Environmental Assessment

for

Wyoming Range Mule Deer Habitat Project

Prepared by

Bureau of Land Management

Pinedale Field Office

Pinedale, Wyoming

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BLM

Pinedale Field Office

It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

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1. INTRODUCTION

1.1 Identifying Information

1.1.1 Title, EA Number, and Type of Project

Wyoming Range Mule Deer Habitat Plan Environmental Assessment, DOI-BLM-WY-100-EA14-46.

1.1.2 Location of Proposed Action

Wyoming Range mule deer habitat, located in the Pinedale and Rock Springs Bureau of Land Management (BLM) field offices.

1.1.3 Name and Location of Preparing Office

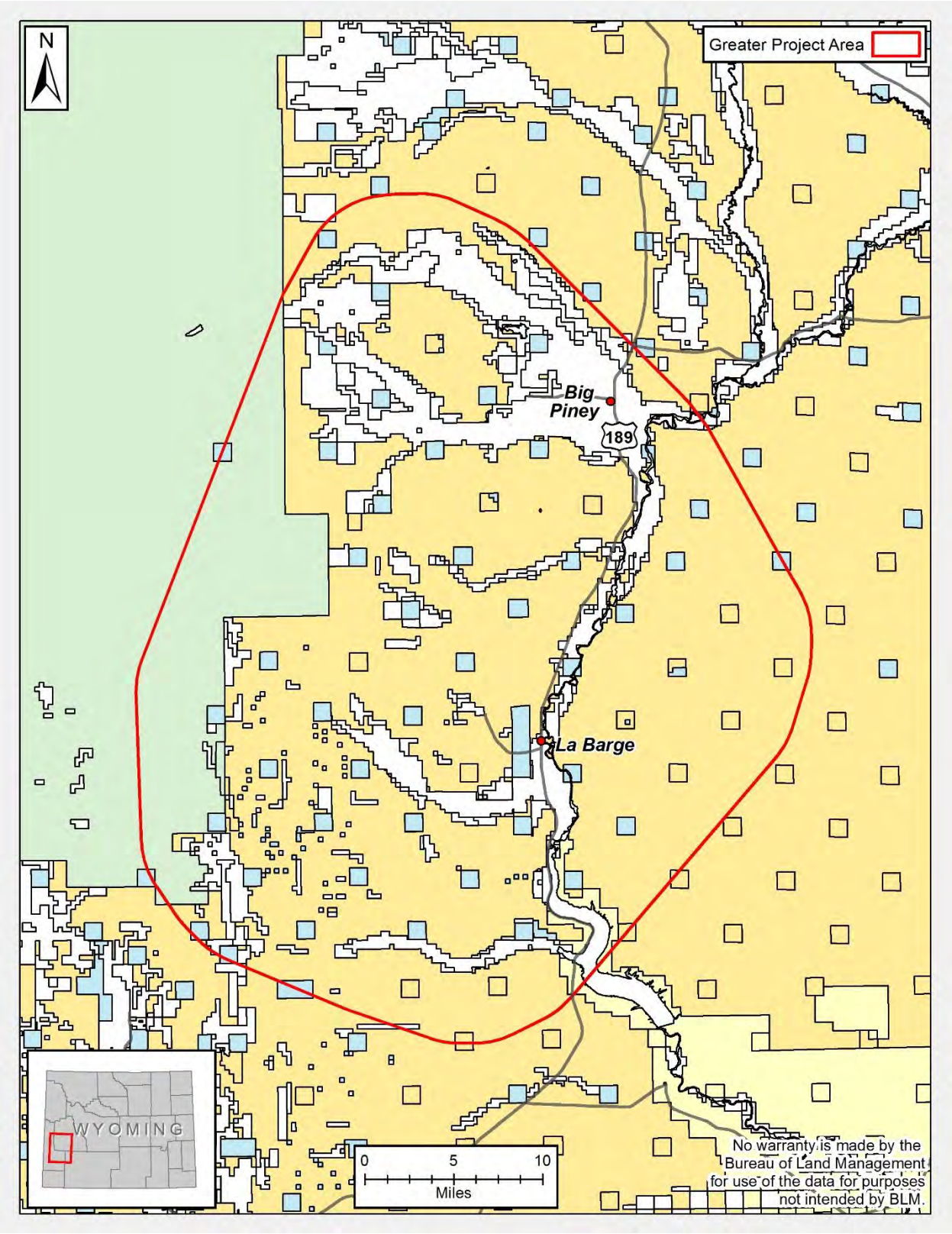
Lead Office – Pinedale Field Office
1625 West Pine Street, PO Box 768
Pinedale, WY 82941

1.2 Introduction

The greater project area includes lands bounded by North Piney Creek to the north, Fontenelle Creek to the south, the Wyoming Range to the west, and includes portions of the Little Colorado Desert to the east (Map 1). The emphasis of this plan is on BLM-managed lands.

This area's annual precipitation varies east to west along a gradient from very low (7-9 inches) to high (20-24 inches). Mule deer crucial winter and winter ranges tend to be located on the lower precipitation areas and migration routes or transition habitat is located in the western portion of the area in relatively higher precipitation zones. The area ranges in elevation from approximately 6,500 feet in the lower areas to 9,500 feet in the Deadline Ridge and Miller Mountain focus areas. Arid rangelands are widespread throughout this area with Wyoming big sagebrush (*Artemisia tridentata* ssp*. wyomingensis*) dominating the landscape intermixed with pockets of saltbush (*Atriplex* spp.). On slopes with greater moisture and favorable soil conditions, mixed mountain shrubs such as true mountain mahogany (*Cercocarpus montanus*), serviceberry (*Amelanchier alnifolia*), chokecherry (*Prunus virginiana*), and other sagebrush (*Artemisia* spp.) become more prevalent on the landscape. Sagebrush communities are generally older age class with lack of recruitment and moderate to excessive hedging of shrubs, particularly on crucial winter ranges. Mixed mountain shrubs are highly preferred winter browse by all wintering ungulates (mule deer (*Odocoileus hemionus*), pronghorn (*Antilocapra americana)*, elk (*Cervus elaphus)*, and moose (*Alces alces)*), and small, isolated patches have resulted in nearly 100 percent of annual leader utilization and very low recruitment in these communities. Significant land uses in the area include cattle grazing, oil and gas development, and recreation by big game and antler hunters.

Map 1. Greater Project Area general location.



1.3 Background

In recent years, concerns have risen over decreasing mule deer populations and the factors limiting population growth in the Intermountain West (Mule Deer Working Group 2003). Although the specific reason for decreasing populations of mule deer are unknown, habitat quality and quantity continue to be identified as consistent factors. In 2007, the Wyoming Game and Fish Department (WGFD) adopted the Wyoming Mule Deer Initiative (Mule Deer Working Group 2007) with the intention of completing key herd unit management plans based on the broader Initiative goals and objectives. Habitat was identified as one of ten issues facing mule deer. WGFD contracted Teton Science Schools (TSS) to complete the Wyoming Range Mule Deer Habitat Assessments for important habitats used by the Wyoming Range mule deer (Smith and Younkin 2010a and 2010b). The habitat assessment assessed current conditions and identified potential treatment areas.

The Wyoming Range Mule Deer Initiative was completed in 2011, and included extensive public involvement. Habitat was once again a reoccurring theme of concern from the public. The public requested additional efforts between WGFD and federal agencies to implement habitat treatments. As a follow up, WGFD hired an additional biologist to develop the Wyoming Range Mule Deer Habitat Plan (Damm and Randall 2012) (Plan). The Plan proposed habitat improvement treatments within 18,509 acres of shrub communities and 6,201 acres of aspen community projects within the Pinedale Bureau of Land Management (BLM) Field Office and 9,999 acres of shrub community projects within the Rock Springs BLM Field Office.

WGFD proposed to implement the habitat improvement actions on BLM lands identified in the Damm and Randall (2012) report. As the project proponent, WGFD biologists provided the Proposed Action to the BLM to improve mule deer habitat conditions in the Wyoming Range. Based on the Proposed Action, an interdisciplinary team of BLM specialists and WGFD was created to review the Proposed Action.

1.4 Purpose and Need

The purpose for the proposed action and alternatives analyzed is to improve vegetation condition in crucial mule deer winter range, and transition and parturition ranges. Objectives of the project include:

- Increased sagebrush vigor and seed production (productivity);
- Increased sagebrush regeneration;
- Increased forb diversity and percent composition;
- Increased grass diversity and percent composition; or
- Release of younger sagebrush; or
- Increased aspen regeneration.

The need for the proposed action and alternatives is to support the Pinedale RMP objective to maintain and enhance big game habitats. In particular, this plan addresses declining mule deer habitat conditions and supports big game populations at Wyoming Game and Fish planning objective levels.

1.5 Relationship to Planning

1.5.1 BLM Resource Management Plan

This project is in conformance with the Record of Decision and Approved Pinedale Resource Management Plan (BLM 2008a). The proposals considered in this EA would help in achieving the following resource management goals identified in the Pinedale Resource Management Plan.

Forestry

Management Goal: Manage all forest and woodland stands for restoration to pre-suppression composition, structure, and function, with generally widely scattered, more fire resilient larger trees and lower numbers of smaller trees in the more frequent fire return interval regimes (primarily Douglas fir; limber and whitebark pine). Realize that pre-suppression characteristics in the longer fire return intervals forests (lodgepole pine and true firs) consisted of stand replacement fires and even aged stands.

Objective 2(b): Restoration of aspen stands will be emphasized through removing/reducing conifer and/or sagebrush invasion. Prescribed fire and overstory removal of dead and dying aspen will be used to rejuvenate and expand these stands so that watershed and wildlife habitat are improved and natural fire breaks are created within the landscape.

Livestock Grazing Management

Management Goal: Maintain and/or enhance livestock grazing opportunities and rangeland health.

Objective 1: Maintain, restore or enhance livestock grazing to meet the Wyoming Standards for Rangeland Health and achieve allotment objectives.

Paleontology and Natural History

Management Goal: Protect significant fossils and known paleontological resources from damage or destruction and facilitate suitable scientific, education, and recreational use of fossils.

Objective 1: Known and newly discovered paleontological resources will be managed to maintain or improve current condition.

Recreation and Visitor Services Management

Management Goal: Provide substantial personal, community, economic and environmental benefits to local residents and visitors through recreation uses of the public lands.

Objective 1: Maintain or enhance the health and viability of recreation-dependent natural resources and settings within the planning area.

Soils Management

Management Goal: Prevent or mitigate impacts on soil stability, productivity, and water infiltration to prevent accelerated erosion and chemical degradation of the soil resource, and provide for optimal plant growth.

Objective 2: Ensure that all newly disturbed areas are successfully reclaimed and that management actions are consistent with inherent soil resource capabilities.

Vegetation Management

Management Goal: Maintain and/or enhance native vegetation community health, composition, and diversity in conformance with Wyoming Standards for Rangeland Health. Reclaim disturbed areas to desired plant communities.

Objective 2: Manage permitted actions to control the spread of and/or eradicate noxious weeds and/or invasive species.

Objective 4: Conduction vegetation treatments to maintain important vegetation types and meet vegetation management goals.

Visual Resources Management

Management Goal: Manage public lands in accordance with VRM objectives. Minimize the impacts on visual resources.

Objective 1: Manage the public lands in a manner that protects the quality of the scenic values of these lands.

Watershed and Water Quality (Surface Water and Groundwater) Management

Management Goals:

Minimize adverse impacts on surface water and groundwater resources and recharge areas from public lands uses.

Maintain or reestablish proper watershed, wetland, riparian, and stream channel functions to support natural or desired surface water flow regimes and meet state water quality standards and the Wyoming Standards for Rangeland Health.

Prevent, minimize, and/or remediate contributions of nonpoint source pollution from federal lands to all receiving waters.

Objective 2: Meet the Wyoming Standards for Rangeland Health and maintain or enhance wetland and riparian vegetation to achieve Proper Functioning Condition.

Wildland Fire and Fuels Management

Management Goals:

Manage a landscape of diverse plant communities and successional stages that would have been produced by historic fire regimes.

Objective 2: Use prescribed fire and WFURB (wildfire use for resource benefit) to meet vegetation goals and to return the ecosystem to pre-suppression composition, structure, and function where possible.

Wildlife and Fish Habitat Management

Management Goals:

Maintain or enhance aquatic and wildlife habitat.

Maintain functioning big game habitats and migration corridors that allow free movement and use of habitats.

1.5.2 Other Documents

This EA is tiered to the analysis and effects disclosed in the Final Programmatic Environmental Impact Statement (PEIS) – Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States (BLM 2007).

1.6 Scoping and Public Involvement

The public has been involved throughout the development of the treatment alternatives. The recommendations provided in Damm and Randall (2012) were created with public comment and feedback. This project was scoped internally by the Bureau of Land Management Pinedale and Rock Springs Field Offices interdisciplinary team. The kickoff meeting was held August 8, 2012. A formal scoping notice regarding this document was published September 17, 2012 and a public meeting was held on October 10, 2012 to review the project. The interdisciplinary team met March 5 and 6, 2013. Additionally, BLM staff met individually with affected grazing permittees and interested public members. Comments submitted to-date have been incorporated into this document as appropriate.

The following issues are analyzed within this EA as a result of internal and external scoping:

- Wildlife
    - Big Game; Raptors and Migratory Birds, Wyoming BLM Sensitive Species; and Federally Endangered, Threatened, or Candidate species
- Vegetation Resources
    - Soils and Ecological Sites; Upland Range Condition; Riparian Condition; Invasive, Non-native Species, and Noxious Weeds; Wyoming BLM Sensitive Species, and Federally Endangered, Threatened, or Candidate Species
- Livestock Grazing
- Wild Horses
- Water Quality
    - Surface and Groundwater
- Air quality
- Special Designation and Management Areas
    - Wilderness Study Areas, Areas of Critical Environmental Concern, and Management Areas
- Lands with Wilderness Characteristics
- Visual Resources
- Energy Development

- Wildfire
- Cultural resources
- Paleontology
- Climate change
- Recreation
- Socioeconomics
- Hazardous Materials

2. PROPOSED ACTION AND ALTERNATIVES

2.1 Introduction

The previous chapter presented the Purpose and Need of the proposed project, as well as those elements that could potentially have a significant impact to the quality of the human environment through the implementation of the proposed project. The WGFD proposed action and BLM alternatives are presented below. For a summary for these actions, see Table 3.

2.2 WGFD Proposed Action

The proposed action consists of the recommendations provided in Damm and Randall (2012) as modified by agreements between BLM and WGFD. Damm and Randall (2012) recommended treatment of 24,710 acres of mule deer habitat in the Pinedale BLM and 9,999 acres in the Rock Springs FO (Table 1). No treatments are proposed on private or Forest Service lands; only BLM and State of Wyoming lands are included in this analysis. For ease of referencing, the proposed actions are provided by Focus Area (Map 2). Tthe Little Colorado Focus Area is located within the Rock Springs FO.

While the focus of the proposed action is to improve mule deer habitats, vegetation treatments were also considered that would also benefit other species such as Greater Sage-grouse, pronghorn, elk, moose and migratory bird species. Chapter 3 contains a full discussion of species potentially affected by the proposed treatments.

Each proposed project will address at least one of the following objectives (Damm and Randall 2012):

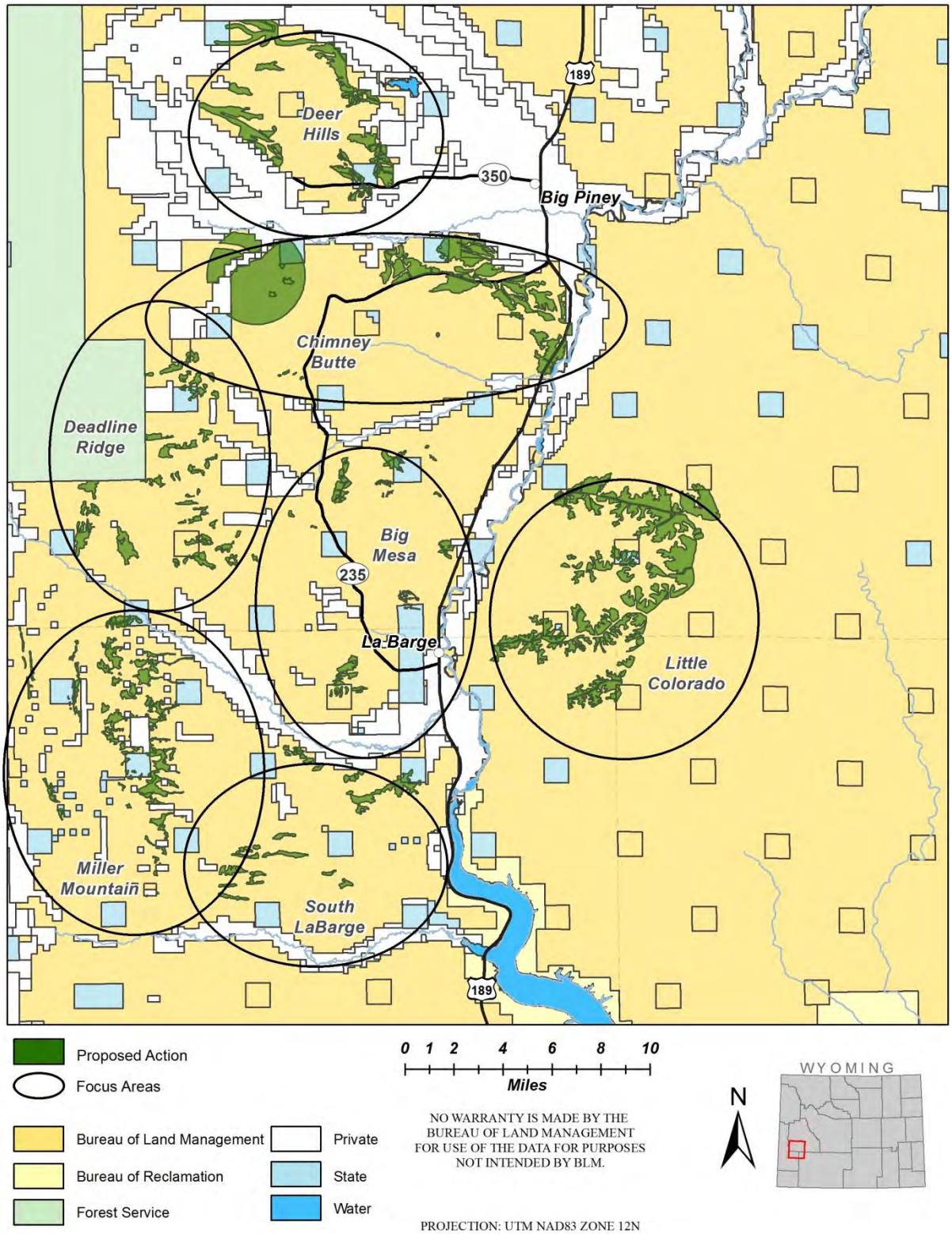
- Increase sagebrush vigor and seed production (productivity),
- Increase sagebrush regeneration,
- Release younger sagebrush,
- Increase forb diversity and percent composition, or
- Increase grass diversity and percent composition.

Proposed treatments areas were prioritized by mule deer use of identified transition and crucial winter range; previously completed treatments; presence/absence of elk; contiguous patches of sagebrush located by aerial imagery; discussions with local biologists, permittees, and the interested public; and local research (Cundy 1989, Smith and Younkin 2010a and 2010b, Damm and Randall 2012). All proposed treatment area descriptions and objectives were taken from Damm and Randall (2012). Proposed projects would be implemented over the next 10 years after additional consultation with permittees to review timing and scheduling. Unless otherwise noted, the proposed treatment is for 100 percent of the acres within the identified area.

Table 1. Proposed vegetation treatments for the Wyoming Range.

WGFD Proposed Action Name	WGFD Proposed Action Treatment	Proposed Treated Acres
SE Deer Hills	Aerator + seeding	772
SE Deer Hills	Mow	403
NE Deer Hills	Mow	925
W Deer Hills	Aerator	1,671
Deer Hills Willow Fencing	fence + grazing management	794
Big Piney	Aerator	3,999
Highway 189	Aerator	893
3 Buttes Fertilizer	Fertilizer	6,065
3 Buttes	Spike®20P	84
Big/Little Mesa	Mow	547
Little Mesa Bowls	Spike®20P	73
Chappell Cr	Spike®20P	391
Red Hill	Aerator	139
LaBarge Mesas	Aerator	643
LaBarge Mesas	Spike®20P	310
LaBarge Bowls	Spike®20P	514
LaBarge Bottoms	Aerate + seeding	286
Little Colorado	Aerate + seeding + mow	9,999
Deadline Ridge Aspen	Prescribed Fire	2,855
Miller Mtn Aspen	Prescribed Fire	3,346
Other Treatments	Cheatgrass Control	
	Enhanced reclamation	
	Mahogany Drift Fence	
Total Acres		**34,709**

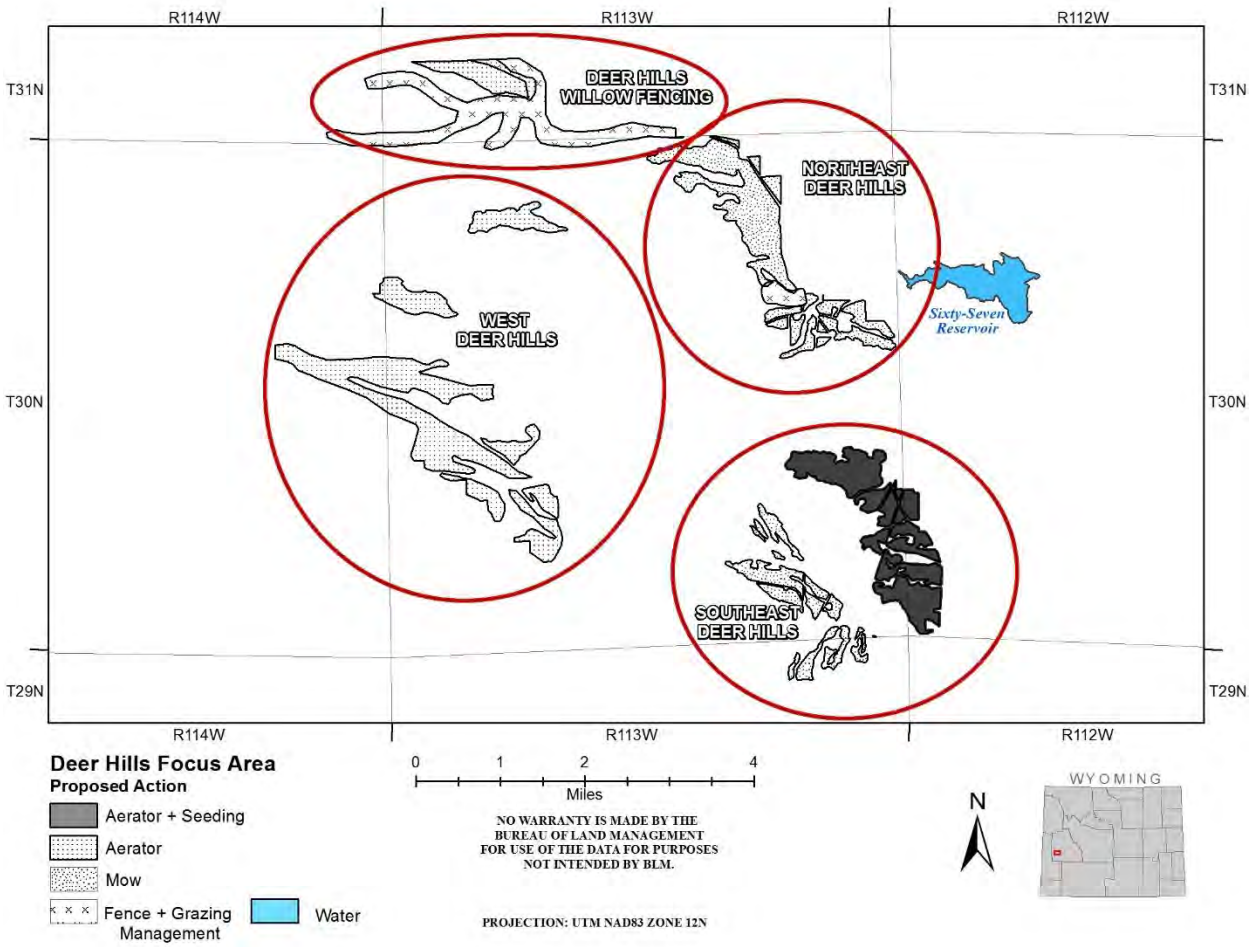
Map 2. WGFD proposed actions by Focus Area.



2.2.1 Deer Hills Focus Area

The Deer Hills Focus Area contains four proposed projects (Map 3) on 4,565 acres.

Map 3. Deer Hills Focus Area proposed project locations.



2.2.1.1 Southeast Deer Hills

The northeast portion of this area is characterized by moderate canopy, mature Wyoming big sagebrush and large amounts of bare ground. Relatively few forb and grass species exist consistently across the site. The objectives for this treatment are to increase sagebrush productivity, increase sagebrush regeneration, and increase forb and native grass species diversity and percent composition. The proposed treatment is to use an aerator and seed forb species on 772 acres.

The southwest portion of this area has young Wyoming big sagebrush across the site and several forb species in low density. Green rabbitbrush (*Chrysothamnus viscidiflorus*) is present in the understory. Objectives for this treatment include releasing young Wyoming big sagebrush, increasing the percent forb composition and increasing grass species diversity and percent composition. The proposed treatment is to mow 403 acres.

2.2.1.2 Northeast Deer Hills

This area is characterized by moderate density, mature Wyoming big sagebrush with moderate productivity. Forbs exist across the site at low densities; native grass species show high productivity with few species represented. Green rabbitbrush exists in the understory. Abandoned well pads within the project area have recovered and sagebrush production on the pads compared to adjacent areas is extremely high. Objectives for this treatment are to increase sagebrush productivity and age classes, and to increase forb and grass diversity and percent composition. The proposed treatment is to mow 925 acres.

2.2.1.3 West Deer Hills

The West Deer Hills treatment area is characterized by high density, mature Wyoming big sagebrush with moderate productivity. Several forb and grass species exist across the area, although in low densities. Severely browsed antelope bitterbrush (*Purshia tridentata*) is present in two of the four units in low densities. Objectives for this treatment are to increase sagebrush productivity and regeneration, increase bitterbrush percent composition where present, increase forb and grass species diversity and species composition. The proposed treatment is to aerate 1,671 acres.

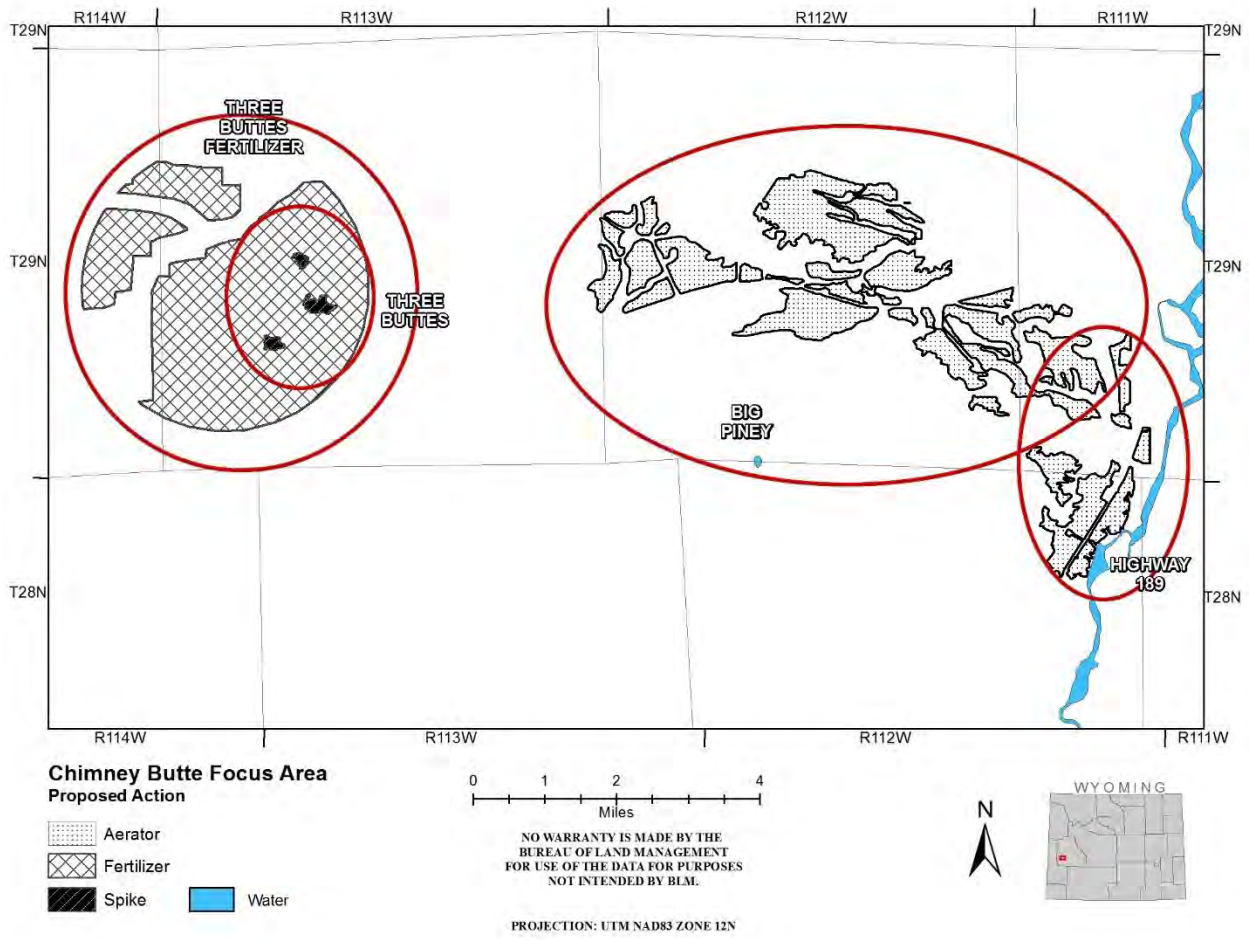
2.2.1.4 Deer Hills Willow Fencing

The Deer Hills Willow Fencing project would protect an intermittent stream within a willow (*Salix* spp.) community and protect a reservoir established for livestock use. Objectives for this fence treatment would be to increase willow productivity and regeneration, and to restore the riparian function on the intermittent stream. The proposed treatment is to build wildlife-friendly fence, implement grazing management strategies and develop additional water sources and includes 794 acres.

2.2.2 Chimney Butte Focus Area

The Chimney Butte Focus Area contains four proposed projects (Map 4) on 11,041 acres.

Map 4. Chimney Butte Focus Area proposed project locations.



2.2.2.1 Big Piney

This area is characterized by high density, mature Wyoming big sagebrush and large amounts of bare ground. The bare ground may be attributed in part to a 2,4-D herbicide application that occurred in the 1960's. Limited grasses and forbs exist on the site; sagebrush is moderately productive and smaller stature sagebrush is present across the site. Objectives for this treatment are to increase sagebrush productivity and age class, and increase forb and grass species diversity and percent composition. The proposed treatment is to aerate 3,999 acres.

2.2.2.2 Highway 189

This area is characterized by moderate density, mature Wyoming big sagebrush with low productivity. Few grass and forb species exist consistently across the site but grass productivity, particularly for needle-and-thread (*Hesperostipa comata*) is high. Objectives for this treatment are to increase sagebrush productivity and regeneration, and increase forb species diversity and percent composition. The proposed treatment is to aerate 893 acres.

2.2.2.3 Three Buttes Fertilizer

This site is characterized by Wyoming big sagebrush/green rabbitbrush stands with some true mountain mahogany (*Cerocarpus montanus*) inclusions on steep north- and east-facing slopes. The objectives for this treatment are to increase sagebrush and mahogany productivity, and increase grass and forb productivity. The proposed treatment is to aerially fertilize 6,065 acres with 40 pounds per acre of nitrogen fertilizer.

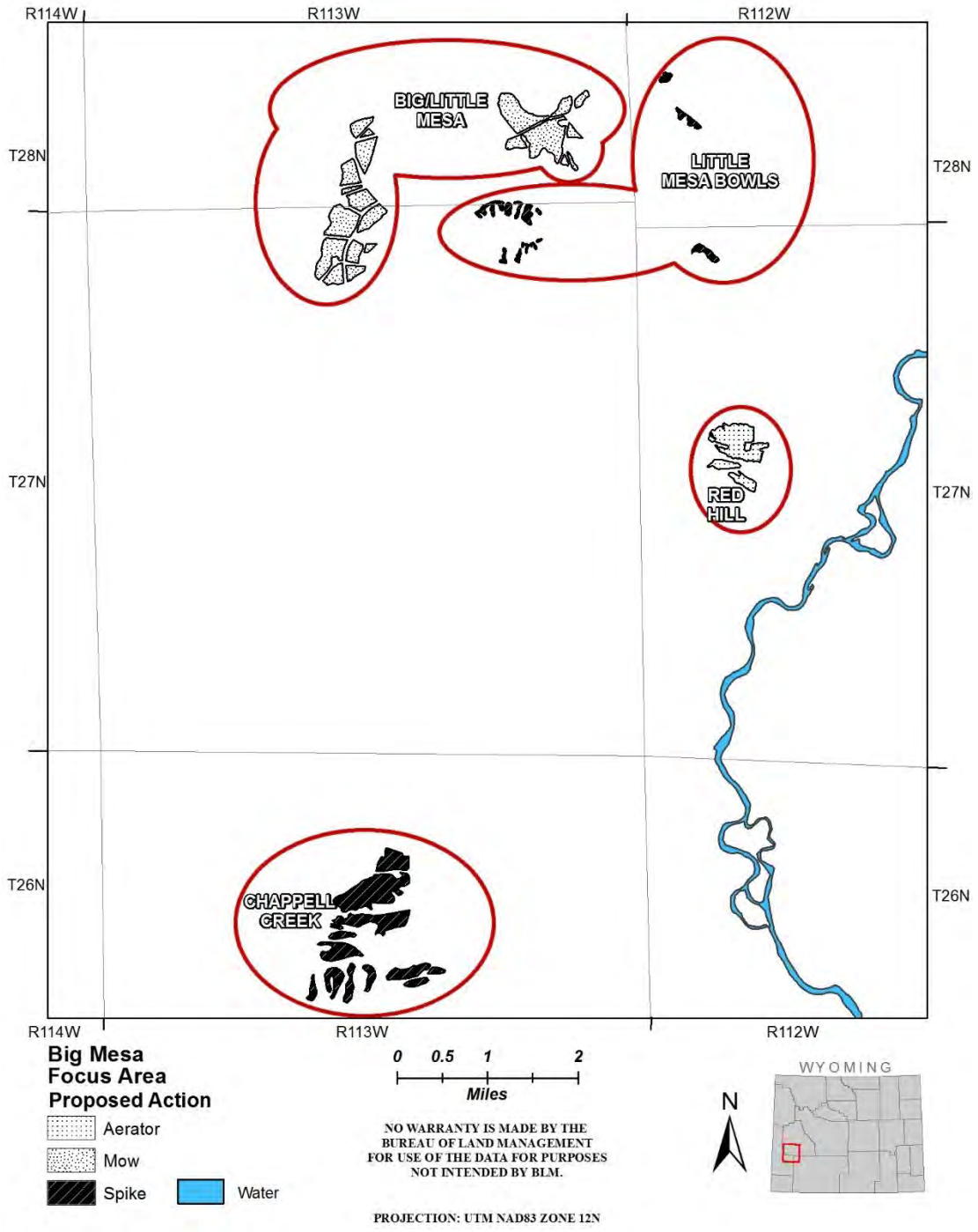
2.2.2.4 Three Buttes

This area is characterized by moderate to high density, mature Wyoming big sagebrush with moderate productivity. Several forb and grass species exist consistently across the site. The objectives for this treatment are to increase sagebrush productivity and regeneration, and to increase forb and grass diversity. The proposed treatment is to use Spike®20P on 84 acres.

2.2.3 Big Mesa Focus Area

The Big Mesa Focus Area contains four proposed projects (Map 5) on 1,150 acres.

Map 5. Big Mesa Focus Area proposed project locations.



2.2.3.1 Big/Little Mesa

This area is characterized by moderate canopy, mature Wyoming big sagebrush with younger plants scattered throughout the site. Few forb and grass species exist consistently across the area. Inclusions of lower density sagebrush exist within the proposed treatment area, particularly near the edge of the mesas. Objectives for this treatment are to release younger sagebrush, and increase forb and grass species diversity and composition. The proposed treatment is to mow 547 acres on the site.

2.2.3.2 Little Mesa Bowls

This area is characterized by moderate to high canopy, mature Wyoming big sagebrush with several grass and forb species present in low densities across the site. These wetter, north-facing slopes contain some of the only treatable Wyoming big sagebrush in the immediate area. Objectives for the site are to increase sagebrush productivity and regeneration, and to increase forb and grass percent composition. The proposed treatment is to use Spike®20P on 73 acres.

2.2.3.3 Chappell Creek

This site is characterized by higher canopy, mature Wyoming big sagebrush with inclusions of rubber rabbitbrush (*Ericameria nauseosa*). Limited forb and grass species exist consistently across the site. Treatment objectives are to increase sagebrush regeneration, increase forb and grass species diversity, and forb percent composition. The proposed treatment is to use Spike®20P on 391 acres.

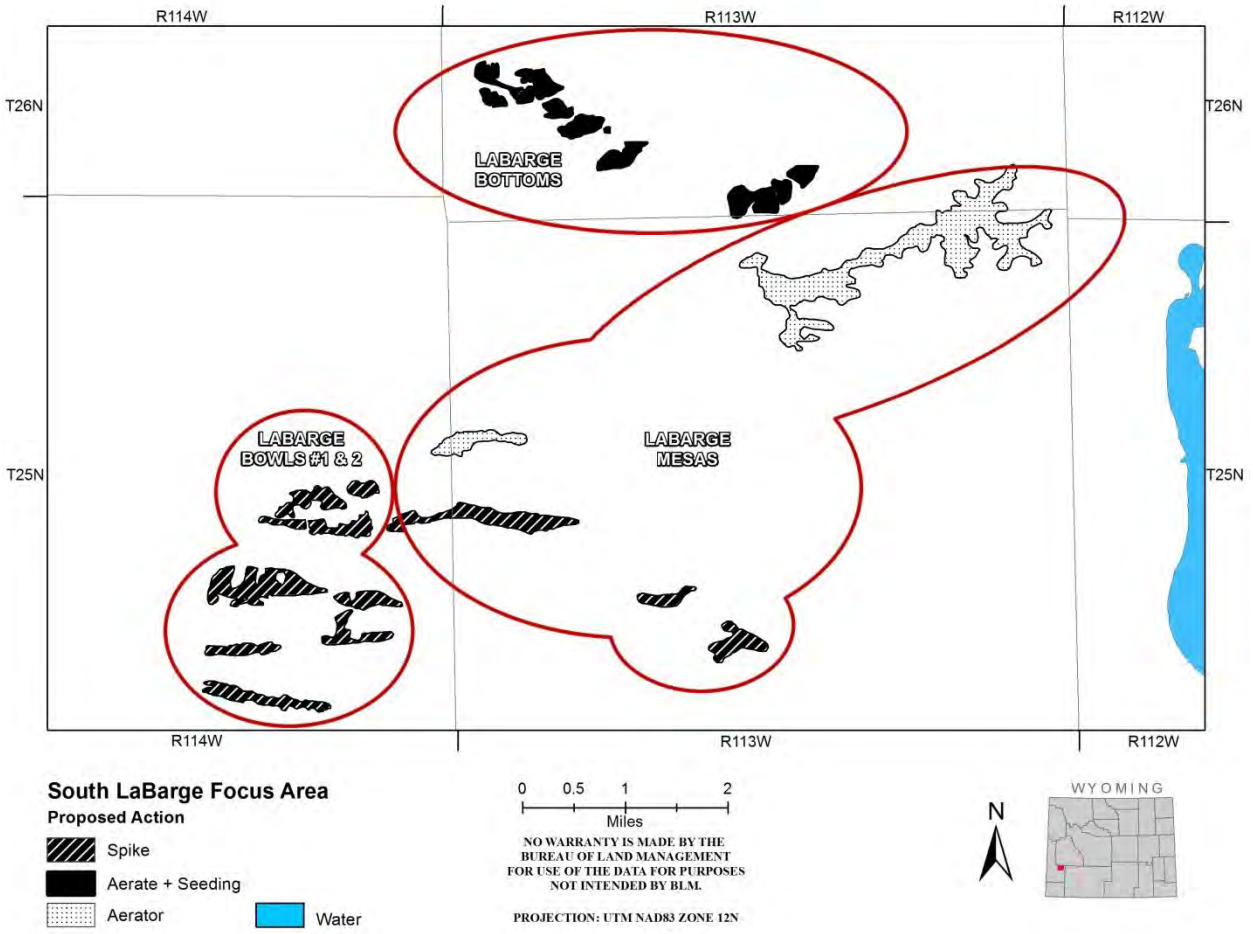
2.2.3.4 Red Hill

This site is characterized by moderate canopy, mature Wyoming big sagebrush with several forb and grass species existing consistently across the site in relatively low density. Objectives for the treatment are to increase sagebrush productivity and regeneration, and increase forb and grass percent composition. The proposed treatment is to aerate 139 acres.

2.2.4 South LaBarge Focus Area

The South LaBarge Focus Area contains five proposed projects (Map 6) on 1,892 acres.

Map 6. South LaBarge Focus Area proposed project locations.



2.2.4.1 LaBarge Mesas

The northern mesa is characterized by moderate canopy, mature, moderately productive Wyoming big sagebrush. Several forb and grass species exist consistently across the site. Large quantities of moose (*Alces alces*) pellets were found on the true mountain mahogany slopes on the north end of this area. Objectives for this treatment are to increase sagebrush productivity and regeneration, and increase forb and grass percent composition. The proposed treatment is to aerate 643 acres on the northern mesa.

The southern mesa is characterized by moderate canopy, mature, moderately productive Wyoming big sagebrush but with few forb and grass species. Objectives for the site are to increase sagebrush productivity, release younger sagebrush, and increase forb and grass diversity and percent composition. The proposed treatment is to treat 310 acres with Spike®20P.

2.2.4.2 LaBarge Bowls

This area is characterized by higher canopy, mature, moderately productive Wyoming big sagebrush with several forb and grass species scattered consistently but in low densities across the site. These wetter, north-facing slopes contain some of the only treatable Wyoming big sagebrush in the immediate area. Objectives for this treatment are to increase sagebrush productivity and regeneration, increase bitterbrush percent composition, and increase forb and grass species diversity and percent composition. The proposed treatment is to use Spike®20P on 514 acres.

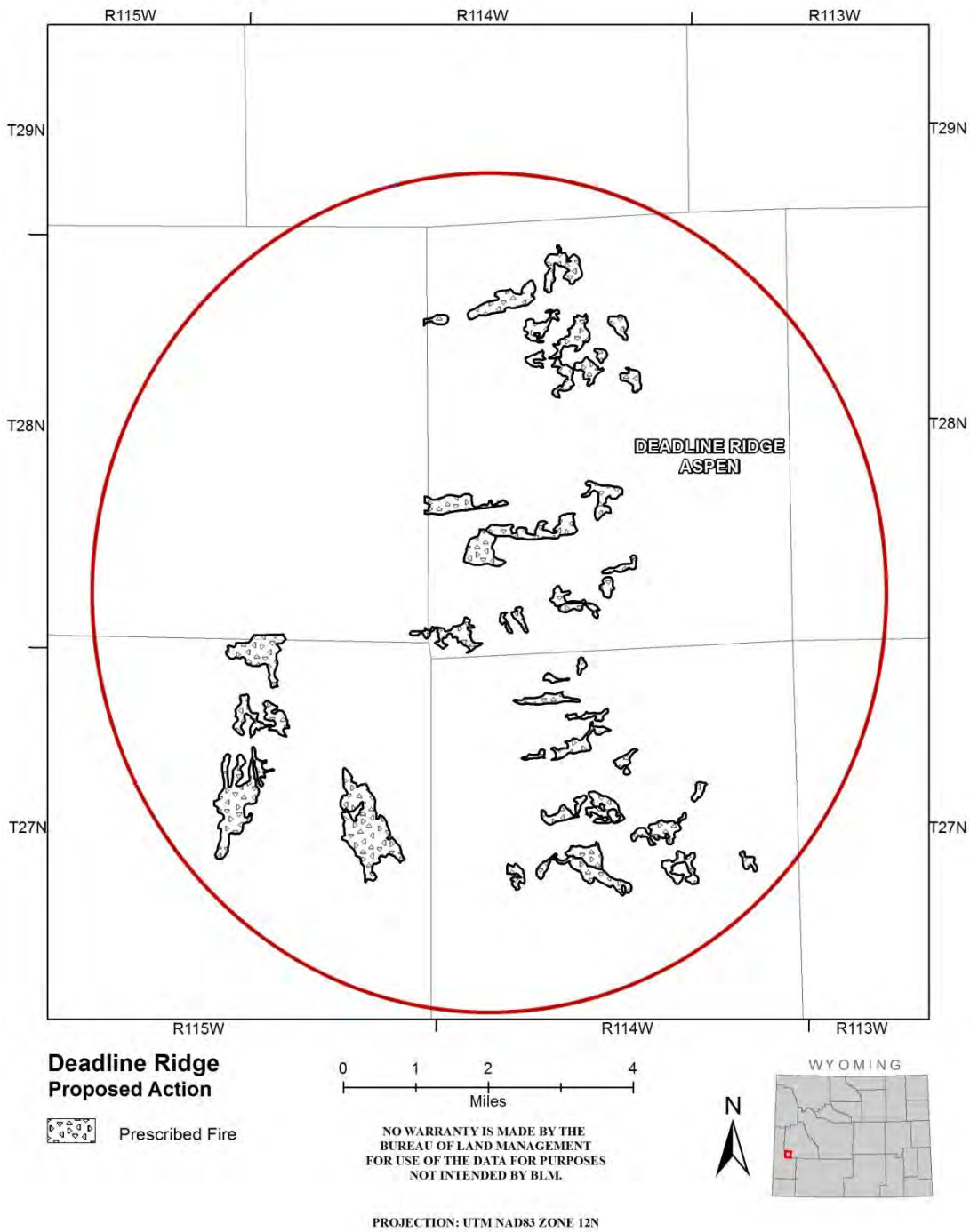
2.2.4.3 LaBarge Bottoms

This site is characterized by moderate canopy, mature Wyoming big sagebrush with younger sagebrush throughout the site. Inclusions of rubber rabbitbrush are present on hilltops, and antelope bitterbrush is located upslope of the site. Small patches of winterfat (*Krascheninnikovia lanata*) are located throughout the area. Large quantities of moose pellets were found on the true mountain mahogany slopes in the south end of this area. Objectives for the treatment are to release younger sagebrush, increase winterfat productivity and regeneration, increase forb species diversity, and increase forb and grass percent composition. The proposed treatment is to aerate the site and seed forbs on 286 acres.

2.2.5 Deadline Ridge Focus Area

The Deadline Ridge Focus Area (Map 7) contains 2,855 acres of aspen stands identified as high or medium priority for treatment based on Smith and Younkin (2010a and 2010b). Objectives for aspen stands are to increase suckering and decrease conifer infestations. The proposed treatment for this area is to complete a prescribed burn.

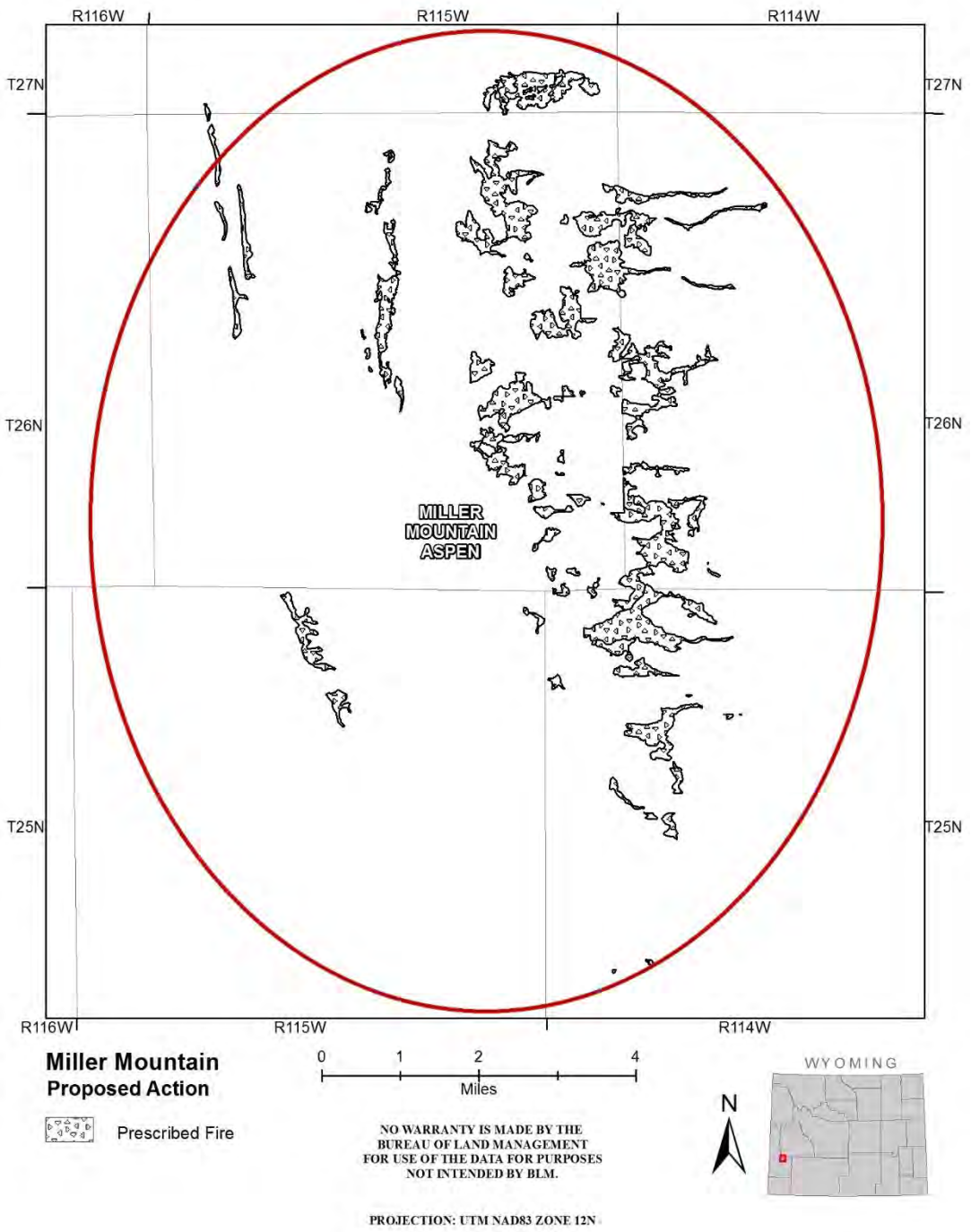
Map 7. Deadline Ridge Focus Area proposed project locations.



2.2.6 Miller Mountain Focus Area

The Miller Mountain Focus Area (Map 8) contains over 3,346 acres of aspen stands identified as high or medium priority for treatment based on Smith and Younkin (2010a and 2010b). Objectives for aspen stands are to increase suckering and decrease conifer infestations. The proposed treatment for this area is to complete a prescribed burn.

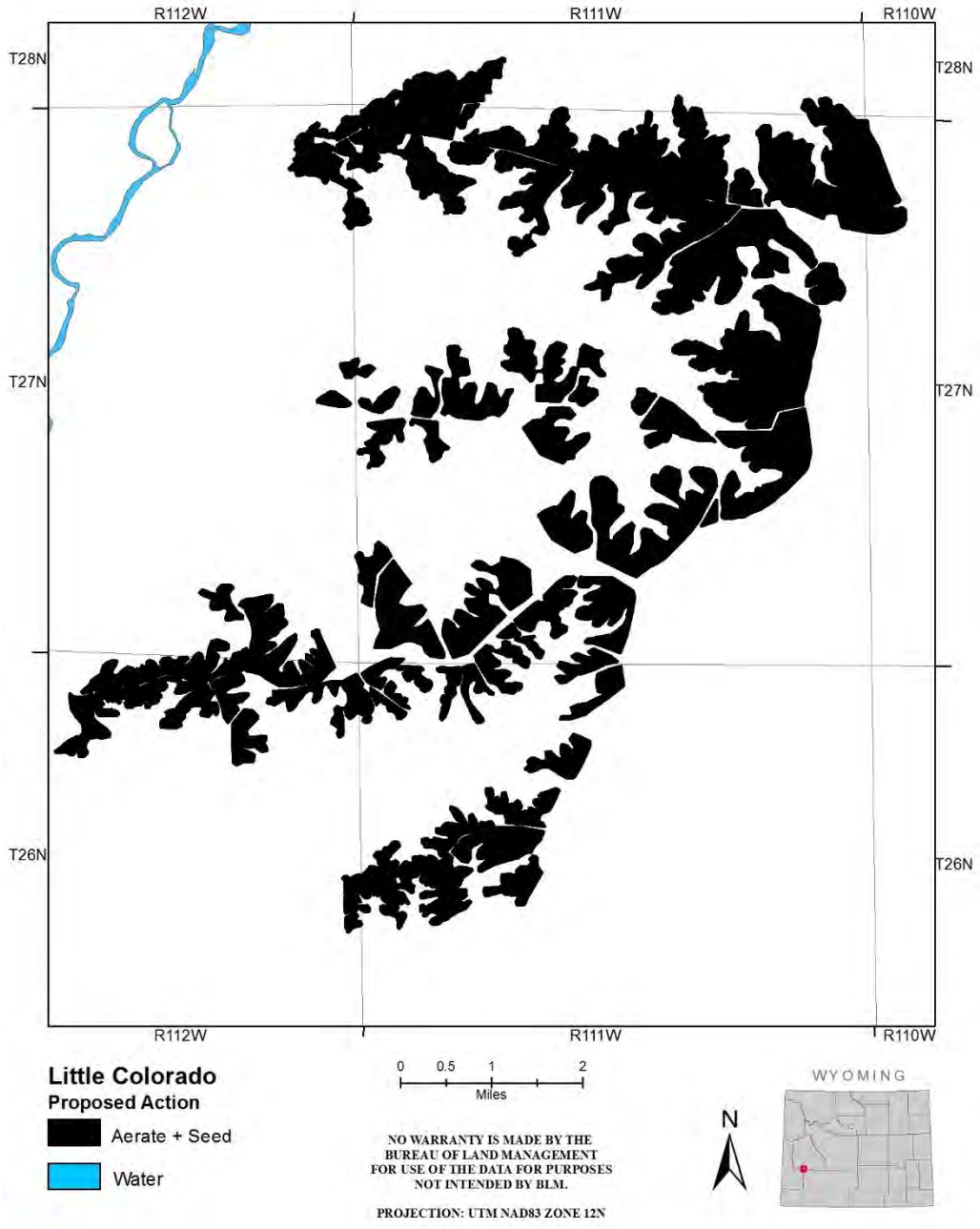
Map 8. Miller Mountain Focus Area proposed project locations.



2.2.7 Little Colorado Focus Area – Rock Springs Field Office

This area consists of 9,999 acres of moderate density, mature Wyoming big sagebrush and large amounts of bare ground (Map 9). Limited forbs and grasses exist consistently across the site. The sagebrush community is moderately productive and a combination of browsing, low precipitation, and a dominance of older age class sagebrush is limiting the community. Objectives for the treatment are to increase sagebrush productivity and regeneration, and increase forb and grass species diversity and percent composition. The proposed treatment is to aerate the site and seed forbs.

Map 9. Little Colorado Focus Area proposed project locations.

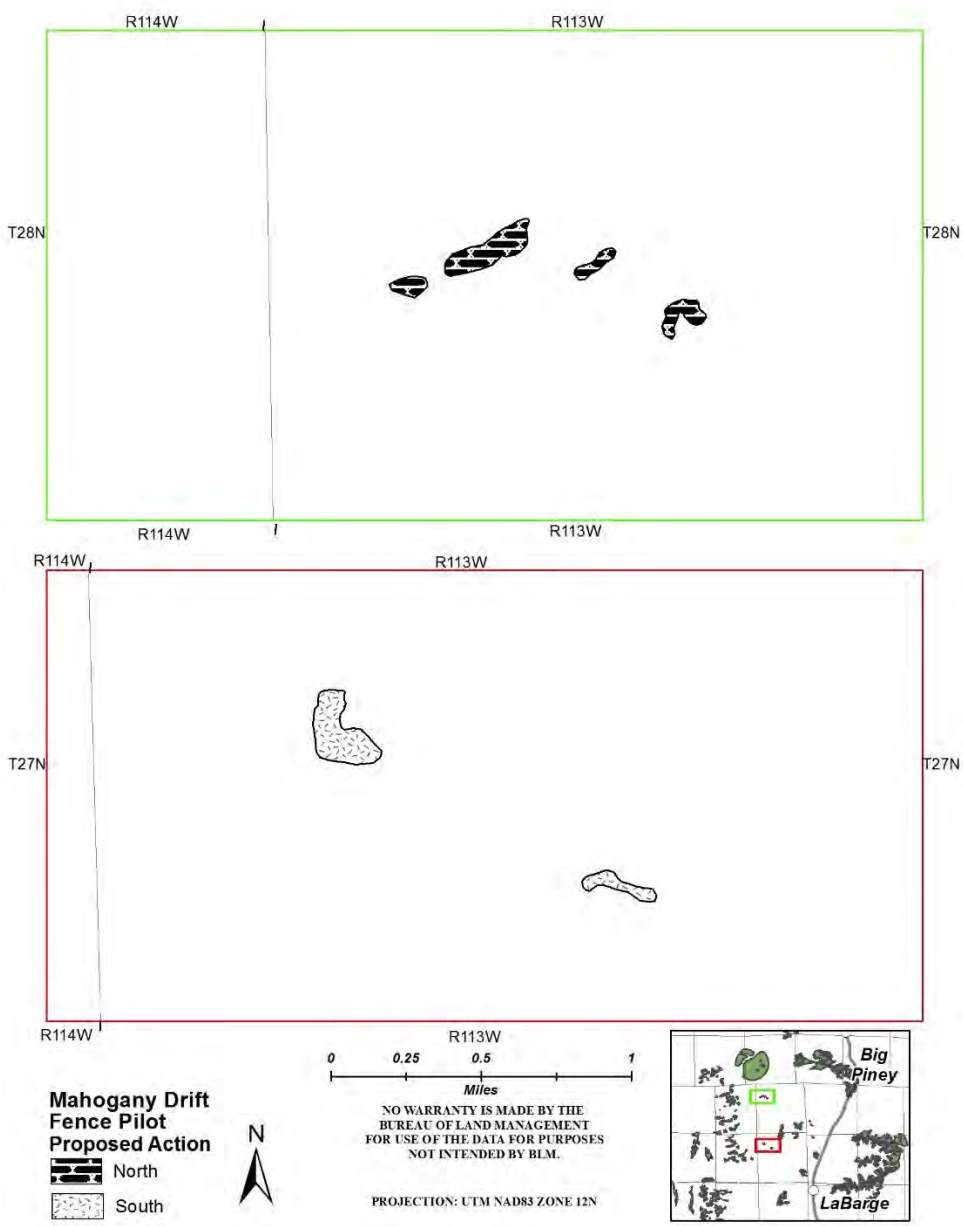


2.2.8 Other Treatments

2.2.8.1 Mahogany Drift Fence Pilot project

Portions of the plant community located within and between the Big Mesa and Chimney Butte Focus areas are dominated by true mountain mahogany with interspersed black sagebrush (*Artemisia nova*) and occasional serviceberry (*Amelanchier alnifolia*). Generally speaking, the shrubs in these areas are severely hedged with little regeneration. The objective of this treatment is to increase mahogany productivity and regeneration. The proposed treatment is to install drift fence perpendicular to prevailing winter winds to increase snow depth and decrease browse potential.

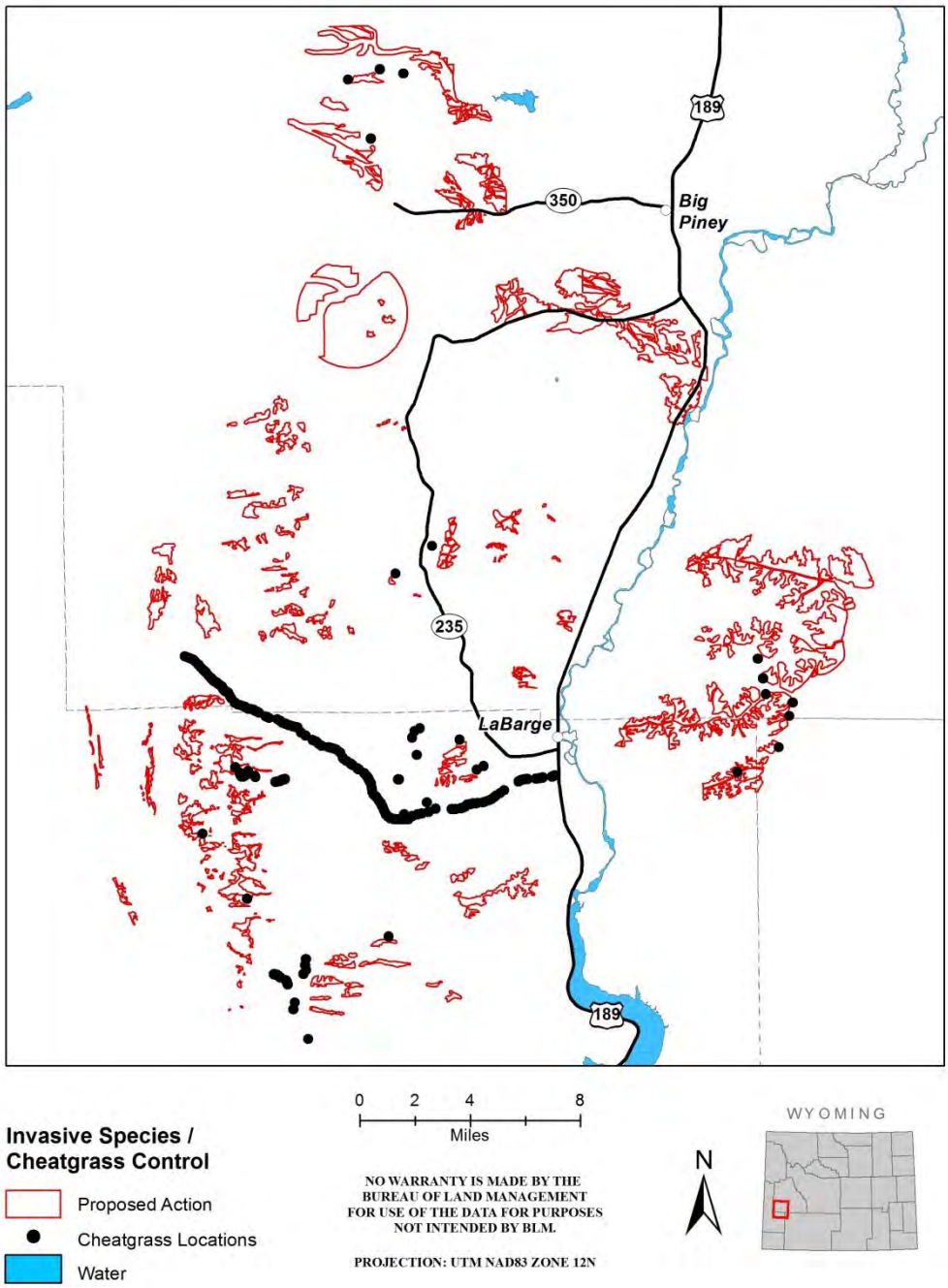
Map 10. Mahogany snow fence locations.



2.2.8.2 Cheatgrass/Invasive species control

Invasive species cheatgrass was found throughout the Focus Area in relatively small patches along several roads (Map 11). Plateau® is the chemical to be used. Mapping efforts from 2013 found cheatgrass in many additional locations in South LaBarge which are also targeted for treatment in 2014.

Map 11. Deer Hills area cheatgrass mapping.



2.2.8.3 Natural Gas Development Enhanced Reclamation

Natural gas wells occur across the greater project area. In general, these wells are reclaimed to satisfy permit requirements, but many could be improved. Some sites have a low diversity of desirable species and a high proportion of undesirable or non-native species (i.e., halogeton, black henbane (*Hyoscyamus niger*), rubber rabbitbrush and cheatgrass). The objective on these areas should be to reduce or eliminate invasive species and to plant appropriate shrub species for the site (i.e., Wyoming big sagebrush, saltbush or winterfat).

2.3 Modified Treatment Alternative

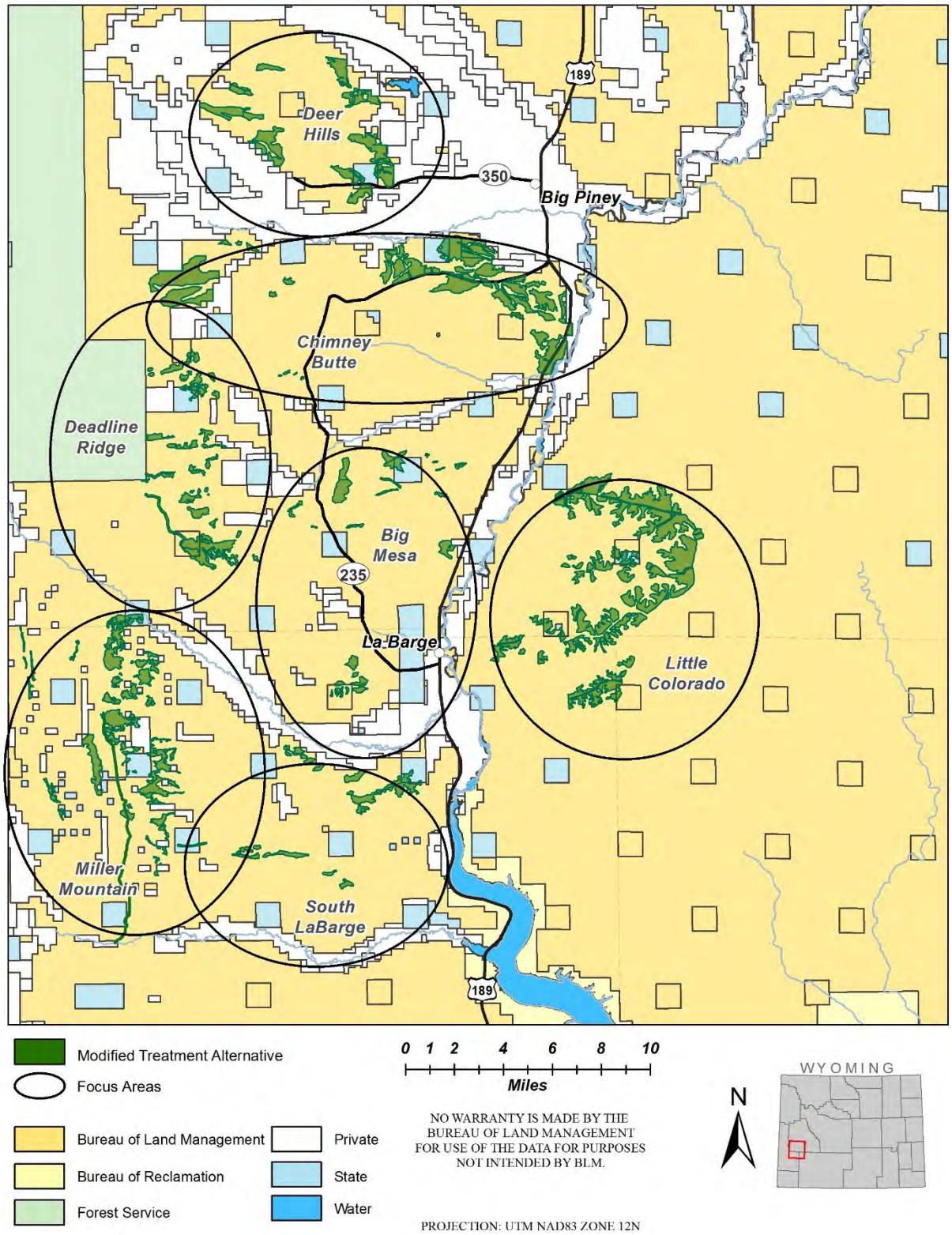
The treatment options proposed by Damm and Randall (2012) were reviewed in detail with BLM and permittees in individual meetings, at a public scoping meeting, and in discussion with BLM and WGFD personnel. In some cases, different treatment areas, acreages and methods were identified. A total of 14,928 acres are proposed for treatment – 12,353 acres in the Pinedale Field Office and 2,575 acres in the Rock Springs Field Office (Map 12). Table 2 identifies methods and acres proposed for treatment. Each project in the Modified Treatment Alternative will address at least one of the following objectives:

- Increased sagebrush vigor and seed production (productivity);
- Increased sagebrush regeneration
- Increased forb diversity and percent composition;
- Increased grass diversity and percent composition;
- Release of younger sagebrush; or
- Increased aspen regeneration

Table 2. Modified treatment alternatives.

Modified Treatment Alternative Name	Modified Treatment Alternative Method	Modified Treatment Alternative Acres	Percent Mosaic	Modified Treatment Alternative Acres Treated
SE Deer Hills	Aerate	831	30	249
SE Deer Hills	Mow	252	30	76
SE Deer Hills	Aerate + seeding	229	30	69
NE Deer Hills	Mow	679	30	204
W Deer Hills	Mowing	1,071	50	536
W Deer Hills	Spike 50% kill	262	100	262
Big Piney	Mow	3,997	30	1,199
Highway 189	Mow	924	50	462
Milleg	Mow	94	50	47
Trail Ridge	Mow	664	30	199
Reed Ridge	Spike 50% kill	1,146	100	1,146
Three Buttes	Pitting + seeding	78	100	78
Big/Little Mesa	Mow	705	30	212
Little Mesa Bowls	Mow	87	30	26
Wildcat	Seeding	66	100	66
Wildcat	Plateau	35	100	35
Saddle Ridge	Plateau	34	100	34
Chappell Cr	Aerate	222	30	67
Chappell Cr	Aerate + seeding	133	30	40
Red Hill	Mow	169	30	51
LaBarge Mesas	Mow	881	50	441
LaBarge Bowls	Mow	151	30	45
LaBarge Bottoms	Mow	331	50	166
Pine Grove	Prescribed Fire	591	100	591
Pine Grove	Cut/Pile	22	100	22
Exxon Unit	Prescribed Fire	319	100	319
Exxon Unit	Cut/Pile	524	100	524
Gentle Annie	Prescribed Fire	822	100	822
Gentle Annie	Cut/Pile	329	100	329
Gentle Annie	Spike 50% kill	39	100	39
Burdick	Prescribed Fire	1,499	100	1,499
S. LaBarge Back	Prescribed Fire	723	100	723
S. LaBarge Front	Prescribed Fire	1,325	100	1,325
S. LaBarge Front	Cut/Pile	453	100	453
Little Colorado	Aerate + seeding	2,519	30	756
	Mow	5,998	30	1,799
	Spike 50% kill	20	100	20
Other Treatments	Cheatgrass Control			
	Mahogany Snow Fence			
	Miller Mountain Fence			
		28,224		14,928

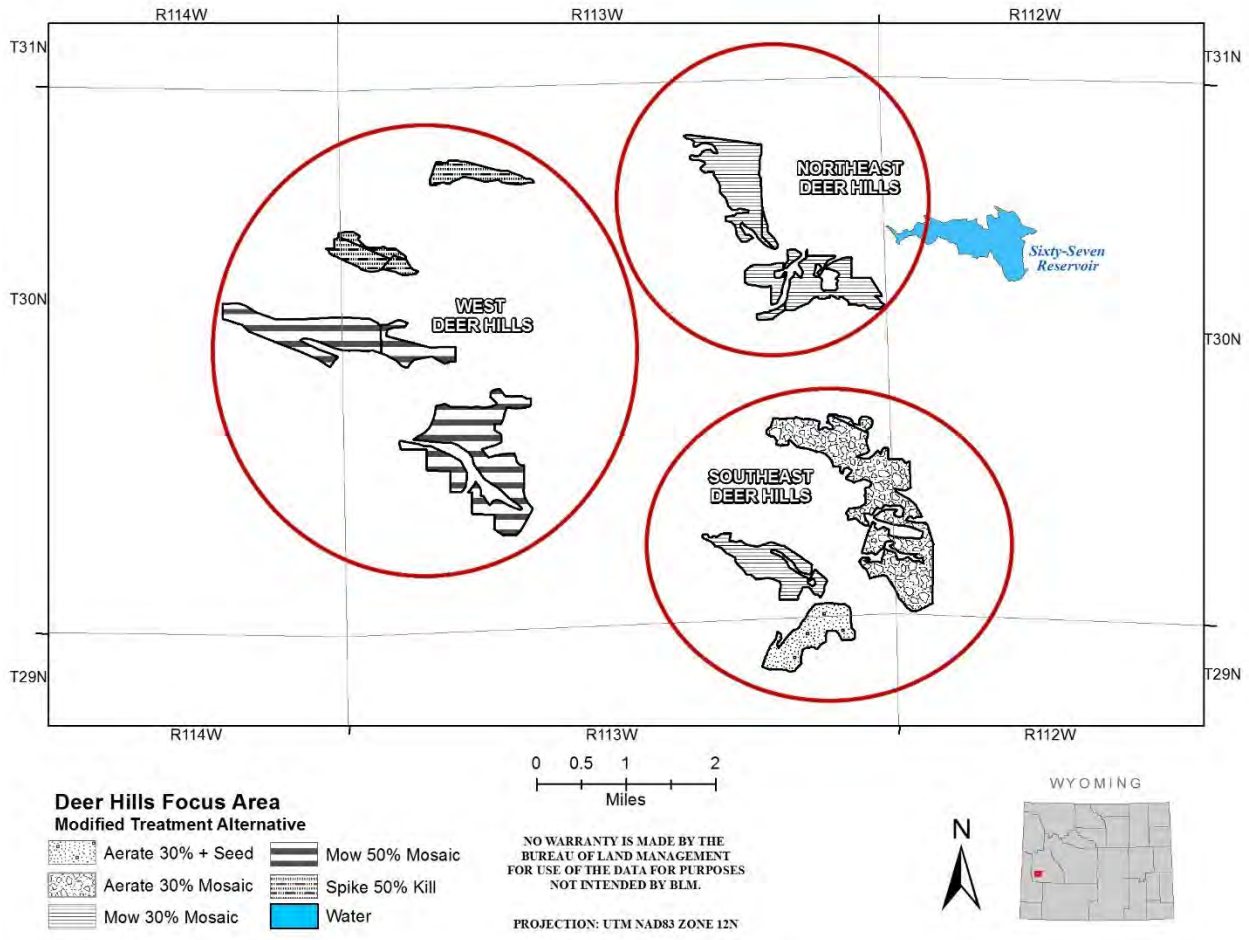
Map 12. Modified treatment alternative treatments by focus area.



2.3.1 Deer Hills Focus Area

The treatments proposed for the Deer Hills Focus Area include treating approximately 1,395 acres within the 3,324 acre project area (Map 133).

Map 13. Deer Hills Focus Area modified treatment actions.



2.3.1.1 Southeast Deer Hills

The modified treatment proposal for this area is to aerate approximately 30 percent of the acreage within the 831 acre treatment polygon. Aeration would be used to open the canopy in a mosaic pattern. A total of 249 acres would be aerated.

The modified treatment proposal is to aerate and seed forbs in the southern portion of this area. Approximately 30 percent of the acreage within a 229 acre polygon would be aerated and seeded in a mosaic pattern to open the shrub canopy. The seed mix will be created using native seed from the Ecological Site Description for the site, and modified if needed based on seed availability and potential for success.

BLM would also treat 30 percent of the acres in the western 252 acre polygon by mowing in a mosaic pattern to open the shrub canopy. A total of 144 acres would be disturbed with this treatment.

2.3.1.2 Northeast Deer Hills

Mowing in a mosaic within approximately 30 percent of the 679 acre polygon is proposed for this site. Approximately 203 acres would be mowed within the project area to open the shrub canopy.

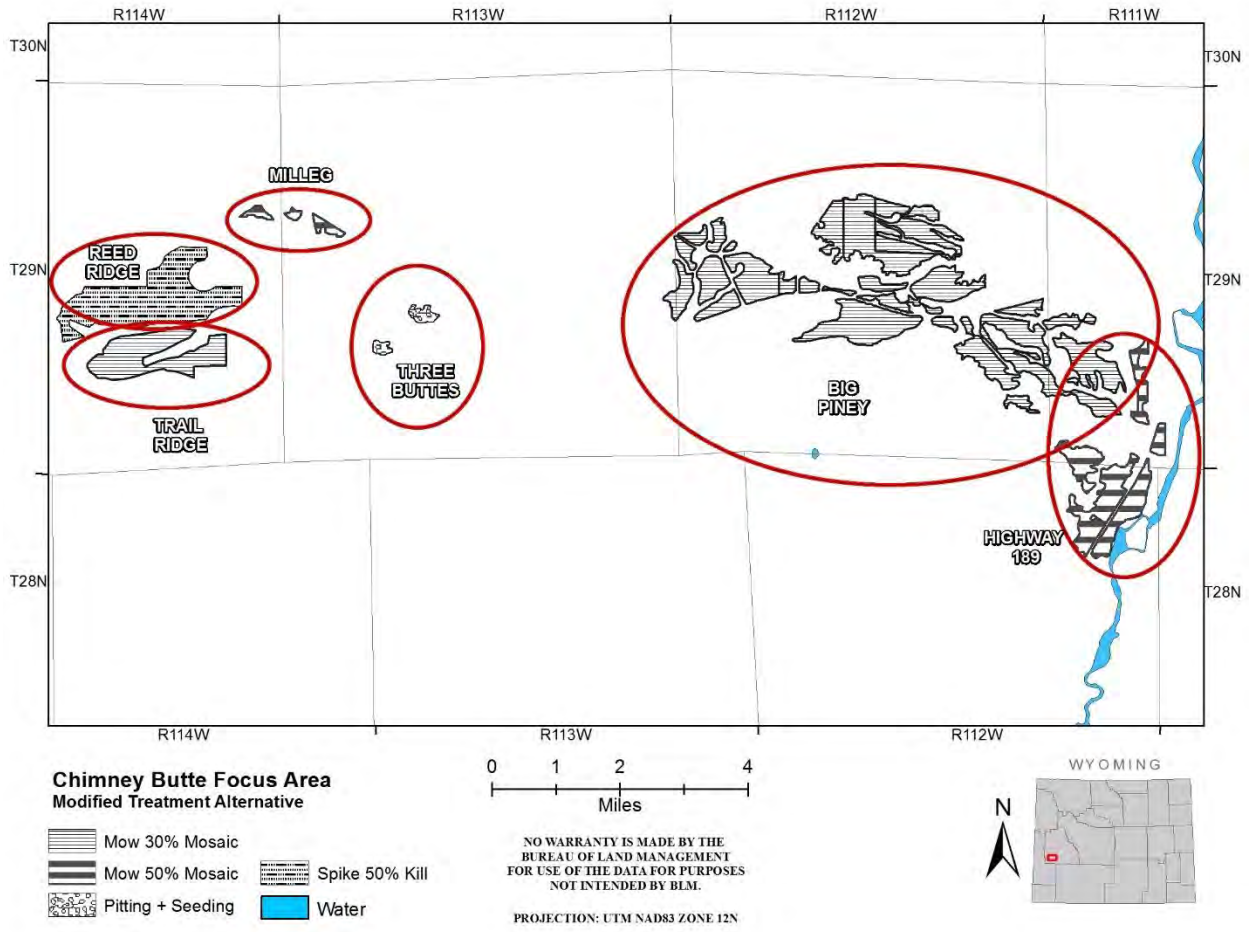
2.3.1.3 West Deer Hills

Mowing approximately 50 percent of 1,071 acres within this area in a mosaic pattern is proposed. Additionally, a treatment of Spike®20P at 1 to 1.5 pounds per acre for mountain big sagebrush area and 1 pound per acre for Wyoming big sagebrush area is proposed on 262 acres. The target kill rate is 50 percent of shrubs.

2.3.2 Chimney Butte Focus Area

The treatments proposed for the Chimney Butte Focus Area include treating approximately 3,131 acres within the 11,041 acre project area (Map 144).

Map 14. Chimney Butte Focus Area modified treatment actions.



2.3.2.1 Big Piney

BLM proposes to mow approximately 1,199 acres within a 3,997 acre polygon in a mosaic pattern to open the shrub canopy.

2.3.2.2 Highway 189

BLM proposes to open the shrub canopy on 462 acres within the 924 acre project area by mowing in a mosaic pattern.

2.3.2.3 Milleg

BLM proposes to treat approximately 50 percent of the acreage within a 94 acre polygon. The treatment would use a brush mower to open the shrub canopy in a mosaic pattern.

2.3.2.4 Trail Ridge

BLM proposes to treat approximately 30 percent of the acreage within a 664 acre polygon. The treatment would use a brush mower to open the shrub canopy in a mosaic pattern.

2.3.2.5 Reed Ridge

Spike®20P is proposed to be applied to 1,146 acres at a rate of 2.5 pounds per acre on mountain big sagebrush and 1.5 pounds per acre on Wyoming big sagebrush communities to achieve a 50 percent kill rate and open the shrub canopy.

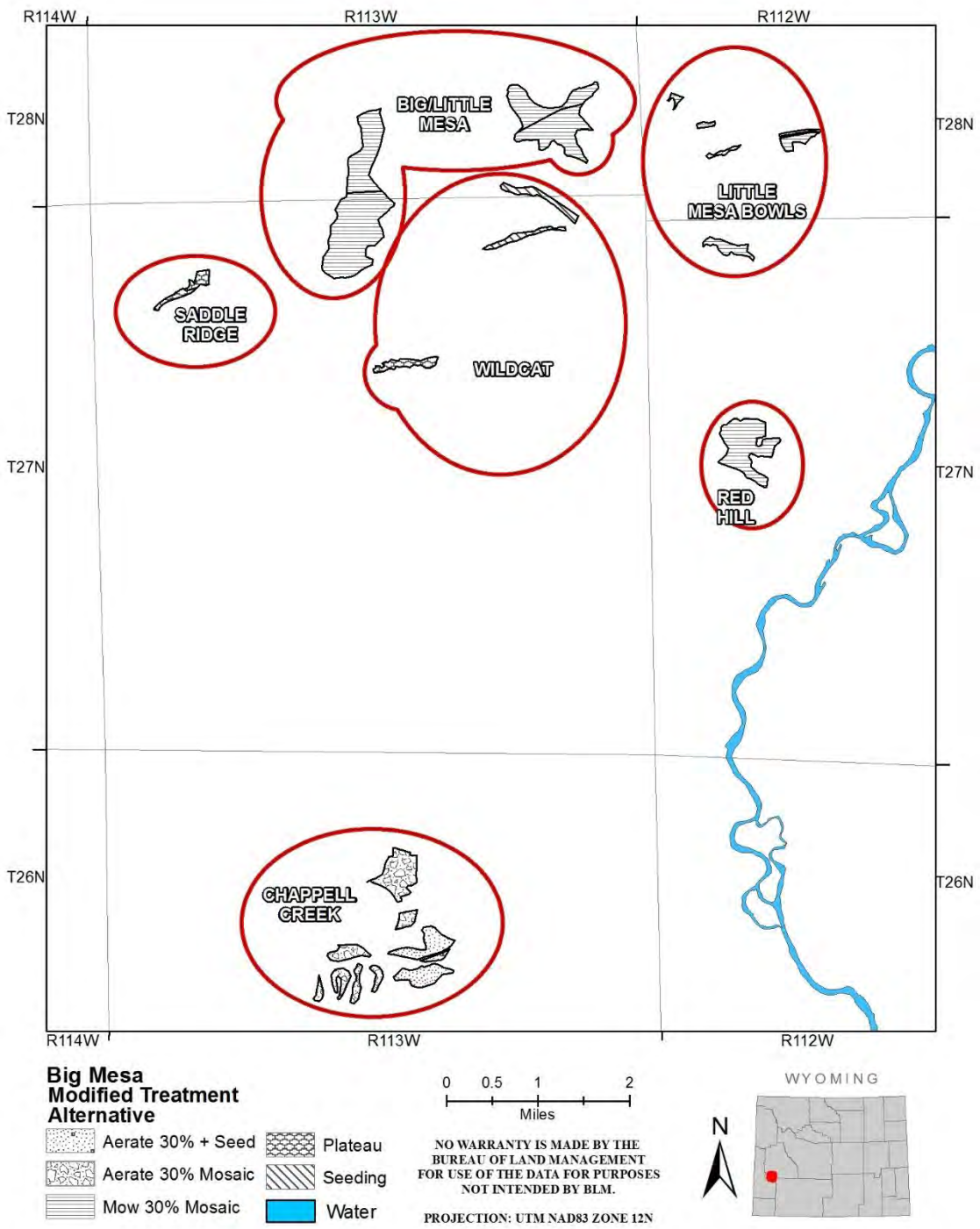
2.3.2.6 Three Buttes

Pitting and seeding is proposed on 78 acres. All of the identified acres would be treated. Wyoming big sagebrush, bluebunch wheatgrass, and Indian ricegrass would be broadcast seeded, although rates and the final species mix will be determined based on availability, price, and germination potential.

2.3.3 Big Mesa Focus Area

The treatments proposed for the Big Mesa Focus Area include treating approximately 479 acres within the 1,011 acre project area (Map 155).

Map 15. Big Mesa Focus Area modified treatment actions.



2.3.3.1 Big/Little Mesa

Mowing approximately 30 percent of a 705 acre treatment area is proposed to open the shrub canopy.

2.3.3.2 Little Mesa Bowls

BLM proposed to mow approximately 30 percent of 87 acres in this area, resulting in 26 acres being mowed in a mosaic pattern to open the shrub canopy.

2.3.3.3 Wildcat

Seeding native species is proposed on 66 acres in Wildcat Canyon. A blend of native species will be drill-seeded or broadcast (depending on availability, price and germination potential) and may include Gardner's saltbush, Wyoming big sagebrush, winterfat, Indian ricegrass, bluebunch wheatgrass, bottlebrush squirreltail, rhizomatous wheatgrass, scarlet globemallow, penstemon, biscuitroot, buckwheat, yarrow and vetch. Additional native species may be added or substituted based on Ecological Site Descriptions. The application of Plateau® (9 ounces per acre of Plateau® with 32 ounces of methylated seed oil per acre) is proposed to mimic a prescribed fire on 35 acres in Wildcat Canyon. The treatment should top kill sprouting shrubs such as true mountain mahogany and encourage suckering/sprouting.

2.3.3.4 Saddle Ridge

The application of Plateau® (9 ounces per acre of Plateau® with 32 ounces of methylated seed oil per acre) is proposed to mimic a prescribed fire on 34 acres on Saddle Ridge. The treatment should top kill sprouting shrubs such as true mountain mahogany and encourage suckering/sprouting.

2.3.3.5 Chappell Creek

BLM proposed to aerate approximately 30 percent of the land within a 355 acre polygon in a mosaic pattern to open the shrub canopy. Within this area, 40 acres are proposed to be seeded with native species.

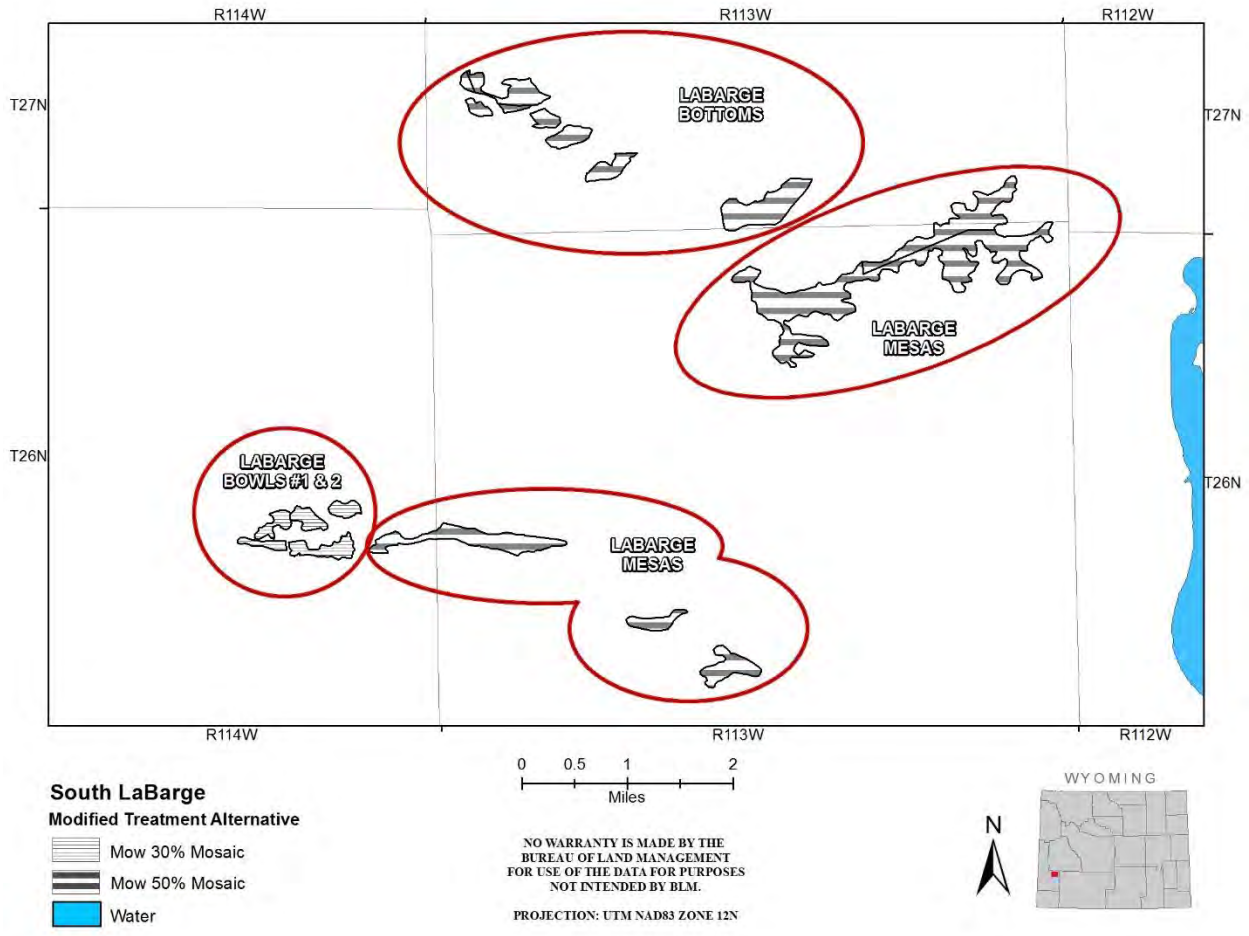
2.3.3.6 Red Hill

BLM proposes to treat approximately 30 percent of 169 acres in this area. The treatment area would be mowed to open the shrub canopy.

2.3.4 South LaBarge Focus Area

The treatments proposed in the South LaBarge Focus Area include treating approximately 702 acres within the 1,892 acre project area (Map 166).

Map 16. South LaBarge Focus Area modified treatment actions.



2.3.4.1 LaBarge Mesas

BLM proposes to treat approximately 50 percent of 881 acres in this area. The treatment area would be mowed to open the shrub canopy.

2.3.4.2 LaBarge Bowls

BLM proposes to treat approximately 30 percent of 151 acres in this area. The treatment area would be mowed to open the shrub canopy

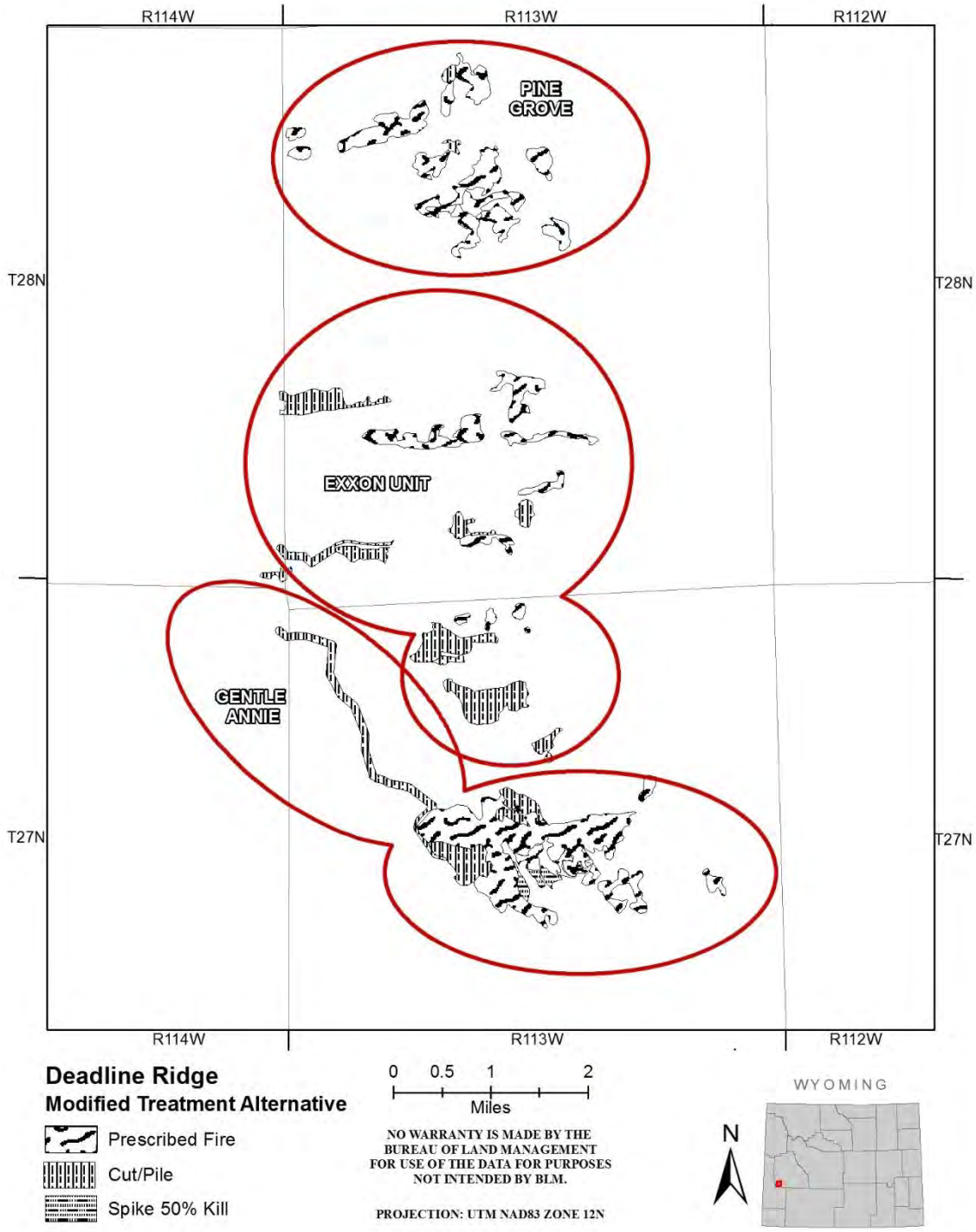
2.3.4.3 LaBarge Bottoms

BLM proposes to treat approximately 50 percent of 331 acres in this area. The treatment area would be mowed to open the shrub canopy

2.3.5 Deadline Ridge Focus Area

The treatments proposed for the Deadline Ridge Focus Area include treating approximately 2,646 acres (Map 177).

Map 17. Deadline Ridge Focus Area modified treatment actions.



2.3.5.1 Pine Grove

Two treatments are proposed in this unit. BLM proposes to prescribe burn 591 acres within this unit and cut/pile on 22 acres within the unit.

2.3.5.2 Exxon Unit

Two treatments are proposed in this unit. BLM proposes to burn 319 acres within this unit and cut/pile on 524 acres within the unit.

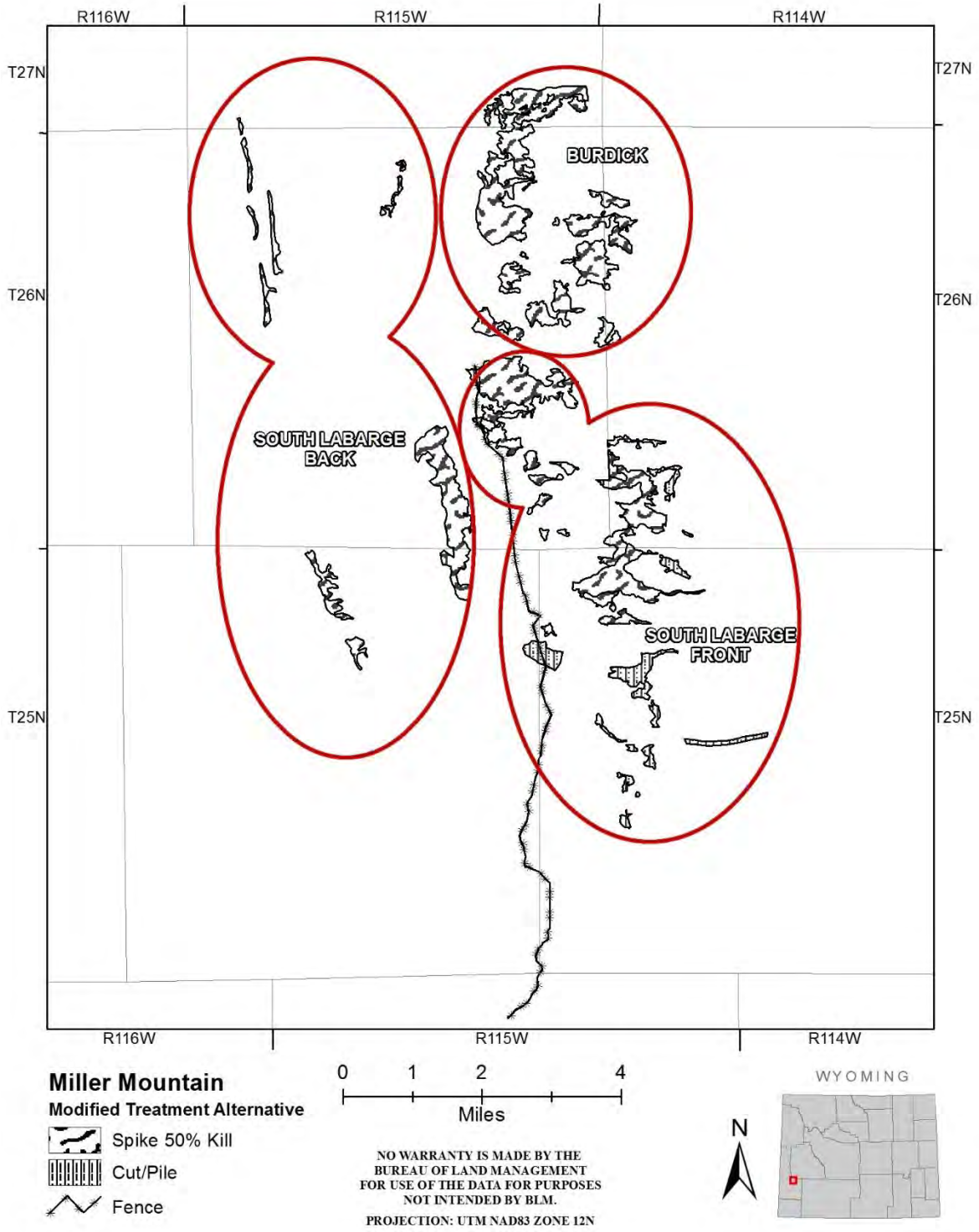
2.3.5.3 Gentle Annie

BLM proposes to apply Spike® 20P at a rate of 1.5 to 2.5 pounds per acre on mountain big sagebrush and 1.5 to 2 pounds per acre on Wyoming big sagebrush in this unit. This treatment should result in a 50 percent kill of treated shrubs. BLM also proposes to cut/pile on 329 acres within the unit and complete a prescribed burn on 822 acres.

2.3.6 Miller Mountain Focus Area

The treatments proposed for the Miller Mountain Focus Area include treating 4,000 acres in this area (Map 18).

Map 18. Miller Mountain Focus Area modified treatment actions.



2.3.6.1 Burdick

BLM proposes to use prescribed fire on 1,499 acres in the Burdick area.

2.3.6.2 South LaBarge Back

BLM proposes to use prescribed fire on 723 acres in this area.

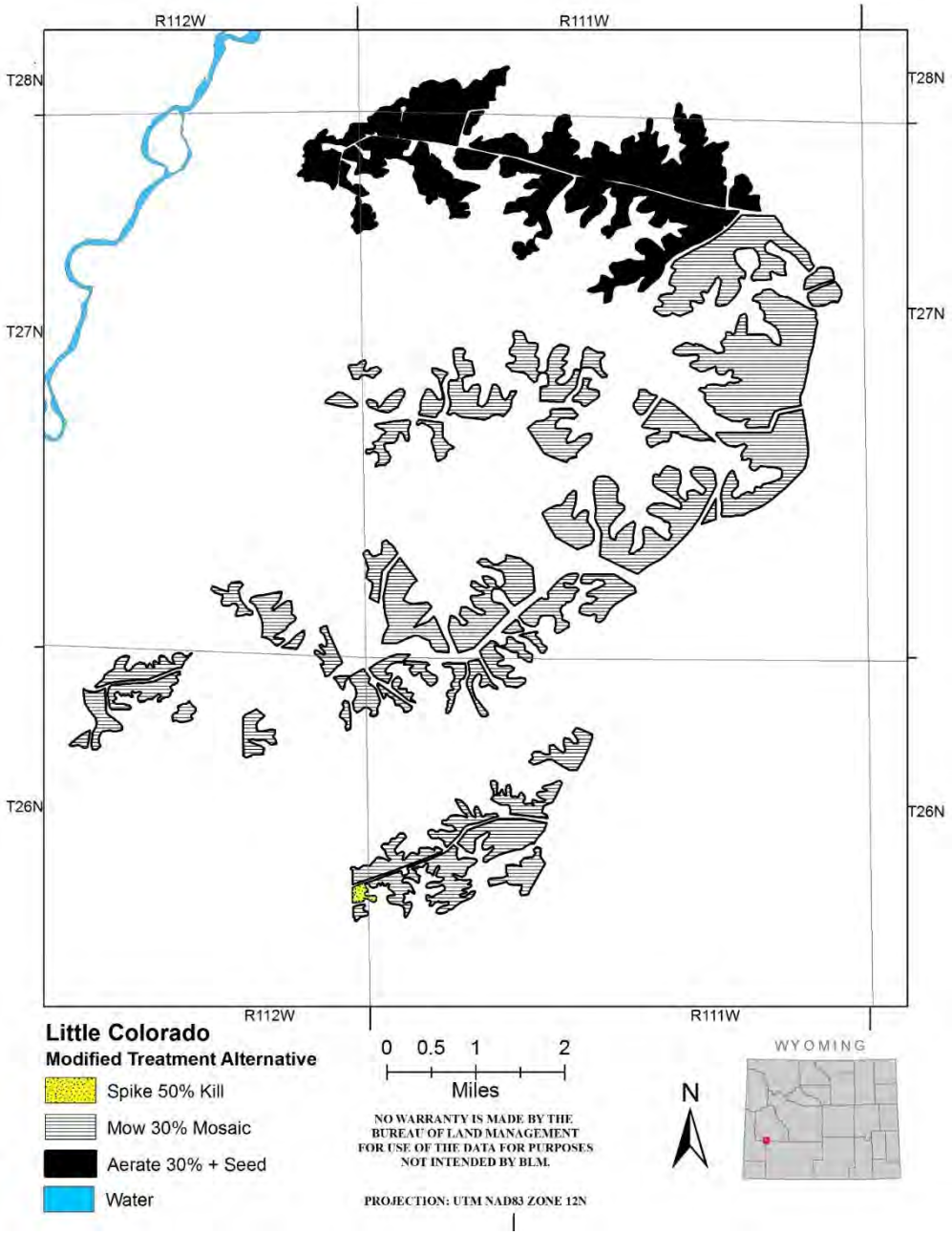
2.3.6.3 South LaBarge Front

Two treatments are proposed for this area. BLM proposes to use prescribed fire on 1,325 acres and cut/pile 453 acres in this unit.

2.3.7 Little Colorado Focus Area – Rock Springs Field Office

The treatments proposed for the Little Colorado Focus Area include treating approximately 2,575 acres in the 9,999 acre project area (Map 199). Aeration and seeding are proposed in a mosaic pattern on approximately 30 percent of 2,519 acres, resulting in 756 acres treated. A seed mix will be created using native seed from the ESD for the site and modified if needed based on seed availability and potential for success. Mowing approximately 30 percent of the acreage within 5,998 acres is proposed, resulting in 1,799 acres treated. Spike®20P at a 50 percent kill rate is proposed on 20 acres. All treatments are proposed in a mosaic pattern to open the shrub canopy.

Map 19. Little Colorado Focus Area modified treatment actions.



2.3.8 Other Treatments

2.3.8.1 Miller Mountain Fence

The Miller Mountain drift fence (Map 188) is proposed to aid in resting the treatments in the Miller Mountain Focus Area by keeping livestock either on the east or west side of the allotment during the appropriate time. The proposed fence will be built to BLM wildlife-friendly standards and consist primarily of lay-down fence construction. It will consist of a 3-wire fence with a maximum height of 42-inches. The top two wires may be barbed; the bottom wire will be smooth wire (barbless) to assist with wildlife movements. Where terrain limits the installation of wire fences, some sections may be constructed of buck-and-rail fence. The top rail will be removed from these sections during migration and winter use periods for big game. Maintenance of this fence to achieve rest for the associated treatments will not be the responsibility of permittees.

2.3.8.2 Cheatgrass Control

Actions will occur as described in the WGFD Proposed Action.

2.3.8.3 Mahogany Snow Fence

Actions will occur as described in the WGFD Proposed Action.

2.3.9 Monitoring

The following parameters will be monitored to determine if objectives are successfully met for this project.

Shrub Community Parameters

1. Promote a minimum of 50% **ground cover** in all shrub prescribed burn areas within two years of treatments*. Minimum of 5 transects with 100 total points, Line point intercept (LPI)*.

2. **Annual leader production** on key shrubs is 25 percent greater in treated areas compared to similar adjacent untreated areas, within three years of treatment. *Minimum of 3 dispersed pace transects with 10 plants on each in control and treatment areas, WGFD shrub monitoring protocol.*

3. Increase **age class diversity** of key shrubs to a minimum of 5 percent young and 20 percent mature age classes within 20 years. *Minimum of 3 dispersed pace transects with 10 plants on each, WGFD shrub monitoring protocol.*

Aspen Community Parameters

1. Promote a minimum of 60% **ground cover** in all aspen prescribed burn areas within two year of treatments. *Minimum of 5 transects with 100 total points, LPI.*

2. Total **browsing** limited to 30% or less of all current-year terminal leaders of aspen as measured in year 2, 5, 10 and 15 post-treatment. *30, variable-radius (1/100 to 1/500 acre) circular aspen plots*

3. Obtain 1000 aspen **stems/acre** over 10 feet tall within 15 years post-treatment as measured in years 2, 5, 10 and 15 post-treatment. *30, variable-radius (1/100 to 1/500 acre) circular aspen plots*

2.4 No Action

The no action alternative would not treat mule deer habitat in the Pinedale or Rock Springs Field Offices. Habitat would not be improved except through any ongoing actions already authorized. Existing vegetation condition would remain with little diversity in age classes throughout the area. Livestock rest for these treatments would not be prescribed in any allotment.

2.5 Alternatives Considered But Eliminated

A number of treatment alternatives exist that were not presented here, including eliminating the use of chemical products. Eliminating the use of chemicals was not considered because of the success rate when using chemicals in this ecosystem is high, and chemicals such as Plateau® and Spike® allow for extremely precise application.

The use of prescribed fire was not considered in Wyoming big sagebrush communities below 12 inch annual precipitation because the reduced precipitation levels reduce the likelihood of successful regeneration (WGFD 2011a).

2.6 Treatment Method Summary

Numerous methods of treating vegetation are proposed for use to accomplish the objectives identified in the Purpose and Need. These methods include brush mowing, aeration, the application of Spike®20P, seeding/re-seeding of native species, pitting, fencing of riparian areas, cutting and piling woody debris, prescribed fire, the application of Plateau® and fertilization. Methods are described in more detail below.

Brush mowing can be accomplished with a large deck mower pulled behind a tractor or larger implement. The device is a rotary mower designed to mow large shrubs. Mowers can mow swaths from six to twenty feet wide and can leave stubble heights from six inches to approximately one foot. Mowing can produce significant levels of debris from the process that can reduce potential erosion and provide vegetation cover and debris to catch snow.

Another brush reduction technique utilizes the Lawson aerator. The Lawson aerator uses a single or multiple drum system fitted with numerous blades that will break down the sagebrush and will aerate the soil, ideally increasing infiltration and soil moisture levels. The drum(s) are pulled behind a tractor or larger implement. This method will leave a similar amount of stubble without the shredding of

mowing, with the brush showing more of a crushed and chopped appearance. This method can be combined with seeding.

Spike®20P, also known as Tebuthiuron, is a nonselective broad spectrum herbicide with a long history of successful use on rangelands. This herbicide is soil active and has also been used to control broadleaves and woody plants. It can be spot applied, broadcast applied aerially or by boom sprayer, it is also often used to treat stumps of sprouting species. Chemical techniques do not increase erosion like some mechanical treatments as they leave the plant intact and standing. However, standing shrub skeletons can be problematic for follow-up treatments such as seeding, and animal movement. Tebuthiuron is highly soluble in water and will move in the soil with soil water movement and has a soil half-life of 360 days (Pesticide Information Project 1993). While readily absorbed in the blood stream of animals, Tebuthiuron is quickly metabolized and excreted in the urine within 72 hours; Tebuthiuron is not apparently hazardous to birds or aquatic organisms (Pesticide Information Project 1993). Rates proposed in this document range from 1.0 to 2.5 pounds per acre for a 50 percent mortality rate. Tebuthiuron has high soil persistence, high probability of groundwater leaching at high application rates, and low potential for surface runoff (BLM 2007).

Once an area is treated for brush, the plant community has been altered. Because of this it is often necessary, or simply preferable, to seed the area to desired species depending upon management goals and objectives. Seed mixes can be either native local species or desired forage species. These species can be mixes of native grasses, forbs, shrubs, trees or a combination of all these. Seeding can be done by hand, by small or large broadcasters, aerially or by direct drilling.

Pitting is another commonly used treatment method. Pitting is completed by using a modified disc plough that scoops a series of pits in the soil, allowing water and soil particles to accumulate in the pit. The plough may have a seed box attached and apply seed during pitting. The pits are approximately 2-5 inches deep, depending on the setting of the plough. A light chain may be pulled behind the plough to help with seed-soil contact. Pitting is most effective on heavy clan or loamy soils. The pitter is designed to roll over stones and small brush without damage.

Fencing is often used around riparian areas to limit ungulate (wildlife and/or livestock) access to important systems. Fences are built to BLM standards to achieve the desired objective. In many cases, fences are built to exclude livestock but allow wildlife entry. Additionally, temporary electric fences can be used to exclude livestock from treated areas.

The cut and pile method is often used for fuels mitigation in areas where prescribed fire is not possible, such as sites near developments or large fuel sources. Trees are cut when they are green and gathered into piles. Generally, these piles are burned in very controlled circumstances (i.e., while snow is on the ground) to minimize the potential escape of the fire. These piles may include tree and shrub limbs, leaves, pine needles and other fuels left by natural debris and forest management activities, such as thinning, pruning, and timber harvesting.

Prescribed fire, or a controlled burn, refers to the application of fire by a team of experts under specific weather conditions to help restore health to fire-adapted environments. Prescribed fires can reduce excessive amounts of litter (brush, shrubs and trees on the ground), promote growth of fire-adapted species such as aspen, and help reduce the risk of catastrophic fire.

Plateau® (Imazapic) was designed to be mixed with water and a surfactant and applied to control weeds, including cheatgrass. It has also been used successfully to top kill sprouting shrubs such as true mountain mahogany. This use is intended to mimic and replace the impacts of fire on sprouting shrubs and encourage new growth in decadent shrub communities.

Fertilizers have been used for many years to increase crop production on agricultural lands. There is limited research on the effects of fertilizing sagebrush rangeland. Goetz (1969) stated “nitrogen fertilizer may be a valuable tool for range improvement when factors of plant and soil response to the applied nitrogen are known and applied on a range site basis.” Liquid or granular fertilization is proposed at a rate of 40 pounds of nitrogen per acre.

2.6.1 Livestock Rest

In compliance with Wyoming Game and Fish Department protocols for treatments in both core and non-core Greater Sage-grouse areas, treatments would be rested “for two full growing seasons unless vegetation recovery dictates otherwise” (WGFD 2011a). This is also consistent with the Pinedale Resource Management Plan guidance for conducting treatments (BLM 2008). Typically, cool-season grasses require two years to establish vigorous top growth which is essential in order to maintain a healthy root system (Briske 1991, NRCS 2011). This results in a plant that produces abundant forage and is more tolerant of drought and other stresses (NRCS 1994). Rest can be accomplished in many ways including herding, use of supplements, temporary electric fence, and making water accessible (or inaccessible). Seasonal changes in grazing periods (i.e., switching to dormant season use or grazing after seedset) can also accomplish rest. For this project the most common form of rest would be through herding, although other methods may be used on a case by case basis in coordination with permittees. Purchasing and maintenance of riders, temporary electric fence, temporary alternative water, and other temporary infrastructure required for livestock rest would not be the responsibility of the permittees. Mule deer project implementation would not change livestock grazing permit terms and conditions. Annual coordination meetings would occur with affected permittees to discuss any necessary adjustments to rest methods or timing.

Table 3. Summary of all treatments.

WGFD Proposed Action Name	WGFD Proposed Action Treatment	WGFD Proposed Action Acres	Modified Treatment Alternative Name	Modified Treatment Alternative Method	Modified Treatment Alternative Acres	Percent Mosaic	Modified Treatment Alternative Acres
SE Deer Hills	Aerator + seeding	772	SE Deer Hills	Aerate	831	30	249
SE Deer Hills	Mow	403	SE Deer Hills	Mow	252	30	76
			SE Deer Hills	Aerate + seeding	229	30	69
NE Deer Hills	Mow	925	NE Deer Hills	Mow	679	30	204
W Deer Hills	Aerator	1,671	W Deer Hills	Mowing	1,071	50	536
			W Deer Hills	Spike 50% kill	262	100	262
Deer Hills Willow Fencing	fence + grazing management	794		dropped			
Big Piney	Aerator	3,999	Big Piney	mow	3,997	30	1,199
Highway 189	Aerator	893	Highway 189	mow	924	50	462
3 Buttes Fertilizer	Fertilizer	6,065	Milleg	Mow	94	50	47
			Trail Ridge	Mow	664	30	199
			Reed Ridge	Spike 50% kill	1,146	100	1,146
3 Buttes	Spike	84	Three Buttes	Pitting + seeding	78	100	78
Big/Little Mesa	Mow	547	Big/Little Mesa	Mow	705	30	212
Little Mesa Bowls	Spike	73	Little Mesa Bowls	Mow	87	30	26
			Wildcat	Seeding	66	100	66
			Wildcat	Plateau	35	100	35
			Saddle Ridge	Plateau	34	100	34
Chappell Cr	Spike	391	Chappell Cr	Aerate	222	30	67
			Chappell Cr	Aerate + seeding	133	30	40

WGFD Proposed Action Name	WGFD Proposed Action	WGFD Proposed Action Acres	Modified Treatment Alternative Name	Modified Treatment Alternative Method	Modified Treatment Alternative Acres	Percent Mosaic	Modified Treatment Alternative Acres
Red Hill	Aerator	139	c	Mow	169	30	51
LaBarge Mesas	Aerator	643	LaBarge Mesas	Mow	881	50	441
LaBarge Mesas	Spike	310					
LaBarge Bowls	Spike	514	LaBarge Bowls	Mow	151	30	45
LaBarge Bottoms	Aerate + seeding	286	LaBarge Bottoms	Mow	331	50	166
Deadline Ridge Aspen	Prescribed Fire	2,855	Pine Grove	Prescribed Fire	591	100	591
			Pine Grove	Cut/Pile	22	100	22
			Exxon Unit	Prescribed Fire	319	100	319
			Exxon Unit	Cut/Pile	524	100	524
			Gentle Annie	Prescribed Fire	822	100	822
			Gentle Annie	Cut/Pile	329	100	329
			Gentle Annie	Spike 50% kill	39	100	39
Miller Mtn. Aspen	Prescribed Fire	3,346	Burdick	Prescribed Fire	1,499	100	1,499
			S. LaBarge Back	Prescribed Fire	723	100	723
			S. LaBarge Front	Prescribed Fire	1,325	100	1,325
			S. LaBarge Front	Cut/Pile	453	100	453
Little Colorado	Aerate + seeding	9,999	Little Colorado	Aerate + seeding	2,519	30	756
				Mow	5,998	30	1,799
				Spike 50% kill	20	100	20
Other Treatments	Cheatgrass Control			Cheatgrass Control			
	Enhanced reclamation			Miller Mtn. Fence			
	Mahogany Drift Fence			Mahogany Snow Fence			
		34,709			28,224		14,928

3. AFFECTED ENVIRONMENT

3.1 Introduction

The greater project area includes lands bounded by North Piney Creek to the north, Fontenelle Creek to the south, the Wyoming Range to the west, and includes portions of the Little Colorado Desert to the east. Elevations range from approximately 6,500 feet in the valley to 9,500 feet in the Deadline Ridge and Miller Mountain Focus Areas. Annual precipitation varies widely across the greater project area, from 7-9 inches in the lower areas in the east to 20-24 inches in the western mountains.

Arid rangelands are widespread throughout the area, dominated by Wyoming big sagebrush intermixed with pockets of saltbush. Mixed mountain shrubs including true mountain mahogany, antelope bitterbrush, serviceberry, chokecherry (*Prunus virginiana*) and other sagebrush species (*Artemisia* spp.) become more prevalent on slopes with greater moisture and favorable soils. At higher elevations in the Deadline Ridge and Miller Mountain Focus Areas, arid rangelands transition to vegetation communities dominated by mixed aspen (*Populus tremuloides*) and conifer species.

The following sections discuss resources that may potentially be impacted by or influence the implementation of proposed treatments, including wildlife, vegetation resources, livestock grazing, wild horses, water quality, air quality, special designation and management areas, lands with wilderness characteristics, visual resources, energy development, wildfire, cultural resources, paleontology, climate change, recreation, socioeconomic, and hazardous or solid wastes.

Potential impacts to the following resources/concerns were evaluated in accordance with criteria listed in the H-1790-1 NEPA Handbook to determine if detailed analysis was required. Consideration of some of these items is to ensure compliance with laws, statutes or Executive Orders that impose certain requirements upon all Federal actions. Other items are relevant to the management of public lands in the Pinedale and Rock Springs districts. The items listed in Table 4 were reviewed and determined to be unaffected by the alternatives, including no action.

Table 4. Resources reviewed in this analysis.

Elements to Consider	Rationale for continuation or dismissal from detailed analysis
Environmental Justice	There are no known disadvantaged populations that would adversely impacted by the project.
Fish Habitat	No fish habitat is located within or adjacent to proposed treatment areas.
Floodplains	No projects are proposed within 100-year floodplains.
Native American Religious Concerns	BLM is not aware of any Native American traditional religious sites or cultural sites of importance within the proposed project area that would be affected as a result of this project.
Wild and Scenic Rivers	There are no wild and scenic rivers that would be impacted by the project.
Prime and Unique Farmlands	No lands with this designation exist in the project area.
Hazardous Waste	No known hazardous or solid wastes exist in the project area. Any spills or discoveries of hazardous or solid waste would be immediately reported to the approving official. Any such situations would be addressed swiftly and by following appropriate rules, regulations, and protocols. A discussion follows.
Wildlife (big game; raptors and migratory birds; Wyoming BLM Sensitive Species; and federally Endangered, Threatened, or Candidate species)	Numerous wildlife species are found in the greater project area (including Greater Sage-grouse), and although the proposed projects were designed for mule deer habitat for other species may be impacted through project implementation. A discussion follows.
Vegetation Resources (soils and ecological sites; upland range condition; riparian condition; invasive, non-native species, and noxious weeds; Wyoming BLM Sensitive Species; and federally Endangered, Threatened, or Candidate species)	Project designs were created with the intention to manage and manipulate vegetation characteristics. The project area contains upland and riparian sites and all special status species. A discussion follows.
Livestock Grazing	Several grazing allotments are located within the greater project area. Actions would be consistent with management plans pertaining to the allotments and have been proposed after consultation with permittees and interested publics. A discussion follows.
Wild Horses	The Little Colorado Herd Management Area is located in the Rock Springs Field Office Project area. A discussion follows.
Water Quality (surface and groundwater)	Project design features, buffer zones, topography, vegetation, and other natural ecosystem components act to minimize or preclude sediment from hillsides entering waterways. The application of potential treatments upon the landscape would not affect water quality in the watershed. A discussion follows.
Air Quality	Air quality may be impacted through these projects. A discussion follows.
Special Designation and Management Areas (Wilderness Study Areas, Areas	The greater project area includes all of these designations; WGFD proposed actions would benefit vegetation resources in

of Critical Environmental Concern, and Management Areas)	these areas. A discussion follows.
Lands with Wilderness Characteristics	The Miller Mountain area includes Lands with Wilderness Characteristics; WGFD proposed actions would benefit the vegetation resources in this area. A discussion follows.
Visual Resources	All four visual resources classes are in the greater project area. Visual resources would be managed according to agency guidelines. A discussion follows.
Energy Development	Existing energy developments in the greater project area would benefit from the reduced risk of wildland fire from implementing the proposed fuel reduction treatments. A discussion follows.
Wildland Fire	The risk of a catastrophic wildland fire would be decreased through implementation of the WGFD proposed actions. A discussion follows.
Paleontology	Paleontological resources would be avoided or mitigated prior to ground disturbing activities. A discussion follows.
Cultural Resources	Cultural resources would be avoided or mitigated prior to ground disturbing activities. A discussion follows.
Climate Change	No measureable impacts to climate change are anticipated. A discussion follows.
Recreation	Any potential impacts to recreation would be mitigated using educational materials. A discussion follows.
Socioeconomics	Negligible impacts to socioeconomics are anticipated A discussion follows.

3.2 Wildlife

3.2.1 Big Game

Mule Deer

Mule deer depend on a variety of habitats throughout their yearly cycle. Mule deer spend the summer in higher elevation forests and benefit from food resources available there. In the fall mule deer move down onto transitional hillsides where they begin to alter their diet to include a greater amount of woody species. Throughout the winter, mule deer select lower elevation areas with limited snow cover and continued access to food resources before moving to transitional areas in the spring (DeVos et al. 2003). Sagebrush provides important forage which may be supplemented during the winter by true mountain mahogany, rabbitbrush, bitterbrush, and serviceberry (BLM 2008b).

The proposed treatment areas fall within the Wyoming Range and Sublette mule deer herd units. Proposed treatments generally target habitat within winter and transitional ranges, however also occur within spring/summer/fall seasonal ranges (Map 20).

The 2012 post-season population estimate for the Wyoming Range mule deer herd unit was 33,000 deer, 34 percent below the herd size management objective of 50,000. While populations have fluctuated over the last 40 years, population levels have been below the management objective and generally decreasing. From 1976-1991, the average population size was 38,900 deer; from 1992-2008,

the population averaged 33,300 despite minimal or no harvest of antlerless deer (WGFD 2011b). Overwinter losses have been above normal every 2-3 years since 1992 on one or more of the herd's winter ranges, stagnating population growth (WGFD 2011b). Proposed treatments are intended to improve habitat for this species.

Pronghorn

Pronghorn are generally associated with low, rolling terrain supporting open grassland and sagebrush communities. Preferred habitat is characterized by a combination of sagebrush, rabbitbrush, and antelope bitterbrush, and the presence of water. The availability of browse appears to be the limiting factor for pronghorn on the winter range, while the availability of readily accessible water is likely a limiting factor on the summer range (BLM 2008b).

The entire project area falls within the Sublette pronghorn herd unit, coinciding with a mix of seasonal habitat including crucial winter/yearlong, winter/yearlong, and spring/summer/fall seasonal ranges (Map 21).

Elk

Elk require habitat that provides adequate cover and forage throughout the year. In winter, elk typically occupy habitat at low elevations or on windswept ridges where snow depth does not inhibit shrub forage; or on elk feedgrounds. In the spring, dense aspen stands with deadfall provide suitable parturition areas. Many elk in this region migrate to the Bridger-Teton National Forest (BTNF) during summer, however some remain on BLM-administered land where cover is adequate and there are few disturbances. Elk generally forage on grasses, forbs, and aspen through the spring and summer, and rely more heavily on shrub browse through the winter (BLM 2008b).

Proposed treatments fall within the Piney and West Green River elk herd units. Proposed treatment areas occur in a range of seasonal habitats for elk, including all categories of winter range in addition to spring/summer/fall range (

Map 2222). Additionally, elk parturition areas occur directly east of Absaroka Ridge and Deadline Ridge, encompassing portions of the Miller Mountain and Deadline Ridge Focus Areas. Two winter feedgrounds are located roughly five miles west of the Deer Hills Focus Area.

Moose

Moose can be found along willow-covered riparian drainages and on aspen-conifer dominated foothills throughout the year. Moose rely on a variety of browse species including willow, bitterbrush, Douglas fir, serviceberry, subalpine fir, mountain ash, whitebark pine, cottonwoods, sedges, rushes, and blue spruce (BLM 2008b).

The greater project area coincides with the Sublette and Lincoln moose herd units, and encompasses a wide variety of seasonal habitat (Map 233). Chimney Butte, Big Mesa, South LaBarge, and Little Colorado Focus Areas are largely located outside of moose seasonal ranges. Deer Hills and Deadline Ridge Focus Areas generally occur within winter seasonal range, and Miller Mountain Focus Area is located within winter seasonal and yearlong range.

3.2.2 Raptors and Migratory Birds

More than 400 avian species have been documented to occur in Wyoming; most are classified as passerine or songbirds, and more than half of these are considered year-round residents. Within the project area most songbird populations are adapted for open areas such as shrub-steppe habitat. However, forest, riparian, and open water habitats within the project area also provide important habitat for numerous other avian species (BLM 2008b).

Raptors are high trophic level predators, which are generally good indicators of habitat quality. Many common raptor species are known to seasonally reside, migrate, or nest within the vicinity of the greater project area. Common raptor species in the region include the golden eagle, red-tailed hawk, sharp-shinned hawk, Cooper's hawk, ferruginous hawk, northern harrier, prairie falcon, American kestrel, osprey, northern saw-whet owl, great horned owl, and long-eared and short-eared owls (BLM 2008b).

Protection for most avian species including raptors and other migratory birds comes under the Migratory Bird Treaty Act (MBTA) (16 USC 703-711) and Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds (66 FR 3853). This legislation directs federal agencies to focus on issues such as restoring and enhancing habitat and avoiding or minimizing adverse impacts on migratory bird populations. Additionally, the bald eagle and golden eagle are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c), which prohibits the taking of bald and golden eagles, including their parts, nests, or eggs.

The BLM places controlled surface use (CSU) stipulations in areas surrounding active raptor nest sites which vary depending upon raptor species and time of year. Raptor nest sites occur throughout the greater project area. Species associated with nests include the red tailed hawk, ferruginous hawk, American kestrel, great horned owl, prairie falcon, and common raven. Raptors and migratory birds potentially present within the project area that are either federally listed under the Endangered Species Act or are listed as BLM Sensitive Species in Wyoming are discussed further in the following sections.

3.2.3 Federally Endangered, Threatened, or Candidate Species

Federally endangered, threatened, or candidate species and critical habitat that may occur within the greater project area include the Greater Sage-grouse (*Centrocercus urophasianus*), Canada lynx (*Lynx canadensis*), grizzly bear (*Ursus arctos horribilis*), and North American wolverine (*Gulegulo luscus*). A full list of endangered, threatened or candidate species found in the Pinedale Resource Area is provided in Appendix 9, BLM (2008b). Brief accounts for species known to be present within the proposed project area and their occurrence are provided below.

Greater Sage-grouse

The Greater Sage-grouse in Wyoming is a candidate for listing under the Endangered Species Act. This species relies on sagebrush habitats year-round, for breeding, nesting, and brood-rearing. Greater Sage-grouse use relatively open areas within sagebrush communities as lek sites, or strutting grounds, where they perform courtship rituals each year. After nesting, females move to riparian areas where succulent plants in the spring and insects in the late summer and early fall provide abundant forage. During late

fall and winter, Greater Sage-grouse feed almost exclusively on sagebrush. Primary threats to the species in Wyoming include habitat loss and degradation, as well as a loss of population connectivity (Braun 1998, Wisdom et al. 2002). Thus, projects that contribute to habitat loss or degradation in sagebrush communities should be carefully evaluated for their impacts on Greater Sage-grouse. Sagebrush habitats can be impacted by events such as wildfires, clearing, and herbicide treatments; vegetation may take several years to recover after such events (Slater 2003, Braun 1998).

Greater Sage-grouse and lek observations exist within the greater project area. WGFD data show that 47 leks occur within the greater project area, including 43 occupied, 3 unoccupied, and 1 lek of undetermined status (Map 244).

- Of these 47 leks, 3 (all occupied) occur within proposed treatment areas (2 in Chimney Butte and 1 in Deer Hills Focus Areas); the perimeter of 2 leks fall within the Little Colorado Focus Area.
- An additional 12 (10 occupied, 1 unoccupied, 1 undetermined) occur within 1/4 mile of treatment area boundaries. Occupied leks occur within 1/4 mile of Deer Hills, Chimney Butte, Big Mesa, Little Colorado and South LaBarge Focus Areas.
- Five occupied leks are within the Miller Mountain Focus area and one occupied lek is within 1/4 mile of treatment area boundaries.
- No leks are present in, or within 1/4 mile of Deadline Ridge.

In addition to Greater Sage-grouse lek data, WGFD has also mapped Greater Sage-grouse core areas and winter concentration areas. Greater Sage-grouse core areas delineate important Greater Sage-grouse breeding and nesting ground in Wyoming, defined by the governor's Greater Sage-grouse Implementation Team in cooperation with regional Local Working Groups. Winter Concentration Areas within the WGFD Pinedale Region were also mapped in order to inform seasonal protection management decisions. Both core and winter concentration areas intersect proposed treatment areas. The Daniel Greater Sage-grouse core area intersects the northern portion of the Deer Hills Focus Area, and the Fontenelle Greater Sage-grouse core area intersects the southern portions of the South LaBarge and Miller Mountain Focus Areas. Winter concentration areas occur in Deer Hills, Chimney Butte, and Little Colorado Focus Areas. It is important to note that winter concentration area mapping is ongoing; as such, they will continue to grow and change as populations are monitored.

Canada Lynx

Canada lynx are listed as a threatened species in Wyoming under the Endangered Species Act. In Wyoming, lynx occupy habitat in subalpine/coniferous forests with mixed structural classes. Lynx require areas of mature forest with large downed trees for denning and shelter. They also rely on younger, denser conifer stands which provide optimal habitat for their primary prey species, snowshoe hare, as well as contiguous forested cover connecting both denning and foraging habitats. Historically, lynx have inhabited all mountain ranges in Wyoming, however, current distribution models (based on observations post-1985) show that potential distribution is limited to the western-most mountain ranges (USFWS 2012a). The greater project area includes designated lynx critical habitat in the Birch-

South Beaver, La Barge Creek and Fontenelle Creek Lynx Analysis Units. While some of the proposed treatments lie within suitable lynx habitat, none of them lie within designated lynx critical habitat.

Grizzly Bear

The grizzly bear is federally listed as threatened under the Endangered Species Act. Grizzly bears in Wyoming currently occupy habitat within Yellowstone and Grand Teton National Parks, and in adjacent lands extending south in the Wind River Range to the Green River Lakes area (Moody et al. 2002). Grizzly bears utilize both moist open-land habitats as well as timbered areas, occupying habitats at varied elevations seasonally. Grizzly bears are unlikely to be affected by any proposed treatment and will not be discussed further.

North American Wolverine

As of December 2010, the North American wolverine is a candidate species for listing under the Endangered Species Act. The continental population of wolverines is considered to be a Distinct Population Unit by the USFWS, which occupies two general regions within the US: the Northern Cascades in Washington, and the Northern Rocky Mountains in Wyoming, Montana, and Idaho. Throughout their range, wolverines occupy a wide variety of boreal, arctic, and alpine habitats. Because females dig natal dens in snow to birth young, wolverines require greater than five feet of persistent snowpack (USFWS 2012b). Wolverines may pass through the greater project area but since proposed treatments are not located in wolverine habitat they are unlikely to be affected by any proposed treatment and will not be discussed further.

3.2.4 Wyoming BLM Sensitive Species

BLM sensitive species that may occur within the greater project area are listed below in Table 5. The following sections provide brief accounts for species known to be present within proposed treatment areas as well as a discussion of their occurrence.

Table 5. BLM sensitive species that may occur within the greater project area.

Common Name	Scientific Name	Habitat	Occurrence in Project Area
Mammals			
Pygmy Rabbit	*Brachylagus idahoensis*	Basin-prairie and riparian shrub	Present
White-tailed Prairie Dog	*Cynomys leucurus*	Basin-prairie shrub, grasslands	Present
Long-eared Myotis	*Myotis evotis*	Conifer and deciduous forests, caves and mines	May occur
Birds			
Northern Goshawk	*Accipter gentilis*	Conifer and deciduous forests	Present
Sage Sparrow	*Amphispiza belli*	Basin-prairie shrub, mountain-foothill shrub	Present
Burrowing Owl	*Athene cunicularia*	Grasslands, basin-prairie shrub	May occur
Ferruginous Hawk	*Buteo regalis*	Basin-prairie shrub, grassland, rock outcrops	Present
Mountain Plover	*Charadrius montanus*	Grasslands, basin prairie shrub	May occur
Trumpeter Swan	*Cygnus buccinator*	Lakes, ponds, rivers	May Occur
Peregrine Falcon	*Falco peregrines*	Tall cliffs	Present
Bald Eagle	*Haliaeetus leucocephalus*	Areas with open water and near concentrations of winter ungulates, waterfowl, and/or fish	Present
Loggerhead Shrike	*Lanius ludovicianus*	Basin-prairie shrub, mountain-foothill shrub	May occur
Long-billed Curlew	*Numenius americanus*	Grasslands, plains, foothills, wet meadows	Present
Sage Thrasher	*Oreoscoptes montanus*	Basin-prairie shrub, mountain-foothill shrub	Present
White-faced Ibis	*Plegadis chichi*	Marshes, wet meadows	May Occur
Brewer's Sparrow	*Spizella breweri*	Basin-prairie shrub	Present
Fish			
Bluehead Sucker	*Catostomus discobolus*	Bear, Snake and Green drainages, all waters	Present
Flannelmouth Sucker	*Catostomus latipinnis*	CO River drainage, large rivers, streams and lakes	Present
Roundtail Chub	*Gila robusta*	CO River drainage, mostly large rivers, also streams and lakes	Present
Colorado River Cutthroat Trout	*Oncorhynchus clarki pleuriticus*	CO River drainage, clear mountain streams	Present
Amphibians and Reptiles			
Boreal Toad (Northern Rocky Mountain population)	*Bufo boreas boreas*	Pond margins, wet meadows, riparian areas	May occur
Columbia Spotted Frog	*Rana luteiventris*	Ponds, sloughs, small streams	May occur
Northern Leopard frog	*Rana pipiens*	Beaver ponds, permanent water in plains and foothills	May occur
Great Basin Spadefoot	*Spea intermontana*	Spring seeps, permanent and temporary waters	May occur

Pygmy Rabbit

Pygmy rabbits occur in a patchy distribution from mid-central Washington south to mid-central California and east to Utah and southwest Wyoming. Typical habitat in Wyoming includes dense big-sagebrush stands near intermittent streams and riparian sagebrush-grasslands. This species relies heavily on sagebrush, as it comprises up to 99 percent of their diet during winter (WGFD 2010). In addition to dense sagebrush, pygmy rabbits also require friable, deep soils as they are only one of two Leporids known to dig their own burrows (Keinath and McGee 2004).

White-tailed Prairie Dog

The national distribution of the white-tailed prairie dog occurs primarily in Wyoming, with smaller portions of the population occurring in Utah, Colorado, and Montana. In Wyoming, this species' range extends from Yellowstone south to the Utah border and east to the Bighorn Mountains. Despite this seemingly large range, only a fraction is considered suitable habitat and an even smaller portion is occupied. Typical habitat occupied by the white-tailed prairie dog includes mid-elevation grasslands and shrublands with a moderate slope (Keinath 2004). White-tailed prairie dogs are located within the project area.

Long-eared Myotis

The long-eared myotis occurs throughout the western United States, and throughout Wyoming. It primarily inhabits coniferous forests and woodlands near water and rocky cliff outcrops. During summer, this species can be found roosting in a wide variety of structures including snag cavities, under loose bark, stumps, buildings, rock crevices, caves, and abandoned mines. The long-eared myotis typically hibernates through the winter in caves (WGFD 2010).

Northern Goshawk

The northern goshawk occurs across North America from Alaska to Newfoundland, south to Rocky Mountain States in the west and Pennsylvania in the east. This species winters within their breeding range, and intermittently southward. The northern goshawk is a common year-round resident in Wyoming, found most commonly in mountain ranges with large patches of coniferous forest. Nesting habitat for this species is characterized by mature forest with high canopy cover, high basal area, and a relatively open understory. Foraging habitat is generally more variable, comprised on average of 50 percent mature forest, with additional habitat including various forest types, ages, and structures, interspersed with shrublands or bordering large open areas (WGFD 2010).

Sage Sparrow

The sage sparrow is a sagebrush-obligate that inhabits prairie and foothill shrubland habitat where sagebrush is present. This species requires large contiguous patches of suitable habitat in order to breed and survive. This species is considered to be a common summer resident in Wyoming threatened by fragmentation and removal of sagebrush habitat (WGFD 2010).

Burrowing Owl

Burrowing owls summer throughout most of the western United States including Wyoming, and winter in southern California and Texas through most of Central America. In Wyoming, the species occurs throughout the state with highest concentrations in the southern and eastern portions of the state. Burrowing owls typically inhabit arid or semiarid habitats with well-drained, level to gently sloping areas characterized by sparse vegetation and bare ground, such as open prairie, desert, grassland, or shrub-steppe habitat. This species relies on the presence of small burrowing mammals (particularly ground squirrels and prairie dogs), as they use these mammal's burrows for nesting, roosting, and shelter (WGFD 2010). Additionally, small vertebrates including ground squirrels comprise the majority of biomass consumed by burrowing owls (Lantz et al. 2004). Burrowing owls are located within the project area.

Ferruginous Hawk

The ferruginous hawk occupies habitat throughout much of the western United States during summer (from Canada south to Arizona and Oklahoma), and winters from the central portion of its summer range south to Baja California and central Mexico. This species inhabits semiarid open country including grasslands, basin-prairie shrublands, and badlands, generally requiring large areas of undisturbed rangeland. This species is considered to be a common resident in Wyoming, occurring throughout most of the state (WGFD 2010).

Mountain Plover

The mountain plover generally breeds throughout the western Great Plains and Rocky Mountain states, and winters in a wide band stretching between California and Texas. This species is considered a common summer resident in Wyoming, inhabiting low, open habitats such as arid short-grass and mixed-grass prairies, as well as saltbush habitats of the shrub-steppe (WGFD 2010). This species was proposed for listing as threatened under the Endangered Species Act in June 2010; in May 2011, the USFWS determined that the species was neither threatened or endangered, based upon a thorough review of current scientific and commercial information (USFWS 2012).

Trumpeter Swan

Trumpeter swans occur in North America from Alaska and interior Canada south to Oregon and east to Michigan. Populations in the tri-state area of Wyoming, Idaho, and Montana have fluctuated over the last century; over the past 20 years, the number of resident trumpeter swans in Wyoming has averaged around 100 individuals. This species requires isolated, shallow open water with dense aquatic plant and invertebrate growth such as shallow ponds, marshes, lakes, and river oxbows. During winter months in Wyoming, trumpeter swans are restricted to areas where geothermal springs or dam outflows maintain ice-free, shallow water. The primary wintering sites within the state include the Snake, Salt, and Green Rivers (south of Fontenelle Dam), although small numbers of individuals occur throughout the state (WGFD 2010). It is unlikely trumpeter swan would be in any proposed treatment area.

Peregrine Falcon

Peregrine falcons are cosmopolitan, occurring on every continent except Antarctica. They generally occupy habitat across Wyoming and breed primarily in the western half of the state. This species forages in open habitats such as open woodlands and forests, grasslands, shrub-steppe, and riparian areas. Peregrine falcons typically nest on cliffs near water and other habitats with abundant prey species (WGFD 2010). Peregrine falcons are found in the project area.

Bald Eagle

Bald eagles reside throughout most of North America. In Wyoming, the species generally nests along major river drainages and lakes throughout the state, with highest concentrations in Teton, Sublette, and Carbon Counties. The bald eagle occupies habitat with abundant prey species including fish, waterfowl, and ungulate carcasses, and requires the presence of old, large diameter cottonwood or conifer trees for nesting (WGFD 2010). Bald eagle observations have been consistently reported within the greater project area.

Loggerhead Shrike

The loggerhead shrike occurs across North America, and throughout Wyoming. This species generally requires open habitat such as grasslands, sagebrush, or other shrub-steppe habitats, with abundant insect prey and perches for hunting (Keinath and Schneider 2005). Loggerhead shrike are located within the project area.

Long-billed Curlew

The long-billed curlew occupies habitat throughout the western United States during summer, and winters generally from southern California east to South Carolina, and south to Mexico. During the breeding season this species can be found throughout Wyoming, but only nests where specific habitat conditions are met. It is considered an uncommon summer resident in the state. This species inhabits a variety of grassland types, usually near water, and nests on the ground where the following conditions are met: grass is less than 12 inches high, some bare ground is present, some shade is provided, there is abundant invertebrate prey, and a minimum of 100 acres of suitable habitat is present (WGFD 2010). Long-billed curlew are found in the project area.

Sage Thrasher

The sage thrasher occupies habitat from southern British Columbia south to New Mexico during the breeding season, and winters from southern California east to Texas and south to central Mexico. This species occurs throughout Wyoming where sagebrush is present, and is considered a common summer resident of the state. This species is sensitive to fragmentation and removal of sagebrush habitat as a sagebrush obligate (WGFD 2010). Sage thrasher are found within the project area.

White-faced Ibis

The white-faced ibis occurs in several distinct populations across North America during the breeding season and winters from southern California east to Louisiana. While this species occurs across the state of Wyoming during summer months, it is considered an uncommon summer resident. The white-faced ibis occupies wetland habitats including marshes, lakes, wet-moist meadows, and irrigated meadows (WGFD 2010). It is unlikely white-faced ibis will be in any proposed treatment area.

Brewer's Sparrow

The Brewer's sparrow occupies habitat from Alaska and Saskatchewan south to southern California and Kansas during the breeding season and winters from southern California east to Texas and south to central Mexico. It is considered a common summer resident of Wyoming, occurring throughout most of the state. This species is considered a sagebrush obligate typically occupying sagebrush habitat with abundant scattered shrubs and short grass. This species is sensitive to shrub-steppe fragmentation as well as habitat treatments involving sagebrush spraying or removal, particularly in tall, dense sagebrush stands (WGFD 2010). Brewer's sparrow are found within the project area.

Bluehead Sucker

The bluehead sucker historically occupied aquatic habitat throughout the Green River drainage (among other tributaries to the Colorado River), however several factors may be contributing to population declines throughout the species' range including hybridization with introduced species and habitat degradation due to impoundment and dewatering. The presence of dams may interfere with migration and reduce habitat quality by altering water temperatures (BLM 2008b).

In the Upper Green River and its tributaries above Fontenelle Dam, populations of the bluehead sucker were drastically reduced after rotenone poisoning in 1962. The current number of bluehead suckers in this drainage is very low and distribution is limited. However, it is likely that this species could occur within the greater project area due to its tolerance of a wide range of habitat types (BLM 2008b).

Flannelmouth Sucker

Flannelmouth suckers historically populated aquatic habitat throughout the Colorado River drainage, including the Upper Green River basin, however hybridization with introduced species and impoundment may be contributing to recent population declines in numbers and distribution throughout the species range. In the Upper Green River and its tributaries above Fontenelle Dam, populations of the flannelmouth sucker were drastically reduced after rotenone poisoning in 1962 (BLM 2008b). This species is likely to be found within large to moderate stretches of river within the greater project area, however the exact limits of their population above the Fontenelle Reservoir are not currently known (BLM 2008b).

Roundtail Chub

The roundtail chub is endemic to the Colorado River Basin and historically occupied habitat in throughout the Basin in medium to large tributaries below 7,500 feet. Habitat degradation associated with dam construction has contributed to population declines throughout the species range. In the Upper Green River and its tributaries above Fontenelle Dam populations of the roundtail chub were drastically reduced after rotenone poisoning in 1962. (BLM 2008b). Currently, this species distribution within the greater project area is not well documented although it is likely that suitable habitat exists above the Fontenelle Reservoir at low elevations (BLM 2008a).

Colorado River Cutthroat Trout

The Colorado River cutthroat trout (CRCT) historically occupies habitat throughout the Colorado River Basin above the Grand Canyon. Currently, only 8 percent of this historic habitat is occupied by non-hybridized, ecologically significant populations (Young 2008). Habitat alterations and non-native trout

introductions have contributed to population declines throughout the species range. Current threats include habitat fragmentation which may be intensified by climate change (Young 2008). This species has been petitioned for listing under the Endangered Species Act; the federal court recently upheld the USFWS decision not to list this species as threatened or endangered (CRCT v. Salazar 2012).

The WGFD identifies the upper LaBarge Creek Watershed as good CRCT habitat. A fish barrier was installed on Lower LaBarge Creek to restrict upstream passage of exotic fish, limiting CRCT hybridization with other trout species (WDEQ 2012). CRCT are known to be located in Miller Creek, Rock Creek, LaBarge Creek, Beaver Creek, South Piney Creek, Middle Piney Creek, North Piney Creek, Trail Ridge Creek, Pine Grove Creek, and South Fork Beaver Creek.

Boreal Toad

The boreal toad in Wyoming is part of the Eastern population and may qualify as a Distinct Population Segment under the Endangered Species Act. The toad inhabits marshes, wet meadows, streams, beaver ponds, and other wet habitats located in subalpine forests from 8,000 to 11,500 feet. Chydrid fungus, a globally occurring disease, is believed to be a major factor in the decline of this species (USFWS 2011). They may be found in the project area.

Columbia Spotted Frog

Spotted frogs are highly aquatic and live in or near permanent bodies of water including lakes, ponds, streams and marshes. They occur within sagebrush-juniper shrublands where emergent vegetation and standing water are present. Habitat destruction and fragmentation is believed to be a major threat to the species. They may be found in the project area.

Northern Leopard Frog

Northern leopard frogs can be found throughout the United States and throughout Wyoming; however population declines have been documented across its range. This species occupies habitat in or near permanent water in plains, foothills, and montane zones. Preferred habitat includes cattail marshes in the plains, and beaver ponds in the foothills and montane zones (WGFD 2010). A low probability of presence exists in the Little Colorado.

Great Basin Spadefoot Toad

In Wyoming, the Great Basin spadefoot toad occurs largely in Sweetwater County, in addition to parts of Lincoln, Sublette, Fremont, and Natrona counties. Spadefoot toads occupy habitat in sagebrush flats and semi-desert shrublands. They require loose sandy soil or existing rodent burrows for burrowing as well as permanent or temporary water sources for breeding (WGFD 2010). They may be found in the project area.

3.3 Vegetation Resources

3.3.1 Soils and Ecological Sites

Eighteen Ecological Sites occur within proposed treatment areas and are summarized in Table 6. Full ecological site descriptions are available online at https://esis.sc.egov.usda.gov/Welcome/pgReportLocation.aspx?type=ESD.

Table 6. Ecological sites present within proposed treatment areas, and associated acreage.

Site ID	Site Name	Treatment Acres
R034AY122WY	Loamy (Green River - Great Divide Basins)	11035.2
R034AY222WY	Loamy (Foothills And Basins West)	5888.9
R043BY258WY	Shallow Clayey (Foothills And Mountains West)	1561.8
R043BY222WY	Loamy (Foothills And Mountains West)	1339.2
R043BY212WY	Gravelly (Foothills And Mountains West)	1149.1
R034AY163WY*	Shallow Loamy, Calcareous (Green River - Great Divide Basins)	1079.3
R034AY262WY	Shallow Loamy (Foothills And Basins West)	1064.0
R034AY112WY	Gravelly (Green River - Great Divide Basins)	915.5
R034AY150WY	Sandy (Green River - Great Divide Basins)	777.6
R043BY210WY	Dense Clay (Foothills And Mountains West)	544.7
R034AY258WY	Shallow Clayey (Foothills And Basins West)	438.4
R043BY262WY	Shallow Loamy (Foothills And Mountains West)	398.9
R034AY204WY	Clayey (Foothills And Basins West)	269.4
R034AY162WY	Shallow Loamy (Green River - Great Divide Basins)	216.9
R034AY144WY	Saline Upland (Green River - Great Divide Basins)	137.4
R043BY274WY	Subirrigated (Foothills And Mountains West)	57.1
R034AY423CO*	Limy Cold Desert	57.2
R034AY140WY	Saline Lowland, Drained (Green River - Great Divide Basins)	14.7

** Ecological Site Description is not available.*

3.3.2 Upland Range Condition

No formal upland range evaluations have been recently conducted by the BLM Pinedale Field Office (PFO) in allotments that contain proposed treatment areas. Currently the PFO is completing an Ecological Site Inventory within the South LaBarge Common allotment and a Standards Determination for the North LaBarge Common allotment, which will help to inform current range condition within the greater project area. In lieu of BLM range evaluations, mule deer habitat assessments conducted by the Teton Science Schools in 2008 and 2009 are summarized below by geographic region.

Deer Hills

Based on habitat mapping data, the shrub communities in this geographic area are represented by early sagebrush, black sagebrush, Bonneville hybrid sagebrush, mountain big sagebrush, Wyoming big sagebrush, yellow/green rabbitbrush, Wyoming and black sagebrush hybrid and antelope bitterbrush. The herbaceous community is typified by pussytoes, buckwheat, prickly phlox, sulphur-flower buckwheat and aster. Dominant grasses include Sandberg bluegrass, bluebunch wheatgrass, western wheatgrass, Indian ricegrass, bluegrass and fescue (Smith and Younkin 2010a).

Shrub-belt data from seven transects indicate an average of 12.4 percent of the shrubs are dead, 17.6 percent are decadent, 60.7 percent are mature, 6.7 percent are young and 2.9 percent are seedlings. These numbers indicate a shrub community with little age class diversity or regeneration taking place. Overall the shrubs are moderately hedged and of a mature age class. The top three species by relative

frequency of shrub-belt data were Wyoming big sagebrush (37.1 percent), yellow/ green rabbitbrush (21.9 percent) and early sagebrush (12.1 percent). The three species with the highest level of hedging were Saskatoon serviceberry, true mountain mahogany and antelope bitterbrush; all were severely hedged (Smith and Younkin 2010a).

The Deer Hills geographic area contains 1,844 acres of aspen community. In all aspen stands, aspen was the dominant tree species. 59 percent of the aspen acreage in this geographic area was classified as *Populus tremuloides-Abies lasiocarpa/Symphoricarpos oreophilus/*Tall Forb (POTR-ABLA/SYOR/TALL FORBS) community type (Mueggler 1988). Browse levels within these aspen stands ranged from medium to high (Smith and Younkin 2010a).

Chimney Butte

Field observations from 2009 indicate a low, dry area of shrub communities with a history of persistent grazing. Small salt lenses are primarily found in the western portion of the geographic area. Based on habitat mapping data, the shrub communities in this geographic area are represented by black sagebrush, Wyoming big sagebrush, Gardner's saltbush, mountain mahogany, yellow/green rabbitbrush and winterfat. The herbaceous community is typified by buckwheat, prickly phlox, Lyall's goldenweed and phlox. Dominant grasses include western wheatgrass, crested wheatgrass, Sandberg bluegrass and needle and thread. It should be noted that at three monitoring sites, a third dominant grass and/ or forb were not listed; at two of these sites, no forbs were listed. This indicates a scarcity of forb and grass species (Smith and Younkin 2010a).

Shrub-belt data from six transects indicate an average of 7.5 percent of the shrubs are dead, 12.5 percent are decadent, 64.0 percent are mature, 12.5 percent are young and 3.5 percent are seedlings. These numbers indicate a shrub community with little age class diversity or regeneration taking place. Overall the shrubs are moderately hedged and of a mature age class. The top three species by relative frequency of shrub-belt data were Wyoming big sagebrush (45.7 percent), yellow/ green rabbitbrush (20.9 percent) and snowberry (9.1 percent). The three species with the highest level of hedging, wax currant, Saskatoon serviceberry and true mountain mahogany, were all severely hedged (Smith and Younkin 2010a).

Big Mesa

Based on habitat mapping data, the shrub communities in this geographic area are represented by black sagebrush, Wyoming big sagebrush, shadscale saltbush, Gardner's saltbush, true mountain mahogany, yellow/green rabbitbrush and winterfat. The herbaceous community is typified by phlox, buckwheat, aster, Lyall's goldenweed, common yarrow and saltlover (*Halogeton*). Dominant grasses include Sandberg bluegrass, western wheatgrass, Indian ricegrass and needle and thread. However, it should be noted that in eight of ten monitoring sites, a third dominant grass and/ or forb were not listed. This indicates a scarcity of forb and grass species indicative of shrub communities with limited understory cover (Smith and Younkin 2010a).

Shrub-belt data from six transects indicate an average of 12.3 percent of the shrubs are dead, 11.0 percent are decadent, 61.2 percent are mature, 12.8 percent are young and 2.8 percent are seedlings.

These numbers indicate a shrub community with little age class diversity or regeneration taking place. Overall the shrubs are moderately hedged and of a mature age class. The top three species by relative frequency of shrub-belt data were Gardner's saltbush (34.0 percent), Wyoming big sagebrush (32.5 percent) and yellow/ green rabbitbrush (10.6 percent). The three species with the highest level of hedging, spiny hopsage (*Grayia spinosa*), a hybrid of Wyoming and black sagebrush and black sagebrush, were all severely hedged (Smith and Younkin 2010a).

South LaBarge

Field observations from 2008 indicate an area dominated by Wyoming big sagebrush. Vegetation patches are primarily differentiated based on the second dominant shrub. The low lying sagebrush areas are primarily Wyoming big sagebrush with yellow/ green rabbitbrush or Wyoming big sagebrush with spiny hopsage. The dominant vegetation along Holden Hollow is Wyoming big sagebrush and basin big sagebrush. The hilltops in this geographic area are Wyoming big sagebrush with either true mountain mahogany or black sagebrush as the second dominant shrub (Smith and Younkin 2010b).

Throughout the geographic area, small salt lenses of saltbush communities are present. These lenses' small size prohibited delineating them within this landscape scale assessment. However, their continued presence in this low precipitation zone warrants mention here and adds to the mosaic of shrub communities (Smith and Younkin 2010b). Saltbush communities are typically dominated by big sagebrush (*Artemisia tridentata*) and shadscale saltbush (*Atriplex confertifolia*) (Blaisdell and Holmgren 1984). Spiny hopsage and greasewood, two shrub species found as dominants in the South LaBarge geographic area, are also associated with saltbush communities (Blaisdell and Holmgren 1984).

Based on habitat mapping data, the shrub communities in this geographic area are represented by black sagebrush, Wyoming big sagebrush, basin big sagebrush, true mountain mahogany, yellow/green rabbitbrush, spiny hopsage, shadscale saltbush, greasewood and snowberry. The herbaceous community is typified by phlox, Lyall's goldenweed and buckwheat. Dominant grasses include needle and thread, bluebunch wheatgrass, Indian ricegrass, Sandberg bluegrass and squirreltail (Smith and Younkin 2010b).

Shrub-belt data from twelve transects indicate an average of 18.1 percent of the shrubs are dead, 13.3 percent are decadent, 52.7 percent are mature, 13.6 percent are young and 2.3 percent are seedlings. These numbers indicate a shrub community with little age class diversity and limited regeneration taking place. Overall the shrubs are moderately hedged and of a mature age class. The top three species by relative frequency of shrub-belt data were Wyoming big sagebrush (52 percent), Gardner's saltbush (10 percent) and bastardsage (subshrub/ forb) (9 percent). The three species with the highest hedging levels, an unknown shrub (possibly a Wyoming big sagebrush hybrid), serviceberry and true mountain mahogany, were all severely hedged (Smith and Younkin 2010b).

Deadline Ridge

Based on habitat mapping data in the western portion of the area, the shrub communities are represented by early sagebrush, silver sagebrush, prairie sagewort, Bonneville hybrid sagebrush, mountain big sagebrush, Wyoming big sagebrush, yellow/green rabbitbrush and antelope bitterbrush.

The herbaceous community is typified by sulphur-flower buckwheat, Lyall's goldenweed, lupine, pussytoes, aster and arrowleaf balsamroot. Dominant grasses include Sandberg bluegrass, western wheatgrass, bluebunch wheatgrass, bluegrass, brome, fescue, Indian ricegrass and sedge (Smith and Younkin 2010a).

Shrub-belt data from five transects indicate an average of 10.2 percent of shrubs are dead, 24.8 percent are decadent, 46.8 percent are mature, 16.6 percent are young and 1.6 percent are seedlings. These numbers indicate a shrub community with little age class diversity or regeneration taking place. Overall the shrubs are moderately hedged and of a mature age class. The top three species by relative frequency of shrub-belt data were mountain big sagebrush (75.1 percent), yellow/ green rabbitbrush (15.0 percent) and rose (4.0 percent). The three species with the highest level of hedging, Bonneville hybrid sagebrush, mountain big sagebrush and yellow/ green rabbitbrush, were all moderately hedged (Smith and Younkin 2010a).

The western Deadline Ridge geographic area contained 3,641 acres of aspen community. Aspen is the dominant overstory species in 78 percent of these stands. 42 percent of the aspen acreage in this geographic area was classified as *Populus tremuloides-Abies lasiocarpa*/ Tall Forbs (POTR-ABLA/ TALL FORBS) community type (Mueggler 1988). Browse levels within these aspen stands ranged from low to high (Smith and Younkin 2010a).

The eastern shrub communities in this geographic area are represented by early sagebrush, silver sagebrush, prairie sagewort, black sagebrush, Bonneville hybrid sagebrush, mountain big sagebrush, Wyoming big sagebrush, mountain mahogany, yellow/green rabbitbrush, Wyoming and black sagebrush hybrid, winterfat, antelope bitterbrush and russet buffaloberry. The herbaceous community is typified by phlox, arrowleaf balsamroot, Lyall's goldenweed, aster and heartleaf arnica. Dominant grasses include western wheatgrass, bluebunch wheatgrass, Sandberg bluegrass, Indian ricegrass, brome and sedge (Smith and Younkin 2010a).

Shrub-belt data from twelve transects indicate an average of 4.1 percent of the shrubs are dead, 15.3 percent are decadent, 61.8 percent are mature, 14.3 percent are young and 4.7 percent are seedlings. These numbers indicate a shrub community with little age class diversity or regeneration taking place. Overall the shrubs are moderately hedged and of a mature age class. The top three species by relative frequency of shrub-belt data were yellow/ green rabbitbrush (22.9 percent), early sagebrush (21.0 percent) and Wyoming big sagebrush (20.3 percent). The three species with the highest level of hedging, true mountain mahogany, winterfat and antelope bitterbrush, were all severely hedged (Smith and Younkin 2010a).

The eastern Deadline Ridge geographic area contained 3,564 acres of aspen community. Aspen was the dominant tree species in 87 percent of these stands. 43 percent of the aspen acreage in this geographic area was classified as *Populus tremuloides-Abies lasiocarpa*/ Tall Forbs (POTR-ABLA/ TALL FORBS) community type (Mueggler 1988). Browse levels within these aspen stands ranged from low to high (Smith and Younkin 2010a).

Miller Mountain

Field observations made in 2008 and 2009 on the eastern side of Miller Mountain indicate an area of intense use by multiple ungulate species. The overarching need in this area is to evaluate the resource use by both wild and domestic ungulates. Based on habitat mapping data, the shrub communities in this geographic area are represented by low sagebrush, early sagebrush, black sagebrush, mountain big sagebrush, yellow/green rabbitbrush, snowberry, rubber rabbitbrush and antelope bitterbrush. The herbaceous community is typified by phlox, lupine, pussytoes, buckwheat, yellow owl's-clover and common yarrow. Dominant grasses include Sandberg bluegrass, bluebunch wheatgrass, western wheatgrass and Indian ricegrass (Smith and Younkin 2010b).

Shrub-belt data from seven transects indicate an average of 5.4 percent of the shrubs are dead, 7.1 percent are decadent, 80.5 percent are mature and 6.9 percent are young with no seedlings. These numbers indicate a shrub community with very little age class diversity and minimal regeneration taking place. Overall the shrubs are moderately hedged and of a mature age class. The top three species by relative frequency of shrub-belt data were black sagebrush (57 percent), mountain big sagebrush (21 percent) and early sagebrush (8 percent). The three species with the highest levels of hedging, serviceberry, Wyoming big sagebrush and snowberry, were all classified as severely hedged (Smith and Younkin 2010b).

The eastern Miller Mountain geographic area contains 4,000 acres of aspen community. Forty-eight percent of the aspen acreage in this geographic area was classified as *Populus tremuloides-Abies lasiocarpa/ Symphoricarpos oreophilus*/ Tall Forbs (POTR-ABLA/SYOR/TALL FORBS) community type (Mueggler 1988). Browse level assessments within these aspen stands range from low to high (Smith and Younkin 2010b).

Field observations in the western portion of Miller Mountain from 2009 indicate an area of higher precipitation and relatively healthy and diverse vegetative communities. Based on habitat mapping data, the shrub communities in this geographic area are represented by early sagebrush, black sagebrush, mountain big sagebrush, curl-leaf mountain mahogany, Booth's willow, silver sagebrush, yellow/green rabbitbrush, Geyer willow, snowberry, rubber rabbitbrush and antelope bitterbrush. The herbaceous community is typified by lupine, phlox, sulphur-flower buckwheat, buckwheat and common yarrow. Dominant grasses include western wheatgrass, bluebunch wheatgrass, squirreltail and wheatgrass (Smith and Younkin 2010b).

Shrub-belt data from eight transects indicate an average of 7.8 percent of the shrubs are dead, 19.0 percent are decadent, 62.0 percent are mature, 9.8 percent are young and 1.3 percent are seedlings. These numbers indicate a shrub community with little age class diversity and minimal regeneration taking place. Overall the shrubs are moderately hedged and of a mature age class. The top three species by relative frequency of shrub-belt data were mountain big sagebrush (47 percent), early sagebrush (35 percent) and yellow/ green rabbitbrush (13 percent). The three species with the highest level of hedging were curl-leaf mountain mahogany (severe), early sagebrush (moderate) and antelope bitterbrush (moderate) (Smith and Younkin 2010b).

The western Miller Mountain geographic area contains 5,314 acres of aspen community. Aspen is the dominant overstory species in 12 of these stands. 39 percent of the aspen acreage in this geographic area was classified as *Populus tremuloides-Abies lasiocarpa*/ Tall Forbs (POTR-ABLA/ TALL FORBS) community type (Mueggler 1988). Browse level assessments within these aspen stands range from low to moderate (Smith and Younkin 2010b).

Little Colorado

Field observations from 2009 indicate an area of vegetation communities associated with low floodplains, drainages and the plateau tops. The vegetation communities transition as elevation increases from low saltbush and greasewood communities to mixed mountain shrub communities to high plateaus dominated by Wyoming big sagebrush. Based on habitat mapping data, the shrub communities in this geographic area are represented by black sagebrush, Wyoming big sagebrush, Gardner's saltbush, true mountain mahogany, yellow/green rabbitbrush, rubber rabbitbrush, winterfat and greasewood**.** The herbaceous community is typified by phlox, pussytoes, plains pricklypear and Lyall's goldenweed. Dominant grasses include Indian ricegrass, western wheatgrass, bluebunch wheatgrass and needle and thread (Smith and Younkin 2010a).

Shrub-belt data from eleven transects indicate an average of 8.1 percent of the shrubs are dead, 11.4 percent are decadent, 71.5 percent are mature, 8.5 percent are young and 0.6 percent are seedlings. These numbers indicate a shrub community with very little age class diversity or regeneration taking place. Overall the shrubs are moderately hedged and of a mature age class. The top three species by relative frequency of shrub-belt data were Wyoming big sagebrush (50.0 percent), winterfat (10.8 percent) and black sagebrush (8.5 percent). The three species with the highest level of hedging, antelope bitterbrush, an unknown shrub (possibly a Wyoming big sagebrush hybrid) and true mountain mahogany, were all severely hedged (Smith and Younkin 2010a).

3.3.3 Riparian Condition

The functioning condition of streams has been assessed for approximately 135 miles of lotic streams within the greater project area, between 1994 and 2012 (Table 7). 40 percent of the assessed miles were given the rating of *Proper Functioning Condition* (PFC), indicating that adequate vegetation, landform, or large woody debris is present to dissipate stream energy and maintain physical stability of the system. 61 percent were considered *Functional – At Risk* (5 percent displayed an upward trend, 37 percent showed no trend, and 19 percent showed a downward trend). Only 0.4 miles (0.3 percent) of stream segments were rated *Nonfunctioning*. Segments rated Nonfunctioning occur along 0.3 miles of Spring Creek (Guio Sections Ind. allotment, surveyed in 1997), and along 0.1 miles of Fogarty Creek (North LaBarge Common allotment, BLM 2009a).

Table 7. Riparian Proper Functioning Condition Summary for assessed streams in the greater project area, grouped by allotment. Only the most recent assessment per stream segment is included in the totals below.

Date(s)	Allotment	Functioning Condition[1] (miles)					Total (miles)
		PFC	FARU	FARNA	FARD	NF	
2010	Beaver Creek Individual; Beaver Cr Meadow Ind.	1.50	0.00	0.00	0.00	0.00	1.50
1997	Guio Sections Individual	0.00	1.23	0.52	0.45	0.30	2.50
2010-2011	LaBarge Individual	0.75	1.00	1.25	0.00	0.00	3.00
1996-2011	North La Barge Common	21.00	1.75	14.75	5.00	0.10	42.60
1998	Section 18 Individual	1.00	0.00	0.00	0.00	0.00	1.00
1994-2012	South La Barge Common	25.50	0.75	31.00	18.00	0.00	73.25
2011	South Piney Individual	0.00	0.00	0.75	0.00	0.00	0.75
2000-2011	Upper North LaBarge	3.25	2.00	2.00	2.25	0.00	9.50
1998	West of Ranch Individual	0.50	0.00	0.00	0.00	0.00	0.50
Total		53.50	6.73	50.27	25.70	0.40	134.60
		39.7%	5.0%	37.3%	19.1%	0.3%	100.0%

[1]PFC = Proper Functioning Condition; FARU = Functioning At Risk, Upward Trend; FARNA = Functioning At Risk, Trend Not Apparent; FARD = Functioning At Risk, Downward Trend; NF = Nonfunctional

In addition to the riparian assessments listed above, the riparian condition of the Green River adjacent to Figure Four allotment was assessed in 2002, as part of the Wyoming Rangelands Standards Conformance Review and Summary for the allotment (BLM 2009b). This assessment notes that the condition of this segment of the Green River was borderline between PFC and Functioning at Risk.

3.3.4 Invasive, Non-native Species and Noxious Weeds

Executive Order 13112 defines noxious weeds as those *species whose introduction does or is likely to cause economic or environmental harm or harm to human health*. Noxious weeds are typically aggressive and can quickly dominate a natural community once introduced to an area. They are often able to establish in areas following a disturbance (BLM 2008b).

The Wyoming Weed and Pest Council designated 25 species as Noxious Weeds, 13 of which are present in the general project area. Additionally, the state has designated Declared Weeds by county, defined in Wyoming Statute 11-5-102(a)(viii) as “any plant which the board and the Wyoming weed and pest council have found, either by virtue of its direct effect, or as a carrier of disease or parasites, to be detrimental to the general welfare of persons residing within a district.” Both state designated noxious weeds and declared weeds in Sublette, Lincoln, and Sweetwater counties found in the project area are listed Table 8.

Table 8. Wyoming Designated Noxious Weeds, and Declared Weeds for Sublette, Lincoln, and Sweetwater counties.

Scientific Name	Common Name	Occurrence in Project Area[1]
Designated Noxious Weeds		
Convolvulus arvensis	Field bindweed	X
Cirsium arvense	Canada thistle	X
Euphorbia esula	Leafy spurge	X
Sonchus arvensis	Perennial sowthistle	X
Agropyron repens	Quackgrass	(no data)
Cardaria draba and *Cardaria pubescens*	Hoary cress	X
Lepiduim latifolium	Perennial pepperweed	X
Chrysanthemum leucanthemum	Ox-eye daisy	
Franseria discolor	Skeletonleaf bursage	
Centaurea repens	Russian knapweed	X
Linaria vulgaris	Yellow toadflax	
Linaria dalmatica	Dalmatian toadflax	
Onopordum acanthium	Scotch thistle	X
Carduus nutans	Musk thistle	X
Arctium minus	Common burdock	
Carduus acanthoides	Plumeless thistle	
Isatis tinctoria	Dyer's woad	X
Cynoglossum officinale	Houndstongue	X
Centaurea maculosa	Spotted knapweed	X
Centaurea diffusa	Diffuse knapweed	
Lythrum salicaria	Purple loosestrife	
Tamarix spp.	Saltcedar	X
Hypericum perforatum	Common St. Johnswort	
Tanacetum Vulgare	Common Tansy	
Elaeagnus angustifolia	Russian Olive	
Declared Weeds		
Rorippa austriaca	Austrian fieldcress.	Sublette
Hyoscyamus niger	Black henbane	Sublette, Lincoln, Sweetwater
Matricaria perforata	Scentless chamomile	Sublette
Knautia arvensis	Field scabious	Sublette
Cicuta douglasii	Western water hemlock	Sublette, Lincoln
Verbascum thapsus	Common mullein	Lincoln
Avena fatua	Wild oat	Lincoln
Conium maculatum	Poison hemlock	Lincoln
Cirsium vulgare	Bull thistle	Lincoln
Hordeum jubatum	Foxtail barley	Sweetwater
Galium verum	Lady's bedstraw	Sweetwater
Thermopis montana	Mountain thermopsis	Sweetwater
Glycyrrhiza lepidota	Wild licorice	Sweetwater

[1] X = Species occurs in township containing proposed treatment areas, based upon 2011 WWPC distribution maps.

Of the species listed in Table 8, perennial pepperweed, leafy spurge, knapweeds, and Dyer's woad are considered to have the highest management priority within the PFO planning area (BLM 2008b).

Other weed species present, though not listed as designated noxious or declared include cheatgrass, halogeton and Russian thistle. Cheatgrass is also problematic throughout the project area, occurring in the Deer Hills, Big Mesa, South LaBarge, and Little Colorado Focus Areas, with populations generally concentrated along the LaBarge Creek Road. It is also common on south-facing slopes from Chapel Creek south to Delaney and Little Muddy Creeks, and present in the McCray Basin. It is less common west of

Miller Mountain. This species can quickly establish in disturbed sites and displace native grasses, especially on hot, south-facing slopes where the natural spaces between plants tend to be larger. Additionally, cheatgrass can establish a dense matrix within sagebrush communities that allows wildfire to spread more rapidly and burn more thoroughly than in areas with native vegetation.

3.3.5 Wyoming BLM Sensitive Plant Species

BLM sensitive plant species that may occur within the project area are listed below in Table 9. The following sections provide brief accounts for species known to be present within or in the vicinity of proposed treatment areas, as well as a discussion of their occurrence. A full list of sensitive species found in the Pinedale Resource Area is provided in Appendix 9, BLM (2008a). Wyoming BLM Sensitive Plant Species that occur in the project area will be avoided by any project that may impact the species or their habitat. There will be no impact to these species and they will not be discussed beyond this section.

Table 9. BLM sensitive plant species potentially occurring in greater project area.

Common Name	Scientific Name	Habitat	Occurrence in Greater Project Area
Meadow Milkvetch	*Astragalus diversifolius*	Low sagebrush valleys and closed drainages in moist alkaline meadows 6,500-6,620’	Historical
Trelease ’s Milkvetch	*Astragalus racemosus* var. *treleasei*	Sparsely vegetated sagebrush communities on shale or limestone outcrops & barren clay slopes at 6500-8200'	Present
Cedar Rim Thistle	*Cirsium aridum*	Barren, chalky hills, gravelly slopes, & fine textured, sandy-shaley draws 6,700-7,200'	Present
Beaver Rim Phlox	*Phlox pungens*	Sparsely vegetated slopes on sandstone, siltstone, or limestone substrates 6,000-7,400'	Present
Tufted Twinpod	*Physaria condensata*	Sparsely vegetated shale slopes & ridges 6,500-7,000'	Present
Limber Pine	*Pinus flexilis*	All mountains near timberline and at low elevation	Present

Meadow Milkvetch

Meadow milkvetch is a small perennial forb known to occur in east-central Idaho, at the southern edge of the Salt Lake Desert of Utah, in the Spring Valley area of Nevada, and in the Great Divide Basin of Sweetwater County, Wyoming. This species is a halophyte and is restricted to low topographic positions within sagebrush valleys and closed basin drainages. Major potential threats to this species include mineral and energy development and noxious weeds (Heidel 2009). It is unlikely this species occurs in any treatment area.

Trelease's Milkvetch

Trelease's milkvetch is a perennial herb endemic to northeastern Utah and southeastern Wyoming, occupying badlands outwashes and slopes along major river valleys. It is generally found within sparsely vegetated habitat with thickspike wheatgrass, rabbitbrush, and shadscale (Heidel 2003). The major potential threat is surface disturbance due to oil and gas development, road construction, and off-road vehicle use (Heidel and Fertig 2003). It is unlikely this species occurs in any treatment area.

Cedar Rim Thistle

Cedar Rim thistle is a perennial taprooted herb endemic to the Green River Basin in Sublette County, Beaver Rim area of Freemont County, Sweetwater River Valley in Carbon County, and highlands on the east side of Flaming Gorge in Sweetwater county. This species is found in sparsely vegetated openings within Wyoming big sagebrush grasslands at 5800-7500 feet. Major potential threats to this species include treatments intended to control populations of Canada or musk thistle, soil erosion, and displacement by off-road vehicles (Fertig 2000). It is unlikely this species occurs in any treatment area.

Beaver Rim Phlox

Beaver Rim phlox is a leafy perennial forb endemic to southwestern Wyoming. It forms loose mats in sparsely vegetated cushion plant communities at 6,000-7,400 feet. Major potential threats to this species include surface disturbance associated with oil and gas development, pipeline and highway construction, off-road vehicle use, and encroachment of exotic species (Fertig and Heidel 2010). It is unlikely this species occurs in any treatment area.

Tufted Twinpod

Tufted twinpod is a small perennial forb endemic to the Overhurst Belt Mountains and the lower Green River Basin in southwest Wyoming. It generally occurs on dry, rocky knolls and ridges, clay banks, and shaley hills in sparsely vegetated cushion plant communities in openings within sagebrush grasslands at 6,700-7,400 feet. Population trends indicate that population levels are apparently stable. Potential threats, though minimal at present, include development associated with mineral exploration (Fertig 2002). Associated habitat descriptions indicate that this species may occur at the edges of proposed project areas but it unlikely to be in any treatment area.

Limber Pine

The Limber pine is an exceptionally slow-growing conifer that inhabits elevations ranging from 5,000 to 12,000 feet. It tends to grow on southwestern slopes on the edges of cliffs or in pockets on talus slopes. It is a relatively small tree (25-30 feet tall). Limber pines are dependent on Clark's nutcrackers for seed dispersal.

3.3.6 Federally Endangered, Threatened or Candidate Plant Species

A full list of endangered, threatened or candidate species found in the Pinedale Resource Area is provided in Appendix 9, BLM (2008b). Brief accounts for species known to be present within the proposed project area and their occurrence are provided below. Only whitebark pine is known to occur in proximity to proposed treatment areas and will be discussed further.

Whitebark Pine

Whitebark pine grows in elevations ranging from 7,300 to 10,500 feet in Wyoming and are long-lived species that regenerate well after fire. These trees are often the pioneer species after disturbance and provide protection for other plant species to grow. Significant concerns exist about the sustainability of whitebark pine systems; threats include white pine blister rust, fire exclusion and climate change. Whitebark pines are important forage species for Clark's nutcracker, black and grizzly bears.

3.4 Livestock Grazing

Proposed treatments occur within 21 different BLM grazing allotments; 20 are managed by the Pinedale BLM FO and one (Figure Four allotment, encompassing the Little Colorado Focus Area) is managed by the Rock Springs FO. These allotments encompass approximately 441,484 acres, the majority of which is public land managed by the BLM, with smaller amounts of state and private land. Within these allotments, treatments are proposed for a maximum total of 34,709 acres (including sagebrush, aspen, and invasive species treatments), or approximately 8.0 percent of the total allotted area (Map 255 - Map 288). Appendix B lists permitted AUM's and grazing start and end dates for each of the 21 allotments.

The North LaBarge Common allotment contains 135,141 acres**,** of which 120,289 acres are managed by the BLM. The allotment encompasses 31 percent of proposed treatment areas. This allotment is permitted for 14,500 AUMs, and supports cattle grazing from May 16 to October 15 annually. This allotment is classified as category I, Improve, indicating that the allotment either exhibits unsatisfactory vegetation conditions or contains significant sensitive resources that justify investments of time and money.

The South LaBarge Common allotment contains 115,005 acres, of which 99,401 acres are managed by the BLM. This allotment encompasses 13 percent of proposed treatment areas. It is permitted for 10,107 AUMs, and supports cattle and horse grazing from May 1 to October 31. This allotment is classified as category I, Improve.

The Figure Four allotment contains 117,693 acres, of which 114,425 acres are public lands managed by the BLM. This allotment encompasses 28 percent of proposed treatment areas. It is permitted for 11,108 AUMs (6,644 active, 4,464 suspended) and supports cattle grazing from May 10 to September 1 and from November 1 to January 10 annually. The 1997 Green River RMP classifies this allotment as category I, Improve (BLM 1997).

Other BLM allotments encompass roughly 75,645 acres, of which 57,345 acres are managed by the BLM. These allotments are generally grazed for 1-3 months between May and September but may be permitted as late as November 30.

3.5 Wild Horses

The Little Colorado Focus Area lies within the northwest corner of the Little Colorado Herd Management Area (HMA), managed concurrently with the White Mountain HMA by the BLM Rock Springs field office (Map 299). Together, these two HMAs encompass roughly 1,014,557 acres of public, private, and state land. The last wild horse gather occurred in August 2011 to reduce the number of wild horses to within

established Appropriate Management Levels (AMLs) of 205-300 wild horses in the White Mountain HMA, and 69-100 wild horses in the Little Colorado HMA. Before the horse gather, it was estimated that approximately 970 wild horses occupied the two HMAs. During the gather, 699 wild horses were removed from the HMAs, 205 were returned, and 11 died. Approximately 274 wild horses remain in the two HMAs, which is within the established AML (BLM 2011). Any management actions (i.e., herding) necessary to achieve objectives will be done in consultation with the Wild Horse and Burro Specialist.

3.6 Water Quality

3.6.1 Surface Water Quality

All proposed treatments fall within the Upper Green Sub-basin (HUC 14040101), which includes all tributaries to the Green River above the Fontenelle Dam, with the exception of the New Fork Sub-basin (Map 30). Three drainages within the greater project area are classified as Category 2 Waters, including LaBarge Creek, Fontenelle Creek (in two areas), and Rock Creek. Category 2 classification indicates that some designated uses are supported, but the status of others remains unknown. Additionally, Reardon Draw is classified as Category 3 Waters, indicating that it has been assessed by WDEQ but there is insufficient data to determine whether any designated uses are supported (WDEQ 2012). Assessed waters within the project area and their supported uses are summarized below in Table 10.

All assessed waters within the project area are Class 2AB. Class 2AB waters are known to support game fish populations or contain spawning and nursery areas at least seasonally. They are also presumed to have sufficient water quality and quantity to support drinking water supplies, and are protected for that use. Additionally, they are protected for nongame fisheries, fish consumption, aquatic life other than fish, recreation, wildlife, industry, agriculture, and scenic value uses (WDEQ 2007).

Table 10. Summary of assessed waters within the greater project area (WDEQ 2012).

Waterbody	305(b) Identifier	Location	Category	Class	Miles	Uses Supported
LaBarge Creek	WYGR140401011102_00	Entire watershed upstream of Little Fall Creek Rd	2	2AB	160.1	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Fontenelle Creek	WYGR140401011302_00	Entire watershed upstream of the confluence with Little Coal Creek	2	2AB	210.0	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Fontenelle Creek	WYGR140401011306_01	From the confluence with Fontenelle Reservoir to a point 13.2 miles upstream	2	2AB	13.2	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Rock Creek	WYGR140401011103_01	Entire watershed upstream of the confluence with LaBarge Creek	2	2AB	16.6	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry
Reardon Draw	WYBH140101011006_01	From the confluence with the Green River to a point 3.2 miles upstream	3	2AB	3.2	Insufficient data to determine supported uses

There are no Category 4 surface waters, or Category 5/303(d) listed waters within the greater project area (WDEQ 2012).

3.6.2 Groundwater Quality

The Water Quality Division established and implemented groundwater quality standards in 1980, in order to protect existing and future groundwater uses. These regulations contain both narrative and numerical standards to classify groundwater and to provide criteria to determine acceptable levels of discharges to groundwater. Additionally, the standards are used to determine the degree of reclamation necessary to restore polluted groundwater to pre-contamination use (States West 2001).

Groundwater quality is variable throughout the greater project area. Near high recharge areas in the mountains on the western edge of the project area, groundwater generally has a Total Dissolved Solids (TDS) concentration less than 500 mg/L, which is considered suitable for domestic use. Groundwater elsewhere can exceed TDS concentrations of 3,000 mg/L, which is still suitable for livestock use. Throughout the PFO planning area, more than half of sampled groundwater wells exceed TDS standards for drinking water (BLM 2008b).

In the Wasatch Formation, groundwater quality is typically reduced by sodium bicarbonate ions in shallow zones and by sodium sulfate ions in deeper sandstones (BLM 2008b). Throughout the PFO planning area, groundwater quality is also reduced by iron, manganese, fluoride, and nitrate (BLM 2008b).

3.7 Air Quality

Air quality, air quality related values (AQRVs) such as visibility and atmospheric deposition, and climate change are the components of air resources which the BLM must consider and analyze to address the potential effects of authorized activities on air resources as part of the planning and decision making

process. The Pinedale Resource Management Plan (BLM 2008a) addresses air quality issues, impacts, and potential mitigations (Sec. 2.3.1, Air Quality Management, p. 2-10).

Regional air quality is influenced by the interaction of meteorology, climate, the magnitude and spatial distribution of local and regional air pollutant sources, and the chemical properties of emitted air pollutants.

The monitoring and enforcement of air-quality standards are administered by the Wyoming Department of Environmental Quality-Air Quality Division (WDEQ). Wyoming Ambient Air Quality Standards (WAAQS) and National Ambient Air Quality Standards (NAAQS) identify maximum limits for concentrations of criteria air pollutants at all locations to which the public has access. The WAAQS and NAAQS are legally enforceable standards. Concentrations above the WAAQS and NAAQS represent a risk to human health that, by law, require public safeguards be implemented. State standards must be at least as protective of human health as federal standards, and may be more restrictive than federal standards, as allowed by the Clean Air Act (CAA). Currently, the WDEQ-AQD does not regulate greenhouse gas emissions other than for permitted major stationary sources.

Pollutant concentration can be defined as the mass of pollutants present in a volume of air and is reported in units of micrograms per cubic meter (µg/m3), parts per million (ppm), or parts per billion (ppb). The state of Wyoming has used monitoring and modeling to determine compliance with WAAQS and NAAQS. In addition, other monitoring systems are operational in the Pinedale area, including the EPA's Clean Air Status and Trends Network (CASTNET) and Wyoming Air Resources Monitoring System (WARMS). Monitoring data from these systems have been determined to be representative of the area. There are six WDEQ sites, two NADP sites, two IMPROVE sites and one WARMS/CASTNET site within the project area. Appendix C provides more information on air quality.

On April 30, 2012, the EPA formally designated the UGRB as a 'Marginal' ozone nonattainment area, effective July 20, 2012.

EPA's designation of the UGRB as marginal nonattainment has significant implications for both currently proposed oil and gas development projects in the area as well as future BLM management actions. As a result of the nonattainment designation, the BLM must comply with General Conformity regulations in 40 CFR 93 subpart B and Chapter 8, Section 3 of the Wyoming Air Quality Standards and Regulations (WAQSR) for any federal action within the designated nonattainment area.

As of July 20, 2013, the BLM is required to conduct a General Conformity analysis and cannot approve any action that would cause or contribute to a new violation of the NAAQS or increase the frequency or severity of any existing violation. A formal General Conformity determination must be conducted for any action where the total of direct and indirect emissions for the WGFD proposed action exceeds the de minimis levels specified in 40 CFR 93.153(b) and WAQSR Chapter 8, Section 3. For projects located in a marginal ozone nonattainment area, this de minimis level is 100 tons per year (tpy) of VOC or NOx. The WGFD proposed action cannot be implemented until a determination of conformity is achieved. For projects that are below the de minimis threshold level of 100 tpy for NOx or VOC, the BLM must

complete a conformity analysis and demonstrate that the proposed project will not exceed the de minimis threshold level and is therefore exempt from requiring a conformity determination.

The WDEQ currently requests that operators submit annual winter-specific emission inventories to help refine the state's NOx and VOC emissions inventories. Beginning on July 20, 2013, the BLM requires proponents to submit an emissions inventory for any WGFD proposed action in order to address conformity requirements.

A wide variety of pollutants can impact visibility, including PM, NO2, NO3, and SO4. Fine particles suspended in the atmosphere decrease visibility by blocking, reflecting, or absorbing light. Regional haze occurs when pollutants from widespread emission sources become mixed in the atmosphere and travel long distances (Appendix C).

3.8 Special Designation and Management Areas

Several areas within the greater project area have received special designations due to the presence of unique features or resources. These designations include Wilderness Study Areas, Areas of Environmental Concern, and Management Areas. Areas in which habitat treatments are proposed are discussed further below, and are shown in Map 3131.

3.8.1 Wilderness Study Areas

The Wilderness Act was passed by Congress in 1964, establishing a national system of lands for the purpose of preserving a representative sample of ecosystems in a natural condition for the benefit of future generations. The BLM manages potential wilderness areas as Wilderness Study Areas (WSAs) until Congress designates (or does not designate) the area as wilderness. WSAs are managed to preserve the wilderness characteristics that make the areas appropriate for designation.

The Lake Mountain WSA occurs within the greater project area, generally between Long Hollow and Graphite Hollow, including the southwestern portion of the Deadline Ridge Focus Area. This WSA contains important elk winter range as well as CRCT habitat (BLM 2008b). Because this WSA was determined to be difficult to manage as wilderness it was not recommended for designation as wilderness in the *Final Rock Springs Wilderness EIS* (BLM 1990). Prescribed burns and a small Spike®20P treatment are proposed within the WSA.

No congressionally designated wilderness currently exists within the greater project area.

Projects proposed in WSAs must be reviewed to determine if the proposal would impair the suitability of the WSA for preservation as a wilderness, referred to as the "non-impairment standard". There are seven classes of exceptions to the non-impairment standard: emergencies, public safety, restoration of impacts from violations and emergencies, valid existing rights, grandfathered uses, protect or enhance wilderness characteristics or values, and other legal requirements (BLM 2012). Actions that benefit a WSA by protecting or enhancing wilderness characteristics are allowable even if they cause impairment, but actions must be completed in the manner that causes the least site disturbance (BLM 2012).

3.8.2 Areas of Critical Environmental Concern

Areas of Critical Environmental Concern (ACEC) contain resources which require special management and protection for maintaining the value of the resource and the area. Such resources may include important wildlife habitat, cultural sites, or rare geologic features. ACEC designation serves as a reminder that significant values exist which must be accommodated for when management actions and land use proposals are considered within the ACEC. Two ACECs, Rock Creek and Beaver Creek, occurred within the greater project area; both were designated during the 1988 RMP planning process and were retained in the 2008 Pinedale RMP.

The Rock Creek ACEC is comprised of approximately 5,270 acres encompassing the Rock Creek drainage, and is contained within the Lake Mountain WSA. The management objective of this ACEC is to ensure quality aquatic habitat for CRCT and to provide crucial winter range for a portion of the Piney elk herd (BLM 2008b). One proposed treatment area within the Deadline Ridge Focus Area intersects the western edge of the Rock Creek ACEC.

The Beaver Creek ACEC encompasses approximately 3,590 acres within the upper Beaver Creek drainage. The management objective of this ACEC is to ensure quality aquatic habitat for the CRCT and to protect elk calving habitat (BLM 2008b). Several proposed treatment areas within the Deadline Ridge Focus Area intersect this ACEC.

3.8.3 Management Areas

Proposed treatment areas occur within one designated BLM Management Area (MA), the Miller Mountain MA. This MA was established in the 2008 Pinedale RMP and encompasses approximately 66,440 acres surrounding Miller Mountain, adjacent to the Lake Mountain WSA. The management goal for this area is to “protect the open space, natural landscape values, and crucial big game winter ranges in the Miller Mountain area” (BLM 2008a). The following excerpt from the FEIS describes unique features of this area:

> This ecosystem is a remote, largely roadless landscape consisting of steep foothills with a combination of sagebrush, aspen, and conifer vegetation types. This area is an extension of the Lake Mountain WSA viewshed and contains VRM Class II values. It is identified as elk parturition and crucial winter range, contains lynx analysis units, and is widely used for big game hunting. It also contains potential CRCT habitat in Miller and Coal Creeks. Numerous small perennial streams and sensitive riparian habitats occur throughout the area. The area offers recreational opportunities for semiprimitive motorized activities. Miller Mountain is rich in cultural history and includes an ancient pictograph site, historic Ft. Hill, and more recent stone sheepherder cairns that signified range boundaries. (BLM 2008b)

3.9 Lands with Wilderness Characteristics

The Pinedale FO is in the process of completing the inventory of Lands with Wilderness Characteristics in the grater project area. Lands with wilderness characteristics provide a range of uses and benefits in addition to their value as settings for solitude or primitive and unconfined recreation. Section 201 of FLPMA requires the BLM to maintain an inventory of all public lands and their resources and other values, including wilderness characteristics. It also provides that the preparation and maintenance of the inventory shall not, of itself, change or prevent change of the management or use of public lands.

At this time, the only Lands with Wilderness Characteristics impacted by any proposed treatment are located in Miller Mountain (WGFD proposed action and modified treatment) and the LaBarge Bowls (WGFD proposed action) (Map 31).

No Lands with Wilderness Characteristics exist that intersect any alternative in the Rock Springs FO. The project area intersects Lands with Wilderness Characteristics Inventory area WY040-2011-135. Area WY040-2011-135 fails to meet the 5000 roadless acres. The inventory area is crossed by numerous gas field development routes, improved two track routes and seismic study routes.

3.10 Visual Resources

The greater project area has been inventoried according to procedures outlined within BLM *Visual Resource Inventory Handbook H-8410-1*, and has been divided into four Visual Resource Inventory classifications based on scenic quality, visual sensitivity levels, and viewer distance zones. VRI classifications in addition to BLM's allocated resources were considered in the establishment of Visual Resource Management (VRM) classes. Each VRM classification has a management objective, as described below:

> **Class I.** The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activities. The level of change to the characteristic landscape should be very low and should not attract attention.
>
> **Class II.** The objective of this class is to retain the existing character of the landscape. The level of change to the landscape should be low. Management activities may be seen but should not attract the attention of the casual observer. Any changes to the landscape must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
>
> **Class III.** The objective of this class is to partially retain the existing character of the landscape. The level of change to the landscape should be moderate. Management activities may attract the attention of the casual observer but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
>
> **Class IV.** The objective of this class is to provide for management activities that require major modifications to the existing character of the landscape. The level of change to the landscape can be high. The management activities may dominate the view and may be the major focus of viewer attention. However, every attempt should be made to minimize the effect of these activities through careful location, disturbance minimization, and repetition of the basic visual elements of form, line, color, and texture (BLM 1986).

All four VRM classes are represented within the greater project area, and intersect proposed treatment areas (Map 3232). ithin proposed treatment areas.

Table 111 provides a summary of acreages for each VRM class on BLM land within proposed treatment areas.

Table 11. Visual Resource Management classifications and acreage within proposed treatment areas.

VRM Classification	WGFD Proposed	Modified Treatment Acres

	Action Acres	
I	1,143	189
II	5,037	5,453
III	10,124	8,901
IV	17,919	12,788

3.11 Energy Development

Oil and gas development occurs throughout the greater project area in varying densities according to designated oil and gas management areas (Map 333). The most densely developed area occurs within the LaBarge Infill, one of the oldest energy fields in the nation. Most of the area within the LaBarge Infill is designated in the Pinedale RMP as *intensively developed fields*. Additional wells are scattered throughout areas classified as *traditional oil and gas leasing areas* at a lower density.

Within proposed treatment areas there are currently 61 oil and gas wells that have been drilled or for which companies have applied for drilling permits. In addition, numerous support facilities and infrastructure such as tank batteries, power lines, compressor stations, pipelines, water disposal wells, and roads occur in or near the greater project area.

3.12 Wildland Fire

Wildland fires may start from natural or human-related causes. Natural fires are generally lightning-caused. Human-caused fires may be accidental (i.e., fireworks, escaped campfires, cigarettes, hot mufflers) or intentional (i.e., prescribed burns). Wildland fire frequency in the area is low; only 5 of 30 known fires burned more than 100 acres. Prescribed fire has been used to treat approximately 8,700 acres in the Pinedale area (BLM 2008b).

Fuels in the greater project area vary from low-elevation sagebrush communities to high-elevation mixed aspen/conifer stands. Fire behavior varies greatly between vegetation types.

In the greater project area, the Fontenelle Fire burned approximately 64,220 acres within the Bridger-Teton National Forest and the BLM High Desert District, in addition to some small parcels of state and private land, between June 24 and October 25, 2012 (Inciweb 2012). The fire occurred roughly 18 miles west of Big Piney. No treatments are proposed for areas that were burned in the Fontenelle wildfire.

3.13 Paleontology

All paleontological resource considerations will adhere to the conditions and requirements as detailed in the Paleontological Resources Preservation Act of 2009 (the Omnibus Public Land Management Act of 2009, title VI-Department of Interior Authorizations, Subtitle D (S. 320)) and the Antiquities Act of 1906.

Rock units representing more than 500 million years of geologic time are present in the planning area. Many of these units contain paleontological resources. The potential for a given geologic formation to contain paleontological resources varies by formation and age. As the potential for paleontological resources increases, the need for mitigating surface disturbing activities also increases. See Appendix D for more detailed information.

Compression and trampling caused by OHV use, cattle and wildlife can adversely affect fossils. This can lead to dislodging, breakage and loss of provenience (Ross 1976) of individual fossils and destruction of known and undiscovered localities. Badlands (areas containing high amounts of shale and clay) are the most susceptible to damage and erosion problems affecting fossils. Areas of sandstone and limestone outcrops are sometimes used by animals as rubbing areas which can also dislodge and break fossils embedded in the matrix. Such areas should be inventoried before any development, including fence placement, trail/road construction, range improvement or reclamation projects.

BLM has classified geologic formations in the planning area according to the probable fossil yield classification (PFYC). This is a planning tool that classifies formations according to the probability of yielding paleontological resources that are of concern to land managers. Existing regulations and policies address the collection and preservation of fossils found on public lands. Common varieties of invertebrate and plant fossils are available for hobby collecting. No commercial collection of any fossils is permitted. Paleontological resource use permits are required for the collection of significant fossils. All vertebrate fossils and, in rare cases, invertebrate or plant fossils are deemed significant under current policy. Significant invertebrate or plant localities are treated on a case-by-case basis, but vertebrate fossils are more widespread and predictable. A classification based largely on how likely it is that a geologic unit will produce vertebrate fossils is provided in Appendix D.

3.14 Cultural Resources

The proposed Wyoming Range Mule Deer Habitat Plan: Big Piney – LaBarge Area project is located within the boundaries of the BLM Pinedale Field Office (PFO) and Rock Springs Field Office (RSFO). The bulk of the project is planned for the PFO, with individual project treatment areas within the Deer Hills, LaBarge Uplift, River, Wyoming Range Front, and South LaBarge/Miller Mountain Cultural Resource Subregions (CRS). These subregions were originally defined in the Cultural Resource Overview of the Pinedale Field Office, Bureau of Land Management. Volume 2: Central Subregions (McNees 2006a) and Cultural Resource Overview of the Pinedale Field Office, Bureau of Land Management. Volume 3: Exterior Subregions (McNees 2006b); additional information can be found in the Proposed Resource Management Plan and Final Environmental Impact Statement for the Pinedale Field Office (BLM 2008a). Brief descriptions of the subregions associated with this project can be found below.

The total potential affected environment for the purposes of cultural resources analysis totals 451,173 acres. As a result of the Class III cultural inventories performed in this extended project area, at least 1,302 archeological sites have been identified and recorded. Of these, 1,080 are prehistoric sites, 152 are historic sites, and 66 are multicomponent sites. The natures of four of these sites are currently undetermined. The eligibilities for the National Register of Historic Places (NRHP) of these 1,302 sites break down as follows: 238 are eligible (with three listed on the NRHP), 541 are ineligible, and 523 are currently unevaluated.

Although this area has not seen as much cultural inventory as some other portions of the PFO, a sufficient amount of acreage in the extended project area has been inventoried, primarily in support of infrastructure for oil and gas operations, to draw some general assumptions about the density and types of cultural resources contained therein. With the exception of the River CRS, site density in the project

area is low. The historic sites are largely comprised of properties associated with ranches and ranching operations. Other types of historic sites include trails, roads, bridges, trash dumps, infrastructure associated with early energy exploration and extraction, irrigation canals, inscription sites, schools, homesteads, cairns, mines, and structures associated with early communications systems. At least one historic grave and one historic church have also been recorded within the area. Most of the prehistoric sites have been identified as open camps comprised of scatters of lithic debitage, worked tools, and/or fire cracked rock. Many of these open camps also contain rock cairns, stone circles, and/or subsurface features such as hearths. Other types of prehistoric sites known to exist in the area include isolated rock cairns and alignments, rock art, quarries, and at least one grave. A third grave is known to exist within the project area but it is unknown if it is historic or prehistoric. Given the amount of inventory that has been conducted within the project area and the number of sites recorded, it is unlikely that a new type of site will be identified as a result of this project.

The Deer Hills Subregion is part of the LaBarge Uplift comprising 68,292 acres. It is bounded by North Piney Creek to the north, Middle and South Piney Creeks to the south, U.S. Highway 189 to the east, and the Wyoming Range foothills to the west, and includes portions of the towns of Big Piney and Marbleton (McNees 2006b:135). The setting includes a large central upland primarily comprised of a large block of BLM-administered land, reaching elevations above 8,000 feet (McNees 2006b:137). Typical prehistoric sites in the area are most often characterized as surface scatters comprised of thermally altered rock and flaked stone artifacts and debitage. Many of these surface scatters have subsurface aspects, including buried hearth features that may be datable. Historic sites in the subregion typically include buildings, structures, features, and trails associated with ranching operations. A portion of the historic Lander Road emigrant trail also crosses through the area. One site within the Deer Hills CRS, the Circle Ranch (also known as the R.L. Miller Ranch), is currently listed on the National Register of Historic Places (NRHP).

The Wyoming Range Front Subregion consists of approximately 73,176 acres of land encompassing the eastern slopes and foothills of the Wyoming Range. It is largely characterized by interfluvial ridges and cut through by numerous east-flowing perennial streams. It is bounded to the west by the Bridger-Teton National Forest. The north and south extents of the subregion are roughly bounded by Cottonwood Creek and Beaver Creek, respectively (McNees 2006b:261). Although a few cultural inventories have been conducted, particularly in the vicinity of Riley Ridge, large portions of this subregion have had very limited cultural investigation, e.g., the central portion of the subregion. Several sites are known to have stone circles and other similar constructed features, such as cairns and rock alignments; such features are not as well represented here as elsewhere in the Pinedale Field Office (McNees 2006b:261). Some historic structures associated with ranching and tie-hacking are known to exist in this subregion, and a portion of the historic Lander Trail passes through the area.

The LaBarge Uplift Subregion is defined as the area bounded by Middle and South Piney Creeks to the North, LaBarge Creek to the South, U.S. Highway 189 to the east, the Bridger-Teton National Forest to the west, and the Wyoming Range Front subregion to the northwest. The town of LaBarge is found near the southeastern corner of the subregion (McNees 2006b:11). Cultural resources within this PFO subregion include impressive prehistoric stone and cairn alignments, petroglyphs, rock shelters,

quarries, housepits, and butchering sites. Historic sites in the subregion include those associated with early oil and gas development, ranching, transportation, and communication (McNees 2006b:11, 13). The physical setting of the LaBarge Uplift subregion includes such topographic features as Deadline Ridge to the west and the Hogsback and Cretaceous Mountains across the central section. The topography of the eastern portion of this subregion is marked by more open areas than is seen in the central and western portions and contains landforms such as Big Mesa (McNees 2006b:13, 15, 19).

The South LaBarge/Miller Mountain Subregion is bounded by LaBarge Creek to the north, Fontenelle Creek to the south and southwest, the Bridger-Teton National Forest to the West, and U.S. Highway 189 to the east (McNees 2006b:91). Major-project cultural inventory has been limited in this subregion compared to adjoining subregions, and the number of sites identified has been correspondingly low. However, important historic Native American petroglyph sites have been identified on the bluffs that run along the Green River (McNees 2006b:91), on lands administered by the Rock Springs Field Office. The western half of the subregion is comprised of portions of the Overthrust Belt, a heavily wooded area featuring steep and dramatic north/south ridges. The eastern portion of the subregion is dominated by Lower Green River Basin ecoregion. A small portion of the Oregon Trail, the Sublette Cutoff, runs through this CRS, and the Names Hill/Holden Hill inscription complex associated with this historic emigrant trail is found therein. Both the Sublette Cutoff and the Names Hill/Holden Hill inscription complex have been determined to be eligible for the NRHP.

The River Subregion is a narrow CRS encompassing 160,612 acres. It is primarily defined by the bottomlands of the Green and New Fork River valleys to the south of Trappers Point. These bottomlands were the focus of extensive historic and prehistoric activities including historic extant portions of the NRHP-eligible Opal Wagon Road. Most of the bottomlands in this CRS are privately owned, with only some small BLM parcels south of Big Piney that can potentially be affected by this project (McNees 2006a:324). Nevertheless, due to the relative proximity of these parcels to the riparian core of this Subregion, overall site density can be expected to generally be greater here than in the other affected subregions.

A single treatment project area has been planned for the RSFO: the Little Colorado Sagebrush Project. This project area lies within the Little Colorado Desert, an upland bluff ridge system east of LaBarge overlooking the Green River Drainage system and vegetated by a short, stagnant sagebrush steppe. It is an area of low site density with limited potential to contain intact, buried cultural resources. The potential affected environment for this project is approximately 50,605 acres. There have been 310 projects inventoried within this area, covering at least 6,180 block and linear acres. As a result of these inventories, 126 cultural resources (106 prehistoric, 12 historic, and eight multicomponent sites) have been identified within the section. Twenty of the prehistoric sites, three of the historic sites, and two of the multi-component sites have been recommended as eligible for nomination to the National Register of Historic Places (NRHP). Seventy-five of the prehistoric sites, seven of the historic sites, and five of the multicomponent sites have been recommended as being not eligible for nomination to the NRHP. The remaining 11 prehistoric sites, two historic sites, and one multicomponent site have not been evaluated for National Register status. Two of the eligible historic cultural resources are comprised of the

Sweetwater and Lincoln County portions of the Sublette Trail, which has been listed on the National Register of Historic Places and is included within the National Historic Trail System.

3.15 Climate Change

Research has identified the potential impacts of greenhouse gas emissions on the global climate. It is assumed greenhouse gas emissions cause a net warming effect of the atmosphere, which increases surface temperatures on Earth. Industrialization and the burning of fossil fuels have caused carbon dioxide (CO_2) concentrations to increase dramatically and are likely to contribute to overall climate changes (BLM 2008b). Several of the proposed treatment actions may generate greenhouse gas emissions, including prescribed fire and activities that require a combustion engine.

Climate change refers to any significant change in the measure of climate, such as precipitation and temperature, lasting for an extended period of time (decades or longer). Temperatures in western Wyoming are expected to increase by 0.25ºF to 0.4ºF per decade and precipitation is expected to decrease by 0.1 to 0.6 inches per decade.

Several activities that occur in PFO area contribute to climate change, including: large wildfires, activities using combustion engines, changes to the natural carbon cycle, changes to radioactive forces and reflectivity, and emissions of greenhouse gases (GHGs). GHGs, including CO_2, as well as, methane (CH_4), nitrous oxide (N_2O), and fluorinated gases, are created and emitted through human activities, including oil and gas development, and agricultural activities. Without additional meteorological monitoring systems, it is difficult to determine spatial and temporal variability and change of climatic conditions, but increasing concentrations of GHGs are likely to accelerate the rate of climate change.

3.16 Recreation

The PFO "Extensive Recreation Management Area" (ERMA) incorporates the area encompassed by the WRMD project. There are no BLM developed recreation sites within the project area, although many recreational opportunities exist in the greater project area including hunting and wildlife viewing, camping, shed antler collecting, camping, photography, hiking, and off-highway vehicle (OHV) use. The recreation objective in the ERMA is to provide an array of resource-dependent dispersed recreation opportunities, such as hunting, fishing, motorized use, and open space. Management will be extensive rather than intensive. Management actions will be custodial in nature and will focus on the development of new recreation facilities only when necessary to protect human health, safety, and natural resource values; the maintenance and enhancement of important public access; and the resolution of resource and social conflicts

3.17 Socioeconomics

The Shoshone, Gros Ventre, Bannock, Sheepeater, and Crow Native American tribes were the first residents of what is now Sublette County. Trappers, mountain men, and white explorers began working their way into the area in the early 1800's and were followed by ranchers (BLM 2008a).

The greater project area has remained very rural, averaging 1.6 persons per square mile. However, the town of Pinedale has increased in population over 31 percent from 1990 to July 2006. Pinedale is the

largest community in the county with an estimated 1,846 residents in 2006. Ranching has remained an important industry for the county, although tourism (including recreation) and oil and gas development have both increased greatly over the past several years (BLM 2008a).

3.18 Hazardous Materials

Hazardous materials could be used during chemical and mechanical treatments. The term hazardous materials as used here means: 1) any substance, pollutant, or contaminant (regardless of quantity) listed as hazardous under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended, 42 U.S.C. 9601 et seq., and the regulations issued under CERCLA, 2) any hazardous waste as defined in the Resource Conservation and Recovery Act (RCRA) of 1976, as amended, and 3) any nuclear or nuclear byproduct as defined by the Atomic Energy Act of 1954, as amended, 42 U.S.C. 2011 et seq.

4. ENVIRONMENTAL EFFECTS

This chapter is organized by resource and outlines the scientific and analytic basis for comparison of the alternatives. This chapter provides the probable consequences of each alternative on the selected environmental resources. The discussion for each resource will include the direct, indirect, cumulative, short-term, long-term, beneficial and adverse consequences from each action.

4.1 Direct and Indirect Effects

4.1.1 Wildlife

Impacts Common to All Alternatives

Short term negative impacts are anticipated to wildlife such as big game, raptors, Greater Sage-grouse, and some BLM sensitive species. These include disruption from noise (chainsaws, tractors, and humans), dust and smoke. Mowing, cut/pile treatments, Plateau, Spike® 20P and prescribed fire application would minimally disturb soils while aeration and pitting would create more soil disturbance. The benefits of treatments include increased forage availability, increased plant diversity, and openings in the sagebrush canopy leading to various age-classes in the community.

Raptors, big game, and Greater Sage-grouse would be minimally impacted during critical life stages due to timing restrictions being observed. Timing restrictions for all wildlife would be applied in accordance to the BLM 2008 Resource Management Plan. Exceptions could be granted on a case by case basis.

Water-oriented wildlife species are not anticipated to be impacted by the treatments. None of the treatment polygons lie within designated critical lynx habitat.

Impacts from the WGFD Proposed Action

Implementation of the WGFD proposed action would result in treatments on approximately 34,709 acres of crucial mule deer winter range. These treatments would increase age class diversity of the shrub community and directly benefit mule deer, moose, elk, pronghorn and other wildlife that use sagebrush and aspen ecosystems, including Greater Sage-grouse.

The Northeast Deer Hills project area includes some Greater Sage-grouse core areas. The projects in the Northeast Deer Hills are largely located within a winter concentration area; a small portion of the Southeast Deer Hills projects are located within a winter concentration area. The Little Colorado project also includes two winter concentration areas. 100% of the acreage in each treatment polygon in these winter concentration areas are proposed for treatment. Additionally, some treatments are located within ¼ mile of Greater Sage-grouse lek perimeters. A plant community disturbance such as mowing or aeration may have a short-term negative impact on Greater Sage-grouse due to the noise and physical presence of implements, but the long-term result will benefit Greater Sage-grouse due to increased plant diversity and variable age classes in sagebrush communities.

Approximately 1100 acres of treatments are located within suitable lynx habitat. Burning these stands could change distribution of snowshoe hares in the short term until stand regeneration occurs. This

could affect prey availability for lynx in the immediate area of treatments. Long-term benefits to lynx could include improvements to snowshoe hare habitat as multi-storied stands regenerate.

Impacts from the Modified Treatment Alternative

Wildlife would be less impacted from implementation of this alternative since the treated acreage is approximately 14,928 acres, or approximately 36 percent of the acreage disturbed by treatments in the WGFD proposed action.

Further, all treatments are outside of Greater Sage-grouse core areas and outside the ¼ mile buffer of all lek perimeters. The projects in the Northeast Deer Hills are largely located within a winter concentration area but only 30 percent of the project area would be treated; a small portion of the Southeast Deer Hills projects are located within a winter concentration area but only 30 percent of the project area would be disturbed by treatment. Two winter concentration areas are included in the Little Colorado project area, but only 30 percent of the area would be treated. A plant community disturbance such as mowing or aeration may have a short-term negative impact on Greater Sage-grouse due to the noise and physical presence of implements. The creation of extensive edge habitat would benefit Greater Sage-grouse and diversify the plant community.

Based on field data, no suitable lynx habitat exists within the treatment polygons.

The Miller Mountain fence would have negligible impacts on wildlife movements since it is a dropdown fence, or the top rail would be removed where it is buck and rail fence. Improvement of the vegetation community through improved livestock management practices would benefit wildlife.

No Action Alternative

The No Action Alternative could negatively impact wildlife due to an eventual decline in resource conditions. Failure to implement this action could directly and indirectly result in an eventual decrease in wildlife populations that inhabit mixed sagebrush communities. The vegetation community would continue to decline from an overabundance of decadent sagebrush and lack of grass and forb cover, resulting in a decline in wildlife habitat condition.

4.1.2 Vegetation Resources

Impacts Common to All Alternatives

All proposed treatments would create an opportunity for new shrubs, grasses and forbs to expand into this plant community by opening the canopy and would benefit rangeland resources. Mowing, aeration and Spike®20P application all select against large stature shrubs and would allow new shrubs, grasses and forbs to access nutrients that were previously committed to mature plants. Mature and decadent Wyoming big sagebrush plants that were mowed or treated with an aerator would likely create a terminal stump; since this species does not reproduce from root material, it would not regenerate. Mountain shrubs that have the ability to regenerate from root material would expand from any of the proposed treatments. The resulting shift in plant composition would result in increased mule deer forage quantity and quality, increased plant diversity, and increased diversity in shrub age classes.

Numerous impacts would occur to upland vegetation as a result of implementing prescribed fires. The primary impact is the removal of vegetation due to the fire (woody species and herbaceous cover) and recovery of certain vegetative species after fire. The WGFD proposed actions would remove portions of mature and decadent sagebrush and replace them with grasses, forbs, and new, young shrub seedlings. Burning existing shrubs would allow the establishment of new shrub seedlings, changing and varying their overall age structure in the project area. Removal of portions of dense shrub stands would also allow increased herbaceous vegetation establishment, which increases ground cover and improves watershed health. By creating a mosaic of burned and unburned areas, forage production, vegetative diversity, "edge effect," and wildlife/livestock distribution would be improved.

The direct result of the burn would be the removal of varying portions of dense stands of sagebrush, conifers, decadent aspen, and mountain shrubs from the treated areas. Most, if not all, of the above-ground plant biomass would be removed from burned areas, potentially increasing surface erosion in the short term. Herbaceous vegetation would be completely removed and grasses at the edges of burned areas would be heated and killed if not removed. Shrubs within the burn zones would be partially to completely denuded. In many cases portions of trunks and limbs would remain as blackened skeletons within the burned area. The edges of the burned areas may contain partially burned shrubs and mortality would be anticipated to be high through the next growing season.

Secondary effects of the WGFD proposed action center on new plant growth following the treatment. Burning completely kills sagebrush and it is unlikely to immediately recolonize the area because of its non-sprouting growth form. Mountain big sagebrush recolonizes burned sites primarily by off-site seed or seed from plants which survive in unburned patches. Herbaceous vegetation would replace the sagebrush in areas where burned and it is expected to take anywhere from 30 to 50 years in Wyoming big sagebrush communities for the sagebrush to re-establish to pre-burn levels of density, cover, and age class. Mountain shrubs, including snowberry, serviceberry, and mountain mahogany reproduce to varying extents by sprouting around and from the stubs of the burned plants and should increase in cover and density relatively quickly after the burn. Aspen would expand rapidly in the burned areas due to its ability to send up hundreds to thousands of suckers (shoots) after a fire. Implementation of either alternative would decrease conifer encroachment into aspen areas, thus benefitting aspen communities.

Control of cheatgrass with Plateau® would benefit the rangeland resource.

The snow/drift fence would increase moisture capture and increase water infiltration behind the snow fence. This may result in increased production and improved species composition in this microclimate.

Overall, increased water infiltration, increased plant root mass, and decreased erosion are anticipated once treatments are complete.

Impacts from the WGFD Proposed Action

The Deer Hills fence and grazing management plan would provide a direct benefit to the riparian zone from managing livestock access and use of Piney Creek. Benefits include decreased sedimentation in the creek due to increased bank vegetation, increased water infiltration, and an increase in bank stability.

The Three Buttes fertilizer treatment would increase production of all plants in the treated area, likely decreasing surface erosion and increasing soil surface stability.

Prescribed fire would open the canopy and reduce the risk of wildfire on a larger acreage in this alternative than in the modified or no action alternative.

Impacts from the Modified Treatment Alternative

The treatment pattern for all areas is a mosaic, so each area would ultimately have a diverse shrub community with varied age classes and cover. Many more areas are proposed for seeding in this alternative, meaning the herbaceous community would benefit from increased diversity and potentially from increased cover. The use of a mosaic pattern would be the closest reproduction to pre-European habitats when vegetation mosaics offered a wide variety of plant species and age classes.

The use of Plateau® to top kill sprouting shrubs would benefit the rangeland resource by encouraging regeneration of shrubs such as true mountain mahogany.

The Miller Mountain fence would aid in vegetation recovery by helping facilitate livestock rest.

No Action Alternative

Forage quality and quantity would stay in its current compromised condition, and no benefit would be received from opening the shrub canopy, creating varied age classes in the shrub community, or increase plant species diversity. The failure to create age class diversity would contribute to a decline in range condition. The establishment of new grasses, forbs and shrubs (important to wildlife, livestock, and ecosystem processes) would be limited by the decadent shrub community. Aspen communities would continue to be invaded by conifers. The risk of high-intensity, large scale wildfires would continue and increase over time.

4.1.3 Livestock Grazing

Impacts Common to All Alternatives

Both proposals would benefit livestock in the project area by improving range condition from increased forage quality and quantity, increased plant species diversity, and a reduced risk of wildfire. With the proposed treatments the health, vigor, recruitment, and production of perennial grasses, forbs and shrubs should improve. This improvement would result in an improved forage base for livestock. Projects are proposed over a 10-year timeframe although implementation schedules vary between the alternatives. Mule deer project implementation will not change livestock grazing permit terms and conditions.

Impacts from the WGFD Proposed Action

This alternative treats approximately 34,709 acres currently grazed by livestock, although district-wide only 8 percent of the area currently grazed would be impacted over the 10-year implementation period. For the Deer Hills Willow Fence, removal of the livestock water source could influence livestock distribution.

Impacts from the Modified Treatment Alternative

Short-term impacts include potential challenges due to resting treated areas and the potential temporary loss of forage.

This alternative has a proposed rest schedule that has been reviewed with permittees and is illustrated in Map 25-27. Given the proposed schedule, the impact of implementing the modified treatment alternative on livestock grazing would be less than for the WGFD proposed action. This alternative treats approximately 14,928 acres currently grazed by livestock, or approximately 1/3 of the area included in the WGFD proposed action, and permittees are aware of the proposed treatment schedule years in advance. This schedule allows permittees to make any necessary adjustments to their operation (if needed) in advance of the proposed treatment, resulting in minimal impacts to permittees and their livestock. Benefits to livestock include increased forage availability and quality.

The Miller Mountain fence would aid herders in keeping livestock in the appropriate areas during post-treatment rest.

No Action Alternative

There would be no short-term impacts to the current livestock grazing on the allotments. In the long term the health and vigor of the plant community; recruitment of shrubs, perennial grasses, and forbs; and increase of conifer species in aspen stands would cause a decline of range condition and a subsequent decrease in forage availability. Livestock use could decrease over time to accommodate the decline in forage production and condition.

4.1.4 Wild Horses

Impacts Common to All Alternatives

The immediate, direct impacts to wild horses in the Little Colorado Focus Area may be negative if horses are in the project area when any treatment occurs. This impact would be short-lived and limited to the duration of the treatment. Ultimately, wild horses would benefit from aeration and seeding on the site beginning approximately two years post-treatment as the seeding matures and adds diversity to the plant community and more available forage.

Impacts from the WGFD Proposed Action

Treatment of 9,999 acres may temporarily displace horses to another area within the HMA during the treatment itself. The benefit of increased forage and plant diversity would be greater for the WGFD proposed action than the modified treatment alternative due to the larger treated acreage.

Impacts from the Modified Treatment Alternative

Implementation of the modified treatment may have a slightly reduced benefit to wild horses because the acreage proposed for the mosaic treatments in the modified proposal is substantially less. However, the varied treatments (mowing, aeration and seeding, and Spike® 20P) may provide better plant response and yield more benefits than the implementation of one treatment method alone and offset the reduced acreage.

No Action Alternative
Wild horses would not receive benefits from opening the shrub canopy, creating a varied age classes in the shrub community, or increasing plant species diversity.

4.1.5 Water Quality

Impacts Common to All Alternatives
Groundwater quality would not be impacted by implementation of any alternative. The proposed rates for Plateau® and Spike®20P are both on the low end of approved application rates, minimizing potential for leaching and surface runoff. Surface waters downhill from areas of proposed burns may have a short-term increase in runoff due to the removal of all surface vegetation the year after the prescribed burn. However, since untreated vegetation buffers exist between all live water and any proposed treatment, any potential impacts to surface water would be negligible.

Impacts from the WGFD Proposed Action
No additional impacts are anticipated.

Impacts from the Modified Treatment Alternative
No additional impacts are anticipated.

No Action Alternative
No chemical applications would occur, eliminating any risk of groundwater contamination. No scheduled surface-baring activities (such as prescribed fire) would occur, so surface erosion levels are expected to stay the same as current levels in the short term. In the long term, however, decreased range condition (decreased herbaceous cover, increased sagebrush canopy) may result in increased surface water runoff, particularly during storm and snowmelt events.

4.1.6 Air Quality

Impacts Common to All Alternatives
Short-term, minor impacts through the release of dust particles may exist during the time of all mechanical treatments. Even prescribed fire would have a short-term, minor impact to air quality. No long-term impacts are anticipated to air quality.

The WGFD proposed actions lie within the Upper Green River Basin (UGRB) Ozone Non-attainment area. It is the BLM's goal under these circumstances, to seek every reasonable opportunity to reduce emissions. The BLM is working cooperatively with the WDEQ to determine the best process for addressing conformity for BLM management actions in the nonattainment area. Best available control technologies (BACT) are required in the UGRB. In addition, the proponent will comply with all applicable local, state, tribal and federal air quality laws, statutes, regulations, standards, and implementation plans, including Wyoming Ambient Air Quality Standards (WAAQS) and National Ambient Air Quality Standards (NAAQS).

Impacts from the WGFD Proposed Action
No additional impacts are anticipated.

Impacts from the Modified Treatment Alternative
No additional impacts are anticipated.

No Action Alternative
No impacts are anticipated to air quality if this alternative is selected.

4.1.7 Special Designation Management Areas

Impacts Common to All Alternatives
The proposed treatments are intended to improve habitat by increasing native species diversity, creating diverse age classes in shrub communities, and decreasing conifer invasion of aspen stands. The results from implementing either alternative would be consistent with the requirements of managing Wilderness Study Areas, ACECs, and BLM Management Areas. All actions meet the definition for an exception to non-impairment to "Protect or enhance wilderness characteristics or values" (BLM 2012). Actions that benefit a WSA by protecting or enhancing wilderness characteristics are allowed even if they are "impairing" by definition, although they must be completed in the least site-disturbing way. Impacts from both proposals will mitigate any surface disturbance by the enhancement of the wilderness values of the area. Both actions will improve the ecosystem function of the area, thus mitigating any potential impacts from site disturbance.

Impacts from the WGFD Proposed Action
No additional impacts are anticipated. Approximately 1,100 acres are proposed for a prescribed burn.

Impacts from the Modified Treatment Alternative
No additional impacts are anticipated, although because fewer acres are disturbed this alternative better meets the non-impairment standard. Approximately 25 acres are proposed for a Spike®20P treatment and approximately 100 acres are proposed for a prescribed burn.

No Action Alternative
The ecological value of these special designation areas would decline over time if no action is taken. No benefit would be received from opening the shrub canopy, creating varied age classes in the shrub and aspen communities, or increase plant species diversity. The failure to create age class diversity would contribute to a decline in range condition as already decadent shrub communities die out and little regeneration is allowed to take place. The establishment of new grasses, forbs and shrubs (important to wildlife, livestock, and ecosystem processes) would be limited by the decadent shrub community. Aspen communities would continue to be invaded by conifers. The risk of high-intensity, large scale wildfires would continue and increase over time.

4.1.8 Lands with Wilderness Characteristics

Impacts Common to All Alternatives
The proposed treatments are intended to improve habitat by increasing native species diversity, creating diverse age classes in shrub communities, and decreasing conifer invasion of aspen stands. The results from implementing either alternative would be consistent with the requirements of managing Lands with Wilderness Characteristics and would improve their condition. The application of Spike® 20P

would be expected to have the least visual impact. Due to the extensive acreages of decadent and dying sagebrush communities found throughout the West, it is probable the 50 percent mortality treatment would just be seen as another decadent sagebrush community and have minimal visual impacts. Prescribed fire would be the most noticeable of the proposed activities on these lands. Fire is a natural part of this ecosystem and would benefit the plant community.

Impacts from the WGFD Proposed Action

No additional impacts are anticipated.

Impacts from the Modified Treatment Alternative

No additional impacts are anticipated.

No Action Alternative

Wilderness characteristics would not be improved with this alternative.

4.1.9 Visual Resources

Impacts Common to All Alternatives

Approximately 14 percent of treated acres are located within Class II lands. Actions proposed on Class II lands include prescribed fire, cut/pile, mowing, and the application of Spike® 20P. Prescribed fire would be the most likely to be noticed by a "casual observer" but the low relative proportion of impacted acres means proposed activities meet the requirement of low levels of change on these lands. While fire is a natural part of this ecosystem, historic suppression activities and educational programming encouraging suppression have resulted in a population that may be sensitive to the visual impacts of fire. Due to the limited acreage proposed for burning, adjacent land uses (i.e., BTNF lands, unburned BLM lands) may decrease any sensitivity about the visual impacts of a burn. The areas proposed for burning are also in special designation management areas including WSAs, ACECs, and Lands with Wilderness Characteristics. By definition, these lands are remote and accessed by relatively few people, potentially decreasing the visual sensitivity about burning these areas. The area is crisscrossed with light duty, rough-bladed/two-track, and BLM roads but is more than 16 miles from the highway. The WGFD proposed actions within these lands meet the objective of retaining the existing character of the landscape, especially in the long-term.

Cut/pile activities would be less obvious from a distance than a prescribed fire, but would be noticeable up close. Again, these management actions are designed to improve the condition of these special status areas. The piles would also be diffuse on the landscape, minimizing their visibility.

Like cut/piling of timber, mowing may be less obvious from a distance than some management activities. Mowing would create an unnaturally straight edge that may draw the eye for some time after treatment. It is assumed, however, that mowing would be completed with consideration of contours and slope, and in a way as to minimize straight lines on the landscape, in which case these actions may be less visible.

The application of Spike® 20P would be expected to have the least visual impact. Due to the extensive acreages of decadent and dying sagebrush communities found throughout the West, it is probable the

50 percent mortality treatment would just be seen as another decadent sagebrush community and have minimal visual impacts.

Class III and IV lands include treatments in the South LaBarge, Big Mesa, Chimney Butte, and Deer Hills focus areas. Treatments proposed include mowing, application of Spike® 20P and aeration in lower elevations and prescribed fire and cut/pile at higher elevations. Impacts are anticipated to be similar to those described for Class II lands, and are consisted with the objectives to partially retain the existing character of the landscape (Class III) and to allow major modification of the character of the landscape (Class IV).

Impacts from the WGFD Proposed Action

Prescribed fire is proposed for lands in the Class I category on Deadline Ridge. Implementation of this alternative may impact visual resources in the project area from the time of treatment for 1 to 5 years, or until the site is recovered from the treatment activities. The primary visual impact would likely be from the prescribed burn and cut/pile treatment areas on Deadline and Miller Ridges. Although fire is a naturally occurring event, and is necessary for many of our ecosystem processes to work, it can be visually startling to see little vegetation (or black earth) where there was previously a plant community. The long-term impacts to visual resources would be negligible to beneficial since fire is a natural part of the ecosystem and these restoration efforts are designed to return the area to a more naturally-functioning plant community.

Impacts from the Modified Treatment Alternative

Fewer acres are proposed for treatment on Class I lands in this alternative; the proposed treatment is the prescribed burn and cut/pile in the Gentle Annie unit. Approximately 40 acres would also be treated with Spike®20P in this unit. Fewer acres are proposed for treatment overall in this alternative, resulting in a lessened visual impact across the project.

The Miller Mountain fence is located in Class II and IV lands. Since the fence is a lay-down fence the impacts to visual resources will be minimized to the time cattle are in the area. This is consistent with Class II and IV objectives.

No Action Alternative

If left untreated, the potential for a catastrophic wildfire increases, which would decimate all visual resource value in the area. A wildfire would likely remove all surface vegetation. Regeneration at high elevations (in Class I and II areas) may be possible but would be slow, and likely impacted by weeds and erosion.

4.1.10 Energy Development

Impacts Common to All Alternatives

Benefits to energy development could result from the implementation of either alternative. A decrease in fuel loads could decrease the likelihood of a catastrophic fire in the area.

Impacts from the WGFD Proposed Action

No additional impacts are anticipated.

Impacts from the Modified Treatment Alternative
This alternative proposes more cutting and piling and less prescribed fire. The cut/pile treatments could be completed in areas in closest proximity to energy developments to reduce the chance of prescribed fire getting out of prescription and potentially burning energy development infrastructure.

No Action Alternative
Energy development could be negatively impacted by implementation of this alternative due to the continued increase in wildfire risk.

4.1.11 Wildland Fire

Impacts Common to All Alternatives
Implementation of either alternative would decrease the likelihood of a catastrophic wildfire in the project area. The extensive alteration of fuel loads across the landscape would result in improving the fire resiliency of the plant community and return portions of this area to an early seral community with aspen and other first-generation successional species. The reduction of fuel across this relatively large area would protect important wildlife habitat, infrastructure (i.e., roads and gas developments), and human health and safety from a potentially catastrophic fire. Recent fires in the have burned in a mosaic pattern, and additional alterations to fuel loading would increase the likelihood wildland fires would burn in a less intense pattern.

Impacts from the WGFD Proposed Action
No additional impacts are anticipated.

Impacts from the Modified Treatment Alternative
No additional impacts are anticipated.

No Action Alternative
The failure to reduce or alter fuel loads makes it more likely the area would be impacted negatively by a catastrophic wildfire. A decrease in fuel loads should decrease the likelihood of a catastrophic fire in the area. While there is risk in completing a prescribed fire, the burn plans should be written with clear parameters to minimize the risk of a prescribed burn turning into a wildfire.

4.1.12 Paleontology

Impacts Common to All Alternatives
Any paleontological resources in the project area are anticipated to be identified during cultural resource inventories. Any identified resource would be marked, recorded, and avoided. No impacts are anticipated to paleontological resources from implementation of either alternative.

Impacts from the WGFD Proposed Action
No additional impacts are anticipated.

Impacts from the Modified Treatment Alternative
No additional impacts are anticipated.

No Action Alternative

Paleontological resources would not be surveyed in the area and may be unwittingly impacted or destroyed by OHV use, recreationists, ungulates, or through many other mechanisms because their presence is unknown.

4.1.13 Cultural Resources

Impacts Common to All Alternatives

Cultural resources would not be affected by the implementation of either alternative. The BLM has chosen to employ a phased approach to historic property identification as allowed under 36 CFR Part 800.4(b)(2) because effects (direct and/or indirect) to historic properties cannot be fully determined prior to completion of the NEPA process. To implement the phased approach, the BLM and the Wyoming SHPO, in consultation with interested parties, are developing a Programmatic Agreement to delineate the cultural compliance strategy for the various treatments planned for this project. The BLM will conduct or cause to be conducted Class III cultural inventories for those treatments that will cause ground disturbance or otherwise cause an adverse effect to historic sites (aeration, pitting, cut and mechanical pile) or will conduct or cause to be conducted reconnaissance for treatments which have the potential to only adversely affect specific and relatively visible aspects of eligible sites (mowing, prescribed fires, herbicides). Treatments determined by the BLM, SHPO, and other interested parties to have no potential to impact historic sites will not require either inventory or reconnaissance (seeding, cut and hand pile, fertilizer). Potential adverse effects will be mitigated by avoidance of all sites determined to be eligible for the National Register of Historic Places, to include at least a 50-meter buffer around each site boundary or as required by previously executed Programmatic Agreements.

Impacts from the WGFD Proposed Action

No additional impacts are anticipated.

Impacts from the Modified Treatment Alternative

No additional impacts are anticipated.

No Action Alternative

Under the No Action Alternative, no treatments would be performed and no cultural sites or materials would be impacted.

4.1.14 Climate Change

Impacts Common to All Alternatives

Global warming is the result of released atmospheric carbon dioxide in to the earth's atmosphere. Carbon sequestration is the process of removing carbon from the atmosphere and depositing it in a reservoir (i.e. water bodies, soils, vegetation, and geologic formation). Carbon sequestration describes long-term storage of carbon dioxide or other forms of carbon to either mitigate or defer global warming. Burning is one such activity that results in a release of carbon dioxide into the atmosphere, thus contributing to global climate change. However, it is the intention of the WGFD proposed action to increase vegetative cover and decrease bare ground across treatment units, thus, increasing the amount

of carbon sequestration by vegetation in the project area. Treated areas should also show an increase in soil nutrient values helping to promote vegetative growth, biomass decomposition, and overall carbon cycling within the system.

Impacts from the WGFD Proposed Action
No additional impacts are anticipated.

Impacts from the Modified Treatment Alternative
No additional impacts are anticipated.

No Action Alternative
Current global warming and carbon sequestration trends would continue as a result of the no action alternative.

4.1.15 Recreation

Impacts Common to All Alternatives
Implementation of treatments in the project area may impact recreationists, including hunting, during the treatment (i.e., areas to be burned would be closed to the public during the burn window). These closures would be expected to be short in duration and on relatively small acreages with ample advance notice, thus minimizing any potential impacts. Trails located in areas where cut/pile treatments would likely be improved by removal of dead and downed trees and overall safety for recreating within the project area would be improved due to reduced risk of wildfire and deadfall trees.

Impacts from the WGFD Proposed Action
No additional impacts are anticipated.

Impacts from the Modified Treatment Alternative
No additional impacts are anticipated.

No Action Alternative
If left untreated, the potential for a wildfire increases, which would negatively impact recreation opportunities.

4.1.16 Socioeconomics

Impacts Common to All Alternatives
Treatments completed to improve species composition and diversity, create variable age classes in the shrub and forest communities, and improved forage production would benefit livestock producers and permittees. The potential for required rest in treated areas has been or would be mitigated through schedules developed between the permittees and the BLM. Recreational opportunities would only be limited during the actual treatments occurring so only negligible impacts are anticipated to tourism.

Impacts from the WGFD Proposed Action
No additional impacts are anticipated.

Impacts from the Modified Treatment Alternative

No additional impacts are anticipated.

No Action Alternative

If left untreated, the potential for a catastrophic wildfire increases, which would negatively impact permittees.

4.1.17 Hazardous Materials

Impacts Common to All Alternatives

Impacts are not expected, however, hazardous material spills could negatively impact human health, wildlife, air, soil, groundwater and surface water quality. Regular maintenance of equipment, handling of chemicals and an effective spill response plan would keep impacts to a minimum.

No Action Alternative

No impacts are anticipated.

4.2 Cumulative Effects

As defined by the Council on Environmental Quality (CEQ) Regulations for Implementing NEPA, Cumulative Effects (40 CFR 1508.7) are defined as, "The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."

4.2.1 Past, Present and Reasonably Foreseeable Future Actions

Past actions in the area include grazing, recreation, hunting, fuels treatments, wildland fires, range improvement projects, energy development, and road development.

Current uses include wildfire management, energy development, grazing, hunting, and recreation.

Reasonably foreseeable future actions include travel management planning, grazing plan revisions, and potentially other fuels and habitat treatments. The LaBarge Platform Exploration and Development project proposes to install oil and gas pads on approximately 218,000 acres across this project area. The final EIS and Record of Decision for this project is anticipated in 2015.

4.2.2 Cumulative Effects Summary

Wildlife

Previous actions such as habitat improvement projects, water developments, and changes to grazing programs have increased forage production and water availability, thus impacting wildlife distribution. Livestock grazing, wildland fires, recreation, hunting, OHV use, camping, road construction and maintenance may have altered wildlife distribution and behavior. Most of these activities are expected to continue into the future and would continue to impact wildlife in a similar fashion. The treatments proposed in the project area should result in improved forage quality, forage abundance, species composition and diversity, and diversity in shrub/tree age classes. All of these outcomes would benefit the target species of mule deer, but also all big game and Greater Sage-grouse.

Vegetation Resources

Past actions impacting this resource include grazing by ungulates (wild and domestic), wildland fire, weed infestations, recreation, and energy development. These activities continue today, and are anticipated to continue into the future. Wildfires have impacted plant communities, soil surfaces, and wildlife habitat through high-intensity fires that may leave little unburned vegetation in their wake. Rehabilitation efforts generally have marginal success due to the marginal condition before areas burn and the intensity of the wildland fire due to the extended fire return interval. Implementation of these actions would increase the likelihood of a lower intensity fire. Drought also plays a role in condition and recovery. An improvement in the vegetation community would be expected through implementing habitat treatments including improved plant recruitment, establishment, production, vigor and diversity. These improvements would also benefit soil health. These improvements may alter the behavior of wildland fires that start in the area, and would benefit all users of the area including wildlife, livestock

and people. Weed control would improve vegetation condition throughout the project area. Healthy plant communities also perform better in drought situations.

Livestock Grazing

Past, present, and reasonably foreseeable future actions combined with treatments included in the Proposed Action would mitigate impacts to vegetation, soils and water relationships by improving the health, vigor and recruitment of perennial grasses, forbs and shrubs; increasing ground cover to improve soil stability, improve water quality by reducing erosion potential; and promote herd health and economic stability by increasing the quantity and quality of forage for livestock use. Over a period of time, forage conditions would improve, which would benefit long term livestock grazing management.

Wild Horses

Past, present and reasonably foreseeable actions combined with the proposed treatments would mitigate impacts to soils and vegetation from wild horses. Wild horses would benefit from the improved plant community illustrated by decreased soil surface runoff, increased soil stability, and improved permeability. Increased plant diversity and age classes and improved forage condition would benefit wild horse populations in the long-term.

Water Quality

Previous actions such as livestock grazing, wildlife grazing, and wild horse grazing may have impacted water quality through increased surface runoff. Large, unplanned disturbances such as wildland fire may have exposed soils across a large area, increasing soil surface runoff. Drought may exacerbate all of these issues. An improvement in the plant community would be expected through implementing habitat treatments including improved plant recruitment, establishment, production, vigor and diversity. These improvements should decrease the potential for surface runoff and sedimentation. Use of chemicals for treatment have some potential risk for impacting water quality but the risk would be mitigated by use of the protocols provided in the BLM Final Programmatic Environmental Impact Statement – Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States (2007).

Air Quality

The scale of the proposed projects are minor when evaluating the area included in the Pinedale and Rock Springs FOs. Non-measurable impacts are anticipated to air quality with the exception of during the prescribed burns, which would occur according to the High Desert District Fire Management Plan and would minimize any potential impacts. Impacts to air quality through the use of fossil fuels to complete treatments are expected to be unmeasurable and diffuse, and very short-term (limited to the time of the burn).

Energy Development

In the greater project area, the LaBarge oil and gas field exists. This historic field is still being developed and 1000 additional wells are being proposed as part of the LaBarge Infill project. Soil disturbance associated with roads, pads and pipelines can change vegetation structure and composition. Implementation of the proposed project may also offset some of the habitat fragmentation and loss created by energy development.

Wildland Fire

Wildland fires have impacted plant communities, soil surfaces, and habitat and forage availability through high-intensity fires that leave little unburned vegetation in their wake. Rehabilitation efforts may have poor success depending on timing, seed availability, condition of the area prior to the burn, and fire intensity. In this area, fires tend to burn in a mosaic fashion, and completing the proposed habitat treatments would further encourage this type of fire. Drought also plays a role in condition and recovery. A decrease in the potential for wildland fire is anticipated with the implementation of either treatment alternative. An improvement in the vegetation community would be expected through implementing habitat treatments including improved plant recruitment, establishment, production, vigor, and diversity. These improvements may alter the behavior of wildland fires that start in the area, and would benefit all users of the area including wildlife, livestock, and people.

Paleontology

Past activities (OHV use, grazing, and recreation) may have inadvertently damaged paleontological resources. The planned treatments would require the inventory of paleontological resources in the project area and implementation would avoid any identified paleontological resource. This would minimize any potential damage to paleontological resources, particularly compared to the loss that may occur to paleontological resources if an unplanned event such as a wildland fire starts. Paleontological resource inventories are rarely completed prior to treatment in those instances and can cause extensive and irreparable damage.

Cultural Resources

Past activities (OHV use, grazing, and recreation) may have inadvertently damaged cultural resources. The planned treatments would require the inventory of cultural resources in the project area and implementation would avoid any identified cultural resource. This would minimize any potential damage to cultural resources, particularly compared to the loss that may occur to cultural resources if an unplanned event such as a wildland fire starts. Cultural resource inventories are rarely completed prior to treatment in those instances and can cause extensive and irreparable damage.

Climate Change

Quantification of any impacts to climate change is not possible due to the lack of site-specific research and general controversy surrounding the topic. However, the WGFD proposed actions would add minimal amounts of greenhouse gases or emissions to the atmosphere, resulting in a negligible impact even without quantification. GHGs would be emitted during the performance of the mechanical treatment, and from vehicular traffic throughout the life of the treatments, if any. It is unknown what net direct or indirect effects the treatments would have on climate.

There are significant uncertainties associated with estimates of Wyoming's GHG emissions, compounded by the fact that there are no regulatory requirements to track CO2 or CH4 emissions. Therefore, estimates based on GHG emissions from each alternative in Wyoming are not possible at this time.

Recreation

Past recreational uses of the area such as hiking, hunting, camping, and photography would be continued into the future. Although no managed campgrounds exist in the treatment areas, treatments would not interfere with recreationists camping in the backcountry. Individuals may choose to move their recreational activity to a different part of the project area based on personal preference (i.e., they do not prefer to camp in early seral plant communities post-fire), but recreation would continue nonetheless. Vegetation treatments may have the effect of encouraging ungulates to use treated areas because of the highly palatable new forage, which may require hunters or wildlife photographers to alter their hunting/viewing locations. Cut/pile projects generally involve removing dead or leaning trees, which would reduce the risk of deadfalls and increase human safety in these remote areas. Improved livestock distribution, forage condition, and overall improvements in the plant community should improve the recreational experience by providing better opportunities for wildlife in the project area.

Socioeconomics

Implementation of either alternative would result in a long-term (>5 year) benefit to livestock grazing permittees, and thus the community. Increased/improved forage could benefit livestock health and weights. As discussed in Recreation, recreational opportunities would not be impaired except during the time of treatment, encouraging and allowing people to continue to visit the Pinedale community. Implementing these treatments could result in a temporary increase in jobs such as tractor operators, livestock riders or vegetation monitoring specialists.

5. TRIBES, INDIVIDUALS, ORGANIZATIONS OR AGENCIES CONSULTED

Tribes:

Northern Arapaho Tribe
Blackfeet Tribe
Ute Tribe of
Eastern Shoshone Tribe
Shoshone-Bannock Tribe

Agencies:

Wyoming Game and Fish Department
Wyoming Department of Agriculture
Wyoming State Lands and Investments
Wyoming State Historic Preservation Office
Sublette County Conservation District
Sublette County Weed and Pest
Lincoln County Conservation District
United States Fish and Wildlife Service

Organizations:

Oregon California Trail Association
Wyoming State Historical Society
Wyoming Association of Professional Archeologists
Sublette County Historical Society
Sublette County Historic Preservation Board
Lincoln County Historical Society
Alliance for Historic Wyoming

Companies/Individuals:

Exxon Mobil
Doug Holmes
Steve Hoffman
Jack Sims
Jay McGinnis
Wayne Barlow
John Chrisman
Tim Thompson
Mike Miller
Pete Thompson
Brad Carnahan
Randy McNinch
Alsade Ltd.
Pam Chrisman

Corby McGinnis
Michael McGinnis
Dan Budd
Janet Beiermann
Brian Espenscheid
Chad Espenshceid
Ken Woodland
Joseph Jones
Glad Jones
Sue Hunt
Ty Hunt
Colin Hunt
Eric and April Barnes

6. LIST OF PREPARERS

Brenda Younkin, Project Manager, M.S. Rangeland Resources Utah State University, 2004
Environmental Policy Planning Certificate, Utah State University, 1998
Y2 Consultants, Inc., Jackson WY

Morgan Graham, GIS Manager & Faculty, B.A., Biology, Macalester College, 2003
Conservation Research Center of Teton Science Schools, Jackson, WY

Sara Fagan, Program Coordinator, M.E.M. (Environmental Management), Duke University, 1999
B.S. and B.A., Botany, Miami University, Oxford, OH, 1996
Conservation Research Center of Teton Science Schools, Jackson, WY

Chauncey Smith, GIS & Natural Resource Technician, B.S. Environmental Science, Minor in Geospatial Technologies, University of Vermont, 2011
Conservation Research Center of Teton Science Schools, Jackson, WY

Sarah Johnson, Biologist, B.A. Biology, Colby College, 2006
Formerly Conservation Research Center of Teton Science Schools, Jackson, WY

6.1 List of Reviewers

Janet Bellis, Hydrogeologist and Air Quality Liaison, Bureau of Land Management[1]
Cherette Bonomo, Rangeland Management Specialist, Bureau of Land Management
James Collis, Archeologist, Bureau of Land Management[2]
Shane DeForest, Field Manager, Bureau of Land Management
James (Sam) Drucker, Archaeologist / Paleontology Coordinator, Bureau of Land Management
James Glennon, Botanist, Bureau of Land Management
Jed Gregory, Natural Resource Specialist, Bureau of Land Management
Kyle Hansen, Assistant Field Manager, Renewable Resources, Bureau of Land Management
John Henderson, Fishery Biologist, Bureau of Land Management
Martin Hudson, Outdoor Recreation Planner, Bureau of Land Management
Rusty Kaiser, Wildlife Biologist, Bureau of Land Management
Lauren McKeever, Planning & Environmental Specialist, Bureau of Land Management
Jill Randall, Terrestrial Habitat Coordinator, Wyoming Game and Fish Department
Greg Reser, Fuels Specialist/HDD Unit Aviation Manager, Bureau of Land Management
Kellie Roadifer, Planning and Environmental Coordinator, Bureau of Land Management
Brian Roberts, Natural Resource Specialist, Bureau of Land Management
Kyle Schumacher, Natural Resource Specialist, Bureau of Land Management
Gene Smith, Archaeologist, Bureau of Land Management[3]
Mark Snyder, Supervisory Wildlife Biologist, Bureau of Land Management
Timothy Zebulske, Supervisory Natural Resource Specialist, Bureau of Land Management

[1] Prepared the Air Quality Section and Impact Analysis
[2] Prepared the Cultural Resources Section, Pinedale Field Office
[3] Prepared the Cultural Resources Section, Rock Springs Field Office

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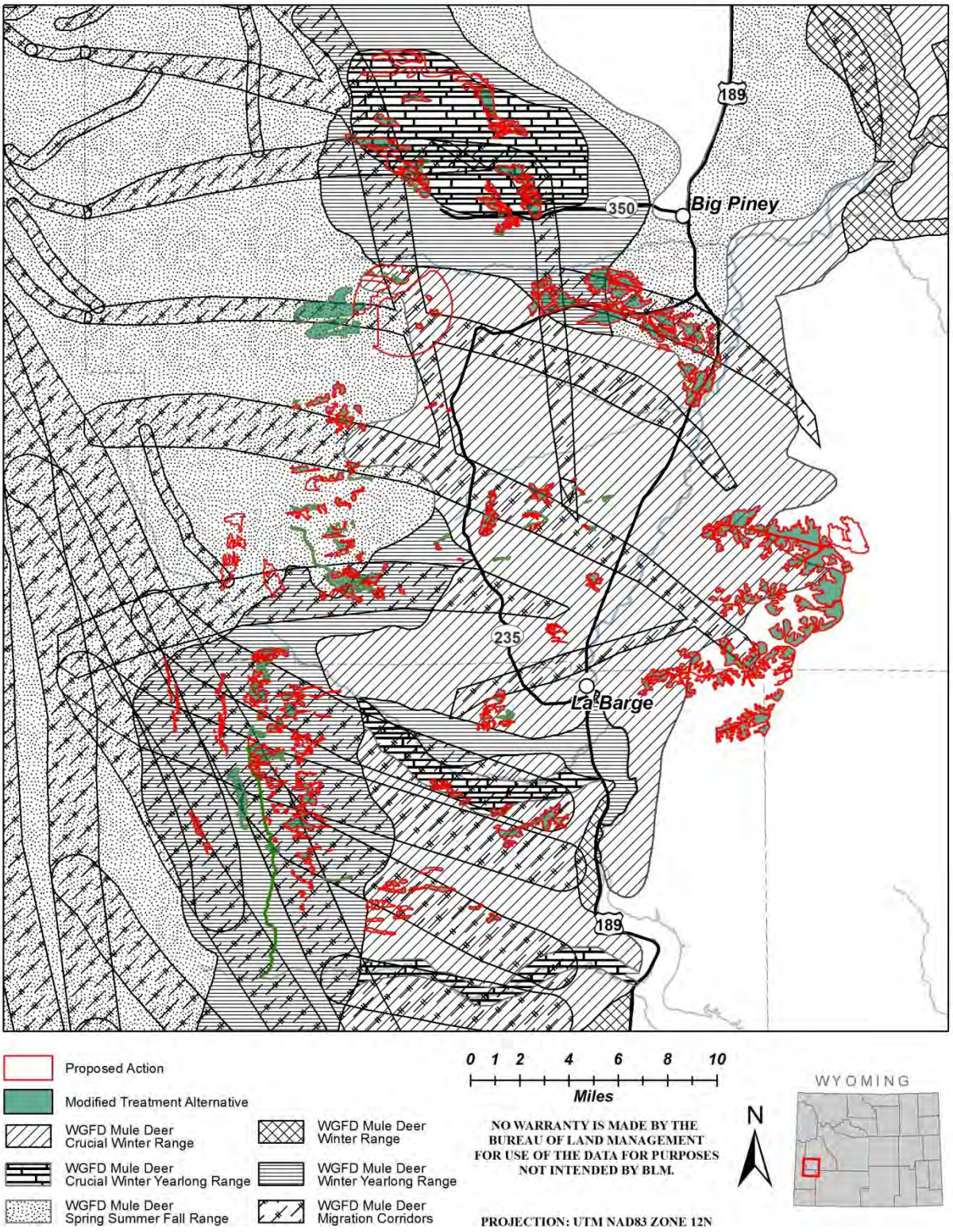
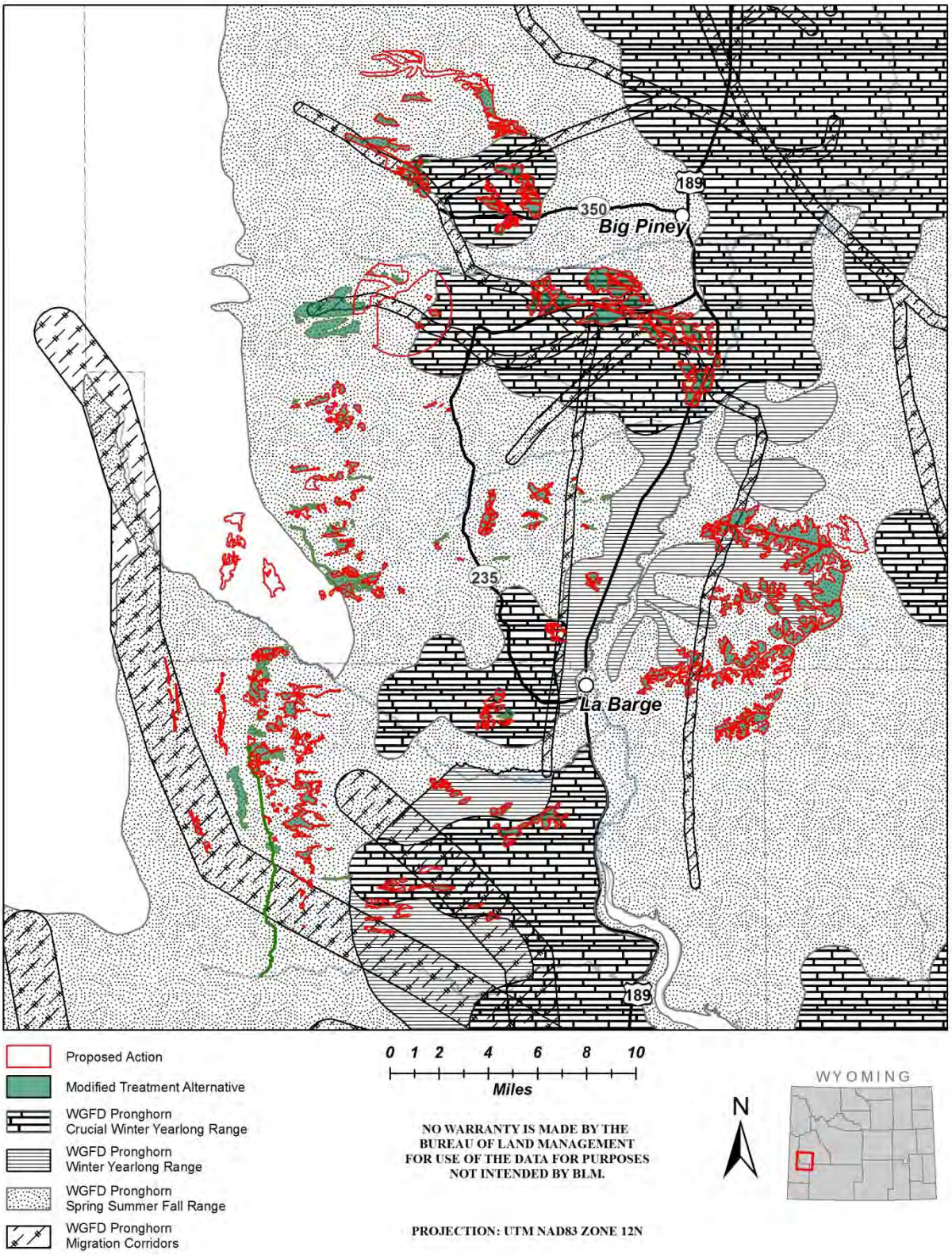
8. APPENDICES

Appendix A - Maps

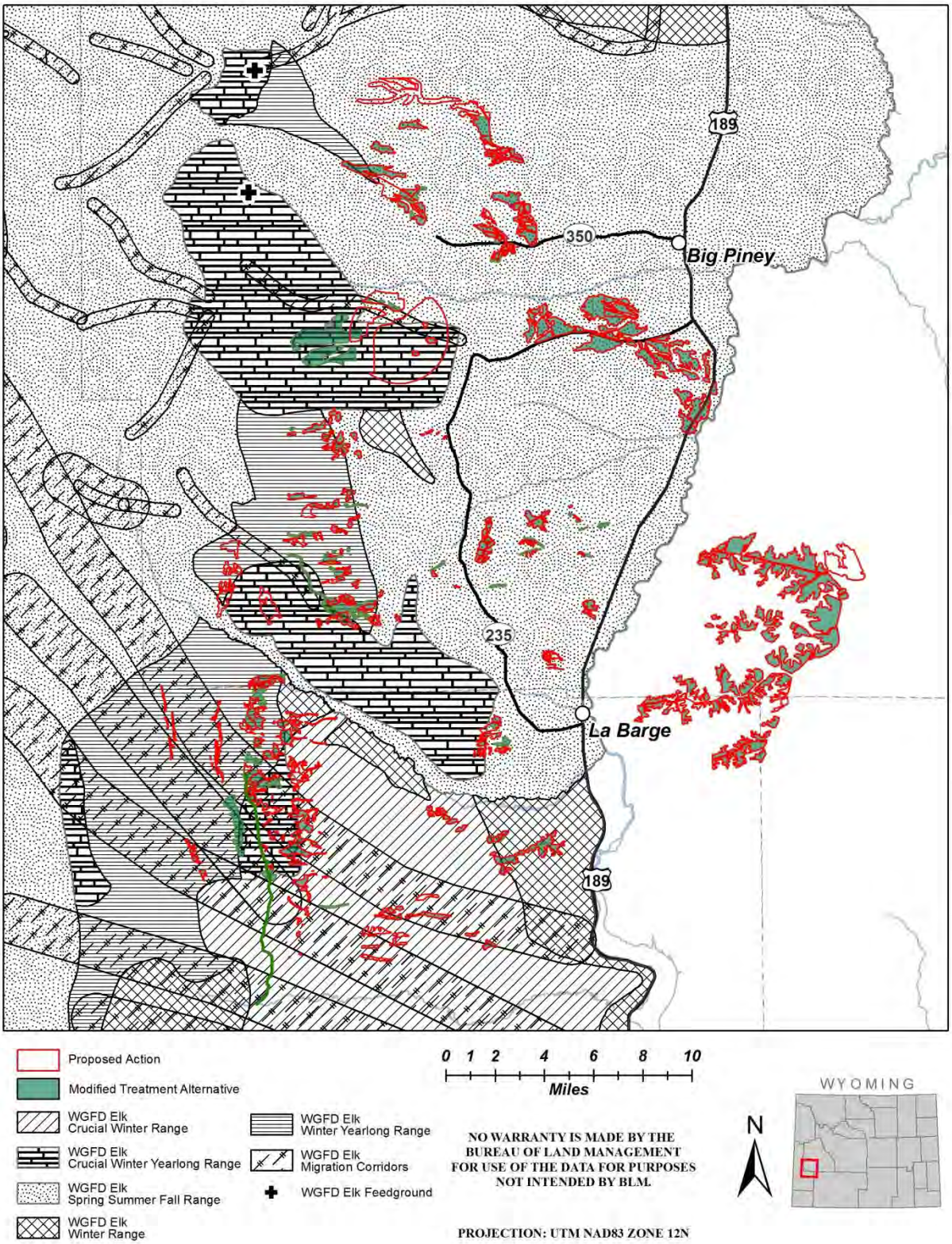
Map 20. Mule deer ranges and migration routes with the proposed and modified treatment alternatives.



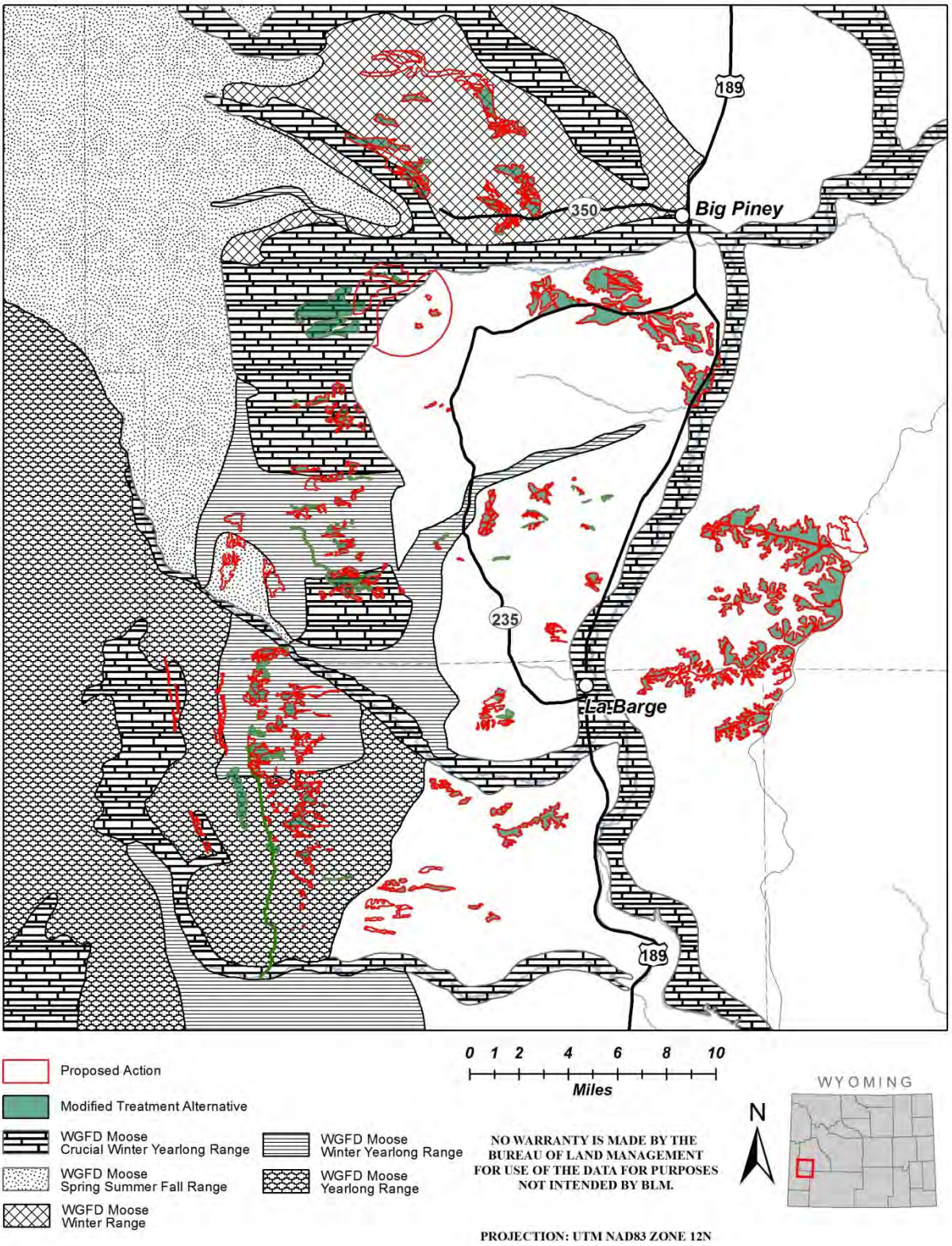
Map 21. Pronghorn ranges and migration routes with the proposed and modified treatments alternatives.



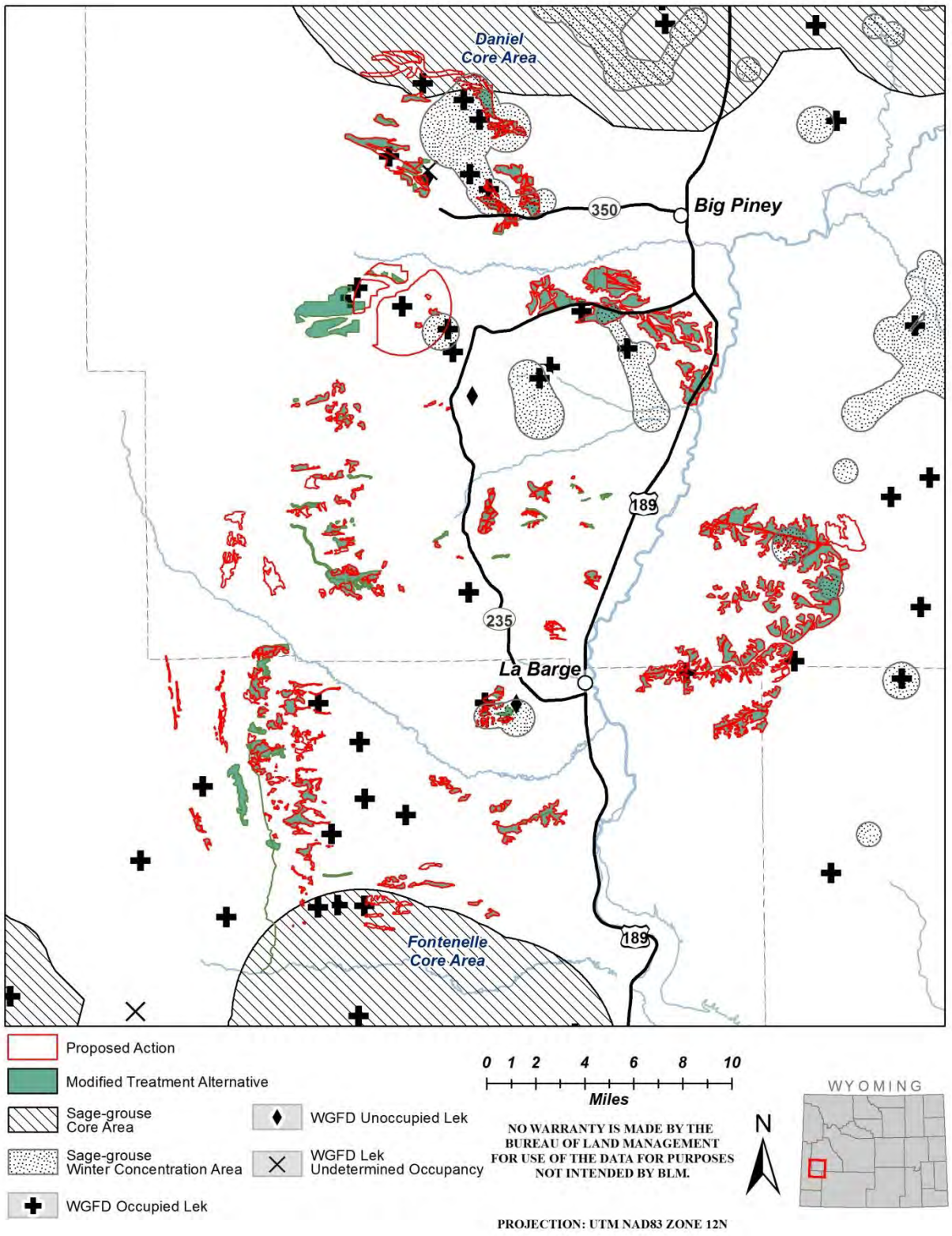
Map 22. Elk ranges and migration routes with the WGFD proposed action and modified treatment alternative.



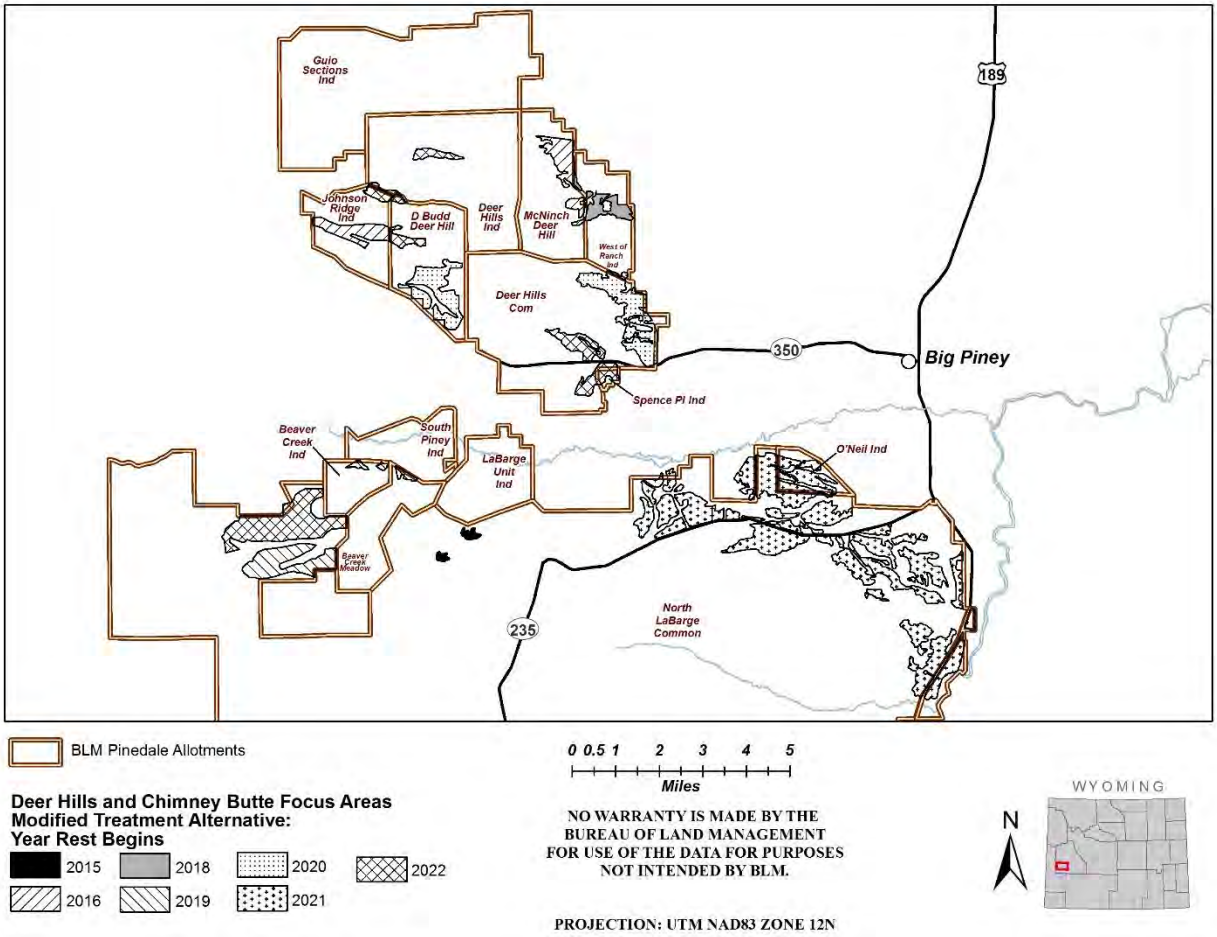
Map 23. Moose ranges and migration routes with the WGFD proposed action and modified treatment alternative.



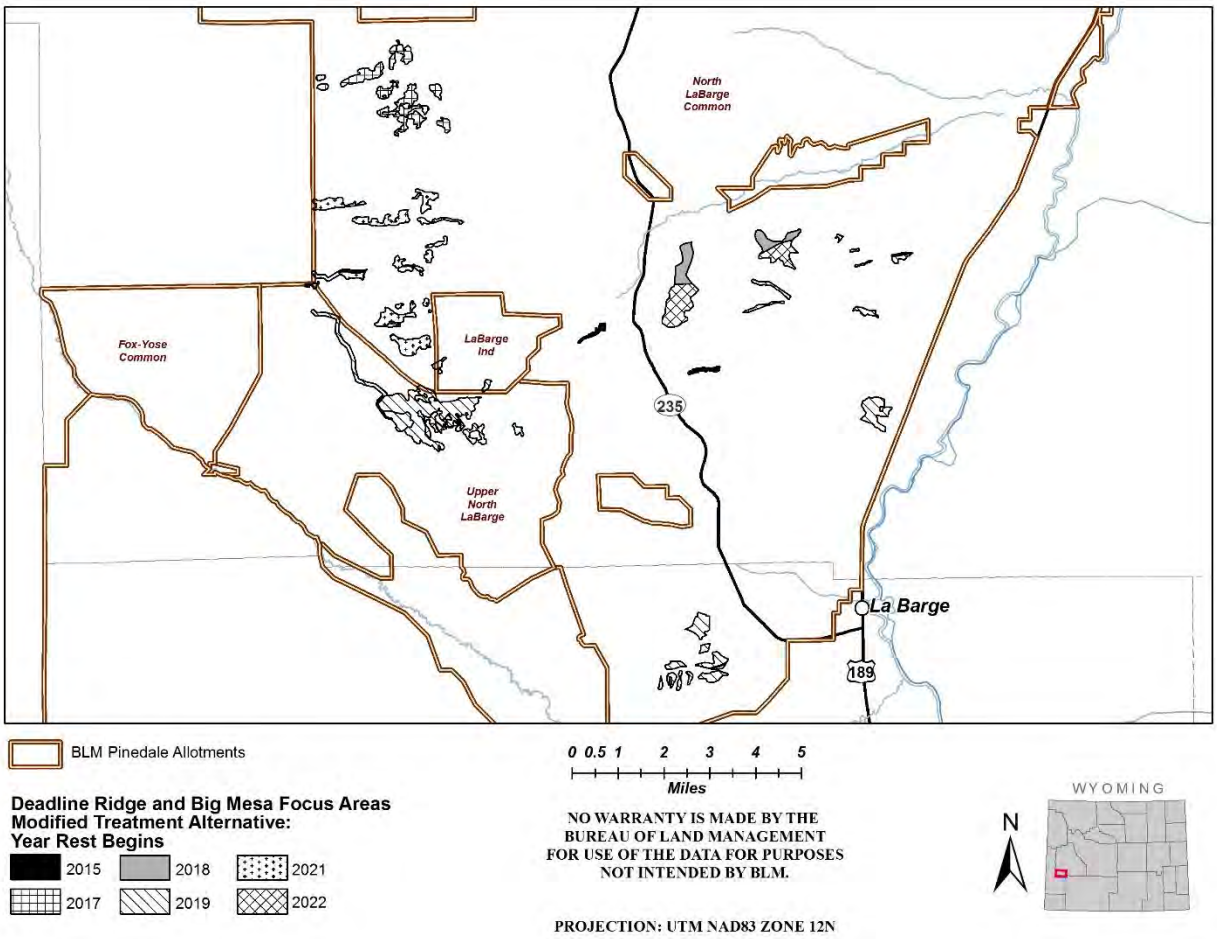
Map 24. Greater Sage-grouse core area and lek locations with the WGFD proposed action and modified treatment alternative.



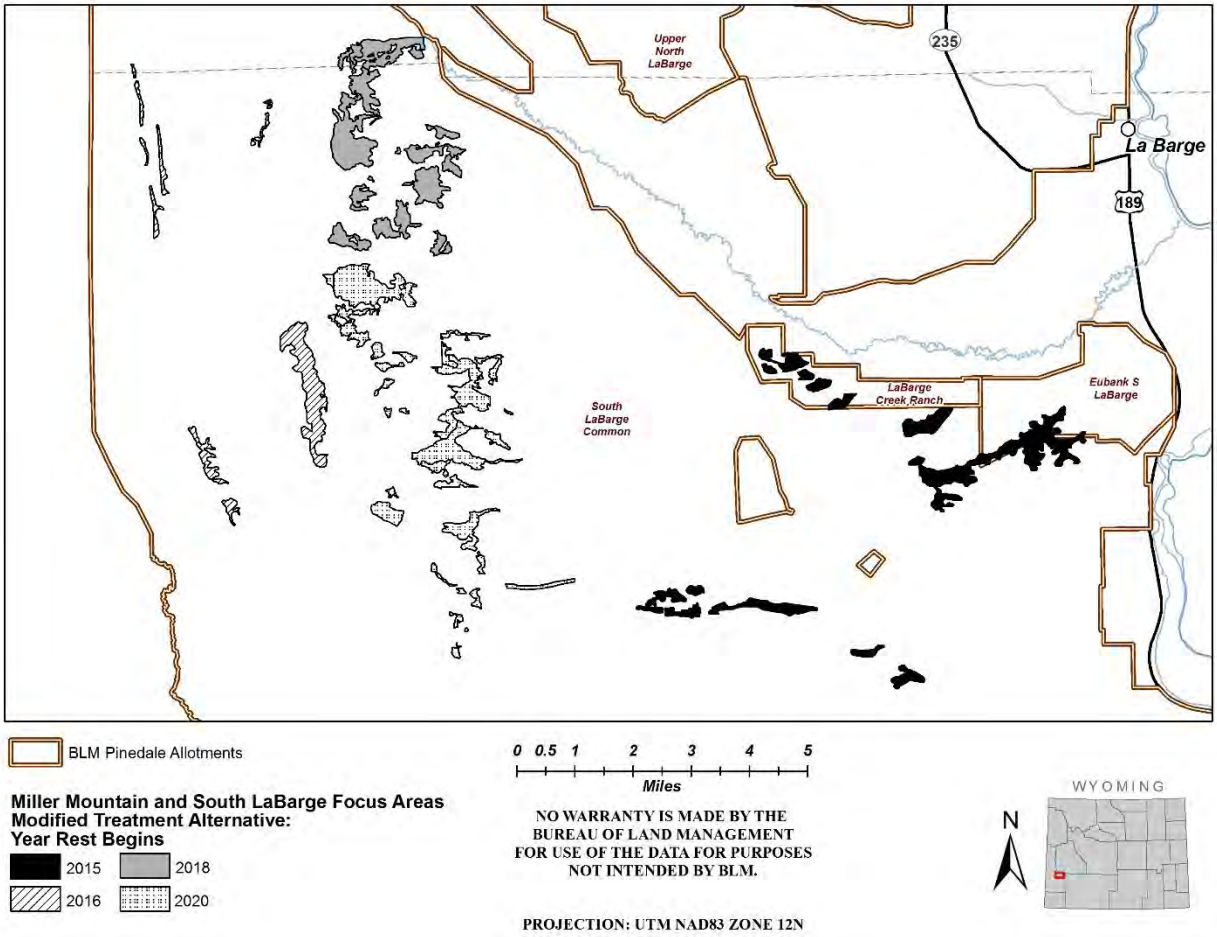
Map 25. The year rest begins for the modified treatment alternative in the Deer Hills and Chimney Butte Focus Areas.



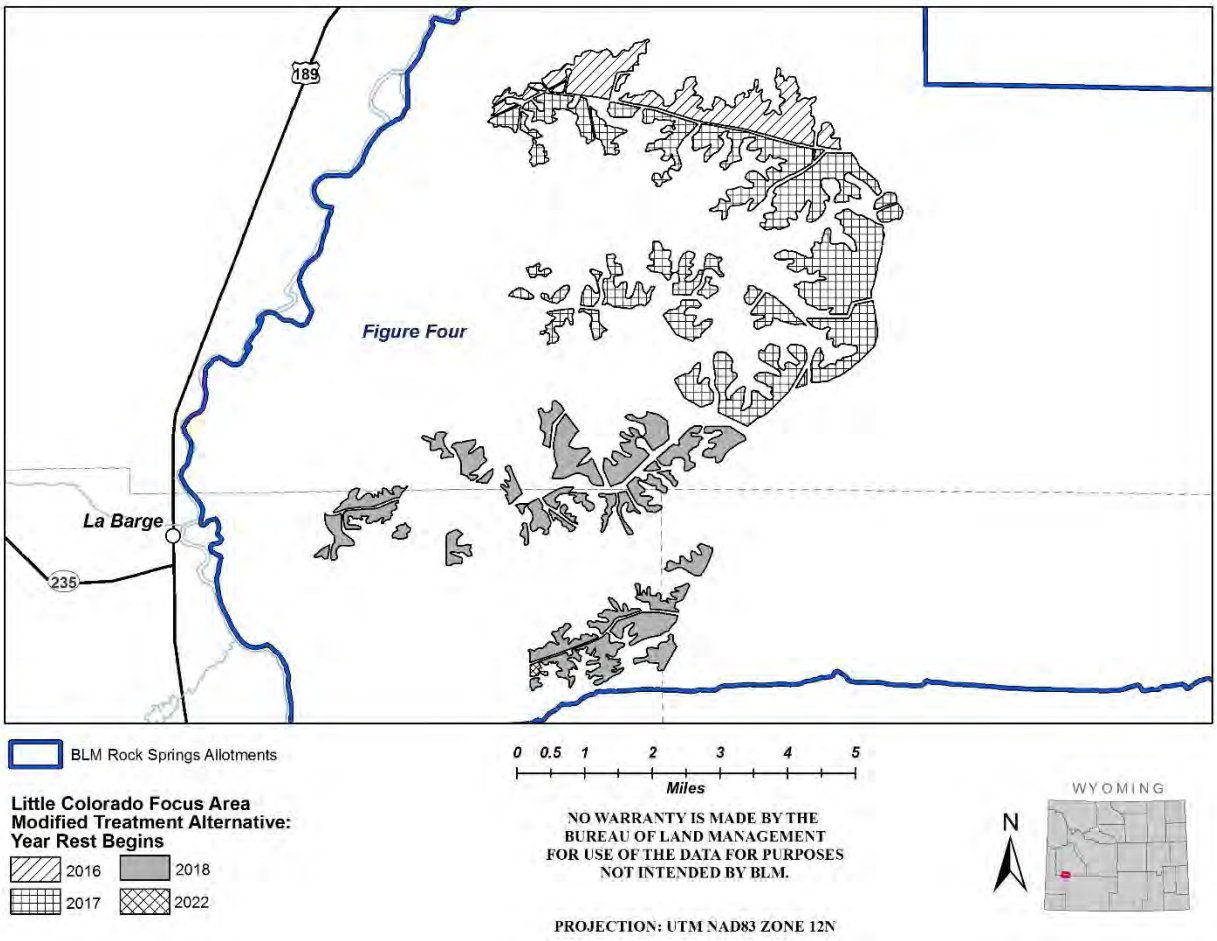
Map 26. The year rest begins for the modified treatment alternative in the Deadline Ridge and Big Mesa Focus Areas.



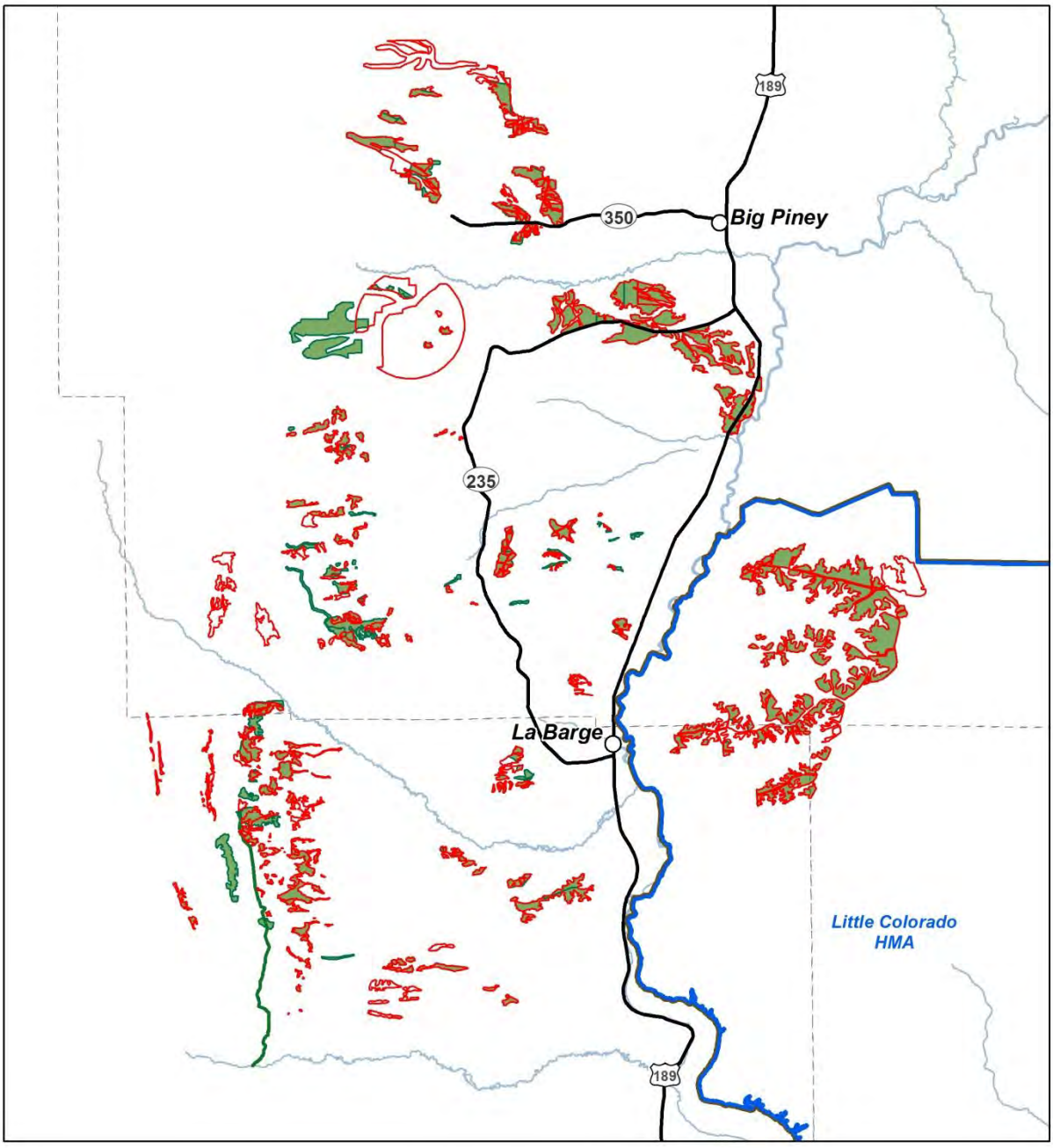
Map 27. The year rest begins for the modified treatment alternative in Miller Mountain and South LaBarge Focus Areas.



Map 28. The year rest begins for the modified treatment alternative in the Little Colorado Focus Area.



Map 29. Wild horse HMAs with the WGFD proposed action and modified treatment alternative.



Proposed Action

Modified Treatment Alternative

Herd Management Area

0 1 2 4 6 8 10
Miles

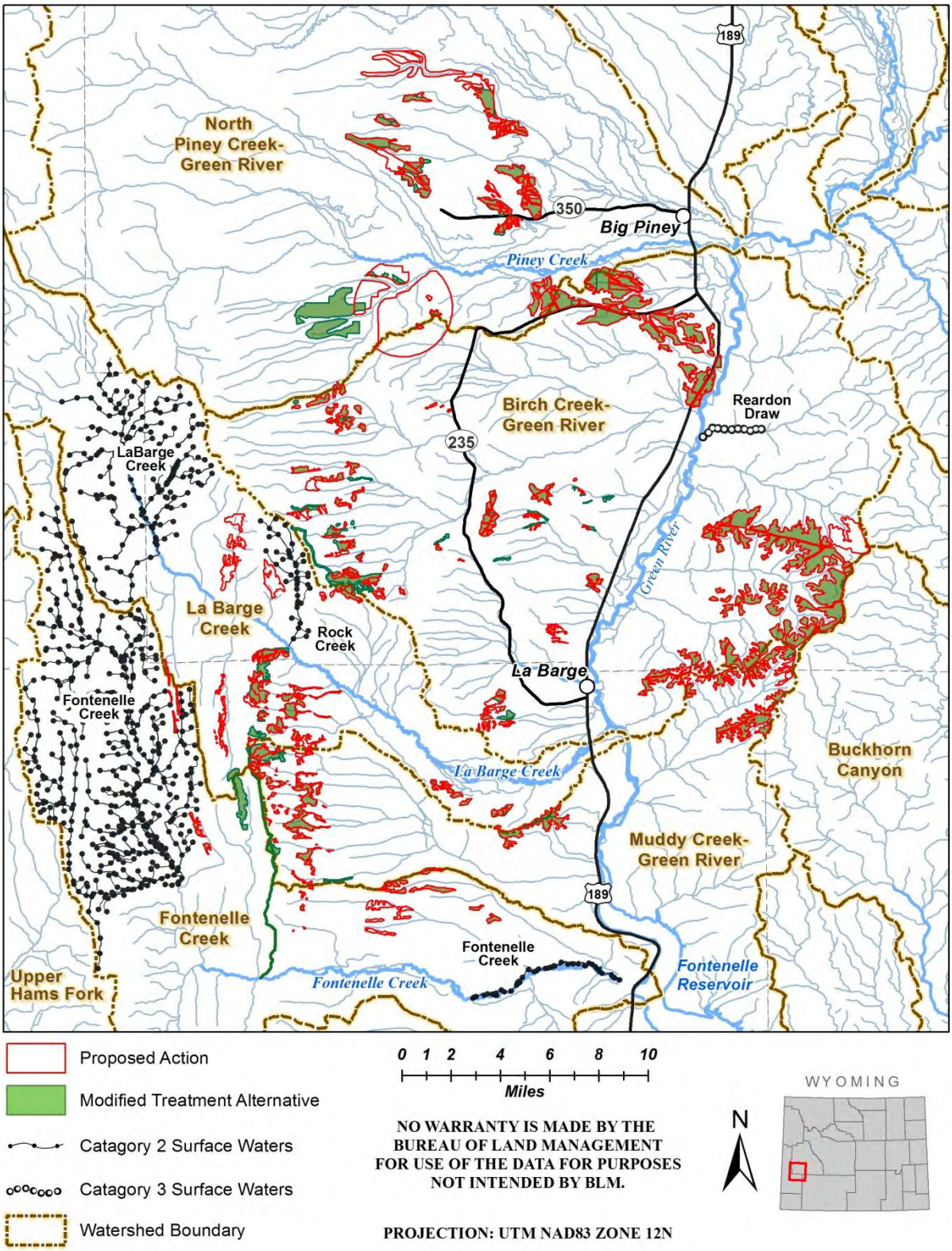
NO WARRANTY IS MADE BY THE BUREAU OF LAND MANAGEMENT FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM.

N

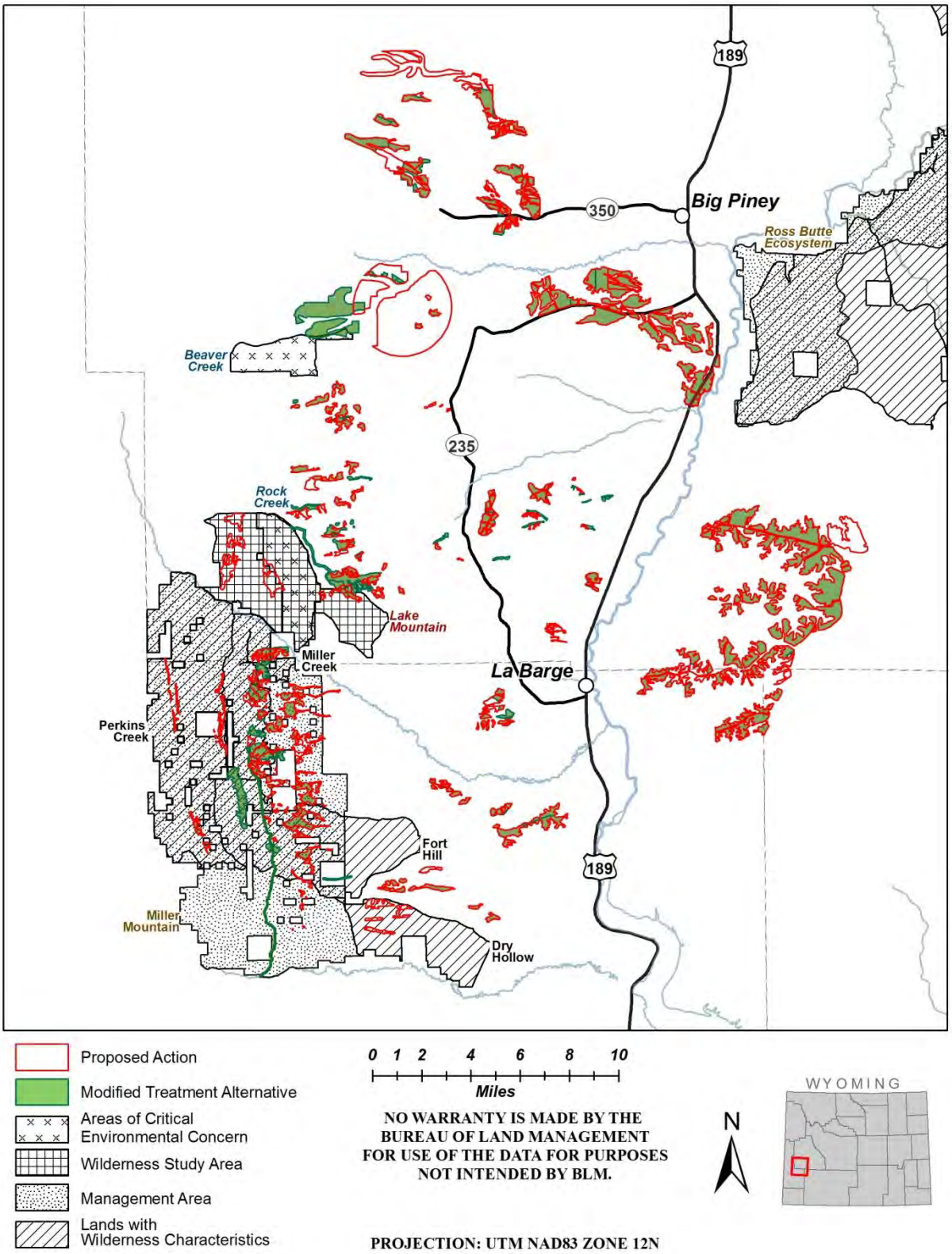
WYOMING

PROJECTION: UTM NAD83 ZONE 12N

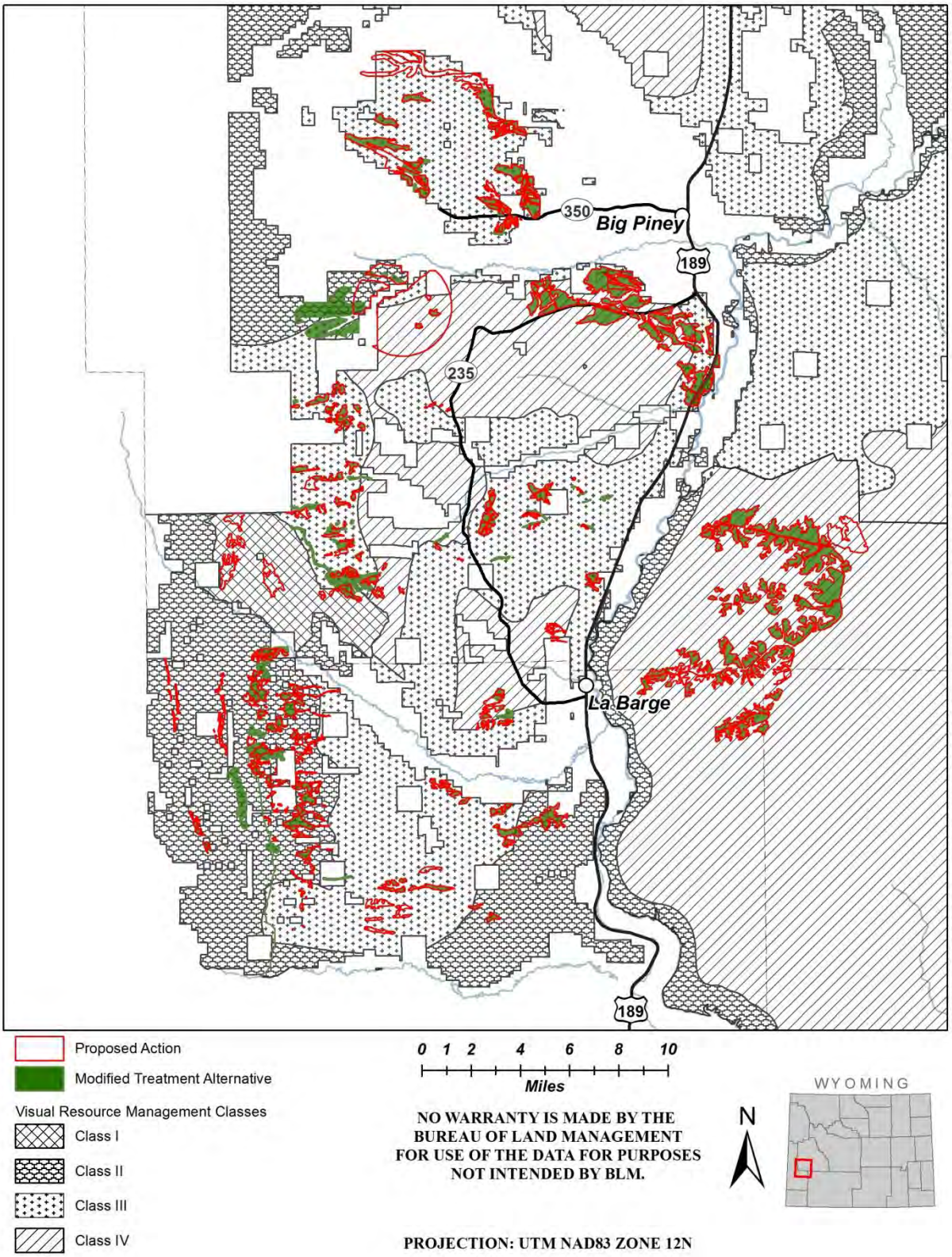
Map 30. Surface water quality with the WGFD proposed action and modified treatment alternative.



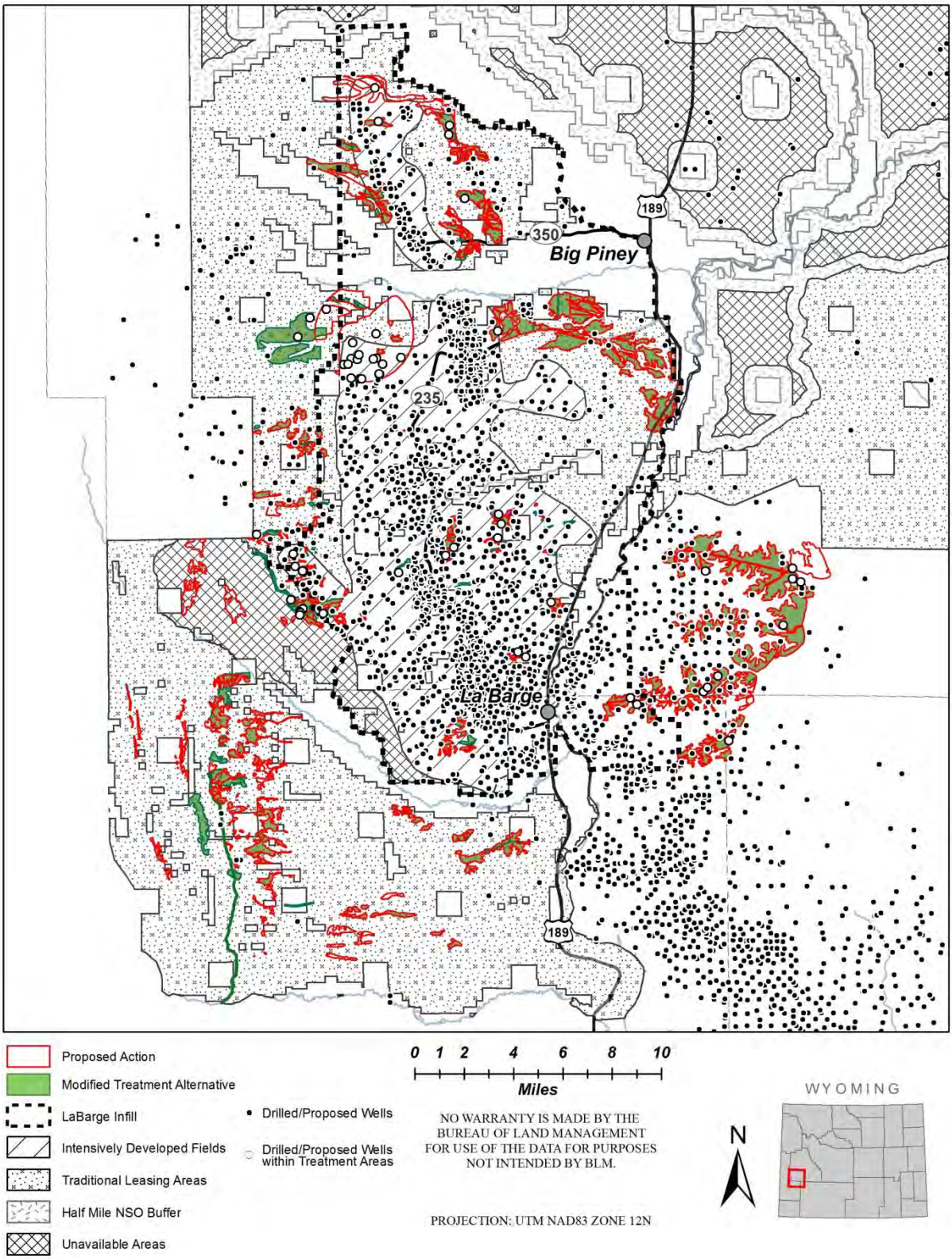
Map 31. Special designation lands with the WGFD proposed action and modified treatment alternative.



Map 32. Visual resources in the project area with the WGFD proposed action and modified treatment alternative.



Map 33. Oil and gas pads in the project area with the WGFD proposed action and modified treatment alternative.



Appendix B - BLM Allotments Containing Proposed Treatment Areas

Table 12. BLM allotments containing proposed treatment areas.

Administrator	Allotment No.	Allotment Name	Proposed Alternative Acreage	Modified Treatment Acreage	Permitted AUMs	Class of Livestock	Grazing Start	Grazing End
BLM - Pinedale	02141	Beaver Creek Individual	560	49	129	Cattle	7/1	7/28
BLM - Pinedale	02142	Beaver Creek Meadow Individual	821	45	20	Cattle	6/15	6/28
BLM - Pinedale	02032	D. Budd Deer Hill Individual	734	745	293	no data	no data	no data
BLM - Pinedale	02150	Deer Hills Common	1093	1188	717	Cattle	5/20	7/1
BLM - Pinedale	02035	Deer Hills Individual	251	146	698	Cattle	5/16	6/30
BLM - Pinedale	02061	Eubank South LaBarge Individual	185	185	80	Cattle	10/16	11/14
BLM - Pinedale	02081	Fox-Yose Common	579	0	661	Cattle Horse	5/16 5/1	6/30 5/31
BLM - Pinedale	02086	Guio Sections Individual	935	0	417	Cattle	6/15	8/10
BLM - Pinedale	02196	Johnson Ridge Individual	545	440	165	Cattle	5/26	7/10
BLM - Pinedale	02075	LaBarge Creek Ranch Individual	177	194	42	Cattle	9/16	10/15
BLM - Pinedale	02091	LaBarge Individual	40	38	337	Cattle	7/1	9/30
BLM - Pinedale	02194	LaBarge Unit Individual	917	0	140	Cattle	5/16	9/15
BLM - Pinedale	12127	McNinch Deer Hill Individual	733	415	252	Horse Cattle	7/1 5/21	8/31 6/30
BLM - Pinedale	02077	North LaBarge Common	11014	9123	14500	Cattle	5/16	10/15
BLM - Pinedale	02163	O'Neil Individual	420	419	80	Cattle	5/16	6/15
BLM - Pinedale	22005	South LaBarge Common	4725	5008	10107	Cattle Horse	5/1 5/1	10/31 10/31
BLM - Pinedale	02195	South Piney Individual	370	0	141	Cattle	6/1	7/15
BLM - Pinedale	02179	Spence Place Individual	45	81	8	Cattle	5/1	5/31
BLM - Pinedale	12201	Upper North LaBarge Individual	891	1163	1985	Cattle	5/15	9/30
BLM - Pinedale	12129	West of Ranch Individual	253	82	130	Cattle	5/16	8/31
BLM - Rock Springs	13023	Figure Four	9999	8539	11108	Cattle	5/10	1/10

Appendix C - Air Quality

Air Resources

Air quality, air quality related values (AQRVs), such as visibility and atmospheric deposition, and climate change are the components of air resources which the BLM must consider and analyze to address the potential effects of authorized activities on air resources as part of the planning and decision making process. The Pinedale Resource Management Plan (RMP, November 26, 2008) addresses air quality issues, impacts, and potential mitigations (Sec. 2.3.1, Air Quality Management, p. 2-10).

Air Quality

Regional air quality is influenced by the interaction of meteorology, climate, the magnitude and spatial distribution of local and regional air pollutant sources, and the chemical properties of emitted air pollutants.

The monitoring and enforcement of air-quality standards are administered by the Wyoming Department of Environmental Quality-Air Quality Division (WDEQ). Wyoming Ambient Air Quality Standards (WAAQS) and National Ambient Air Quality Standards (NAAQS) identify maximum limits for concentrations of criteria air pollutants at all locations to which the public has access. The WAAQS and NAAQS are legally enforceable standards. Concentrations above the WAAQS and NAAQS represent a risk to human health that, by law, require public safeguards be implemented. State standards must be at least as protective of human health as federal standards, and may be more restrictive than federal standards, as allowed by the Clean Air Act (CAA). Currently, the WDEQ-AQD does not regulate greenhouse gas emissions other than for permitted major stationary sources.

Pollutant concentration can be defined as the mass of pollutants present in a volume of air and is reported in units of micrograms per cubic meter (µg/m3), parts per million (ppm), or parts per billion (ppb). The state of Wyoming has used monitoring and modeling to determine compliance with WAAQS and NAAQS. In addition, other monitoring systems are operational in the Pinedale area, including the EPA's Clean Air Status and Trends Network (CASTNET) and Wyoming Air Resources Monitoring System (WARMS). Monitoring data from these systems have been determined to be representative of the area. There are six WDEQ sites, two NADP sites, two IMPROVE sites and one WARMS/CASTNET site within the project area.

Criteria Air Pollutants

Criteria Air Pollutants are those for which national concentration standards have been established. Pollutant concentrations that are greater than the established standards pose a risk to human health and/or welfare. Five of the six criteria pollutants for which the EPA has established NAAQs are:

- Carbon monoxide (CO): CO is an odorless, colorless gas formed during combustion of any carbon-based fuel, such as during the operation of engines, fireplaces, and furnaces. Because carbon monoxide data are generally collected only in urban areas where automobile traffic levels are high, recent data are often unavailable for rural areas.

- Nitrogen dioxide (NO_2): NO_2 is a highly reactive compound formed at high temperatures during fossil fuel combustion. During combustion, nitrogen monoxide (NO) is released into the air which reacts with oxygen in the atmosphere to form NO_2. NO plus NO_2 forms a mixture of nitrogen gases, collectively called nitrogen oxides (NOx). NOx emissions can convert to ammonium nitrate particles and nitric acid, which can cause visibility impairment and atmospheric deposition. NOx can contribute to "brown cloud" conditions and ozone formation, and can convert to ammonium (NH_4), nitrate particles (NO_3), and nitric acid (HNO_3). Internal combustion engines are a major source of NOx emissions.

- Ozone: Ozone is a gaseous pollutant that is not emitted directly into the atmosphere but is formed in the atmosphere from complex photochemical reactions involving NOx and reactive volatile organic compounds (VOCs). Common sources of VOCs include automotive and heavy equipment emissions, paints and varnishes, oil and gas operations, and wildfires. Ozone is a strong oxidizing chemical that can burn the lungs and eyes and damage plants. Ozone is a severe respiratory irritant at concentrations in excess of the federal standards.

- Particulate matter (PM): PM is small particles suspended in the air that settle to the ground slowly and may be re-suspended if disturbed. Ambient air particulate matter standards are based on the size of the particle. The two types of particulate matter are:
    - PM_{10} (particles with diameters less than 10 micrometers): small enough to be inhaled and capable of causing adverse health effects.
    - $PM_{2.5}$ (particles with diameters less than 2.5 micrometers): small enough to be drawn deeply into the lungs and cause serious health problems. These particles are a primary cause of visibility impairment.

- Sulfur dioxide (SO_2) and sulfates (SO_4): SO_2 and SO_4 form during combustion from trace levels of sulfur in coal or diesel fuel. SO_2 also participates in chemical reactions and can form sulfates and sulfuric acid in the atmosphere.

- Prevention of Significant Deterioration (PSD) Increments: PSD relates to Class I areas (wilderness areas with protected air quality status due to their pristine condition) and Class II areas (areas with protected air quality status due to their sensitive condition). The PSD program goal is to maintain pristine air quality required to protect public health and welfare from air pollution effects and "to preserve, protect, and enhance the air quality in national parks, national wilderness areas, national monuments, national seashores, and other areas of special national or regional natural, recreation, scenic or historic value. PSD Class I and other sensitive areas located in close proximity to the PFO.

Wyoming Ambient Air Quality Standards (WAAQS) & National Ambient Air Quality Standards (NAAQS)

Pollutant	Averaging Time	National Ambient Air Quality Standards (NAAQS)			Wyoming Ambient Air Quality Standards (WAAQS)		
		Primary			Primary		
		(ppm)	(ppb)	(ug/m^3)	(ppm)	(ppb)	(ug/m^3)
Carbon Monoxide	1 hour	**35** [(a)]	35,000	40,000	**35**	35,000	40 (mg/m^3)
	8 hour	**9** [(a)]	9,000	10,000	**9**	9,000	10 (mg/m^3)
Lead	Rolling 3-month	**---**	**---**	**0.15**	**---**	**---**	**0.15**
Nitrogen Dioxide	1 hour	0.1	**100** [(b)]	189	0.1	**100**	189
	Annual (Arithmetic Mean)	0.053	**53**	100	0.053	**53**	100
PM_{10}	24 hour	**---**	**---**	**150** [(c)]	**---**	**---**	**150**
	Annual (Arithmetic Mean)	None			**---**	**---**	**50**
$PM_{2.5}$	24 hour	**---**	**---**	**35** [(d)]	**---**	**---**	**35**
	Annual (Arithmetic Mean)	**---**	**---**	**12.0** [(e)]	**---**	**---**	**15.0**
Ozone	8 hour	**0.075** [(f)]	75	147	**0.075**	75	147
Sulfur Dioxide	1 hour	0.075	**75** [(g)]	197	0.075	**75**	197
Hydrogen Sulfide	1/2 hour average	**---**	**---**	**---**	0.05	50	**70** [(h)]
	1/2 hour average	**---**	**---**	**---**	0.03	30	**40** [(i)]

Note: **Bold** indicates the standard as written in the corresponding regulation. Other values are conversions.

[(a)] Not to be exceeded more than once per year.

[(b)] To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 100 ppb (effective January 22, 2010).

[(c)] Not to be exceeded more than once per year on average over 3 years.

[(d)] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m^3 (effective December 17, 2006).

[(e)] To attain this standard, the 3-year average of the weighted annual mean PM2.5 concentrations from single or multiple community-oriented monitors must not exceed 12.0 µg/m^3 (effective December 14, 2012).

[(f)] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm (effective March 27, 2008).

[(g)] To attain this standard, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 ppb (effective June 22, 2010).

[(h)] not to be exceeded more than two times per year.

[(i)] not to be exceeded more than two times in any five consecutive days.

Ozone

Air quality in the Pinedale Field Office (PFO) meets the WAAQS and the NAAQS, with the exception of ozone. Several of Sublette County's ambient air monitoring stations recorded ozone concentrations above the current ozone standard of 75 parts per billion (ppb) over an eight-hour period on several occasions in 2005, 2006, 2008 and 2011.

Although elevated ozone occurs throughout the year, the occurrence of Upper Green River Basin (UGRB) high ozone events from early February to late March contrasts with the more typical summer occurrences in other areas of the United States. Winter ozone becomes elevated in the UGRB when there is a presence of ozone-forming precursor emissions including NOx and VOCs coupled with strong temperature inversions, low winds, snow cover, and bright sunlight. Ozone advisories are issued by the WDEQ when weather conditions appear conducive for the formation of ozone. Ozone levels are measured at five permanent monitoring stations in the UGRB: Big Piney, Pinedale, Daniel South, Boulder and Juel Spring.

On April 30, 2012, the EPA formally designated the UGRB as a 'Marginal' ozone nonattainment area, effective July 20, 2012.

EPA's designation of the UGRB as marginal nonattainment has significant implications for both currently proposed oil and gas development projects in the area as well as future BLM management actions. As a result of the nonattainment designation, the BLM must comply with General Conformity regulations in 40 CFR 93 subpart B and Chapter 8, Section 3 of the Wyoming Air Quality Standards and Regulations (WAQSR) for any federal action within the designated nonattainment area.

As of July 20, 2013, the BLM is required to conduct a General Conformity analysis and cannot approve any action that would cause or contribute to a new violation of the NAAQS or increase the frequency or severity of any existing violation. A formal General Conformity determination must be conducted for any action where the total of direct and indirect emissions for the WGFD proposed action exceeds the de minimis levels specified in 40 CFR 93.153(b) and WAQSR Chapter 8, Section 3. For projects located in a marginal ozone nonattainment area, this de minimis level is 100 tons per year (tpy) of VOC or NOx. The WGFD proposed action cannot be implemented until a determination of conformity is achieved. For projects that are below the de minimis threshold level of 100 tpy for NOx or VOC, the BLM must complete a conformity analysis and demonstrate that the proposed project will not exceed the de minimis threshold level and is therefore exempt from requiring a conformity determination.

Visibility

The Clean Air Act includes "as a National Goal the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory Class I federal areas in which impairment results from manmade air pollution." The CAA gives federal managers the affirmative responsibility, but no regulatory authority, to protect air quality-related values, including visibility, from degradation. A wide

variety of pollutants can impact visibility, including PM, NO_2, NO_3, and SO_4. Fine particles suspended in the atmosphere decrease visibility by blocking, reflecting, or absorbing light. Regional haze occurs when pollutants from widespread emission sources become mixed in the atmosphere and travel long distances.

Visibility is quantified in terms of the deciview (dv), which is defined as a change in light extinction, with one dv representing the minimal perceptible change in visibility to the human eye, and in terms of the Standard Visible Range (SVR), which is defined as the greatest distance that a standard object can be seen by the unaided eye. Figure 1 displays annual average visibility in deciviews for the 20 percent best days, 20 percent worst days, and all days for each year during the period 2000-2010 for the Bridger Wilderness IMPROVE site.

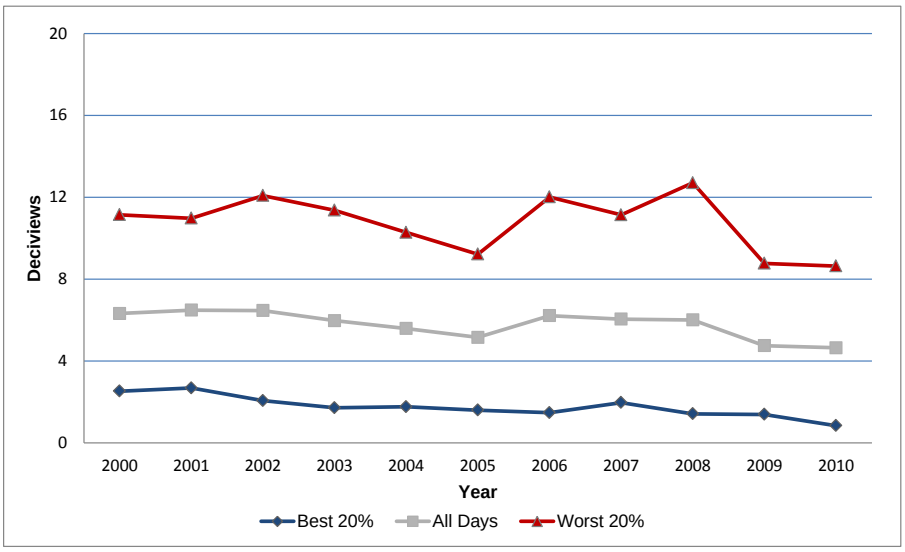


Figure 1. Source: VIEWS 2012

Deposition

Through a process called atmospheric deposition, air pollutants fall out of the atmosphere and are deposited on terrestrial and aquatic ecosystems. These pollutants are deposited via wet deposition (precipitation) and dry deposition (gravitational settling of particles and gaseous pollutants that adhere to soil, water, and vegetation). Substances deposited include:

- Acids, such as sulfuric acid and nitric acid (HNO_3) (referred to as "acid rain")
- Air toxins, such as pesticides, herbicides, and VOCs
- Nutrients, such as nitrate and ammonium (NH_4^+)

Deposition is reported as the mass of material deposited on an area (kilogram per hectare per year). Total deposition refers to the sum of airborne material transferred to the Earth's surface by both wet and dry deposition.

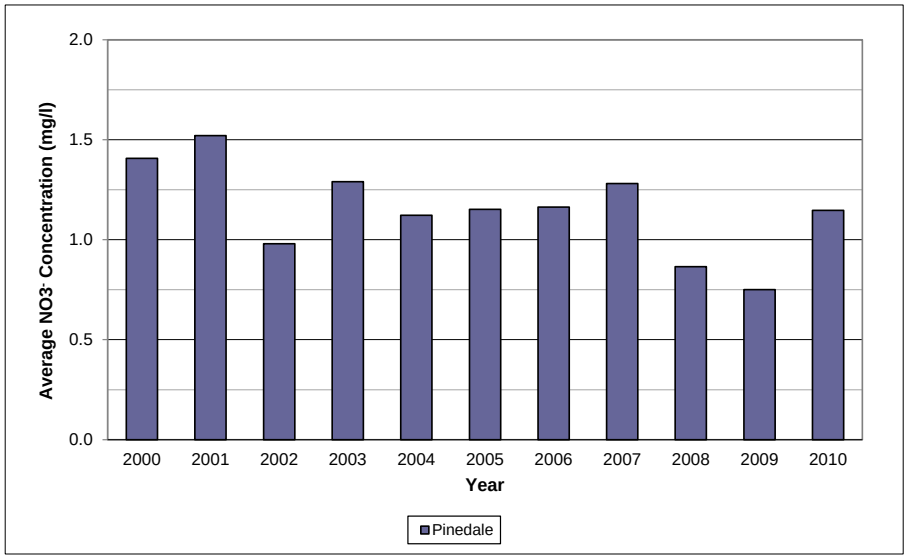
Atmospheric deposition of nitrogen and sulfur compounds can cause acidification of lakes and streams. One expression of Lake Acidification is a change in acid neutralizing capacity (ANC), which is a lake's ability to resist acidification from atmospheric deposition. ANC is expressed in units of micro-equivalents per liter (µeq/l). Lakes with ANC values of 25 to100 µeq/l are considered sensitive to atmospheric deposition; lakes with ANC values of 10 to 25 µeq/l are considered very sensitive; and lakes with ANC values of less than 10 are considered extremely sensitive.

Site-specific lake water chemistry background data (pH, ANC, total bulk deposition of nitrate, sulfate, etc.) have been collected by the U.S. Forest Service (USFS) in Hobbs and Black Joe lakes in the Bridger Wilderness area to determine the chemical deposition of particles in the air, which are washed out with precipitation. These sites are sampled every two weeks in the summer, and every four weeks in the winter. Rocky Mountain Research Station analyzes samples and the USFS reviews and summarizes the data to complete an annual report for the WDEQ and industry. These sample sites are co-located with Long-term Lake Sampling (LLS) sites to allow study of the cause and effect of pollutants. The USFS has identified a specific methodology to determine acceptable changes in ANC, which are used to evaluate potential air quality impacts from deposition at acid sensitive lakes. They have established a level of acceptable change (LAC) of no greater than a 1 µeq/l change in ANC (from human causes) for lakes with existing ANC levels less than or equal to 25 µeq/l. A limit of 10 percent change in ANC reduction was adopted for lakes with an ANC greater than 25 µeq/l.

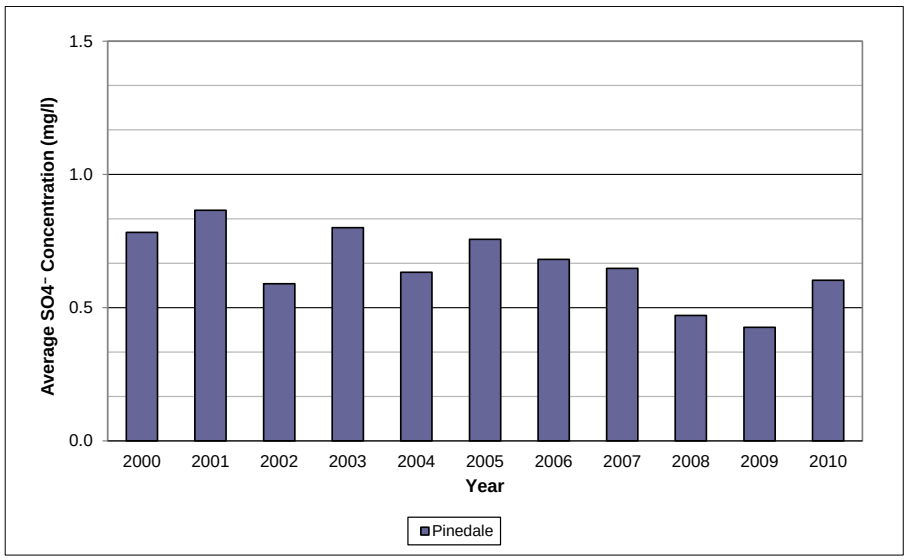
Atmospheric deposition is measured at NADP (wet deposition) and CASTNet (dry deposition) sites in Pinedale. Wet deposition is characterized by the concentration of NO_3^-, SO_4^{--}, and NH_4^+ in precipitation samples. Figure 2 (a)-(c) displays annual average concentration data for NO_3^-, SO_4^{--}, and NH_4^+ from precipitation samples for each year during the period of 2000-2010 for the NADP site. For each year, the data represent the average concentration based on all sampling periods. Units are milligrams per liter (mg/l). The data indicate a decrease over time for all three species in precipitation samples during this period. The downward trend is statistically significantly only for the sulfate ion.

Figure 2. Annual Average Concentration in Wet Deposition (mg/l) for the NADP Monitoring Site at Pinedale.

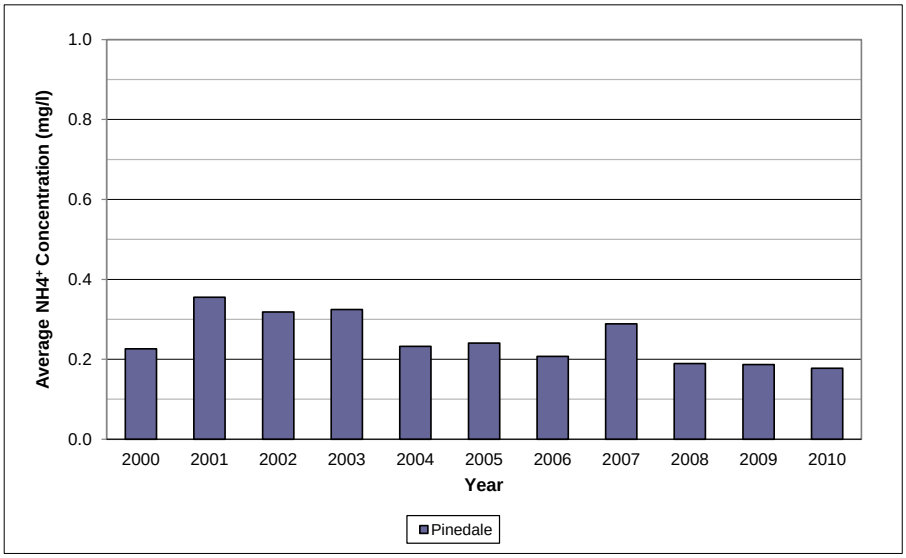
(a) Nitrate Ion Concentration



(b) Sulfate Ion Concentration



(c) Ammonium Ion Concentration



Appendix D - Geology and Paleontology

Geology

Recent alluvium (Qal) and gravels (Qc) as well as slightly older Pleistocene alluvium (Qa) and terrace gravels (Qgt) perched above the present-day drainage level have been deposited over older geological units in the Wyoming Range Mule Deer Project area. Other bedrock surfaces delineated by Oriel and Platt (1980), who mapped the geology of the Preston quadrangle for the USGS, are also now mostly covered by modern soil horizons that developed on gently inclined, relatively stabilized slopes. A section of Oriel and Platt's map that encompasses the Wyoming Range Mule Deer Project. Additional information incorporated into Oriel and Platt's 1 degree by 2 degree map forms the basis of the following rock unit descriptions and interpretations. The Wyoming Range Mule Deer Project area encompasses part (or all) of seventeen Wyoming townships.

Upper and Middle Tongues of the Green River Formation and the Upper Tongue of the Wasatch Formation (Tgm) range from the early to middle Eocene Epoch in age and are collectively about 100m thick within the LBPI project area. The Green River Formation tongues are pale-weathering tan limestone and siltstone; the intermediately deposited Wasatch Formation tongue is red and brown mudstone and siltstone. The slightly older Fontenelle Tongue of the Green River Formation (Tgf) is up to 40 meters thick. It includes buff-colored laminated marlstones and limestone, brown oil shale, and siltstone.

The Diamictite of the Wasatch Formation (Twd) was developed before the Fontenelle Tongue was locally deposited at the base of the Green Giver Formation. The Diamictite unit incorporates unsorted boulders and blocks in a mudstone matrix that grades laterally into other units of the Wasatch Formation. Thinning basinward, it may be hundreds of meters thick in some areas. The dull red and green early Eocene mudstone, brown sandstone, and thin limestone beds of the New Fork Tongue of the Wasatch Formation (Twn) can be as much as 20 meters thick altogether. The early Eocene La Barge Member of the Wasatch Formation (Twl) can be up to 500 meters thick. The La Barge Member includes red and brown mudstone and conglomerate, yellow sandstone, and pisolitic limestone. The late Paleocene to early Eocene Chappo Member of the Wasatch Formation (Twc) includes red to gray conglomerate and sandstone up to 20 meters thick.

The Eocene Green River and Wasatch Formation members and tongues were deposited horizontally and sequentially in the same basin during the Miocene Era. These terrestrial and lake sediments, which still retain their essentially layer-cake character, accumulated above the eroded surface of older sediments deposited and deformed before the rise of mammals. These rocks include one formation deposited during the Mesozoic Era age of dinosaurs and older Cambrian to Permian Period formations deposited earlier during the Paleozoic Era.

The Adaville Formation (Kav) is brown-weathering, gray sandstone, siltstone, and carbonaceous clay that accumulated late in the Cretaceous Period near the end of the Mesozoic Era. This formation ranges up to 640 meters in overall thickness in some areas. The upper part is coarse and conglomeratic, and the lower part is coal-bearing.

The Wells Formation (PPw) is Pennsylvanian to Permian in age. It includes inter-bedded gray limestone and pale-yellow calcareous sandstone. It also includes minor gray dolomite and is cherty in the lower part. This formation thins eastward from 600 to 100 meters in thickness.

The upper Mississippian-to-Pennsylvanian Amsden Formation (PMa) includes red and gray cherty limestone as well as yellow siltstone, sandstone, and conglomerate. The Amsden Formation thins eastward from 170 to 100 meters thick.

The Madison Limestone (Mm) is lower to upper Mississippian in age. It includes massive light-gray limestone in the upper part (Mission Canyon Member) and thin-bedded dark-grey limestone in the lower part (Lodgepole Member). The Madison Limestone varies from 300 to 560 meters in thickness.

The upper part of the Darby Formation (MDd) includes black, yellow, and red sandstone with dark-gray dolomite and dolomitic limestone in the lower part. This formation was deposited during the upper Devonian and lower Mississippian. It is 140 meters thick.

The upper Ordovician aged Bighorn Dolomite (Ob) is entirely composed of light-gray, massive dolomite from 250 to 120 meters thick as it thins westward. Deposition of the Gros Ventre Formation (Cvg) began during the middle Cambrian and continued into the upper Cambrian. The late Cambrian Gallatin Limestone (Cg) was deposited above the Gros Ventre Formation. The Gallatin Limestone is 120 meters thick and is mottled gray and tan in color.

The Gros Ventre Formation thins eastward and ranges from 400 to 200 meters in thickness. The oldest bedrock geological unit found in the Wyoming Range Mule Deer Project area includes gray and tan limestone that is partly oolitic. The limestone portions of the Gros Ventre Formation occur above and below a zone of greenish-gray micaceous shale in the middle.

Paleontology

All paleontological resource considerations will adhere to the conditions and requirements as detailed in the Paleontological Resources Preservation Act of 2009 (the Omnibus Public Land Management Act of 2009, title VI-Department of Interior Authorizations, Subtitle D (S. 320)) and the Antiquities Act of 1906.

The Probable Fossil Yield Classification (PFYC) system, as adapted by BLM's Regional Paleontologist (BLM 2002), serves as a guide for classification for potential paleontological resources (BLM 2003). The PFYC is a draft classification system wherein geological units are classified according to the probability of yielding paleontological resources that are of concern to land managers (USFS 2001).

Areas underlain by either the Wasatch or Green River formations have a high potential for containing vertebrate paleontological resources (fossils) and outcrops should be evaluated for fossil potential before surface disturbing activities will be authorized. Based on the results of the paleontological survey, additional monitoring and/or mitigation may be necessary. Approximately ½ of the total acres of the Wyoming Range Mule Deer Project area contain the Wasatch and Green River formations. Alluvial formations make up most of the remainder of the Wyoming Range Mule Deer Project geologic units.

The U.S Bureau of Land Management has adopted a standardized 1 through 5 system of assigning shorthand Probable Fossil Yield Class (PFYC) ratings to geological formations and other mappable rock bodies. PFYC numbers that have been provisionally assigned to the bedrock sedimentary formations that underlie the Wyoming Range Mule Deer Project area are addressed in this section and listed within brackets next to formation names. The PFYC numbers are defined as follows:

Class 1. Igneous or metamorphic rock bodies that cannot preserve fossils, with the exception of air-fall or water-lain volcanic ash, which sometimes does.

Class 2. Sedimentary geologic units that is not likely to contain vertebrate fossils or scientifically significant invertebrate or plant fossils.

Class 3. Fossiliferous sedimentary geologic units that preserve fossils with variable significance, abundance, and occurrences. This class also includes sedimentary units of unknown fossil potential.

Class 4. Geologic units that regularly and predictably produce vertebrate fossils and/or scientifically significant invertebrate or plant fossils (like Class 5 units) where the risk of natural degradation and/or of human-caused adverse impacts is low.

Class 5. Geologic units that regularly and predictably produce vertebrate fossils and/or scientifically significant invertebrates and plants where the risk of natural degradation and/or adverse human-caused is elevated.

Associated lake deposits of the Green River Formation [PFYC 5] in Wyoming, Utah, and Colorado are renowned for well-preserved fish that are significantly clustered side-by-side in a small number of incredibly crowded death-assembly horizons documenting ecological total-catastrophes. The formation is also slowly but surely unveiling a vanishingly small number of the oldest recognizable primitive bats on record (Simmons and others, 2008). Fifty million years later, bats have emerged (by the dark of night) as an exceptionally diverse mammalian order that now embraces one-fifth of all living mammal species (Nowak, 1991).

The twenty-four recognized species of Green River Formation [PFYC 5] fish are overwhelmingly the most commonly preserved fossils (Grande, 1984). These delicately boned skeletons are occasionally associated with less commonly preserved aquatic plants, semiaquatic reptiles, and semi-terrestrial amphibians that more or less inhabited the same lacustrine habitat. Organic terrestrial detritus (mammals, birds, insects, leaves, and seeds) is also comparatively rare in these lake deposits. Within the Wyoming Range Mule Deer Project area, scientifically significant fossils from the Diamictite mapping unit and the Upper, Middle, and Fontenelle Tongues area are unrecognized, unreported, or nonexistent.

The Wasatchian NALMA (North American Land Mammal Age) was initially characterized by the entire suite of fossil mammalian species reported from the Wasatch Formation [PFYC 5]. The Society of Vertebrate Paleontology's committee on Nomenclature and Correlation of the North American Continental Tertiary (Wood and others, 1941) proposed and defined the term "Wasatchian" as an arbitrary time or age designation for the part of the Eocene that occurred before the middle Eocene

Bridgerian NALMA. Because the term “Wasatchian” is limited by definition to the Eocene, it cannot apply to the Paleocene portion of time documented by the lowermost strata included in the Wasatch Formation [PFYC 5] (Gazin, 1962).

The fluvial deposits of the Wasatch Formation [PFYC 5] contain disarticulated skeletons of crocodiles, turtles, birds, and fish as well as mammals. In the New Fork-Big Sandy area where fossil mammals were intensively collected from New Fork Tongue of the formation by R.M. West (1973), the ubiquitous remains of lower vertebrates were present at every mammalian locality. No records were kept of turtle occurrences because carapace and plastron fragments were too abundant and fragmentary to seriously tabulate and contemplate. Except for the conglomerate beds at the very base of the formation, vertebrate fossils have been found in all Wasatch Formation [PFYC 5] members (Murphy and Daitch, 2007). However, the distribution of these fossils varies considerably both stratigraphically and geographically.

Gazin (1962) collected and described mammals from New Fork Tongue within the Wyoming Range Mule Deer Project area on both sides of the Green River, and in a roughly parallel area further east (and out of the Wyoming Range Mule Deer Project area) along Alkali Creek until it merges with the Green River close to the northern confluence with the New Fork River. The La Barge local fauna was collected a few feet to more than a hundred feet below the base of the Fontenelle Tongue of the Green River Formation. The New Fork local fauna was collected at an analogous stratigraphic horizon from exposures outside the Wyoming Range Mule Deer Project area along the south side of the New Fork to the east of Big Piney, and along both sides of Alkali Creek.

Forty-three species from twelve mammalian orders were represented in the Wyoming Range Mule Deer Project area; local fauna (numerical species totals are enclosed by parentheses): marsupials (2), insectivores (2), primates (7), tillodonts (1), taeniodonts (1), endentates (1), rodents (5), carnivores (13), condylarths (3), pantodonts (1), perissodacyls (4), and artiodactyls (3). Thirty-three species from nine orders were represented in the New Fork local fauna: insectivores (1), primates (3), tillodonts (1), rodents (2), carnivores (10), condylarths (4), dinoceratids (1), perissodactyls (5) and artiodactyls (3)

R.M. West (1973) collected vertebrate fossils at nine additional New Fork Tongue exposures in the New Fork-Big Sandy area east of Wyoming Range Mule Deer Project outside of the APE project area. Small mammals are probably underrepresented in this collection. Turtles and crocodiles are also present in this area. Thirty-one lower Wasatchian mammalian species from twelve orders were recognized in the New Fork-Big Sandy local fauna: primates (3), insectivores (1), rodents (1), condylarths (5), taeniodonts (1), tillodonts (1), dinoceratids (1), pantodonts (1), carnivores (5), creodonts (3), artiodactyls (1), and perissodactyls (7).

The Middle Tiffanian NALMA to Clarkfordian NALMA, middle-late Paleocene to early Eocene Chappo Member, the stratigraphically lowest member of the Wasatch Formation [PFYC 5] in the Infill project area, is exposed in the southern end of the Wyoming Range Mule Deer Project area in the northwest corner of T26N R113W, the northeast corner of T26N R114W, and the southeast corner of T27N R114W. The faunal mix from the Buckman Hollow locality in T26n R114W on the west flank of Hogsback Ridge,

one of three Chappo Member localities collected by Dorr and Gingerich (1980), includes sixteen species from seven orders: multituberculates (1), primates (3), rodents (1), condylarths (7), taeniodonts (1), dinoceratids (1), and pantodonts (1). A carnivore species, an artiodactyl species, a perissidactyl species, and a pantodont species were present at their Oil Well locality just west of La Barge in T26N, R113W. Nineteen species from eight orders were also recognized by these workers at the Chappo Member type locality in T26N, R113W: multituberculates (3), marsupials (1), proteutheres (2), insectivores (1), primates (4), condylarths (7), carnivores (1), and teaniodonts (1).

Upper Cretaceous invertebrate and plant remains in Lincoln County, Wyoming exposures of the Adaville Formation [PFYC 3] have been recognized (Rubey and others, 1975). Vertebrate fossils have not been reported. In southeast Idaho, Mansfeld (1952) recognized bryzoans and a brachiopod in the lower Wells Formation [PFYC 3]. Numerous invertebrate and plant fossils found in the Amsden Formation [PFYC 3] have been described: marine algae and foraminifera (Manet, 1975), corals (Sando, 1975), ostracods (Morey, 1935), brachiopods (Gordon, 1975), clams and rostroconchs (Gordon and Projeta, 1975), and snails, ammonites, and trilobites (Gordon and Yochelson, 1975). A western Wyoming sandstone marker bed in the Ranchester Limestone Member of the Amsden Formation [PFYC 3] characteristically contains an abundance of fossil fish teeth. Noted fish paleontologist D.H. Dunkle recognized six genera of upper Mississippian fish from ten Amsden Formation [PFYC 3] localities (Sando and others, 1975).

In southeastern Idaho, invertebrate and plant fossils are common and sometimes well-preserved in exposures of the Madison Limestone [PFYC 3], according to Krumennacker (2009). Mansfield (1927) recognized horn corals, colonial corals, snails, bryzoans, articulate brachiopods, and cephalopods from this formation. Fossil snails have also been reported from Darby Formation [PFYC 2] in Idaho (Krumennacker, 2009).

The middle to upper Ordovician Bighorn Formation [PFYC 2] is typically barren or only sparsely fossiliferous. Well-preserved fossils are relatively abundant at two localities in the upper part of the Bighorn Formation at roughly the same stratigraphic horizon in the Bighorn Mountains. Seventeen articulate brachiopod species have been recognized at these two localities (Macomber, 1970), but the rest of the invertebrate fauna as not yet been described. Orbiculoid brachiopods and conodonts, the later including forms resembling Furnishina and Westergaardodina have been collected from the upper Gros Ventre Shale and lower Gallatin Limestone and conodonts have been collected from the upper part of the Gallatin Limestone in the Big Horn Mountains of Wyoming by Kouchy and others (1961).

In recently-surveyed areas near the Wyoming Range Mule Deer Project area, significant fossil fish localities have been discovered in a pipeline trench on and near Yellow Point Ridge in the Jonah Field (2006) along Luman Road in the Jonah gas field expanding the northerly limits of the ancient lake, Gosiute. Crocodilian/Alligatorid fossils recently discovered near Stud Horse Butte represent a new species (UintaPaleo 2007). High concentrations of fossils can be found in the blue/purple/maroon bands of clay located throughout the APE of this project.

Paleontological Classification Descriptions

Class	Description	Basis	Comments
1	Igneous and metamorphic (tuffs are excluded from this category) geologic units or units representing heavily disturbed preservational environments that are not likely to contain recognizable fossil remains	• Fossils of any kind known not to occur except in the rarest of circumstances. • Igneous or metamorphic origin.	The land manager's concern for paleontological resources on Class 1 acres is negligible. Ground disturbing activities will not require mitigation except in rare circumstances.
2	Sedimentary geologic units that are not likely to contain vertebrate fossils or scientifically significant invertebrate fossils	• Vertebrate fossils known to occur very rarely or not at all. • Age greater than Devonian. • Deep marine origin. • Diagenetic alteration.	The land manager's concern for paleontological resources on Class 2 acres is low. Ground disturbing activities are not likely to require mitigation.
3	Fossiliferous sedimentary geologic units in which fossil content varies in significance, abundance, and predictable occurrence. Also sedimentary units of unknown fossil potential.	• Units with sporadic known occurrences of vertebrate fossils. • Vertebrate fossils and significant invertebrate fossils known to occur inconsistently; predictability known to be low. • Poorly studied and/or poorly documented. Potential yield cannot be assigned without ground reconnaissance.	The land manager's concern for paleontological resources on Class 3 acres may extend across the entire range of management. Ground disturbing activities will require sufficient mitigation to determine whether significant paleontological resources occur in the area of a WGFD proposed action. Mitigation beyond initial findings will range from no further mitigation necessary to full and continuous monitoring of significant localities during the action.

Class	Description	Basis	Comments
4	Class 4 geologic units are Class 5 units (see below) that have lowered risks of human-caused adverse impacts and/or lowered risk of natural degradation	• Significant soil/vegetative cover; outcrop is not likely to be impacted. • Areas of any exposed outcrop are smaller than two contiguous acres. • Outcrop forms cliffs of sufficient height and slope that most is out of reach by normal means. • Other characteristics that lower the vulnerability of both known and unidentified fossil sites.	The land manager's concern for paleontological resources on Class 4 acres is toward management and away from unregulated access. Proposed ground disturbing activities will require assessment to determine whether significant paleontological resources occur in the area of a WGFD proposed action and whether the action will affect the paleontological resources. Mitigation beyond initial findings will range from no further mitigation necessary to full and continuous monitoring of significant localities during the action.
5	Highly fossiliferous geologic units that regularly and predictably produce vertebrate fossils and/or scientifically significant invertebrate fossils and that are at risk of natural degradation and/or human-caused adverse impacts	• Vertebrate fossils and/or scientifically significant invertebrate fossils are known and documented to occur consistently, predictably, and/or abundantly. • Unit is exposed; little or no soil/vegetative cover. • Outcrop areas are extensive; discontinuous areas are larger than two contiguous acres. • Outcrop erodes readily, may form badlands. • There is easy access to extensive outcrop in remote areas. • Other characteristics that increase the sensitivity of both known and unidentified fossil sites.	The land manager's highest concern for paleontological resources should focus on Class 5 acres. These areas are likely to be poached. Mitigation of ground disturbing activities is required and may be intense. Areas of special interest and concern should be designated and intensely managed.

Source: Originally developed by the Paleontology Center of Excellence and the Region 2 (USFS) Paleo Initiative, 1996. Some modification by Dale Hanson, Regional Paleontologist, Wyoming BLM, 2002.