EDIT database (<https://edit.jornada.nmsu.edu/>) at the time of this publication. The Natural Resources Conservation Service made ecological site descriptions available to the interdisciplinary team for use during this analysis and the descriptions are included in the project record. Current models do not include plant communities associated with prairie dog colonies.

Spatial and Temporal Context for Effects Analysis

Monitoring information from the 2019 field season shows prairie dogs currently occupy approximately 2,438 acres on National Forest System land on the Thunder Basin National Grassland—less than 1 percent of National Forest System land within the administrative boundary. Historic levels have been as high as approximately 9 percent of National Forest System land, with the maximum documented extent occurring in 2016 and 2017; however, not all of the National Forest System land within the administrative boundary was surveyed during this time.

The spatial boundaries for analyzing the direct and indirect effects to ecological sites and their plant communities are National Forest System 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 National Forest System 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

Ecological Sites

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 2,438 acres of the grassland at the time of this analysis. To estimate the occupation of prairie dogs on certain ecological sites, data from 2016 and 2017, gathered at the height of prairie dog extent, were used to understand the ecological sites where prairie dogs are likely to occur. 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. Additional descriptions of the biophysical environment including projected changes to climate and weather events on the Thunder Basin National Grassland are presented at the start of chapter 3 in “Framing the Analysis.”

Table 6 displays the acres of different ecological sites on the Thunder Basin National Grassland and the percentage 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 to 2017 on the Thunder Basin National Grassland within Major Land Resource Area 58B in the 10-to-14-inch precipitation zone (Thunder Basin and Inyan Kara Grazing Associations) and 15-to-17-inch precipitation zone (Spring Creek Grazing Association)

Ecological Site	Acres in the 10-to-14-inch Precipitation Zone	Acres in the 15-to-17-inch Precipitation Zone	Prairie Dog Acres Inventoried 2016 and 2017 in 10-to-14-inch Precipitation Zone	% of Total Prairie Dog Acres Inventoried 2016 and 2017 in 10-to-14-inch 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	466	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 percent 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

Livestock Grazing Management

Permitting

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 authorize grazing of livestock on National Forest System 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 on the Thunder Basin National Grassland range from approximately 109 acres to 70,591 acres, with an average of approximately 6,372 acres. In 1980, 143,000 head months were permitted across the grassland; 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,²⁰ grazed by 53 association members. Over the last several decades, permitted AUMs have decreased for the Thunder Basin Grazing Association. In 1940 and 1952, permitted AUMs were 97,530 and 90,096 respectively. To date, approximately 5,200 AUMs are no longer available to the Thunder Basin Grazing Association because of mine development and resulting special use permits. While some of the AUMs are being used while restoring previous mining areas, these are under direct arrangements with the coal companies and are not administered by the Thunder Basin Grazing Association. The Inyan Kara Grazing Association encompasses 9,593 active grazing allotments with 35,500 permitted AUMs, grazed by livestock owned by 76 association members. The Spring Creek Grazing Association encompasses 15 active grazing allotments with 13,800 permitted AUMs, grazed by livestock owned by 12 association members.

Table 8 displays the current permitted AUMs and average actual use AUMs for each of the grazing associations. Table 9 displays the actual use AUMS for the Thunder Basin Grazing Association from 2009 to 2018. Authorized stocking is adjusted annually, as needed, to account for the effect of natural processes (e.g., droughts, wildfires, hail, prairie dogs, and grasshoppers) on forage availability and resource conditions. Changes in AUMs were not considered as part of this plan amendment because the Forest Service is authorized to adjust AUMs at any time and an amendment to the grassland plan is not needed to do so.

Grazing practices and stocking rates for livestock (primarily cattle on the Thunder Basin) have changed since the 1930s. In general, stocking rates have decreased over time and allotments are considered moderately stocked today. There are many reasons for this decrease in stocking, of which prairie dog colonies are only one. Prairie dog colony impacts on livestock stocking have been variable depending on circumstances over the years. In 2016, when prairie dog populations were at a historic high, livestock did not use the North ½ of the East pasture and Keyton Creek pasture in the Fiddleback Allotment due to lack of forage. The Fiddleback Allotment, as a whole, was also stocked at 12 percent less than permitted, resulting in a difference of 1,903 AUMs. Members in the Lower Frog pasture rotated livestock two months earlier than anticipated, resulting in a difference of 307 AUMs. In other situations, another member was stocked at 70 percent of what was permitted in 2013; and 37, 56, and 75 percent in 2014, 2015, and 2016, respectively. This was due to many reasons, but prairie dog populations did influence their ability to fully stock. On allotments permitted to the Inyan Kara Grazing Association, one allotment has had a difference of 480 AUMs since 2013. Other allotment management examples from 2016 include adjustments of 1,819, 556, 482, and 135 livestock AUMs not used, totaling 20 to 50 percent of those affected allotments.

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 personnel 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.

²⁰ 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 (Mean 2008 to 2018)
Thunder Basin	71,500	54,909
Inyan Kara	35,500	33,630
Spring Creek	13,800	13,800

Table 9. Actual use AUMs by year for Thunder Basin Grazing Association from 2008 to 2018

Year	Actual Use AUMs or Head Months
2008	43,212
2009	56,521
2010	56,424
2011	61,476
2012	59,651
2013	54,722
2014	53,554
2015	54,524
2016	55,445
2017	54,833
2018	53,636

Interests Related to Prairie Dog Colonies

Effects of prairie dog activity at the allotment level are highly variable and dependent on the overall size of the individual allotments in comparison to acres of prairie dog colonies present and the percentage of the allotment that is National Forest System land.



Figure 23. Cattle on a prairie dog colony on Thunder Basin National Grassland. Photograph by Dave Pellatz

Livestock and prairie dogs often occupy the same areas, and competition between livestock and prairie dogs has long been a concern of livestock operators (Hygnstrom and Virchow 1994, Connell et al. 2019) (figure 23). Competition, defined as a phenomenon that results when sharing of resources by two species adversely affects one or both species, is difficult to study under natural conditions, but commonly occurs between livestock and prairie dogs (Hoogland 2006). Several studies have attempted to estimate the degree of competition between livestock and cattle. 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 ecological site descriptions to estimate changes in available herbage.

We do, however, consider the findings of past studies that estimate consumption by prairie dogs and dietary overlap with cattle. These studies include estimates of how many prairie dogs or what extent of prairie dogs are equivalent to one cow or one animal unit month, noting difficulties that arise due to varying densities of prairie dogs, ecological site characteristics, and levels of predation and disease. 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 above ground 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 in one month (Connell et al. 2019).

Concerns related to prairie dog colonies and competition with cattle are often heightened during periods of reduced forage, such as drought. In drought years, livestock performance may decline. Information gathered at the Jornada Experimental Range north of Las Cruces, New Mexico, found that during drought, weaning weights were significantly lower than during normal climatic years (Herbel et al. 1984). Cow weights at calf weaning were also reduced in 2 out of 3 years during the study. During year 2, low conception of cows was also observed. Similarly, Bellido and others (1981) found that drought reduced calf weight gain by 20 percent and adjusted weaning weights were 17 percent lower than during average years.

Livestock management tools can be used to either 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, such as adjustments to season of use, modifying the grazing rotations, fencing (permanent and temporary), additional watering facilities, salt licks, and herding.

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 pathways identified in the state-and-transition models. 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 move 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 could be effective in minimizing expansion. The length and width of the fenced vegetation barriers vary depending on the size of the colony, topography, soils, plant species present or capable of growing on the site, and other factors such as weather. On the Thunder Basin National Grassland, the predominant factor influencing the efficacy of vegetation barriers is soils and the ecological sites' vegetation capability. Vegetation barriers can be used independently or in combination with lethal control or other management.

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 affect 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.

Many of the existing range improvements on Thunder Basin National Grassland were constructed years ago; sometimes their current location does not mitigate for livestock conflicts with other resources or distribution challenges within a pasture or allotment. Without additional fencing or water developments, pastures are not grazed as efficiently and cannot be rested adequately for general rangeland health or other required vegetation management activities. Altering season of use or implementing grazing systems with the addition of fencing or water developments would allow species to be grazed at different phenological²¹ stages. By adjusting the season of use, plants can initiate growth without the stresses of grazing. Using rotational grazing systems ensures the plants are not grazed during the same phenological stage every year, again, allowing initial growth and recovery. Incorporating rest into a grazing system allows plants to complete their entire life cycle without the stresses that may be associated with defoliation. This can affect the plant community by providing those plants associated with different phases the opportunity to recover from grazing utilization. Temporary fencing to exclude livestock may also be incorporated to promote taller vegetation (i.e., vegetation barrier) and reduce encroachment onto private land.

Structural improvements would help improve the overall grazing management on these allotments. Water sources that function properly and fences in advantageous locations help distribute the grazing utilization, drawing grazing animals out of riparian areas, and facilitate rotational grazing. The use of rotational grazing and managing the distribution of the grazing utilization are important tools for achieving the desired conditions and for enhancing or protecting sensitive 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.

Activities such as constructing fences and managing placement of water developments and salt and supplement locations are expected to result in improved livestock distribution, which would relieve a small amount of grazing pressure to habitats such as riparian areas, floodplains, and woody draws. Livestock exclusion through temporary or permanent fencing and resting allotments could benefit certain ecosystems that are sensitive to disturbance, such as riparian areas and natural springs. The construction of new infrastructure including fences and stock tanks can change the distribution of grazing within a pasture, resulting in localized increases or decreases in grazing pressure. Areas with increased grazing pressure may promote prairie dog colony expansion or persistence.

Construction and installation activities of range infrastructure such as pipelines may result in disturbance or mortality of individual prairie dogs and temporary impacts to habitat. However, such impacts would not likely appreciably impact the prairie dog population.

Grassland plan direction will be followed for all new or reconstructed fences to meet big game specifications. Grassland staff would continue to prioritize and, as funding allows, reconstruct fences not meeting big game specifications.

²¹ Phenology – the timing of seasonal life cycle events in plants and animals (Browning et al. 2019).

Effects from Application of Ecological Site Descriptions

All alternatives include changes to geographic area direction (appendix A, chapter 2) that would replace objectives and guidelines to manage for specific percentages of seral and structural stages within each management area and geographic area with desired conditions and guidelines to manage rangeland vegetation based on ecological site descriptions published by the Natural Resources Conservation Service. Current (2002) grassland plan direction is based on early concepts such as those described by Sampson (1917) that evaluate rangeland vegetation following the Clements' (1916) successional theories. These theories were linear in concept, describing that plant communities develop from an early successional "seral stage" to "late seral" stage (historic climax plant community). Much has been observed and learned over the past 100 years with regard to these concepts. The introduction of state-and transition models by Westoby and others (1989) provides an alternative way of describing rangeland plant community development that is not linear and does not refer to a single historic climax plant community, but rather describes many transitional pathways for plant community development.

Ecological site descriptions include state-and transition diagrams that illustrate the current understanding of how rangeland plant communities on the Thunder Basin National Grassland respond to various natural and human-caused disturbances. The state-and transition diagrams, along with the ecological dynamics narratives, identify and describe the different plant community states, phases, thresholds, transitional pathways, and drivers that may occur on a site. Understanding these dynamics help managers predict how a plant community will respond to changes in management and understand dynamics of wildlife habitats across landscapes or home ranges (Holmes and Miller 2010). Recent research emphasizes the importance of heterogeneity on grassland landscapes and the importance of managing for heterogeneity to build resiliency in grassland ecosystems (Fuhlendorf et al. 2017). Use of ecological site descriptions as a tool for management promotes the concepts of ecological heterogeneity more so than the current grassland plan focus on seral and structural stages. Recent reviews of ecological site descriptions have found that grazing is overused as a driver of ecological degradation and restoration, that ecological site descriptions are not currently suitable tools for projecting climate change impacts in rangelands (Twidwell et al. 2014), and that heterogeneity is not yet adequately incorporated into state-and transition models (Fuhlendorf et al. 2012). However, ecological site descriptions can be updated and improved when users identify new information, and are the most comprehensive, up-to-date, standard resource available for rangeland vegetation and wildlife habitat management. Changing plan direction to using ecological site descriptions for all alternatives would:

- Help managers develop recommendations for moving toward desired conditions for a specific site. For example, ecological site descriptions can help clarify what type of vegetation and how much productivity one should expect in certain areas of the grassland.
- Help managers plan long-term vegetation management and with determine optimal seed mixtures for restoration projects. The state-and transition diagrams within each ecological site description describe causes of change and management actions needed to prevent or initiate change.
- Help meet guidelines for managing to prevent or minimize impacts to biotic integrity, soil and site stability, hydrologic function, and forage availability,
- Allow Forest Service, Natural Resource Conservation Service, and Bureau of Land Management personnel to all speak the same language regarding vegetation objectives when communicating with each other and with producers.
- Help inform recovery of sites following prairie dog colony expansion across the grassland, including what seed mixes to use, where vegetation barriers might be the most successful based on the soils, and what level of production one could expect following restoration.

- Be consistent with the Rangeland Interagency Ecological Site Manual, 2013 Interagency Ecological Site Handbook for Rangelands, Department of the Interior and Related Agencies Appropriations Act of 2002 and 2019 Forest Service Washington Office direction to directors and forest supervisors to begin using ecological site descriptions for rangeland and habitat management. This direction follows an executive order and congressional support for use of ecological site descriptions.

General Effects of Livestock and Associated Activities on Noxious Weeds

Livestock and associated management activities are known vectors for noxious weed spread; weeds can accidentally become established in new sites through livestock management activities that bring seeds or plant parts into previously uninfested areas and the livestock themselves can be vectors for new infestations (Belsky and Gelbard 2000). Removing grazing from the project area would remove that vector. However, the infestations that are already established are expected to continue to expand, with or without the influence of livestock grazing. Furthermore, 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 or light use, as demonstrated in invasive species inventory and treatment data gathered in pastures with varying levels of use.

Noxious weeds in the project area are treated as described in the Invasive Plant Management Final Environmental Impact Statement and Record of Decision for the Medicine Bow – Routt National Forests and Thunder Basin National Grassland (USDA Forest Service 2015b). Treatment of noxious weeds will continue regardless of this project. However, with no grazing, cooperation with the grazing association would cease to exist, likely resulting in a reduced number of acres being monitored and treated annually, and ultimately, in an increase in the size of noxious weed infestations.

General Effects of Grazing on Soils

Numerous studies have shown that soil surface ground cover is a major factor in erosion. Wood and Blackburn (1981), McCalla et al. (1984a, b), and Lusby (1965), reported that standing vegetation, litter, bare ground, total ground cover, bulk density, initial soil moisture content, organic matter content, and rock cover all had some influence on infiltration, runoff, and sediment yield. Dadkhah and Gifford (1980) stated that the most important factor influencing sediment production was grass cover, and that 50 percent protective ground cover was sufficient to provide adequate soil stabilization.

Areas where compaction is likely to occur due to reduced ground cover from grazing include watering sites, salting locations, bedding ground locations, trailing paths, or other areas of extensive use (Hausenbuiller 1985). These areas generally represent very small isolated soil disturbances within allotments. Soils in these areas are compacted and have increased susceptibility to wind and water erosion because of reduced vegetative cover and increased bare ground (Clary and Leininger 2000).

Soils in riparian areas are especially susceptible to streambank trampling, soil puddling, and erosion damage where concentrated use is associated with watering and bedding sites. As livestock range across the landscape, minor compaction can occur over broader areas, but it seldom causes long-term degradation. Compaction from livestock is generally a short-term impact, as the effect is often controlled by root action, frost-heave action, and the shrink-swell capacity of the soil.

Effects of Prairie Dogs on 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 prairie dog activity can have a substantial effect on plant community composition and function (Field et al. 2016), 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 conditions, including disturbance processes. On higher productivity sites, taller vegetation may occur and more herbage may be produced; 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 individuals 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 impacted by a disturbance, a decline in vegetative vigor and composition is expected, giving prairie dogs opportunity to inhabit the site. Livestock grazing can increase prairie dog density and extent by creating short-statured vegetation (Field et al. 2016), and through continuous, season-long defoliation, livestock grazing 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 National Grassland, 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; however, species composition did change.

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 is of 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; thus, any increase in quality can only offset the decrease in quantity for so long.

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 et al. 2015). Guenther and Detling (2003) found cattle use of prairie dog colonies to be 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 because of less availability. The attraction of highly palatable forage may alter livestock distribution within an allotment, potentially resulting in modifications to the existing grazing system as well as increased expansion of existing prairie dog colonies. The season of use on the allotment may determine whether this may be a concern. Findings on the Thunder Basin National Grassland suggest that preferential grazing on prairie dog colonies with 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 (occupied 3 to 8 years), there may be little difference in species composition and production, whereas older colonies (occupied discontinuously for more than 26 years) often lead to lower overall plant productivity and changes in species composition (Coppock et al. 1983). Removing prairie dogs following short-term prairie dog occupation may allow the site to return to its prior state or plant community phase, as long as a disturbance threshold has not been crossed (figure 24). Vegetation responses vary widely depending on ecological site, past management, precipitation, and other factors.



Figure 24. Vegetation recovery following 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 right show vegetation conditions in 2018 following the plague event. Photographs by Dave Pellatz.

Table 10 displays the predicted potential maximums of 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 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.

As an example, in the loamy ecological site description state-and-transition model, a transition is initiated as a result of frequent and severe defoliation during the growing season of cool-season grasses. Continued long-term prairie dog occupation 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 different stable plant community. The pathway toward the reference plant community is highly variable and not always linear; much depends on availability and diversity of a viable seed bank of higher successional species within the existing plant community and neighboring plant communities, length of time in a given stable state, and precipitation patterns. 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 ecological drivers and feedback mechanisms (pathways) and resulting changes in plant community composition 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 10 (e.g., community phase 2.2). Other factors also contribute to the rate at which the plant community changes occur, for example, livestock grazing management, brush management, climate conditions, and prescribed fire or wildfire.

Table 10. Ecological site and predicted plant community change with heavy continuous grazing with overstocking; long-term continuous grazing without adequate recovery; frequent and severe defoliation; and fire, brush management, or both with long-term continuous grazing

Ecological Site	Reference Plant Community	Alternative State within the Ecological Site	Alternative State within the Ecological Site	State with Greatest 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

With continuous defoliation as occurs with prairie dog occupation, 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 (Coppock et al.

1983). Once a plant community transitions from one state to another and crosses a threshold, it may be difficult to revert toward a different stable plant community or 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.

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 (state 1.1) and sod-bound (state 2) plant communities were compared to the representative value of production for the vegetation state expected from long-term prairie dog occupation (state 2 or state 4, generally the increased bare ground state). Herbage production is expected to decrease with the shift in species composition from long-term prairie dog occupation (Coppock et al. 1983). 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 11 displays the representative values of herbage production for different states on ecological sites that had more than 1 percent of the prairie dogs mapped in 2016 and 2017. Calculations assumed a harvest efficiency of 25 percent. 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).

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 11. Range in herbage production for plant communities representative of varying degrees of prairie dog occupancy for ecological sites with at least 1 percent of prairie dog colonies mapped in 2016 and 2017. The estimated difference in herbage production is based on the difference in production from state 1 to state 2 or state 4 and from state 2 to state 4.

Ecological Site	Production RV for reference vegetation (state 1) (lbs/acre)	Production RV for sod-bound state (state 2) (lbs/acre)	Production RV for increased bare ground state (State 4) (lbs/acre)	Estimated difference in herbage production (lbs/acre)
Clayey	1,100	650	400	450 to 700
Loamy	1,200	600	500	600 to 700
Lowland	2,300	1500	900	800 to 1,400
Saline Upland*	500	325	325	175
Sandy	1,200	800	650	400 to 550
Shallow Loamy	900	675	600	225 to 300

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

* Two states represented in the saline upland ecological site description

Effects of Prairie Dog Management on Livestock Grazing

None of the action alternatives proposes 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.

The changes to herbage production resulting from disturbances such as prairie dog occupancy 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 because 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. For livestock production, regardless of ecological site or occupation of prairie dogs, limited forage availability negates forage quality after a certain amount of time. In addition to affecting cattle weight gains, a change in herbage availability has the potential to impact authorized AUMs for any given year or could lead to voluntary reductions in stocking.

This analysis calculated the predicted differences in available herbage (table 11) 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 sod-bound, 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.

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 and 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 herbage 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 herbage 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 herbage 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).
- 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). However, 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):
 - ◆ reduced livestock performance due to higher temperatures,
 - ◆ water quality issues with confined feeding operations due to predicted increases in downpours,
 - ◆ increased 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, and
 - ◆ enhanced woody plant expansion.

Alternative 1 – No Action

Under current management, resource conflicts related to prairie dog occupancy and livestock grazing would likely continue. As prairie dog colonies increase in extent from the current 2,438 acres to the acreage objective of 33,000 acres or more, conflicts would likely increase. 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 12 displays the estimated differences in available forage and AUMs if current management continues and prairie dogs expand to the acreage objective of 33,000 acres, considering a 25 percent harvest efficiency for livestock grazing. The estimated difference in available AUMs was calculated following standard Natural Resources Conservation Service protocols (Sedivec and Printz 2012). 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.

Table 12. Resource indicators and measures for the no-action alternative

Resource element	Indicator or measure	Value
Rangeland vegetation	Prairie dog colony acreage objective, representing acres occupied by prairie dogs that may transition away from state 1 or state 2	33,000 acres
Livestock grazing management	Estimated decrease in herbage production on occupied acres. Range represents estimates for transitions from state 1 to state 2, state 2 to state 4, and state 1 to state 4.	3,617,000 to 17,398,000 pounds
Livestock grazing management	Estimated difference in available AUMs	3,960 to 19,060 AUMs

Alternatives 2 and 5 – Proposed Action and Preferred Alternative

Both the proposed action and the preferred alternative propose an acreage objective of 10,000 acres of prairie dog colonies in management area 3.67.

Direct and Indirect Effects

Effects to vegetation communities currently impacted by prairie dogs would continue to transition toward or remain in a plant community expected from long-term prairie dog use (table 10). Over time, expansion of prairie dogs would be expected, but it is difficult to determine where and when this would occur, as it will likely be variable by colony. Any newly colonized areas would also transition toward a plant community expected from prairie dog use.

Existing conflicts with livestock grazing management activities would continue, but boundary management zones should minimize prairie dogs from Federal lands from impacting herbage production on adjacent non-Federal lands. 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 of authorized AUMs or adjustment in grazing management, such as early removal of livestock, could occur depending on the extent of expansion within the allotment and desired conditions.

Table 13 displays the estimated differences in available forage and AUMs if the prairie dog colony acreage objective of 10,000 acres is achieved, Prairie dog colonies will occur outside of management area 3.67 that may be unaccounted for above the 10,000-acre objective that will affect herbage availability on those allotments.

Livestock grazing rotations will need to be coordinated with prairie dog control activities, as livestock may need to be temporarily rotated or removed from the pasture if certain rodenticides are used. The use of rodenticide will follow the product label, standards and guidelines, and other applicable rules and regulations.

Table 13. Resource indicators and measures for the proposed action

Resource element	Indicator or measure	Value
Rangeland vegetation	Prairie dog colony acreage objective, representing acres occupied by prairie dogs that may transition away from state 1 or state 2	10,000 acres
Livestock grazing management	Estimated decrease in herbage production on occupied acres. Range represents estimates for transitions from state 1 to state 2, state 2 to state 4, and state 1 to state 4.	822,000 to 5,272,100 pounds
Livestock grazing management	Estimated difference in available AUMs	900 to 5,775 AUMs

Cumulative Effects

Overall, the proposed action and preferred alternative would have reduced impacts to rangeland vegetation 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.

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 an acreage objective of 10,000 to 15,000 acres of prairie dog colonies across the grassland.

Direct and Indirect Effects

The direct and indirect effects to rangeland vegetation and livestock grazing of alternative 3 would be similar to alternatives 2 and 5. The most appreciable difference is the increase in the prairie dog colony acreage objective to a range of 10,000 to 15,000 acres and subsequent adjustment in herbage availability (table 14) 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, because colonies anywhere on National Forest System lands can count toward the acreage objective.

Table 14 displays the estimated differences in available forage and AUMs if the prairie dog colony acreage objective of 10,000 to 15,000 acres is achieved.

Table 14. Resource indicators and measures for grassland-wide alternative

Resource element	Indicator or measure	Value
Rangeland vegetation	Prairie dog colony acreage objective, representing acres occupied by prairie dogs that may transition away from state 1 or state 2	10,000 to 15,000 acres
Livestock grazing	Estimated decrease in herbage production on occupied acres. Range represents estimates for transitions from state 1 to state 2, state 2 to state 4, and state 1 to state 4.	1,096,000 to 7,908,200 pounds
Livestock grazing management	Estimated difference in available AUMs	1,200 to 8,660 AUMs

Cumulative Effects – Alternative 3

Cumulative effects would be similar to alternative 2.

Alternative 4 – Prairie Dog Emphasis

The prairie dog emphasis alternative proposes an acreage objective of 27,000 acres of prairie dog colonies in category 1 and 2 areas on the grassland.

Direct and Indirect Effects

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 prairie dog colony acreage objectives for prairie dogs with an objective of 27,000 acres, nearly three times that of alternative 2, and the subsequent adjustment in forage availability (table 15). 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.

Table 15. Resource indicators and measures for prairie dog emphasis alternative

Resource element	Indicator or measure	Value
Rangeland vegetation	Prairie dog colony acreage objective, representing acres occupied by prairie dogs that may transition away from state 1 or state 2	27,000 acres
Livestock grazing	Estimated decrease in herbage production on occupied acres. Range represents estimates for transitions from state 1 to state 2, state 2 to state 4, and state 1 to state 4.	2,959,400 to 14,234,800 pounds
Livestock grazing management	Estimated difference in available AUMs	3,240 to 15,590 AUMs

Cumulative Effects

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

Summary

Interaction between prairie dogs and large herbivores are scale and time dependent. Small colonies in large areas are not likely to reduce forage availability enough to affect animal performance or stocking capacity. Similarly, young colonies cause few changes in plant species composition that negatively affect other grazers. However, forage quantity becomes more limited as colonies age and occupy greater portions of an area, leading to reduced forage availability. As colonies age and grow, the plant community will shift due to heavy or continuous repeated defoliation, shifting the species composition of those communities to lower stature species. This analysis shows a range of estimated difference in herbage production accounting for shifts in species composition for the plant community phases identified in the ecological site descriptions. This range accounts for likely scenarios that could occur as a result of this plan amendment.

Vegetation Monitoring

During the last two decades, several methods for monitoring changes in rangeland vegetation have been developed and refined. These include use of a similarity index and rangeland health assessments to evaluate 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”²² (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 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.

Analysis of Socioeconomic Resources

Socioeconomic issues related to the plan amendment include impacts 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 and comment periods. Prairie dog management activities are expected to continue to contribute to current and future social and economic conditions on the Thunder Basin National Grassland. The grassland provides valuable ecosystem services, including forage for livestock grazing and habitat for wildlife, and this plan amendment aims to reduce conflicts among stakeholders who value these services differently.

The socioeconomic analysis area is the area in which social and economic impacts are likely to occur from changes in prairie dog management proposed under the alternatives. It comprises 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

²² Interpreting Indicators of Rangeland Health: https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1043944.pdf

plan amendment could affect the economic activity in the area. Natrona County is included in the analysis area because ranching supplies could be purchased in Casper.

Effects Summary

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

For all alternatives, there would 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 10 years, 2016 and 2017 had the highest recorded extent of black-tailed prairie dog colonies on the Thunder Basin National Grassland. During that time, grazing permittees made different choices about use of permitted AUMs. Some did not change their management; while others removed cattle early or used supplemental feed (see “Permitting” in the Analysis of Rangeland Vegetation and Livestock Grazing). 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 the use of boundary management zones would reduce prairie dog encroachment on private and State lands. Lower acreage objectives under the preferred alternative, proposed action, and grassland-wide alternatives are also expected to decrease conflicts compared to the no-action alternative. Costs and actual expenditures for prairie dog management are expected to be similar among the action alternatives each year due to budget constraints, but management priorities would differ among alternatives. When management scenarios based on 2012 and 2019 data were applied to the alternatives, full implementation of alternatives 2 and 3 would be less expensive than full implementation of alternatives 4 or 5, and alternative 1 would be most expensive to implement, overall. Stakeholders who value livestock grazing and recreational shooting are likely to be most aligned with the preferred alternative, proposed action, or grassland-wide alternatives, which have lower acreage objectives, while stakeholders who prioritize native ecosystem function and biodiversity are likely to be most aligned with the prairie dog emphasis or no-action alternatives, which have higher acreage objectives.

Affected Environment

Population

The economic analysis area (Campbell, Converse, Crook, Natrona, Niobrara, and Weston Counties) is home to approximately 160,000 people, which is approximately 27 percent of Wyoming’s population (U.S. Census Bureau 2018). Wyoming’s population grew by 7 percent between 2010 and 2017 (U.S. Census Bureau 2018). Converse, Weston, and Niobrara Counties grew more slowly during 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 3 percent of total employment in the analysis area (figure 25). Although this industry sector is a small percentage of total employment in the area, changes to forage availability for livestock production could have concentrated impacts to local communities that rely on the jobs and income from grazing activities.

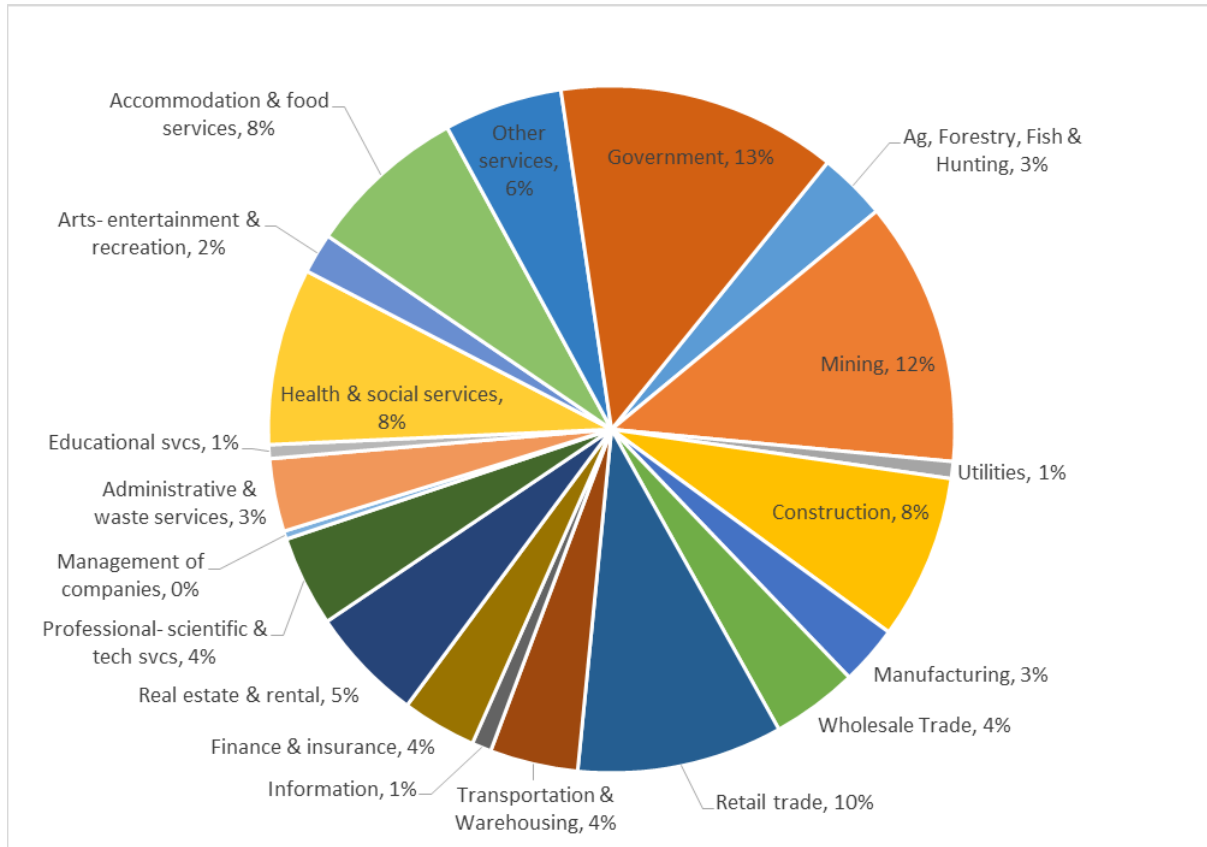


Figure 25. Employment by sector in the socioeconomic analysis area (IMPLAN 2017).

Currently, there are 120,800 permitted AUMs in the planning area permitted through three grazing associations. Assuming full use of the existing permitted AUMs, this level of grazing activity contributes 204 jobs and \$5.6 million in labor income to the economic analysis area annually (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 and table 9).

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 National Forest System 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 National Forest System land like wildlife management can affect 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.

Currently, 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 across the grassland, regardless of management area or prairie dog management category. Lethal control is also allowed in many circumstances in category 1, 2, and 3 areas when acreage objectives have been met. Thus, under current management, some but not all concerns have been addressed. 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 National Forest System land. Unit costs associated with prairie dog management on State and private lands are similar to unit costs on National Forest System land (see the “Economic Costs” section).

Land values, the market values for different types of property, can change based on many 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 several years (table 16).

Table 16. 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

Costs of Prairie Dog Management

The purchase and application of rodenticides is a common expense for prairie dog management. 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).

Other potential costs include use of plague-mitigation tools, installation or maintenance of vegetation barriers or fencing, and 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.

To understand how implementation of the action alternatives could differ from the existing condition, it is important to know current and past costs of prairie dog management on the grassland. Table 17 shows estimated Forest Service expenditures for zinc phosphide treatment, application of deltamethrin for sylvatic plague mitigation, translocation, and prescribed fire for wildlife habitat improvement between 2010 and 2019. Costs for 2010 to 2014 were estimated based on cost per unit and acres treated, whereas costs from 2015 to 2019 were based on actual receipts.

Table 17. Forest Service acres and costs of prairie dog management activities on the Thunder Basin National Grassland, 2010 to 2019. Costs for 2010 through 2014 were estimated based on cost per unit and acres; costs for 2015 through 2019 were based on actual receipts.

Fiscal Year	Acres of prairie dogs in MA 3.63	Acres treated with zinc phosphide	Cost of zinc phosphide treatment	Acres dusted with deltamethrin	Cost of plague treatment ^a	Acres of translocation	Cost of translocation	Acres of prescribed fire for wildlife habitat	Cost of prescribed fire for wildlife habitat	Total estimated cost of prairie dog management ^b
2010	3,538	116	\$5,800	132	\$1,320	120	\$45,000	2,519	\$43,730	\$95,850
2011	5,886	734	\$29,000	1,997	\$19,970	166	\$35,000	4,045	\$84,400	\$168,370
2012	10,970	979	\$23,000	780	\$7,800	0	0	2,519	\$43,730	\$74,530
2013	15,382	1,557	\$19,997	3,000	\$50,000	0	0	0	0	\$69,997
2014	16,040	940	\$18,800	2,400	\$38,400	0	0	0	0	\$57,200
2015	18,316	1,384	\$46,690	1,002	0	0	0	942	\$21,939	\$68,629
2016	25,075	1,677	\$39,150	25	0	0	0	0	0	\$39,150
2017	31,521	2,239	\$30,896	0	0	0	0	0	0	\$30,896
2018	250	507	\$9,740	0	0	0	0	0	0	\$9,740
2019	1,065	112	\$2,246	38	\$1,045	0	0	0	0	\$3,291

^a Plague management costs were estimated using unit costs different than the treatment unit costs presented in the Environmental Consequences section. For 2010 to 2014, deltamethrin was donated to the Forest Service and volunteers helped with the labor. Therefore, unit costs to estimate previous plague treatment costs were much lower than the unit costs used for effects analysis by alternative (these unit costs assume work is done by a contractor). For 2015 and 2016, dusting occurred through partnership with an external research project, and the Forest Service did not fund the application of deltamethrin. The 2019 cost in the table (\$1,045) used the \$27.50/acre unit cost presented in the Environmental Consequences section.

^b Costs for inventory and mapping are not included here but are included in table 18.

Forest Service and partners coordinate annually to inventory and map prairie dog colonies on the Thunder Basin National Grassland. Costs for this activity vary depending on the size of the inventoried area, the extent of mapped colonies, and specific inventory and monitoring objectives for a particular year. Costs to inventory and map prairie dog colonies on the Thunder Basin for the past 4 years are detailed in table 18. These costs include inventory and mapping performed by Great Plains Wildlife Consulting, Inc., and Forest Service staff.

Table 18. Prairie dog inventory and mapping costs on the Thunder Basin National Grassland

Year	Acres inventoried	Cost
2016/17	190,000	\$187,729
2018	69,000	\$138,090
2019	126,000	\$184,839

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, which has happened recently to family members of grazing permittees. 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.

In 2017, the commercial hunting and trapping industry in the analysis area supported 44 jobs (0.04 percent of total employment in the analysis area) (IMPLAN 2017). Recreation activity also generates jobs and income in other sectors, such as retail, food, gas, and lodging (figure 25). 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 not known, so we cannot accurately 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 National Forest System land. Healthy grasslands provide numerous ecosystem services, including clean water and air, wildlife habitat, and forage for grazing. Ecosystem services provided in association with prairie dog colonies include improved water infiltration, nutrient cycling, recreational sightseeing opportunities, and native ecosystems and biodiversity (O'Meilia et al. 1982). Ecosystem services that could benefit from increased control of prairie dog colonies include forage production for livestock and recreational shooting opportunities.

Social and economic values associated with the resources and ecosystem services provided on the Thunder Basin National Grassland are often in conflict, but none is mutually exclusive. Similar to other areas with prairie dog populations, there is a gradient in the values, beliefs, and attitudes exhibited toward prairie dog colonies (Reading et al 1999). Many stakeholders value forage production for livestock production and associated social values and ecosystem services. Many of these stakeholders are local to the Thunder Basin National Grassland and are concerned that changes to forage availability could affect 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 value 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. In addition, some stakeholders believe in the intrinsic value of all animals, and therefore, oppose killing prairie dogs. These stakeholders represent individuals and groups that take a local, regional, and national perspective on conservation (Bruskotter et al 2018). Management actions to reduce prairie dog populations could negatively affect these stakeholders. In many cases, diverse stakeholders share at least some values and wish to balance forage production for livestock and wildlife while maintaining the ability for local ranches to thrive.

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 the state, 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 19). 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 19. Percentage of population by race and ethnicity, average from 2013 to 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 20 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 20. Percentage 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.

Costs for Prairie Dog Management

Unit costs for labor and treatment of prairie dog colonies are the same across all alternatives (table 21). The frequency and degree to which different treatments are used under each alternative would vary, and the exact number of units per treatment option under each alternative is unknown (for example, number of

acres that would be treated each year using rodenticides). Treatment effectiveness is assumed to be consistent across the alternatives.

Table 21. Unit costs and timing for prairie dog management activities

Management activity	Cost per unit	Labor cost	How often to repeat treatment?
Inventory and mapping	\$1.50/acre ^a	Included in cost per unit	Annually
Vegetation barrier	\$16,000/mile ^b	\$10,000	Variable
Translocation ^c	\$200/acre ^d	Included in cost per unit	Variable
Plague dusting	\$27.50/acre ^e	Included in cost per unit	Annually
Zinc phosphide prairie dog bait	\$1.65/acre ^f	\$15/acre ^g	Annually
ZP Rodent Oat Bait AG	\$4.70/acre ^h	\$15/acre	Annually
Prozap Zinc Phosphide Oat Bait	\$2.40/acre ⁱ	\$15/acre	Annually
Rozol prairie dog bait (anticoagulant)	\$13.25/acre ^j	\$35/acre for treatment and monitoring ^k	Variable
Kaput -D Prairie Dog Bait (anticoagulant)	\$9.50/acre ^l	\$35/acre for treatment and monitoring	Variable
Fumitoxon tablets (fumigant)	\$12.80/acre ^m	NA	Variable
Gas cartridge (fumigant)	\$87/acre ⁿ	NA	Variable

^a Cost based on average cost per acre from inventory and mapping work completed 2016 to 2019 as shown in table 18.

^b 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.

^c Translocation is trapping and relocating prairie dogs.

^d Cost based on 2011 labor and supplies during 2011 field season from “2012 Anticipated Budget – Prairie Dog Management Thunder Basin” report, dated January 2011.

^e 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.

^f Cost from South Dakota/Wheatland County Store and assumes average coverage of 50-pound bag is 33.3 acres.

^g Labor cost from South Dakota Department of Agriculture based on information from a commercial applicator and ranges from \$12 to \$18 per acre.

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

ⁱ 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.

^j Cost from Van Diest and assumes average coverage of 10 acres per 50 pound bag.

^k Labor cost from South Dakota Department of Agriculture based on information from a commercial applicator.

^l Cost from Van Diest and assumes average coverage of 50 pound bag is 10 acres.

^m Cost is from Van Diest and assumes 500 tablet container has average coverage of 3.12 acres.

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

For each alternative, costs would depend on where prairie dogs colonize, total extent of prairie dog colonies compared to colony acreage objectives, extent of boundary management zones, and identification of areas with acreage objectives (i.e., management area 3.63 or 3.67 or category 1, 2, or 3 areas). Estimates for inventory and mapping work assume that inventory and mapping would not occur in Management Area 8.4 – Mineral Production and Development (45,909 acres).

Employment and Labor Income

Contributions to the analysis area economy through market-based production can be measured using the IMPLAN input-output model. The IMPLAN database describes the economy in 546 sectors using Federal

data from 2017.²³ These sectors are further aggregated in this analysis to better identify areas relevant to Forest Service management activities. Input-output models describe the flow of goods and services from producers to intermediate and final consumers. Thus, IMPLAN not only examines the direct contributions from the analysis area, but also indirect and induced contributions. Indirect employment and labor income contributions occur when a sector purchases supplies and services from other industries to produce their product. Induced contributions are the employment and labor income generated as a result of spending new household income generated by direct and indirect employment.

Social Values

The social analysis attempts to explain the values, beliefs, and attitudes of stakeholders with anticipated effects from the plan amendment. Scoping comments provided insight into the values, beliefs, and attitudes of area residents and surrounding communities. Although all 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 five alternatives—the no-action alternative, proposed action, grassland-wide alternative, prairie dog emphasis alternative, and preferred alternative.

Effects Common to All Alternatives

Costs of Prairie Dog Management

The Forest Service incurs costs from prairie dog management associated with rodenticide application, translocation, plague mitigation, inventory²⁴ and mapping²⁵, vegetation management, and other forms of conservation and control. Cost per unit of management activity is provided in table 21, and applied to all alternatives. Although the Forest Service must approve all prairie dog colony conservation and control work done on National Forest System lands each year, the work is funded and implemented using many different tools. The Forest Service relies on many partners and cooperators, and without them, the prairie dog management work would not be completed to the extent that it has been in the past or could be in the future. For example, the Thunder Basin has partnership, participating, challenge cost-share, and good neighbor agreements in place with many partner agencies and organizations. Individuals and

²³ IMPLAN data is derived from a variety of sources included the Bureau of Economic Analysis, Regional Economic Information System, Bureau of Labor Statistics, U.S. Census, etc.

²⁴ Inventory: Searching identified areas for the presence of prairie dog colonies.

²⁵ Mapping: Specific mapping of the extent of individual colonies.

organizations also commonly donate labor, materials and supplies, and additional funding for conservation and control work. For prairie dog control, the Forest Service has agreements with county weed and pest organizations, grazing associations provide conservation practice credits, and in some cases, the Forest Service authorizes permittees to do control work on their allotments. For plague management and nonlethal control, the Forest Service receives funding from nongovernmental organizations. The Forest Service works with many partners to fund and coordinate inventory and mapping efforts, and with many different researchers for monitoring. Building these relationships to implement solutions and reduce costs to the Forest Service is critical for successful management activities.

For each alternative, costs would depend on where prairie dogs colonize, total extent of prairie dog colonies compared to colony acreage objectives, extent of boundary management zones, and identification of areas with acreage objectives (i.e., management area 3.63 or 3.67 or category 1, 2, or 3 areas). It is possible that implementing alternatives with lower acreage objectives for total prairie dog colony extent would lead to more quickly achieving acreage objectives, and thus, faster implementation of control work and assumption of related control costs. It is also possible that as acreage objectives increase, the greater extent of prairie dog colonies would make management more difficult, and costs for control could increase exponentially instead of linearly as colony extent increases. If boundary management zones are established and actively managed while prairie dog colony extent is low, costs for maintaining boundary management zones may remain relatively low in subsequent years.

Costs for rodenticide use and other forms of prairie dog control would depend on the location of prairie dog colonies each year, prairie dog colony acreage objectives, maintenance of a boundary management zone, and total size of areas where lethal and nonlethal control are allowed. Forest Service personnel would continue to make prairie dog control within 1 mile of residences the highest priority under each alternative. The Forest Service will work internally and with local stakeholders to determine other priorities annually, which are likely to include treating colonies in the boundary management zones, treating colonies that are causing infrastructure damage (informed by reports from landowners), density control where requested and approved, and other locations outside the boundary management zones where prairie dog colony acreage objectives do not apply or when acreage objectives are achieved. Although managed differently under each alternative, total annual expenditures associated with prairie dog control are expected to be limited by available funding each fiscal year, and thus, be nearly the same across the alternatives.

The Forest Service staff accepts and responds to requests for prairie dog control and conservation work. In the past, the Douglas Ranger District asked for private landowners, ranchers, or other interested parties to submit prairie dog expansion or private land encroachment issues to the district office. In 2015 and 2016, Forest Service personnel sent letters to local landowners asking that requests for prairie dog control be submitted in writing and include location and past and present treatments on the colony on Federal, State, and private land. The Forest Service received 17 requests in 2015, and 21 requests in 2016. The decision screens from the Prairie Dog Conservation Assessment and Management Strategy were then used to determine the types of tools available and prioritization of each request (i.e., prioritization in the 1-mile residence buffer). In 2017, meetings with landowners, grazing associations, weed and pest districts, and other interested parties were held to prioritize areas for control in fall 2017. Those areas were also used as priorities in 2018 and 2019.

Costs associated with sylvatic plague mitigation have varied annually during implementation of the 2002 plan, depending on prairie dog colony acres and distribution and the time and resources available for dusting with deltamethrin. Although a comprehensive plague management plan is not currently in place,

Forest Service personnel anticipate applying deltamethrin or fipronil to some or all colonies in management area 3.63 or 3.67 under all alternatives. Plan direction would not limit plague-mitigation work on colonies outside of the management area, but this analysis assumes that resources would be prioritized for use within management area 3.63 or 3.67, and that colonies outside of these areas would not be treated in most years. Costs of plague mitigation are detailed under effects of each alternative.

As described in appendix B, Forest Service priorities for control work would be the 1-mile residence buffer, any impacted facilities, and the boundary management zone. Other control needs would be prioritized annually. Costs associated with applying plague-mitigation tools, any additional conservation or nonlethal control work, and inventory and mapping costs would also be incurred on an annual basis and would need to be prioritized.

The Forest Service intends to inventory and map acres needed for management decision-making annually under each alternative. An estimate of \$1.50 per acre for inventory and mapping costs was used for all alternatives, based on average total expenditures and area inventoried and mapped from 2016 to 2019. This cost includes expenses incurred by a contractor, paid through different sources, as well as the cost of Forest Service staff including seasonal crews. In the future, the Forest Service will continue to explore alternative methods for inventory and mapping work that achieve an acceptable level of precision and are cost effective. Aerial photography has been used to inventory prairie dog colonies for decades (Schenbeck and Myhre 1986, Sidle et al. 2012). Satellite imagery may be practical to meet certain inventory objectives (Sidle et al. 2002), and now, high-resolution remotely sensed imagery from unmanned aircraft systems, as well as other options for data collection, are being explored to collect more precise data and decrease the cost of inventory and mapping work.

Employment and Labor Income

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).²⁶ Increases in the extent of prairie dogs, in combination with other events, could result in adjustments to authorized or actual use. Economic contributions may be lower than this estimate if actual use by the Thunder Basin Grazing Association continues to be lower than permitted (table 8). In the past 10 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 management.

It is expected that any differences in forage availability and associated AUMs among alternatives would have minimal impacts to jobs and labor income because the Forest Service does not expect available AUMs to change significantly. Based on information from the National Agricultural Statistical Service for beef cattle ranching in Wyoming, 1.23 total estimated full and part time jobs and \$31,696 (2017 dollars) in labor income are contributed to the local economy per 1,000 AUMs (Anderes et al. 2019). While AUMs support jobs, it is also important to consider that there could be a substitute effect should there be a change in AUMs. For instance, if affordable supplemental feed is readily available, the actual economic effect of a loss of forage due to prairie dogs could be minimal.

Costs associated with prairie dog management (whether they are incurred by the Forest Service, neighboring landowners, or other partners) result in job and income contributions to the analysis area. For

²⁶ These economic contributions include direct, indirect, and induced effects from the permitted level of grazing. See Methodology section for more details.

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 17), the impacts could have greater importance in small communities.

Public Health and Safety

While there is a public perception that 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-mitigation 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 National Forest System lands.

Environmental Justice

There is not a substantially 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.

Summary of Costs of Prairie Dog Management

Costs for implementing the alternatives could include rodenticide application, translocation, plague management, vegetation management, enforcement of recreational shooting restrictions, and inventory and mapping. Estimated costs that could be quantified are summarized below. Prairie dog acres for 2012 and 2019 are used to show the range of potential treatment areas in the future, so we presented both scenarios for comparison. The 2012 scenario represents a year with high prairie dog occupancy, and 2019 represents a year with low prairie dog occupancy. It is uncertain how prairie dogs will colonize in the future under the alternatives, but this presents two scenarios to compare associated costs.

Table 22. Summary of prairie dog control^a and plague mitigation costs per alternative

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
2012 scenario	\$563,984	\$135,178	\$137,370	\$169,070	\$205,493
2019 scenario	\$119,934	\$47,227	\$33,486	\$64,998	\$63,518

^a This includes costs of zinc phosphide, anticoagulants, fumigants, and translocation, as allowed under each alternative.

Table 23. Inventory and mapping costs per alternative^a

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Acres	507,165	129,727	507,165	156,732	135,301
Cost	\$760,748	\$194,591	\$760,748	\$235,098	\$202,952

^a Assumes inventory and mapping cost is \$1.50 per acre.

Alternative 1 – No Action

Costs of Prairie Dog Management

Costs for implementing alternative 1 could include rodenticide application, translocation, plague management, vegetation management, enforcement of recreational shooting restrictions, and inventory and mapping.

Cost estimates for plague mitigation are based on 2012 and 2019 prairie dog mapping and implementation data. The analysis assumes that under alternatives 1, 2, and 3, the actual treated acres for that year would be treated (780 acres in 2012, and 38 acres in 2019). Therefore, under alternative 1, the 2012 scenario assumes 780 acres would be treated for plague, and the 2019 scenario assumes 38 acres would be treated for plague, which would cost \$21,450²⁷ and \$1,045, respectively. The estimated costs of plague mitigation are the same under alternatives 1, 2, and 3 and less than alternatives 4 and 5.

Since this alternative has the highest acreage objective 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 acreage objectives. 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 acreage objectives 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.

Table 24 shows the estimated treatment costs of prairie dog management for alternative 1, assuming that treatment will occur where prairie dogs are within a half mile of State or private lands in category 1 and 2 areas and within the residential buffer. Cost estimates assume that half of the acres will be treated with zinc phosphide and half will be treated with translocation because under alternative 1 nonlethal treatment options must be tried first. Under both scenarios, alternative 1 estimated treatment costs are the highest compared to all other alternatives. The total estimated treatment cost in the 2012 scenario is \$542,534, and the total estimated treatment cost in the 2019 scenario is \$118,890.

Table 24. Alternative 1 estimated treatment costs

Treatment area ^a	Acres	Cost of zinc phosphide treatment (\$17.9 per acre ^b)	Cost of translocation (\$200 per acre ^c)
2012 prairie dog acres in category 1 and 2 areas within ½ mile of State or private land	4,437	\$39,715	\$443,740
2019 prairie dog acres within ½ mile of State or private land	571	\$5,107	\$57,066
2012 prairie dog acres in residential buffers	542	\$4,853	\$54,226
2019 prairie dog acres in residential buffers	521	\$4,659	\$52,057

^a Prairie dog acres for 2012 and 2019 are used to show the range of potential treatment areas in the future. The 2012 scenario represents a year with high prairie dog occupancy, and 2019 represents a year with low prairie dog occupancy. It is uncertain how prairie dogs will colonize in the future under the alternatives, but this presents two scenarios to compare associated costs.

^b\$17.9 per acre is an average of unit costs for zinc phosphide prairie dog bait, oat bait AG, and Prozap oat bait. This includes labor and product costs. See unit costs table for estimated costs of each zinc phosphide treatment.

Inventory and mapping costs for alternative 1 would likely be the highest of all alternatives (similar to alternative 3). To understand the acres contributing to acreage objectives for categories 1, 2, and 3, and make responsive management decisions, the estimate assumes the full grassland would be inventoried and mapped annually (less management area 8.4). The total estimated inventory and mapping acres per year under alternative 1 is 507,165 acres. For \$1.50 per acre, the estimated cost is \$760,748.

Enforcement of recreational shooting restrictions may also have some associated costs, such as with the installation of signage. Costs associated with enforcing recreational shooting restrictions under alternative

²⁷ Assumes \$27.50 per acre for plague dusting.

1 would be similar to alternatives 2, 4, and 5, which also have large restricted areas, but higher than alternative 3, which has no default shooting restrictions.

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 acreage objectives. 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 acreage objectives on the rest of the grassland.

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 effects to grazing-related employment and labor income would be the greatest under the no-action and prairie dog emphasis alternatives based on impacts to forage availability. 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 likely be highest under this alternative, and encroachment could have negative effects on neighboring facilities, treatment costs, and forage availability. With the highest prairie dog colony acreage objectives, stakeholders who value livestock grazing, would be negatively impacted by the no-action alternative. Because this alternative has the highest prairie dog colony acreage objective, 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

Costs of Prairie Dog Management

Costs for implementing alternative 2 could include rodenticide application, translocation, plague management, vegetation management, enforcement of recreational shooting restrictions, and inventory and mapping. With a lower prairie dog colony acreage objective and the allowance for density control, control treatment and costs could occur sooner than would occur under the other action alternatives.

Cost estimates for plague mitigation are based on 2012 and 2019 prairie dog mapping and implementation data. The analysis assumes that under alternatives 1, 2, and 3, the actual treated acres for that year would be treated (780 acres in 2012, and 38 acres in 2019). Therefore, under alternative 1, the 2012 scenario assumes 780 acres would be treated for plague and the 2019 scenario assumes 38 acres would be treated for plague, which would cost \$21,450²⁸ and \$1,045, respectively. The estimated costs of plague mitigation are the same under alternatives 1, 2, and 3 and less than alternatives 4 and 5.

²⁸ Assumes \$27.50 per acre for plague dusting.

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 alternative 1 or 4.

Table 25 shows the estimated treatment costs of prairie dog management for alternative 2, assuming that treatment would occur in the boundary management zone, within residential buffers, and in some areas where prairie dogs are colonized outside 3.67. Cost estimates assume that half of the acres outside 3.67 would be treated with zinc phosphide since the Forest Service does not expect to treat all acres. This estimate also assumes that all boundary management zone acres in 2019 would be treated with translocation, since prairie dog colony acreage is far below the acreage objective. Under both scenarios, estimated treatment costs of alternative 2 are less than the no-action alternative and alternative 5. Total estimated management costs for the 2012 scenario are \$113,728, and total estimated treatment costs for the 2019 scenario are \$46,182.

Table 25. Alternative 2 estimated treatment costs

Treatment area ^a	Acres	Cost of zinc phosphide treatment (\$17.9 per acre ^b)	Cost of translocation (\$200 per acre)
2012 prairie dog acres in boundary management zone	1,162	\$20,804	0
2019 prairie dog acres in boundary management zone	54	0	\$10,808
2012 prairie dog acres outside management area 3.67	9,298	\$83,217	0
2019 prairie dog acres outside management area 3.67	2,911	\$26,056	0
2012 prairie dog acres in residential buffers	542	\$9,706	0
2019 prairie dog acres in residential buffers	521	\$9,318	0

^a Prairie dog acres for 2012 and 2019 are used to show the range of potential treatment acres in the future. The 2012 scenario represents a year with high prairie dog occupancy and 2019 represents a year with low prairie dog occupancy. It is uncertain how prairie dogs will colonize in the future, but this presents two scenarios to compare associated costs.

^b\$17.9 per acre is an average of unit costs for zinc phosphide prairie dog bait, oat bait AG, and Prozap oat bait. This includes labor and product costs. See unit costs table for estimated costs of each zinc phosphide treatment.

Inventory and mapping costs for alternative 2 would likely be the lowest of all alternatives. To understand the acres contributing to the acreage objective for management area 3.67, the full management area should be inventoried and mapped annually. In addition, the full grassland (less management area 8.4) should be inventoried and mapped at least every 5 years to understand the status of other colonies on the grassland and potential satellite colonies. The total estimated inventory and mapping acres per year under alternative 2 is 129,727 acres. For \$1.50 per acre, the estimated cost is \$194,591.

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, 4, and 5, which also have large restricted areas, but higher than alternative 3, which has no default shooting restrictions.

Grazing

Under alternative 2, permitted AUMs would remain at the current level of 120,800 AUMs. With a lower acreage objective 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 objective 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 objectives than under the grassland-wide alternative, impacts could be more concentrated on those allotments.

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 prairie dog colony acreage objective, stakeholders who value livestock grazing would be positively impacted. 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. Recreational shooting opportunities 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

Costs of Prairie Dog Management

Costs for implementing alternative 3 could include rodenticide application, translocation, plague management, vegetation management, and inventory and mapping. With a lower prairie dog colony acreage objective 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 after three consecutive applications of zinc phosphide. Nonlethal control tools such as vegetation barriers and translocation would be used less often under alternative 3, than in alternative 1 or 4.

Cost estimates for plague mitigation are based on 2012 and 2019 prairie dog mapping and implementation data. The analysis assumes that under alternatives 1, 2, and 3, the actual treated acres for that year would be treated (780 acres in 2012 and 38 acres in 2019). Therefore, under alternative 1, the 2012 scenario assumes 780 acres would be treated for plague and the 2019 scenario assumes 38 acres would be treated for plague, which would cost \$21,450²⁹ and \$1,045, respectively. The estimated costs of plague mitigation are the same under alternatives 1, 2, and 3 and less than alternatives 4 and 5.

Table 26 shows the estimated treatment costs of prairie dog management for alternative 3. We assume that treatment will occur in the boundary management zone, where prairie dogs are colonized outside boundary management zone and residential buffer above 15,000 acres, and within residential buffers. We assume that 75 percent of the acres would be treated with zinc phosphide, and 25 percent of the acres

²⁹ Assumes \$27.50 per acre for plague dusting.

would be treated with anticoagulants or fumigants since they can only be applied after three applications of zinc phosphide. Under both scenarios, estimated treatment costs of alternative 3 are less than the no-action alternative and alternative 5. The total estimated costs for the 2012 scenario are \$115,920, and the total estimated costs for the 2019 scenario are \$32,440.

Table 26. Alternative 3 estimated treatment costs

Treatment area ^a	Acres	Cost of zinc phosphide treatment (\$17.9 per acre ^b)	Cost of anticoagulant/fumigant treatment (\$48.1 per acre) ^c
2012 prairie dog acres in boundary management zone	4,013	\$53,869	\$48,251
2019 prairie dog acres in boundary management zone	754	\$10,124	\$9,068
2012 prairie dog acres outside boundary management zone and residential buffer	13,507	None since not over 15,000 acres	NA
2019 prairie dog acres outside boundary management zone and residential buffer	2,389	None since not over 15,000 acres	NA
2012 prairie dog acres in residential buffers	542	\$7,280	\$6,521
2019 prairie dog acres in residential buffers	521	\$6,989	\$6,260

^a Prairie dog acres for 2012 and 2019 are used to show the range of potential treatment acres in the future. The 2012 scenario represents a year with high prairie dog occupancy and 2019 represents a year with low prairie dog occupancy. It is uncertain how prairie dogs will colonize in the future, but this presents two scenarios to compare associated costs.

^b\$17.9 per acre is an average of unit costs for zinc phosphide prairie dog bait, oat bait AG, and Prozap oat bait. This includes labor and product costs. See unit costs table for estimated costs of each zinc phosphide treatment.

^cThe average cost of anticoagulant and fumigant treatment (\$48.1 per acre) is the average of the unit costs presented in effects common to all alternatives section above. This is based on estimated cost of Rozol, Kaput, fumitoxon tablets, and gas cartridges.

Inventory and mapping costs for alternative 3 would be higher than other alternatives and similar to alternative 1. To understand the acres contributing to the grassland-wide acreage objective and make responsive management decisions, the estimate assumes the full grassland would be inventoried and mapped annually (less management area 8.4). The total estimated inventory and mapping acres per year under alternative 3 is 507,165 acres. For \$1.50 per acre, the estimated cost is \$760,748.

Because there are no default restrictions on recreational shooting of prairie dogs, costs related to management of recreational shooting in colonies would be minimized.

Grazing

Under alternative 3, permitted AUMs would remain at the current level of 120,800 AUMs. With a prairie dog colony acreage objective of 10,000 to 15,000 acres, 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 or 5, 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 National Forest System land. However, impacts may be better distributed away from the small number of allotments that overlap management area 3.67

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 prairie dog colony acreage objectives lower than under alternatives 1 and 4, stakeholders who value 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

Costs of Prairie Dog Management

Costs for implementing alternative 4 could include rodenticide application, translocation, plague management, vegetation management, enforcement of recreational shooting restrictions, and inventory and mapping. With a higher prairie dog colony acreage objective and no allowance for density control when objectives 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 alternative 2 or 3.

Cost estimates for plague mitigation are based on 2012 and 2019 prairie dog mapping implementation data. Under alternative 4, a higher proportion of colonies would be treated. For 2012, when there were thousands of acres of prairie dog colonies in category 1 and 2 areas and management area 3.67 outside of the boundary management zone and residence buffers, the analysis estimates that the maximum number of acres of colonies in management area 3.67 would be treated, within the Forest Service financial capability. The analysis used the maximum number of acres treated on record for this estimate (3,000 acres based on 2013 data). For 2019, when prairie dog colony acreage is lower in category 1 and 2 areas and management area 3.67, the analysis assumes that alternative 4 would treat all acres in these areas. This assumption is based on the stronger emphasis on plague mitigation in this alternative. Therefore, under alternative 4, the 2012 scenario assumes 3,000 acres would be treated for plague and the 2019 scenario assumes 1,469 acres would be treated for plague, which would cost \$82,500³⁰ and \$40,400, respectively. The estimated cost of plague mitigation under alternative 4 is higher than the other alternatives.

³⁰ Assumes \$27.50 per acre for plague dusting.

Table 27 shows the estimated treatment costs of prairie dog management for alternative 4. The analysis assumes that treatment will occur in the boundary management zone, within residential buffers, and where prairie dogs are colonized outside management area 3.67 and category 1 and 2 areas. The analysis assumes for the purpose of this cost analysis that half of the acres where prairie dogs are colonized outside 3.67 and category 1 and 2 areas, boundary management zone, and residential buffers will be treated with zinc phosphide. Under both scenarios, estimated treatment costs of alternative 4 are less than the other alternatives. Total estimated treatment costs for the 2012 scenario are \$86,570, and total estimated treatment costs for the 2019 scenario are \$24,598.

Table 27. Alternative 4 estimated treatment costs

Treatment area ^a	Acres	Cost of zinc phosphide treatment (\$17.9 per acre ^b)
2012 prairie dog acres in boundary management zone	1,630	\$29,172
2019 prairie dog acres in boundary management zone	118	\$2,120
2012 prairie dog acres outside category 1 and 2 areas, boundary management zone, and residential buffer	5,329	\$47,692
2019 prairie dog acres outside category 1 and 2 areas, boundary management zone, and residential buffer	1,470	\$13,160
2012 prairie dog acres in residential buffers	542	\$9,706
2019 prairie dog acres in residential buffers	521	\$9,318

^a Prairie dog acres for 2012 and 2019 are used to show the range of potential treatment acres in the future. The 2012 scenario represents a year with high prairie dog occupancy and 2019 represents a year with low prairie dog occupancy. It is uncertain how prairie dogs will colonize in the future, but this presents two scenarios to compare associated costs.

^b \$17.9 per acre is an average of unit costs for zinc phosphide prairie dog bait, oat bait AG, and Prozap oat bait. This includes labor and product costs. See unit costs table for estimated costs of each zinc phosphide treatment.

Inventory and mapping costs for alternative 4 would be lower than alternatives 1 and 3, but higher than the other action alternatives. To understand the acres contributing to acreage objectives for categories 1 and 2 and make responsive management decisions, the estimate assumes these areas would be inventoried and mapped annually. In addition, the full grassland (less management area 8.4) should be inventoried and mapped at least every 5 years to understand the status of other colonies on the grassland. The total estimated inventory and mapping acres per year under alternative 4 is 156,732 acres. For \$1.50 per acre, the estimated cost is \$235,098.

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, 2, and 5, which also have large restricted areas, but higher than alternative 3, which has no default shooting restrictions.

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, 3, and 5 because alternative 4 has higher prairie dog colony acreage objectives. Conflicts would be expected to be lower than 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.

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 effects to grazing-related employment and labor income would be the greatest under the no-action and prairie dog emphasis alternatives based on impacts to forage availability. Shooting restrictions in category 1 and 2 areas would maintain impacts similar 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 prairie dog colony acreage objectives lower than alternative 1 but higher than the other action alternatives, stakeholders who value 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.

Alternative 5 – Preferred Alternative

Costs of Prairie Dog Management

Costs for implementing alternative 5 could include rodenticide application, translocation, plague management, vegetation management, enforcement of recreational shooting restrictions, and inventory and mapping. With a lower prairie dog colony acreage objective compared to alternatives 1, 3, and 4 and the allowance of density control, costs of prairie dog control could occur sooner than would occur under the other action alternatives (similar to alternative 2). 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 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 5 than in alternatives 1 and 4.

Cost estimates for plague mitigation are based on 2012 and 2019 prairie dog mapping implementation data. Under alternative 5, a higher proportion of colonies would be treated than in other alternatives. For 2012, when there were thousands of acres of prairie dog colonies in category 1 and 2 areas and management area 3.67 outside of the boundary management zone and residence buffers, the analysis estimates that the maximum number of acres of colonies in management area 3.67 would be treated, within the Forest Service financial capability. The analysis used the maximum number of acres treated on record for this estimate (3,000 acres based on 2013 data). For 2019, when prairie dog colony acreage is lower in category 1 and 2 areas and management area 3.67, the analysis assumes that alternative 4 would treat all acres in these areas. This assumption is based on the stronger emphasis on plague mitigation in this alternative. Therefore, under alternative 5, the 2012 scenario assumes 3,000 acres would be treated for plague and the 2019 scenario assumes 999 acres would be treated for plague, which would cost

\$82,500³¹ and \$27,470, respectively. The estimated cost of plague mitigation under alternative 5 is higher than the other alternatives and similar to that of alternative 4.

Table 28 shows the estimated treatment costs of prairie dog management for alternative 5. We assume that treatment will occur in the boundary management zone, where prairie dogs are colonized outside management area 3.67 and the residential buffer, and within residential buffers. Cost estimates assume that 67 percent of the boundary management zone and residential buffer acres would be treated with zinc phosphide and 33 percent would be treated with fumigants. Acres where prairie dogs are colonized outside management area 3.67 and the residential buffer are generally available for treatment on the rest of the grassland and the analysis assumes that 50 percent of these acres would be treated with zinc phosphide. Under both scenarios, estimated treatment costs of alternative 5 are less than the no-action alternative. Total costs under the 2012 scenario are \$122,993 and total costs under the 2019 scenario are \$36,047.

Table 28. Alternative 5 estimated treatment costs

Treatment area ^a	Acres	Cost of zinc phosphide treatment (\$17.9 per acre ^b)	Cost of fumigant treatment (\$48.1 per acre)
2012 prairie dog acres in boundary management zone	1,583	\$18,892	\$25,383
2019 prairie dog acres in boundary management zone	161	\$1,925	\$2,586
2012 prairie dog acres outside management area 3.67, residential buffer	7,101	\$63,552	0
2019 prairie dog acres outside management area 3.67, residential buffer	1,897 ^c	\$16,977	0
2012 prairie dog in residential buffers	542	\$6,471	\$8,694
2019 prairie dog in residential buffers	521	\$6,212	\$8,346

^aPrairie dog acres for 2012 and 2019 are used to show the range of potential treatment acres in the future. The 2012 scenario represents a year with high prairie dog occupancy and 2019 represents a year with low prairie dog occupancy. It is uncertain how prairie dogs will colonize in the future, but this presents two scenarios to compare associated costs.

^b\$17.9 per acre is an average of unit costs for zinc phosphide prairie dog bait, oat bait AG, and Prozap oat bait. This includes labor and product costs. See unit costs table for estimated costs of each zinc phosphide treatment.

^cSince these acres are under the acreage objective, some could be treated with translocation under this scenario instead of zinc phosphide, which would increase treatment costs.

Inventory and mapping costs for alternative 5 would likely be similar to alternative 2. To understand the acres contributing to the acreage objective for management area 3.67, the estimate assumes the full management area would be inventoried and mapped annually. In addition, the full grassland (less management area 8.4) should be inventoried and mapped at least every 5 years to understand the status of other colonies on the grassland. The total estimated inventory and mapping acres per year under alternative 5 is 135,301 acres. For \$1.50 per acre, the estimated cost is \$202,952.

Enforcement of recreational shooting restrictions may also have some associated costs, such as the installation of signage. Costs associated with enforcement of recreational shooting restrictions under alternative 5 would be similar to alternatives 1, 2, and 4, which also have large restricted areas, but higher than alternative 3, which has no default shooting restrictions.

³¹ Assumes \$27.50 per acre for plague dusting.

Grazing

Under alternative 5, permitted AUMs would remain at the current level of 120,800 AUMs. With a lower prairie dog colony acreage objective 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 acreage objective. 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 colonies exist. Though fewer allotments would be impacted by colony acreage objectives than under the grassland-wide alternative, impacts could be more concentrated on those allotments.

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 plan 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 5, 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 prairie dog colony acreage objective (similar to alternative 2), stakeholders who value 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.

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 and could have combined impacts with prairie dog conservation and management on the grassland. For example, the Thunder Basin Grazing Association has decreased use of AUMs as a result of coal mining, and this loss may be exacerbated where permittees experience both a decrease in AUMs and expanding prairie dog colonies. These effects would be most pronounced on allotments that have fewer options for management, such as where there are few private lands available or few pastures available for rotating cattle. Alternatives that focus prairie dog colony acreage objectives in smaller areas and on fewer allotments, such as the proposed action, may provide fewer options to those permittees that may be affected by other activities.

Cumulative effects to social and economic conditions could be a further shift from ranching to a mining and recreation-based economy if less forage is available for livestock grazing and more land is committed to coal, oil and gas development, and recreation. This is a shift in the way of life for ranchers and the economy that historically was more driven by ranching. The no-action and prairie dog emphasis alternatives would result in the greatest potential for prairie dog occupancy, and thus, the largest potential

impacts to herbage production and forage availability for livestock. Therefore, the cumulative effects to grazing-related employment and labor income would be the greatest under the no-action and prairie dog emphasis alternatives.

Other stressors on the land could also 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 the preliminary list of 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 and is documented in appendix E.

Introduction

Effects to wildlife species as a result of the proposed plan amendment are formally evaluated in a biological assessment, a biological evaluation (appendix E), and a preliminary list of potential species of conservation concern analysis (appendix E), which are separate documents posted to the project website. Evaluations of species that meet the minimum criteria for consideration as 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 preliminary list of potential species of conservation concern analysis (appendix E) include information on sensitive species and a preliminary list of 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 preliminary list of 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 29). The effects analysis sections below include more information on effects determinations and rationale.

Table 29. Summary of effects of all alternatives for endangered species, Forest Service sensitive species, and species that meet minimum criteria for consideration as potential species of conservation concern (SCC)

Class	Common Name	Status*	Determination for all alternatives
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
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

Class	Common Name	Status*	Determination for all alternatives
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
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	Ottoo skipper	Sensitive	No impact
Invertebrate	Regal fritillary	Sensitive	No impact
Invertebrate	Western bumblebee	Sensitive	No impact
Mammal	Black-footed ferret	Endangered	No impact

Class	Common Name	Status*	Determination for all alternatives
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
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

*Species listed here as Potential SCC have not been officially recommended to the Regional Forester as species of conservation concern. They have been found to meet the minimum criteria for consideration as potential species of conservation concern for this analysis.

Methodology

Analysis Area

The analysis area includes the full Thunder Basin National Grassland administrative boundary. 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. The area is sufficiently large enough to evaluate the habitat for all species addressed. For many species, the analysis of direct, indirect, and cumulative effects focuses within proposed management area 3.67 for each alternative because this is where many of the proposed activities will occur.

Resource Indicators and Measures

A useful way to evaluate impact significance within the context of the National Environmental Policy Act is to use resource indicators to characterize the status of resource elements and monitor their response to potential stressors introduced by the alternatives. Below are the resource indicators and measures used for this analysis (table 30).

Table 30. Resource indicators and measures to evaluate effects of the proposed plan amendment

Resource element	Resource indicator	Measure (quantify if possible)	Used to address Purpose and Need or key issue?	Source
Ecological Conditions: 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 – when data was available	FSM 2670
Ecological Conditions: 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 mortality of individuals	Yes – when data was available	FSM 2670

Framework for Analysis of Species Persistence

The 2012 Planning Rule requires forest and grassland plans to incorporate plan components that “maintain or restore”: (1) “the ecological integrity of terrestrial and aquatic ecosystems and watersheds in the plan area”; and (2) “the diversity of ecosystems and habitat types throughout the plan area” (36 CFR 219.9(a)).

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.”

The 2012 Planning Rule sets forth three possible outcomes of the responsible official’s analysis of plan components with respect to species of conservation concern. Additionally, a fourth outcome may arise when the planning unit has developed a set of ecosystem based plan components it thinks will provide for species persistence, but also provides supplementary species-specific plan components if the responsible official determines the ecosystem plan components alone are unlikely to provide for persistence of at-risk species in the plan area.

1. The responsible official may find that the plan components required by 36 CFR 219.9(a) are sufficient to provide the ecological conditions necessary to maintain a viable population of each species of conservation concern within the planning area. 36 CFR 219.9(b)(1).

Note: 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 Regional Forester. Because the plan amendment will not fully revise the grassland plan, the existing grassland plan will continue to be guided by the older planning rule under which it was originally written. This means that the Regional Forester’s Sensitive Species list will remain in place and environmental analysis of the proposed plan amendment will analyze effects to sensitive species.

2. The responsible official may determine that the plan components required by 36 CFR 219.9(a) are insufficient to provide the ecological conditions necessary to maintain a viable population of each species of conservation concern within the planning area, and that “additional, species-specific plan components, including standards or guidelines, must be included in the plan to provide such ecological conditions in the plan area.” 36 CFR 219.9(b)(1).

3. The responsible official may determine “that it is beyond the authority of the Forest Service or not within the inherent capability of the plan area to maintain or restore the ecological conditions to maintain a viable population of a species of conservation concern in the plan area.” If the responsible official makes this determination, it shall: (1) document the basis for the determination; and (2) “[i]nclude plan components, including standards and guidelines, to maintain or restore ecological conditions within the plan area to contribute to maintaining a viable population of the species within its range,” in coordination with other Federal, State, Tribal, and private land managers.

Species Viability and Persistence

Determinations regarding effects to sensitive species and a species that meet the minimum criteria for consideration as potential species of conservation concern are dependent on several definitions laid out in Forest Service planning regulations and the Forest Service Manual. For sensitive species, the 1982 Planning Rule applies and a determination is made about the species’ viability in the planning area or possible trends toward Federal listing.

Regional Forester Sensitive Species and the 1982 Planning Rule

Specific direction concerning viability is provided in the National Forest Management Act implementing regulations from 1982 (“1982 Planning Rule”) at 36 CFR 219.19:

"Fish and wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area. For planning purposes, a viable population shall be regarded as one, which has the estimated numbers, and distribution of reproductive individuals to insure its continued existence is well distributed in the planning area. In order to insure that viable populations will be maintained, habitat must be provided to support, at least, a minimum number of reproductive individuals and that habitat must be well distributed so that those individuals can interact with others in the planning area."

Various sections of the Forest Service Manual address viability, particularly FSM 2620 and 2670, which include policy statements such as the following:

"Management of habitat provides for the maintenance of viable populations of existing native and desired non-native wildlife, fish, and plant species, generally well-distributed throughout their current geographic range" (FSM 2622.01(2)). Maintain viable populations of all native and desired non-native wildlife, fish and plant species in habitats distributed throughout their geographic range on National Forest System lands (FSM 2670.22(2)).

Species of Conservation Concern and the 2012 Planning Rule

For potential species of conservation concern in an amendment to a plan written under planning regulations previous to the 2012 Planning Rule, a finding is made regarding substantial adverse impacts and substantially lessened protections. For this analysis, we have defined substantial adverse impacts and substantially lessened protections in terms of species viability. Therefore, the meaning of viability was critical to determining effects on both sensitive species and potential species of conservation concern in this analysis.

The 2012 Planning Rule defines a “viable population” 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 Forest Service Handbook 1909.12, section 23.13c (1)(b) notes that the preamble to the proposed Planning Rule 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”.

The Forest Service Handbook further defines the words and phrases “*persist over the long term*,” “*sufficient distribution*,” “*resilient*,” and “*adaptable*,” used in the Planning Rule’s definition of “*viable population*,” as follows:

- The words “*persist over the long term*” means the species continues to exist in the plan area over a sufficiently long period that encompasses multiple generations of the species, the time interval between major disturbance events, the time interval to develop all successional stages of major habitat types, or the time interval needed for the overall ecosystem to respond to management. Understand that confidence in the evaluations of persistence decreases rapidly as the timeframe of projections increases and that the responsible official will change plan components using plan amendments and plan revisions when the responsible official decides plan components need to be changed because of changed conditions (FSH 1909.12 section 23.13c (1)(c)).
- 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. Recognize 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 National Forest System lands 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 (FSH 1909.12, section 23.13c(1)(d)).
- The word “*resilient*” suggests that when disturbance events or stressors result in the local disappearance of individuals or extirpation from an area, recolonization of suitable habitat may occur in the future to facilitate long-term persistence in the plan area (FSH 1909.12 section 23.13c(1)(e)).
- The word “*adaptable*” means that the species is able to adjust to new conditions. Ecological conditions to support the species are distributed in a way that the species may be represented in a variety of locally adapted ecotypes for increased likelihood of persistence in unknown future environments (FSH 1909.12 section 23.13c (1)(f)).

For many species, essential ecological conditions may be provided for through ecosystem level (also known as coarse-filter) plan components that include desired conditions for specific vegetation types. These ecosystem-level plan components may be adequate to ensure persistence of most species and maintain viable populations within the plan area. For other species, species-specific (also known as fine-filter plan) components that are more specialized (e.g., timing restrictions) may be required to ensure persistence and viability.

In brief, substantial concern about the species' capability to persist over the long term in the plan area is evidenced by one or more of the following criteria:

- habitat is limited or rare within the plan area
- current management activities are negatively impacting habitat within the plan area

- available monitoring indicates a decline in population, range, or both within the plan area

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 available on the project website.

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 March 2020), along with the Region 2 threatened, endangered, proposed and sensitive species list.

Table 31 describes the listing status for each species, habitat presence in the project area, and whether the species was 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 31. U.S. Fish and Wildlife Service threatened, endangered, and proposed species list for the Thunder Basin National Grassland

Common Name	Status	Recognized on FWS IPAC List for the Thunder Basin?	Recognized on the Region 2 TEP 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 (<i>Mustela nigripes</i>)	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 (<i>Sternula antillarum</i>) 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 (<i>Charadrius melodus</i>) No. Great Plains 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.
Whooping crane (<i>Grus americana</i>)	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. In addition, there is no Critical Habitat on the Thunder Basin National Grassland for this species and the project will not affect downstream Critical Habitat due to depletions.
Northern long-eared bat (<i>Myotis septentrionalis</i>)	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 the U.S. Fish and Wildlife Service has determined 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-essential, 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 public comment periods, 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 support ecological conditions that do not preclude reintroduction of the black-footed ferret.

Best available data indicate the reintroduction of black-footed ferrets to the Thunder Basin National Grassland is biologically feasible and would promote conservation and recovery of the species. Each of the alternatives includes an acreage objective for prairie dog colonies to support at-risk species. This acreage objective also provides assurance to conserve prairie dog colonies at an extent adequate for black-footed ferret reintroduction. Although U.S. Fish and Wildlife Service staff and the Wyoming Game and Fish Department staff do not currently have plans to reintroduce ferrets on the Thunder Basin National Grassland, the ecological conditions needed for reintroduction will continue to be provided in management area 3.67. The 2013 Recovery Plan for Black-footed Ferret³² and 2018 Wyoming Black-footed Ferret Management Plan³³ include objectives of maintaining a minimum of 341 breeding adults distributed among 5 or more populations in Wyoming; maintaining a minimum of 30 breeding adults in each population, with at least 2 populations containing a minimum of 100 breeding adults; and establishing at least 2 populations within white-tailed prairie dog colonies and at least 1 population within black-tailed prairie dog colonies, with remaining populations distributed among colonies of either prairie dog species. These plans also state 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. The 10,000 acres of prairie dog colonies provided for in the proposed action, grassland-wide alternative, and preferred alternative, as well as the larger objectives included in the no action alternative and prairie dog emphasis alternative, would provide adequate habitat for reintroduction of at least 30 ferrets and would meet the Forest Service obligations under the National Forest Management Act and the Endangered Species Act. In addition, the new requirement to implement an integrated approach to plague management in management area 3.67 in the preferred alternative would reduce impacts from sylvatic plague and decrease the likelihood of major plague events that could affect available habitat

³² The 2013 Recovery Plan for Black-footed Ferret is available at: <https://www.fws.gov/mountain-prairie/es/species/mammals/blackfootedferret/2013NovRevisedRecoveryPlan.pdf>

³³ The 2018 Wyoming Black-footed Ferret Management Plan is available at: https://wgfd.wyo.gov/WGFD/media/content/PDF/Wildlife/Nongame/Wyoming-BFF-Management-Plan_11-14-2018.pdf

in the future. If the site were selected for black-footed ferret reintroduction in the future, it would contribute to local, regional, and national criteria for downlisting and delisting. If reintroduction were proposed or implemented, the changed conditions may comprise a need to amend the grassland plan.

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) to prioritize new areas for reintroduction. This prioritization matrix will allow members to evaluate different criteria related to the biological and social context for reintroduction at sites recommended as reintroduction sites. Only sites that meet the 6 requirements for reintroduction would 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 ranking criteria need to be met for a site to be considered for reintroduction.

This analysis compares each alternative's responsiveness to the requirements for reintroduction established by the Wyoming Black-Footed Ferret Working Group. The proposed action, prairie dog emphasis alternative, and preferred alternative include management components that would not 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 an objective 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. 18,000 acres or more of prairie dog colonies in management area 3.63 is expected to be enough acreage to support at least 100 breeding adult 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 an objective 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. 10,000 acres of prairie dog colonies in management area 3.67 is expected to be enough acreage to support at least 30 breeding adult 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 an objective 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. 10,000 to 15,000 acres of prairie dog colonies is expected to be enough acreage to support up to 100 breeding adult ferrets. However, the colonies may not be in close enough proximity to provide ideal reintroduction areas.
- 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 to cease 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. 18,000 acres of prairie dog colonies in management area 3.67 is expected to be enough acreage to support at least 100 adult 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.

Alternative 5 – Preferred 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
- Requirement 1, minimum prairie dog acreage: With an objective 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. 10,000 acres of prairie dog colonies in management area 3.67 is expected to be enough acreage to support at least 30 breeding adult 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.

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 evidenced 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 32) 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 32:

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 design of the proposed action eliminates any potential for impact on the species.

For those species carried forward for detailed analysis, 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 (appendix E). A summary of determinations is included in table 29 and table 32.

Table 32. Forest Service sensitive species list for the Thunder Basin National Grassland and occurrence in the analysis area

Class	Common name (scientific Name)	Habitat features	Status on Regional Forester's Sensitive Species List*	Habitat present in the analysis area?	Rationale for effects analysis	Determination for all alternatives
Amphibian	Northern leopard frog (<i>Lithobates pipiens</i>)	In or near permanent water features and riparian areas in the plains, foothills, and montane zones	Known - observations on the Thunder Basin National Grassland	Habitat is present on the Thunder Basin National Grassland, but not where activities are proposed.	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 (<i>Spizella breweri</i>)	Sagebrush obligate species	Known - observations on the Thunder Basin National Grassland	Habitat is present on the Thunder Basin National Grassland and where activities are proposed.	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	Burrowing owl (<i>Athene cunicularia</i>)	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 - observations on the Thunder Basin National Grassland	Habitat is present on the Thunder Basin National Grassland and where activities are proposed.	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 (scientific Name)	Habitat features	Status on Regional Forester's Sensitive Species List*	Habitat present in the analysis area?	Rationale for effects analysis	Determination for all alternatives
Bird	Chestnut-collared longspur (<i>Calcarius ornatus</i>)	Open tracts of shortgrass and mixed-grass prairie; may use prairie dog colonies as habitat	Known - observations on the Thunder Basin National Grassland	Habitat is present on the Thunder Basin National Grassland and where activities are proposed.	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	Ferruginous hawk (<i>Buteo regalis</i>)	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 - observations on the Thunder Basin National Grassland	Habitat is present on the Thunder Basin National Grassland and where activities are proposed.	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 (<i>Psiloscops flammeolus</i>)	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 known observations on the Thunder Basin National Grassland.	Habitat is present on the Thunder Basin National Grassland, but not where activities are proposed.	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	Grasshopper sparrow (<i>Ammodramus savannarum</i>)	Broad array of open grassland habitat types, including prairie dog colonies	Known - observations on the Thunder Basin National Grassland	Habitat is present on the Thunder Basin National Grassland and where activities are proposed.	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 (scientific Name)	Habitat features	Status on Regional Forester's Sensitive Species List*	Habitat present in the analysis area?	Rationale for effects analysis	Determination for all alternatives
Bird	Greater sage-grouse (<i>Centrocercus urophasianus</i>)	Sagebrush obligate species that depends on large areas of contiguous sagebrush	Known - observations on the Thunder Basin National Grassland	Habitat is present on the Thunder Basin National Grassland and where activities are proposed.	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	Lewis's woodpecker (<i>Melanerpes lewis</i>)	Commonly found in forests dominated by Ponderosa Pine, open riparian woodland dominated by cottonwood	Known - observations on the Thunder Basin National Grassland	Habitat is present on the Thunder Basin National Grassland, but not where activities are proposed.	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 (<i>Lanius ludovicianus</i>)	Open habitats with short vegetation, especially hay fields and pastures	Known - observations on the Thunder Basin National Grassland	Habitat is present on the Thunder Basin National Grassland, but not where activities are proposed.	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 (scientific Name)	Habitat features	Status on Regional Forester's Sensitive Species List*	Habitat present in the analysis area?	Rationale for effects analysis	Determination for all alternatives
Bird	Long-billed curlew (<i>Numenius americanus</i>)	Breeding 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 - observations on the Thunder Basin National Grassland	Habitat is present on the Thunder Basin National Grassland and where activities are proposed.	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	McCown's longspur (<i>Rhynchophanes mccownii</i>)	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 - observations on the Thunder Basin National Grassland	Habitat is present on the Thunder Basin National Grassland and where activities are proposed.	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 (scientific Name)	Habitat features	Status on Regional Forester's Sensitive Species List*	Habitat present in the analysis area?	Rationale for effects analysis	Determination for all alternatives
Bird	Mountain plover (<i>Charadrius montanus</i>)	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 - observations on the Thunder Basin National Grassland	Habitat is present on the Thunder Basin National Grassland and where activities are proposed.	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 (<i>Accipiter gentilis</i>)	Mature montane coniferous forests	Known - observations on the Thunder Basin National Grassland	Habitat is present on the Thunder Basin National Grassland, but not where activities are proposed.	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 (scientific Name)	Habitat features	Status on Regional Forester's Sensitive Species List*	Habitat present in the analysis area?	Rationale for effects analysis	Determination for all alternatives
Bird	Northern harrier (<i>Circus hudsonius</i>)	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 - observations on the Thunder Basin National Grassland	Habitat is present on the Thunder Basin National Grassland and where activities are proposed.	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 (<i>Contopus cooperi</i>)	Montane and northern coniferous forests	Known - observations on the Thunder Basin National Grassland	Habitat is present on the Thunder Basin National Grassland, but not where activities are proposed.	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	Sagebrush sparrow (<i>Artemisospiza nevadensis</i>)	Sagebrush-obligate species that breeds preferentially in arid shrub lands dominated by big sagebrush	Known - observations on the Thunder Basin National Grassland	Habitat is present on the Thunder Basin National Grassland and where activities are proposed.	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 (scientific Name)	Habitat features	Status on Regional Forester's Sensitive Species List*	Habitat present in the analysis area?	Rationale for effects analysis	Determination for all alternatives
Fish	Finescale dace (<i>Phoxinus neogaeus</i>)	Slow or stagnant water with abundant vegetation or other cover	Suspected – no known observations on the Thunder Basin National Grassland.	Habitat is present on the Thunder Basin National Grassland, but not where activities are proposed.	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
Fish	Flathead chub (<i>Platygobio gracilis</i>)	Main channels of sandy, turbid streams with small substrates, deep water, and woody debris	Known - observations on the Thunder Basin National Grassland	Habitat is present on the Thunder Basin National Grassland, but not where activities are proposed	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
Fish	Mountain sucker (<i>Catostomus platyrhynchus</i>)	Clear, cold creeks and small to medium rivers with clear rubble, gravel or sand substrate; rarely found in lakes	Known - observations on the Thunder Basin National Grassland	Habitat is present on the Thunder Basin National Grassland, but not where activities are proposed	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 (scientific Name)	Habitat features	Status on Regional Forester's Sensitive Species List*	Habitat present in the analysis area?	Rationale for effects analysis	Determination for all alternatives
Fish	Plains minnow (<i>Hybognathus placitus</i>)	Large, turbid, prairie streams and rivers, slow water and side pool habitat	Known - observations on the Thunder Basin National Grassland	Habitat is present on the Thunder Basin National Grassland, but not where activities are proposed	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
Fish	Plains topminnow (<i>Fundulus sciadicus</i>)	Shallow, slow water in clear streams with heavy vegetation	Suspected – no known observations on the Thunder Basin National Grassland.	Habitat is present on the Thunder Basin National Grassland, but not where activities are proposed.	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
Fish	Sturgeon chub (<i>Macrhybopsis gelida</i>)	Mainstem dwellers and are rarely found in tributary streams, associated with hard substrates and relatively shallow, high current velocity habitats	Known - observations on the Thunder Basin National Grassland	Habitat is present on the Thunder Basin National Grassland, but not where activities are proposed	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 (scientific Name)	Habitat features	Status on Regional Forester's Sensitive Species List*	Habitat present in the analysis area?	Rationale for effects analysis	Determination for all alternatives
Insect	Monarch butterfly (<i>Danaus plexippus</i>)	Open habitats including fields, meadows, weedy areas, marshes, and roadsides	Suspected – no known observations on the Thunder Basin National Grassland.	Habitat is present on the Thunder Basin National Grassland, but not where activities are proposed.	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 (<i>Hesperia ottoe</i>)	Native tall-grass prairie	Suspected – no known observations on the Thunder Basin National Grassland.	Habitat is present on the Thunder Basin National Grassland, but not where activities are proposed.	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	Regal fritillary (<i>Speyeria idalia</i>)	Tall-grass prairie and other open sites including damp meadows, marshes, wet fields, and mountain pastures	Suspected – no known observations on the Thunder Basin National Grassland.	Habitat is present on the Thunder Basin National Grassland, but not where activities are proposed.	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 (scientific Name)	Habitat features	Status on Regional Forester's Sensitive Species List*	Habitat present in the analysis area?	Rationale for effects analysis	Determination for all alternatives
Insect	Western bumblebee (<i>Bombus occidentalis</i>)	Bumblebees 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 - observations on the Thunder Basin National Grassland	Habitat is present on the Thunder Basin National Grassland, but not where activities are proposed	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 (<i>Cynomys ludovicianus</i>)	Short-statured grassland and bare ground; flat areas with short vegetation and few visual barriers	Known - observations on the Thunder Basin National Grassland	Habitat is present on the Thunder Basin National Grassland and where activities are proposed.	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	Fringed myotis (<i>Myotis thysanodes</i>)	Forested habitats, both deciduous and coniferous; trees, snags, caves, rocks, cliffs; grasslands, deserts, and shrub lands	Known - observations on the Thunder Basin National Grassland	Habitat is present on the Thunder Basin National Grassland, but not where activities are proposed	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 (<i>Lasiurus cinereus</i>)	Forested habitats, both deciduous and coniferous; trees, snags, caves, rocks, cliffs; grasslands, deserts, and shrub lands	Known - observations on the Thunder Basin National Grassland	Habitat is present on the Thunder Basin National Grassland, but not where activities are proposed	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 (scientific Name)	Habitat features	Status on Regional Forester's Sensitive Species List*	Habitat present in the analysis area?	Rationale for effects analysis	Determination for all alternatives
Mammal	Rocky Mountain bighorn sheep (<i>Ovis canadensis</i>)	High visibility habitats near rocky escape terrain that allow efficient foraging, enhanced detection of predators, and opportunities to evade them	Known - observations on the Thunder Basin National Grassland	Habitat is present on the Thunder Basin National Grassland, but not where activities are proposed	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	Swift fox (<i>Vulpes velox</i>)	Short-grass and mid-grass prairies with flat or gently sloping topography; utilizes previously excavated burrows by other mammals for denning habitat	Known - observations on the Thunder Basin National Grassland	Habitat is present on the Thunder Basin National Grassland and where activities are proposed.	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 (<i>Corynorhinus townsendii</i>)	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 - observations on the Thunder Basin National Grassland	Habitat is present on the Thunder Basin National Grassland, but not where activities are proposed	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

Effects Analysis – Preliminary List of 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 species met the minimum requirements to be considered for identification as potential species of conservation concern.

The Forest Service initially considered 82 animal species to determine if they met the criteria for potential species of conservation concern and would be affected by the proposed plan amendment. The Forest Service 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, the Forest Service 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 further information would be needed 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 from the species evaluations for detailed analysis in the biological evaluation of animal species and preliminary list of potential species of conservation concern report (appendix E).

The focus of the potential species of conservation concern 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 preliminary list of potential species of conservation concern report (Appendix E) contains detailed information about species life history, occurrence on the Thunder Basin National Grassland, environmental consequences of alternatives, and rationale for the effects determinations. The effects determinations are summarized in table 29.

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 National Forest System 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 preliminary list of 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. Two insecticides are 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 (USDA 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 (US EPA 1998a, b, and c).

APHIS personnel evaluated the human health and ecological risk of aluminum phosphide (a fumigant) for rodent control (USDA APHIS 2017a). Aluminum phosphide reacts with moisture in the atmosphere to produce phosphine gas, which is the substance that is active as a pesticide (US EPA 1998a). Although phosphine gas is toxic to humans, the risk to human health is low because inhalation exposure is slight for underground applications (USDA APHIS 2017a). The EPA only considered dietary exposure from food because drinking water exposure is not expected, and there is currently only limited residential use. 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 that 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 that 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 (US 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 (USDA 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 (US 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 (USDA 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 30, 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 30, 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 (USDA 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 (US 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 (US 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 (US EPA 1998c). Reading and following label instructions is the best way to ensure 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 (US 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 (US EPA 1998c) and which may be utilized by plants.

Residues of zinc phosphide were detected on grasses (US 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” (US 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” (US 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 (US EPA 1998c).

Environmental Fate

In moist soils, zinc phosphide rapidly degrades to phosphine, which attaches to soil and oxidizes to phosphate ions and phosphorus (US EPA 1998c). On dried soil, zinc phosphide appears to be moderately persistent; half-lives may be greater than one month (US 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 (US 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 (US 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. 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 (US EPA 1998c) determined these products would 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 (US 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 (US 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 individual's risk resulting from accidental ingestion or oral exposure (US 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 (US 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 chlorophacinone, no carcinogenicity studies were required (US 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 waterbodies. 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 (US 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 waterbodies. 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 (US EPA 1998b).

Environmental Fate

Chlorophacinone appears to be very immobile and readily degradable in the environment. It has the following characteristics (US 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 to 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 (US 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 (US 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 and preferred alternatives allow use of fumigants. The grassland-wide alternative allows use of fumigants only in boundary management zones and after three applications of zinc phosphide. The preferred alternative allows use of fumigants in the boundary management zone, 1-mile residence buffer, and within 1/4 mile of non-Federal land across the grassland, after two applications of zinc phosphide.

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 (USDA 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 that 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 (US 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 and preferred alternatives allow use of fumigants. The grassland-wide alternative allows use of fumigants only in boundary management zones and after three applications of zinc phosphide. The preferred alternative allows use of fumigants in the boundary management zone, 1-mile residence buffer, and within 1/4 mile of non-Federal land across the grassland, after two applications of zinc phosphide.

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 that are directed into the pest burrow, which is sealed or covered. Inhalation exposure to the applicator should, therefore, be negligible. EPA staff believe the pesticide active ingredient sodium nitrate, as registered for use in products evaluated, does not present any unreasonable adverse effects to humans (US 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 (USDA APHIS 2017b).

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 (USDA 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 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 (USDA APHIS 2017b).

Environmental Fate

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

Insecticide (Deltamethrin – Pyrethrin)

Deltamethrin is a broad-spectrum Type II pyrethroid insecticide designed to kill a wide range of insects that targets the nervous system. Deltamethrin is commonly used to reduce flea abundance in prairie dog colonies to reduce the plague vector (*Oropsylla hirsuta*) and other flea species. An application of 0.05 percent deltamethrin dust using handheld dusters is commonly used (Eads and Biggins 2019). Pyrethrins have been used as insecticides in the United States since the 1950s, with approximately 1,350 end-use products containing pyrethrins for use on agricultural, commercial, residential, and public health areas (US EPA 2006). A reregistration eligibility decision for pyrethrins was signed in June 2006, and a draft human health risk assessment for registration review was signed in June 2017 by the EPA.

Alternatives Proposing Deltamethrin

All alternatives allow the application of deltamethrin.

Effects to Human Health and Safety

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 all applicators 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 using metered release devices, however it is believed that this risk is lower due to the occupational areas generally having greater ventilation capacity (US EPA 2006).

Length and Route of Exposure; Toxicity

Pyrethrins have a moderate acute toxicity via inhalation route of exposure and minimal dermal toxicity with no dermal hazard being identified (US EPA 2017). It is minimally irritating to the eye and non-irritating to skin (US EPA 2017).

Based on the toxicity profile, the EPA did not conduct dermal (all durations) or intermediate and long-term inhalation exposure elements for adults and children. Inhalation post-application exposure is expected to be minimal (US EPA 2017). The acute, chronic, short-term, intermediate-term and long risks from food, drinking water and residential exposures do not exceed the EPAs levels of concern (US EPA 2006).

Carcinogenicity, Mutagenicity

The EPA classified deltamethrin as “not likely to be a human carcinogen by all routes of exposure in accordance with the EPA Final Guidance for Carcinogen Risk Assessment.

Dietary Exposure from Drinking Water

Acute dietary (food and drinking water) risk does not exceed the EPAs level of concern for the general U.S. population (US EPA 2006).

Environmental Fate

When applied to a field, deltamethrin is likely to partition in the soil and organic matter in crops. It appears to bind strongly to soil and organic matter, though binding is not instantaneous and is not expected to leach into sub-surfaces (US EPA 2017). Deltamethrin appears to be moderately to highly persistent in terrestrial environments, has the potential to persist in aquatic environments and unlikely to volatilize substantially (US EPA 2017).

Deltamethrin

- EPA registration number: 432-772
- Treatment period: Year round
- Grazing Restriction: No
- RUP: No
- Re-treatment: Yes
- Active ingredient: deltamethrin 0.05%

Insecticide (Fipronil – Permethrin)

Permethrin is part of the pyrethroid class of pesticides. It is a broad spectrum, non-systemic, synthetic pyrethroid insecticide, and is registered for use on numerous food/feed crops, livestock and livestock housing, modes of transportation, structures and buildings (US EPA 2009). Permethrin was first registered and tolerances established in the United States in 1979 for use on cotton (US EPA 2009). From 1979 to

1982, there was considerable scientific debate over the interpretation of the carcinogenicity database, which delayed the establishment of new crop tolerances and non-food registrants (US EPA 2009) including mosquito abatement areas. Fipronil a form of permethrin was introduced for use in 1993, and registered in the United States in 1996 (Gunasekara 2007). Fipronil can be formulated as a solid (insect bait), liquid spray, or as a granular product for turf applications (Gunasekara 2007). Fipronil is a widely used compound designed to protect plant products that cause damage to crops. It is also used to control parasites such as fleas, ticks, and worms on domesticated animals and as pesticides to control non-agricultural pests (Pisa et al. 2014). Poché et al. (2017) in Laramie County, Colorado, reported that grain rodent bait containing fipronil (0.005%) was effective in reducing the mean number of fleas infesting prairie dogs by 95 to 100 percent, maintaining efficacy for more than 31 days post application. A reregistration eligibility decision and accompanying risk assessment was signed for permethrin in June 2006; a draft human health risk assessment for registration review was signed in May 2009 by the EPA.

Alternatives Proposing Permethrin

All alternatives allow the application of permethrin.

Effects to Human Health and Safety

The EPA determined there is a potential for exposure to permethrin in residential settings for homeowners who handle (mix, load, and apply) products containing permethrin, as well as post-application exposure from entering permethrin-treated areas (US EPA 2009). The EPA determined that the established tolerances for permethrin meet the safety standards and that there is reasonable certainty no harm will result to the general population or any subgroup (children or infants) from the use of permethrin (US EPA 2009). The label for the product fipronil (EPA 72500-28) states “keep pets and livestock out of treated areas until bait has been consumed by the rodents.”

Length and Route of Exposure; Toxicity

Exposure to homeowners handling permethrin is likely to occur via dermal (skin) and inhalation routes during the residential use of permethrin in a variety of indoor and outdoor environments (US EPA 2009). Non-cancer (dermal and inhalation) risks for homeowners handling permethrin are below the EPA’s level of concern (US EPA 2009). The EPA also has no risk concerns associated with post-application exposure to permethrin from outdoor residential misting systems. Permethrin is classified as category III for eye irritation potential and category IV for dermal irritation potential. The majority of cases resulted in minor effects to the skin (primarily rash, irritation, itching), eyes (redness, pain, burning), headache, dizziness, nausea, vomiting, and shortness of breath or difficulty breathing (US EPA 2009). In addition, fipronil occurrence in surface water suggests possible exposure to swimmers (CDPR 2017).

Carcinogenicity, Mutagenicity

The EPA classified permethrin as “likely to be carcinogenic to humans” by the oral route (US EPA 2009). However, since there is no developmental or reproductive toxicity of concern for permethrin, no appropriate endpoint or study was selected for the female (ages 13 to 49) subgroup (US EPA 2009). The residential handler cancer risk for post-application was negligible with exposure occurring over a 50-year period with a 70-year lifetime. However, two scenarios were identified above the EPA’s level of concern: indoor broadcast surface sprays (1% active ingredient) and indoor total release foggers (US EPA 2009). Subsequently, the application rate was reduced from 1% to 0.5% active ingredient.

Dietary Exposure from Drinking Water

The EPA determined the estimated lifetime average daily exposure from food and drinking water does not exceed the EPA's level of concern (US EPA 2009).

Environmental Fate

Permethrin is a persistent pyrethroid in the environment, and was immobile in several soils tested. It is also slow to hydrolyze and biodegrade. At a pH of 9, permethrin degraded very slowly with a half-life of 125 to 350 days. The relatively low water solubility and hydrophobic nature of permethrin leads to strong soil adsorption and tendency to partition to sediment in aquatic systems, and will bioconcentrate in aquatic systems. Permethrin has very low mobility, is moderately persistent, and has a high affinity to bind to soils or sediments and organic carbon.

Fipronil

- EPA registration number: 72500-28
- Treatment period: September 1 to April 30
- Grazing Restriction: Yes
- RUP: Yes
- Re-treatment: Yes, with limitations
- Active ingredient: fipronil 0.005%

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 (National Environmental Policy Act section 101).

Action alternatives developed for this plan amendment project would generally decrease the objective for acres of habitat provided for species that use or rely on short-stature vegetation, including prairie dogs. Actions associated with implementing 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.

Laws, Regulations, and Policies Related to the Analysis

Federal Law and Regulations

Bankhead Jones Farm Tenant Act

- 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.

Granger Thye 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

- 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

- 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

- National Forest Management Act) 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 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 National Forest Management Act 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 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 to 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).
 - ◆ Descriptions of how the plan amendment complies with the procedural and substantive requirements of the 2012 Planning Rule are included in chapter 1 of this final environmental impact statement and in the record of decision.

Clean Water Act

- The Federal Water Pollution Control Act of 1948, expanded and reorganized in 1972 (Federal Water Pollution Control Amendments of 1972), is commonly known as the Clean Water Act. The objective of the Clean Water Act is to restore and maintain the chemical, physical, and biological integrity of the nation’s waters. Ongoing and future site-specific projects will adhere to the standards, guidelines, and direction in place in the 2002 grassland plan, and by doing so will continue to be consistent with the Clean Water Act and amendments. Label restrictions for applying pesticides approved for use in this decision will protect waterbodies from detrimental chemical application. Therefore, this decision is compliant with the Clean Water Act.

Clean Air Act

- Under the Clean Air Act of 1970, the Forest Service is tasked to provide particular protection to air quality-related values. This decision is consistent with the Clean Air Act. The plan amendment does not create, authorize, or execute any activities with the potential to alter air quality. There are no emissions related to implementation of this decision. Implementation of the plan amendment

direction will not result in exceedance of Wyoming Ambient Air Quality standards. Therefore, this decision is compliant with the Clean Air Act.

National Historic Preservation Act

- The National Historic Preservation Act and subsequent amendments require Federal agencies to consider the effects of their undertakings on historic properties. As required under the act, site-specific project areas are subject to requirements for survey, identification of resources, determination of eligibility, evaluation of effect, consultation, and resolution of adverse effects, if any. This decision does not approve site-specific ground-disturbing activities. Projects will comply fully with the laws and regulations that ensure protection of cultural resources. This decision complies with the National Historic Preservation Act and other statutes that pertain to the protection of cultural resources.

Endangered Species Act

- 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. Forest Service 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 was developed for consultation with the U.S. Fish and Wildlife Service. Forest Service personnel would contribute to recovering the endangered black-footed ferret by providing at least 10,000 acres of habitat ecologically suitable for reintroduction.

Migratory Bird Treaty Act

- 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.” To comply with the act, Thunder Basin National Grassland staff have completed analyses of effects to migratory birds that are Forest Service sensitive species and potential species of conservation concern. These species serve as proxies for analysis of effects to other migratory bird species. Approaches to identify and minimize take have been incorporated into revised plan components.

Bald and Golden Eagle Protection Act

- 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

- The Federal Insecticide, Fungicide, and Rodenticide Act (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.

Policy and Guidance for Pesticide Use

- EPA Worker Protection Standard (40 CFR 170) is designed to protect workers 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 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 use of a given pesticide might harm humans or other species in the environment.

The Animal Damage Control Act

- 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 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.

Civil Rights Act

- 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

Civil Rights and Environmental Justice

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. The Forest Service considered information on the presence of minority and low-income

populations to assess the potential for disproportionately high and adverse impacts on minority or low-income populations. Consideration of impacts includes existence of high and adverse human health and environmental effects and the degree to which low-income populations are more likely to be exposed or vulnerable to those effects. 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.

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 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 preparing this final environmental impact statement as members of the project interdisciplinary team.

Table 33. Project interdisciplinary team members listed in alphabetical order by last name

Name	Title, Affiliation	Responsibility
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.
Dru Bower	Tri-County Commissioners representative	Provide expertise related to local government, community development, social and economic factors
Joe Budd	Policy advisor, Wyoming Department of Agriculture and Wyoming Governor's Office	Provide expertise related to range and livestock management
Tim Byer	Wildlife biologist, Thunder Basin National Grassland	Provide expertise related to wildlife
Casey Campbell	Project record support, Medicine Bow-Routt National Forests and Thunder Basin National Grassland	Assist with project record keeping, notes, and document compilation
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
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
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
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
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.
Geri Proctor	Range program manager, Medicine Bow-Routt National Forests and Thunder Basin National Grassland	Provide expertise related to range management and rodenticide use
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

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
Rob Robertson	District ranger, Thunder Basin National Grassland	Responsible for project oversight, general management considerations
Shay Rogge	Fire management officer, Thunder Basin National Grassland	Primary responsibility for analysis of issues related to wildfire and prescribed fire
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
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.
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
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
Kristen Waltz	Social scientist, U.S. Forest Service Enterprise Program	Primary responsibility for analysis of social and economic issues
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
Amanda Withroder	Habitat Protection Program biologist, Wyoming Game and Fish Department	Provide expertise related to wildlife management
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

Many other U.S. Forest Service professionals were consulted during preparation of this final 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 developing recommendations for this plan amendment. Their contributions are displayed in the recommendations provided to the 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 Cheney's 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 Governor's 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 Barrasso's Office
- Senator Enzi's 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 agency status for this project was 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 environmental impact statement, and provided a preliminary review of this final 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, Wyoming
- Campbell County Conservation District
- Campbell County Weed and Pest District
- Converse County, Wyoming
- Converse County Conservation District
- Converse County Weed and Pest District
- Weston County, Wyoming
- Weston County Natural Resource District
- West County Weed and Pest District
- Niobrara County, Wyoming
- Niobrara County Conservation District
- Niobrara County Weed and Pest District
- Crook County, Wyoming
- Crook County Conservation District
- Crook County Weed and Pest District

Tribes

In April 2019, formal consultation was initiated with the 18 tribal entities listed below. The Tribes were provided with scoping information and information on the draft environmental impact statement. No Tribes have provided formal comments in advance of release of the final 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 and Draft Environmental Impact Statement Comment Period Commenters

Approximately 520 individuals and organizations offered comments during the scoping period and 275 during the formal 90-day public comment 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 Final Environmental Impact Statement

This final environmental impact statement and a draft record of decision are 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 final 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 final environmental impact statement has been distributed to individuals who specifically requested notification, submitted comments during the scoping or 90-day draft environmental impact statement 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 2016), notice of this final 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 Engineer's 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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