# Idaho and Southwestern Montana Greater Sage-Grouse Approved Resource Management Plan Amendment

**Attachment 1**

**From the USDI 2015 Record of Decision and Approved Resource Management Plan Amendments for the Great Basin Region including the Greater Sage-Grouse Sub-Regions of: Idaho and Southwestern Montana, Nevada and Northeastern California, Oregon, and Utah**


Prepared by
US Department of the Interior
Bureau of Land Management
Idaho State Office



September 2015


BLM

**MISSION STATEMENT**

The BLM manages more than 245 million acres of public land, the most of any Federal agency. This land, known as the National System of Public Lands, is primarily located in 12 Western states, including Alaska. The BLM also administers 700 million acres of sub-surface mineral estate throughout the nation. The BLM's mission is to manage and conserve the public lands for the use and enjoyment of present and future generations under our mandate of multiple-use and sustained yield. In Fiscal Year 2014, the BLM generated $5.2 billion in receipts from public lands.

BLM/ID/SG/EIS-15+1610

## State Director Recommendation for Approval

We hereby recommend for approval the Idaho and Southwestern Montana Greater Sage-Grouse Resource Management Plan Amendment.

Timothy M. Murphy

Timothy M. Murphy, Idaho State Director

September 15, 2015

Date

Jamie E. Connell

Jamie E. Connell, Montana State Director

Sept 15, 2015

Date

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**Appendix A (Figures 2-1 through 2-14):**

# APPENDICES

# ACRONYMS AND ABBREVIATIONS

| Acronyms and Abbreviations | Full Phrase |
|---|---|
| AML | appropriate management level |
| APD | application for permit to drill |
| ARMPA | approved resource management plan amendment |
| AUM | animal unit-month |
| BLM | United States Department of the Interior, Bureau of Land Management |
| BMP | best management practices |
| BSU | biologically significant unit |
| CA | conservation area |
| CEQ | Council on Environmental Quality |
| CFR | Code of Federal Regulations |
| COA | condition of approval |
| COT | Conservation Objectives Team |
| CSU | controlled surface use |
| DOI | United States Department of the Interior |
| EA | environmental assessment |
| EIS | environmental impact statement |
| EPA | United States Environmental Protection Agency |
| ESA | US Endangered Species Act of 1973 |
| ESR | emergency stabilization and rehabilitation |
| FIAT | wildfire and invasive species habitat assessments |
| FLPMA | Federal Land Policy and Management Act of 1976 |
| GDP | geothermal drilling permit |
| GHMA | general habitat management area(s) |
| GIS | geographic information system |
| GRSG | Greater Sage-Grouse |
| HAF | habitat assessment framework |
| HMA | herd management area |
| HMAP | habitat management area plan |
| IDFG | Idaho Department of Fish and Game |
| IHMA | important habitat management area(s) |
| JEDI | Jobs and Economic Development Impact model |
| KPLA | known phosphate leasing area |
| LUPA | land use plan amendment |
| MFP | management framework plan |
| MFWP | Montana Fish, Wildlife, and Parks |
| MLP | master leasing plan |
| NEPA | National Environmental Policy Act of 1969 |
| NOA | notice of availability |
| NPS | National Park Service |
| NSO | no surface occupancy |
| OHV | off-highway vehicle |

| **ACRONYMS AND ABBREVIATIONS** *(continued)* | Full Phrase |
|---|---|
| PAC | priority areas for conservation |
| PDF | preferred design feature |
| PFC | proper functioning condition |
| PHMA | priority habitat management area(s) |
| RDF | required design feature |
| RFD | reasonably foreseeable development |
| RFPA | Rangeland Fire Protection Association |
| RMP | resource management plan |
| ROD | record of decision |
| ROW | right-of-way |
| S&Gs | standards and guidelines |
| SFA | sagebrush focal area(s) |
| SSS | special status species |
| TL | timing limitation |
| USFWS | United States Department of the Interior, Fish and Wildlife Service |
| USGS | United States Geological Survey |
| VDDT | Vegetation Dynamics Development Tool |
| WAFWA | Western Association of Fish and Wildlife Agencies |
| WEM | waivers, exceptions, and modifications |
| WSA | Wilderness Study Area |
| WUI | wildland-urban interface |

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# CHAPTER 1
# INTRODUCTION

The Federal Land Policy and Management Act of 1976 (FLPMA) directs the US Department of the Interior (DOI), Bureau of Land Management (BLM) to develop and periodically revise or amend its resource management plans (RMPs), which guide management of BLM-administered lands.

This Approved Resource Management Plan Amendment (ARMPA) is the result of the March 2010 US Fish and Wildlife Service (USFWS) 12-Month Finding for Petitions to List the Greater Sage-Grouse (*Centrocercus urophasianus*) as Threatened or Endangered (75 *Federal Register* 13910, March 23, 2010; USFWS 2010a). In that finding, the USFWS concluded that the Greater Sage-Grouse (GRSG) was "warranted, but precluded" for listing as a threatened or endangered species.

The USFWS reviewed the status of and threats to the GRSG in relation to the five listing factors provided in Section 4(a)(1) of the ESA. The USFWS determined that Factor A, "the present or threatened destruction, modification, or curtailment of the habitat or range of the GRSG," and Factor D, "the inadequacy of existing regulatory mechanisms," posed "a significant threat to the GRSG now and in the foreseeable future" (USFWS 2010a). The USFWS identified the principal regulatory mechanisms for the BLM as conservation measures in RMPs.

## 1.1 DESCRIPTION OF THE IDAHO AND SOUTHWESTERN MONTANA SUBREGIONAL PLANNING AREA

The ARMPA planning area boundary includes all lands regardless of jurisdiction (see **Figure 1-1**, Idaho and Southwestern Montana Planning Area Surface Management and Subsurface Estate, and **Figure 1-2**, Idaho and Southwestern Montana Planning Area, Greater Sage-Grouse Habitat Management Areas across All Jurisdictions). **Table 1-1** outlines the number of surface acres that are administered by specific federal agencies, states, and local governments and lands that are privately owned in the planning area.

The planning area includes other BLM-administered lands that are not allocated as habitat management areas for GRSG. The ARMPAs do not establish any additional management for these lands; these lands will continue to be managed according to their existing, underlying land use plans.

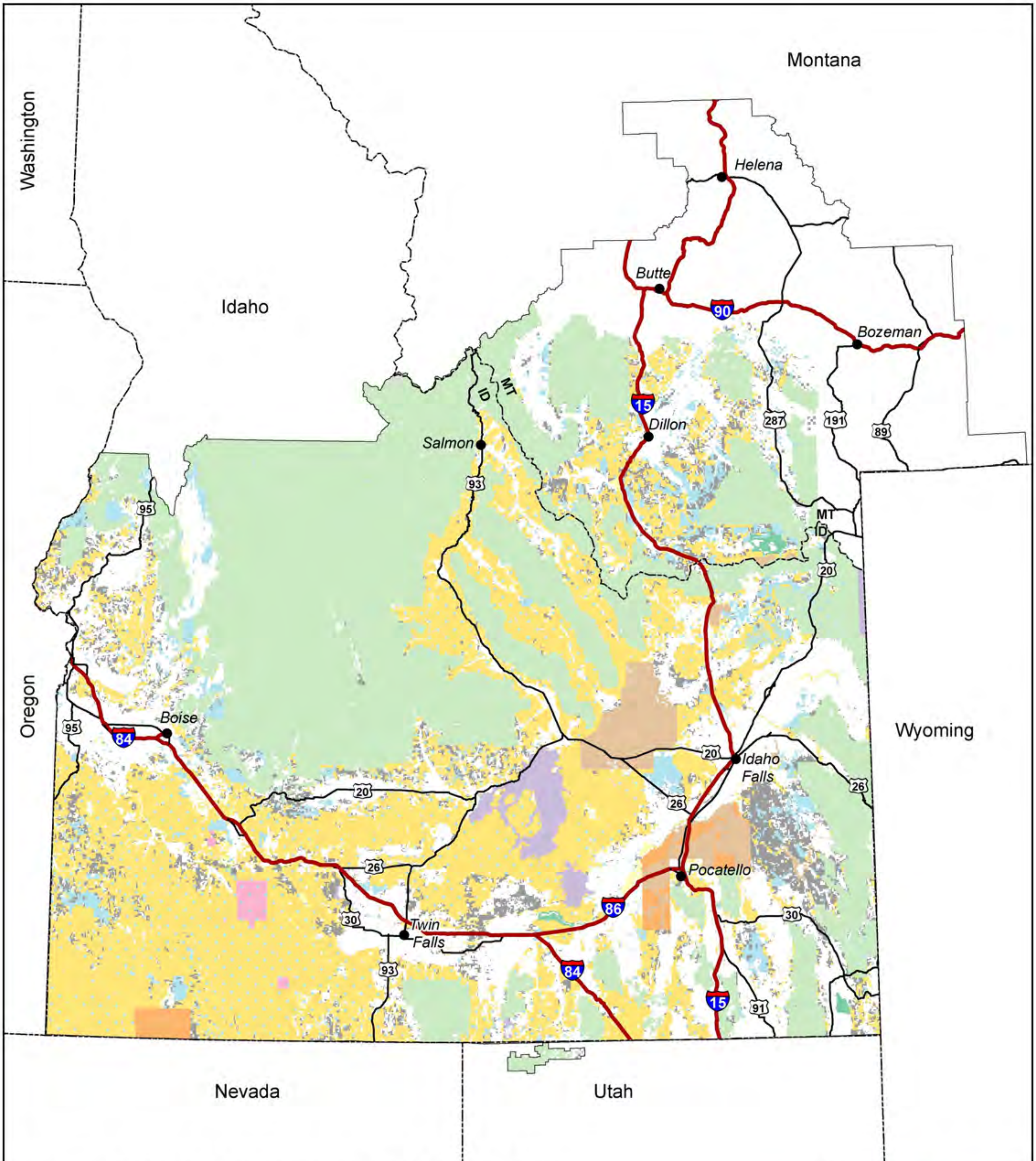


**Figure 1-1: Idaho and Southwestern Montana Planning Area Surface Management and Sub-Surface Estate**

Legend

- Bureau of Land Management
- National Park Service
- US Forest Service
- Indian Reservation
- US Fish and Wildlife
- Bureau of Reclamation
- Department of Defense
- Other Federal
- State
- Private\Other
- Non-Federal Surface, Federal Sub-Surface
- Planning Area Boundary
- State Boundary

0 25 50 Miles

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No warranty is made by the Bureau of Land Management (BLM). The accuracy, reliability, or completeness of these data for individual use or aggregate use with other data is not guaranteed.

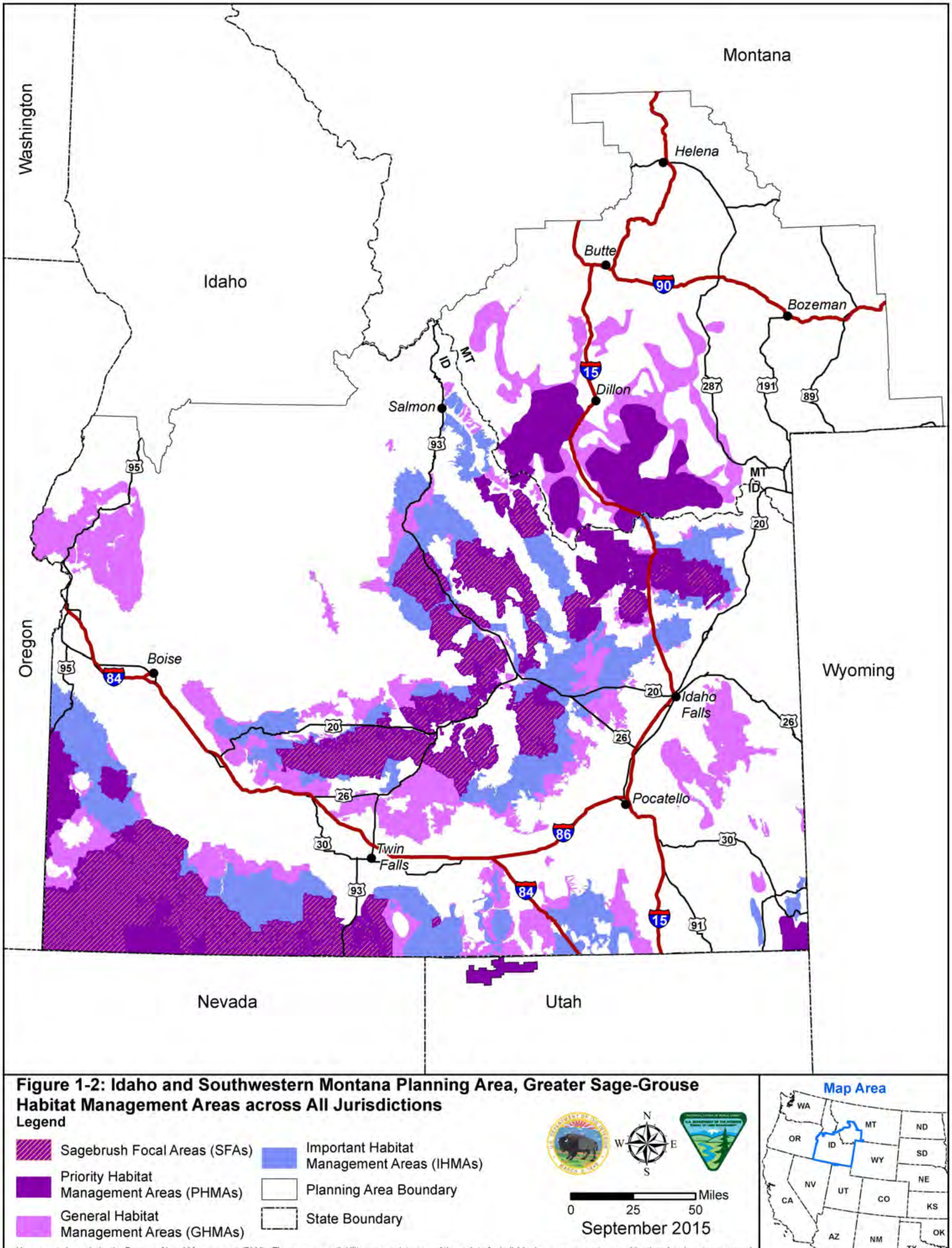


**Figure 1-2: Idaho and Southwestern Montana Planning Area, Greater Sage-Grouse Habitat Management Areas across All Jurisdictions**

No warranty is made by the Bureau of Land Management (BLM). The accuracy, reliability, or completeness of these data for individual use or aggregate use with other data is not guaranteed.

**Table 1-1**
**Land Management in the Planning Area**

| Surface Land Management | Total Surface Land Management Acres |
|---|---|
| BLM | 12,449,000 |
| Forest Service | 13,252,400 |
| Private | 13,637,700 |
| Indian Reservation | 343,600 |
| USFWS | 81,400 |
| Other | 414,400 |
| State | 2,646,100 |
| National Park Service | 511,700 |
| Other federal | 562,200 |
| Bureau of Reclamation | 116,300 |
| Department of Defense | 127,400 |
| **Total acres** | **43,842,300** |

Source: BLM and Forest Service GIS 2013

The decision area for the ARMPA is BLM-administered lands in GRSG habitat management areas (see **Figure 1-3**, Idaho and Southwestern Montana Decision Area, Greater Sage-Grouse Habitat Management Areas for BLM Administered Lands (with SFA)), including surface and split-estate lands with BLM subsurface mineral rights. Any decisions in the ARMPA apply only to BLM-administered lands, including split-estate lands within GRSG habitat management areas (the decision area). These decisions are limited to providing land use planning direction specific to conserving GRSG and its habitat.

GRSG habitat on BLM-administered lands in the decision area consists of lands allocated as priority habitat management areas (PHMA), important habitat management areas (IHMA), and general habitat management areas (GHMA; see **Table 1-2**).

PHMA, IHMA, and GHMA are defined as follows:

- PHMA—BLM-administered lands identified as having the highest value to maintaining sustainable GRSG populations. Areas of PHMA largely coincide with areas identified as priority areas for conservation in the USFWS's COT report. These areas include breeding, late brood-rearing, winter concentration areas, and migration or connectivity corridors.
- IHMA—BLM-administered lands that provide a management buffer for PHMA and connect patches of PHMA. IHMA encompass areas of generally moderate to high conservation value habitat and populations but that are not as important as PHMA. There are no IHMA designated within southwestern Montana.
- GHMA—BLM-administered lands where some special management will apply to sustain GRSG populations; areas of occupied seasonal or year-round habitat outside of PHMA or IHMA.

This ARMPA also identifies specific sagebrush focal areas (SFA), which are a subset of PHMA (see **Figure 1-3**). The SFA were derived from GRSG stronghold areas described in a USFWS memorandum

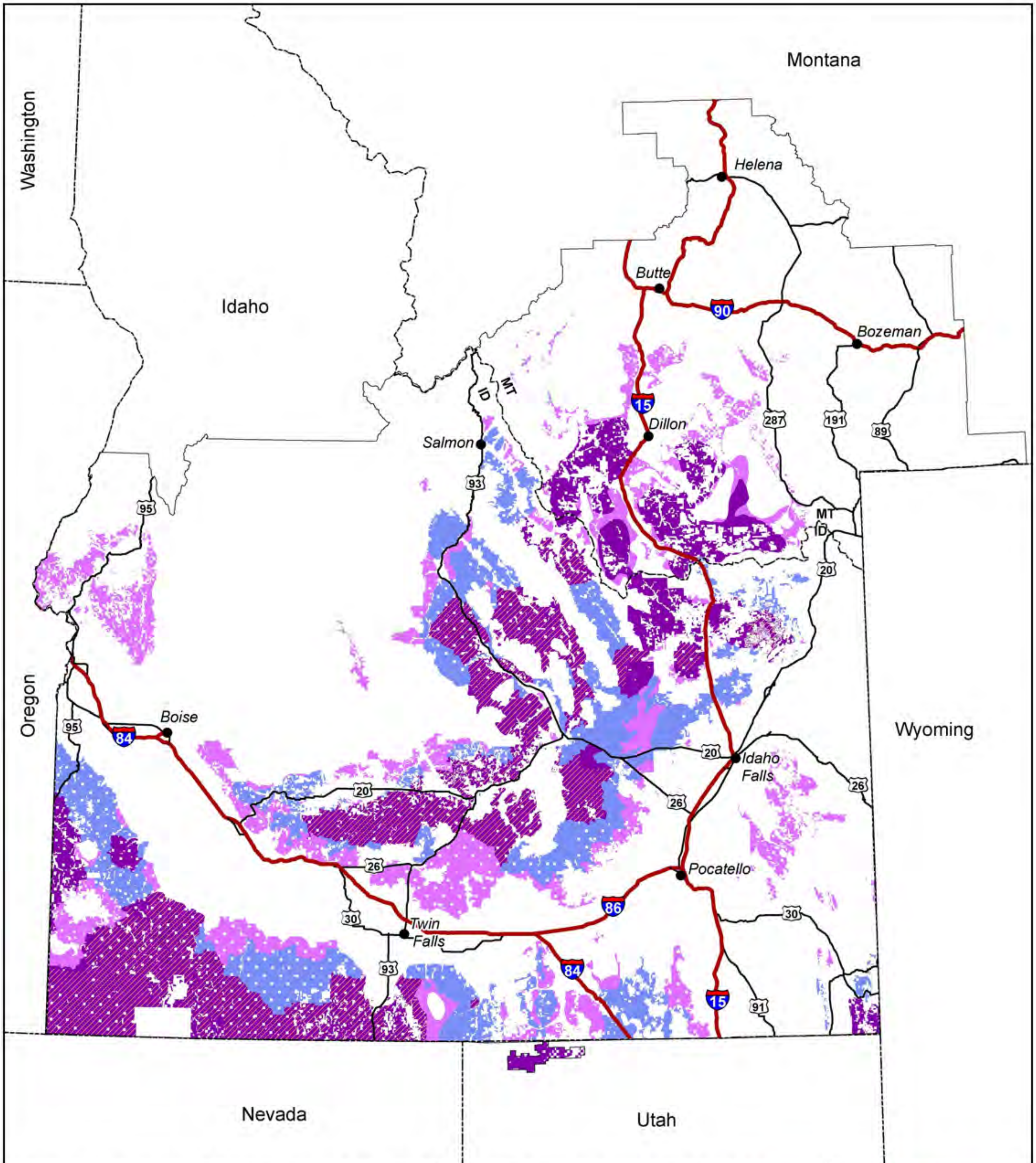


**Figure 1-3: Idaho and Southwestern Montana Decision Area, Greater Sage-Grouse Habitat Management Areas for BLM Administered Lands**

**Legend**

Sagebrush Focal Areas (SFAs)
Priority Habitat Management Areas (PHMAs)
General Habitat Management Areas (GHMAs)
Important Habitat Management Areas (IHMAs)
Planning Area Boundary
State Boundary

0 25 50 Miles

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Map Area

No warranty is made by the Bureau of Land Management (BLM). The accuracy, reliability, or completeness of these data for individual use or aggregate use with other data is not guaranteed.

**Table 1-2**
**Acres of PHMA, IHMA, and GHMA in the Decision Area for the ARMPA**

| | PHMA | IHMA | GHMA |
|---|---|---|---|
| BLM-administered surface | 4,627,200 | 2,737,600 | 2,179,700 |
| BLM-administered mineral estate | 5,198,400 | 3,253,400 | 2,791,600 |

Source: BLM GIS 2015

to the BLM titled Greater Sage-Grouse: Additional Recommendations to Refine Land Use Allocations in Highly Important Landscapes (USFWS 2014). The memorandum and associated maps provided by the USFWS identify areas that represent recognized strongholds for GRSG that have been noted and referenced as having the highest densities of GRSG and other criteria important for the persistence of the species.

PHMA (including SFA), IHMA, and GHMA on BLM-administered lands in the decision area fall within 28 counties in Idaho and portions of 2 counties in southwestern Montana (see **Table 1-3**). The habitat management areas also span 10 BLM Idaho field offices and 1 BLM Montana field office (see **Table 1-4**).

**Table 1-3**
**Acres[1] of GRSG Habitat by County in the Decision Area (BLM-Administered Lands Only)**

| County Name | ARMPA | | | |
|---|---|---|---|---|
| | PHMA[2] | IHMA | GHMA | TOTAL |
| Ada | 0 | 0 | 510 | 510 |
| Adams | 0 | 0 | 22,200 | 22,200 |
| Bear Lake | 31,100 | 18,400 | 1,420 | 50,800 |
| Bingham | 2,240 | 84,200 | 90,800 | 177,200 |
| Blaine | 285,600 | 159,700 | 95,700 | 541,000 |
| Bonneville | 0 | 6,510 | 14,900 | 21,400 |
| Butte | 328,600 | 163,500 | 4,080 | 496,100 |
| Camas | 95,500 | 1,460 | 15,500 | 112,500 |
| Caribou | 0 | 0 | 15,200 | 15,200 |
| Cassia | 5,130 | 202,200 | 134,200 | 341,500 |
| Clark | 251,400 | 66,400 | 16,200 | 334,000 |
| Custer | 408,000 | 255,800 | 102,600 | 766,400 |
| Elmore | 19,200 | 85,600 | 138,100 | 242,800 |
| Fremont | 57,300 | 42,300 | 1,800 | 101,400 |
| Gem | 0 | 0 | 33,300 | 33,300 |
| Gooding | 148,200 | 30,800 | 59,900 | 238,800 |
| Jefferson | 56,400 | 122,000 | 5,040 | 183,500 |
| Jerome | 0 | 0 | 98,900 | 98,900 |
| Lemhi | 98,900 | 272,800 | 45,900 | 417,700 |
| Lincoln | 213,200 | 41,400 | 302,400 | 557,000 |
| Madison | 23,700 | 11,600 | 101,400 | 136,600 |
| Minidoka | 54,800 | 78,100 | 19,400 | 152,200 |
| Oneida | 0 | 152,300 | 85,000 | 237,300 |

**Table 1-3**
**Acres[1] of GRSG Habitat by County in the Decision Area (BLM-Administered Lands Only)**

| County Name | ARMPA | | | |
|---|---|---|---|---|
| | PHMA[2] | IHMA | GHMA | TOTAL |
| Owyhee | 1,852,200 | 781,200 | 398,100 | 3,031,500 |
| Payette | 0 | 0 | 20,000 | 20,000 |
| Power | 0 | 73,300 | 26,500 | 99,800 |
| Twin Falls | 258,800 | 88,100 | 10,300 | 357,200 |
| Washington | 0 | 0 | 199,500 | 199,500 |
| Beaverhead | 436,900 | 40 | 120,700 | 557,600 |
| Silver Bow | 0 | 0 | 50 | 50 |
| **Grand Total** | **4,627,100** | **2,737,600** | **2,179,700** | **9,544,500** |

Source: BLM GIS 2015

[1] Surface acres; does not include subsurface mineral estate.
[2] PHMA acres in the proposed plan include 3,606,100 acres associated with SFA in the counties of Blaine, Bingham, Butte, Camas, Cassia, Clark, Custer, Elmore, Fremont, Gooding, Jefferson, Lemhi, Lincoln, Minidoka, Owyhee, and Twin Falls.

**Table 1-4**
**Acres[1] of GRSG Habitat by BLM District/Field Office in the Decision Area (BLM-Administered Lands Only)**

| BLM Field Office | ARMPA | | | |
|---|---|---|---|---|
| | PHMA[2] | IHMA | GHMA | TOTAL |
| Bruneau | 941,800 | 106,200 | 129,800 | 1,177,700 |
| Burley | 104,000 | 257,600 | 173,000 | 534,600 |
| Challis | 335,300 | 313,500 | 111,200 | 760,000 |
| Four Rivers | 0 | 86,100 | 392,300 | 478,500 |
| Jarbidge | 421,300 | 380,500 | 116,500 | 918,200 |
| Owyhee | 649,300 | 357,000 | 158,300 | 1,164,600 |
| Pocatello | 31,100 | 179,400 | 111,800 | 322,300 |
| Salmon | 94,400 | 207,800 | 34,100 | 336,200 |
| Shoshone | 776,400 | 257,300 | 583,500 | 1,617,200 |
| Upper Snake | 813,100 | 592,100 | 147,300 | 1,552,500 |
| Dillon | 460,600 | 0 | 222,000 | 682,600 |
| **Total Acres** | **4,627,200** | **2,737,600** | **2,179,700** | **9,544,500** |

Source: BLM GIS 2015

[1] Surface acres; does not include subsurface mineral estate.
[2] Includes 3,606,100 acres of SFA in the Bruneau, Burley, Challis, Jarbidge, Owyhee, Salmon, Shoshone, and Upper Snake Field Offices.

The Bruneau, Burley, Challis, Four Rivers, Jarbidge, Owyhee, Pocatello, Salmon, Shoshone, and Upper Snake BLM Field Offices in Idaho and the Dillon BLM Field Office in Montana administer the 24 pertinent RMPs being amended by this ARMPA.

The following BLM RMPs are hereby amended to incorporate appropriate GRSG conservation measures:

***Montana RMP***

- Dillon RMP (BLM 2006)

***Idaho RMPs***

- Bruneau MFP (BLM 1983)
- Cassia RMP (BLM 1985)
- Twin Falls MFP (BLM 1982)
- Challis RMP (BLM 1999)
- Cascade RMP (BLM 1988)
- Kuna MFP (BLM 1983)
- Snake River Birds of Prey National Conservation Area RMP (BLM 2008)
- Jarbidge RMP (BLM 1987)
- Owyhee RMP (BLM 1999)
- Pocatello RMP (BLM 2012)
- Lemhi RMP (BLM 1987)
- Craters of the Moon National Monument RMP (BLM 2006)
- Magic MFP (BLM 1975)
- Sun Valley MFP (BLM 1981)
- Bennett Hills/Timmerman Hills MFP (BLM 1980)
- Monument RMP (BLM 1985)
- Little Lost-Birch Creek MFP (BLM 1981)
- Medicine Lodge RMP (BLM 1985)
- Big Desert MFP (BLM 1981)
- Big Lost MFP (BLM 1983)
- Four Rivers RMP Revision
- Upper Snake RMP Revision
- Jarbidge Revision

## 1.2 PURPOSE AND NEED

The BLM has prepared this ARMPA with an associated EIS to amend RMPs for field offices and district offices containing GRSG habitat. This planning process is needed to respond to the USFWS's March 2010 "warranted, but precluded" ESA listing petition decision for GRSG. The USFWS identified (1) the present or threatened destruction, modification, or curtailment of habitat or range and (2) the inadequacy of existing regulatory mechanisms as significant threats and identified the principal regulatory mechanisms for the BLM as conservation measures incorporated into land use plans.

The purpose of the ARMPA is to identify and incorporate appropriate measures in existing land use plans to conserve, enhance, and restore GRSG habitat by avoiding, minimizing, or compensating for unavoidable impacts on GRSG habitat in the context of the BLM's multiple use and sustained yield mission under FLPMA. Changes in management of GRSG habitats are necessary to avoid the continued decline of populations across the species' range. This ARMPA focuses on areas affected by threats to GRSG habitat identified by the USFWS in the March 2010 listing decision and in the USFWS COT 2013 report.

The major threats to GRSG or their habitat on BLM-administered lands in the Idaho and southwestern Montana subregion are the following:

- Wildfire—loss of large areas of GRSG habitat due to wildfire
- Invasive species—conversion of GRSG habitat to cheatgrass-dominated plant communities
- Conifer invasion—encroachment of pinyon or juniper into GRSG habitat
- Infrastructure—fragmentation of GRSG habitat due to development, such as rights-of-way and renewable energy development
- Grazing—loss of habitat components due to improper livestock grazing
- Wild horses and burros—loss of habitat components due to excessive grazing
- Hard rock mining—fragmentation of GRSG habitat due to mineral exploration and development
- Fluid mineral development—fragmentation of GRSG habitat due to mineral exploration and development
- Human uses—fragmentation of GRSG habitat or modification of GRSG behavior due to human presence and activities
- Climate change–fragmentation of GRSG habitat due to climate stress
- Agriculture—conversion of GRSG habitat to agricultural uses
- Predation—mortality caused by a variety of predators
- Disease—mortality caused by a variety of parasites and diseases
- Water development—degradation of important brood-rearing habitat and facilitation of West Nile virus spread caused by livestock water developments
- Hunting—mortality caused by legal and illegal hunting

Because the BLM administers a large portion of GRSG habitat in the affected states, changes in GRSG habitat management are anticipated to have a considerable beneficial impact on present and future GRSG populations.

## 1.3 IDAHO AND SOUTHWESTERN MONTANA SUBREGIONAL GRSG CONSERVATION SUMMARY

The ARMPA identifies and incorporates measures to conserve, enhance, and restore GRSG habitat by avoiding, minimizing, and compensating for unavoidable impacts of threats to GRSG habitat. The ARMPA addresses threats to GRSG and its habitat identified by the GRSG National Technical Team (NTT), by the USFWS in the March 2010 listing decision, as well as those threats described in the USFWS's 2013 COT report. In that report, the USFWS identified threats by GRSG population across the range and stated whether that threat is present and widespread, present but localized, or unknown for that specific population. **Table 1-5** identifies the GRSG populations contained within the Idaho and southwestern Montana Subregion.

**Table 1-5**
**Threats to GRSG in the Idaho and Southwestern Montana Subregion as Identified by the Conservation Objectives Team**

| GRSG Identified Populations from the COT Report Applicable to the Idaho/Southwest Montana Subregion | Unit Number | Isolated Small Size | Sagebrush Elimination | Agriculture Conversion | Fire | Conifers | Weeds/Annual Grasses | Energy | Mining | Infrastructure | Improper Grazing | Free-Roaming Equids | Recreation | Urbanization |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Wyoming Basin (Wyoming, Idaho) | 9a | | L | | L | L | L | **Y** | L | **Y** | **Y** | L | **Y** | L |
| East Central (Idaho) | 18 | **Y** | L | **Y** | L | **Y** | L | **Y** | | **Y** | **Y** | | L | |
| Southwest Montana (Montana) | 19-22 | | L | | L | L | **Y** | L | L | L | **Y** | | L | L |
| Snake-Salmon-Beaverhead (Idaho) | 23 | | L | L | **Y** | L | **Y** | **Y** | | L | **Y** | **Y** | L | |
| Weiser (Idaho) | 25 | **Y** | L | L | L | L | **Y** | **Y** | | L | **Y** | | L | L |
| Northern Great Basin (Idaho, Oregon, Nevada) | 26a | | L | L | **Y** | **Y** | **Y** | L | L | **Y** | **Y** | L | **Y** | **Y** |
| Box Elder (Utah) | 26b | | | **Y** | **Y** | **Y** | **Y** | L | **Y** | **Y** | | | **Y** | |
| Sawtooth (Idaho) | 27 | **Y** | L | | L | U | L | | | **Y** | **Y** | | L | |

Source: COT 2013

Threats are characterized as Y = threat is present and widespread, L = threat present but localized, and U = unknown.

**Table 1-6** provides a crosswalk as to how the ARMPA for the Nevada and California Subregion addresses the threats from the COT Report.

**Table 1-6**
**Key Components of the Idaho and Southwestern Montana GRSG ARMPA Addressing COT Report Threats**

| Threats to GRSG and Its Habitat (from COT Report) | Key Component of the Idaho and Southwestern Montana ARMPA |
|---|---|
| All threats | • Implement the adaptive management plan, which allows for more restrictive land use allocations and management actions to be implemented if habitat or population hard triggers are met.<br>• Require and ensure mitigation that provides a net conservation gain to GRSG.<br>• Monitor implementation and effectiveness of conservation measures in GRSG habitats according to the habitat assessment framework. |
| All development threats, including mining, infrastructure, and energy development | • PHMA—Implement an anthropogenic disturbance cap of 3% within the biologically significant unit (BSU) and proposed project analysis areas (Idaho and Montana). Apply anthropogenic disturbance exception criteria and anthropogenic disturbance development criteria (Idaho only).<br>• PHMA/IHMA—Implement a density cap of an average of 1 energy and mining facility per 640 acres.<br>• IHMA—Implement the 3% disturbance cap. Apply anthropogenic disturbance development criteria.<br>• Apply buffers necessary based on project type and location to address impacts on leks when authorizing actions in GRSG habitat.<br>• Apply required design features (RDFs) when authorizing actions that affect GRSG habitat.<br>• Minimize the effects of infrastructure projects, including siting, using the best available science, updated as monitoring information on current infrastructure projects becomes available. |
| Energy development—fluid minerals, including geothermal resources | • PHMA—Open to fluid mineral leasing subject to no surface occupancy (NSO) stipulation without waiver or modification and with limited exception. In SFA, NSO without waiver, modification, or exception.<br>• IHMA—Open to fluid mineral leasing, subject to NSO stipulation without waiver or modification and with limited exception.<br>• GHMA—Open to fluid mineral leasing subject to controlled surface use (CSU) and timing limitation (TL) stipulations.<br>• Prioritize the leasing and development of fluid mineral resources outside GRSG habitat. |
| Energy development—wind energy | • PHMA—Exclusion area (not available for wind energy development under any conditions)<br>• IHMA—Avoidance area (may be available for wind energy development with special stipulations)<br>• GHMA—Avoidance area (may be available for wind energy development with special stipulations) |

**Table 1-6**
**Key Components of the Idaho and Southwestern Montana GRSG ARMPA Addressing COT Report Threats**

| Threats to GRSG and Its Habitat (from COT Report) | Key Component of the Idaho and Southwestern Montana ARMPA |
|---|---|
| Energy development—solar energy | • PHMA—Exclusion area (not available for solar energy development under any conditions)<br>• IHMA—Avoidance area (may be available for solar energy development with special stipulations)<br>• GHMA— Exclusion area (not available for solar energy development under any conditions) |
| Infrastructure—major ROWs | • PHMA—Avoidance area (may be available for major ROWs with special stipulations)<br>• IHMA—Avoidance area (may be available for major ROWs with special stipulations)<br>• GHMA—Avoidance area (may be available for major ROWs with special stipulations) |
| Infrastructure—minor ROWs | • PHMA—Avoidance area (may be available for minor ROWs with special stipulations)<br>• IHMA—Avoidance area (may be available for minor ROWs with special stipulations) |
| Mining—locatable minerals | • SFA—Recommend withdrawal from the Mining Law of 1872 |
| Mining—nonenergy leasable minerals | • PHMA—Closed area (not available for nonenergy leasable minerals) |
| Mining—salable minerals | • PHMA—Closed area (not available for salable minerals) with a limited exception (may remain open to free use permits and expansion of existing active pits if criteria are met) |
| Mining—coal | • Not applicable in the Idaho and Southwestern Montana subregional planning area. |
| Improper livestock grazing | • Prioritize the review and processing of grazing permits and leases in SFA, followed by PHMA.<br>• Include in the NEPA analysis for renewals and modifications of grazing permits and leases specific management thresholds, based on the GRSG habitat objectives (**Table 2-2**), land health standards, and ecological site potential, to allow adjustments to grazing that have already been subjected to NEPA analysis.<br>• Prioritize field checks in SFA, followed by PHMA, to ensure compliance with the terms and conditions of grazing permits. |
| Free-roaming equid (wild horses and burros) management | • Manage herd management areas (HMAs) in GRSG habitat within established appropriate management level (AML) ranges to achieve and maintain GRSG habitat objectives.<br>• Prioritize rangeland health assessment, gathers and population growth suppression techniques, monitoring, and review and adjustment of AMLs and preparation of HMA plans in GRSG habitat. |

**Table 1-6**
**Key Components of the Idaho and Southwestern Montana GRSG ARMPA Addressing COT Report Threats**

| Threats to GRSG and Its Habitat (from COT Report) | Key Component of the Idaho and Southwestern Montana ARMPA |
|---|---|
| Range management structures | • Allow range improvements that do not impact GRSG or that provide a conservation benefit to GRSG, such as fences for protecting important seasonal habitats.<br>• Remove livestock ponds built in perennial channels that are negatively impacting riparian habitats. Do not permit new ponds in these areas subject to valid existing rights. |
| Recreation | • PHMA and IHMA—Do not construct new recreation facilities.<br>• Allow special recreation permits only if their effects on GRSG and their habitat are neutral or result in a net conservation gain. |
| Fire | • Identify and prioritize areas that are vulnerable to wildfires and prescribe actions important for GRSG protection.<br>• Prioritize prevention, suppression, and restoration in SFA, then in PHMA, IHMA, and GHMA. |
| Nonnative, invasive plant species | • Improve GRSG habitat by treating annual grasses.<br>• Treat sites in PHMA, IHMA, and GHMA that contain invasive species infestations through an integrated pest management approach. |
| Sagebrush removal | • PHMA—Maintain all lands ecologically capable of producing sagebrush (but no less than 70%) with a minimum of 15% sagebrush cover or as consistent with specific ecological site conditions.<br>• Ensure that all BLM use authorizations contain terms and conditions regarding the actions needed to meet or progress toward meeting the habitat objectives for GRSG. |
| Pinyon or juniper expansion | • Remove conifers encroaching into sagebrush habitats, in a manner that considers tribal cultural values, prioritizing occupied GRSG habitat. |
| Agricultural conversion and exurban development | • Retain GRSG habitat in federal management, unless (1) the agency can demonstrate that disposal of the lands, including land exchanges, would provide a net conservation gain to the GRSG or (2) the agency can demonstrate that the disposal, including land exchanges, of the lands would have no direct or indirect adverse impact on conservation of the GRSG. |

The ARMPA also identifies and incorporates conservation measures for other uses and resources that are designed to conserve, enhance, and restore GRSG habitat. Specifically, the ARMPA requires the following summarized management decisions, subject to valid existing rights:

- Providing a framework for prioritizing areas in PHMA, IHMA, and GHMA for wildfire, invasive annual grass, and conifer treatments
- Requiring specific design features for certain lands and realty uses
- Implementing the anthropogenic disturbance exception criteria and anthropogenic disturbance development criteria

- Including GRSG habitat objectives in land health standards, as appropriate
- Adjusting grazing practices as necessary, based on GRSG habitat objectives, land health standards, and ecological site potential

The ARMPA also establishes screening criteria and conditions for new anthropogenic activities in PHMA and GHMA to ensure a net conservation gain to GRSG. The ARMPA will reduce habitat disturbance and fragmentation by limiting surface-disturbing activities, while addressing changes in resource condition and use through monitoring and adaptive management.

The ARMPA adopts key elements of the recommendations from the State of Idaho's GRSG Task Force by establishing conservation measures and developing a three-tiered habitat map (i.e., PHMA, IHMA, and GHMA) that directs disturbance out of the best GRSG habitat where possible. The three-tiered map also serves as the foundation for an adaptive management approach that includes habitat and population hard and soft triggers and for shifting IHMA to PHMA when triggers are hit.

For a full description of the BLM's ARMPA, see **Section 2**.

## 1.4 Planning Criteria

Planning criteria are based on appropriate laws, regulations, BLM manual and handbook sections, and policy directives. Criteria are also based on public participation and coordination with cooperating agencies, other federal agencies, state and local governments, and Native American tribes. These criteria are the standards, rules, and factors used as a framework to resolve issues and develop alternatives. They are prepared to ensure decision-making is tailored to the issues and to ensure that the BLM avoid unnecessary data collection and analysis. Preliminary planning criteria were included in the Draft RMPA/Draft EIS and were further refined for the Proposed RMPA/Final EIS.

Planning criteria carried forward for this ARMPA are as follows:

- The BLM used the WAFWA Conservation Assessment of GRSG and Sagebrush Habitats (Connelly et al. 2004) and any other appropriate resources (e.g., Knick et al. 2011) to identify GRSG habitat requirements and required design features.
- The ARMPA is consistent with the BLM's 2011National GRSG Conservation Strategy.
- The ARMPA complies with BLM direction, such as FLPMA, NEPA, and CEQ regulations at 40 CFR, Parts 1500-1508; DOI regulations at 43 CFR, Parts 4 and 1600; the BLM H-1601-1 Land Use Planning Handbook, "Appendix C: Program-Specific and Resource-Specific Decision Guidance Requirements" for affected resource programs; the 2008 BLM NEPA Handbook (H-1790-1; BLM 2008e); and all other applicable BLM policies and guidance.
- The ARMPA complies with the Wild Free-Roaming Horses and Burro Act of 1971 (as amended).
- The ARMPA is limited to providing direction specific to conserving GRSG species and habitats.
- The BLM considered land allocations and prescriptive standards to conserve GRSG and its habitat, as well as objectives and management actions to restore, enhance, and improve GRSG habitat.

- The ARMPA recognizes valid existing rights.
- The ARMPA addresses BLM-administered land in GRSG habitats, including surface and split-estate lands with BLM subsurface mineral rights. Any decisions in the ARMPA apply only to BLM-administered lands.
- Where more restrictive land use allocations or decisions are made in existing RMPs, they will remain in effect and will not be amended by this LUPA.
- The BLM used a collaborative and multi-jurisdictional approach, where appropriate, to determine the desired future condition of BLM-administered lands for conserving GRSG and their habitats.
- As described by law and policy, the BLM ensured that conservation measures are as consistent as possible with other planning jurisdictions within the planning area boundaries.
- The BLM considered a range of reasonable alternatives, including appropriate management prescriptions that focus on the relative values of resources, while contributing to the conservation of the GRSG and their habitat.
- The BLM addressed socioeconomic impacts of the alternatives and updated socioeconomic analysis for the Proposed RMPA/Final EIS. Socioeconomic analysis used such tools as the input-output quantitative models IMPLAN and the National Renewable Energy Laboratory's Jobs and Economic Development Impact model (JEDI) for renewable energy analysis, where quantitative data is available.
- The BLM used the best available scientific information, research, technologies, and results of inventory, monitoring, and coordination to inform appropriate local and regional management strategies that will enhance or restore GRSG habitats.
- Management of GRSG habitat that intersects with Wilderness Study Areas (WSAs) on BLM-administered lands will be guided by BLM Manual 6330 Management of Wilderness Study Areas. Land use allocations made for WSAs must be consistent with Manual 6330 and with other laws, regulations, and policies related to WSA management.
- The ARMPA is consistent with the objectives in BLM Manual 6840 Special Status Species Management.
- Management of other special designation areas (e.g., Wild and Scenic Rivers, National Historic Trails, Wilderness Areas, National Monuments, and National Conservation Areas) will be guided by the appropriate BLM manual or handbook.
- For BLM-administered lands, all activities and uses in GRSG habitats have followed existing land health standards. Standards and guidelines (S&G) for livestock grazing and other programs that have developed S&Gs are applicable to all alternatives for BLM-administered lands.
- The BLM has consulted with Native American tribes to identify sites, areas, and objects important to their cultural and religious heritage in GRSG habitats.
- The BLM has coordinated and communicated with state, local, and tribal governments to ensure that the BLM provided pertinent plans, that it sought to resolve inconsistencies

between state, local, and tribal plans, and that it provided ample opportunities for state, local, and tribal governments to comment on the development of amendments.

- The ARMPA has incorporated the principles of adaptive management.
- Reasonably foreseeable development (RFD) scenarios and planning for fluid minerals follow the BLM Handbook H-1624-1 and current fluid minerals manual guidance (oil and gas, coal bed methane, and oil shale) and geothermal resources.
- Data used in developing the ARMPA are consistent with the principles of the Information Quality Act of 2000 (Public Law [PL] 106-554, Section 515); state data was used as the basis for PHMA and GHMA identification.
- State fish and wildlife agencies' GRSG data and expertise have been considered in making management determinations on BLM-administered lands.

# CHAPTER 2
# APPROVED RESOURCE MANAGEMENT PLAN AMENDMENT

## 2.1 APPROVED RESOURCE MANAGEMENT PLAN AMENDMENT INSTRUCTIONS

This ARMPA is now the baseline plan for managing GRSG in Idaho and southwestern Montana in the following district offices: Boise, Twin Falls, and Idaho Falls in Idaho and Western Montana in Montana. The ARMPA adopts the management described in the Idaho and Southwest Montana Greater Sage-Grouse Proposed Resource Management Plan Amendment and Final Environmental Impact Statement (2015), with modifications and clarifications as described in the *Modifications and Clarifications* section of the record of decision (ROD).

In the event there are inconsistencies or discrepancies with previously approved RMPs, this ARMPA's decisions will be followed, unless there are more restrictive decisions in the existing plans. The BLM will continue to tier to statewide, national, and programmatic EISs and other NEPA and planning documents and will apply RDFs or other management protocols in other planning documents after appropriate site-specific analysis.

All future resource authorizations and actions in GRSG habitat will conform to or be consistent with the decisions contained in this ARMPA. All existing operations and activities authorized under permits, contracts, cooperative agreements, or other authorizations will be modified, as necessary and appropriate, to conform to this plan amendment within a reasonable time frame. However, this ARMPA does not repeal valid existing rights on public lands. A valid existing right is a claim or authorization that takes precedence over the decisions developed in this plan. If such authorizations come up for review and can be modified, they will also be brought into conformance with this plan amendment, as appropriate.

While the Final EIS for the Idaho and Southwestern Montana Proposed GRSG RMP Amendment constitutes compliance with NEPA for the broad-scale decisions made in this ARMPA, the BLM will continue to prepare environmental assessments (EAs) and EISs where appropriate as part of implementation level planning and decision-making.

## 2.2 GOALS, OBJECTIVES, AND MANAGEMENT DECISIONS

This section of the ARMPA presents the goals, objectives, land use allocations, and management actions established for protecting and preserving Greater Sage-grouse and its habitat on public lands managed by the BLM in Idaho and Southwestern Montana. These management decisions are presented by program area. Not all types of decisions were identified for each program. Land use allocations are depicted in **Appendix A**. A *Monitoring Framework* is also included (in **Appendix D**) to describe how the implemented program decisions will be monitored.

This section is organized by program area beginning with the Special Status Species (SSS) program, which identifies specific goals, objectives, and management actions for Greater Sage-grouse and its habitat. For ease of identification into the future, each program area has identified abbreviations (see below) for these program areas and each decision in that program is numbered in coordination with the abbreviation:

- Special Status Species **(SSS)**
  - GRSG Management Areas
  - Adaptive Management
  - Anthropogenic Disturbance
  - Monitoring
- Vegetation **(VEG)**
  - Sagebrush Steppe
  - Conifer Encroachment
  - Invasive Species
  - Riparian and Wetlands
- Fire and Fuels Management **(FIRE)**
  - Pre-Suppression
  - Suppression
  - Fuels Management
  - Post-Fire Management
- Livestock Grazing **(LG)**
- Wild Horses and Burros **(WHB)**
- Minerals Resources **(MR)**
  - Fluid Minerals
  - Locatable Minerals
  - Saleable Minerals
  - Non-Energy Leasable Minerals
  - Mineral Split Estate

- Renewable Energy (Wind and Solar) **(RE)**
- Lands and Realty **(LR)**
  - Utility Corridors and Communication Sites
  - Land Use Authorizations
  - Land Tenure
  - Recommended Withdrawals
- Recreation and Visitor Services **(REC)**
- Travel and Transportation **(TTM)**
- Mitigation **(Montana)**
- Coordination **(CC)**

**Table 2-1** is a summary of the allocation decisions presented for each GRSG habitat management area.

**Table 2-1**
**Summary of Allocation Decisions by GRSG Habitat Management Areas**

| Resource | PHMA | IHMA | GHMA |
|---|---|---|---|
| Land Tenure | Retain | Retain | Retain |
| Solar | Exclusion | Avoidance | Idaho – Open<br>Montana- Avoidance |
| Wind | Exclusion | Avoidance | Idaho – Open<br>Montana- Avoidance |
| Major ROWs | Avoidance | Avoidance | Open<br>Montana - Avoidance |
| Minor ROWs | Avoidance | Avoid | Open |
| Oil and Gas | Open with Major Stipulations | Open with Major Stipulations | Open with Controlled Surface use and Standard Stipulations |
| Geothermal | Open with Major Stipulations | Open with Major Stipulations | Open with Controlled Surface use and Standard Stipulations |
| Non-energy Leasables | Closed | Open | Open |
| Salable Minerals | Closed | Open | Open |
| Locatable Minerals | SFA = Recommend Withdrawal<br>Other PHMA = Open | Open | Open |
| Travel Management | Limited | Limited | Idaho –Limited<br>Montana Limited to Designated (see Dillon RMP) |
| Livestock Grazing | Open | Open | Open |

### 2.2.1 Special Status Species (SSS)

***Goal SSS 1:*** *Maintain and/or increase the abundance, distribution and connectivity of GRSG by conserving, enhancing and restoring GRSG habitat to maintain resilient populations by reducing, eliminating or minimizing threats to GRSG habitats.*

***Goal SSS 2:*** *Provide for the needs of GRSG and their habitat while also providing for resource uses in accordance with BLM's direction for multiple use and sustained yield as described in FLPMA.*

***Goal SSS 3:*** *Manage anthropogenic development and human disturbance to minimize the likelihood of adverse population level effects on GRSG.*

***Goal SSS 4:*** *Reduce the risk of West Nile Virus or other disease outbreaks from BLM management actions.*

***Goal SSS 5:*** *Conserve, enhance, and restore the sagebrush ecosystem upon which GRSG populations depend in an effort to maintain and/or increase their abundance and distribution, in cooperation with other conservation partners.*

**Objective SSS 1:** Maintain or make progress toward all lands within PHMA and IHMA (at least 70%) capable of producing sagebrush so there is a minimum of 15 percent sagebrush cover and conifers absent to uncommon within 1.86 miles of occupied leks.

**Objective SSS 2:** Incorporate GRSG Seasonal Habitat Objectives (**Table 2-2**), into the design of projects or activities, as appropriate, based on site conditions and ecological potential, unless achievement of fuels management objectives require additional reduction in sagebrush cover to meet strategic protection of GRSG habitat and conserve habitat quality for the species or at least one of the following conditions can be demonstrated and documented in the NEPA analysis associated with the specific project:

- A specific objective is not applicable to the site-specific conditions of the project or activity;
- An alternative objective is determined to provide equal or better protection for GRSG or its habitat (based on appropriate scientific findings); or
- Analysis concludes that following a specific objective will provide no more protection to GRSG or its habitat than not following it, for the project being proposed**.**
- These habitat objectives in **Table 2-2** summarize the characteristics that research has found represent the seasonal habitat needs for GRSG. The specific seasonal components identified in the table were adjusted based on local science and monitoring data to define the range of characteristics used in this subregion. Thus, the habitat objectives provide the broad vegetative conditions we strive to obtain across the landscape that indicate the seasonal habitats used by GRSG. These habitat indicators are consistent with the rangeland health indicators used by the BLM.
- The habitat objectives will be part of the GRSG habitat assessment to be used during land health evaluations (see **Appendix D**, Monitoring Framework). These habitat objectives are not obtainable on every acre within the designated GRSG habitat management areas. Therefore, the determination on whether the objectives have been met will be based on the specific site's ecological ability to meet the desired condition identified in the table.

**Table 2-2**
**Habitat Objectives for GRSG**

| Attribute | Indicator | Desired Condition | Reference |
|---|---|---|---|
| **LEK HABITAT (Seasonal Use Period March 1 – May 15)[1]** | | | |
| Lek Security | Proximity of trees | Trees (i.e., in Idaho mainly juniper, conifers, and does not include old-growth juniper, pinyon pine and mountain mahogany; in Montana mainly Douglas-fir) absent or uncommon on shrub/grassland ecological sites within 1.86 miles (3 km) of occupied leks. | Baruch-Mordo et al. 2013[7]<br><br>Stiver et al. 2015[13] |
| | Proximity of sagebrush to leks | Adjacent protective sagebrush cover within 328 ft. (100 m) of an occupied lek | Stiver et al. 2015[13] |
| **NESTING/EARLY BROOD REARING [1,5,10,12,13,14] (Seasonal Use Period May 1 – June 30) [1]** | | | |
| Cover and Food | Seasonal habitat extent (Percent of Seasonal Habitat Meeting Desired Conditions) | >80% of the nesting habitat meets the recommended vegetation characteristics, where appropriate (relative to ecological site potential, etc.). | Connelly et al. 2000[8] |
| | Sagebrush cover [2] | 15-25% | Connelly et al. 2000[8]<br>Connelly et al. 2003[9]<br>Hagen et al. 2007[11] |
| | Sagebrush height<br><br>Arid sites[3]<br>Mesic sites[4] | <br><br>12-31 inches (30-80cm)<br>16-31 inches (40-80cm) | Connelly et al. 2000[8] |
| | Predominant sagebrush shape | Predominantly spreading shape[5] | Stiver et al. 2015[13] |
| | Perennial grass cover (such as native bunchgrasses) [2]<br><br>Arid sites[3]<br>Mesic sites[4] | <br><br><br><br>≥10%<br>≥15% | Connelly et al. 2000[8]<br>Stiver et al. 2015[13] |
| | Perennial grass (and forb) height (includes residual grasses) | ≥ 7 inches | Connelly et al. 2000[8]<br>Connelly et al. 2003[9]<br>Hagen et al. 2007[11]<br>Stiver et al. 2015[13] |
| | Perennial forb cover [2]<br>Arid sites[3]<br>Mesic sites[4] | <br>≥5%<br>≥10% | Connelly et al. 2000[8] |
| | Perennial forb availability | Preferred forbs are common with several species present[6] | Stiver et al. 2015[13] |
| **LATE BROOD-REARING/SUMMER[1, 15] (July-October)[1] Late brood-rearing areas, such as riparian, meadows, springs, higher elevation mesic uplands, etc. may occur within other mapped seasonal habitat areas. Apply late brood rearing/summer habitat desired conditions locally as appropriate.** | | | |
| Cover and Food | Seasonal habitat extent (Percent of Seasonal Habitat Meeting Desired Condition) | >40% of the summer/brood habitat meets recommended brood habitat characteristics where appropriate (relative to ecological site potential, etc.) | Connelly et al. 2000[8] |
| | Sagebrush cover[2] | Uplands 10-25%<br>Riparian/Meadow: Sagebrush cover within 100 m | Connelly et al. 2000[8] |

**Table 2-2**
**Habitat Objectives for GRSG**

| Attribute | Indicator | Desired Condition | Reference |
|---|---|---|---|
| | Sagebrush height | 16 to 32 inches (40-80cm) | Connelly et al. 2000[8] |
| | Perennial grass and forb cover [2] | >15% | |
| | Upland and riparian perennial forb availability [2] | Preferred forbs are common with appropriate numbers of species present[6] | Stiver et al. 2015[13] |
| | Riparian and/or meadow habitat condition | Proper Functioning Condition | Stiver et al. 2015[13] |
| **WINTER[1] November-March[1] (Apply to areas of known or likely winter-use)** | | | |
| Cover and Food | Seasonal habitat extent (Percent of Seasonal Habitat Meeting Desired Condition) | >80% of the wintering habitat meets winter habitat characteristics where appropriate (relative to ecological site, etc.). | Connelly et al. 2000[8] |
| | Sagebrush cover and height above snow | Sagebrush is at least 10 inches (25 cm) above snow and ≥10% cover[16] | Connelly et al. 2000[8] Stiver et al. 2015[13] |

Notes and references:
1 Seasonal dates can be adjusted by local unit according to geographic region.
2 Since plant species and/or life forms may overlap, total vegetative cover, inclusive of shrubs, forbs and grasses may exceed 100%.
3 Arid corresponds to the 10 – 12 inch precipitation zone; *Artemisia tridentata wyomingensis* is a common big sagebrush sub-species for this type site (Stiver et al. 2015).
4 Mesic corresponds to the ≥12 inch precipitation zone; *Artemisia tridentata vaseyana* is a common big sagebrush sub-species for this type site (Stiver et al. 2015).
5Collectively the indicators for sagebrush (cover, height, and shape), perennial grass and perennial forb (cover, height and/or availability) represent the desired condition range for nesting/early brood rearing habitat characteristics, consistent with the breeding habitat suitability matrix identified in Stiver et al. *2015*. Sagebrush plants that are more tree or columnar-shaped provide less protective cover near the ground than sagebrush plants with a spreading shape (Stiver et al. 2015). Some sagebrush plants are naturally columnar (e.g., Great Basin big sagebrush), and a natural part of the plant community. However, a predominance of columnar shape arising from animal impacts may warrant management investigation or adjustments at site specific scales.
6 Preferred forbs are listed in Stiver et al. 2015. Overall total forb cover may be greater than that of preferred forb cover since not all forb species are listed as preferred.
7Baruch-Mordo, S., J. S. Evans, J. P. Severson, D. E. Naugle, J. D. Maestas, J. M. Kiesecker, M. J. Falkowski, C. A. Hagen, and K. P. Reese. 2013. Saving sage-grouse from trees. Biological Conservation 167:233-241.
8 Connelly, J. W., M. A. Schroeder, A. R. Sands, and C. E. Braun. 2000. Guidelines to manage sage-grouse populations and their habitats. Wildlife Society Bulletin 28:967-985.
9 Connelly, J. W., K. P. Reese, and M. A. Schroeder. 2003. Monitoring of Greater sage-grouse habitats and populations. University of Idaho College of Natural Resources Experiment Station Bulletin 80. University of Idaho, Moscow, Idaho.
10Doherty, K. 2008. Sage-grouse and Energy Development: Integrating Science with Conservation Planning to Reduce Impacts. Ph.D. Dissertation. University of Montana, Missoula, Montana.
11 Hagen, C. A., J. W. Connelly, and M. A. Schroeder. 2007. A meta-analysis of greater sage-grouse *Centrocercus urophasianus* nesting and brood-rearing habitats. Wildlife Biology 13 (Supplement 1):42-50.
12Holloran, M. J., and S. H. Anderson. 2005. Spatial Distribution of Greater Sage-grouse nests in relatively contiguous sagebrush habitats. Condor 107:742-752.
13Stiver, S. J., E. T. Rinkes, D. E. Naugle, P. D. Makela, D. A. Nance, and J. W. Karl. 2015. Sage-Grouse Habitat Assessment Framework: A Multi-scale Habitat Assessment Tool. Bureau of Land Management and Western Association of Fish and Wildlife Agencies Technical Reference 6710-1. U.S. Bureau of Land Management, Denver, Colorado.
14 Connelly, J.W., A. Moser, and D. Kemner. 2013. Greater Sage-Grouse breeding habitats: Landscape-based comparisons. Grouse News 45. Research Reports.
15 Some late brood habitat occurs at higher elevations outside of mapped nesting habitat and some is embedded within nesting landscapes especially areas such as wet meadows, riparian areas, springs and seeps.
16Winter habitat metrics are a guideline but snow depths and habitat availability may vary widely depending on winter severity, topography and elevation.

- All BLM use authorizations will contain terms and conditions regarding the actions needed to meet or progress toward meeting the habitat objectives. If monitoring data show the habitat objectives have not been met nor progress being made towards meeting them, there will be an evaluation and a determination made as to the cause. If it is determined that the authorized use is a cause, the use will be adjusted by the response specified in the instrument that authorized the use.

***Greater Sage-Grouse Management Areas***

**Objective SSS 3:** Maintain a resilient population of GRSG in Idaho and Southwestern Montana.

**Objective SSS 4:** Designate GRSG management areas and associated management to maintain a resilient population and to designate strategically located adjacent areas to provide a buffer from unpredictable habitat loss such as wildfire to the resilient population areas.

**Objective SSS 5:** Identify and strategically protect larger intact sagebrush areas and areas of lower fragmentation to maintain GRSG population persistence.

*Management Decisions (MD)*

**MD SSS-1:** Designate five GRSG Conservation Areas (see Glossary) within the subregion to form the geographic basis for achieving population objectives; evaluating the disturbance density and adaptive regulatory triggers; and tailor adaptive management responses. These conservation areas are depicted in **Figure 2-13**. These areas are referred to as Mountain Valleys, Desert, West Owyhee, Southern and Southwestern Montana Conservation Areas.

Conservation Area Description

Mountain Valleys Conservation Area – generally located north of the Snake River Plain, including GRSG habitat in the Salmon and Challis areas, and habitat in west-central population area. It extends west from Rexburg, north and west of Highway 33 to Howe, north and west of Highway 33/22 to Arco, north and west of Highway 26/20/93 to Carey, north and west of Highway 20 west to Hill City, north and west of Highway 20 to the Dylan Karaus Road, west to Canyon Creek. Canyon Creek to the confluence with the Snake River form the western boundary.

Desert Conservation Area – located north of the Snake River and south of the Mountain Valleys Conservation Area. It extends from the confluence of Canyon Creek and the Snake River, eastward to Idaho Falls. The Snake River and Henry's Fork form the eastern boundary.

West Owyhee Conservation Area – located south of the Snake River and west of the Bruneau River.

Southern Conservation Area – located south of the Snake River and east of the Bruneau River, including East Idaho uplands and Bear Lake Plateau, and the Utah portion of the Sawtooth National Forest in Box Elder County.

Southwestern Montana – located in southwestern Montana - encompassing the Dillon Butte BLM Field Office and Beaverhead-Deerlodge National Forest boundaries (the Butte RMP is not being amended and since there are limited GRSG federal GHMA, management actions do not apply in the Butte Field Office).

In general, GRSG habitats in the Desert and West Owyhee CAs are relatively contiguous, while those in the Mountain Valleys and Southern CAs tend to be more fragmented due to more complex topography, and elevational differences and/or effects from wildfires, agriculture, urbanization or other factors.

**MD SSS 2:** Within each Conservation Area designate GRSG Habitat Management Areas: Priority, Important and General Habitat Management Areas (**Figure 2-1**). **Priority Habitat Management Areas (PHMA**) focus on conserving the two key meta-populations in the subregion. PHMA encompasses areas with the highest conservation value to GRSG, based on the presence of larger leks, habitat extent, important movement and connectivity corridors and winter habitat. PHMA include adequate area to accommodate continuation of existing land uses and landowner activities. **Important Habitat Management Areas (IHMA)** contain additional habitat and populations that provide a management buffer for the PHMA and to connect patches of PHMA. IHMA encompasses areas of generally moderate to high conservation value habitat and/or populations and in some Conservation Areas includes areas beyond those identified by USFWS as necessary to maintain redundant, representative and resilient populations (Priority Areas for Conservation (PACs)). IHMA are typically adjacent to PHMA but generally reflect somewhat lower GRSG population status and/or reduced habitat value due to disturbance, habitat fragmentation or other factors. There are no IHMA designated within the Southwestern Montana Conservation Area. **General Habitat Management Areas (GHMA)** encompass habitat that is outside of PHMA or IHMA. GHMA contain approximately 10 percent of the occupied leks that are also of relatively low male attendance compared to leks in PHMA or IHMA. GHMA are generally characterized by lower quality disturbed or patchy habitat of low lek connectivity.

**MD SSS 3**: In Idaho, designate PHMA and IHMA to encompass 90 percent of the breeding males in Idaho. In Montana, designate PHMA to encompass Montana Fish, Wildlife, and Parks 2009 Greater Sage Grouse Core Area designations.

**MD SSS 4**: Annually prioritize Conservation Areas at the state scale considering results of the annual adaptive regulatory trigger evaluations relative to implementation of restoration and mitigation activities.

**MD SSS 5**: Prioritize activities and mitigation to conserve, enhance and restore GRSG habitats (i.e., fire suppression activities, fuels management activities, vegetation treatments, invasive species treatments etc.) first by Conservation Area, if appropriate (Conservation Area under adaptive management or at risk of meeting an adaptive management soft or hard trigger), followed by PHMA, then IHMA then GHMA within the Conservation Areas. Local priority areas within these areas will be further refined as a result of completing the GRSG Wildfire and Invasive Species Habitat Assessments as described in **Appendix H**. This can include projects outside GRSG habitat when those projects will provide a benefit to GRSG habitat.

**MD SSS 6:** The management area map and Biologically Significant Unit (BSU) baseline map will be re-evaluated in conjunction with plan evaluation processes (i.e. approximately every 5 years). This re-evaluation can indicate the need to adjust PHMA, IHMA or GHMA or the habitat baseline. These adjustments can occur upon completion of the appropriate analysis and process (e.g., plan amendment) to review the allocation decisions based on the map. Results from the Wildfire and Invasive Species Assessments, such as identified focal or emphasis areas will also be used to help inform mapping adjustments during this evaluation.

**MD SSS 7**: GRSG habitat within the project area will be assessed during project-level NEPA analysis within the management area designations (PHMA, IHMA, GHMA). Project proposals and their effects will be evaluated based on the habitat and values affected.

**MD SSS 8**: Idaho BLM will annually update the Key Habitat map, in order to reflect habitat changes resulting from wildfire, succession, and vegetation treatments that occurred or were observed since the last update. Key habitat includes areas of generally intact sagebrush that provide sage-grouse habitat during some portion of the year. This map also identifies potential restoration areas (perennial grassland annual grasslands, conifer encroachment and recent burns). This map a broad scale current vegetation map that changes as habitat is lost or restored. The Key Habitat Map is not an allocation decision such as PHMA, IHMA, and GHMA. Updates to the map will also occur if it is determined that mapping errors or omissions have occurred, or that radio-telemetry studies indicate that GRSG are consistently utilizing an area. Updates are also intended to capture recommendations by the field offices, GRSG Local Working Groups, or agency partners in GRSG conservation. Project-level evaluations of GRSG habitat during the NEPA process can also be used to inform the annual update.

**MD SSS 9**: Areas of habitat outside of delineated habitat management areas identified during the Key habitat update process will be evaluated during site specific NEPA for project level activities and GRSG required design features (**Appendix C**) and buffers (**Appendix B**) will be included as part of project design. These areas will be further evaluated during plan evaluation and the 5-year update to the management areas, to determine whether they should be included as PHMA, IHMA, or GHMA.

**MD SSS 10**: Designate Sagebrush Focal Areas (SFA) as shown on **Figure 1-2**. SFA will be managed as PHMA, with the following additional management:

- Recommended for withdrawal from the General Mining Act of 1872, as amended, subject to valid existing rights.
- Managed as NSO, without waiver, exception, or modification, for fluid mineral leasing.
- Prioritized for vegetation management and conservation actions in these areas, including, but not limited to land health assessments, wild horse and burro management actions, review of livestock grazing permits/leases, and habitat restoration (see specific management sections).

***Adaptive Management***

**MD SSS 11:** Idaho: Use hard and soft population and habitat triggers to determine an appropriate management response as described in MD SSS 16 to MD SSS 26. Hard and soft triggers responses are applied at the Conservation Area (MD SSS-1) scale (**Appendix E**).

**MD SSS 12:** Utilize monitoring information collected through the Monitoring Framework (**Appendix D**) to determine when adaptive regulatory triggers have been met.

**MD SSS 13:** Idaho: BLM will maintain GRSG habitat information, through use of the Key Habitat map or latest sagebrush/vegetation map, which will be used to track and identify habitat changes to assess the habitat trigger in the adaptive management approach. Key habitat map updates are made each winter by BLM in coordination with the Forest Service and IDFG, using the process described in Appendix F of the FEIS.

**MD SSS 14:** Idaho: BLM will coordinate with the IDFG regarding population information collected and maintained by the IDFG to track and identify population changes to assess the population trigger in the adaptive management approach.

**MD SSS 15:** Idaho: The hard and soft trigger data will be analyzed as soon as it becomes available after the signing of the ROD, and twice each year thereafter the applicable monitoring information will be reviewed to determine if any adaptive management triggers have been met. Montana: The hard and soft trigger data will be analyzed as soon as it becomes available after the signing of the ROD and then at a minimum, analyzed annually thereafter.

**MD SSS 16:** Idaho: Adaptive habitat triggers will be individually calculated across all ownerships within the BSUs (**Appendix E**). The BSU is defined as the IDFG modeled nesting and wintering habitat (IDFG 2013, unpublished data) within PHMA and IHMA within a Conservation Area. The sagebrush component of the BSU is represented by the Key habitat within the BSU present during the 2011 baseline and as mapped during subsequent annual Key habitat map updates. Key habitat is defined as areas of generally intact sagebrush that provide GRSG habitat during some portion of the year (ISAC 2006).

**MD SSS 17:** Habitat Hard Triggers are defined as:

- A 20 percent loss of Key Habitat within the BSU of the PHMA of a Conservation Area when compared to the 2011 baseline, inclusive of all land ownerships or
- A 20 percent loss of Key Habitat within the BSU of the IHMA of a Conservation Area when compared to the 2011 baseline.

**MD SSS 18:** Habitat Soft Triggers are defined as:

- A 10 percent loss of Key Habitat within the BSU of the PHMA of a Conservation Area when compared to the 2011 baseline; or
- A 10 percent loss of Key Habitat within the BSU of the IHMA of a Conservation Area when compared to the 2011 baseline.

**MD SSS 19:** Population Hard Triggers are defined as:

- A 20 percent decline in the current 3-year average of total maximum number of males counted compared to the 2011 maximum male baseline and a finite rate of change ($\lambda$) significantly below 1.0 within PHMA within a Conservation Area over the same 3-year period; or
- A 20 percent decline in the current 3-year average of total maximum number of males counted compared to the 2011 maximum male baseline and a finite rate of change ($\lambda$) significantly below 1.0 within IHMA within a Conservation Area over the same 3-year period.
- Significance is defined by the 90 percent confidence interval around the current 3-year finite rate of change. If the 90 percent confidence interval is less than, and does not include 1.0, then the finite rate of change is considered significant. The finite rate of change and variance will be calculated following Garton et al. (2011).

**MD SSS 20:** Population Soft Triggers are defined as:

- A 10 percent decline in the current 3-year average of total maximum number of males counted compared to the 2011 maximum male baseline and a finite rate of change (λ) below 1.0 within PHMA within a Conservation Area over the same 3-year period; or
- A 10 percent decline in the current 3-year average of total maximum number of males counted compared to the 2011 maximum male baseline and a finite rate of change (λ) below 1.0 within IHMA within a Conservation Area over the same 3-year period.

**MD SSS 21:** When any of the Criteria for Soft Triggers have been met the Implementation Team will evaluate causal factors and recommend additional potential implementation level activities (**Appendix E**).

**MD SSS 22:** When any of the Criteria for Hard Triggers have been met then all PHMA management actions will be applied to the IHMA within that Conservation Area and the Implementation Team will evaluate causal factors and recommend additional potential implementation level activities.

**MD SSS 23:** If an adaptive regulatory trigger is tripped and livestock grazing is identified as a probable limiting factor then adjustments will follow the Adaptive Grazing Management Response described in **Appendix E**.

**MD SSS 24:** Remove any adaptive management response when the habitat or maximum male population count (i.e., 3-year average) returns to or exceeds the 2011 baseline levels within the associated Conservation Area in accordance with the Adaptive Management Strategy (**Appendix E**). In such a case, changes in management allocations resulting from a tripped trigger will revert back to the original allocation (MD SSS 22)**.**

**MD SSS 25**: Montana: Follow the NPT Adaptive Management Guidance and Sideboards. When a hard trigger is hit in a BSU, the designated response will be put in place in that BSU. Triggers and responses have been developed with local state and USFWS experts (**Appendix E**).

**MD SSS 26:** Idaho and Montana: When a hard trigger is hit in a BSU within a PAC that has multiple BSUs, including those that cross state lines, the WAFWA Management Zone Greater Sage-Grouse Conservation Team will convene to determine the causal factor, put project-level responses in place, as appropriate and discuss further appropriate actions to be applied. The team will also investigate the status of the hard triggers in other BSUs within the PAC and will invoke the appropriate plan response.

***Anthropogenic Disturbance***

**MD SSS 27:** For Idaho and Montana, if the 3 percent anthropogenic disturbance cap is exceeded on lands (regardless of land ownership) within GRSG PHMA (or IHMA in Idaho) Habitat Management Areas in any given BSU, then no further discrete anthropogenic disturbances (subject to applicable laws and regulations, such as the General Mining Law of 1872, as amended, valid existing rights, etc.) will be permitted by BLM within GRSG PHMA and IHMA in any given BSU until the disturbance has been reduced to less than the cap, as measured according to the Disturbance and Adaptive Management Appendix (**Appendix E**) for the intermediate scale.

For Idaho, if the 3 percent disturbance cap is exceeded on all lands (regardless of land ownership) within a proposed project analysis area (**Appendix E**) in a PHMA (or IHMA in Idaho), then no further anthropogenic disturbance will be permitted by BLM until disturbance in the proposed project analysis area has been reduced to maintain the area under the cap (subject to applicable laws and regulations, such as the General Mining Law of 1872, as amended, valid existing rights, etc.).

For Montana, if the 3 percent disturbance cap is exceeded on lands (regardless of land ownership) or if anthropogenic disturbance and habitat loss associated with conversion to agricultural tillage or fire exceed 5% within a project analysis area in PHMA, then no further discrete anthropogenic disturbances (subject to applicable laws and regulations, such as the 1872 Mining Law, valid existing rights, etc.) will be permitted by BLM within PHMA in a project analysis area until the disturbance has been reduced to less than the cap. If the BLM determines that the State of Montana has adopted a GRSG Habitat Conservation Program that contains comparable components to those found in the State of Wyoming's Core Area Strategy including an all lands approach for calculating anthropogenic disturbances, a clear methodology for measuring the density of operations, and a fully operational Density Disturbance Calculation Tool, the 3% disturbance cap will be converted to a 5% cap for all sources of habitat alteration within a project analysis area.

In both Idaho and Montana, within existing designated utility corridors, the 3% disturbance cap may be exceeded at the project scale if the site specific NEPA analysis indicates that a net conservation gain to the species will be achieved. This exception is limited to projects which fulfill the use for which the corridors were designated (ex., transmission lines, pipelines) and the designated width of a corridor will not be exceeded as a result of any project co-location.

For Idaho the BSU (**Figure 2-2**) is defined as the currently mapped nesting and wintering habitat within PHMA and IHMA within a Conservation Area, inclusive of all ownerships. For Montana the BSU is defined as the PHMA in Montana. Anthropogenic disturbance excludes habitat disturbance from wildfire and fuels management activities and includes the following developments (see **Appendix E** for further details):

- Oil and Gas Wells and Development Facilities
- Coal Mines
- Wind Towers
- Solar Fields
- Geothermal Development Facilities
- Mining (Active Locatable, Non-Energy Leasable and Saleable Developments)
- Roads
- Railroads
- Power lines
- Communication Towers
- Other Vertical Structures
- Coal bed Methane Ponds

- Meteorological Towers (e.g., wind energy testing)
- Nuclear Energy Facilities
- Airport Facilities and Infrastructure
- Military Range Facilities and Infrastructure
- Hydroelectric Plants
- Recreation Areas Facilities and infrastructure

For Idaho this disturbance is measured by direct footprint or by ROW width for linear features (power lines, pipelines and roads). For Montana disturbance is measured similar to the Wyoming Disturbance Density Calculation Tool process described in **Appendix E**.

Subject to applicable laws and regulations and valid existing rights, if the average density of one energy and mining facility per 640 acres (the density cap) is exceeded on all lands (regardless of land ownership) in the Priority Habitat Management Area within a proposed project analysis area, then no further disturbance from energy or mining facilities will be permitted by BLM: (1) until disturbance in the proposed project analysis area has been reduced to maintain the limit under the cap; or (2) unless the energy or mining facility is co-located into an existing disturbed area.

**MD SSS 28:** New anthropogenic disturbances within PHMA or IHMA within a Conservation Area where the disturbance cap is already exceeded from any source or where the proposed development will result in the cap being exceeded will not be allowed in within that Conservation Area until enough habitat has been restored within that Conservation Area to maintain the area under this cap (subject to valid existing rights).

**MD SSS 29:** New anthropogenic disturbances within PHMA (Idaho only): Anthropogenic Disturbance Screening Criteria. In order to avoid surface-disturbing activities in PHMA, priority will be given to development (including ROWs, fluid minerals and other mineral resources subject to applicable stipulations) outside of PHMA. When authorizing development in PHMA, priority will be given to development in non-habitat areas first and then in the least suitable habitat for GRSG. In addition to the PHMA and IHMA Anthropogenic Disturbance Development Criteria (MD SSS 30), the following criteria must all be met in the project screening and assessment process:

a. The population trend for the GRSG within the associated Conservation Area is stable or increasing over a three-year period and the population levels are not currently engaging the adaptive management triggers (this applies strictly to new authorizations; renewals and amendments of existing authorizations will not be subject to this criteria when it can be shown that long-term impacts from those renewals or amendments will be substantially the same as the existing development);
b. The development with associated mitigation will not result in a net loss of GRSG Key habitat and mitigation will provide a net conservation benefit to the respective PHMA;
c. The project and associated impacts will not result in a net loss of GRSG Key habitat or habitat fragmentation or other impacts causing a decline in the population of the species within the relevant Conservation Area (the project will be outside Key habitat in areas not

meeting desired habitat conditions or the project will provide a benefit to habitat areas that are functioning in a limited way as habitat);

d. The development cannot be reasonably accomplished outside of the PHMA; or can be either: 1) developed pursuant to a valid existing authorization; or 2) is co-located within the footprint of existing infrastructure (proposed actions will not increase the 2011 authorized footprint and associated impacts more than 50 percent, depending on industry practice).

e. Development will be implemented adhering to the required design features (RDF) described in **Appendix C**;

f. The project will not exceed the disturbance cap (MD SSS 27)

g. The project has been reviewed by the State Implementation Team and recommended for consideration by the Idaho Governor.

**MD SSS 30:** The following Anthropogenic Disturbance Development Criteria must be met in the screening and assessment process for proposals in PHMA and IHMA to discourage additional disturbance in PHMA and IHMA (as described in MD LR 2 and MD RE 1; applies to Idaho only):

a. Through coordination with the USFWS and State of Idaho (as described in MD CC 1), it is determined that the project cannot be achieved, technically or economically, outside of this management area; and

b. The project siting and/or design should best reduce cumulative impacts and/or impacts on GRSG and other high value natural, cultural, or societal resources; this may include co-location within the footprint for existing infrastructure, to the extent practicable; and

c. The project results in a net conservation gain to GRSG Key habitat or with beneficial mitigation actions reduces habitat fragmentation or other threats within the Conservation Area; and

d. The project design mitigates unavoidable impacts through appropriate compensatory mitigation; and

e. Development will be implemented adhering to the RDFs described in **Appendix C**.

f. The project will not exceed the disturbance cap (MD SSS 27).

In Montana, the BLM will apply the project/action screen and mitigation process (**Appendix J**)

**MD SSS 31:** Co-locating new infrastructure within existing ROWs and maintaining and upgrading ROWs is preferred over the creation of new ROWs or the construction of new facilities in all management area. Colocation for various activities is defined as:

- Communication Sites – The installation of new equipment/facilities on or within or adjacent to existing authorized equipment/facilities or within a communication site boundary as designated in the Communication Site Plan.
- Electrical Lines – Installation of new ROWs adjacent to current ROWs boundaries, not necessarily placed on the same power poles.

- Other Rights-of-Way – The installation of new ROWs within the existing footprint of an approved ROW boundary or adjacent to an approved ROW boundary.
- Designated Corridors – The installation of new rights-of-way within the existing corridor or adjacent to the existing corridor.

**MD SSS 32:** Incorporate RDFs as described in **Appendix C** in the development of project or proposal implementation, reauthorizations or new authorizations and suppression activities, as conditions of approval (COAs) into any post-lease activities and as best management practices for locatable minerals activities, to the extent allowable by law, unless at least one of the following conditions can be demonstrated and documented in the NEPA analysis associated with the specific project:

a. A specific RDF is not applicable to the site-specific conditions of the project or activity;

b. A proposed design feature or BMP is determined to provide equal or better protection for GRSG or its habitat; or

c. Analysis concludes that following a specific RDF will provide no more protection to GRSG or its habitat than not following it, for the project being proposed.

**MD SSS 33:** Conduct implementation and project activities, including construction and short-term anthropogenic disturbances consistent with seasonal habitat restrictions described in **Appendix C**.

**MD SSS 34:** RDFs and seasonal habitat restrictions will not be required for emergency or short-term activities necessary to protect and preserve human life or property.

**MD SSS 35:** In undertaking BLM management actions, and consistent with valid and existing rights and applicable law in authorizing third-party actions, the BLM will apply the lek buffer-distances identified in the USGS Report Conservation Buffer Distance Estimates for Greater Sage-Grouse – A Review (Open File Report 2014-1239) in accordance with **Appendix B**.

**MD SSS 36:** Incorporate appropriate conservation measures for slickspot peppergrass (Lepidium papilliferum) as described in the 2014 Conservation Agreement (as updated, amended or reauthorized) into implementation and project design within slickspot peppergrass habitat in the Jarbidge and Four Rivers Field Offices to avoid and minimize impacts on slickspot peppergrass.

***Monitoring***

**MD SSS 37:** Once FIAT Assessments are complete, annually complete a review of FIAT Assessment implementation efforts within GRSG habitat with appropriate USFWS and state agency personnel.

**MD SSS 38:** Monitor the effectiveness of projects (e.g., fuel breaks. fuels treatments) until objectives have been met or until it is determined that objectives cannot be met, according to the monitoring schedule identified for project implementation.

**MD SSS 39:** Monitor invasive vegetation post vegetation management treatment.

**MD SSS 40:** Monitor project construction areas for noxious weed and invasive species for at least 3 years, unless control is achieved earlier.

**MD SSS 41:** Use lek, nesting and winter habitat maps and key habitat map (updates) to annually assess GRSG population and habitat status in the context of the adaptive management triggers.

**MD SSS 42:** Continue to support updates to the Key Habitat map to track vegetation changes in relation to GRSG habitat on a yearly basis, until such a time this process is replaced. The process used to update the Key Habitat Map is described in Appendix F of the FEIS.

**MD SSS 43:** Monitor GRSG habitat as described in the monitoring framework plan (**Appendix D**) in coordination with IDFG and Montana FWP.

### 2.2.2 Vegetation (VEG)

**Objective VEG 1:** Reconnect and expand areas of higher native plant community integrity/rangeland health to increase the extent of high quality habitat and, where possible, to accommodate the future effects of climate change.

**Objective VEG 2:** Increase the amount and functionality of seasonal habitats by:

a. Increasing or enhancing canopy cover and average patch size of sagebrush.
b. Increasing the amount, condition and connectivity of seasonal habitats.
c. Protecting or improving GRSG migration/movement corridors.
d. Reducing conifer encroachment within GRSG seasonal habitats.
e. Improving understory (grass, forb) and/or riparian condition within breeding and late brood-rearing habitats.
f. Reducing the extent of annual grasslands within and adjacent to PHMA and IHMA.

Decadal treatment objectives by population area are identified in **Table 2-3**, Estimated Acres of Treatment Needed within a 10-Year Period to Achieve Vegetation Objectives on BLM-Administered Lands1.

**Objective VEG 3:** In all SFA and PHMA, the desired condition is to maintain all lands ecologically capable of producing sagebrush (but no less than 70%) with a minimum of 15% sagebrush canopy cover or as consistent with specific ecological site conditions. The attributes necessary to sustain these habitats are described in Interpreting Indicators of Rangeland Health (BLM Tech Ref 1734-6).

*Management Decisions (MD)*

<u>Sagebrush Steppe</u>

**MD VEG 1:** Implement habitat rehabilitation or restoration projects in areas that have potential to improve GRSG habitat using a full array of treatment activities as appropriate, including chemical, mechanical and seeding treatments.

**Table 2-3**
**Estimated Acres of Treatment Needed within a 10-Year Period to Achieve Vegetation Objectives on BLM-Administered Lands[1]**

| Population Area | Mechanical[2] | Prescribed Fire (MD FIRE 31)[3] | Grass Restoration (MD VEG 2)[4] |
|---|---|---|---|
| Bear Lake Plateau | 1,000 | 0 | 0 |
| East Idaho Uplands | 6,000 | 9,000 | 1,000 |
| S Central Idaho/N Snake River and Mountain Valleys | 18,000 | 11,000 | 162,000 |
| Weiser | 0 | 0 | 13,000 |
| SW Idaho | 52,000 | 10,000 | 444,000 |
| SW Montana | 0 | 0 | 0 |

Notes:
[1] These are estimates of treatments required to achieve and/or maintain desired habitat conditions over a period of ten years. There are many dynamic and highly variable disturbances that may happen over that period of time that can have a significant effect on the amount, type, and timing of treatment needed. Those disturbances are factored into the ten-year simulation using stochastic, not predictive, techniques. Probabilities of events such as large wildfires are used in the model to make the simulation as realistic as possible, given empirical data about such events in the past, but the results of the simulation cannot be used to predict the future occurrence of such events, including their timing, size, or location, which are essentially random.
[2] Removal of conifers that have invaded sagebrush including phase one juniper that is 10 percent or less and reducing sagebrush cover in areas over 30 percent canopy cover
[3] Acres are those that are greater than 30 percent sagebrush canopy cover and/or invaded by 10 percent or greater conifer.
[4] Acres presently dominated by annual grasses that can be improved by herbicide application and seeding of perennial vegetation.

**MD VEG 2:** Implement vegetation rehabilitation or manipulation projects to enhance sagebrush cover or to promote diverse and healthy grass and forb understory to achieve the greatest improvement in GRSG habitat based on FIAT Assessments, HAF assessments, other vegetative assessment data and local, site specific factors that indicate sagebrush canopy cover or herbaceous conditions do not meet habitat management objectives (i.e. is minimal or exceeds optimal characteristics). This may necessitate the use of prescribed fire as a site preparation technique to remove annual grass residual growth prior to the use of herbicides in the restoration of certain lower elevation sites (e.g., Wyoming big sagebrush) but such efforts will be carefully planned and coordinated to minimize impacts on GRSG seasonal habitats.

**MD VEG 3:** Require use of native seeds for restoration based on availability, adaptation (ecological site potential), and probability of success (Richards et al. 1998). Non-native seeds may be used as long as they support GRSG habitat objectives (Pyke 2011) to increase probability of success, when adapted seed availability is low or to compete with invasive species especially on harsher sites.

**MD VEG 4:** Implement management changes in restoration and rehabilitation areas, as necessary, to maintain suitable GRSG habitat, improve unsuitable GRSG habitat and to ensure long-term persistence of improved GRSG habitat (Eisworth and Shonkwiler 2006). Management changes can be considered during livestock grazing permit renewals, travel management planning, and renewal or reauthorization of ROWs.

**MD VEG 5:** Consider establishing seed harvest areas that are managed for seed production (Armstrong 2007) to provide a reliable source of locally adapted seed to use during rehabilitation and restoration activities.

**MD VEG 6:** Allocate use of native seed to GRSG or ESA listed species habitat in years when preferred native seed is in short supply. This may require reallocation of native seed from ESR projects outside of PHMA or IHMA to those inside it. Where probability of success or native seed availability is low, nonnative seeds may be used as long as they meet GRSG habitat conservation objectives (Pyke 2011). Re-establishment of appropriate sagebrush species/subspecies and important understory plants, relative to site potential, shall be the highest priority for rehabilitation efforts.

**MD VEG 7:** During land health assessments, evaluate the relative value of existing nonnative seeding within GRSG habitat as: 1) a component of a grazing system allowing improvement of adjacent native vegetation, 2) development of a forage reserve, 3) incorporation into a fuel break system (Davies et al. 2011) or 4) restoration/diversification for GRSG habitat improvement. Where appropriate and feasible, diversify seedings, or restore to native vegetation when potential benefits to GRSG habitat outweigh the other potential uses of the non-native seeding, with emphasis on PHMA and IHMA. Allow recolonization of seedings by sagebrush and other native vegetation.

<u>Conifer Encroachment</u>

**MD VEG 8:** Remove conifers encroaching into sagebrush habitats, in a manner that considers tribal cultural values. Prioritize treatments closest to occupied GRSG habitats and near occupied leks, and where juniper encroachment is phase 1 or phase 2. Use of site-specific analysis and tools like the FIAT report (Chambers et. al., 2014) will help refine the location for specific areas to be treated.

<u>Invasive Species</u>

**MD VEG 9:** Incorporate results of the FIAT Assessments into projects and activities addressing invasive species as appropriate.

**MD VEG 10:** Implement noxious weed and invasive species control using integrated vegetation management actions per national guidance and local weed management plans for Cooperative Weed Management Areas in cooperation with State and Federal agencies, affected counties, and adjoining private lands owners.

**MD VEG 11:** Conduct integrated weed management actions for noxious and invasive weed populations that are impacting or threatening GRSG habitat quality using a variety of eradication and control techniques including chemical, mechanical and other appropriate means.

**MD VEG 12:** Require project proponent (projects described in MD SSS 27 and which are included in the anthropogenic disturbance cap evaluation) to ensure that noxious weeds and invasive species caused as a result of the project are treated to eliminate establishment on the disturbed project construction areas for at least 3 years and monitored and treated during the life of the project.

**MD VEG 13:** Treat areas that contain cheatgrass and other invasive or noxious species to minimize competition and favor establishment of desired species.

### 2.2.3 Fire and Fuels Management (FIRE)

**Objective FIRE 1:** Design fuel treatments to restore, enhance, or maintain GRSG habitat.

**Objective FIRE 2:** Manage wildfires to minimize loss of sagebrush and protect GRSG habitat.

*Management Decisions (MD)*

Pre-Suppression

**MD FIRE 1:** (Wildfire Preparedness): Support development and implementation of Rangeland Fire Protection Associations (RFPAs) in coordination with the State of Idaho.

**MD FIRE 2:** Develop a consistent approach to fire restrictions within GRSG habitat through the existing coordinated inter-agency approach to fire restrictions based upon National Fire Danger Rating System thresholds (fuel conditions, drought conditions, and predicted weather patterns).

**MD FIRE 3:** Annually incorporate into existing fire management plans results and updates from the Wildfire and Invasive Species Habitat Assessments (FIAT Assessments) described in **Appendix H**, to communicate/explain the resource value of GRSG habitat, including fire prevention messages and actions to reduce human-caused ignitions.

**MD FIRE 4:** Continue to participate with the Wildland Fire Leadership Council, a cooperative, interagency organization dedicated to achieving consistent implementation of the goals, actions, and policies in the National Fire Plan and the Federal Wildland Fire Management Policy.

**MD FIRE 5:** Continue annual coordination meetings held between cooperating agencies that have fire suppression responsibilities. Incorporate Rangeland Fire Protection Associations and other stakeholders into this coordination. Discuss priority suppression areas and distribute maps showing priority suppression areas at both the Conservation Area and the local office levels as based on the adaptive management strategy and FIAT Assessments.

**MD FIRE 6:** Ensure firefighter personnel receive annual orientation regarding GRSG habitat and sagebrush management issues as related to wildfire suppression.

**MD FIRE 7**: As part of the FIAT Assessments, identify roads, trails, and recreational use areas with high frequency of human caused fires within or adjacent to the PHMA or IHMA. Consider these areas during annual fire restriction evaluations, and as appropriate, through site specific management.

**MD FIRE 8:** Coordinate with Federal, State and local jurisdictions on fire and litter prevention programs to reduce human caused ignitions.

**MD FIRE 9**: Implement activities identified within the FIAT Assessments.

Suppression

**MD FIRE 10**: Complete Wildland Fire and Invasive Species Assessments (FIAT Assessments) as described within **Appendix H** and incorporate results into appropriate Fire Management Plans as they are completed. FIAT Assessments are interdisciplinary evaluations of the threats posed by wildfire and invasive species, as well as identification of focal and emphasis habitats/treatment opportunities for fuels management, fire management, and restoration. These FIAT Assessments identify focal and emphasis habitats and describe strategies for fuels management, suppression and restoration activities. Focal and Emphasis Habitats identified through the FIAT Assessment to further refine priority areas for treatments to reduce the threats posed by wildfire, invasive annual grass and conifer expansion.

**MD FIRE 11:** As part of the FIAT Assessments incorporate a wildfire response time analysis focusing on response time to identified priority areas within PHMA and IHMA or on those fires that have the potential to impact PHMA and IHMA. Incorporate findings into Unit Initial Attack program that determines initial attack resources.

**MD FIRE 12**: As part of the FIAT Assessment incorporate a water capacity analysis for suppression purposes, including potential private water sources. Utilized the analysis to ensure water availability for response to fire in or threatening PHMA and IHMA during initial attack.

**MD FIRE 13**: During high fire danger conditions, stage initial attack and secure additional resources closer to priority areas identified in the FIAT Assessments, based on anticipated fires and weather conditions, with particular consideration of the West Owyhee, Southern and Desert Conservation Areas to ensure quicker response times in or near GRSG habitat after considerations and placement of resources to protect human life and property.

**MD FIRE 14**: Utilize a full range of fire management strategies and tactics through strategic wildfire suppression planning consistent with appropriate management response and within acceptable risk levels, to achieve resource objectives for GRSG habitat consistent with land use plan direction. Utilizing both direct and indirect attack as appropriate to limit the overall amount of GRSG habitat burned. This can include suppressing fires in intact sagebrush habitats; limiting fire growth in GHMA when suppression resources are available or managing wildfire for resource benefit in areas of conifer (juniper) encroachment.

**MD FIRE 15**: Suppression priorities: The protection of human life is the single, overriding priority. Setting priorities among protecting human communities and community infrastructure, other property and improvements, and natural and cultural resources will be done based on the values to be protected, human health and safety, and the costs of protection. Maintaining GRSG habitat will be the highest natural resources priority immediately after human life and property, commensurate with threatened and endangered species habitat or other critical habitats to be protected.

**MD FIRE 16**: Ensure close coordination with federal and state firefighters including the Rangeland Fire Protection Associations during suppression activities.

<u>Fuels Management</u>

**MD FIRE 17**: Design and implement fuels treatments that will reduce the potential start and spread of unwanted wildfires and provide anchor points or control lines for the containment of wildfires during suppression activities with an emphasis on maintaining, protecting, and expanding sagebrush ecosystems and successfully rehabilitated areas and strategically and effectively reduce wildfire threats in the greatest area.

**MD FIRE 18:** Enhance (or maintain/retain) sagebrush canopy cover and community structure to match expected potential for the ecological site and consistent with GRSG habitat objectives unless fuels management objectives requires additional reduction in sagebrush cover to meet strategic protection of GRSG habitat. Closely evaluate the benefits of the fuel management treatments against the additional loss of sagebrush cover on the local landscape in the NEPA process.

**MD FIRE 19:** Apply appropriate seasonal restrictions for implementing vegetation and fuels management treatments according to the type of seasonal habitats present. Allow no treatments in known winter range unless the treatments are designed to strategically reduce wildfire risk around and/or in the winter range and will protect, maintain, increase, or enhance winter range habitat quality. Ensure chemical applications are utilized where they will assist in success of fuels treatments. Strategically place treatments on a landscape scale to prevent fire from spreading into PHMA or WUI.

**MD FIRE 20**: Develop a fuels continuity and management strategy to expand, enhance, maintain and protect GRSG habitat informed by the FIAT Assessments completed as described in **Appendix H**.

**MD FIRE 21**: When developing the fuels management strategy as part of the FIAT Assessment described in **Appendix H** consider up-to-date fuels profiles; land use plan direction; current and potential habitat fragmentation; sagebrush and GRSG ecological factors; active vegetation management steps to provide critical breaks in fuel continuity where appropriate; incorporate a comparative risk analysis with regard to the risk of increased habitat fragmentation from a proposed action versus the risk of large scale fragmentation posed by wildfires if the action is not taken.

**MD FIRE 22:** Fuel treatments will be designed through an interdisciplinary process to expand, enhance, maintain, and protect GRSG habitat which considers a full range of cost effective fuel reduction techniques, including: chemical, biological (including grazing and targeted grazing), mechanical and prescribed fire treatments.

**MD FIRE 23:** Existing and proposed linear ROWs can be considered for use and maintenance as vegetated fuel breaks in appropriate areas (this activity may or may not be part of the ROW permit or the responsibility of the permit holder, in cases where this activity is considered part of mitigation for project design then it will be appropriately included as part of the ROW permit and the responsibility of the permit holder for development and maintenance).

**MD FIRE 24:** Fuel breaks will incorporate existing vegetation treatments (seedings), rocky areas or other appropriate topography or features or be located adjacent to existing linear disturbance areas where appropriate. Fuel breaks should be placed in areas with the greatest likelihood of compartmentalizing a fire and/or to foster suppression options to protect existing intact habitat.

**MD FIRE 25:** Strategically pre-treat areas to reduce fine fuels consistent with areas and results identified within the Wildfire and Invasive Species Assessments.

**MD FIRE 26:** Protect vegetation restoration and rehabilitation efforts/projects from subsequent fire events.

**MD FIRE 27:** Targeted grazing as a fuels treatment to adjust the vegetation conditions to reduce the potential start and spread of wildfires may be implemented within existing grazing authorizations if feasible such as through temporary non-renewable authorizations, or through contracts, agreements or other appropriate means separate from existing grazing authorizations and permits.

**MD FIRE 28:** Targeted grazing to achieve fuels management objectives should conform to the following criteria:

a. Targeted grazing should be implemented strategically on the landscape, and directly involve the minimum footprint and grazing intensity required to meet fuels management objectives.
b. Conform to the applicable Standards for Rangeland Health and Guidelines for Livestock Grazing Management (Idaho or Montana) at the assessment scale (pasture/watershed).
c. Where feasible and applicable coordinate with the grazing permittee to strategically reduce fuels through livestock management within the Mandatory Terms and Conditions of the applicable grazing authorizations

**MD FIRE 29:** Prioritize the use of native seeds for fuels management treatment based on availability, adaptation (site potential), and probability of success. Where probability of success or native seed availability is low or non-economical, nonnative seeds may be used to meet GRSG habitat objectives to trend toward restoring the fire regime. When reseeding, use fire resistant native and nonnative species, as appropriate, to provide for fuel breaks.

**MD FIRE 30:** Maintain effectiveness of fuels projects, including fuel breaks, to ensure long-term success, including persistence of seeded species and/or other treatment components while maintaining the integrity of adjacent vegetation.

**MD FIRE 31:** If prescribed fire is used in GRSG habitat, the NEPA analysis for the Burn Plan will address:

- why alternative techniques were not selected as a viable options;
- how GRSG goals and objectives will be met by its use;
- how the COT Report objectives will be addressed and met;
- a risk assessment to address how potential threats to GRSG habitat will be minimized.

Allow prescribed fire as a vegetation or fuels treatment in Wyoming big sagebrush sites or other xeric sagebrush species sites, or in areas with a potential for post-fire exotic annual dominance only after the NEPA analysis for the Burn Plan has addressed the four bullets outlined above. Prescribed fire can be used to meet specific fuels objectives that will protect Greater Sage-Grouse habitat in PHMA (e.g., creation of fuel breaks that will disrupt the fuel continuity across the landscape in stands where annual invasive grasses are a minor component in the understory, burning slash piles from conifer reduction treatments, used as a component with other treatment methods to combat annual grasses and restore native plant communities).

Allow prescribed fire in known sage-grouse winter range only after the NEPA analysis for the Burn Plan has addressed the four bullets outlined above. Any prescribed fire in winter habitat will need to be designed to strategically reduce wildfire risk around and/or in the winter range and designed to protect winter range habitat quality.

Post Fire Management

**MD FIRE 32:** Utilize the findings and Restoration/Rehabilitation Strategy developed as part of the FIAT Assessment process described in **Appendix H** to determine if GRSG rehabilitation actions are needed, based on ecological potential, and direct emergency stabilization and rehabilitation (ESR) (BLM) actions after fire.

**MD FIRE 33:** Incorporate GRSG Habitat Management Objectives into ESR/BAER plans based on site potential and in accordance with the Restoration/Rehabilitation Strategy developed as a result of the FIAT Assessments.

**MD FIRE 34:** Provide adequate rest from livestock grazing to allow natural recovery of existing vegetation and successful establishment of seeded species within burned/ESR areas. All new seedings of grasses and forbs should not be grazed until at least the end of the second growing season, and longer as needed to allow plants to mature and develop robust root systems which will stabilize the site, compete effectively against cheatgrass and other invasive annuals, and remain sustainable under long-term grazing management. Adjust other management activities, as appropriate, to meet ESR objectives.

**MD FIRE 35:** Adjust, as appropriate, livestock management on adjacent unburned areas to mitigate the effect of the burn on local GRSG populations.

**MD FIRE 36:** Following seedling establishment, modify grazing management practices if needed to achieve long-term vegetation and habitat objectives.

### 2.2.4 Livestock Grazing (LG)

*Management Decisions (MD)*

**MD LG 1**: Maintain existing areas designated as available or unavailable for livestock grazing. Existing active AUMs for livestock grazing within the planning area will not be changed at the broad scale, though the number of AUMs available on an allotment may be adjusted based on site-specific conditions to meet management objectives during term permit renewals, AMP development, or other appropriate implementation planning. Additionally, temporary adjustments can be made annually to livestock numbers, the number of AUMs, and season of use in accordance with applicable regulations.

**MD LG 2**: Prioritize BLM land health assessments and processing of BLM grazing permits consistent with management area prioritization (MD SSS 4), unless other higher priority considerations exist (MD LG 15) or other factors such as threatened, endangered and proposed species habitat that livestock grazing can affect. Where possible, conduct land health assessments at the watershed, or other meaningful landscape-scale.

**MD LG 3**: Where opportunities exist, coordinate with other land managers to encourage livestock operations that utilize mixed federal, private and/or state land to be managed at the landscape scale to benefit GRSG and their habitat across land ownerships.

**MD LG 4**: PHMA & IHMA: During the land health assessment process, identify the type(s) of seasonal habitat the assessed areas are capable of supporting. Utilize the habitat assessment framework, (Stiver et al. 2015) or other BLM approved methodology, in accordance with current policy and guidance to determine whether vegetation structure, condition and composition are meeting GRSG habitat objectives including riparian and lentic areas (Objective SSS 2; Table 2-2). Use appropriate Ecological Site Descriptions, reference sheets and state and transition models to inform desired habitat conditions and expected responses to management changes for the land unit being assessed.

**MD LG 5**: When modifying grazing management, analyze indirect impacts on habitat, including changes in fuel loading and wildfire behavior.

**MD LG 6:** When livestock management practices are determined to not be compatible with meeting or making progress towards achievable habitat objectives following appropriate consultation, cooperation and coordination, implement changes in grazing management through grazing authorization modifications, or allotment management plan implementation. Potential modifications include, but are not limited to, changes in:

- Season or timing of use;
- Numbers of livestock;
- Distribution of livestock use;
- Duration and/or level of use;
- Kind of livestock (e.g., cattle, sheep, horses, or goats) (Briske et al. 2011); and
- Grazing schedules (including rest or deferment).

*Not in Priority Order

**MD LG 7**: Where opportunities exist, establish forage reserves to facilitate restoration and rehabilitation efforts in GRSG habitat areas. A forage reserve is an area that is set aside for use as needed by various permittees who might be displaced by wildfire, ESR, restoration efforts, etc. rather than having a term permit issued for grazing like a regular allotment.

**MD LG 8:** PHMA & IHMA - Where practical, design pasture rotations to utilize non-native perennial grass seedings and/or annual grasslands, during GRSG nesting season annually or periodically.

**MD LG 9:** Evaluate the locations where salt/supplements are placed, coordinate salt/supplements placement to reduce impacts on GRSG habitat (e.g., existing disturbed areas).

**MD LG 10**: Incorporate RDFs into Terms and Conditions for crossing permits to limit disturbance of occupied leks when trailing livestock across BLM administered lands in the spring. Work with permittees in locating over-nighting, watering and bedding locations to minimize impacts on seasonal habitats.

**MD LG 11:** Design any new structural range improvements, following appropriate cooperation, consultation and coordination, to minimize and/or mitigate impacts on GRSG habitat. Any new structural range improvements should be placed along existing disturbance corridors or in unsuitable habitat, to the extent practical, and are subject to RDFs (**Appendix C**). Structural range improvement in this context, include, but are not limited to: fences, exclosures, corrals or other livestock handling structures; pipelines, troughs, storage tanks (including moveable tanks used in livestock water hauling), windmills, ponds/reservoirs, solar panels and spring developments.

**MD LG 12:** During the land health assessment and grazing permit renewal process, evaluate existing livestock management range improvements with respect to their effect on GRSG habitat. Consider removal of projects that are not needed for effective livestock management, are no longer in working condition, and/or negatively affect GRSG habitat, with the exception of functional projects needed for management of habitat for other threatened, endangered or proposed species or other sensitive resources.

**MD LG 13**: Prioritize removal, modification or marking of fences or other structures in areas of high collision risk following appropriate cooperation, consultation and coordination to reduce the incidence of GRSG mortality due to fence strikes (Stevens et al. 2012).

**MD LG 14**: In response to weather conditions (i.e. drought) adjust grazing management (i.e., delay turnout, adjust pasture rotations, adjust the amount and/or duration of grazing) as appropriate to provide for adequate food and cover for GRSG.

**MD LG 15**: The BLM will prioritize (1) the review of grazing permits/leases, in particular to determine if modification is necessary prior to renewal, and (2) the processing of grazing permits/leases in Sagebrush Focal Areas (SFA) followed by PHMA outside of the SFA. In setting workload priorities, precedence will be given to existing permits/leases in these areas not meeting Land Health Standards, with focus on those containing riparian areas, including wet meadows. Management and conservation action prioritization will occur at the Conservation Area (CA) scale and be based on GRSG population and habitat trends: Focusing management and conservation actions first in SFA followed by areas of PHMA outside SFA. The BLM may use other criteria for prioritization to respond to urgent natural resource concerns (e.g., fire) and legal obligations.

**MD LG 16**: The NEPA analysis for renewals and modifications of livestock grazing permits/leases that include lands within SFA and PHMA will include specific management thresholds, based on GRSG Habitat Objectives Table, Land Health Standards (43 CFR 4180.2) and ecological site potential, and one or more defined responses that will allow the authorizing officer to make adjustments to livestock grazing that have already been subjected to NEPA analysis.

**MD LG 17**: Allotments within SFA, followed by those within PHMA, and focusing on those containing riparian areas, including wet meadows, will be prioritized for field checks to help ensure compliance with the terms and conditions of the grazing permits. Field checks can include monitoring for actual use, utilization, and use supervision. Management and conservation action prioritization will occur at the Conservation Area (CA) scale and be based on GRSG population and habitat trends: Focusing management and conservation actions first in SFA followed by areas of PHMA outside SFA.

**MD LG 18**: At the time a permittee or lessee voluntarily relinquishes a permit or lease, the BLM will consider whether the public lands where that permitted use was authorized should remain available for livestock grazing or be used for other resource management objectives, such as reserve common allotments or fire breaks. This does not apply to or impact grazing preference transfers, which are addressed in 43 CFR 4110.2-3.

### 2.2.5 Wild Horses and Burros (WHB)

*Management Decisions (MD)*

**WHB-1**: Manage herd management areas (HMAs) in GRSG habitat within established AML ranges to achieve and maintain GRSG habitat objectives (Table 2-2).

**WHB-2**: Complete rangeland health assessments for HMAs containing GRSG habitat using an interdisciplinary team of specialists (e.g. range, wildlife, and riparian). The priorities for conducting assessments are: 1) HMAs Containing SFA; 2) HMAs containing PHMA; 3) HMAs containing IHMA; 4) HMAs containing GHMA; 5) HMAs containing sagebrush habitat outside of PHMA, IHMA, and GHMA mapped habitat; 6) HMAs without GRSG Habitat.

**WHB-3**: Prioritize gathers and population growth suppression techniques in HMAs in GRSG habitat, unless removals are necessary in other areas to address higher priority environmental issues, including herd health impacts. Place higher priority on Herd Areas not allocated as HMAs and occupied by wild horses and burros in SFA followed by PHMA.

**WHB-4**: In SFA and PHMA outside of SFA, assess and adjust AMLs through the NEPA process within HMAs when wild horses or burros are identified as a significant causal factor in not meeting land health standards, even if current AML is not being exceeded.

**WHB-5:** In SFA and PHMA outside of SFA, monitor the effects of wild horse and burro use in relation to GRSG seasonal habitat objectives on an annual basis to help determine future management actions.

**WHB-6**: Develop or amend herd management area plans (HMAPs) to incorporate GRSG habitat objectives and management considerations for all HMAs within GRSG habitat, with emphasis placed on SFA and other PHMA.

**WHB-7:** Consider removals or exclusion of wild horse and burros during or immediately following emergency situations (such as fire, floods, and drought) to facilitate meeting GRSG habitat objectives where HMAs overlap with GRSG habitat.

**WHB-8**: When conducting NEPA analysis for wild horse and burro management activities, water developments, or other rangeland improvements for wild horses, address the direct and indirect impacts on GRSG populations and habitat. Implement any water developments or rangeland improvements using the criteria identified for domestic livestock.

**WHB-9:** Coordinate with professionals from other federal and state agencies, researchers at universities, and others to utilize and evaluate new management tools (e.g., population growth suppression, inventory techniques, and telemetry) for implementing the wild horse and burro program.

### 2.2.6 Mineral Resources (MR)

***Fluid Minerals***

**Objective MR 1:** Priority will be given to leasing and development of fluid mineral resources, including geothermal, outside of PHMA, IHMA, and GHMA. When analyzing leasing and authorizing development of fluid mineral resources, including geothermal, in PHMA, IHMA, and GHMA, and subject to applicable stipulations for the conservation of GRSG, priority will be given to development in non-habitat areas first and then in the least suitable habitat for GRSG. The implementation of these priorities will be subject to valid existing rights and any applicable law or regulation, including, but not limited to, 30 USC 226(p) and 43 CFR 3162.3-1(h).

**Objective MR 2:** Where a proposed fluid mineral development project on an existing lease can adversely affect GRSG populations or habitat, the BLM will work with the lessees, operators, or other project proponents to avoid, minimize and apply compensatory mitigation to the extent compatible with lessees' rights to drill and produce fluid mineral resources. The BLM will work with the lessee, operator, or project proponent in developing an APD or Geothermal Drilling Permit (GDP) for the lease to avoid, minimize, and apply compensatory mitigation to impacts on GRSG or its habitat and will ensure that the best information about the GRSG and its habitat informs and helps to guide development of such Federal leases.

*Management Decisions (MD)*

**MD MR 1**: Idaho and Montana: Areas within SFA will be open to fluid mineral leasing and development and geophysical exploration subject to NSO without waiver, exception, or modification. Areas within PHMA (outside SFA) and IHMA will be open to mineral leasing and development and geophysical exploration subject to NSO with a limited exception (MD MR 3). GHMA will be open to mineral leasing and development and geophysical exploration subject to CSU which includes buffers and standard stipulations.

**MD MR 2:** In Idaho, parcels nominated for lease in PHMA or IHMA will be evaluated prior to lease offering to determine if development is feasible. In GHMA, parcels will not be offered for lease if buffers and restrictions (including RDFs) preclude development in the leasing area.

**MD MR 3:** PHMA and IHMA: No waivers or modifications to a fluid mineral lease NSO stipulation will be granted. The Authorized Officer may grant an exception to a fluid mineral lease NSO stipulation only where the proposed action:

i. Will not have direct, indirect, or cumulative effects on GRSG or its habitat; or,
ii. Is proposed to be undertaken as an alternative to a similar action occurring on a nearby parcel, and will provide a clear conservation gain to GRSG.

Exceptions based on conservation gain (ii) may only be considered in (a) PHMA of mixed ownership where federal minerals underlie less than fifty percent of the total surface, or (b) areas of the public lands where the proposed exception is an alternative to an action occurring on a nearby parcel subject to a valid Federal fluid mineral lease existing as of the date of this RMP amendment. Exceptions based on conservation gain must also include measures, such as enforceable institutional controls and buffers, sufficient to allow the BLM to conclude that such benefits will endure for the duration of the proposed action's impacts.

Any exceptions to this lease stipulation may be approved by the Authorized Officer only with the concurrence of the State Director. The Authorized Officer may not grant an exception unless the applicable state wildlife agency, the USFWS, and the BLM unanimously find that the proposed action satisfies (i) or (ii). Such finding shall initially be made by a team of one field biologist or other GRSG expert from each respective agency. In the event the initial finding is not unanimous, the finding may be elevated to the appropriate BLM State Director, USFWS State Ecological Services Director, and state wildlife agency head for final resolution. In the event their finding is not unanimous, the exception will not be granted. Approved exceptions will be made publically available at least quarterly.

**MD MR 4:** Incorporate required design features and best management practices appropriate to the management area as COAs when post leasing activity is proposed into any post-lease authorizations.

**MD MR 5:** In Montana, prior to leasing conduct a Master Leasing Plan process when all four of the following criteria are met:

- A substantial portion of the area to be analyzed in the MLP is not currently leased.
- There is a majority Federal mineral interest.
- The oil and gas industry has expressed a specific interest in leasing, and there is a moderate or high potential for oil and gas confirmed by the discovery of oil and gas in the general area.
- Additional analysis or information is needed to address likely resource or cumulative impacts if oil and gas development were to occur where there are:
  - multiple-use or natural/cultural resource conflicts;
  - impacts on air quality;
  - impacts on the resources or values of any unit of the National Park System, national wildlife refuge, or National Forest wilderness area, as determined after consultation or coordination with the NPS, the USFWS, or the Forest Service; or
  - impacts on other specially designated areas. – analyzing likely development scenarios and varying mitigation levels.

**MD MR 6:** In Idaho, complete a Master Development Plan, consistent with plan development guide on leases where a producing field is proposed to be developed.

**MD MR 7:** Encourage unitization when deemed necessary for proper development and operation of an area (with strong oversight and monitoring). The unitization must be designed in a manner to minimize adverse impacts on GRSG according to the Federal Lease Form, 3100-11, Sections 4 and 6.

**MD MR 8:** Issue Written Orders of the Authorized Officer (43 CFR 3161.2) requiring reasonable protective measures consistent with the lease terms where necessary to avoid or minimize impacts on GRSG populations or habitat.

***Locatable Minerals***

**MD MR 9:** Apply reasonable and appropriate RDFs to locatable minerals, to the extent consistent with applicable law to prevent unnecessary or undue degradation of GRSG habitat when a Plan of Operations is submitted for BLM approval, in accordance with 43 CFR 3809.411(d)(2).

**MD MR 10:** Recommend SFA for withdrawal from the General Mining Act of 1872, as amended, subject to valid existing rights.

### *Salable Minerals*

**MD MR 11:** PHMA: All PHMA will be closed to mineral materials development. However, existing free use permits and the expansion of existing free use permits may be considered only if the following criteria are met:

- the project area disturbance cap is not exceeded within a BSU;
- the activity is subject to the provisions set forth in the mitigation framework [**Appendix F**];
- all applicable required design features are applied; and
- the activity is permissible under the Idaho exception and development criteria (MD SSS 29 and MD SSS 30)
    - IHMA: All IHMA will be open to mineral materials development, consistent with the Idaho Anthropogenic Disturbance Criteria (MD SSS 30), and subject to RDFs, and buffers. Sales from existing community pits within IHMA will be subject to seasonal timing restrictions (**Appendix C**).
    - GHMA: All GHMA will be open to mineral materials development, subject to RDFs and buffers. Sales from existing community pits within GHMA will be subject to seasonal timing restrictions (**Appendix C**).

**MD MR 12:** Restore salable mineral pits no longer in use to meet GRSG habitat management objectives.

**MD MR 13:** Require reclamation bonding that will require restoration of GRSG habitat on new site authorizations for mineral material pits in IHMA (this will not apply to free use permits issued to a government entity such as a county road district, but will apply to non-profit entities).

**MD MR 14:** Montana: PHMA are closed to new mineral material sales. However, these areas remain "open" to free use permits and the expansion of existing active pits, only if the following criteria are met:

- the activity is within the BSU and project area disturbance cap;
- the activity is subject to the provisions set forth in the mitigation framework [**Appendix F**];
- all applicable required design features are applied; and
- the activity is permissible under the Montana screening criteria (MD SSS 30) **Appendix J**.

### *Nonenergy Leasable Minerals*

**MD MR 15:** PHMA are closed to leasing. IHMA and GHMA: Areas within Known Phosphate Leasing Areas (KPLAs) will remain open to leasing subject to standard stipulations. IHMA areas outside of KPLAs are open to prospecting and subsequent leasing provided the Anthropogenic Disturbance Development Criteria (MD SSS 30) and the anthropogenic disturbance cap (MD SSS 27) can be met. RDFs and buffers shall be applied to prospecting permits. GHMA: Lands outside KPLAs are available for prospecting and subsequent leasing and initial mine development subject to RDFs, buffers, and standard stipulations.

**MD MR 16:** Require seasonal and daily timing restrictions (**Appendix C**) in undeveloped nonenergy mineral leases when exploration activities or initial mine development is proposed (e.g. exploration drilling, timber removal, shrub clearing, etc.) as COAs.

**MD MR 17:** Include RDFs as COAs to mine plans in undeveloped non-energy mineral leases for exploration activities or initial mine development.

***Coal (Montana)***

**MD MR 18:** At the time an application for a new coal lease or lease modification is submitted to the BLM, the BLM will determine whether the lease application area is "unsuitable" for all or certain coal mining methods pursuant to 43 CFR 3461.5. PHMA is essential habitat for maintaining GRSG for purposes of the suitability criteria set forth at 43 CFR 3461.5(o)(1).

***Mineral Split Estate***

**MD MR 19:** BLM Owns Mineral Estate – non-federal surface owner: Where the federal government owns the mineral estate in PHMA, IHMA, and GHMA, and the surface is in non-federal ownership, apply the same stipulations, COAs, and/or conservation measures and RDFs applied if the mineral estate is developed on BLM-administered lands in that management area, to the maximum extent permissible under existing authorities, and in coordination with the landowner.

**MD MR 20:** BLM owns surface – non-federal mineral estate owner: Where the federal government owns the surface and the mineral estate is in non-federal ownership in PHMA, IHMA, and GHMA, apply appropriate surface use COAs, stipulations, and mineral RDFs through ROW grants or other surface management instruments, to the maximum extent permissible under existing authorities, in coordination with the mineral estate owner/lessee.

### 2.2.7 Renewable Energy (Wind and Solar) (RE)

*Management Decisions (MD)*

<u>Industrial Solar, Wind, Nuclear, and Hydropower Development</u>

**MD RE 1:** PHMA: Designate and manage PHMA as exclusion areas for utility scale (20 MW) wind and solar testing and development, nuclear and hydropower energy development. IHMA: Designate and manage IHMA as avoidance areas for wind and solar testing and development, nuclear and hydropower development. GHMA **(Idaho)**: Designate and manage GHMA as open for wind and solar testing and development and nuclear and hydropower development subject to RDFs and buffers. GHMA **(Montana)**: Designate and manage GHMA as avoidance for wind and solar testing and development and nuclear and hydropower development.

### 2.2.8 Lands and Realty (LR)

**Objectives LR 1:** Effects of infrastructure projects, including siting, will be minimized using the best available science, updated as monitoring information on current infrastructure projects becomes available.

*Management Decisions (MD)*

Utility Corridors and Communication Sites

**MD LR 1:** Existing designated corridors, including Section 368 Corridors, will remain Open in all habitat management areas (subject to the ongoing settlement agreement).

Also see **MD LR 10** and **MD SSS 31**

Land Use Authorizations

**MD LR 2**: PHMA: Designate and manage PHMA as ROW avoidance areas, consistent with MD SSS 29 and subject to RDFs and buffers (Appendices B and C). IHMA: Designate and manage IHMA as ROW avoidance areas, consistent with MD SSS 30 and subject to RDFs and buffers. GHMA **(Idaho and Montana)**: Designate and manage GHMA as open with proposals subject to RDFs and buffers.

**MD LR 3**: PHMA: Development of commercial service airports and facilities (as defined by FAA 2014 – publically owned airports that have at least 2,500 passenger boardings each calendar year and receive scheduled passenger service) will not be allowed within PHMA. IHMA and GHMA are Avoidance and Open respectively for these types of ROW applications as described in MD LR 2.

**MD LR 4**: PHMA: Development of new or expansion of existing landfills will not be allowed within PHMA. IHMA and GHMA are Avoidance and Open respectively for these types of ROW applications as described in MD LR 2.

**MD LR 5**: Consistent with MD LR 3, MD LR 4, and MD RE 1, Rights-of-way for development of new or amended ROWs and land use authorizations (including permits and leases) in PHMA will only be considered when consistent with the Anthropogenic Disturbance Screening Criteria (MD SSS 29); Rights-of-way for development of new or amended ROWs and land use authorizations (including permits and leases) in IHMA can be considered consistent with the IHMA Anthropogenic Disturbance Development Criteria (MD SSS 30). GHMA: New ROW and land use authorizations can be considered.

**MD LR 6**: In PHMA, if a higher voltage transmission line is required adjacent to an existing line (i.e. the project is an incremental upgrade/capacity increase of existing development (i.e. power line capacity upgrade):

- the existing transmission line must be removed and area rehabilitated within a specified amount of time after the new line is installed and energized; and
- the new line must be constructed in the same alignment as the existing line unless an alternate route will benefit GRSG or GRSG habitat.

**MD LR 7**: Process unauthorized use. If the unauthorized use is subsequently authorized, it will be authorized consistent with direction from this plan including RDFs and buffers. If the use is not subsequently authorized the site will be reclaimed by removing these unauthorized (trespass) features and rehabilitating the habitat.

**MD LR 8**: Land use authorizations that are temporary (less than 3 years) in nature and are not otherwise excluded or restricted will be subject to seasonal or timing restrictions (**Appendix C**) and mitigation requirements regarding habitat loss as needed.

**MD LR 9**: New ROW applications for water facilities (ditches, canals, pipelines), or amendments to existing water facilities which include additional structures to improve fish passage or benefits to fisheries (new diversions, fish screens) will be allowed on a case-by-case basis subject to RDFs to reduce impacts on GRSG habitat and mitigation requirements regarding GRSG habitat loss as needed.

**MD LR 10**: When a ROW grant expires and is not requested to be renewed, is relinquished, or terminated, the lease holder will be required to reclaim the site by removing overhead lines and other infrastructure and to eliminate avian predator nesting opportunities provided by anthropogenic development on public lands associated with the now void ROW grant (e.g., remove power line and communication facilities no longer in service).

**MD LR 11**: As opportunities and priorities indicate work with existing ROW holders to retrofit existing towers and structures consistent with RDFs described in **Appendix C**.

**MD LR 12**: PHMA **(Idaho and Montana)** and IHMA **(Idaho)**, and GHMA **(Montana only)** are designated as avoidance areas for high voltage transmission line and large pipeline ROWs, except for Gateway West and Boardman to Hemingway Transmission Projects. All authorizations in these areas, other than the following identified projects, must comply with the conservation measures outlined in this proposed plan, including the RDFs and avoidance criteria presented in MD SSS 29 and MD SSS 30 of this document. The BLM is currently processing an application for Gateway West and Boardman to Hemingway Transmission Projects and the NEPA review for this project is well underway. Conservation measures for GRSG are being analyzed through the project's NEPA review process, which should achieve a net conservation benefit for the GRSG.

**MD LR 13:** Consider the likelihood of development of not-yet-constructed surface disturbing activities – as defined in Table 2 of the Monitoring Framework (**Appendix D**) – under valid existing rights.

<u>Land Tenure</u>

**MD LR 14**: Lands classified as PHMA, IHMA, and GHMA for GRSG will be retained in federal management unless: (1) the agency can demonstrate that disposal of the lands, including land exchanges, will provide a net conservation gain to the GRSG or (2) the agency can demonstrate that the disposal, including land exchanges, of the lands will have no direct or indirect adverse impact on conservation of the GRSG. Land tenure adjustments will be subject to the following disposal, exchange, and acquisition criteria, which include retaining lands with GRSG habitat. Retention of areas with GRSG will reduce the likelihood of habitat conversion to agriculture, urbanization, or other uses that will remove sagebrush habitat and potentially impact sensitive plants. Criteria:

a. Acquire habitat within PHMA and IHMA, when possible (i.e. willing landowner), and retain ownership of habitat within all Areas, except if disposal will allow for additional or more contiguous federal ownership patterns.

b. Lands within PHMA, IHMA and GHMA will be retained unless disposal of those lands will increase the extent or provide for connectivity of PHMA, IHMA or GHMA.

c. Evaluate potential land exchanges containing historically low-quality GRSG habitat that may be too costly to restore in exchange for lands of higher quality habitat, lands that connect seasonal GRSG habitats or lands providing for threatened and endangered species. These potential exchanges should lead to an increase in the extent or continuity of or provide for improved connectivity of PHMA. Higher priority will be given to exchanges for those in-tact areas of sagebrush that will contribute to the expansion of sagebrush areas within PHMA currently in public ownership. Lower priority will be given to other lands that will promote enhancement in the PHMA and IHMA (i.e., areas with fragmented or less in-tact sagebrush).

d. Identify lands for acquisition that increase the extent of or provide for connectivity of PHMA.

Withdrawals

See **MD SS 10** regarding Sagebrush Focal Areas (SFA).

### 2.2.9 Recreation and Visitor Services (REC)

*Management Decisions (MD)*

**REC-1**: Manage existing recreation uses and sites to minimize adverse effects on GRSG or their habitat through incorporation of RDFs, buffers and seasonal restrictions.

**REC-2**: In PHMA and IHMA, do not construct new recreation facilities (e.g., campgrounds, trails, trailheads, staging areas) unless the development will have a net conservation gain to GRSG habitat (such as concentrating recreation, diverting use away from critical areas, etc.), or unless the development is required for visitor health and safety or resource protection.

### 2.2.10 Travel and Transportation (TTM)

*Management Decisions (MD)*

**MD TTM 1:** Limit off-highway vehicle travel within Idaho BLM Field Offices to existing roads, primitive roads, and trails in areas where travel management planning has not been completed or is in progress. This excludes areas previously designated as open through a land use plan decision or currently under review for designation as open, currently being analyzed in ongoing RMP revision efforts in the Four Rivers, Jarbidge and Upper Snake Field Offices.

**MD TTM 2:** In PHMA, IHMA, and GHMA, temporary closures will be considered in accordance with 43 CFR subpart 8364 (Closures and Restrictions); 43 CFR subpart 8351 (Designated National Area); 43 CFR subpart 6302 (Use of Wilderness Areas, Prohibited Acts, and Penalties); 43 CFR subpart 8341 (Conditions of Use) and other applicable law and policy.

**MD TTM 3:** Develop Travel Management Plans for each Field Office as described in the BLM Travel Management Handbook 8342.1 and according to the travel management planning guidelines (Appendix L of FEIS).

**MD TTM 4:** During subsequent travel management planning design and designate a travel system to minimize adverse effects on GRSG. Locate areas and trails to minimize disturbance of GRSG and/or to have a neural or positive effect on GRSG habitat and populations. Give special attention to protect endangered or threatened species and their habitats. Allow for route upgrade, closure of existing routes, timing restrictions, seasonal closures, and creation of new routes to help protect habitat and meet user group needs, thereby reducing the potential for pioneering unauthorized routes. The emphasis of the comprehensive travel and transportation planning within PHMA will be placed on having a neutral or positive effect on GRSG habitat. Individual route designations will occur during subsequent travel management planning efforts.

**MD TTM 5:** Conduct road construction, upgrades, and maintenance activities to avoid disturbance during the lekking season – see **Appendix C**.

### 2.2.11 Mitigation (Montana)

(Also see **Appendix F** and **J**)

*Management Decisions (MD)*

**Montana 1**: BLM will establish an inter-agency State GRSG Conservation Team at the state level (both Idaho and Montana) to help guide conservation of GRSG through compensatory mitigation, within 90 days of the issuance of the Record of Decision.

**Montana 2**: The BLM, in coordination with the GRSG Conservation Team will develop a Mitigation Strategy within one year of the issuance of the Record of Decision. In Idaho this strategy will be consistent with the Idaho Mitigation Framework (**Appendix F**).

**Montana 3**: In all GRSG habitat, in undertaking BLM management actions, and, consistent with valid existing rights and applicable law, in authorizing third-party actions that result in habitat loss and degradation (**Appendix E**, Table E-1), the BLM will require and ensure mitigation that provides a net conservation gain to the species including accounting for any uncertainty associated with the effectiveness of such mitigation. This will be achieved by avoiding, minimizing, and compensating for impacts by applying beneficial mitigation actions.

**Montana 4**: Mitigate anthropogenic development (**Appendix E**, Table E-1) impacts on GRSG habitat through application of appropriate mitigation in accordance with the Mitigation Framework (**Appendix F** and **L**).

**Montana 5**: Consistent with regulations for minerals activities, require a full reclamation bond specific to the site when surface disturbing activities are proposed. Ensure reclamation bonds are sufficient to cover costs to fully rehabilitate lost GRSG habitat. Base the reclamation costs on the assumption that contractors for the BLM will perform the work. Areas are considered fully rehabilitated when they meet the conditions described in Table 2-2.

### 2.2.12 Coordination (CC)

*Management Decisions (MD)*

**MD CC 1:** Collaborate, coordinate and utilize cooperative planning efforts to implement and monitor activities to achieve desired conditions and to maximize the utilization of available funding opportunities. Coordination efforts can include: adjacent landowners, federal and state agencies, local governments, tribes, communities, other agencies, resource advisory groups, public lands permit holders and non-governmental organizations.

**MD CC 2:** Develop a cooperative MOU between the BLM, Forest Service and State of Idaho to establish the State of Idaho as a cooperating agency during implementation of the final decision. The MOU will identify responsibilities, role and interaction of the BLM, Forest Service and State of Idaho.

Montana BLM will participate as appropriate on Montana's Sage-grouse Oversight Team to facilitate coordination and implementation of BLM's final decision and Montana's Executive Order No. 10-2014.

**MD CC 3:** The BLM will consider any recommendations from the Governor of Idaho as a result of evaluation completed by the Sage-Grouse Implementation Task Force.

**MD CC 4:** Idaho: The BLM will coordinate with the State of Idaho and the Idaho Sage-Grouse Implementation Task Force regarding proposed management changes, the implementation of conservation measures, mitigation, and site-specific monitoring, related to adaptive management, anthropogenic disturbance and livestock grazing.

**MD CC 5:** Montana: The BLM will coordinate with the State of Montana and the Montana Sage-grouse Oversight Team regarding proposed management changes, the implementation of conservation measures, mitigation, and site-specific monitoring, related to adaptive management and anthropogenic disturbance.

**MD CC 6:** Upon completion of the Record of Decision the BLM will develop an initial Implementation Guide for BLM District and Field Offices within a year of issuance of the Record of Decision. This Guide will define and describe consistent application of the allocations, management actions, required design features, and etc. that are contained within the final plan and will be updated and expanded as needed to respond to issues and concerns.

**MD CC 7**: At the state level, BLM will coordinate with IDFG, MFWP, USFWS, and other conservation partners in collaborative efforts with adjacent states (Oregon, Nevada, Utah, Montana, Wyoming) in GRSG MZs IV and II to evaluate GRSG habitat and population status and trends and make appropriate regional recommendations for GRSG conservation at broader scales.

**MD CC 8:** At the state level, BLM will coordinate with the appropriate WAFWA Sage-grouse Technical Committee to develop consistent population and habitat monitoring approaches that facilitate GRSG conservation at the MZ scale.

**MD CC 9:** All prescribed burning will be coordinated with state and local air quality agencies to ensure that local air quality is not significantly impacted by BLM activities.

### 2.2.13 RDFs Defined

RDFs are means, measures, or practices intended to reduce or avoid adverse environmental impacts. This LUPA/EIS proposes a suite of design features that will establish the minimum specifications for water developments, certain mineral development, and fire and fuels management and will mitigate adverse impacts. These design features will be required to provide a greater level of regulatory certainty than through implementing BMPs.

In general, the design features are accepted practices that are known to be effective when implemented properly at the project level. However, their applicability and overall effectiveness cannot be fully assessed except at the project-specific level when the project location and design are known. Because of site-specific circumstances, some features may not apply to some projects (e.g., when a resource is not present on a given site) or may require slight variations from what is described in the LUPA/EIS (e.g., a larger or smaller protective area). All variations in design features will require appropriate analysis and disclosure as part of future project authorizations. Additional mitigation measures may be identified and required during individual project development and environmental review. The proposed RDFs are presented in **Appendix C**.

# CHAPTER 3
# CONSULTATION, COORDINATION, AND PUBLIC INVOLVEMENT

The BLM land use planning activities are conducted in accordance with NEPA requirements, CEQ regulations, and Department of the Interior and BLM policies and procedures implementing NEPA. NEPA and associated laws, regulations, and policies require the BLM to seek public involvement early in and throughout the planning process. Public involvement and agency consultation and coordination, which have been at the heart of the planning process leading to this ARMPA, were achieved through *Federal Register* notices, public and informal meetings, individual contacts, media releases, planning bulletins, and the Idaho GRSG website (http://http://www.blm.gov/id/st/en/prog/wildlife_and_fisheries/greater_sage-grouse.html).

## 3.1 CONSULTATION AND COORDINATION

The BLM collaborated with numerous agencies, municipalities, and tribes throughout the preparation of this ARMPA. Its outreach and collaboration with cooperating agencies are described in Section 6.3 of the Proposed RMP and Final EIS. Twenty-eight agencies[1] accepted the offer to participate in the BLM planning process as cooperating agencies. The BLM formally invited the cooperating agencies to help develop the alternatives for the RMPA and EIS and to provide data and other information related to their agency responsibilities, goals, mandates, and expertise.

### 3.1.1 Section 7 Consultation

In accordance with Section 7 of the Endangered Species Act of 1973 (ESA), as amended, the BLM on November 19, 2013, requested a species list from the USFWS of any federally listed, federally proposed, or current federal candidate species that may be present in the RMP planning area. Over the ensuing months, it held regular meetings to identify the species that will be analyzed in the biological assessment, to address which actions can affect those species, and to determine whether the implementation of the

[1] Beaverhead County, Beaverhead-Deerlodge National Forest, Bingham County, Blaine County, Boise National Forest, Caribou-Targhee National Forest, Clark County, Craters of the Moon National Monument, Custer County, Fremont County, Idaho Association of Counties, Idaho Department of Fish and Game, Idaho Governor's Office of Species Conservation, Jefferson County, Lemhi County, Madison County, Montana Fish, Wildlife and Parks, Natural Resources Conservation Service, Owyhee County, Power County, Sawtooth National Forest, Twin Falls County, US Department of Defense, and USFWS

proposed plan "may affect" the species for which this consultation occurred. The BLM requested concurrence with their effects determinations from the USFWS under Section 7 of the ESA in May 2015. Informal Section 7 consultation was completed on June 11, 2015, when the USFWS provided a letter of concurrence on the impacts of the proposed plan amendment on listed species.

### 3.1.2 Native American Consultation

As part of the NEPA scoping and consultation process and as an opportunity to provide comment under Section 106 of the NHPA, the BLM notified the Idaho State Historic Preservation Officer (SHPO) seeking information on historic properties and land use planning direction included in this ARMPA. The BLM sought information about historic properties in consideration of land use planning decisions included in this ARMPA, in accordance with the National Programmatic Agreement (PA) between the BLM, Advisory Council on Historic Preservation, the National Conference of State Historic Preservation Officers, and the Idaho, Montana, and Oregon State Protocol Agreement between the BLM and the SHPO. The BLM incorporated the information it received from SHPOs and tribes into the Proposed RMPAs and considered such information in making the land use plan amendment decisions. The BLM has met its obligations under Section 106 of the NHPA, 54 USC, Section 306108, as outlined in the PA and the state protocols.

## 3.2 Public Involvement

The public involvement process, consultation, and coordination conducted for the RMP are described in Chapter 6 of the Proposed RMP and Final EIS. As required, public scoping meetings were conducted following the publication of the NOI to prepare an EIS in the *Federal Register* on December 9, 2011.

A notice of availability (NOA) for the Draft RMPA/EIS was published in the *Federal Register* on November 1, 2013, which initiated a 90-day public comment period. The BLM held seven public comment open houses, from January 6 through January 15, 2014, for the Draft RMPA/EIS at the following locations:

- Murphy, Idaho, on January 6, 2014
- Idaho Falls, Idaho, on January 7, 2014
- Salmon, Idaho, on January 8, 2014
- Dillon, Montana, on January 9, 2014
- Pocatello, Idaho, on January 13, 2014
- Twin Falls, Idaho, on January 14, 2014
- Boise, Idaho, on January 15, 2014

All meetings were from 5:30 to 7:30 p.m. The comments received on the Draft RMPA and EIS and BLM's responses were summarized in Appendix T of the Proposed RMP and Final EIS.

The NOA for the Proposed RMP and Final EIS was published on May 29, 2015, initiating a 30-day public protest period and a 60-day governors consistency review period. The 30-day protest period ended on June 29, 2015; the BLM received 20 protest letters.

# CHAPTER 4
# PLAN IMPLEMENTATION

## 4.1 IMPLEMENTING THE PLAN

Implementation, after a BLM RMP or RMP amendment is approved, is a continuous and active process. Decisions presented as management Decisions can be characterized as *immediate* or *one-time future* decisions.

Immediate decisions—These decisions are the land use planning decisions that go into effect when the ROD is signed. They include goals, objectives, and allowable uses and management direction, such as designating lands as open or closed for salable mineral sales, as open with stipulations for oil and gas leasing, and lands for OHV use. These decisions require no additional analysis and guide future land management actions and subsequent site-specific implementation decisions in the planning area. Proposals for future actions, such as oil and gas leasing, land adjustments, and other allocation-based actions, will be reviewed against these land use plan decisions to determine if the proposal is in conformance with the plan.

One-time future decisions—These are the decisions that are not implemented until additional decision-making and site-specific analysis is completed. Examples are implementation of the recommendations to withdraw lands from locatable mineral entry or development of travel management plans. Future one-time decisions require additional analysis and decision-making and are prioritized as part of the BLM budget process. Priorities for implementing one-time RMP decisions will be based on the following criteria:

- National BLM management direction
- Available resources

General implementation schedule of one-time decisions—Future decisions discussed in this ARMPA will be implemented over a period of years, depending on budget and staff availability. After issuing the ROD, the BLM will prepare implementation plans that establish tentative time frames for completing one-time decisions identified in the ARMPA. These actions require additional site-specific decision-making and analysis.

This schedule will assist BLM managers and staff in preparing budget requests and in scheduling work. However, the proposed schedule must be considered tentative and will be affected by future funding, nondiscretionary workloads, and cooperation by partners and the public. Yearly review of the plan will provide consistent tracking of accomplishments and information that can be used to develop annual budget requests to continue implementation.

## 4.2 Maintaining the Plan

The ARMPA can be maintained as necessary to reflect minor changes in data. Plan maintenance is limited to further refining or documenting a previously approved decision incorporated in the plan or clarifying previously approved decisions.

The BLM expects that new information gathered from field inventories and assessments, research, other agency studies, and other sources will update baseline data or support new management techniques, BMPs, and scientific principles. Where monitoring shows land use plan actions or BMPs are not effective, the plan may be maintained or amended, as appropriate.

Plan maintenance will be documented in supporting records. Plan maintenance does not require formal public involvement, interagency coordination, or the NEPA analysis required for making new land use plan decisions.

## 4.3 Changing the Plan

The ARMPA may be changed, should conditions warrant, through an amendment or revision. A plan amendment may become necessary to make major changes or to consider a proposal or action that is not in conformance with the plan. The results of monitoring, new data evaluation, or policy and public needs changes might also require a plan amendment. If several areas of the plan become outdated or otherwise obsolete, a plan revision may become necessary.

Plans are amended and revised with public input and the appropriate level of environmental analysis conducted according to the CEQ procedures for implementing NEPA.

The BLM and Forest Service have worked closely with the State of Idaho and USFWS in using the best available science to delineate GRSG occupancy in Idaho to the extent possible, as reflected in the boundaries of the PHMA, IHMA, and GHMA identified in this ARMPA. These management areas will be reviewed and updated approximately every five years, through plan maintenance or amendment or revision, as appropriate. However, before a specific five-year update, it is possible that additional areas of occupied GRSG habitat may be identified outside the three management areas. This would be due to progress toward conservation and habitat restoration, vegetation succession, or new information arising from scientific studies or targeted surveys. Such new areas of occupancy would be based on sound science (e.g., telemetry and formal habitat assessments documenting GRSG use) and would represent an occupied seasonal habitat. They must not be based solely on random or occasional observations of GRSG.

In these areas GRSG habitat on BLM-administered or Forest Service-managed lands would be managed in accordance with RDFs, seasonal restrictions, or BMPs deemed appropriate by the BLM or Forest Service for that area (see **Appendix C**, Required Design Features). During the five-year map update plan amendment/revision process, the BLM and Forest Service would consider formally designating these new areas as PHMA, IHMA, or GHMA, in coordination with the State of Idaho and the USFWS, along with other recommendations for modification to existing PHMA, IHMA or GHMA areas.

## 4.4 Plan Evaluation, Monitoring, and Adaptive Management

Plan evaluation is the process by which the plan and monitoring data are reviewed to determine if management goals and objectives are being met and if management direction is sound. Land use plan evaluations determine if decisions are being implemented, if mitigation measures are satisfactory, if there are significant changes in the related plans of other entities, if there is new data of significance to the plan, and if decisions should be amended or revised. Monitoring data gathered over time is examined and used to draw conclusions on whether management actions are meeting stated objectives, and if not, why not. Conclusions are then used to make recommendations on whether to continue current management or to identify what changes need to be made in management practices to meet objectives.

The BLM will use land use plan evaluations to determine if the decisions in the ARMPA, supported by the accompanying NEPA analysis, are still valid in light of new information and monitoring data. Evaluations will follow the protocols established by the BLM Land Use Planning Handbook (H-1601-1) or other appropriate guidance in effect at the time the evaluation is initiated. The monitoring framework for this ARMPA can be found in **Appendix D**.

The ARMPA also includes an adaptive management strategy that includes soft and hard triggers and responses. These triggers are not specific to any particular project but identify habitat and population thresholds. Triggers are based on the two key metrics that are being monitored during the life of the ARMPA: habitat loss and population declines. Soft triggers represent an intermediate threshold indicating that management changes are needed at the implementation level to address habitat or population losses. If a soft trigger were tripped during the life of the plans, the BLM's response would be to apply more conservative or restrictive conservation measures to mitigate for the specific cause in the decline of populations or habitats, with consideration of local knowledge and conditions. These adjustments will be made to preclude tripping a "hard" trigger (which signals more severe habitat loss or population declines). Hard triggers represent a threshold indicating that immediate action is necessary to stop a severe deviation from GRSG conservation objectives set forth in the ARMPA.

In the event that new scientific information becomes available demonstrating that the hard wired response will be insufficient to stop a severe deviation from GRSG conservation objectives set forth in the ARMPA, the BLM would implement interim management direction to ensure that conservation options are not foreclosed. It would also undertake any appropriate plan amendments or revisions. More information on the ARMPA's adaptive management strategy can be found in **Appendix E** and in the adaptive management direction in **Section 2.2** of this ARMPA.

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# CHAPTER 5
# GLOSSARY

**Actual use.** The amount of animal unit months consumed by livestock based on the numbers of livestock and grazing dates submitted by the livestock operator and confirmed by periodic field checks by the BLM.

**Adjacent.** Installation of new linear improvements parallel, near, or next to existing linear improvements.

**Allotment.** An area of land in which one or more livestock operators graze their livestock. Allotments generally consist of BLM-administered lands but may include other federally managed, state-owned, and private lands. An allotment also may include one or more separate pastures. Livestock numbers and periods of use are specified for each allotment.

**Animal unit month.** The amount of forage necessary to sustain one cow or its equivalent for one month.

**Anthropogenic disturbances.** Human-created features that include paved highways, graded gravel roads, transmission lines, substations, wind turbines, oil and gas wells, geothermal wells and associated facilities, pipelines, landfills, agricultural conversion, homes, and mines.

**Authorized/authorized use.** This is an activity (i.e., resource use) occurring on the public lands that is either explicitly or implicitly recognized and legalized by law or regulation. This term may refer to those activities occurring on the public lands for which the BLM or other appropriate authority (e.g., Congress for RS 2477 rights-of-way or FERC for major interstate rights-of-way) has issued a formal authorization document, such as a livestock grazing lease or permit, a right-of-way grant, a coal lease, or an oil and gas permit to drill. Formally authorized uses can involve commercial and noncommercial activity, facility placement, or event. These formally authorized uses are often limited by area or time. Unless constrained or bound by statute, regulation, or an approved land use plan decision, legal activities involving public enjoyment and use of the public lands for such activities as hiking, camping, and hunting require no formal BLM.

**Avoidance/avoidance area.** These terms usually address mitigation of some resource use. Paraphrasing the CEQ Regulations (40 CFR, Part 1508.20), avoidance means to circumvent or bypass an impact altogether by not taking a certain action or parts of an action. Therefore, avoidance does not necessarily prohibit a proposed activity, but it may require relocating or totally redesigning an action to eliminate any potential impacts resulting from it.

**Baseline.** The existing condition of a defined area or resource that can be quantified by an appropriate measure. During environmental reviews, the baseline is considered the affected environment at the time the review begins and is used to compare predictions of the effects of the proposed action or a reasonable range of alternatives.

**Best management practices.** A suite of techniques that guide or may be applied to management actions to aid in achieving desired outcomes. BMPs are often developed in conjunction with land use plans, but they are not considered a planning decision unless the plans specify that they are mandatory.

**Biologically significant unit.** A geographical area within GRSG habitat that contains relevant and important habitats and that is used as the basis for comparative calculations to evaluate changes to habitat. A biologically significant unit or subset of the unit is used to calculate the human disturbance threshold and the adaptive management habitat trigger. The biologically significant unit is defined as follows:

- Idaho—All of the modeled nesting and delineated winter habitat, based on 2012 data, within priority and important habitat management areas within a conservation area
- Montana—All of the PHMA and SFA.

**Candidate species.** Taxa for which the USFWS has sufficient information on their status and threats to propose the species for listing as endangered or threatened under the Endangered Species Act, but for which issuing a proposed rule is currently precluded by higher priority listing actions. Separate lists for plants, vertebrate animals, and invertebrate animals are published periodically in the *Federal Register* (BLM Manual 6840, Special Status Species Manual).

**Collocate.** Installing new linear improvements in or on existing linear improvements.

**Communication tower site.** Sites that include broadcast types of uses, such as television, AM/FM radio, cable television, and broadcast translators, and non-broadcast uses, such as commercial or private mobile radio service, cellular telephone, microwave, local exchange network, and passive reflectors.

**Compensatory mitigation.** Compensating for the residual impact of a certain action or parts of an action by replacing or providing substitute resources or environments (40 CFR, Part 1508.20).

**Condition of approval.** Requirement under which an application for a permit to drill or sundry notice is approved.

**Conservation area.** Area determined to be necessary to monitor population objectives to evaluate the disturbance density and adaptive regulatory triggers and engage adaptive management responses. Conservation areas may contain PHMA, IHMA, GHMA, and SFA. Specifically, these areas are Mountain Valleys, Desert, West Owyhee, and 1stern Montana.

**Conservation measures.** Undertakings to conserve, enhance, or restore GRSG habitat by reducing, eliminating, or minimizing threats.

**Controlled surface use.** This is a category of moderate constraint stipulations that allows some use and occupancy of public land, while protecting identified resources or values and is applicable to fluid mineral leasing and all activities associated with fluid mineral leasing. CSU areas are open to fluid mineral leasing, but the stipulation allows the BLM to require special operational constraints, or the activity can be shifted more than 656 feet to protect the specified resource or value.

**Cooperating agency.** Assists the lead federal agency in developing an environmental assessment or environmental impact statement. This can be any agency with jurisdiction by law or special expertise for proposals covered by NEPA (40 CFR, Part 1501.6). Any tribe or federal, state, or local government jurisdiction with such qualifications may become a cooperating agency by agreement with the lead agency.

**Council on Environmental Quality.** An advisory council to the president, established by NEPA. It reviews federal programs to analyze and interpret environmental trends and information.

**Cultural resources.** Locations of human activity, occupation, or use. Cultural resources are archaeological, historical, or architectural sites, structures, or places with important public and scientific uses and locations of traditional cultural or religious importance to specified social or cultural groups.

**Cumulative effects.** The direct and indirect effects of a proposed project alternative's incremental impacts when they are added to other past, present, and reasonably foreseeable actions, regardless of who carries out the action.

**Decision area.** Lands and federal mineral estate within the planning area that are administered by the BLM.

**Designated roads and trails.** Specific roads and trails identified by the BLM where some type of motorized/nonmotorized use is appropriate and allowed, either seasonally or year-long (H-1601-1, BLM Land Use Planning Handbook).

**Ecological site.** A distinctive kind of land with specific physical characteristics that differs from other lands in its ability to produce a distinctive kind and amount of vegetation.

**Endangered species.** Any species that is in danger of extinction throughout all or a significant portion of its range and is so designated by the Secretary of Interior, in accordance with the 1973 Endangered Species Act.

**Enhance.** Improve habitat by increasing missing or modifying unsatisfactory components or attributes of the habitat (e.g., road commissioning) to meet GRSG objectives.

**Environmental impact statement.** A detailed written statement required by NEPA when an agency proposes a major federal action significantly affecting the quality of the human environment.

**Exception (minerals).** A case-by-case exemption from a lease stipulation. The stipulation continues to apply to all other sites within the leasehold to which the restrictive criteria apply. The BLM Authorized

Officer may grant an exception if an environmental record of review determines that the action, as proposed or conditioned, will not impair the function or utility of the site for the current or subsequent seasonal habitat, life history, or behavioral needs of GRSG.

**Exclusion area.** An area on the public lands where a certain activity is prohibited to protect other resources on the site. The term is frequently used in reference to lands and realty actions and proposals, such as rights-of-way, but it is not unique to lands and realty activities. This restriction is functionally analogous to "no surface occupancy," which is used by the oil and gas program and is applied as an absolute condition to those affected activities. A less restrictive analogous term is "avoidance area."

**Exploration.** Drilling and geophysical operations to determine the presence of a mineral resource or to determine the extent of a reservoir or mineral deposit.

**Facility, energy and mining.** Constructed assets designed and created to serve a particular function and to afford a particular convenience or service that is affixed to a specific locations, such as oil and gas well pads and associated infrastructure.

**Federal Land Policy and Management Act of 1976 (FLPMA).** Public Law 94-579, which gives the BLM legal authority to establish public land policy, to establish guidelines for administering such policy, and to provide for management, protection, development, and enhancement of the public land.

**Federal mineral estate.** Subsurface mineral estate owned by the United States and administered by the BLM. Federal mineral estate under BLM jurisdiction is composed of mineral estate underlying BLM-administered lands, privately owned lands, and state-owned lands.

**Fire suppression.** All work and activities connected with fire extinguishing operations, beginning with discovery of a fire and continuing until the fire is completely out.

**Fluid minerals.** Oil, gas, coal bed natural gas, and geothermal resources.

**Forage.** All browse and herbaceous foods that are available to grazing animals.

**Forage reserve.** An area that is set aside for use as needed by various permittees who might be displaced by such circumstances as wildfire, emergency stabilization and rehabilitation, or restoration. rather than having a term permit issued for grazing like a regular allotment.

**General Habitat Management Areas.** Encompass habitat that is outside of PHMA or IHMA. GHMA contain approximately 10 percent of the occupied leks that are also of relatively low male attendance compared to leks in PHMA or IHMA. GHMA are generally characterized by lower quality disturbed or patchy habitat of low lek connectivity.

**Grazing relinquishment**. The voluntary and permanent surrender by an existing permittee or lessee, (with concurrence of any base property lienholder), of their priority (preference) to use a livestock forage allocation on public land as well as their permission to use this forage. Relinquishments do not require the BLM's consent or approval. The BLM's receipt of a relinquishment is not a decision to close areas to livestock grazing.

**Grazing system.** Scheduled grazing use and non-use of an allotment to reach identified goals or objectives by improving the quality and quantity of vegetation. It includes developing pastures, utilization levels, grazing rotations, timing and duration of use periods, and necessary range improvements.

**Habitat.** An environment that meets a specific set of physical, biological, temporal, or spatial characteristics that satisfy the requirements of a plant or animal species or group of species for part or all of their life cycle.

**Hard triggers.** Thresholds indicating that immediate action is necessary to stop a severe deviation from GRSG conservation objectives set forth in the land and resources management plan.

**High-voltage transmission line.** An electrical power line that is 100 kilovolts or larger.

**Holder.** An individual or entity that holds a valid special use authorization.

**Impact.** The effect, influence, alteration, or imprint caused by an action.

**Important Habitat Management Areas (IMHA).** High value habitat and populations that provide a management buffer for and connect patches of PHMA and SFA. They are of generally moderate to high conservation value habitat and populations and, in some conservation areas, include areas beyond those identified by the USFWS as necessary to maintain redundant, representative, and resilient populations. IMHA are typically next to PHMA and SFA but generally reflect somewhat lower GRSG population status or reduced habitat value due to disturbance, habitat fragmentation, or other factors. No important habitat management areas are designated within the southwestern Montana conservation area.

**Indicators.** Factors that describe resource condition and change and can help the BLM determine trends over time.

**Invasive species (invasive plant species, invasives).** An alien species whose introduction causes or is likely to cause economic or environmental harm or harm to human health. The species must cause or be likely to cause harm and be exotic to the ecosystem it has infested before it is considered invasive.

**Landscape.** A distinct association of land types that exhibit a unique combination of local climate, landform, topography, geomorphic process, surficial geology, soil, biota, and human influences. Landscapes are generally of a size that the eye can comprehend in a single view.

**Land tenure adjustment.** This term refers to a change in landownership patterns or legal status to improve their administrative manageability and their usefulness to the public.

**Late brood-rearing area.** Habitat includes mesic sagebrush and mixed shrub communities, wet meadows, and riparian habitats, as well as some agricultural lands, such as alfalfa fields.

**Leasable minerals.** Those minerals or materials designated as leasable under the Mineral Leasing Act of 1920. They include energy-related mineral resources, such as oil, natural gas, coal, and geothermal, and some nonenergy minerals, such as phosphate, sodium, potassium, and sulfur. Geothermal resources are also leasable under the Geothermal Steam Act of 1970.

**Lease.** A type of special use authorization (usually granted for uses other than linear rights-of-way) that is used when substantial capital investment is required and when conveyance of a conditional and transferable interest in BLM-administered lands is necessary or desirable to serve or facilitate authorized long-term uses and that may be revocable and compensable according to its terms.

**Lek.** A traditional courtship display area attended by male GRSG in or next to sagebrush-dominated habitat. A lek is designated based on observing two or more male GRSG engaged in courtship displays during the breeding season. Each state may have a slightly different definition of lek, active lek, inactive lek, occupied lek, and unoccupied leks. Regional planning will use the appropriate definition provided by the state of interest. Below are Idaho and Montana definitions.

**Lek, active.** Idaho—Any lek that has been attended by more than one male GRSG during the breeding season. Montana—Data supports the existence of a lek. Supporting data defined as one year with two or more males lekking on-site followed by evidence of lekking within 10 years of that observation.

**Lek, inactive.** Idaho—Any lek where sufficient data suggests that there was no strutting activity throughout a breeding season. (Absence of male GRSG during a single visit is insufficient documentation to establish that a lek is inactive.) This designation requires documentation of one of the following scenarios:

- An absence of GRSG on the lek during at least two ground surveys separated by at least seven days. These surveys must be conducted under acceptable weather conditions (clear to partly cloudy and winds less than 10 knots per hour) and in the absence of obvious disturbance.
- A ground check of the exact known lek site late in the strutting season that fails to find any sign (tracks, droppings, or feathers) of strutting activity. (Data collected by aerial surveys should not be used to designate inactive status as the aerial survey may actually disrupt activities.)

Montana—A confirmed active lek with no evidence of lekking for the last 10 years. Requires a minimum of 3 survey years with no evidence of lekking during a 10 year period.

**Lek, occupied.** Idaho—A lek that has been active during at least one breeding season within the prior five years. Montana—No definition; see definition for lek, active, above.

**Lek, unoccupied.** Idaho—An unoccupied lek is one that has not been active for five consecutive years. To be designated unoccupied, a lek must be inactive (see above criteria) for five consecutive breeding seasons. Montana—No definition; see lek, inactive, above.

**Locatable minerals.** Mineral disposable under the General Mining Act of 1872, as amended, that was not excepted in later legislation. They include hard rock, placer, industrial minerals, and uncommon varieties of rock found on public domain lands.

**Major pipeline.** A pipeline that is 24 inches or more in outside-pipe diameter (Mineral Leasing Act of 1920, 30 USC, Section 181; 36 CFR, Part 251.54[f][1]).

**Master development plan.** A set of information common to multiple planned wells, including drilling plans, surface use plans of operations, and plans for future production.

**Mineral.** Any naturally formed inorganic material, solid, or fluid inorganic substance that can be extracted from the earth; any of various naturally occurring homogeneous substances (as stone, coal, salt, sulfur, sand, petroleum, water, or natural gas) obtained usually from the ground. Under federal laws, considered as locatable (subject to the general mining laws), leasable (subject to the Mineral Leasing Act of 1920), and salable (subject to the Materials Act of 1947).

**Mineral materials (salable minerals).** Common varieties of sand, stone, pumice, gravel, and clay that are not obtainable under the mining or leasing laws but that can be acquired under the Materials Act of 1947, as amended. In accordance with regulations in 43 CFR, Part 3600, the BLM sells mineral materials to the public at fair market value but gives them free to states, counties, or other government entities for public projects. Disposal of mineral materials is subject to all applicable laws and BLM policy in Handbook H-3600-1.

**Mining claim.** A parcel of land that a miner takes and holds for mining purposes, having acquired the right of possession by complying with the Mining Law and local laws and rules. A mining claim may contain as many adjoining locations as the locator may make or buy. There are four categories of mining claims: lode, placer, mill site, and tunnel site.

**Minimization mitigation.** Minimizing impacts by limiting the degree or magnitude of the action and its implementation (40 CFR 1508.20 [b]).

**Mitigation.** Includes specific means, measures, or practices that could reduce, avoid, or eliminate adverse impacts. Mitigation can include avoiding the impact altogether by not taking a certain action or parts of an action, minimizing the impact by limiting the degree of magnitude of the action and its implementation, rectifying the impact by repairing, rehabilitation, or restoring the affected environment, reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action, and compensating for the impact by replacing or providing substitute resources or environments.

**Modification (oil and gas).** A fundamental change to the provisions of a lease stipulation, either temporarily or for the term of the lease. A modification may include an exemption from or alteration of a stipulated requirement. Depending on the specific modification, the stipulation may or may not apply to all other sites within the leasehold to which the restrictive criteria applied.

**Monitoring (plan monitoring).** The process of tracking the implementation of land use plan decisions and collecting and assessing data necessary to evaluate the effectiveness of land use planning decisions.

**Native plant species.** Species that were found here before Euro-American contact and consequently are in balance with their ecosystems because they have well-developed parasites, predators, and pollinators.

**Net conservation gain.** The actual benefit or gain above baseline conditions.

**No surface occupancy.** A major constraint where use or occupancy of the land surface for fluid mineral exploration or development and surface-disturbing activities is prohibited to protect identified resource values. Areas identified as NSO are open to fluid mineral leasing, but surface-disturbing activities cannot be conducted. Access to fluid mineral deposits will require directional drilling from outside the boundaries of the NSO. NSO areas are treated as avoidance areas for rights-of-way, which would not be granted unless there were no feasible alternatives. The NSO stipulation includes stipulations that may be worded as No Surface Use/Occupancy, No Surface Disturbance, Conditional NSO, or Surface Disturbance or Surface Occupancy Restriction (by location).

**Old-growth juniper.** Characterized by rounded tops and spreading canopies, often containing dead limbs or spike tops, large branches near the base of the tree, as well as furrowed, fibrous bark, and are typically host to arboreal lichens. Leader growth in the upper quarter of the tree is usually less than one inch. These trees are generally distributed on rock outcrops, rubble land soils, or other soils with coarse fragments in the surface or slopes over 12 to 25 percent, where juniper vegetation type is the climax plant community (Miller et al. 2005; USDI and USGS 2007).

**Off-highway vehicle.** Any motorized vehicle capable of, or designed for, travel on or immediately over land, water, or other natural terrain, excluding the following:

- Any nonamphibious registered motorboat
- Any military, fire, emergency, or law enforcement vehicle while being used for emergency purposes
- Any vehicle whose use is expressly authorized by the authorized officer or otherwise officially approved
- Vehicles in official use where official use is by an employee, agent, or designated representative of the federal government or one of its contractors, in the course of employment, agency, or representation
- Any combat or combat support vehicle when used in times of national defense emergencies (43 CFR, Part 8340.0 5)

**Permittee.** A person or company permitted to graze livestock on public land.

**Plan of operations.** Required for all mining activity conducted under the General Mining Act of 1872, as amended, if the proposed operations would likely significantly disturb surface resources. It describes the type of operations proposed and how they will be conducted, the type and standard of existing and proposed roads or access routes, the means of transportation to be used, the period during which the proposed activity will take place, and measures to be taken to meet the requirements for environmental protection (36 CFR, Part 228.4).

**Policy.** A statement of guiding principles or procedures designed and intended to influence planning decisions, operating actions, or other affairs of the BLM. A policy is an established interpretation of legislation, executive orders, regulations, or other presidential, secretarial, or management directives.

**Prescribed fire.** Any fire ignited by management actions to meet specific objectives. A written, approved prescribed fire plan must exist and NEPA requirements, where applicable, must be met before it is ignited.

**Primitive road.** A linear route managed for use by four-wheel drive or high clearance vehicles. Primitive roads do not normally meet any BLM road design standards.

**Priority habitat management areas.** PHMA have the highest conservation value for GRSG, based on the presence of larger leks, habitat extent, important movement and connectivity corridors, and winter habitat. They include adequate area to accommodate existing land uses and landowner activities.

**Range improvement.** Any activity, structure, or program on or relating to rangelands that is designed to improve production of forage, change vegetative composition, control patterns of use, provide water, stabilize soil and water conditions, and provide habitat for livestock and wildlife. The term includes structures, treatment projects, and use of mechanical means to accomplish the desired results.

**Reclamation.** The suite of actions taken in an area affected by human disturbance, the outcome of which is intended to change the condition of the disturbed area to meet predetermined objectives or make it acceptable for certain defined resources, such as wildlife habitat, grazing, and ecosystem function.

**Required design features (RDFs).** These are required for certain activities in all GRSG habitat. RDFs establish the minimum specifications for certain activities to help mitigate adverse impacts. However, the applicability and overall effectiveness of each RDF cannot be fully assessed until the project begins, when the project location and design are known. Because of site-specific circumstances, some RDFs may not apply to some projects (e.g., a resource is not present on a given site) or may require slight variations (e.g., a larger or smaller protective area). All variations in RDFs will require that at least one of the following be demonstrated in the NEPA analysis associated with the project or activity:

- A specific RDF is documented to not be applicable to the site-specific conditions of the project or activity (e.g., due to site limitations or engineering considerations). Economic considerations, such as increased costs, do not necessarily require that an RDF be varied or rendered inapplicable.
- An alternative RDF, state-implemented conservation measure, or plan-level protection is determined to provide equal or better protection for GRSG or its habitat.
- A specific RDF will provide no additional protection to GRSG or its habitat.

**Reserve common allotment.** An area designated in the land use plan as available for livestock grazing but reserved as for use as an alternative to grazing in another allotment. This would be to facilitate rangeland restoration treatments and recovery from natural disturbances, such as drought or wildfire. The reserve common allotment would provide needed flexibility that would help the agency apply temporary rest from grazing where vegetation treatments or management would be most effective.

**Resource management plan.** A land use plan prescribed by the Federal Land Policy and Management Act that establishes, for a given area of land, land use allocations, coordination guidelines for multiple-use, objectives, and actions to be achieved.

**Restoration.** Implementation of a set of actions that promotes plant community diversity and structure that allows plant communities to be more resilient to disturbance and invasive species over the long term. The long-term goal is to create functional high quality habitat that is occupied by GRSG. The short-term goals may be to restore the landform, soils, and hydrology and to increase the percentage of preferred vegetation, seeding of desired species, or treatment of undesired species.

**Restriction/restricted use.** A limitation or constraint on public land uses and operations. Restrictions can be of any kind, but most commonly apply to certain types of vehicle use, time or area constraints, or certain authorizations.

**Right-of-way.** Land authorized to be used or occupied for the construction, operation, maintenance, and termination of a project or facility passing over, on, under or through such land.

**Road.** A linear route declared a road by the owner, managed for use by low-clearance vehicles having four or more wheels, and maintained for regular and continuous use.

**Sagebrush focal area.** Areas identified by the USFWS that represent recognized strongholds for GRSG and that have been noted and referenced by the conservation community as having the highest densities of GRSG and other criteria important for its persistence.

**Season of use.** The time during which livestock grazing is permitted on a given range area, as specified in the grazing lease.

**Soft triggers.** An intermediate threshold indicating that management changes are needed at the implementation level to address habitat or population losses.

**Special recreation permits.** Authorizations that allow for recreation on public lands and related waters. Issued as a means to control visitor use, to protect recreational and natural resources, and to provide for the health and safety of visitors. Commercial special recreation permits also are issued as a mechanism to provide a fair return for the commercial use of public lands.

**Special status species.** These are proposed species, listed species, and candidate species under the ESA; also, state-listed species and BLM State Director-designated sensitive species (BLM Manual 6840, Special Status Species Management).

**Split-estate.** A circumstance where the surface of a particular parcel of land is owned by a different party than the one that owns the minerals below. Split-estates may have any combination of surface/subsurface owners: federal/state, federal/private, state/private, or percentage ownerships. When referring to the split-estate ownership on a particular parcel of land, it is generally necessary to describe the surface/subsurface ownership pattern of the parcel.

**Stipulation (general).** A condition of lease issuance that provides a level of protection for other resource values or land uses by restricting lease operations during certain times or locations or to avoid unacceptable impacts to an extent greater than standard lease terms or regulations. A stipulation is an enforceable term of the lease contract; it supersedes any inconsistent provisions of the standard lease form and is attached to and made a part of the lease. Lease stipulations further implement the BLM's regulatory authority to protect resources or resource values. Lease stipulations are developed through the land use planning process.

**Stipulation (oil and gas).** A provision that modifies standard oil and gas lease terms and conditions in order to protect other resource values or land uses. It is attached to and made a part of the lease.

**Surface disturbance.** Suitable habitat is considered disturbed when it is removed and unavailable for immediate GRSG use.

- Long-term removal occurs when habitat is physically removed through activities that replace suitable habitat with long-term occupancy of unsuitable habitat, such as a roads, power lines, well pads, or active mines. Long-term removal may also result from any activities that cause soil mixing, removal, and exposure to erosive processes.
- Short-term removal occurs when vegetation is removed in small areas but is restored to suitable habitat in less than five years of disturbance, such as a successfully reclaimed pipeline or a successfully reclaimed drill hole or pit.
- Suitable habitat is rendered unusable due to numerous anthropogenic disturbances.
- Anthropogenic surface disturbance are surface disturbances meeting the above definitions and that result from human activities

**Surface-disturbing and disruptive activities.** Actions that alter the vegetation, surface/near surface soil resources, or surface geologic features beyond natural site conditions and on a scale that affects other public land values. Examples of surface-disturbing activities are operation of heavy equipment to construct well pads, roads, pits, and reservoirs; installation of pipelines and power lines; and several types of vegetation treatments (e.g., prescribed fire). Surface-disturbing activities may be either authorized or prohibited.

**Surface uses.** Activities that may be present on the surface or near-surface (e.g., pipelines) of public lands. When administered as a use restriction (e.g., no surface occupancy), this phrase prohibits all but specified resource uses and activities in a certain area to protect particular sensitive resource values and property. This designation typically applies to small acreage sensitive resource sites (e.g., plant community study exclosure), or administrative sites (e.g., government ware-yard) where only authorized agency personnel are admitted.

**Technically/economically feasible.** Actions that are practical or feasible from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant. It is the BLM's sole responsibility to determine what actions are technically and economically feasible. The BLM considers whether implementation of the proposed action is likely, given past and current practice and technology; this consideration does not necessarily require a cost-benefit analysis or speculation about an applicant's costs and profit.

**Timing limitation.** Areas identified for timing limitations, a moderate constraint, are closed to fluid mineral exploration and development, surface-disturbing activities, and intensive human activity during identified time frames. This stipulation does not apply to operation and basic maintenance activities, including associated vehicle travel, unless otherwise specified. Construction, drilling, completions, and other operations considered to be intensive are not allowed. Intensive maintenance, such as work overs on wells, is not permitted. TLs can overlap with NSOs and CSUs, as well as with areas that have no other restrictions.

**Trail (BLM).** A linear route managed for human-powered, stock, or off-highway vehicle forms of transportation or for historical or heritage values. Trails are not generally managed for use by four-wheel drive or high-clearance vehicles.

**Transfer of grazing preference.** the BLM's approval of an application to transfer grazing preference from one party to another or from one base property to another, or both. Grazing preference means a superior or priority position against others for the purposes of receiving a grazing permit or lease. This priority is attached to base property owned or controlled by the permittee or lessee.

**Transition.** A shift between two states. Transitions are not reversible by simply altering the intensity or direction of factors that produced the change. Instead, they require new inputs, such as revegetation or shrub removal. Practices such as these that accelerate succession are often expensive to apply.

**Transmission line.** An electrical utility line with a capacity greater than or equal to 100 kilovolts or a natural gas, hydrogen, or water pipeline greater than or equal to 24 inches in diameter.

**Unitization.** The process by which lessees may unite with each other in collectively adopting and operating under a unit plan for the development of any oil, gas, or geothermal field.

**Utility-scale or commercial energy development.** A project that is capable of producing 20 or more megawatts of electricity for distribution to customers through the electricity transmission grid system.

**Valid existing rights.** Documented legal rights or interests in the land that allow a person or entity to use it for a specific purpose and that are still in effect. Such rights include fee title ownership, mineral rights, rights-of-way, easements, permits, and licenses. They may have been reserved, acquired, leased, granted, permitted, or otherwise authorized over time.

**Vegetation treatments.** Management practices that are designed to maintain current vegetation structure or to change the vegetation structure to a different stage of development. Methods may include managed or prescribed fire or chemical, mechanical, and seeding treatments.

**WAFWA Management Zone GRSG Conservation Team.** WAFWA management zones will be used to identify and address cross-state issues, such as regional mitigation and adaptive management monitoring response, through WAFWA Management Zone GRSG Conservation Teams (Teams). These Teams will convene and respond to issues at the appropriate scale, and will utilize existing coordination and management structures to the extent possible.

**Waiver (oil and gas).** Permanent exemption from a lease stipulation. The stipulation no longer applies anywhere within the leasehold.

**West Nile virus.** Found in temperate and tropical regions of the world and most commonly transmitted by mosquitoes, West Nile virus can cause flu-like symptoms in humans and can be lethal to birds, including GRSG.

**Wilderness Study Area.** Areas with wilderness characteristics identified and designated through the inventory and study processes authorized by Section 603 of FLPMA and, prior to 2003, through the planning process authorized by Section 202 of FLPMA.

**Wilderness.** A congressionally designated area of undeveloped federal land retaining its primeval character and influence, without permanent improvements or human habitation, that is protected and managed to preserve its natural conditions and that (1) generally appears to have been affected mainly by the forces of nature, with human imprints substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least 5,000 acres or is large enough to make practical its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historic value. The definition is contained in Section 2(c) of the Wilderness Act of 1964 (78 Stat. 891).

**Wildfire suppression.** An appropriate management response to wildfire or prescribed fire that curtails fire spread and eliminates all identified threats from a particular fire.

**Wildland fire.** An unplanned, unwanted wildfire, including unauthorized human-caused fires, escaped wildfire use, escaped prescribed fire projects, and all other wildfires where the objective is to put the fire out. (National Wildfire Coordinating Group October 2014, http://www.nwcg.gov/pms/pubs/glossary/w.htm).

**Winter concentration areas.** Habitats that are occupied each winter by GRSG and provide sufficient sagebrush cover and food to support them for the entire winter (especially periods with above average snow cover). Many of these areas support several different breeding populations. GRSG typically show high fidelity for these areas, and loss or fragmentation can result in significant population impacts.

**Withdrawal.** A withholding of an area of federal land from settlement, sale, location, or entry under some or all of the general land laws to achieve the following:

- Limit activity under those laws in order to maintain other public values in the area
- Reserve the area for a particular public purpose or program
- Transfer jurisdiction of the area from one federal agency to another

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# CHAPTER 6
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# Appendices

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# Appendix A

## Approved RMP Amendment Maps

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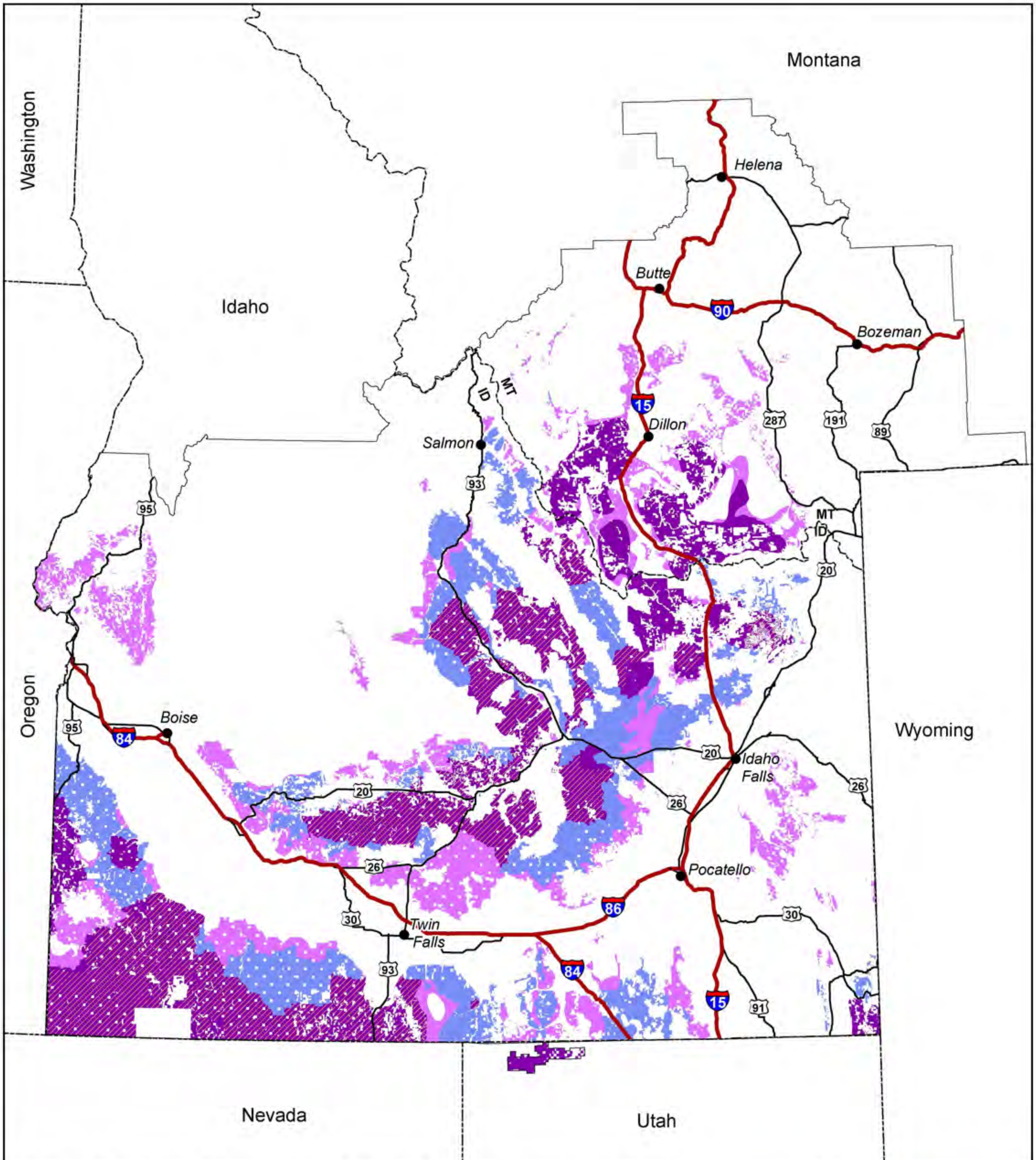


**Figure 2-1: Idaho and Southwestern Montana Habitat Management Areas**

**Legend**

- Sagebrush Focal Areas (SFAs)
- Priority Habitat Management Areas (PHMAs)
- General Habitat Management Areas (GHMAs)
- Important Habitat Management Areas (IHMAs)
- Planning Area Boundary
- State Boundary

0 25 50 Miles

September 2015

**Map Area**


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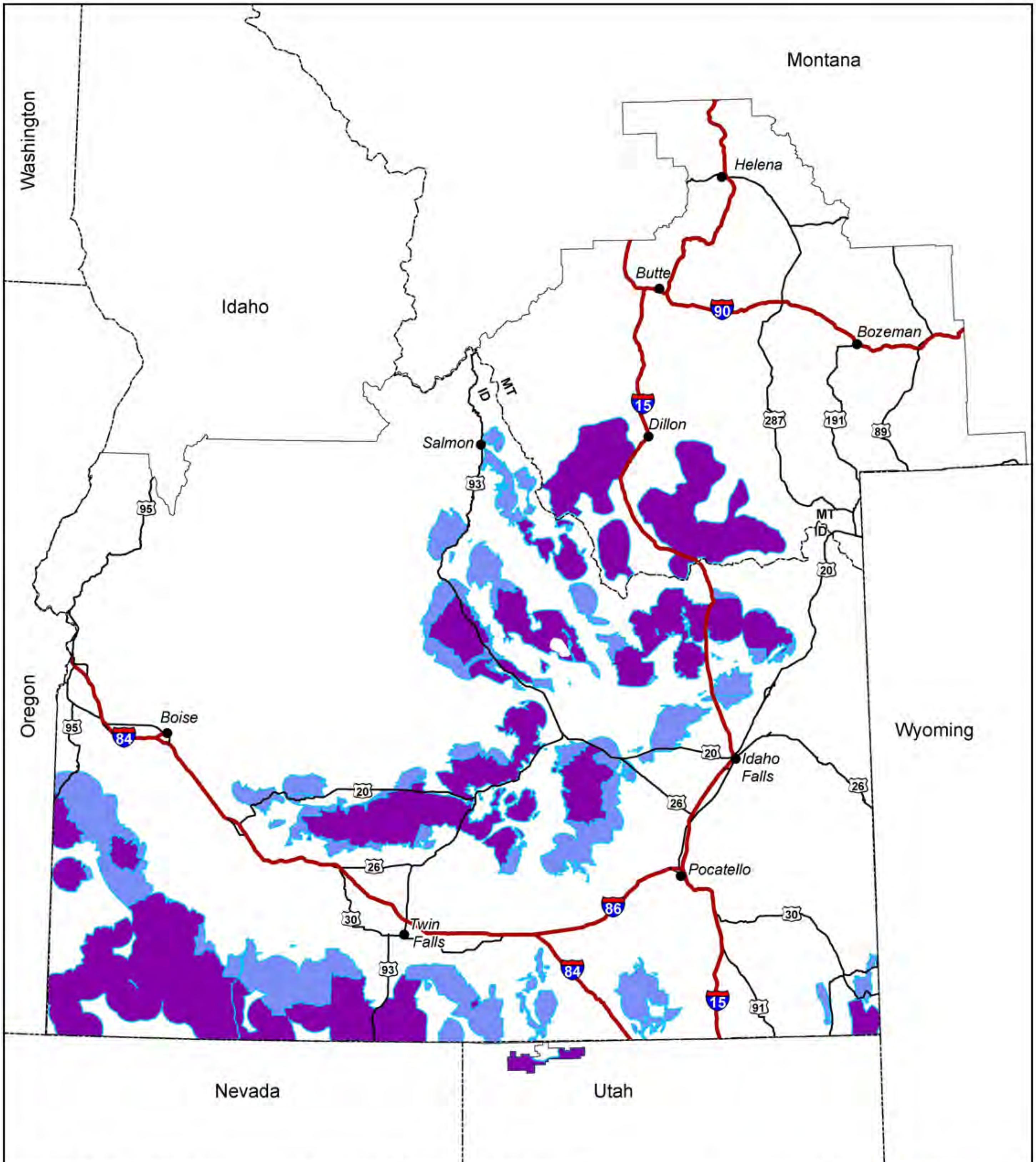


**Figure 2-2: Idaho and Southwestern Montana , Greater Sage-Grouse Biologically Significant Units and Priority and Important Habitat Management Areas**

**Legend**

Biologically Significant Units (BSU)

Priority Habitat Management Areas (PHMAs)

Important Habitat Management Areas (IHMAs)

Planning Area Boundary

State Boundary

0 25 50 Miles

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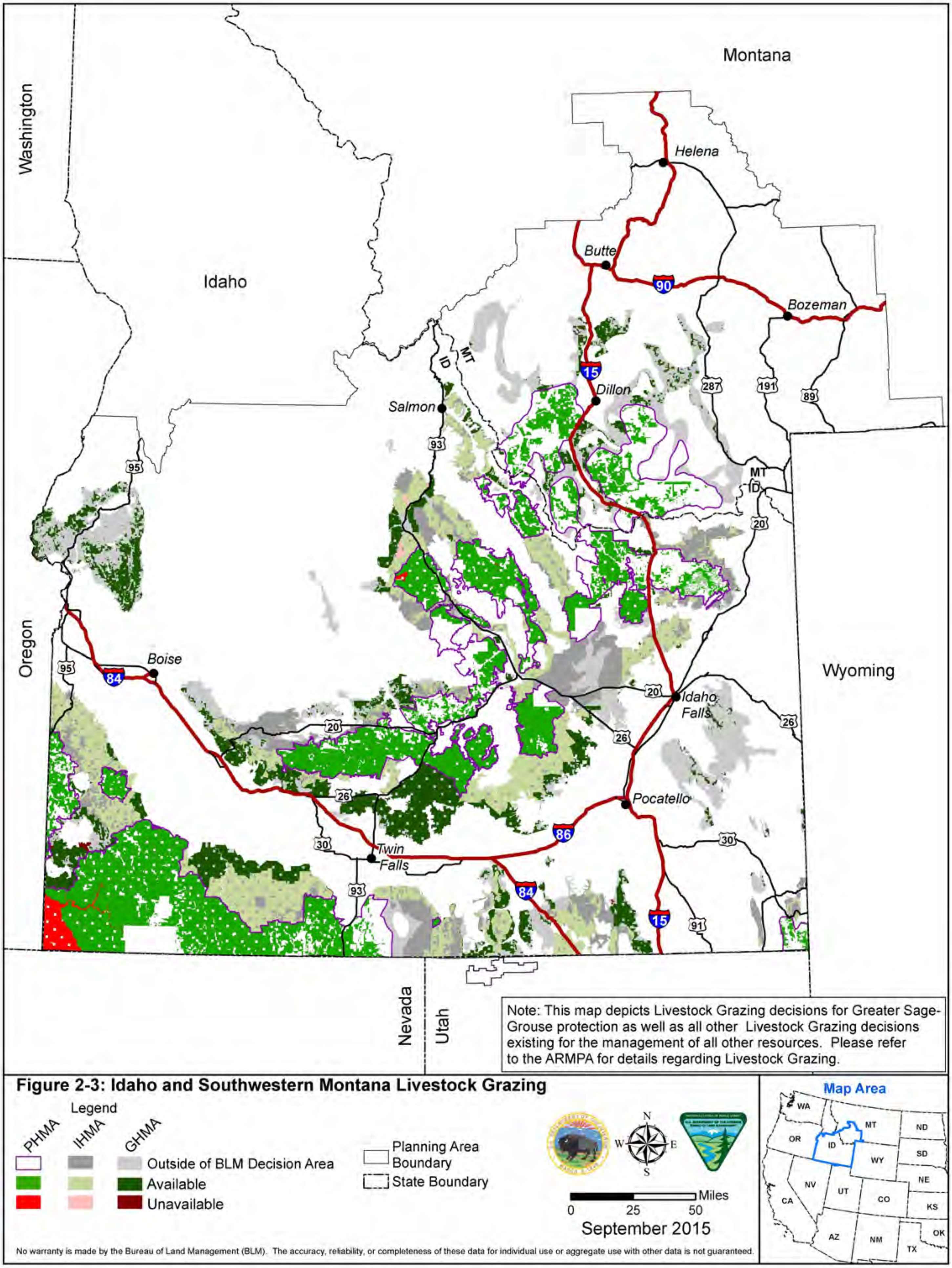



Figure 2-3: Idaho and Southwestern Montana Livestock Grazing

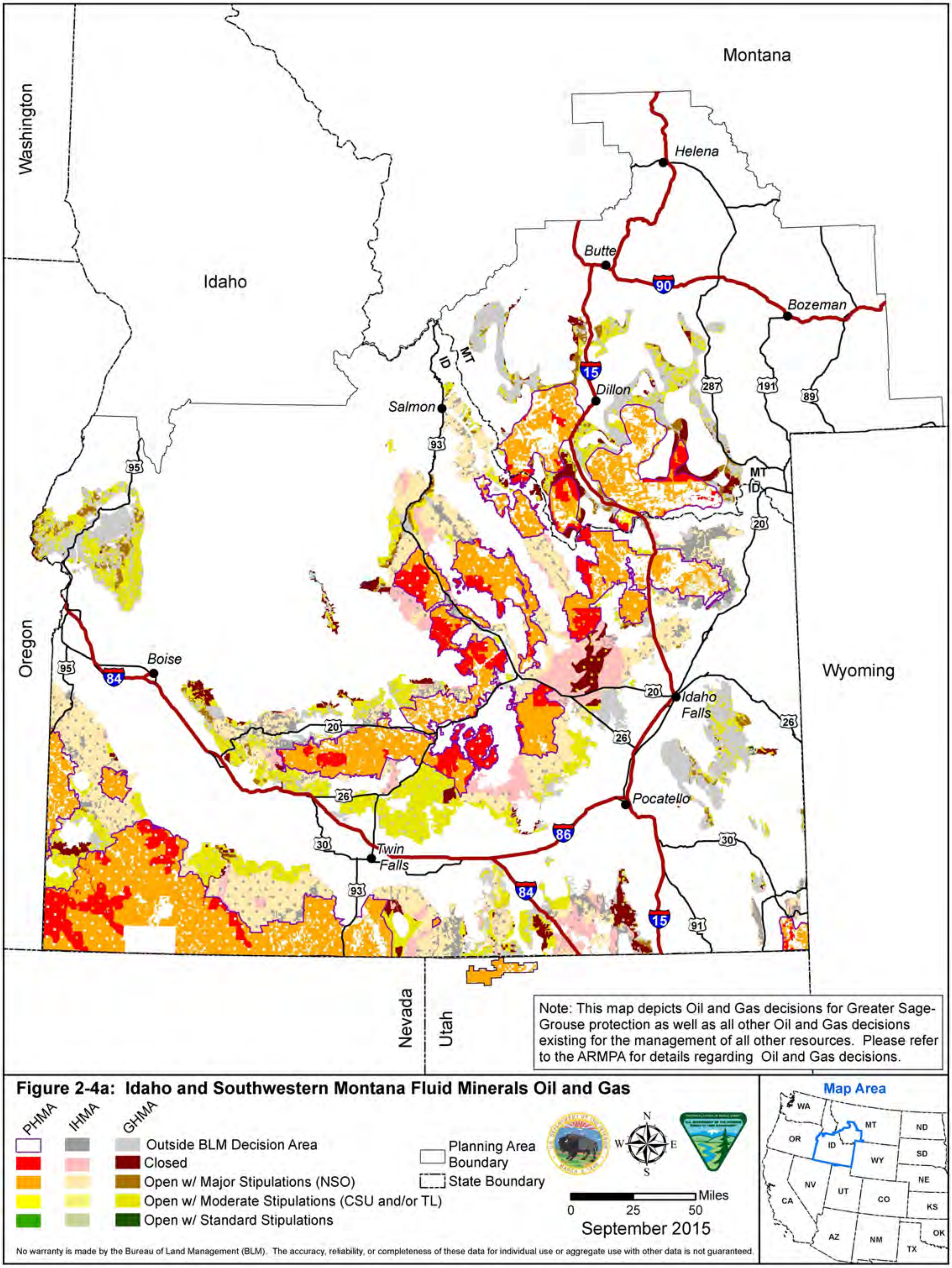



**Figure 2-4a: Idaho and Southwestern Montana Fluid Minerals Oil and Gas**

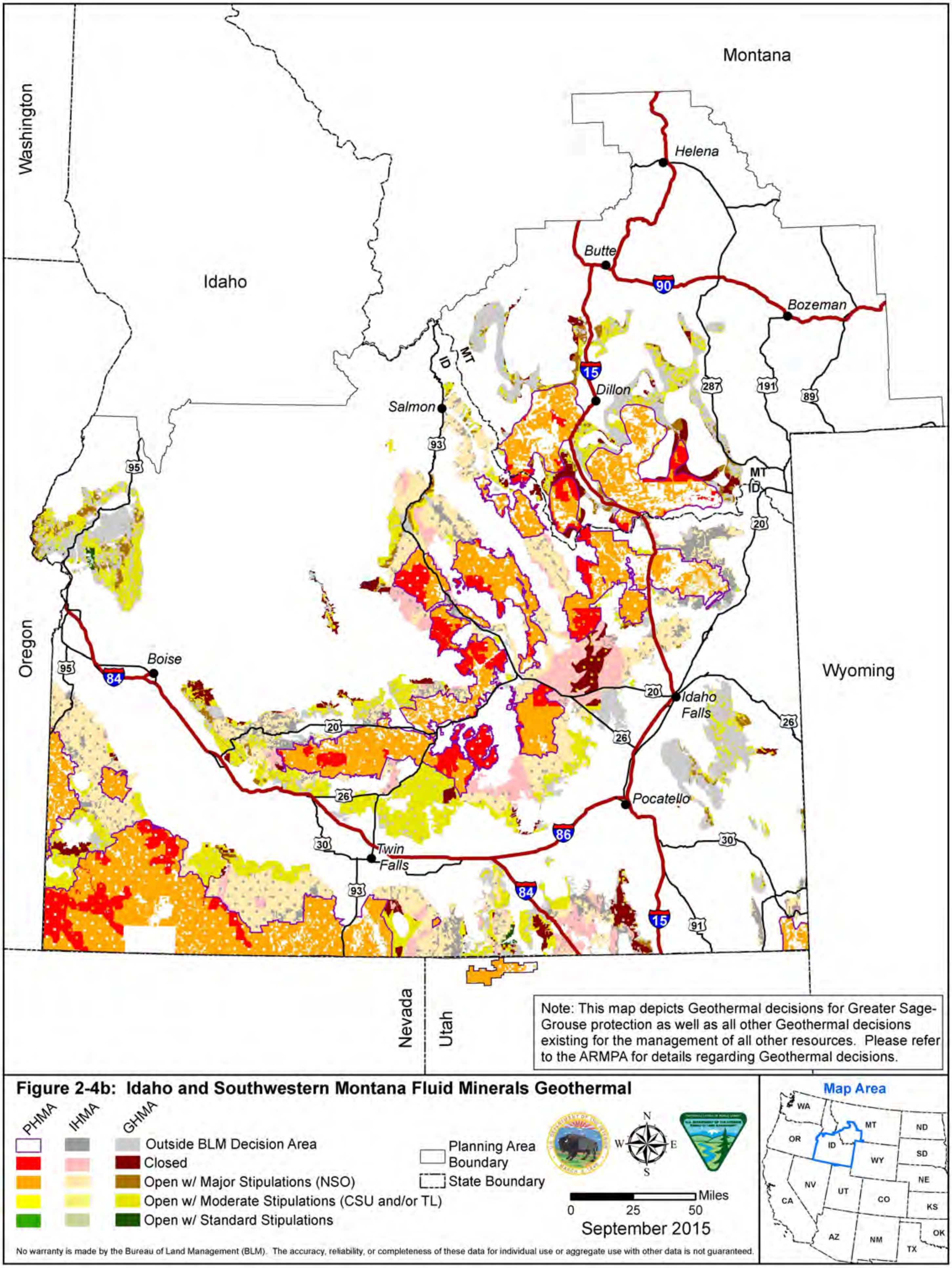



**Figure 2-4b: Idaho and Southwestern Montana Fluid Minerals Geothermal**

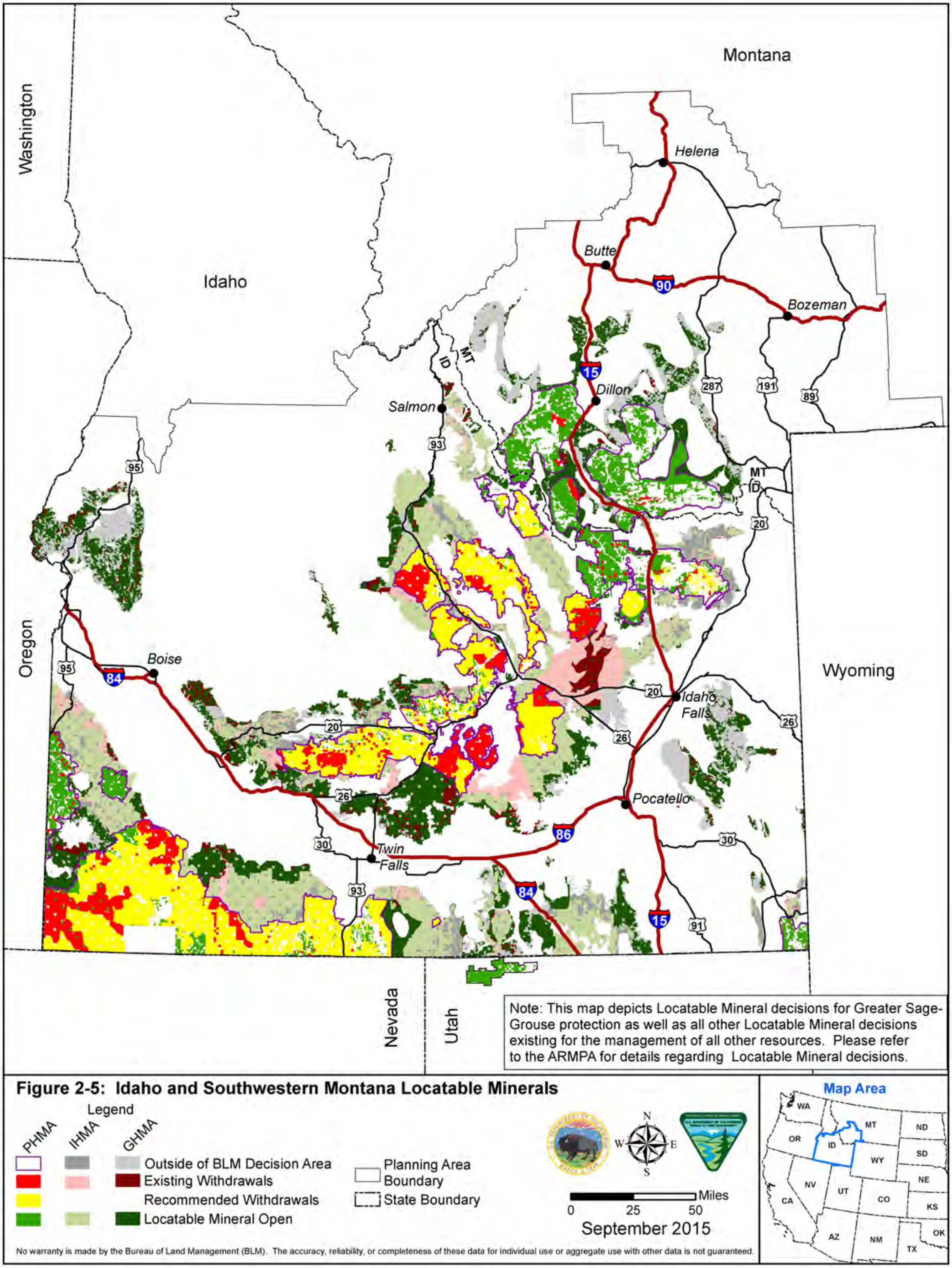



**Figure 2-5: Idaho and Southwestern Montana Locatable Minerals**

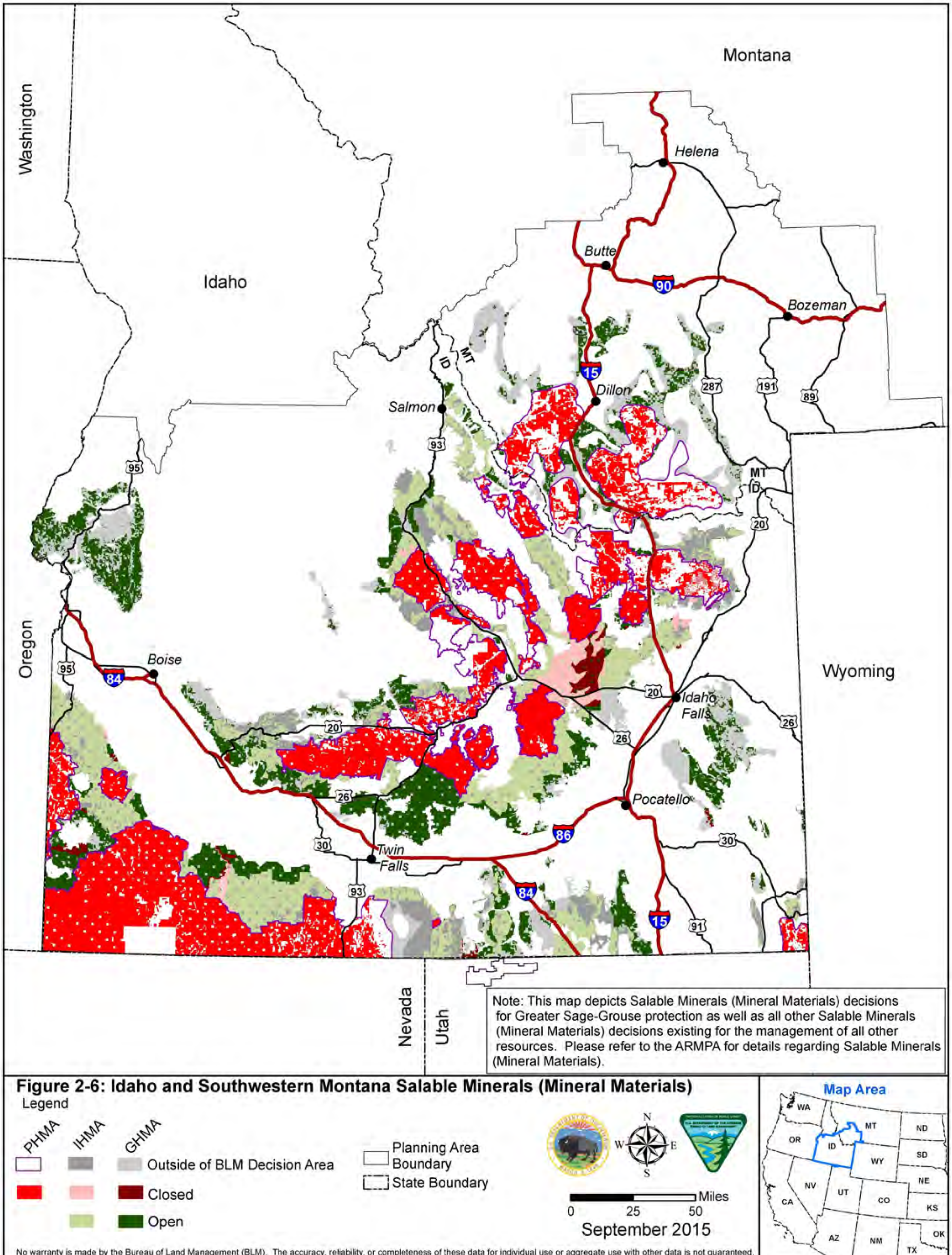



**Figure 2-6: Idaho and Southwestern Montana Salable Minerals (Mineral Materials)**

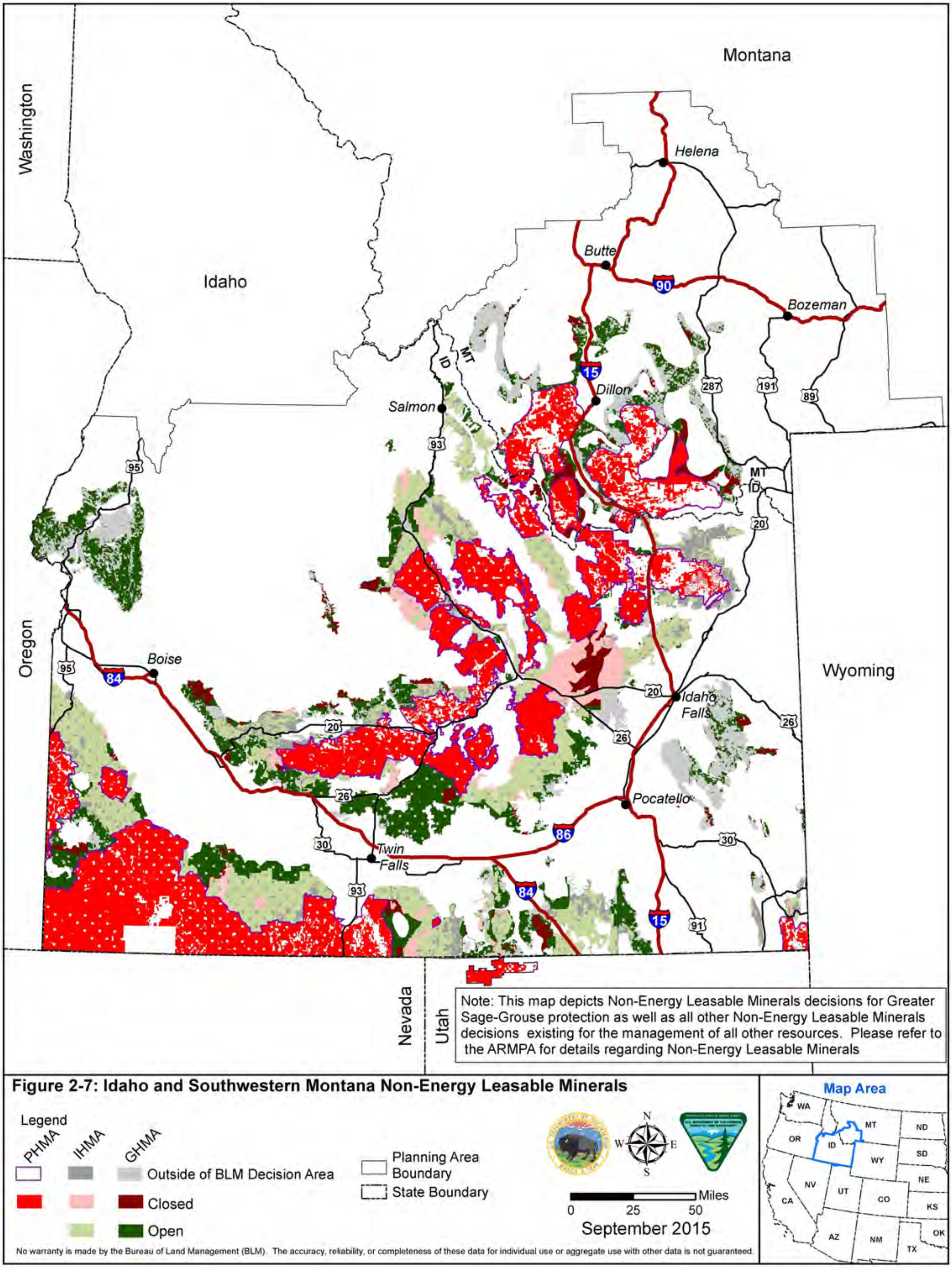
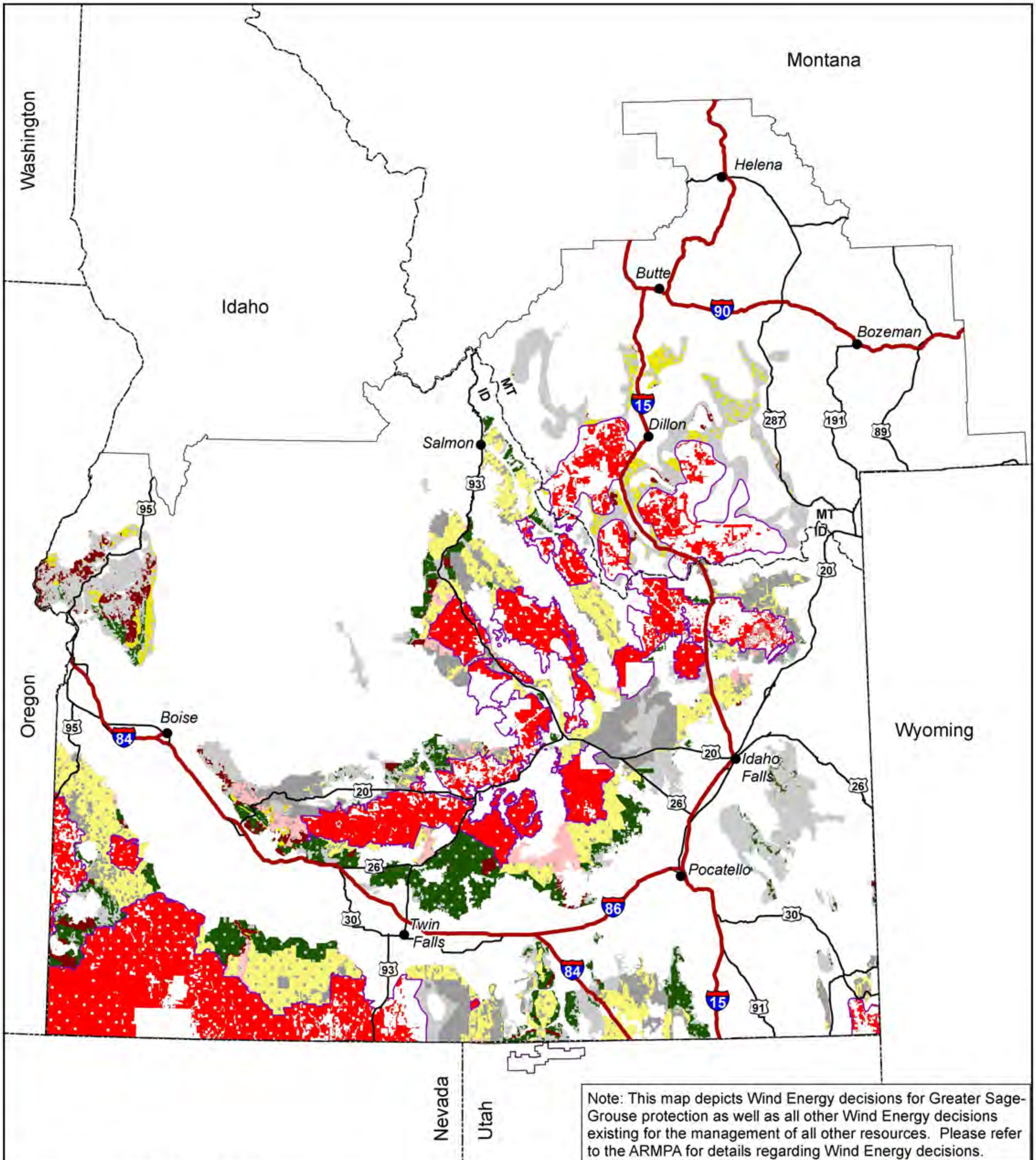



**Figure 2-7: Idaho and Southwestern Montana Non-Energy Leasable Minerals**




Note: This map depicts Wind Energy decisions for Greater Sage-Grouse protection as well as all other Wind Energy decisions existing for the management of all other resources. Please refer to the ARMPA for details regarding Wind Energy decisions.

**Figure 2-8: Idaho and Southwestern Montana Wind Energy**

Legend

| PHMA | IHMA | GHMA | |
|---|---|---|---|
| | | | Outside BLM Decision Area |
| | | | Exclusion |
| | | | Avoidance |
| | | | Open |

Planning Area Boundary

State Boundary

0 25 50 Miles

September 2015

Map Area

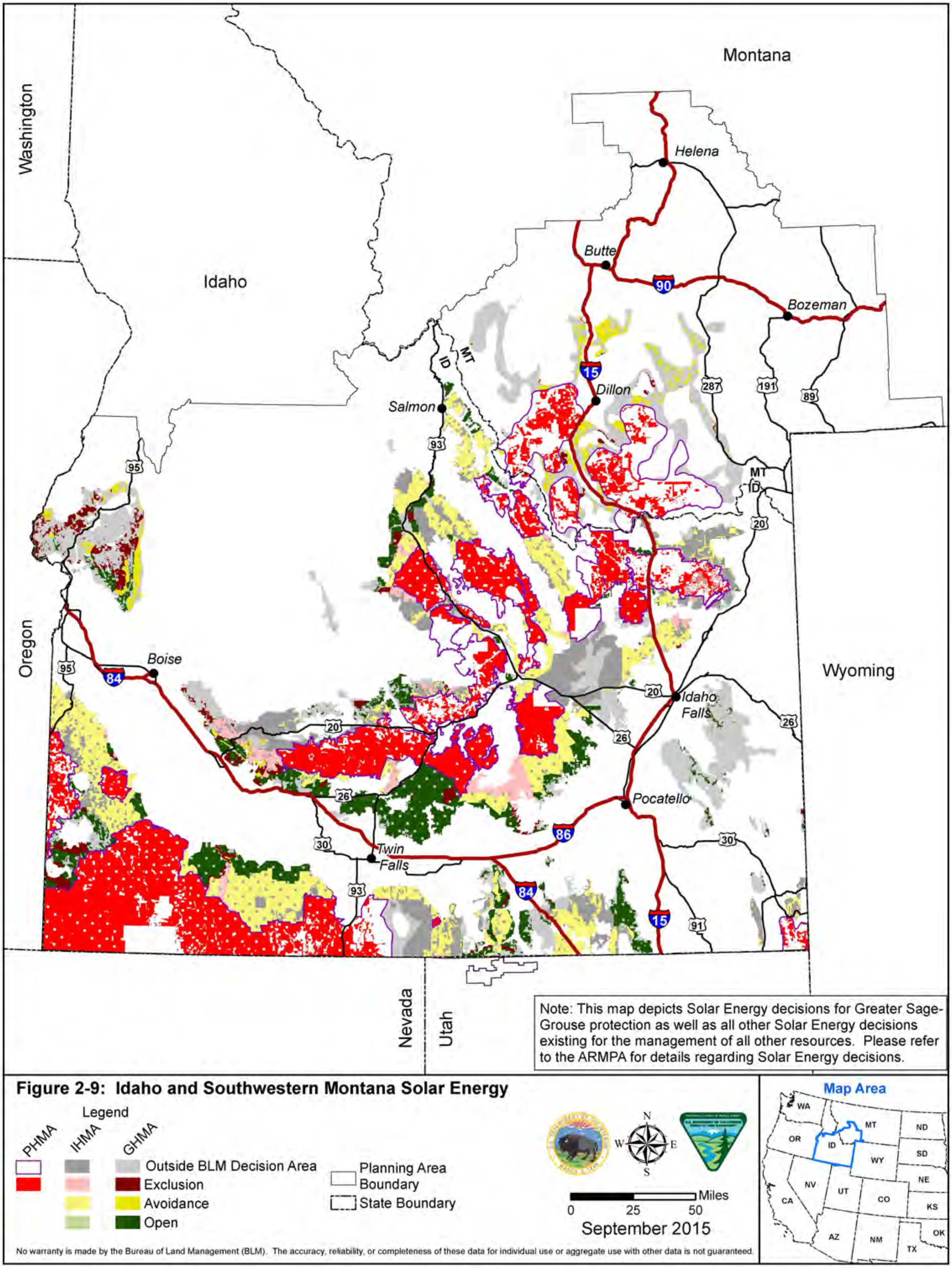



**Figure 2-9: Idaho and Southwestern Montana Solar Energy**

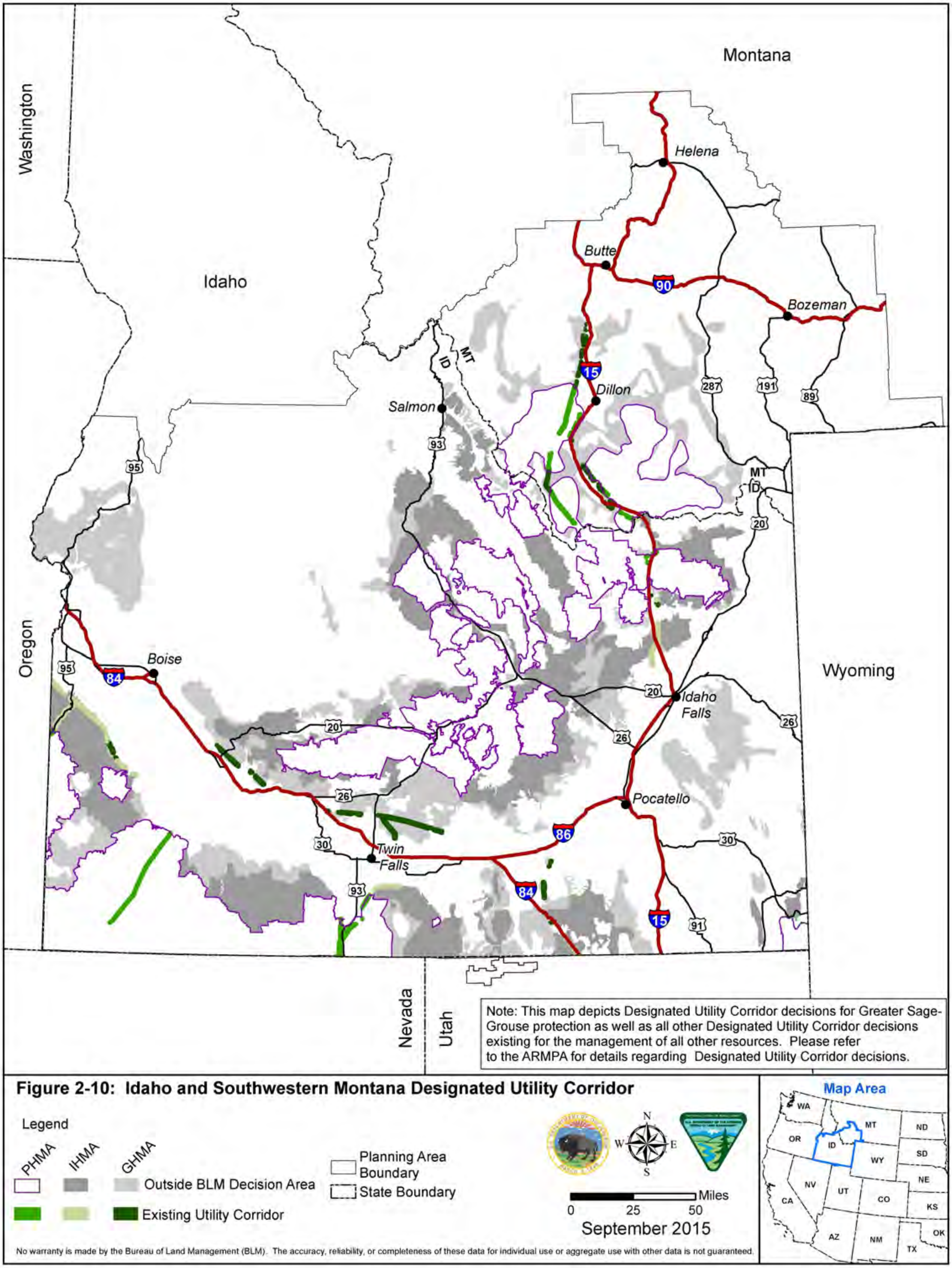



**Figure 2-10: Idaho and Southwestern Montana Designated Utility Corridor**

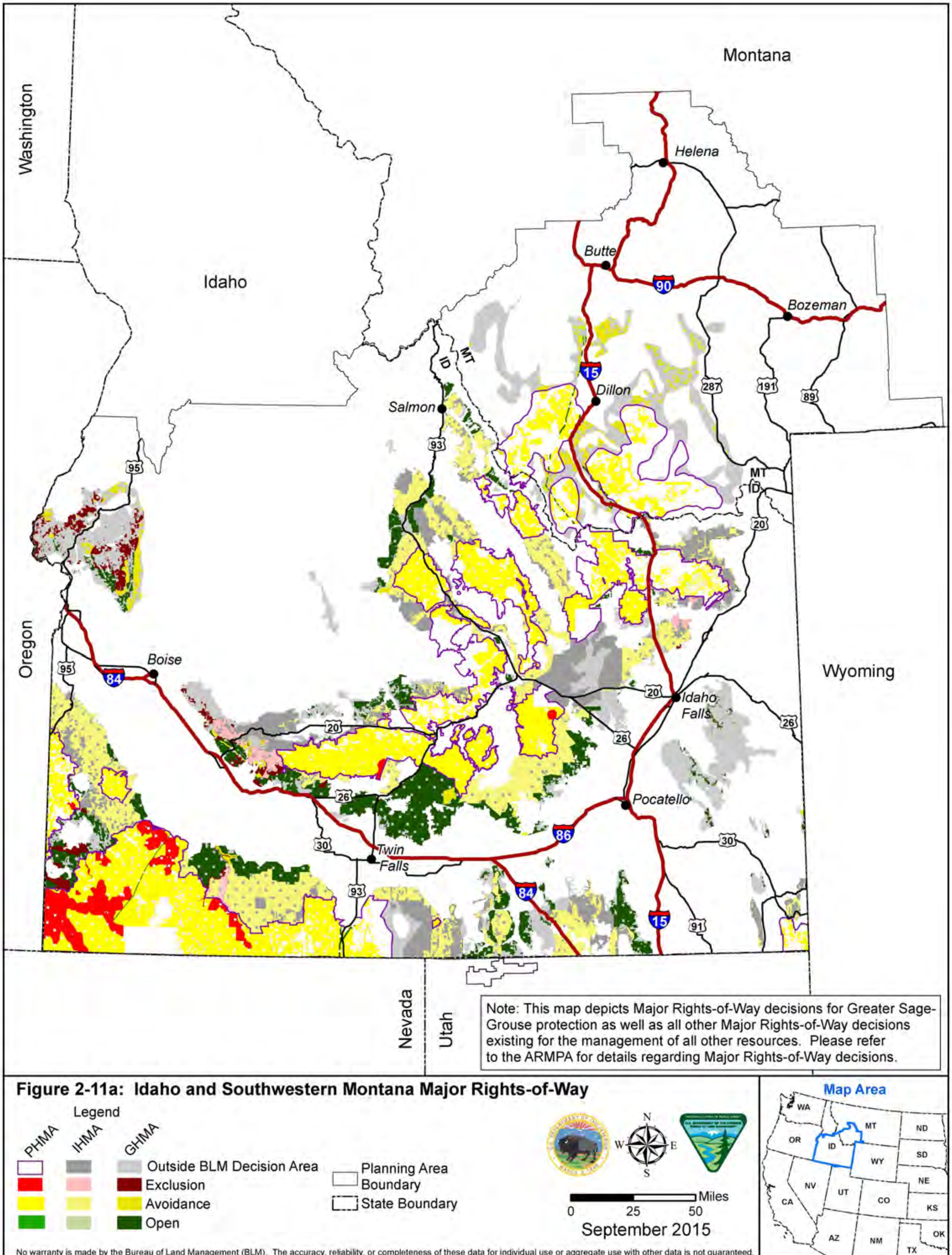



**Figure 2-11a: Idaho and Southwestern Montana Major Rights-of-Way**

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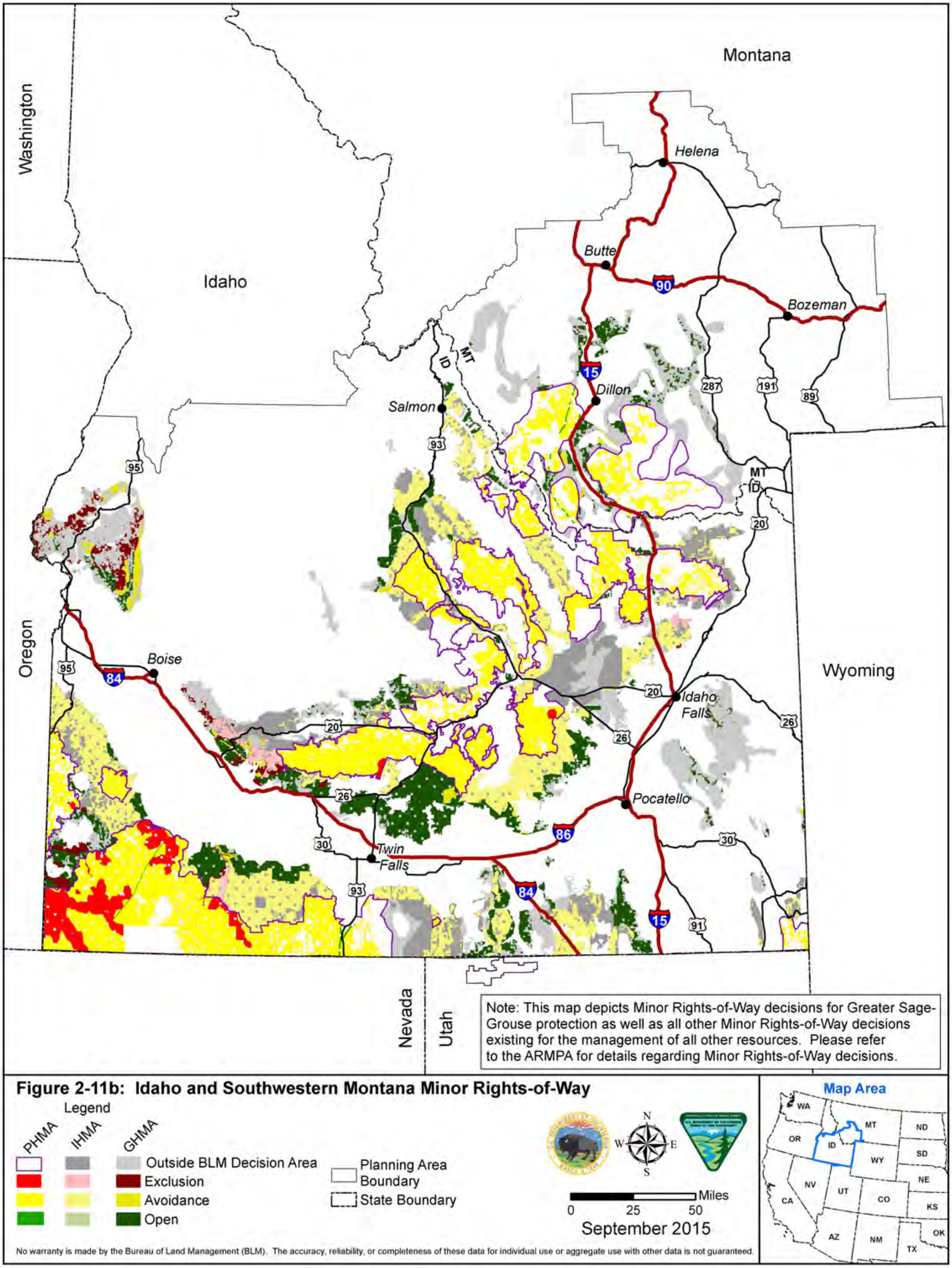
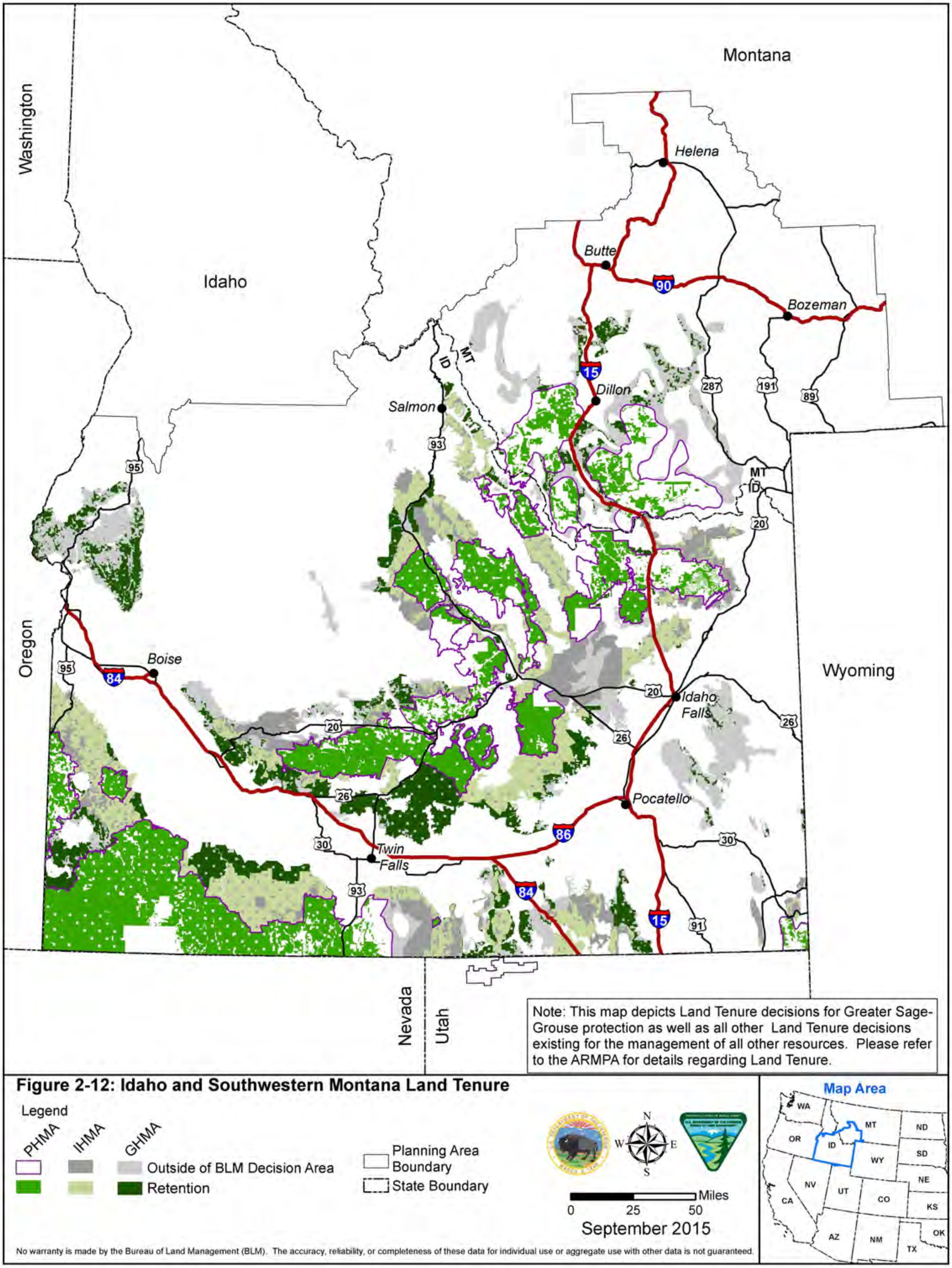



**Figure 2-11b: Idaho and Southwestern Montana Minor Rights-of-Way**


Montana
Washington
Idaho
Oregon
Wyoming
Nevada
Utah
Helena
Butte
Bozeman
Dillon
Salmon
Boise
Idaho Falls
Pocatello
Twin Falls
MT
ID
90
15
84
86
287
191
89
93
95
20
26
30
91
Note: This map depicts Land Tenure decisions for Greater Sage-Grouse protection as well as all other Land Tenure decisions existing for the management of all other resources. Please refer to the ARMPA for details regarding Land Tenure.
Figure 2-12: Idaho and Southwestern Montana Land Tenure
Legend
PHMA
IHMA
GHMA
Outside of BLM Decision Area
Retention
Planning Area Boundary
State Boundary
Miles
0
25
50
September 2015
Map Area
WA
MT
ND
OR
ID
SD
WY
NE
NV
UT
CO
CA
KS
AZ
NM
OK
TX
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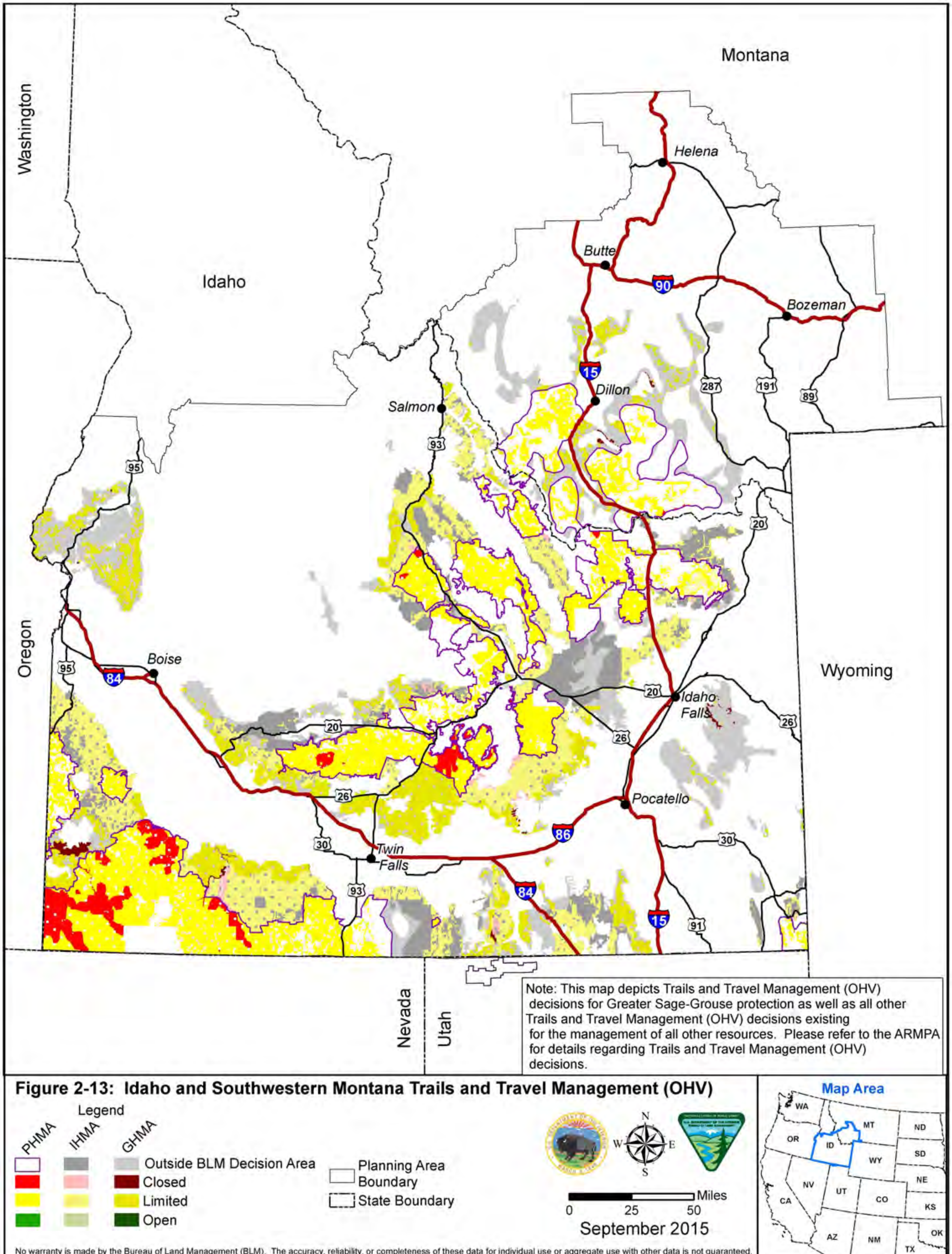


**Figure 2-13: Idaho and Southwestern Montana Trails and Travel Management (OHV)**

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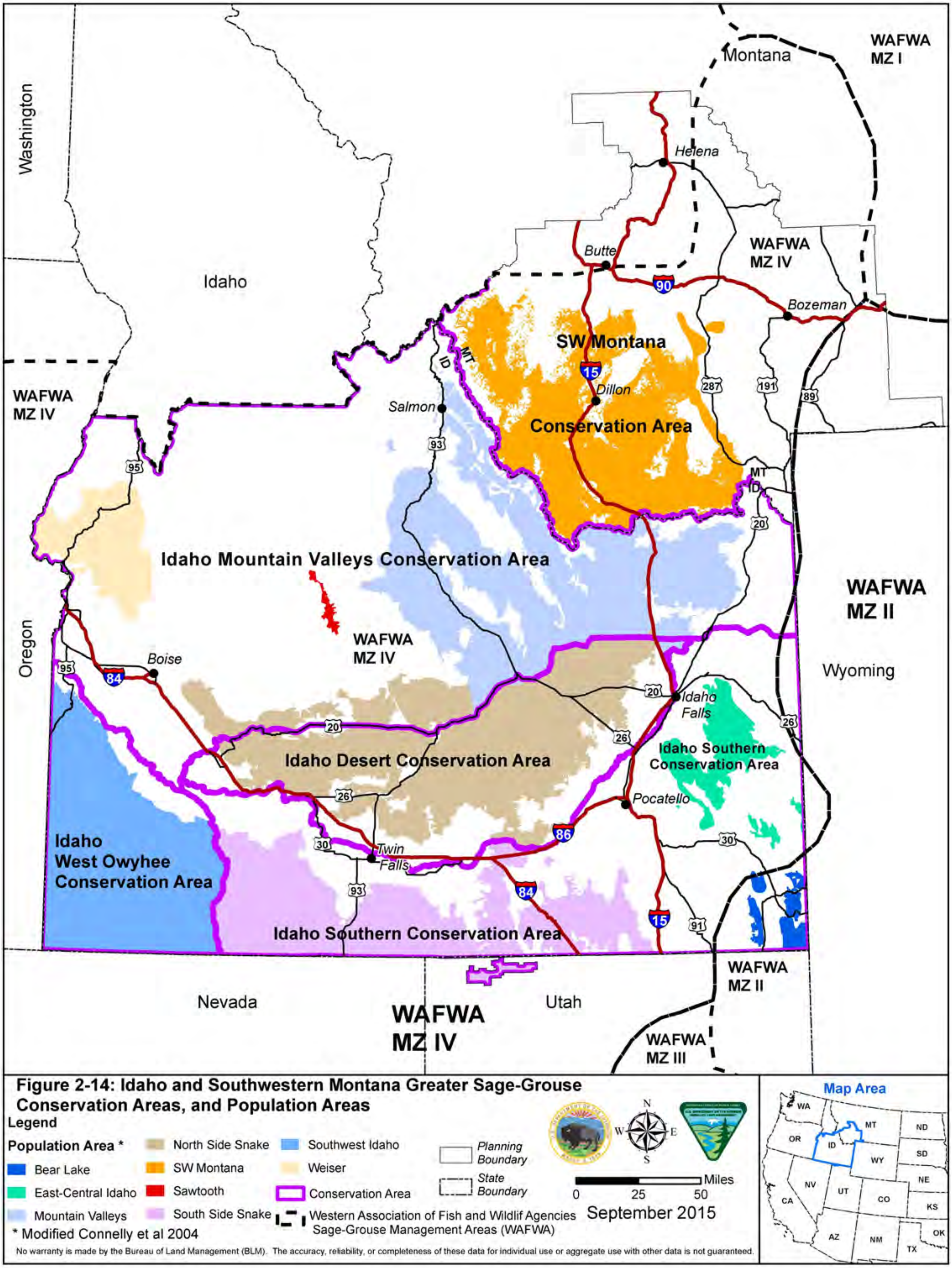


**Figure 2-14: Idaho and Southwestern Montana Greater Sage-Grouse Conservation Areas, and Population Areas**

# Appendix B

## Buffers

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## B. Buffers

### Applying Lek Buffer-Distances When Approving Actions

- *Buffer Distances and Evaluation of Impacts to Leks*

  Evaluate impacts to leks from actions requiring NEPA analysis. In addition to any other relevant information determined to be appropriate (e.g. State wildlife agency plans), the BLM will assess and address impacts from the following activities using the lek buffer-distances as identified in the USGS Report *Conservation Buffer Distance Estimates for Greater Sage-Grouse – A Review* (Open File Report 2014-1239). The BLM will apply the lek buffer-distances specified as the lower end of the interpreted range in the report unless justifiable departures are determined to be appropriate (see below). The lower end of the interpreted range of the lek buffer-distances is as follows:

  - linear features (roads) within 3.1 miles of leks
  - infrastructure related to energy development within 3.1 miles of leks.
  - tall structures (e.g., communication or transmission towers, transmission lines) within 2 miles of leks.
  - low structures (e.g., fences, rangeland structures) within1.2 miles of leks.
  - surface disturbance (continuing human activities that alter or remove the natural vegetation) within 3.1 miles of leks.
  - noise and related disruptive activities including those that do not result in habitat loss (e.g., motorized recreational events) at least 0.25 miles from leks.

  Justifiable departures to decrease or increase from these distances, based on local data, best available science, landscape features, and other existing protections (e.g., land use allocations, state regulations) may be appropriate for determining activity impacts. The USGS report recognized "that because of variation in populations, habitats, development patterns, social context, and other factors, for a particular disturbance type, there is no single distance that is an appropriate buffer for all populations and habitats across the sage-grouse range". The USGS report also states that "various protection measures have been developed and implemented… [which have] the ability (alone or in concert with others) to protect important habitats, sustain populations, and support multiple-use demands for public lands". All variations in lek buffer-distances will require appropriate analysis and disclosure as part of activity authorization.

  In determining lek locations, the BLM will use the most recent active or occupied lek data available from the state wildlife agency.

- *For Actions in GHMA*

  The BLM will apply the lek buffer-distances identified above as required conservation measures to fully address the impacts to leks as identified in the NEPA analysis. Impacts should first be avoided by locating the action outside of the applicable lek buffer – distance(s) identified above.

  The BLM may approve actions in GHMA that are within the applicable lek buffer distance identified above only if:

  - Impacts should first be avoided by locating the action outside of the applicable lek buffer-distance(s) identified above.
  - If it is not possible to relocate the project outside of the applicable lek buffer-distance(s) identified above, the BLM may approve the project only if:
    - Based on best available science, landscape features, and other existing protections, (e.g., land use allocations, state regulations), the BLM determines that a lek buffer-distance other than the applicable distance identified above offers the same or a greater level of protection to GRSG and its habitat, including conservation of seasonal habitat outside of the analyzed buffer area; or
    - The BLM determines that impacts to GRSG and its habitat are minimized such that the project will cause minor or no new disturbance (ex. co-location with existing authorizations); and
    - Any residual impacts within the lek buffer-distances are addressed through compensatory mitigation measures sufficient to ensure a net conservation gain, as outlined in the Mitigation Strategy (Appendix X).

- *For Actions in PHMA & IHMA*

  The BLM will apply the lek buffer-distances identified above as required conservation measures to fully address the impacts to leks as identified in the NEPA analysis. Impacts should be avoided by locating the action outside of the applicable lek buffer-distance(s) identified above.

  The BLM may approve actions in PHMA and IMHA that are within the applicable lek buffer distance identified above only if:

  - The BLM, with input from the state fish and wildlife agency, determines, based on best available science, landscape features, and other existing protections, that a buffer distance other than the distance identified above offers the same or greater level of protection to GRSG and its habitat, including conservation of seasonal habitat outside of the analyzed buffer area.

- Range improvements which do not impact GRSG, or, range improvements which provide a conservation benefit to GRSG such as fences for protecting important seasonal habitats, meet the lek buffer requirement.
- The BLM will explain its justification for determining the approved buffer distances meet these conditions in its project decision.

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# Appendix C

## Required Design Features (RDFs)

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## C. Required Design Features

Required Design Features (RDFs) are required for certain activities in all GRSG habitat. RDFs establish the minimum specifications for certain activities to help mitigate adverse impacts. However, the applicability and overall effectiveness of each RDF cannot be fully assessed until the project level when the project location and design are known. Because of site-specific circumstances, some RDFs may not apply to some projects (e.g., a resource is not present on a given site) and/or may require slight variations (e.g., a larger or smaller protective area). RDFs are continuously improving as new science and technology become available and therefore are subject to change. All variations in RDFs would require that at least one of the following be demonstrated in the NEPA analysis associated with the project/activity:

- A specific RDF is documented to not be applicable to the site-specific conditions of the project/activity (e.g. due to site limitations or engineering considerations). Economic considerations, such as increased costs, do not necessarily require that an RDF be varied or rendered inapplicable;
- An alternative RDF, a state-implemented conservation measure or plan-level protection is determined to provide equal or better protection for GRSG or its habitat.
- A specific RDF will provide no additional protection to GRSG or its habitat.

The following required design features (RDFs) are included for consideration and use based upon review of current science and effects analysis (circa 2014) (**Table C-1**). These may be reviewed during project evaluation and updated through plan maintenance as new information and updated scientific findings become available.

The table is organized by program area grouping the RDFs most relevant to that program. All relevant RDFs, regardless of which program they are grouped under, should be considered during project evaluation and applicable RDFs should be applied during implementation. The following measures would be applied as RDFs for all solid minerals. They would also apply to locatable minerals consistent with applicable law. In some cases the RDFs may not all be appropriate based on local conditions and would be assessed in the appropriate site specific NEPA analysis, these all should be considered and where determined to be beneficial to achieving GRSG habitat objectives included as part of the site specific project. In other cases additional project design criteria or best management practices could be incorporated into project implementation to address site specific concerns not fully addressed by the RDFs described here.

**Table C-1**
**Required Design Features**

| Required Design Feature | |
|---|---|
| **General** | |
| 1. | Solicit and consider expertise and ideas from local landowners, working groups, and other federal, state, county, and private organizations during development of projects. |
| 2. | No repeated or sustained behavioral disturbance (e.g., visual, noise over 10 dbA at lek, etc.) to lekking birds from 6:00 pm to 9:00 am within 2 miles (3.2 km) of leks during the lekking season. |
| 3. | Avoid mechanized anthropogenic disturbance, in nesting habitat during the nesting season when implementing: 1) fuels/vegetation/habitat restoration management projects, 2) infrastructure construction or maintenance, 3) geophysical exploration activities; 4) organized motorized recreational events. |
| 4. | Avoid mechanized anthropogenic disturbance during the winter, in wintering areas when implementing: 1) fuels/vegetation/habitat restoration management projects, 2) infrastructure construction or maintenance, 3) geophysical exploration activities; 4) organized motorized recreational events. |
| **Wildfire Suppression** | |
| 5. | Compile district-level information into state-wide sage-grouse tool boxes. Tool boxes will contain maps, listing of resource advisors, contact information, local guidance, and other relevant information for each district, which will be aggregated into a state-wide document. |
| 6. | Provide localized maps to dispatch offices and extended attack incident commanders for use in prioritizing wildfire suppression resources and designing suppression tactics. The Fire Planning and Fuels Management Division (FA-600) hosts a webpage containing up-to-date maps, instruction memoranda, conservation measures, BMPs, and spatial data specific to fire operations and fuels management/sage-grouse interactions. These resources can be accessed at: http://web.blm.gov/internal/fire/fpfm/sg/index.html . Additional BLM sage-grouse information can be found at: http://www.blm.gov/wo/st/en/prog/more/fish__wildlife_and/sage-grouse-conservation.html . |
| 7. | Assign a resource advisor with sage-grouse expertise, or who has access to sage-grouse expertise, to all extended attack fires in or near sage-grouse habitat areas. Prior to the fire season, provide training to sage-grouse resource advisors on wildfire suppression organization, objectives, tactics, and procedures to develop a cadre of qualified individuals. Involve state wildlife agency expertise in fire operations through:<br>• instructing resource advisors during preseason trainings;<br>• qualification as resource advisors;<br>• coordination with resource advisors during fire incidents;<br>• contributing to incident planning with information such as habitat features or other key data useful in fire decision making |

**Table C-1**
**Required Design Features**

| Required Design Feature | |
|---|---|
| 8. | At the onset of an emerging wildland fire the Agency Administrators and Fire Management Officers will an engage a local Resource Advisor to assess sage-grouse habitat that may be affected by the fire or suppression activities. |
| 9. | If complexity of the wildland fire warrants the activation of an Incident Management Team, locally refined information regarding important sage-grouse habitat will be relayed during in brief and continually throughout the incident. |
| 10. | On critical fire weather days, pre-position additional fire suppression resources to optimize a quick and efficient response in sage-grouse habitat areas. |
| 11. | As appropriate, utilize existing fuel breaks, such as roads or discrete changes in fuel type, as control lines in order to minimize fire spread. |
| 12. | During periods of multiple fires, ensure line officers are involved in setting priorities. |
| 13. | To the extent possible, locate wildfire suppression facilities (i.e., base camps, spike camps, drop points, staging areas, heli-bases, etc.) in areas where physical disturbance to sage-grouse habitat can be minimized. These include disturbed areas, grasslands, near roads/trails or in other areas where there is existing disturbance or minimal sagebrush cover. |
| 14. | Power-wash all firefighting vehicles, to the extent possible, including engines, water tenders, personnel vehicles, and all-terrain vehicles (ATV) prior to deploying in or near sage-grouse habitat areas to minimize noxious weed spread. |
| 15. | Minimize cross-country vehicle travel during fire operations in sage-grouse habitat. |
| 16. | Minimize burnout operations in key sage-grouse habitat areas by constructing direct fireline whenever safe and practical to do so. |
| 17. | Utilize retardant, mechanized equipment, and other available resources to minimize burned acreage during initial attack. |
| 18. | As safety allows, conduct mop-up where the black adjoins unburned islands, dog legs, or other habitat features to minimize sagebrush loss. |
| 19. | Adequately document fire operation activities in sage-grouse habitat for potential follow-up coordination activities. |
| **Fuels Management**<br>Unless otherwise specified as part of the land use plan consider the full array of fuels management treatment types (prescribed fire, mechanical, chemical and biological) when implementing the following RDFs. | |
| 20. | Where applicable, design fuels treatment objectives to protect existing sagebrush ecosystems, modify fire behavior, restore native plants, and create landscape patterns which most benefit sage-grouse habitat. |
| 21. | Provide training to fuels treatment personnel on sage-grouse biology, habitat requirements, and identification of areas utilized locally. |

**Table C-1**
**Required Design Features**

| Required Design Feature |
|---|
| 22. Use burning prescriptions which minimize undesirable effects on vegetation or soils (e.g., minimize mortality of desirable perennial plant species and reduce risk of annual grass invasion). |
| 23. Ensure proposed sagebrush treatments are planned with full interdisciplinary input pursuant to NEPA and coordination with state fish and wildlife agencies, and that treatment acreage is conservative in the context of surrounding sage-grouse seasonal habitats and landscape. |
| 24. Where appropriate, ensure that treatments are configured in a manner that promotes use by sage-grouse. |
| 25. Where applicable, incorporate roads and natural fuel breaks into fuel break design. |
| 26. Power-wash all vehicles and equipment involved in fuels management activities, prior to entering the area, to minimize the introduction of undesirable and/or invasive plant species. |
| 27. Design vegetation treatments in areas of high fire frequency which facilitate firefighter safety, reduce the potential acres burned, and reduce the fire risk to sage-grouse habitat. Additionally, develop maps for sage-grouse habitat which spatially display existing fuels treatments that can be used to assist suppression activities. |
| 28. As funding and logistics permit, restore annual grasslands to a species composition characterized by perennial grasses, forbs, and shrubs or one of that referenced in land use planning documentation. |
| 29. Emphasize the use of native plant species, especially those from a warmer area of the species' current range, recognizing that non-native species may be necessary depending on the availability of native seed and prevailing site conditions. |
| 30. Remove standing and encroaching trees within at least 110 yards of occupied sage-grouse leks and other habitats (e.g., nesting, wintering and brood rearing) to reduce the availability of perch sites for avian predators, as resources permit. |
| 31. Protect wildland areas from wildfire originating on private lands, infrastructure corridors, and recreational areas. |
| 32. Reduce the risk of vehicle- or human-caused wildfires and the spread of invasive species by installing fuel breaks and/or planting perennial vegetation (e.g., green-strips) paralleling road rights-of-way. |
| 33. Strategically place and maintain pre-treated strips/areas (e.g., mowing, herbicide application, etc.) to aid in controlling wildfire, should wildfire occur near PHMA or priority restoration areas (such as where investments in restoration have already been made). |

**Table C-1**
**Required Design Features**

| Required Design Feature |
|---|
| 34. Design treatments to provide a break in fuel continuity in large, at-risk, expanses of continuous sagebrush. Use local knowledge of fire occurrence, spread patterns, and habitat values at risk to determine the proper placement and size of the fuel break. |
| 35. Use existing agreements with local, county, and state road departments to improve and maintain existing fuel breaks during routine road maintenance. Examples include: blading, mowing, disking, grading, and spraying roadside vegetation. |
| 36. Form partnerships with linear right-of-way holders to maintain fuel breaks, which reduce fuel continuity and serve to protect at-risk landscapes. |
| 37. Use existing NEPA documentation and authorities, where possible, when conducting road right-of-way maintenance. In many instances, existing authorizations for roads or linear rights-of-way contain provisions for maintenance activities that could be implemented and incorporated into a vegetation and habitat protection strategy without requiring additional NEPA analysis. Document this with a Determination of NEPA Adequacy (DNA). |
| 38. Enter into agreements with road departments which may help fund the construction and maintenance of fuel breaks adjacent to roads, as funding permits. |
| 39. Spatially depict the locations of existing and planned fuel breaks in a landscape fuel break map and label each vegetation polygon for reference. Offices will make these maps available to suppression resources for use in fire operations. |
| **Vegetation Treatment** |
| 40. Utilize available plant species based on their adaptation to the site when developing seed mixes. (Lambert 2005;  VegSpec). |
| 41. Utilizing the warmer component of a species' current range when selecting native species for restoration when available (Kramer and Havens 2009). |
| 42. Reduce annual grass densities and competition through herbicide, targeted grazing, tillage, prescribed fire, etc. (Pyke 2011). |
| 43. Reduce density and competition of introduced perennial grasses using appropriate techniques to accomplish this reduction (Pellant and Lysne 2005). |
| 44. Utilize techniques to introduce desired species to the site such as drill seeding, broadcast seeding followed by a seed coverage technique, such as harrowing, chaining or livestock trampling, and transplanting container or bare-root seedlings. |
| 45. Assess existing on-site vegetation to ascertain if enough desirable perennial vegetation exists to consider techniques to increase on-site seed production to facilitate an increase in density of desired species. |
| 46. Use site preparation techniques that retain existing desirable vegetation. |
| 47. Use "mother plant" techniques or planting of satellite populations of desirable plants to serve as seed sources. |
| 48. Utilize post-treatment control of annual grass and other invasive species. |

**Table C-1**
**Required Design Features**

| Required Design Feature |
|---|
| 49. Utilize new tools and use of new science and research as it becomes available. |
| 50. Give higher priority to vegetation rehabilitation or manipulation projects that include:<br>• Sites where environmental variables contribute to improved chances for project success (Meinke et al. 2009).<br>• Areas where seasonal habitat is limiting GRSG distribution and/or abundance (wintering areas, wet meadows and riparian areas, nesting areas, leks, etc.).<br>• Re-establish sagebrush cover in otherwise suitable GRSG with consideration to local needs and conditions using the general priorities in the following order:<br>• Recently burned native areas<br>• Native grassland with suitable forb component<br>• Nonnative grassland with suitable forb component<br>• Recently converted annual grass areas<br>• Native grassland<br>• Nonnative grassland<br>• Where desirable perennial bunchgrasses and/or forbs are deficient in existing sagebrush stands, use appropriate mechanical, aerial or other techniques to re-establish them. Examples include but are not limited to, use of a Lawson aerator with seeding, harrow or chain with seeding, drill seeding, hand planting plugs, aerial seeding or other appropriate technique.<br>• Cooperative efforts that may improve GRSG habitat quality over multiple ownerships.<br>• Projects that may provide connectivity between suitable habitats or expand existing good quality habitats.<br>• Projects that address conifer encroachment into important GRSG habitats. In general the priority for treatment is 1) Phase 1 (≤10% conifer cover), 2) Phase 2 (10-30%), and 3) Phase 3 (>30%).<br>• Replacing stands of annual grasses within otherwise good quality habitats with desirable perennial species. Other factors that contribute to the importance of the restoration project in maintaining or improving GRSG habitat. |
| 51. When conducting vegetation treatments in areas inhabited or potentially inhabited by slickspot peppergrass (*Lepidium papilliferum*) follow the conservation measures in the applicable conservation agreement between Idaho BLM and US Fish and Wildlife Service (most recent version dated September 2014). |
| **Lands and Realty** |
| 52. Where technically and financially feasible, bury distribution powerlines and communication lines within existing disturbance. |
| 53. Above-ground disturbance areas would be seeded with perennial vegetation as per vegetation management. |
| 54. Place infrastructure in already disturbed locations where the habitat has not been fully restored. |

**Table C-1**
**Required Design Features**

| Required Design Feature |
|---|
| 55. Cluster disturbances, operations (fracturing stimulation, liquids gathering, etc.) and facilities as close as possible. |
| 56. Co-locate linear facilities within one mile of existing linear facilities. |
| 57. Micro-site linear facilities to reduce impacts to sage-grouse habitats. |
| 58. Locate staging areas outside the Priority Habitat Management Areas to the extent possible. |
| 59. Consider colocating powerlines, flowlines and pipelines under or immediately adjacent to a road or adjacent to other pipelines first, before considering co-locating with other ROW. |
| 60. Restrict the construction of tall facilities and fences to the minimum number and amount needed. |
| 61. Use free standing structures where possible, to limit the use of guy wires. Where guy wires are necessary and appropriate bird collision diverters would be used, if doing so would not cause a human safety risk. |
| 62. Place new utility developments (power lines, pipelines, etc.) and transportation routes in existing utility or transportation corridors. |
| 63. Construction and development activities should conform to seasonal restrictions. |
| **Fluid Mineral Leasing** |
| 64. Use directional drilling and/or multi well-pads to reduce surface disturbance. |
| 65. Apply a phased development approach with concurrent reclamation. |
| 66. Place liquid gathering facilities outside of PHMAs. Have no tanks at well locations within PHMAs to minimize truck traffic and perching and nesting sites for ravens and raptors. |
| 67. Use remote monitoring techniques for production facilities and develop a plan to reduce the frequency of vehicle use (Lyon and Anderson 2003). |
| 68. Site and/or minimize linear ROWs or SUAs to reduce disturbance to sagebrush habitats. |
| 69. Design or site permanent structures which create movement (e.g. pump jack) to minimize impacts to GRSG. |
| 70. Equip tanks and other above-ground facilities with structures or devices that discourage nesting of raptors and corvids. |
| 71. Control the spread and effects of non-native plant species (Gelbard and Belnap 2003, Bergquist et al. 2007, Evangelista et al. 2011). (E.g. by washing vehicles and equipment.) |
| 72. Restrict pit and impoundment construction to reduce or eliminate threats from West Nile virus (Doherty 2007). |

**Table C-1**
**Required Design Features**

| Required Design Feature | |
|---|---|
| 73. | Remove or re-inject produced water to reduce habitat for mosquitoes that vector West Nile virus. If surface disposal of produced water continues, use the following steps for reservoir design to limit favorable mosquito habitat:<br>• Overbuild size of ponds for muddy and non-vegetated shorelines.<br>• Build steep shorelines to decrease vegetation and increase wave actions.<br>• Avoid flooding terrestrial vegetation in flat terrain or low lying areas.<br>• Construct dams or impoundments that restrict down slope seepage or overflow.<br>• Line the channel where discharge water flows into the pond with crushed rock.<br>• Construct spillway with steep sides and line it with crushed rock.<br>• Treat waters with larvicides to reduce mosquito production where water occurs on the surface |
| 74. | Require noise shields when drilling during the lek, nesting, brood-rearing, or wintering season. |
| 75. | The BLM/Forest Service would work with proponents to limit project related noise where it would be expected to reduce functionality of habitats in Priority and Important Habitat Management Areas. |
| 76. | The BLM/Forest Service would evaluate the potential for limitation of new noise sources on a case-by-case basis as appropriate. |
| 77. | Limit noise sources that would be expected to negatively impact populations in Priority and Important Habitat Management Areas and continue to support the establishment of ambient baseline noise levels for occupied leks in Priority Habitat Management Areas. |
| 78. | As additional research and information emerges, specific new limitations appropriate to the type of projects being considered would be evaluated and appropriate limitations would be implemented where necessary to minimize potential for noise impacts on sage-grouse core population behavioral cycles. |
| 79. | As new research is completed, new specific limitations would be coordinated with the IDFG and MT FWP and partners. |
| 80. | Fit transmission towers with anti-perch devices (Lammers and Collopy 2007). |
| 81. | Require sage-grouse-safe fences. |
| 82. | Locate new compressor stations outside Priority Habitat Management Areas and design them to reduce noise that may be directed towards Priority Habitat Management Areas. |
| 83. | Clean up refuse (Bui et al. 2011). |
| 84. | Locate man camps outside of priority sage-grouse habitats. |

**Table C-1**
**Required Design Features**

| Required Design Feature |
|---|
| 85. Consider using oak (or other material) mats for drilling activities to reduce vegetation disturbance and for roads between closely spaced wells to reduce soil compaction and maintain soil structure to increase likelihood of vegetation reestablishment following drilling. |
| 86. Use only closed-loop systems for drilling operations and no reserve pits. |
| 87. Cover (e.g., fine mesh netting or use other effective techniques) all drilling and production pits and tanks regardless of size to reduce sage-grouse mortality. |
| **Roads** |
| 88. Utilize existing roads, or realignments of existing routes to the extent possible. |
| 89. Design roads to an appropriate standard no higher than necessary to accommodate their intended purpose. |
| 90. Do not issue ROWs or SUAs to counties on newly constructed energy or mineral development roads, unless for a temporary use consistent with all other terms and conditions included in this document. |
| 91. Establish speed limits on BLM and FS system roads to reduce vehicle/wildlife collisions or design roads to be driven at slower speeds. |
| 92. Coordinate road construction and use among ROW or SUA holders. |
| 93. Construct road crossings at right angles to ephemeral drainages and stream crossings. |
| 94. Use dust abatement on roads and pads. |
| 95. Close and reclaim duplicate roads by restoring original landform and establishing desired vegetation. |
| **Roads Specific to Priority and Important Habitat Management Areas** |
| 96. Locate roads to avoid priority areas and habitats as described in the Wildfire and Invasive Species Assessments. |
| 97. Establish trip restrictions (Lyon and Anderson 2003) or minimization through use of telemetry and remote well control (e.g., Supervisory Control and Data Acquisition). |
| 98. Restrict vehicle traffic to only authorized users on newly constructed routes (using signage, gates, etc.) |
| **Reclamation Activities** |
| 99. Include objectives for ensuring habitat restoration to meet sage-grouse habitat needs in reclamation practices/sites (Pyke 2011). |
| 100. Address post reclamation management in reclamation plan such that goals and objectives are to protect and improve sage-grouse habitat needs. |
| 101. Maximize the area of interim reclamation on long-term access roads and well pads, including reshaping, topsoiling and revegetating cut-and-fill slopes. |

**Table C-1**
**Required Design Features**

| Required Design Feature |
|---|
| 102. Restore disturbed areas at final reclamation to the pre-disturbance landforms and desired plant community. |
| 103. Irrigate interim reclamation if necessary for establishing seedlings more quickly. |
| 104. Utilize mulching techniques to expedite reclamation and to protect soils. |
| **Grazing** |
| 105. Avoid building new wire fences within 2 km of occupied leks (Stevens 2011). If this is not feasible, ensure that high risk segments are marked with collision diverter devices or as latest science indicates. |
| 106. Place new, taller structures, including corrals, loading facilities, water storage tanks, windmills, out of line of sight or at least one kilometer (preferably 3 km) from occupied leks, where such structures would increase the risk of avian predation. |
| 107. Utilize temporary fencing (e.g., ESR, drop down fencing) where feasible and appropriate to meet management objectives. |
| 108. Fence wetlands (e.g., springs, seeps, wet meadows and/or riparian areas) where appropriate, to maintain or foster progress toward Proper Functioning Condition and to facilitate management of sage-grouse habitat objectives. Where constructing fences or exclosures to improve riparian and/or upland management, incorporate fence marking or other BMPs/RDFs as appropriate. |
| 109. During lekking periods, as determined locally (approximately March 15-May 1 in lower elevations and March 25-May 15 in higher elevations), livestock trailing will be avoided to the extent possible within 1 km (0.62 mile) of occupied leks between 6:00 p.m. and 9:00 a.m. to avoid disturbance to lekking and roosting sage-grouse. Over-nighting, watering and sheep bedding locations on public lands must be at least 1 km from occupied leks during the lekking season to reduce disturbance from sheep, human activity and guard animals. |
| 110. Work with permittees in locating sheep over-nighting, watering and sheep bedding locations to minimize impacts to sage-grouse seasonal habitats. |
| 111. When trailing livestock during the lekking or nesting season, use roads or existing trails, to the extent possible to reduce disturbance to roosting, lekking or nesting sage-grouse. |
| 112. Design new spring developments in GRSG habitat to maintain or enhance the free flowing characteristics of springs and wet meadows. Modify developed springs, seeps and associated pipelines to maintain the continuity of the predevelopment riparian area within priority GRSG habitat where necessary. |
| 113. Install ramps in new and existing livestock troughs and open water storage tanks to facilitate the use of and escape from troughs by GRSG and other wildlife. |

**Table C-1**
**Required Design Features**

| Required Design Feature |
| --- |
| **West Nile Virus** |
| 114. Construct water return features and maintain functioning float valves to prohibit water from being spilled on the ground surrounding the trough and/or tank and return water to the original water source, to the extent practicable. |
| 115. Minimize the construction of new ponds or reservoirs except as needed to meet important resource management and/or restoration objectives. |
| 116. Develop and maintain non-pond/reservoir watering facilities, such as troughs and bottomless tanks, to provide livestock water. |
| 117. For most spring developments or wells, mosquito breeding habitat usually is not an issue. Flowing cold (less than 50° Fahrenheit) water and steep sides of the stock tanks are not conducive for egg laying or larvae production. If flows are low, the water is warm, or moss production is an issue in the tank, mosquito breeding habitat could exist in the tank. |
| 118. Maintenance of healthy wetlands at spring sources helps control mosquitoes and their larvae by providing habitat for natural predators such as birds, dragonflies and amphibians. Protecting the wetland at the spring source with a fence is an option to consider. |
| 119. Clean and drain stock tanks before the season starts. If never cleaned or drained, many tanks will fill with silt or debris causing warmer water and heavy vegetation growth conducive to mosquito reproduction. |
| 120. Draining tanks after the period of use is completed, particularly in warmer weather, also reduces potential habitat by eliminating stagnant standing water. |
| 121. Maintain a properly functioning overflow to prevent water from flowing onto the pad and surrounding area, to eliminate or minimize pooling of water that is attractive to breeding mosquitoes. |
| 122. Clean or deepen overflow ponds to maintain colder temperatures to reduce mosquito habitat. |
| 123. Install and maintain float valves on stock tank fill pipes to minimize overflow |
| 124. Harden stock tank pads to reduce tracks that can potentially hold water where mosquitoes may breed. |
| 125. Build ponds with steep shorelines to reduce shallow water (>60 cm) and aquatic vegetation around the perimeter of impoundments to deter colonizing by mosquitos (Knight et al. 2003, cited in NTT report page 61). |
| 126. Consider removing and controlling trees and shrubs to reduce shade and wind barriers on pit and reservoir shorelines if not needed for wildlife, fish, or recreational values. |
| 127. Impoundments that remain accessible to livestock and wildlife can cause tracking and nutrient enrichment from manure which can create favorable mosquito breeding habitat. Where this is a concern, it may be desirable to fence the reservoir and pipe the water to a tank. |

**Table C-1**
**Required Design Features**

| Required Design Feature |
|---|
| 128. Construct dams or impoundments that minimize down-slope seepage or overflow. Seepage and overflow results in down-grade accumulation of vegetated shallow water areas that support breeding mosquitoes. |
| 129. On ponds and reservoirs with enough depth and volume, introduce native fish species, which feed on mosquito larvae. |
| 130. Line the overflow of a dam's spillway with crushed rock and constructing the spillway with steep sides to preclude the accumulation of shallow water and vegetation to reduce mosquito habitat. |
| 131. Where an existing reservoir has filled with silt, consider cleaning to reduce shallow water habitat conducive to mosquito reproduction. |
| 132. During confirmed West Nile virus outbreaks in sage-grouse habitat, consider larvicide applications. |
| **Travel Management** |
| 133. Designate or design routes to direct use away from priority areas identified in Wildfire and Invasive Species Assessments and still provide for high-quality and sustainable travel routes and administrative access, legislatively mandated requirements, and commercial needs |
| **Recreation** |
| 134. Direct use away from GRSG priority areas as described in the Wildfire and Invasive Species Assessments. |
| 135. Eliminate or minimize external food sources for corvids. |
| 136. Avoid development of new campgrounds or recreation facilities in nesting habitat. |

# Appendix D

## Monitoring Framework

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# THE GREATER SAGE-GROUSE MONITORING FRAMEWORK

Bureau of Land Management

U.S. Forest Service

*Developed by the Interagency Greater Sage-Grouse Disturbance and Monitoring Subteam*

May 30, 2014

# The Greater Sage-Grouse Monitoring Framework

Developed by the Interagency Greater Sage-Grouse Disturbance and Monitoring Subteam

## INTRODUCTION

The purpose of this U.S. Bureau of Land Management (BLM) and U.S. Forest Service (USFS) Greater Sage-Grouse Monitoring Framework (hereafter, monitoring framework) is to describe the methods to monitor habitats and evaluate the implementation and effectiveness of the BLM's national planning strategy (attachment to BLM Instruction Memorandum 2012-044), the BLM resource management plans (RMPs), and the USFS's land management plans (LMPs) to conserve the species and its habitat. The regulations for the BLM (43 CFR 1610.4-9) and the USFS (36 CFR part 209, published July 1, 2010) require that land use plans establish intervals and standards, as appropriate, for monitoring and evaluations based on the sensitivity of the resource to the decisions involved. Therefore, the BLM and the USFS will use the methods described herein to collect monitoring data and to evaluate implementation and effectiveness of the Greater Sage-Grouse (GRSG) (hereafter, sage-grouse) planning strategy and the conservation measures contained in their respective land use plans (LUPs). A monitoring plan specific to the Environmental Impact Statement, land use plan, or field office will be developed after the Record of Decision is signed. For a summary of the frequency of reporting, see Attachment A, An Overview of Monitoring Commitments. Adaptive management will be informed by data collected at any and all scales.

To ensure that the BLM and the USFS are able to make consistent assessments about sage-grouse habitats across the range of the species, this framework lays out the methodology—at multiple scales—for monitoring of implementation and disturbance and for evaluating the effectiveness of BLM and USFS actions to conserve the species and its habitat. Monitoring efforts will include data for measurable quantitative indicators of sagebrush availability, anthropogenic disturbance levels, and sagebrush conditions. Implementation monitoring results will allow the BLM and the USFS to evaluate the extent that decisions from their LUPs to conserve sage-grouse and their habitat have been implemented. State fish and wildlife agencies will collect population monitoring information, which will be incorporated into effectiveness monitoring as it is made available.

This multiscale monitoring approach is necessary, as sage-grouse are a landscape species and conservation is scale-dependent to the extent that conservation actions are implemented within seasonal habitats to benefit populations. The four orders of habitat selection (Johnson 1980) used in this monitoring framework are described by Connelly et al. (2003) and were applied specifically to the scales of sage-grouse habitat selection by Stiver et al. (*in press)* as first order (broad scale), second order (mid scale), third order (fine scale), and fourth order (site scale). Habitat selection and habitat use by sage-grouse occur at multiple scales and are driven by multiple environmental and behavioral factors. Managing and monitoring sage-grouse habitats are complicated by the differences in habitat selection across the range and habitat use by individual birds within a given season. Therefore, the tendency to look at a single indicator of habitat suitability or only one scale limits managers' ability to identify the threats to sage-grouse and to respond at the appropriate scale. For descriptions of these habitat suitability indicators for each scale, see "Sage-Grouse Habitat Assessment Framework: Multiscale Habitat Assessment Tool" (HAF; Stiver et al. *in press*).

Monitoring methods and indicators in this monitoring framework are derived from the current peer-reviewed science. Rangewide, best available datasets for broad- and mid-scale monitoring will be acquired. If these existing datasets are not readily available or are inadequate, but they are necessary to inform the indicators of sagebrush availability, anthropogenic disturbance levels, and sagebrush conditions, the BLM and the USFS will strive to develop datasets or obtain information to fill these data gaps. Datasets that are not readily available to inform the fine- and site-scale indicators will be developed. These data will be used to generate monitoring reports at the appropriate and applicable geographic scales, boundaries, and analysis units: across the range of sage-grouse as defined by Schroeder et al. (2004), and clipped by Western Association of Fish and Wildlife Agencies (WAFWA) Management Zone (MZ) (Stiver et al. 2006) boundaries and other areas as appropriate for size (e.g., populations based on Connelly et al. 2004). (See Figure 1, Map of Greater Sage-Grouse range, populations, subpopulations, and Priority Areas for Conservation as of 2013.) This broad- and mid-scale monitoring data and analysis will provide context for RMP/LMP areas; states; GRSG Priority Habitat, General Habitat, and other sage-grouse designated management areas; and Priority Areas for Conservation (PACs), as defined in "Greater Sage-grouse *(Centrocercus urophasianus)* Conservation Objectives: Final Report" (Conservation Objectives Team [COT] 2013). Hereafter, all of these areas will be referred to as "sage-grouse areas."

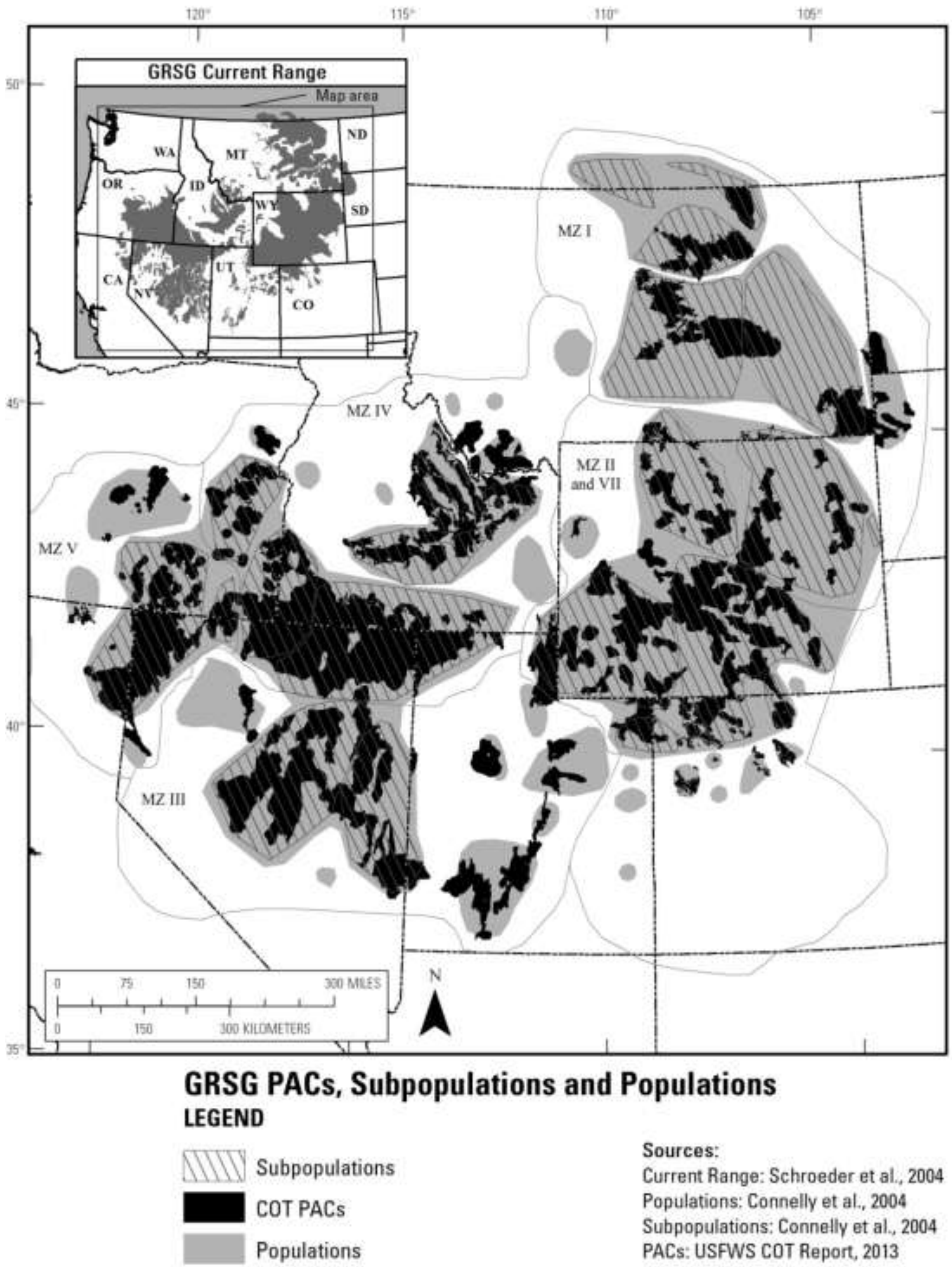


**Figure 1.** Map of Greater Sage-Grouse range, populations, subpopulations, and Priority Areas for Conservation as of 2013.

This monitoring framework is divided into two sections. The broad- and mid-scale methods, described in Section I, provide a consistent approach across the range of the species to monitor implementation decisions and actions, mid-scale habitat attributes (e.g., sagebrush availability and habitat degradation), and population changes to determine the effectiveness of the planning strategy and management decisions. (See Table 1, Indicators for monitoring implementation of the national planning strategy, RMP/LMP decisions, sage-grouse habitat, and sage-grouse populations at the broad and mid scales.) For sage-grouse habitat at the fine and site scales, described in Section II, this monitoring framework describes a consistent approach (e.g., indicators and methods) for monitoring sage-grouse seasonal habitats. Funding, support, and dedicated personnel for broad- and mid-scale monitoring will be renewed annually through the normal budget process. For an overview of BLM and USFS multiscale monitoring commitments, see Attachment A.

**Table 1.** Indicators for monitoring implementation of the national planning strategy, RMP/LMP decisions, sage-grouse habitat, and sage-grouse populations at the broad and mid scales.

| | Implementation | Habitat | | Population (State Wildlife Agencies) |
|---|---|---|---|---|
| *Geographic Scales* | | Availability | Degradation | Demographics |
| Broad Scale: From the range of sage-grouse to WAFWA Management Zones | BLM/USFS National planning strategy goal and objectives | Distribution and amount of sagebrush within the range | Distribution and amount of energy, mining, and infrastructure facilities | WAFWA Management Zone population trend |
| Mid Scale: From WAFWA Management Zone to populations; PACs | RMP/LMP decisions | Mid-scale habitat indicators (HAF; Table 2 herein, e.g., percent of sagebrush per unit area) | Distribution and amount of energy, mining, and infrastructure facilities (Table 2 herein) | Individual population trend |

## I. BROAD AND MID SCALES

First-order habitat selection, the broad scale, describes the physical or geographical range of a species. The first-order habitat of the sage-grouse is defined by populations of sage-grouse associated with sagebrush landscapes, based on Schroeder et al. 2004, and Connelly et al. 2004, and on population or habitat surveys since 2004. An intermediate scale between the broad and mid scales was delineated by WAFWA from floristic provinces within which similar environmental factors influence vegetation communities. This scale is referred to as the WAFWA Sage-Grouse Management Zones (MZs). Although no indicators are specific to this scale, these MZs are biologically meaningful as reporting units.

Second-order habitat selection, the mid-scale, includes sage-grouse populations and PACs. The second order includes at least 40 discrete populations and subpopulations (Connelly et al. 2004). Populations range in area from 150 to 60,000 $mi^2$ and are nested within MZs. PACs range from 20 to 20,400 $mi^2$ and are nested within population areas.

Other mid-scale landscape indicators, such as patch size and number, patch connectivity, linkage areas, and landscape matrix and edge effects (Stiver et al. *in press*) will also be assessed. The methods used to calculate these metrics will be derived from existing literature (Knick et al. 2011, Leu and Hanser 2011, Knick and Hanser 2011).

### A. Implementation (Decision) Monitoring

Implementation monitoring is the process of tracking and documenting the implementation (or the progress toward implementation) of RMP/LMP decisions. The BLM and the USFS will monitor implementation of project-level and/or site-specific actions and authorizations, with their associated conditions of approval/stipulations for sage-grouse, spatially (as appropriate) within Priority Habitat, General Habitat, and other sage-grouse designated management areas, at a minimum, for the planning area. These actions and authorizations, as well as progress toward completing and implementing activity-level plans, will be monitored consistently across all planning units and will be reported to BLM and USFS headquarters annually, with a summary report every 5 years, for the planning area. A national-level GRSG Land Use Plan Decision Monitoring and Reporting Tool is being developed to describe how the BLM and the USFS will consistently and systematically monitor and report implementation-level activity plans and implementation actions for all plans within the range of sage-grouse. A description of this tool for collection and reporting of tabular and spatially explicit data will be included in the Record of Decision or approved plan. The BLM and the USFS will provide data that can be integrated with other conservation efforts conducted by state and federal partners.

## B. Habitat Monitoring

The U.S. Fish and Wildlife Service (USFWS), in its 2010 listing decision for the sage-grouse, identified 18 threats contributing to the destruction, modification, or curtailment of sage-grouse habitat or range (75 FR 13910 2010). The BLM and the USFS will, therefore, monitor the relative extent of these threats that remove sagebrush, both spatially and temporally, on all lands within an analysis area, and will report on amount, pattern, and condition at the appropriate and applicable geographic scales and boundaries. These 18 threats have been aggregated into three broad- and mid-scale measures to account for whether the threat predominantly removes sagebrush or degrades habitat. (See Table 2, Relationship between the 18 threats and the three habitat disturbance measures for monitoring.) The three measures are:

Measure 1: Sagebrush Availability (percent of sagebrush per unit area)

Measure 2: Habitat Degradation (percent of human activity per unit area)

Measure 3: Energy and Mining Density (facilities and locations per unit area)

These three habitat disturbance measures will evaluate disturbance on all lands, regardless of land ownership. The direct area of influence will be assessed with the goal of accounting for actual removal of sagebrush on which sage-grouse depend (Connelly et al. 2000) and for habitat degradation as a surrogate for human activity. Measure 1 (sagebrush availability) examines where disturbances have removed plant communities that support sagebrush (or have broadly removed sagebrush from the landscape). Measure 1, therefore, monitors the change in sagebrush availability—or, specifically, where and how much of the sagebrush community is available within the range of sage-grouse. The sagebrush community is defined as the ecological systems that have the capability of supporting sagebrush vegetation and seasonal sage-grouse habitats within the range of sage-grouse (see Section I.B.1., Sagebrush Availability). Measure 2 (see Section I.B.2., Habitat Degradation Monitoring) and Measure 3 (see Section I.B.3., Energy and Mining Density) focus on where habitat degradation is occurring by using the footprint/area of direct disturbance and the number of facilities at the mid scale to identify the relative amount of degradation per geographic area of interest and in areas that have the capability of supporting sagebrush and seasonal sage-grouse use. Measure 2 (habitat degradation) not only quantifies footprint/area of direct disturbance but also establishes a surrogate for those threats most likely to have ongoing activity. Because energy development and mining activities are typically the most intensive activities in sagebrush habitat, Measure 3 (the density of active energy development, production, and mining sites) will help identify areas of particular concern for such factors as noise, dust, traffic, etc. that degrade sage-grouse habitat.

**Table 2.** Relationship between the 18 threats and the three habitat disturbance measures for monitoring**.**

Note: Data availability may preclude specific analysis of individual layers. See the detailed methodology for more information.

| **USFWS Listing Decision Threat** | **Sagebrush Availability** | **Habitat Degradation** | **Energy and Mining Density** |
|---|---|---|---|
| Agriculture | X | | |
| Urbanization | X | | |
| Wildfire | X | | |
| Conifer encroachment | X | | |
| Treatments | X | | |
| Invasive Species | X | | |
| Energy (oil and gas wells and development facilities) | | X | X |
| Energy (coal mines) | | X | X |
| Energy (wind towers) | | X | X |
| Energy (solar fields) | | X | X |
| Energy (geothermal) | | X | X |
| Mining (active locatable, leasable, and saleable developments) | | X | X |
| Infrastructure (roads) | | X | |
| Infrastructure (railroads) | | X | |
| Infrastructure (power lines) | | X | |
| Infrastructure (communication towers) | | X | |
| Infrastructure (other vertical structures) | | X | |
| Other developed rights-of-way | | X | |

The methods to monitor disturbance found herein differ slightly from methods used in Manier et al. 2013, which provided a baseline environmental report (BER) of datasets of disturbance across jurisdictions. One difference is that, for some threats, the BER data were for federal lands only. In addition, threats were assessed individually, using different assumptions from those in this monitoring framework about how to quantify the location and magnitude of threats. The methodology herein builds on the BER methodology and identifies datasets and procedures to use the best available data across the range of the sage-grouse and to formulate a consistent approach to quantify impact of the threats through time. This methodology also describes an approach to combine the threats and calculate each of the three habitat disturbance measures.

### B.1. Sagebrush Availability (Measure 1)

Sage-grouse populations have been found to be more resilient where a percentage of the landscape is maintained in sagebrush (Knick and Connelly 2011), which will be determined by sagebrush availability. Measure 1 has been divided into two submeasures to describe sagebrush availability on the landscape:

> Measure 1a: the current amount of sagebrush on the geographic area of interest, and
>
> Measure 1b: the amount of sagebrush on the geographic area of interest compared with the amount of sagebrush the landscape of interest could ecologically support.

Measure 1a (the current amount of sagebrush on the landscape) will be calculated using this formula: [the existing updated sagebrush layer] divided by [the geographic area of interest]. The appropriate geographic areas of interest for sagebrush availability include the species' range, WAFWA MZs, populations, and PACs. In some cases these sage-grouse areas will need to be aggregated to provide an estimate of sagebrush availability with an acceptable level of accuracy.

Measure 1b (the amount of sagebrush for context within the geographic area of interest) will be calculated using this formula: [existing sagebrush divided by [pre-EuroAmerican settlement geographic extent of lands that could have supported sagebrush]. This measure will provide information to set the context for a given geographic area of interest during evaluations of monitoring data. The information could also be used to inform management options for restoration or mitigation and to inform effectiveness monitoring.

The sagebrush base layer for Measure 1 will be based on geospatial vegetation data adjusted for the threats listed in Table 2. The following subsections of this monitoring framework describe the methodology for determining both the current availability of sagebrush on the landscape and the context of the amount of sagebrush on the landscape at the broad and mid scales.

### a. Establishing the Sagebrush Base Layer

The current geographic extent of sagebrush vegetation within the rangewide distribution of sage-grouse populations will be ascertained using the most recent version of the Existing Vegetation Type (EVT) layer in LANDFIRE (2013). LANDFIRE EVT was selected to serve as the sagebrush base layer for five reasons: 1) it is the only nationally consistent vegetation layer that has been updated multiple times since 2001; 2) the ecological systems classification within LANDFIRE EVT includes multiple sagebrush type classes that, when aggregated, provide a more accurate (compared with individual classes) and seamless sagebrush base layer across jurisdictional boundaries; 3) LANDFIRE performed a rigorous accuracy assessment from which to derive the rangewide uncertainty of the sagebrush base layer; 4) LANDFIRE is consistently used in several recent analyses of sagebrush habitats (Knick et al. 2011, Leu and Hanser 2011, Knick and Hanser 2011); and 5) LANDFIRE EVT can be compared against the geographic extent of lands that are believed to have had the capability of supporting sagebrush vegetation pre-EuroAmerican settlement [LANDFIRE Biophysical Setting (BpS)]. This fifth reason provides a reference point for understanding how much sagebrush currently remains in a defined geographic area of interest compared with how much sagebrush existed historically (Measure 1b). Therefore, the BLM and the USFS have determined that LANDFIRE provides the best available data at broad and mid scales to serve as a sagebrush base layer for monitoring changes in the geographic extent of sagebrush. The BLM and the USFS, in addition to aggregating the sagebrush types into the sagebrush base layer, will aggregate the accuracy assessment reports from LANDFIRE to document the cumulative accuracy for the sagebrush base layer. The BLM—through its Assessment, Inventory, and Monitoring (AIM) program and, specifically, the BLM's landscape monitoring framework (Taylor et al. 2014)—will provide field data to the LANDFIRE program to support continuous quality improvements of the LANDFIRE EVT layer. The sagebrush layer based on LANDFIRE EVT will allow for the mid-scale estimation of the existing percent of sagebrush across a variety of reporting units. This sagebrush base layer will be adjusted by changes in land cover and successful restoration for future calculations of sagebrush availability (Measures 1a and 1b).

This layer will also be used to determine the trend in other landscape indicators, such as patch size and number, patch connectivity, linkage areas, and landscape matrix and edge effects (Stiver et al. *in press*). In the future, changes in sagebrush availability, generated annually, will be included in the sagebrush base layer. The landscape metrics will be recalculated to examine changes in pattern and abundance of sagebrush at the various geographic boundaries. This information will be included in effectiveness monitoring (See Section I.D., Effectiveness Monitoring).

Within the USFS and the BLM, forest-wide and field office–wide existing vegetation classification mapping and inventories are available that provide a much finer level of data than what is provided through LANDFIRE. Where available, these finer-scale products will be useful for additional and complementary mid-scale indicators and local-scale analyses (see Section II, Fine and Site Scales). The fact that these products are not available everywhere limits their utility for monitoring at the broad and mid scale, where consistency of data products is necessary across broader geographies.

### *Data Sources for Establishing and Monitoring Sagebrush Availability*

There were three criteria for selecting the datasets for establishing and monitoring the change in sagebrush availability (Measure 1):

- Nationally consistent dataset available across the range
- Known level of confidence or accuracy in the dataset
- Continual maintenance of dataset and known update interval

Datasets meeting these criteria are listed in Table 3, Datasets for establishing and monitoring changes in sagebrush availability.

### *LANDFIRE Existing Vegetation Type (EVT) Version 1.2*

LANDFIRE EVT represents existing vegetation types on the landscape derived from remote sensing data. Initial mapping was conducted using imagery collected in approximately 2001. Since the initial mapping there have been two update efforts: version 1.1 represents changes before 2008, and version 1.2 reflects changes on the landscape before 2010. Version 1.2 will be used as the starting point to develop the sagebrush base layer.

Sage-grouse subject matter experts determined which of the ecological systems from the LANDFIRE EVT to use in the sagebrush base layer by identifying the ecological systems that have the capability of supporting sagebrush vegetation and that could provide suitable seasonal habitat for the sage-grouse. (See Table 4, Ecological systems in BpS and EVT capable of supporting sagebrush vegetation and capable of providing suitable seasonal habitat for Greater Sage-Grouse.) Two additional vegetation types that are not ecological systems were added to the EVT: *Artemisia tridentata* ssp. *vaseyana* Shrubland Alliance and *Quercus gambelii* Shrubland Alliance. These alliances have species composition directly related to the Rocky Mountain Lower Montane-Foothill Shrubland ecological system and the Rocky Mountain Gambel Oak-Mixed Montane Shrubland ecological system, both of which are ecological systems in LANDFIRE BpS. In LANDFIRE EVT, however, in some map zones, the Rocky Mountain Lower Montane-Foothill Shrubland ecological system and the Rocky Mountain Gambel Oak-Mixed Montane Shrubland ecological system were named *Artemisia tridentata* ssp. *vaseyana* Shrubland Alliance and *Quercus gambelii* Shrubland Alliance, respectively.

**Table 3.** Datasets for establishing and monitoring changes in sagebrush availability.

| Dataset | Source | Update Interval | Most Recent Version Year | Use |
|---|---|---|---|---|
| BioPhysical Setting v1.1 | LANDFIRE | Static | 2008 | Denominator for sagebrush availability |
| Existing Vegetation Type v1.2 | LANDFIRE | Static | 2010 | Numerator for sagebrush availability |
| Cropland Data Layer | National Agricultural Statistics Service | Annual | 2012 | Agricultural updates; removes existing sagebrush from numerator of sagebrush availability |
| National Land Cover Dataset Percent Imperviousness | Multi-Resolution Land Characteristics Consortium (MRLC) | 5-Year | 2011 (next available in 2016) | Urban area updates; removes existing sagebrush from numerator of sagebrush availability |
| Fire Perimeters | GeoMac | Annual | 2013 | < 1,000-acre fire updates; removes existing sagebrush from numerator of sagebrush availability |
| Burn Severity | Monitoring Trends in Burn Severity | Annual | 2012 (2-year delay in data availability) | > 1,000-acre fire updates; removes existing sagebrush from numerator of sagebrush availability except for unburned sagebrush islands |

**Table 4.** Ecological systems in BpS and EVT capable of supporting sagebrush vegetation and capable of providing suitable seasonal habitat for Greater Sage-Grouse.

| Ecological System | Sagebrush Vegetation that the Ecological System has the Capability of Producing |
|---|---|
| Colorado Plateau Mixed Low Sagebrush Shrubland | *Artemisia arbuscula* ssp. *longiloba*<br>*Artemisia bigelovii*<br>*Artemisia nova*<br>*Artemisia frigida*<br>*Artemisia tridentata* ssp. *wyomingensis* |
| Columbia Plateau Low Sagebrush Steppe | *Artemisia arbuscula*<br>*Artemisia arbuscula* ssp. *longiloba*<br>*Artemisia nova* |

| | |
|---|---|
| Columbia Plateau Scabland Shrubland | *Artemisia rigida* |
| Columbia Plateau Steppe and Grassland | *Artemisia* spp. |
| Great Basin Xeric Mixed Sagebrush Shrubland | *Artemisia arbuscula* ssp. *longicaulis*<br>*Artemisia arbuscula* ssp. *longiloba*<br>*Artemisia nova*<br>*Artemisia tridentata* ssp. *wyomingensis* |
| Inter-Mountain Basins Big Sagebrush Shrubland | *Artemisia tridentata* ssp. *tridentata*<br>*Artemisia tridentata* ssp. *xericensis*<br>*Artemisia tridentata* ssp. *vaseyana*<br>*Artemisia tridentata* ssp. *wyomingensis* |
| Inter-Mountain Basins Big Sagebrush Steppe | *Artemisia cana* ssp. *cana*<br>*Artemisia tridentata* ssp. *tridentata*<br>*Artemisia tridentata* ssp. *xericensis*<br>*Artemisia tridentata* ssp. *wyomingensis*<br>*Artemisia tripartita* ssp. *tripartita*<br>*Artemisia frigida* |
| Inter-Mountain Basins Curl-Leaf Mountain Mahogany Woodland and Shrubland | *Artemisia tridentata* ssp. *vaseyana*<br>*Artemisia arbuscula*<br>*Artemisia tridentata* |
| Inter-Mountain Basins Mixed Salt Desert Scrub | *Artemisia tridentata* ssp. *wyomingensis*<br>*Artemisia spinescens* |
| Inter-Mountain Basins Montane Sagebrush Steppe | *Artemisia tridentata* ssp. *vaseyana*<br>*Artemisia tridentata* ssp. *wyomingensis*<br>*Artemisia nova*<br>*Artemisia arbuscula*<br>*Artemisia tridentata* ssp. *spiciformis* |
| Inter-Mountain Basins Semi-Desert Shrub-Steppe | *Artemisia tridentata*<br>*Artemisia bigelovii*<br>*Artemisia tridentata* ssp. *wyomingensis* |
| Northwestern Great Plains Mixed Grass Prairie | *Artemisia cana* ssp. *cana*<br>*Artemisia tridentata* ssp. *vaseyana*<br>*Artemisia frigida* |
| Northwestern Great Plains Shrubland | *Artemisia cana* ssp. *cana*<br>*Artemisia tridentata* ssp. *tridentata*<br>*Artemisia tridentata* ssp. *wyomingensis* |
| Rocky Mountain Gambel Oak-Mixed Montane Shrubland | *Artemisia tridentata* |
| Rocky Mountain Lower Montane-Foothill Shrubland | *Artemisia nova*<br>*Artemisia tridentata*<br>*Artemisia frigida* |
| Western Great Plains Floodplain Systems | *Artemisia cana* ssp. *cana* |
| Western Great Plains Sand Prairie | *Artemisia cana* ssp. *cana* |
| Wyoming Basins Dwarf Sagebrush Shrubland and Steppe | *Artemisia arbuscula* ssp. *longiloba*<br>*Artemisia nova*<br>*Artemisia tridentata* ssp. *wyomingensis*<br>*Artemisia tripartita* ssp. *rupicola* |
| *Artemisia tridentata* ssp. *vaseyana* Shrubland Alliance (EVT only) | *Artemisia tridentata* ssp. *vaseyana* |
| *Quercus gambelii* Shrubland Alliance (EVT only) | *Artemisia tridentata* |

### *Accuracy and Appropriate Use of LANDFIRE Datasets*

Because of concerns over the thematic accuracy of individual classes mapped by LANDFIRE, all ecological systems listed in Table 4 will be merged into one value that represents the sagebrush base layer. With all ecological systems aggregated, the combined accuracy of the sagebrush base layer (EVT) will be much greater than if all categories were treated separately.

LANDFIRE performed the original accuracy assessment of its EVT product on a map zone basis. There are 20 LANDFIRE map zones that cover the historical range of sage-grouse as defined by Schroeder (2004). (See Attachment B, User and Producer Accuracies for Aggregated Ecological Systems within LANDFIRE Map Zones.) The aggregated sagebrush base layer for monitoring had user accuracies ranging from 57.1% to 85.7% and producer accuracies ranging from 56.7% to 100%.

*LANDFIRE EVT data are not designed to be used at a local level*. In reports of the percent sagebrush statistic for the various reporting units (Measure 1a), the uncertainty of the percent sagebrush will increase as the size of the reporting unit gets smaller. LANDFIRE data should never be used at the 30m pixel level ($900m^2$ resolution of raster data) for any reporting. The smallest geographic extent for using the data to determine percent sagebrush is at the PAC level; for the smallest PACs, the initial percent sagebrush estimate will have greater uncertainties compared with the much larger PACs.

### *Agricultural Adjustments for the Sagebrush Base Layer*

The dataset for the geographic extent of agricultural lands will come from the National Agricultural Statistics Service (NASS) Cropland Data Layer (CDL) (http://www.nass.usda.gov/research/Cropland/Release/index.htm). CDL data are generated annually, with estimated producer accuracies for "large area row crops ranging from the mid 80% to mid-90%," depending on the state (http://www.nass.usda.gov/research/Cropland/sarsfaqs2.htm#Section3_18.0). Specific information on accuracy may be found on the NASS metadata website (http://www.nass.usda.gov/research/Cropland/metadata/meta.htm). CDL provided the only dataset that matches the three criteria (nationally consistent, known level of accuracy, and periodically updated) for use in this monitoring framework and represents the best available agricultural lands mapping product.

The CDL data contain both agricultural classes and nonagricultural classes. For this effort, and in the baseline environmental report (Manier et al. 2013), nonagricultural classes were removed from the original dataset. The excluded classes are:

> Barren (65 & 131), Deciduous Forest (141), Developed/High Intensity (124), Developed/Low Intensity (122), Developed/Med Intensity (123), Developed/Open Space (121), Evergreen Forest (142), Grassland Herbaceous (171), Herbaceous Wetlands (195), Mixed Forest (143), Open

Water (83 & 111), Other Hay/Non Alfalfa (37), Pasture/Hay (181), Pasture/Grass (62), Perennial Ice/Snow (112), Shrubland (64 & 152), Woody Wetlands (190).

The rule set for adjusting the sagebrush base layer for agricultural lands (and for updating the base layer for agricultural lands in the future) is that once an area is classified as agriculture in any year of the CDL, those pixels will remain out of the sagebrush base layer even if a new version of the CDL classifies that pixel as one of the nonagricultural classes listed above. The assumption is that even though individual pixels may be classified as a nonagricultural class in any given year, the pixel has not necessarily been restored to a natural sagebrush community that would be included in Table 4. A further assumption is that once an area has moved into agricultural use, it is unlikely that the area would be restored to sagebrush. Should that occur, however, the method and criteria for adding pixels back into the sagebrush base layer would follow those found in the sagebrush restoration monitoring section of this monitoring framework (see Section I.B.1.b., Monitoring Sagebrush Availability).

***Urban Adjustments for the Sagebrush Base Layer***

The National Land Cover Database (NLCD) (Fry et al. 2011) includes a percent imperviousness dataset that was selected as the best available dataset to be used for urban adjustments and monitoring. These data are generated on a 5-year cycle and are specifically designed to support monitoring efforts. Other datasets were evaluated and lacked the spatial specificity that was captured in the NLCD product. Any new impervious pixel in NLCD will be removed from the sagebrush base layer through the monitoring process. Although the impervious surface layer includes a number of impervious pixels outside of urban areas, this is acceptable for the adjustment and monitoring for two reasons. First, an evaluation of national urban area datasets did not reveal a layer that could be confidently used in conjunction with the NLCD product to screen impervious pixels outside of urban zones. This is because unincorporated urban areas were not being included, thus leaving large chunks of urban pixels unaccounted for in this rule set. Second, experimentation with setting a threshold on the percent imperviousness layer that would isolate rural features proved to be unsuccessful. No combination of values could be identified that would result in the consistent ability to limit impervious pixels outside urban areas. Therefore, to ensure consistency in the monitoring estimates, all impervious pixels will be used.

***Fire Adjustments for the Sagebrush Base Layer***

Two datasets were selected for performing fire adjustments and updates: GeoMac fire perimeters and Monitoring Trends in Burn Severity (MTBS). An existing data standard in the BLM requires that all fires of more than 10 acres are to be reported to GeoMac; therefore, there will be many small fires of less than 10 acres that will not be accounted for in the adjustment and monitoring attributable to fire. Using fire perimeters from GeoMac, all sagebrush pixels falling within the perimeter of fires less than 1,000 acres will be used to adjust and monitor the sagebrush base layer.

For fires greater than 1,000 acres, MTBS was selected as a means to account for unburned sagebrush islands during the update process of the sagebrush base layer. The MTBS program (http://www.mtbs.gov) is an ongoing, multiyear project to map fire severity and fire perimeters consistently across the United States. One of the burn severity classes within MTBS is an unburned to low-severity class. This burn severity class will be used to represent unburned islands of sagebrush within the fire perimeter for the sagebrush base layer. Areas within the other severity classes within the fire perimeter will be removed from the base sagebrush layer during the update process. Not all wildfires, however, have the same impacts on the recovery of sagebrush habitat, depending largely on soil moisture and temperature regimes. For example, cooler, moister sagebrush habitat has a higher potential for recovery or, if needed, restoration than does the warmer, dryer sagebrush habitat. These cooler, moister areas will likely be detected as sagebrush in future updates to LANDFIRE.

### *Conifer Encroachment Adjustment for the Sagebrush Base Layer*

Conifer encroachment into sagebrush vegetation reduces the spatial extent of sage-grouse habitat (Davies et al. 2011, Baruch-Mordo et al. 2013). Conifer species that show propensity for encroaching into sagebrush vegetation resulting in sage-grouse habitat loss include various juniper species, such as Utah juniper *(Juniperus osteosperma),* western juniper *(Juniperus occidentalis),* Rocky Mountain juniper *(Juniperus scopulorum),* pinyon species, including singleleaf pinyon *(Pinus monophylla)* and pinyon pine *(Pinus edulis),* ponderosa pine *(Pinus ponderosa),* lodgepole pine *(Pinus contorta),* and Douglas fir *(Pseudotsuga menziesii)* (Gruell et al. 1986, Grove et al. 2005, Davies et al. 2011).

A rule set for conifer encroachment was developed to adjust the sagebrush base layer. To capture the geographic extent of sagebrush that is likely to experience conifer encroachment, ecological systems within LANDFIRE EVT version 1.2 (NatureServe 2011) were identified if they had the capability of supporting both the conifer species (listed above) and sagebrush vegetation. Those ecological systems were deemed to be the plant communities with conifers most likely to encroach into sagebrush vegetation. (See Table 5, Ecological systems with conifers most likely to encroach into sagebrush vegetation.) Sagebrush vegetation was defined as including sagebrush species or subspecies that provide habitat for the Greater Sage-Grouse and that are included in the HAF. (See Attachment C, Sagebrush Species and Subspecies Included in the Selection Criteria for Building the EVT and BpS Layers.) An adjacency analysis was conducted to identify all sagebrush pixels that were directly adjacent to these conifer ecological systems, and these pixels were removed from the sagebrush base layer.

**Table 5.** Ecological systems with conifers most likely to encroach into sagebrush vegetation.

| EVT Ecological Systems | Coniferous Species and Sagebrush Vegetation that the Ecological System has the Capability of Producing |
|---|---|
| Colorado Plateau Pinyon-Juniper Woodland | *Pinus edulis*<br>*Juniperus osteosperma*<br>*Artemisia tridentata*<br>*Artemisia arbuscula*<br>*Artemisia nova*<br>*Artemisia tridentata* ssp. *tridentata*<br>*Artemisia tridentata* ssp. *wyomingensis*<br>*Artemisia tridentata* ssp. *vaseyana*<br>*Artemisia bigelovii*<br>*Artemisia pygmaea* |
| Columbia Plateau Western Juniper Woodland and Savanna | *Juniperus occidentalis*<br>*Pinus ponderosa*<br>*Artemisia tridentata*<br>*Artemisia arbuscula*<br>*Artemisia rigida*<br>*Artemisia tridentata* ssp. *vaseyana* |
| East Cascades Oak-Ponderosa Pine Forest and Woodland | *Pinus ponderosa*<br>*Pseudotsuga menziesii*<br>*Artemisia tridentata*<br>*Artemisia nova* |
| Great Basin Pinyon-Juniper Woodland | *Pinus monophylla*<br>*Juniperus osteosperma*<br>*Artemisia arbuscula*<br>*Artemisia nova*<br>*Artemisia tridentata*<br>*Artemisia tridentata* ssp. *vaseyana* |
| Northern Rocky Mountain Ponderosa Pine Woodland and Savanna | *Pinus ponderosa*<br>*Artemisia tridentata*<br>*Artemisia arbuscula*<br>*Artemisia tridentata* ssp. *vaseyana* |
| Rocky Mountain Foothill Limber Pine-Juniper Woodland | *Juniperus osteosperma*<br>*Juniperus scopulorum*<br>*Artemisia nova*<br>*Artemisia tridentata* |
| Rocky Mountain Poor-Site Lodgepole Pine Forest | *Pinus contorta*<br>*Pseudotsuga menziesii*<br>*Pinus ponderosa*<br>*Artemisia tridentata* |
| Southern Rocky Mountain Pinyon-Juniper Woodland | *Pinus edulis*<br>*Juniperus monosperma*<br>*Artemisia bigelovii*<br>*Artemisia tridentata*<br>*Artemisia tridentata* ssp. *wyomingensis*<br>*Artemisia tridentata* ssp. *vaseyana* |
| Southern Rocky Mountain Ponderosa Pine Woodland | *Pinus ponderosa*<br>*Pseudotsuga menziesii* |

| | |
|---|---|
| | *Pinus edulis*<br>*Pinus contorta*<br>*Juniperus* spp.<br>*Artemisia nova*<br>*Artemisia tridentata*<br>*Artemisia arbuscula*<br>*Artemisia tridentata* ssp. *vaseyana* |

***Invasive Annual Grasses Adjustments for the Sagebrush Base Layer***

There are no invasive species datasets from 2010 to the present (beyond the LANDFIRE data) that meet the three criteria (nationally consistent, known level of accuracy, and periodically updated) for use in the determination of the sagebrush base layer. For a description of how invasive species land cover will be incorporated in the sagebrush base layer in the future, see Section I.B.1.b., Monitoring Sagebrush Availability.

***Sagebrush Restoration Adjustments for the Sagebrush Base Layer***

There are no datasets from 2010 to the present that could provide additions to the sagebrush base layer from restoration treatments that meet the three criteria (nationally consistent, known level of accuracy, and periodically updated); therefore, no adjustments were made to the sagebrush base layer calculated from the LANDFIRE EVT (version 1.2) attributable to restoration activities since 2010. Successful restoration treatments before 2010 are assumed to have been captured in the LANDFIRE refresh.

**b. Monitoring Sagebrush Availability**

***Monitoring Sagebrush Availability***

Sagebrush availability will be updated annually by incorporating changes to the sagebrush base layer attributable to agriculture, urbanization, and wildfire. The monitoring schedule for the existing sagebrush base layer updates is as follows:

> ***2010 Existing Sagebrush Base Layer*** = [Sagebrush EVT] minus [2006 Imperviousness Layer] minus [2009 and 2010 CDL] minus [2009/10 GeoMac Fires that are less than 1,000 acres] minus [2009/10 MTBS Fires that are greater than 1,000 acres, excluding unburned sagebrush islands within the perimeter] minus [Conifer Encroachment Layer]
>
> ***2012 Existing Sagebrush Update*** = [2010 Existing Sagebrush Base Layer] minus [2011 Imperviousness Layer] minus [2011 and 2012 CDL] minus [2011/12 GeoMac Fires < 1,000 acres] minus [2011/12 MTBS Fires that are greater than 1,000 acres, excluding unburned sagebrush islands within the perimeter]
>
> ***Monitoring Existing Sagebrush post 2012*** = [Previous Existing Sagebrush Update Layer] minus [Imperviousness Layer (if new data are available)] minus [Next 2 years of CDL] minus [Next 2 years of GeoMac Fires < 1,000 acres] minus [Next 2 years of MTBS Fires that are greater than

1,000 acres, excluding unburned sagebrush islands within the perimeter] plus [restoration/monitoring data provided by the field]

### *Monitoring Sagebrush Restoration*

Restoration after fire, after agricultural conversion, after seedings of introduced grasses, or after treatments of pinyon pine and/or juniper are examples of updates to the sagebrush base layer that can add sagebrush vegetation back into sagebrush availability in the landscape. When restoration has been determined to be successful through rangewide, consistent, interagency fine- and site-scale monitoring, the polygonal data will be used to add sagebrush pixels back into the broad- and mid-scale sagebrush base layer.

### *Measure 1b: Context for Monitoring the Amount of Sagebrush in a Geographic Area of Interest*

Measure 1b describes the amount of sagebrush on the landscape of interest compared with the amount of sagebrush the landscape of interest could ecologically support. Areas with the potential to support sagebrush were derived from the BpS data layer that describes sagebrush pre-EuroAmerican settlement (v1.2 of LANDFIRE).

The identification and spatial locations of natural plant communities (vegetation) that are believed to have existed on the landscape (BpS) were constructed based on an approximation of the historical (pre-EuroAmerican settlement) disturbance regime and how the historical disturbance regime operated on the current biophysical environment. BpS is composed of map units that are based on NatureServe (2011) terrestrial ecological systems classification.

The ecological systems within BpS used for this monitoring framework are those ecological systems that are capable of supporting sagebrush vegetation and of providing seasonal habitat for sage-grouse (Table 4). Ecological systems selected included sagebrush species or subspecies that are included in the HAF and listed in Attachment C.

The BpS layer does not have an associated accuracy assessment, given the lack of any reference data. Visual inspection of the BpS data, however, reveals inconsistencies in the labeling of pixels among LANDFIRE map zones. The reason for these inconsistencies is that the rule sets used to map a given ecological system will vary among map zones based on different physical, biological, disturbance, and atmospheric regimes of the region. These variances can result in artificial edges in the map. Metrics will be calculated, however, at broad spatial scales using BpS potential vegetation type, not small groupings or individual pixels. Therefore, the magnitude of these observable errors in the BpS layer will be minor compared with the size of the reporting units. Since BpS will be used to identify broad landscape patterns of dominant vegetation, these inconsistencies will have only a minor impact on the percent sagebrush availability calculation. *As with the LANDFIRE EVT, LANDFIRE BpS data are not designed to be used at a local level*. LANDFIRE data should never be used at the 30m pixel level for reporting.

In conclusion, sagebrush availability data will be used to inform effectiveness monitoring and initiate adaptive management actions as necessary. The 2010 estimate of sagebrush availability will serve as the base year, and an updated estimate for 2012 will be reported in 2014 after all datasets become available. The 2012 estimate will capture changes attributable to wildfire, agriculture, and urban development. Subsequent updates will always include new fire and agricultural data and new urban data when available. Restoration data that meet the criteria for adding sagebrush areas back into the sagebrush base layer will be factored in as data allow. Given data availability, there will be a 2-year lag (approximately) between when the estimate is generated and when the data used for the estimate become available (e.g., the 2014 sagebrush availability will be included in the 2016 estimate).

### *Future Plans*

Geospatial data used to generate the sagebrush base layer will be available through the BLM's EGIS web portal and geospatial gateway or through the authoritative data source. Legacy datasets will be preserved so that trends may be calculated. Additionally, accuracy assessment data for all source datasets will be provided on the portal either spatially, where applicable, or through the metadata. Accuracy assessment information was deemed vital to help users understand the limitation of the sagebrush estimates; it will be summarized spatially by map zone and will be included in the portal.

LANDFIRE plans to begin a remapping effort in 2015. This remapping has the potential to improve the overall quality of data products greatly, primarily through the use of higher-quality remote sensing datasets. Additionally, the BLM and the Multi-Resolution Land Characteristics Consortium (MRLC) are working to improve the accuracy of vegetation map products for broad- and mid-scale analyses through the Grass/Shrub mapping effort. The Grass/Shrub mapping effort applies the Wyoming multiscale sagebrush habitat methodology (Homer et al. 2009) to depict spatially the fractional percent cover estimates for five components rangewide and West-wide. These five components are percent cover of sagebrush vegetation, percent bare ground, percent herbaceous vegetation (grass and forbs combined), annual vegetation, and percent shrubs. A benefit of the design of these fractional cover maps is that they facilitate monitoring "within" class variation (e.g., examination of declining trend in sagebrush cover for individual pixels). This "within" class variation can serve as one indicator of sagebrush quality that cannot be derived from LANDFIRE's EVT information. The Grass/Shrub mapping effort is not a substitute for fine-scale monitoring but will leverage fine-scale data to support the validation of the mapping products. An evaluation will be conducted to determine if either dataset is of great enough quality to warrant replacing the existing sagebrush layers. At the earliest, this evaluation will occur in 2018 or 2019, depending on data availability.

## B.2. Habitat Degradation Monitoring (Measure 2)

The measure of habitat degradation will be calculated by combining the footprints of threats identified in Table 2. The footprint is defined as the direct area of influence of "active" energy and infrastructure; it is used as a surrogate for human activity. Although these analyses will try to summarize results at the aforementioned meaningful geographic areas of interest, some may be too small to report the metrics appropriately and may be combined (smaller populations, PACs within a population, etc.). Data sources for each threat are found in Table 6, Geospatial data sources for habitat degradation. Specific assumptions (inclusion criteria for data, width/area assumptions for point and line features, etc.) and methodology for each threat, and the combined measure, are detailed below. All datasets will be updated annually to monitor broad- and mid-scale year-to-year changes and to calculate trends in habitat degradation to inform adaptive management. A 5-year summary report will be provided to the USFWS.

### a. Habitat Degradation Datasets and Assumptions

***Energy (oil and gas wells and development facilities)***

This dataset will compile information from three oil and gas databases: the proprietary IHS Enerdeq database, the BLM Automated Fluid Minerals Support System (AFMSS) database, and the proprietary Platts (a McGraw-Hill Financial Company) GIS Custom Data (hereafter, Platts) database of power plants. Point data from wells active within the last 10 years from IHS and producing wells from AFMSS will be considered as a 5-acre (2.0ha) direct area of influence centered on the well point, as recommended by the BLM WO-300 (Minerals and Realty Management). Plugged and abandoned wells will be removed if the date of well abandonment was before the first day of the reporting year (i.e., for the 2015 reporting year, a well must have been plugged and abandoned by 12/31/2014 to be removed). Platts oil and gas power plants data (subset to operational power plants) will also be included as a 5-acre (2.0ha) direct area of influence.

> ***Additional Measure: Reclaimed Energy-related Degradation.*** This dataset will include those wells that have been plugged and abandoned. This measure thereby attempts to measure energy-related degradation that has been reclaimed but not necessarily fully restored to sage-grouse habitat. This measure will establish a baseline by using wells that have been plugged and abandoned within the last 10 years from the IHS and AFMSS datasets. Time lags for lek attendance in response to infrastructure have been documented to be delayed 2–10 years from energy development activities (Harju et al. 2010). Reclamation actions may require 2 or more years from the Final Abandonment Notice. Sagebrush seedling establishment may take 6 or more years from the point of seeding, depending on such variables as annual precipitation, annual temperature, and soil type and depth (Pyke 2011). This 10-year period is conservative and assumes some level of habitat improvement 10 years after plugging. Research by Hemstrom et al. (2002), however,

proposes an even longer period—more than 100 years—for recovery of sagebrush habitats, even with active restoration approaches. Direct area of influence will be considered 3 acres (1.2ha) (J. Perry, personal communication, February 12, 2014). This additional layer/measure could be used at the broad and mid scale to identify areas where sagebrush habitat and/or potential sagebrush habitat is likely still degraded. This layer/measure could also be used where further investigation at the fine or site scale would be warranted to: 1) quantify the level of reclamation already conducted, and 2) evaluate the amount of restoration still required for sagebrush habitat recovery. At a particular level (e.g., population, PACs), these areas and the reclamation efforts/success could be used to inform reclamation standards associated with future developments. Once these areas have transitioned from reclamation standards to meeting *restoration* standards, they can be added back into the sagebrush availability layer using the same methodology as described for adding restoration treatment areas lost to wildfire and agriculture conversion (see Monitoring Sagebrush Restoration in Section I.B.1.b., Monitoring Sagebrush Availability). This dataset will be updated annually from the IHS dataset.

***Energy (coal mines)***

Currently, there is no comprehensive dataset available that identifies the footprint of active coal mining across all jurisdictions. Therefore, point and polygon datasets will be used each year to identify coal mining locations. Data sources will be identified and evaluated annually and will include at a minimum: BLM coal lease polygons, U.S. Energy Information Administration mine occurrence points, U.S. Office of Surface Mining Reclamation and Enforcement coal mining permit polygons (as available), and U.S. Geological Survey (USGS) Mineral Resources Data System mine occurrence points. These data will inform where active coal mining may be occurring. Additionally, coal power plant data from Platts power plants database (subset to operational power plants) will be included. Aerial imagery will then be used to digitize manually the active coal mining and coal power plants surface disturbance in or near these known occurrence areas. While the date of aerial imagery varies by scale, the most current data available from Esri and/or Google will be used to locate (generally at 1:50,000 and below) and digitize (generally at 1:10,000 and below) active coal mine and power plant direct area of influence. Coal mine location data source and imagery date will be documented for each digitized coal polygon at the time of creation. Subsurface facility locations (polygon or point location as available) will also be collected if available, included in density calculations, and added to the active surface activity layer as appropriate (if an actual direct area of influence can be located).

***Energy (wind energy facilities)***

This dataset will be a subset of the Federal Aviation Administration (FAA) Digital Obstacles point file. Points where “Type_” = “WINDMILL” will be included. Direct area of influence of these point features will be measured by converting to a polygon dataset as a direct area of influence of 3 acres (1.2ha) centered on each tower point. See the BLM's "Wind Energy Development Programmatic Environmental Impact Statement" (BLM 2005). Additionally, Platts power plants database will be used for transformer stations associated with wind energy sites (subset to operational power plants), also with a 3-acre (1.2ha) direct area of influence.

***Energy (solar energy facilities)***

This dataset will include solar plants as compiled with the Platts power plants database (subset to operational power plants). This database includes an attribute that indicates the operational capacity of each solar power plant. Total capacity at the power plant was based on ratings of the in-service unit(s), in megawatts. Direct area of influence polygons will be centered over each point feature representing 7.3ac (3.0ha) per megawatt of the stated operational capacity, per the report of the National Renewable Energy Laboratory (NREL), "Land-Use Requirements for Solar Power Plants in the United States" (Ong et al. 2013).

***Energy (geothermal energy facilities)***

This dataset will include geothermal wells in existence or under construction as compiled with the IHS wells database and power plants as compiled with the Platts database (subset to operational power plants). Direct area of influence of these point features will be measured by converting to a polygon dataset of 3 acres (1.2ha) centered on each well or power plant point.

***Mining (active developments; locatable, leasable, saleable)***

This dataset will include active locatable mining locations as compiled with the proprietary InfoMine database. Aerial imagery will then be used to digitize manually the active mining surface disturbance in or near these known occurrence areas. While the date of aerial imagery varies by scale, the most current data available from Esri and/or Google will be used to locate (generally at 1:50,000 and below) and digitize (generally at 1:10,000 and below) active mine direct area of influence. Mine location data source and imagery date will be documented for each digitized polygon at the time of creation. Currently, there are no known compressive databases available for leasable or saleable mining sites beyond coal mines. Other data sources will be evaluated and used as they are identified or as they become available. Point data may be converted to polygons to represent direct area of influence unless actual surface disturbance is available.

***Infrastructure (roads)***

This dataset will be compiled from the proprietary Esri StreetMap Premium for ArcGIS. Dataset features that will be used are: Interstate Highways, Major Roads, and Surface Streets to capture most paved and "crowned and ditched" roads while not including "two-track" and 4-wheel-drive routes. These minor roads, while not included in the broad- and mid-scale monitoring, may support a volume of traffic that can have deleterious effects on sage-grouse leks. It may be appropriate to consider the frequency and type of use of roads in a NEPA analysis for a proposed project. This fine- and site-scale analysis will require more site-specific data than is identified in this monitoring framework. The direct area of influence for roads will be represented by 240.2ft, 84.0ft, and 40.7ft (73.2m, 25.6m, and 12.4m) total widths centered on the line feature for Interstate Highways, Major Roads, and Surface Streets, respectively (Knick et al. 2011). The most current dataset will be used for each monitoring update. *Note: This is a related but different dataset than what was used in BER (Manier et al. 2013). Individual BLM/USFS planning units may use different road layers for fine- and site-scale monitoring.*

***Infrastructure (railroads)***

This dataset will be a compilation from the Federal Railroad Administration Rail Lines of the USA dataset. Non-abandoned rail lines will be used; abandoned rail lines will not be used. The direct are of influence for railroads will be represented by a 30.8ft (9.4m) total width (Knick et al. 2011) centered on the non-abandoned railroad line feature.

***Infrastructure (power lines)***

This line dataset will be derived from the proprietary Platts transmission lines database. Linear features in the dataset attributed as “buried” will be removed from the disturbance calculation. Only “In Service” lines will be used; “Proposed” lines will not be used. Direct area of influence will be determined by the kV designation: 1–199 kV (100ft/30.5m), 200–399 kV (150ft/45.7m), 400–699 kV (200ft/61.0m), and 700-or greater kV (250ft/76.2m) based on average right-of-way and structure widths, according to BLM WO-300 (Minerals and Realty Management).

***Infrastructure (communication towers)***

This point dataset will be compiled from the Federal Communications Commission (FCC) communication towers point file; all duplicate points will be removed. It will be converted to a polygon dataset by using a direct area of influence of 2.5 acres (1.0ha) centered on each communication tower point (Knick et al. 2011).

***Infrastructure (other vertical structures)***

This point dataset will be compiled from the FAA’s Digital Obstacles point file. Points where “Type_” = “WINDMILL” will be removed. Duplicate points from the FCC communication towers point file will be removed. Remaining features will be converted to a polygon dataset using a direct area of influence of 2.5 acres (1.0ha) centered on each vertical structure point (Knick et al. 2011).

***Other Developed Rights-of-Way***

Currently, no additional data sources for other rights-of-way have been identified; roads, power lines, railroads, pipelines, and other known linear features are represented in the categories described above. The newly purchased IHS data do contain pipeline information; however, this database does not currently distinguish between above-ground and underground pipelines. If additional features representing human activities are identified, they will be added to monitoring reports using similar assumptions to those used with the threats described above.

### b. Habitat Degradation Threat Combination and Calculation

The threats targeted for measuring human activity (Table 2) will be converted to direct area of influence polygons as described for each threat above. These threat polygon layers will be combined and features dissolved to create one overall polygon layer representing footprints of active human activity in the range of sage-grouse. Individual datasets, however, will be preserved to indicate which types of threats may be contributing to overall habitat degradation.

This measure has been divided into three submeasures to describe habitat degradation on the landscape. Percentages will be calculated as follows:

> Measure 2a. Footprint by geographic area of interest: Divide area of the active/direct footprint by the total area of the geographic area of interest (% disturbance in geographic area of interest).
>
> Measure 2b. Active/direct footprint by historical sagebrush potential: Divide area of the active footprint that coincides with areas with historical sagebrush potential (BpS calculation from habitat availability) within a given geographic area of interest by the total area with sagebrush potential within the geographic area of interest (% disturbance on potential historical sagebrush in geographic area of interest).
>
> Measure 2c. Active/direct footprint by current sagebrush: Divide area of the active footprint that coincides with areas of existing sagebrush (EVT calculation from habitat availability) within a given geographic area of interest by the total area that is current sagebrush within the geographic area of interest (% disturbance on current sagebrush in geographic area of interest).

## B.3. Energy and Mining Density (Measure 3)

The measure of density of energy and mining will be calculated by combining the locations of energy and mining threats identified in Table 2. This measure will provide an estimate of the intensity of human activity or the intensity of habitat degradation. The number of energy facilities and mining locations will be summed and divided by the area of meaningful geographic areas of interest to calculate density of these activities. Data sources for each threat are found in Table 6. Specific assumptions (inclusion criteria for data, width/area assumptions for point and line features, etc.) and methodology for each threat, and the combined measure, are detailed below. All datasets will be updated annually to monitor broad- and mid-scale year-to-year changes and 5-year (or longer) trends in habitat degradation.

**Table 6.** Geospatial data sources for habitat degradation (Measure 2).

| Degradation Type | Subcategory | Data Source | Direct Area of Influence | Area Source |
|---|---|---|---|---|
| **Energy (oil & gas)** | Wells | IHS; BLM (AFMSS) | 5.0ac (2.0ha) | BLM WO-300 |
| | Power Plants | Platts (power plants) | 5.0ac (2.0ha) | BLM WO-300 |
| **Energy (coal)** | Mines | BLM; USFS; Office of Surface Mining Reclamation and Enforcement; USGS Mineral Resources Data System | Polygon area (digitized) | Esri/ Google Imagery |
| | Power Plants | Platts (power plants) | Polygon area (digitized) | Esri Imagery |
| **Energy (wind)** | Wind Turbines | Federal Aviation Administration | 3.0ac (1.2ha) | BLM WO-300 |
| | Power Plants | Platts (power plants) | 3.0ac (1.2ha) | BLM WO-300 |
| **Energy (solar)** | Fields/Power Plants | Platts (power plants) | 7.3ac (3.0ha)/MW | NREL |
| **Energy (geothermal)** | Wells | IHS | 3.0ac (1.2ha) | BLM WO-300 |
| | Power Plants | Platts (power plants) | Polygon area (digitized) | Esri Imagery |
| **Mining** | Locatable Developments | InfoMine | Polygon area (digitized) | Esri Imagery |
| **Infrastructure (roads)** | Surface Streets (Minor Roads) | Esri StreetMap Premium | 40.7ft (12.4m) | USGS |
| | Major Roads | Esri StreetMap Premium | 84.0ft (25.6m) | USGS |
| | Interstate Highways | Esri StreetMap Premium | 240.2ft (73.2m) | USGS |
| **Infrastructure (railroads)** | Active Lines | Federal Railroad Administration | 30.8ft (9.4m) | USGS |
| **Infrastructure (power lines)** | 1-199kV Lines | Platts (transmission lines) | 100ft (30.5m) | BLM WO-300 |
| | 200-399 kV Lines | Platts (transmission lines) | 150ft (45.7m) | BLM WO-300 |
| | 400-699kV Lines | Platts (transmission lines) | 200ft (61.0m) | BLM WO-300 |
| | 700+kV Lines | Platts (transmission lines) | 250ft (76.2m) | BLM WO-300 |
| **Infrastructure (communication)** | Towers | Federal Communications Commission | 2.5ac (1.0ha) | BLM WO-300 |

### a. Energy and Mining Density Datasets and Assumptions

***Energy (oil and gas wells and development facilities)***

(See Section I.B.2., Habitat Degradation Monitoring.)

***Energy (coal mines)***

(See Section I.B.2., Habitat Degradation Monitoring.)

***Energy (wind energy facilities)***

(See Section I.B.2., Habitat Degradation Monitoring.)

***Energy (solar energy facilities)***

(See Section I.B.2., Habitat Degradation Monitoring.)

***Energy (geothermal energy facilities)***

(See Section I.B.2., Habitat Degradation Monitoring.)

***Mining (active developments; locatable, leasable, saleable)***

(See Section I.B.2., Habitat Degradation Monitoring.)

### b. Energy and Mining Density Threat Combination and Calculation

Datasets for energy and mining will be collected in two primary forms: point locations (e.g., wells) and polygon areas (e.g., surface coal mining). The following rule set will be used to calculate density for meaningful geographic areas of interest including standard grids and per polygon:

1) Point locations will be preserved; no additional points will be removed beyond the methodology described above. Energy facilities in close proximity (an oil well close to a wind tower) will be retained.
2) Polygons will not be merged, or features further dissolved. Thus, overlapping facilities will be retained, such that each individual threat will be a separate polygon data input for the density calculation.
3) The analysis unit (polygon or 640-acre section in a grid) will be the basis for counting the number of mining or energy facilities per unit area. Within the analysis unit, all point features will be summed, and any individual polygons will be counted as one (e.g., a coal mine will be counted as one facility within population). Where polygon features overlap multiple units (polygons or pixels), the facility will be counted as one in each unit where the polygon occurs (e.g., a polygon crossing multiple 640-acre

sections would be counted as one in each 640-acre section for a density per 640-acre-section calculation).

4) In methodologies with different-sized units (e.g., MZs, populations, etc.) raw facility counts will be converted to densities by dividing the raw facility counts by the total area of the unit. Typically this will be measured as facilities per 640 acres.
5) For uniform grids, raw facility counts will be reported. Typically this number will also be converted to facilities per 640 acres.
6) Reporting may include summaries beyond the simple ones above. Zonal statistics may be used to smooth smaller grids to help display and convey information about areas within meaningful geographic areas of interest that have high levels of energy and/or mining activity.
7) Additional statistics for each defined unit may also include adjusting the area to include only the area with the historical potential for sagebrush (BpS) or areas currently sagebrush (EVT).

Individual datasets and threat combination datasets for habitat degradation will be available through the BLM's EGIS web portal and geospatial gateway. Legacy datasets will be preserved so that trends may be calculated.

### C. Population (Demographics) Monitoring

State wildlife management agencies are responsible for monitoring sage-grouse populations within their respective states. WAFWA will coordinate this collection of annual population data by state agencies. These data will be made available to the BLM according to the terms of the forthcoming Greater Sage-Grouse Population Monitoring Memorandum of Understanding (MOU) (2014) between WAFWA and the BLM. The MOU outlines a process, timeline, and responsibilities for regular data sharing of sage-grouse population and/or habitat information for the purposes of implementing sage-grouse LUPs/amendments and subsequent effectiveness monitoring. Population areas were refined from the "Greater Sage-grouse *(Centrocercus urophasianus)* Conservation Objectives: Final Report" (COT 2013) by individual state wildlife agencies to create a consistent naming nomenclature for future data analyses. These population data will be used for analysis at the applicable scale to supplement habitat effectiveness monitoring of management actions and to inform the adaptive management responses.

### D. Effectiveness Monitoring

Effectiveness monitoring will provide the data needed to evaluate BLM and USFS actions toward reaching the objective of the national planning strategy (BLM IM 2012-044)—to conserve sage-grouse populations and their habitat—and the objectives for the land use planning area. Effectiveness monitoring methods described here will encompass multiple larger scales, from areas as large as the WAFWA MZ to the scale of this LUP. Effectiveness data used for these larger-scale evaluations will include all lands in the area of interest, regardless of surface ownership/management, and will help inform where finer-scale evaluations are needed, such as population areas smaller than an LUP or PACs within an LUP (described in Section II, Fine and Site Scales). Data will also include the trend of disturbance within these areas of interest to inform the need to initiate adaptive management responses as described in the land use plan.

Effectiveness monitoring reported for these larger areas provides the context to conduct effectiveness monitoring at finer scales. This approach also helps focus scarce resources to areas experiencing habitat loss, degradation, or population declines, without excluding the possibility of concurrent, finer-scale evaluations as needed where habitat or population anomalies have been identified through some other means.

To determine the effectiveness of the sage-grouse national planning strategy, the BLM and the USFS will evaluate the answers to the following questions and prepare a broad- and mid-scale effectiveness report:

1) Sagebrush Availability and Condition:
    a. What is the amount of sagebrush availability and the change in the amount and condition of sagebrush?
    b. What is the existing amount of sagebrush on the landscape and the change in the amount relative to the pre-EuroAmerican historical distribution of sagebrush (BpS)?
    c. What is the trend and condition of the indicators describing sagebrush characteristics important to sage-grouse?
2) Habitat Degradation and Intensity of Activities:
    a. What is the amount of habitat degradation and the change in that amount?
    b. What is the intensity of activities and the change in the intensity?
    c. What is the amount of reclaimed energy-related degradation and the change in the amount?
3) What is the population estimation of sage-grouse and the change in the population estimation?
4) How are the BLM and the USFS contributing to changes in the amount of sagebrush?
5) How are the BLM and the USFS contributing to disturbance?

The compilation of broad- and mid-scale data (and population trends as available) into an effectiveness monitoring report will occur on a 5-year reporting schedule (see Attachment A), which may be accelerated to respond to critical emerging issues (in consultation with the USFWS and state wildlife agencies). In addition, effectiveness monitoring results will be used to identify emerging issues and research needs and inform the BLM and the USFS adaptive management strategy (see the adaptive management section of this Environmental Impact Statement).

To determine the effectiveness of the sage-grouse objectives of the land use plan, the BLM and the USFS will evaluate the answers to the following questions and prepare a plan effectiveness report:

1) Is this plan meeting the sage-grouse habitat objectives?
2) Are sage-grouse areas within the LUP meeting, or making progress toward meeting, land health standards, including the Special Status Species/wildlife habitat standard?
3) Is the plan meeting the disturbance objective(s) within sage-grouse areas?
4) Are the sage-grouse populations within this plan boundary and within the sage-grouse areas increasing, stable, or declining?

The effectiveness monitoring report for this LUP will occur on a 5-year reporting schedule (see Attachment A) or more often if habitat or population anomalies indicate the need for an evaluation to facilitate adaptive management or respond to critical emerging issues. Data will be made available through the BLM's EGIS web portal and the geospatial gateway.

***Methods***

At the broad and mid scales (PACs and above) the BLM and the USFS will summarize the vegetation, disturbance, and (when available) population data. Although the analysis will try to summarize results for PACs within each sage-grouse population, some populations may be too small to report the metrics appropriately and may need to be combined to provide an estimate with an acceptable level of accuracy. Otherwise, they will be flagged for more intensive monitoring by the appropriate landowner or agency. The BLM and the USFS will then analyze monitoring data to detect the trend in the amount of sagebrush; the condition of the vegetation in the sage-grouse areas (MacKinnon et al. 2011); the trend in the amount of disturbance; the change in disturbed areas owing to successful restoration; and the amount of new disturbance the BLM and/or the USFS has permitted. These data could be supplemented with population data (when available) to inform an understanding of the correlation between habitat and PACs within a population. This overall effectiveness evaluation must consider the lag effect response of populations to habitat changes (Garton et al. 2011).

*Calculating Question 1, National Planning Strategy Effectiveness:* The amount of sagebrush available in the large area of interest will use the information from Measure 1a (I.B.1., Sagebrush Availability) and calculate the change from the 2012 baseline to the end date of the reporting period. To calculate the change in the amount of sagebrush on the landscape to compare with the historical areas with potential to support sagebrush, the information from Measure 1b (I.B.1., Sagebrush Availability) will be used. To calculate the trend in the condition of sagebrush at the mid scale, three sources of data will be used: the BLM's Grass/Shrub mapping effort (Future Plans in Section I.B.1., Sagebrush Availability); the results from the calculation of the landscape indicators, such as patch size (described below); and the BLM's Landscape Monitoring Framework (LMF) and sage-grouse intensification effort (also described below). The LMF and sage-grouse intensification effort data are collected in a statistical sampling framework that allows calculation of indicator values at multiple scales.

Beyond the importance of sagebrush availability to sage-grouse, the mix of sagebrush patches on the landscape at the broad and mid scale provides the life requisite of space for sage-grouse dispersal needs (see the HAF). The configuration of sagebrush habitat patches and the land cover or land use between the habitat patches at the broad and mid scales also defines suitability. There are three significant habitat indicators that influence habitat use, dispersal, and movement across populations:  the size and number of habitat patches, the connectivity of habitat patches (linkage areas), and habitat fragmentation (scope of unsuitable and non-habitats between habitat patches). The most appropriate commercial software to measure patch dynamics, connectivity, and fragmentation at the broad and mid scales will be used, along with the same data layers derived for sagebrush availability.

The BLM initiated the LMF in 2011 in cooperation with the Natural Resources Conservation Service (NRCS). The objective of the LMF effort is to provide unbiased estimates of vegetation and soil condition and trend using a statistically balanced sample design across BLM lands. Recognizing that sage-grouse populations are more resilient where the sagebrush plant community has certain characteristics unique to a particular life stage of sage-grouse (Knick and Connelly 2011, Stiver et al. *in press*), a group of sage-grouse habitat and sagebrush plant community subject matter experts identified those vegetation indicators collected at LMF sampling points that inform sage-grouse habitat needs. The experts represented the Agricultural Research Service, BLM, NRCS, USFWS, WAFWA, state wildlife agencies, and academia. The common indicators identified include: species composition, foliar cover, height of the tallest sagebrush and herbaceous plant, intercanopy gap, percent of invasive species, sagebrush shape, and bare ground. To increase the precision of estimates of sagebrush conditions within the range of sage-grouse, additional plot locations in occupied sage-grouse habitat (Sage-Grouse Intensification) were added in 2013. The common indicators are also collected on sampling locations in the NRCS National Resources Inventory Rangeland Resource Assessment (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/technical/nra/nri/?&cid=stelprdb1041620).

The sage-grouse intensification baseline data will be collected over a 5-year period, and an annual sage-grouse intensification report will be prepared describing the status of the indicators. Beginning in year 6, the annual status report will be accompanied with a trend report, which will be available on an annual basis thereafter, contingent on continuation of the current monitoring budget. This information, in combination with the Grass/Shrub mapping information, the mid-scale habitat suitability indicator measures, and the sagebrush availability information will be used to answer Question 1 of the National Planning Strategy Effectiveness Report.

*Calculating Question 2, National Planning Strategy Effectiveness:* Evaluations of the amount of habitat degradation and the intensity of the activities in the area of interest will use the information from Measure 2 (Section I.B.2., Habitat Degradation Monitoring) and Measure 3 (Section I.B.3., Energy and Mining Density). The field office will collect data on the amount of reclaimed energy-related degradation on plugged and abandoned and oil/gas well sites. The data are expected to demonstrate that the reclaimed sites have yet to meet the habitat restoration objectives for sage-grouse habitat. This information, in combination with the amount of habitat degradation, will be used to answer Question 2 of the National Planning Strategy Effectiveness Report.

*Calculating Question 3, National Planning Strategy Effectiveness:* The change in sage-grouse estimated populations will be calculated from data provided by the state wildlife agencies, when available. This population data (Section I.C., Population [Demographics] Monitoring) will be used to answer Question 3 of the National Planning Strategy Effectiveness Report.

*Calculating Question 4, National Planning Strategy Effectiveness:* The estimated contribution by the BLM or the USFS to the change in the amount of sagebrush in the area of interest will use the information from Measure 1a (Section I.B.1., Sagebrush Availability). This measure is derived from the national datasets that remove sagebrush (Table 3). To determine the relative contribution of BLM and USFS management, the current Surface Management Agency geospatial data layer will be used to differentiate the amount of change for each management agency for this measure in the geographic areas of interest. This information will be used to answer Question 4 of the National Planning Strategy Effectiveness Report.

*Calculating Question 5, National Planning Strategy Effectiveness:* The estimated contribution by the BLM or the USFS to the change in the amount of disturbance in the area of interest will use the information from Measure 2a (Section I.B.2., Monitoring Habitat Degradation) and Measure 3 (Section I.B.3., Energy and Mining Density). These measures are all derived from the national disturbance datasets that degrade habitat (Table 6). To determine the relative contribution of BLM and USFS management, the current Surface Management Agency geospatial data layer will be used to differentiate the amount of change for each management agency for these two measures in the geographic areas of interest. This information will be used to answer Question 5 of the National Planning Strategy Effectiveness Report.

Answers to the five questions for determining the effectiveness of the national planning strategy will identify areas that appear to be meeting the objectives of the strategy and will facilitate identification of population areas for more detailed analysis. Conceptually, if the broad-scale monitoring identifies increasing sagebrush availability and improving vegetation conditions, decreasing disturbance, and a stable or increasing population for the area of interest, there is evidence that the objectives of the national planning strategy to maintain populations and their habitats have been met. Conversely, where information indicates that sagebrush is decreasing and vegetation conditions are degrading, disturbance in sage-grouse areas is increasing, and/or populations are declining relative to the baseline, there is evidence that the objectives of the national planning strategy are not being achieved. Such a determination would likely result in a more detailed analysis and could be the basis for implementing more restrictive adaptive management measures.

With respect to the land use plan area, the BLM and the USFS will summarize the vegetation, disturbance, and population data to determine if the LUP is meeting the plan objectives. Effectiveness information used for these evaluations includes BLM/USFS surface management areas and will help inform where finer-scale evaluations are needed, such as seasonal habitats, corridors, or linkage areas. Data will also include the trend of disturbance within the sage-grouse areas, which will inform the need to initiate adaptive management responses as described in the land use plan.

*Calculating Question 1, Land Use Plan Effectiveness:* The condition of vegetation and the allotments meeting land health standards (as articulated in "BLM Handbook 4180-1, Rangeland Health Standards") in sage-grouse areas will be used to determine the LUP's effectiveness in meeting the vegetation objectives for sage-grouse habitat set forth in the plan. The field office/ranger district will be responsible for collecting this data. In order for this data to be consistent and comparable, common indicators, consistent methods, and an unbiased sampling framework will be implemented following the principles in the BLM's AIM strategy (Taylor et al. 2014; Toevs et al. 2011; MacKinnon et al. 2011), in the BLM's Technical Reference "Interpreting Indicators of Rangeland Health" (Pellant et al. 2005), and in the HAF (Stiver et al. *in press*) or other approved WAFWA MZ–consistent guidance to measure and monitor sage-grouse habitats. This information will be used to answer Question 1 of the Land Use Plan Effectiveness Report.

*Calculating Question 2, Land Use Plan Effectiveness:* Sage-grouse areas within the LUP that are achieving land health stands (or, if trend data are available, that are making progress toward achieving them)—particularly the Special Status Species/wildlife habitat land health standard—will be used to determine the LUP's effectiveness in achieving the habitat objectives set forth in the plan. Field offices will follow directions in "BLM Handbook 4180-1, Rangeland Health Standards," to ascertain if sage-grouse areas are achieving or making progress toward achieving land health standards. One of the recommended criteria for evaluating this land health standard is the HAF indicators.

*Calculating Question 3, Land Use Plan Effectiveness:* The amount of habitat disturbance in sage-grouse areas identified in this LUP will be used to determine the LUP's effectiveness in meeting the plan's disturbance objectives. National datasets can be used to calculate the amount of disturbance, but field office data will likely increase the accuracy of this estimate. This information will be used to answer Question 3 of the Land Use Plan Effectiveness Report.

*Calculating Question 4, Land Use Plan Effectiveness:* The change in estimated sage-grouse populations will be calculated from data provided by the state wildlife agencies, when available, and will be used to determine LUP effectiveness. This population data (Section I.C., Population [Demographics] Monitoring) will be used to answer Question 4 of the Land Use Plan Effectiveness Report.

Results of the effectiveness monitoring process for the LUP will be used to inform the need for finer-scale investigations, initiate adaptive management actions as described in the land use plan, initiate causation determination, and/or determine if changes to management decisions are warranted. The measures used at the broad and mid scales will provide a suite of characteristics for evaluating the effectiveness of the adaptive management strategy.

## II. FINE AND SITE SCALES

Fine-scale (third-order) habitat selected by sage-grouse is described as the physical and geographic area within home ranges during breeding, summer, and winter periods. At this level, habitat suitability monitoring should address factors that affect sage-grouse use of, and movements between, seasonal use areas. The habitat monitoring at the fine and site scale (fourth order) should focus on indicators to describe seasonal home ranges for sage-grouse associated with a lek or lek group within a population or subpopulation area. Fine- and site-scale monitoring will inform LUP effectiveness monitoring (see Section I.D., Effectiveness Monitoring) and the hard and soft triggers identified in the LUP's adaptive management section.

Site-scale habitat selected by sage-grouse is described as the more detailed vegetation characteristics of seasonal habitats. Habitat suitability characteristics include canopy cover and height of sagebrush and the associated understory vegetation. They also include vegetation associated with riparian areas, wet meadows, and other mesic habitats adjacent to sagebrush that may support sage-grouse habitat needs during different stages in their annual cycle.

As described in the Conclusion (Section III), details and application of monitoring at the fine and site scales will be described in the implementation-level monitoring plan for the land use plan. The need for fine- and site-scale-specific habitat monitoring will vary by area, depending on proposed projects, existing conditions, habitat variability, threats, and land health. Examples of fine- and site-scale monitoring include: habitat vegetation monitoring to assess current habitat conditions; monitoring and evaluation of the success of projects targeting sage-grouse habitat enhancement and/or restoration; and habitat disturbance monitoring to provide localized disturbance measures to inform proposed project review and potential mitigation for project impacts. Monitoring plans should incorporate the principles outlined in the BLM's AIM strategy (Toevs et al. 2011) and in "AIM-Monitoring: A Component of the Assessment, Inventory, and Monitoring Strategy" (Taylor et al. 2014). Approved monitoring methods are:

- “BLM Core Terrestrial Indicators and Methods” (MacKinnon et al. 2011);
- The BLM’s Technical Reference “Interpreting Indicators of Rangeland Health” (Pellant et al. 2005); and,
- “Sage-Grouse Habitat Assessment Framework: Multiscale Assessment Tool” (Stiver et al. *in press*).

Other state-specific disturbance tracking models include: the BLM’s Wyoming Density and Disturbance Calculation Tool (http://ddct.wygisc.org/) and the BLM’s White River Data Management System in development with the USGS. Population monitoring data (in cooperation with state wildlife agencies) should be included during evaluation of the effectiveness of actions taken at the fine and site scales.

Fine- and site-scale sage-grouse habitat suitability indicators for seasonal habitats are identified in the HAF. The HAF has incorporated the Connelly et al. (2000) sage-grouse guidelines as well as many of the core indicators in the AIM strategy (Toevs et al. 2011). There may be a need to develop adjustments to height and cover or other site suitability values described in the HAF; any such adjustments should be ecologically defensible. To foster consistency, however, adjustments to site suitability values at the local scale should be avoided unless there is strong, scientific justification for making those adjustments. That justification should be provided. WAFWA MZ adjustments must be supported by regional plant productivity and habitat data for the floristic province. If adjustments are made to the site-scale indicators, they must be made using data from the appropriate seasonal habitat designation (breeding/nesting, brood-rearing, winter) collected from sage-grouse studies found in the relevant area and peer-reviewed by the appropriate wildlife management agency(ies) and researchers.

When conducting land heath assessments, the BLM should follow, at a minimum, “Interpreting Indicators of Rangeland Health” (Pellant et. al. 2005) and the “BLM Core Terrestrial Indicators and Methods” (MacKinnon et al. 2011). For assessments being conducted in sage-grouse designated management areas, the BLM should collect additional data to inform the HAF indicators that have not been collected using the above methods. Implementation of the principles outlined in the AIM strategy will allow the data to be used to generate unbiased estimates of condition across the area of interest; facilitate consistent data collection and rollup analysis among management units; help provide consistent data to inform the classification and interpretation of imagery; and provide condition and trend of the indicators describing sagebrush characteristics important to sage-grouse habitat (see Section I.D., Effectiveness Monitoring).

## III. CONCLUSION

This Greater Sage-Grouse Monitoring Framework was developed for all of the Final Environmental Impact Statements involved in the sage-grouse planning effort. As such, it describes the monitoring activities at the broad and mid scales and provides a guide for the BLM and the USFS to collaborate with partners/other agencies to develop the land use plan- specific monitoring plan.

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**Attachment A.** An Overview of Monitoring Commitments

| | Broad and Mid Scales | | | | | Fine and Site Scales |
|---|---|---|---|---|---|---|
| | **Implemen-tation** | **Sagebrush Availability** | **Habitat Degradation** | **Population** | **Effectiveness** | |
| ***How will the data be used?*** | Track and document implementation of land use plan decisions and inform adaptive management | Track changes in land cover (sagebrush) and inform adaptive management | Track changes in disturbance (threats) to sage-grouse habitat and inform adaptive management | Track trends in sage-grouse populations (and/or leks; as determined by state wildlife agencies) and inform adaptive management | Characterize the relationship among disturbance, implementation actions, and sagebrush metrics and inform adaptive management | Measure seasonal habitat, connectivity at the fine scale, and habitat conditions at the site scale, calculate disturbance, and inform adaptive management |
| ***Who is collecting the data?*** | BLM FO and USFS Forest | NOC and NIFC | National datasets (NOC), BLM FOs, and USFS Forests as applicable | State wildlife agencies through WAFWA | Comes from other broad- and mid-scale monitoring types, analyzed by the NOC | BLM FO and SO, USFS Forests and RO (with partners) |
| ***How often are the data collected, reported, and made available to USFWS?*** | Collected and reported annually; summary report every 5 years | Updated and changes reported annually; summary report every 5 years | Collected and changes reported annually; summary report every 5 years | State data reported annually per WAFWA MOU; summary report every 5 years | Collected and reported every 5 years (coincident with LUP evaluations) | Collection and trend analysis ongoing, reported every 5 years or as needed to inform adaptive management |
| ***What is the spatial scale?*** | Summarized by LUP with flexibility for reporting by other units | Summarized by PACs (size dependent) with flexibility for reporting by other units | Summarized by PACs (size dependent) with flexibility for reporting by other units | Summarized by PACs (size dependent) with flexibility for reporting by other units | Summarized by MZ and LUP with flexibility for reporting by other units (e.g., PAC) | Variable (e.g., projects and seasonal habitats) |
| ***What are the potential personnel and budget impacts?*** | Additional capacity or re-prioritization of ongoing monitoring work and budget realignment | At a minimum, current skills and capacity must be maintained; data management costs are TBD | At a minimum, current skills and capacity must be maintained; data management and data layer purchase cost are TBD | No additional personnel or budget impacts for the BLM or the USFS | Additional capacity or re-prioritization of ongoing monitoring work and budget realignment | Additional capacity or re-prioritization of ongoing monitoring work and budget realignment |

| | | | | | | |
|---|---|---|---|---|---|---|
| ***Who has primary and secondary responsi-bilities for reporting?*** | 1) BLM FO & SO; USFS Forest & RO<br>2) BLM & USFS Planning | 1) NOC<br>2) WO | 1) NOC<br>2) BLM SO, USFS RO, & appropriate programs | 1) WAFWA & state wildlife agencies<br>2) BLM SO, USFS RO, NOC | 1) Broad and mid scale at the NOC, LUP at BLM SO, USFS RO | 1) BLM FO & USFS Forests<br>2) BLM SO & USFS RO |
| ***What new processes/ tools are needed?*** | National implementation datasets and analysis tools | Updates to national land cover data | Data standards and rollup methods for these data | Standards in population monitoring (WAFWA) | Reporting methodologies | Data standards data storage; and reporting |

FO (field office); NIFC (National Interagency Fire Center); NOC (National Operations Center); RO (regional office); SO (state office); TBD (to be determined); WO (Washington Office)

**Attachment B.** User and Producer Accuracies for Aggregated Ecological Systems within LANDFIRE Map Zones

| LANDFIRE Map Zone Name | User Accuracy | Producer Accuracy | % of Map Zone within Historical Schroeder |
|---|---|---|---|
| Wyoming Basin | 76.9% | 90.9% | 98.5% |
| Snake River Plain | 68.8% | 85.2% | 98.4% |
| Missouri River Plateau | 57.7% | 100.0% | 91.3% |
| Grand Coulee Basin of the Columbia Plateau | 80.0% | 80.0% | 89.3% |
| Wyoming Highlands | 75.3% | 85.9% | 88.1% |
| Western Great Basin | 69.3% | 75.4% | 72.9% |
| Blue Mountain Region of the Columbia Plateau | 85.7% | 88.7% | 72.7% |
| Eastern Great Basin | 62.7% | 80.0% | 62.8% |
| Northwestern Great Plains | 76.5% | 92.9% | 46.3% |
| Northern Rocky Mountains | 72.5% | 89.2% | 42.5% |
| Utah High Plateaus | 81.8% | 78.3% | 41.5% |
| Colorado Plateau | 65.3% | 76.2% | 28.8% |
| Middle Rocky Mountains | 78.6% | 73.3% | 26.4% |
| Cascade Mountain Range | 57.1% | 88.9% | 17.3% |
| Sierra Nevada Mountain Range | 0.0% | 0.0% | 12.3% |
| Northwestern Rocky Mountains | 66.7% | 60.0% | 7.3% |
| Southern Rocky Mountains | 58.6% | 56.7% | 7.0% |
| Northern Cascades | 75.0% | 75.0% | 2.6% |
| Mogollon Rim | 66.7% | 100.0% | 1.7% |
| Death Valley Basin | 0.0% | 0.0% | 1.2% |

There are two anomalous map zones with 0% user and producer accuracies, attributable to no available reference data for the ecological systems of interest.

***User accuracy*** is a map-based accuracy that is computed by looking at the reference data for a class and determining the percentage of correct predictions for these samples. For example, if I select any sagebrush pixel on the classified map, what is the probability that I'll be standing in a sagebrush stand when I visit that pixel location in the field? ***Commission Error*** equates to including a pixel in a class when it should have been excluded (i.e., commission error = 1 – user's accuracy).

***Producer accuracy*** is a reference-based accuracy that is computed by looking at the predictions produced for a class and determining the percentage of correct predictions. In other words, if I know that a particular area is sagebrush (I've been out on the ground to check), what is the probability that the digital map will correctly identify that pixel as sagebrush? ***Omission Error*** equates to excluding a pixel that should have been included in the class (i.e., omission error = 1 – producer's accuracy).

**Attachment C.** Sagebrush Species and Subspecies Included in the Selection Criteria for Building the EVT and BpS Layers

- *Artemisia arbuscula* subspecies *longicaulis*
- *Artemisia arbuscula* subspecies *longiloba*
- *Artemisia bigelovii*
- *Artemisia nova*
- *Artemisia papposa*
- *Artemisia pygmaea*
- *Artemisia rigida*
- *Artemisia spinescens*
- *Artemisia tripartita* subspecies *rupicola*
- *Artemisia tripartita* subspecies *tripartita*
- *Tanacetum nuttallii*
- *Artemisia cana* subspecies *bolanderi*
- *Artemisia cana* subspecies *cana*
- *Artemisia cana* subspecies *viscidula*
- *Artemisia tridentata* subspecies *wyomingensis*
- *Artemisia tridentata* subspecies *tridentata*
- *Artemisia tridentata* subspecies *vaseyana*
- *Artemisia tridentata* subspecies *spiciformis*
- *Artemisia tridentata* subspecies *xericensis*
- *Artemisia tridentata* variety *pauciflora*
- *Artemisia frigida*
- *Artemisia pedatifida*

# Appendix E

## Anthropogenic Disturbance And Adaptive Management

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# E. Anthropogenic Disturbance and Adaptive Management

## E.1 Part I – Baseline Map and Description of Development

The **biologically significant units (BSUs)** are geographical/spatial areas within Greater Sage-grouse habitat that contains relevant and important habitats which is used as the basis for comparative calculations to support evaluation of changes to habitat. The BSUs include all land ownerships for evaluation, although application of the anthropogenic disturbance cap is specific only to BLM and Forest Service lands. The BSUs are used in the evaluation of anthropogenic disturbance and in the adaptive management habitat trigger.

For the Idaho and Southwestern Montana Greater Sage-Grouse Plan Amendment EIS the biologically significant units are defined as:

> ***Idaho: All of the modeled nesting[1] and delineated winter habitat, which is based on 2011 data, occurring within Priority and/or Important Habitat Management Areas within individual Conservation Areas[2]***
>
> ***Montana: All of the Priority Habitat Management Area***

These BSUs form the geographic basis for the calculation of anthropogenic disturbance and in the soft and hard adaptive management habitat triggers.

While the BSUs define the geographic extent and scale of the Subregion's landscape that will be considered in evaluating anthropogenic disturbance and the adaptive management habitat triggers, how disturbance and habitat triggers are calculated differ since anthropogenic disturbance and habitat loss affect Greater Sage-grouse differently (Knick et al. 2013).

The BSU is the total area (acreage) of nesting and wintering habitat within Priority or Important Habitat Management Areas, separately, by each Conservation Area. For Idaho this results in 8 BSUs, 2 each within the Idaho Conservation Areas – 1 in Priority Habitat Management Areas and 1 in Important Habitat Management Areas. There is 1 BSU in southwest Montana and 1 BSU for the Utah portion of the Sawtooth National Forest (Raft River BSU). There are a total of 10 BSUs within the Idaho and Southwestern Montana Subregion as shown in **Map-E-1**.

In developing these BSUs it was determined at the subregional level that data from these units must be compatible with aggregation to the PAC and WAFWA Management Zone levels, in order to meet FWS needs. In addition, BSUs must be edge matched/aligned with neighboring states. All sub-regions acknowledge there may be locally important biologically significant units smaller than PACs which may or may not be rolled up to PAC level. The

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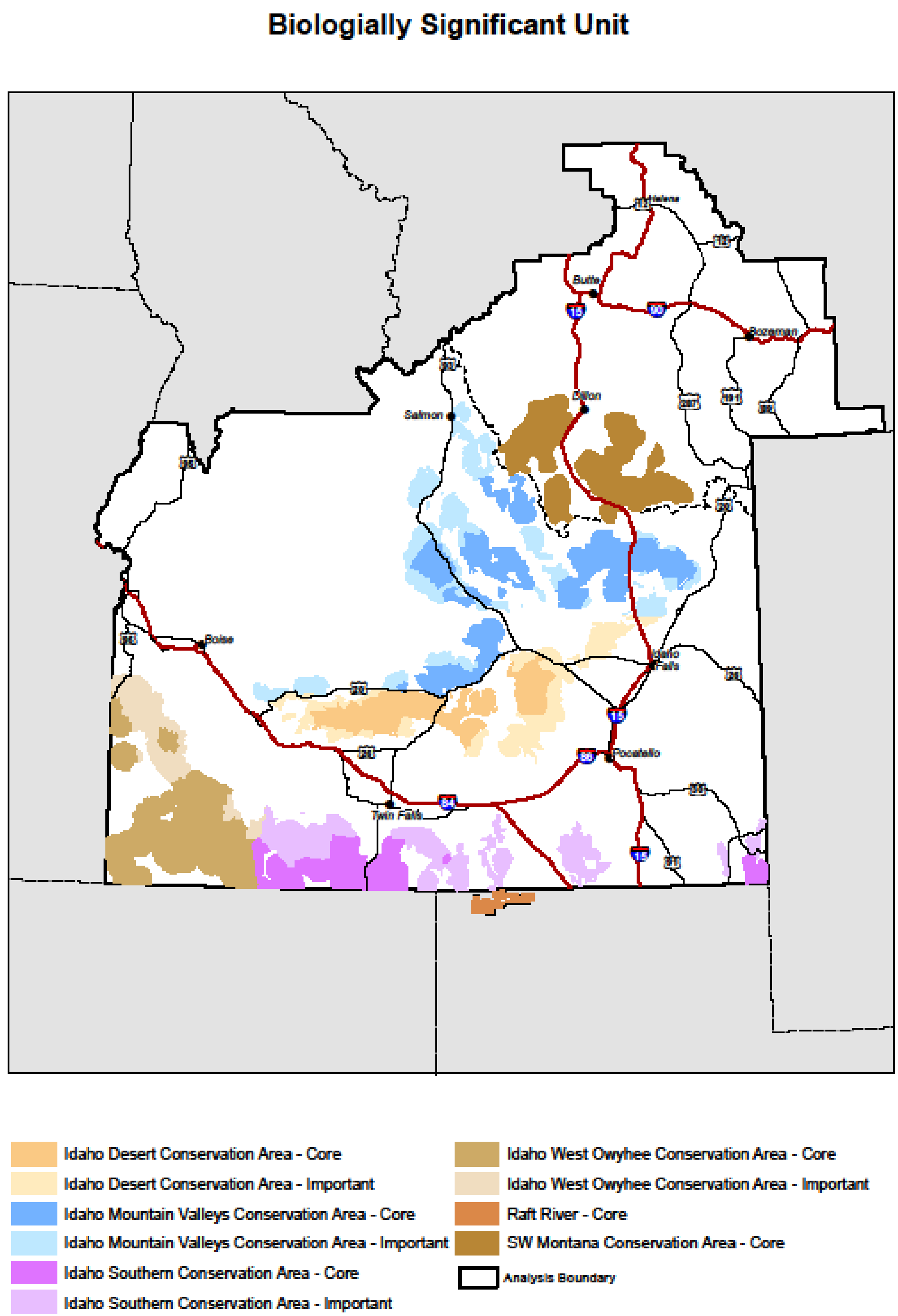
[1] Modeled nesting habitat is defined as those areas of Priority or Important Habitat Management Areas within 6.2 miles of 2011 active leks.

[2] The Utah portion of the Sawtooth National Forest is calculated separately for the Southern Conservation area.

**Map-E-1. Biologically Significant Unit**

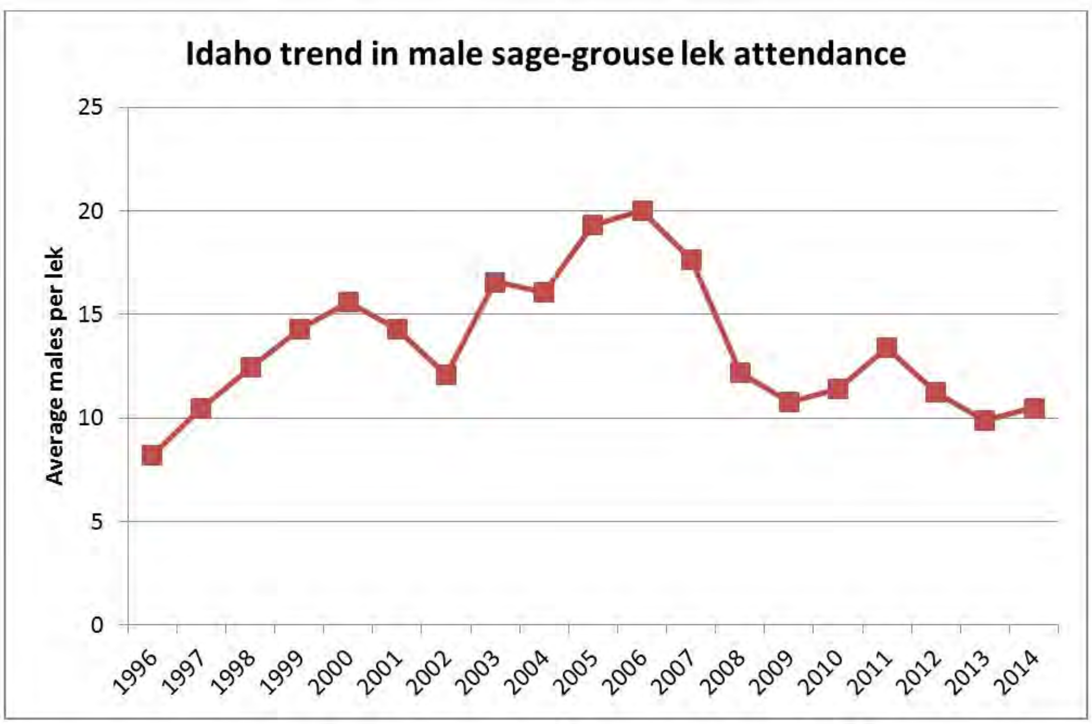


Subregions also acknowledge that assessing disturbance at larger scales such as certain PACs, or via rollup of data, provides a baseline metric for future comparison, but dilution may likely mask disturbance concerns occurring at more local scales.

The application of these calculations requires certain assumptions and associated baseline values which set an appropriate benchmark for future comparison.

For the adaptive management evaluation in Idaho the baseline year for comparison of both the population and habitat values is set at 2011. Sage-grouse have been monitored by counting males on leks since the 1950's (IDFG files). Average male lek attendance (statewide average) reached a low point in 1996 (IDFG in file). A more consistent and intensified survey of leks began with the annual monitoring of all 78 lek routes across southern Idaho in 1996. Average male lek attendance has fluctuated since 1996 (**Figure G-1**) in response to favorable or unfavorable conditions (e.g. weather, habitat improvements or loss, and West Nile virus). Peaks were in 2000, 2006, and 2011 with low points in 2002 and 2009. The increase in male lek attendance after previous declines indicates that sage-grouse populations can rebound over a relatively short time frame (e.g. 5 years) given desirable conditions. The baseline was set at 2011 because the average number of males is approximately the medium (8 higher and 7 lower years) of the counts between1996-2011. At the statewide scale, the 2011 baseline allows 10% and 20% population triggers to be above the second lowest point in 2009. Application of the trigger at a smaller (Conservation Area) scale is a more conservative approach that will indicate potential trends sooner than if applied at the state-wide scale.

**Figure E-1. Idaho Trend in Male Sage-grouse Lek Attendance.**



## E.2 Part II – Anthropogenic Disturbance Calculation

In the USFWS's 2010 listing decision for sage-grouse, the USFWS identified 18 threats contributing to the destruction, modification, or curtailment of the sage-grouse's habitat or range (75 FR 13910 2010. The 18 threats have been aggregated into three measures:

Sagebrush Availability (percent of sagebrush per unit area)

Habitat Degradation (percent of human activity per unit area)

Density of Energy and Mining (facilities and locations per unit area)

Habitat Degradation and Density of Energy and Mining will be evaluated under the Disturbance Cap and Density Cap respectively and are further described in this appendix. The three measures, in conjunction with other information, will be considered during the NEPA process for projects authorized or undertaken by the BLM.

### E.2.1 Disturbance Cap

This land use plan has incorporated a 3% disturbance cap within Greater Sage-Grouse (GRSG) Priority Habitat Management Areas (PHMAs) and the subsequent land use planning actions if the cap is met:

*For Idaho and Montana, if the 3 percent anthropogenic disturbance cap is exceeded on lands (regardless of land ownership) within GRSG PHMA (or IHMA in Idaho) Habitat Management Areas in any given BSU, then no further discrete anthropogenic disturbances (subject to applicable laws and regulations, such as the General Mining Law of 1872, as amended, valid existing rights, etc.) will be permitted by BLM within GRSG PHMAs and IHMAs in any given BSU until the disturbance has been reduced to less than the cap. As measured according to the Monitoring Framework (Appendix G) for the intermediate scale.*

*For Idaho, if the 3 percent disturbance cap is exceeded on all lands (regardless of land ownership) within a proposed project analysis area (Appendix G) in a PHMA (or IHMA in Idaho), then no further anthropogenic disturbance will be permitted by BLM until disturbance in the proposed project analysis area has been reduced to maintain the area under the cap (subject to applicable laws and regulations, such as the General Mining Law of 1872, as amended, valid existing rights, etc.).*

*For Montana, if the 3 percent disturbance cap is exceeded on lands (regardless of land ownership) or if anthropogenic disturbance and habitat loss associated with conversion to agricultural tillage or fire exceed 5% within a project analysis area in PHMAs, then no further discrete anthropogenic disturbances (subject to applicable laws and regulations, such as the 1872 Mining Law, valid existing rights, etc.) will be permitted by BLM within PHMA in a project analysis area until the disturbance has been reduced to less than the cap. If the BLM determines that the State of Montana has adopted a GRSG Habitat Conservation Program that contains comparable components to those found in the State of Wyoming's Core Area Strategy including an all lands approach for calculating anthropogenic disturbances, a clear methodology for measuring the density of operations, and a fully operational Density Disturbance Calculation Tool, the 3% disturbance cap will be converted to a 5% cap for all sources of habitat alteration within a project analysis area.*

The disturbance cap applies to the PHMA within both the Biologically Significant Units (BSU) and at the project authorization scale. For the BSUs, west-wide habitat degradation (disturbance) data layers (**Table E-1**) will be used at a minimum to calculate the amount of disturbance and to determine if the disturbance cap has been exceeded as the land use plans (LUP) are being implemented. Locally collected disturbance data will be used to determine if the disturbance cap has been exceeded for project authorizations, and may also be used to calculate the amount of disturbance in the BSUs.

Although locatable mine sites are included in the degradation calculation, mining activities under the 1872 mining law may not be subject to the 3% disturbance cap. Details about locatable mining activities will be fully disclosed and analyzed in the NEPA process to assess impacts to sage-grouse and their habitat as well as to BLM goals and objectives, and other BLM programs and activities.

Formulas for calculations of the amount of disturbance in the PHMA in a BSU and or in a proposed project area are as follows:

- For the BSUs:

  **% Degradation Disturbance = (combined acres of the 12 degradation threats[1]) ÷ (acres of all lands within the PHMAs in a BSU) x 100.**

- For the Project Analysis Area:

  **% Degradation Disturbance = (combined acres of the 12 degradation threats[1] plus the 7 site scale threats[2]) ÷ (acres of all lands within the PHMA in the project analysis area) x 100.**

[1] see **Table E-1**. [2] see **Table E-2**

The denominator in the disturbance calculation formula consists of all acres of lands classified as PHMA within the analysis area (BSU or project area). Areas that are not sage-grouse seasonal habitats, or are not currently supporting sagebrush cover (e.g., due to wildfire), are not excluded from the acres of PHMA in the denominator of the formula. Information regarding sage-grouse seasonal habitats, sagebrush availability, and areas with the potential to support sage-grouse populations will be considered along with other local conditions that may affect sage-grouse during the analysis of the proposed project area.

### E.2.2 Density Cap

This land use plan has also incorporated a cap on the density of energy and mining facilities at an average of one facility per 640 acres in the PHMA in a project authorization area. If the disturbance density in the PHMA in a proposed project area is on average less than 1 facility per 640 acres, the analysis will proceed through the NEPA process incorporating mitigation

**Table E-1**
**Anthropogenic disturbance types for disturbance calculations. Data sources are described for the west-wide habitat degradation estimates**
**(Table copied from the GRSG Monitoring Framework)**

| Degradation Type | Subcategory | Data Source | Direct Area of Influence | Area Source |
|---|---|---|---|---|
| **Energy (oil & gas)** | Wells | IHS; BLM (AFMSS) | 5.0ac (2.0ha) | BLM WO-300 |
| | Power Plants | Platts (power plants) | 5.0ac (2.0ha) | BLM WO-300 |
| **Energy (coal)** | Mines | BLM; USFS; Office of Surface Mining Reclamation and Enforcement; USGS Mineral Resources Data System | Polygon area (digitized) | Esri/ Google Imagery |
| | Power Plants | Platts (power plants) | Polygon area (digitized) | Esri Imagery |
| **Energy (wind)** | Wind Turbines | Federal Aviation Administration | 3.0ac (1.2ha) | BLM WO-300 |
| | Power Plants | Platts (power plants) | 3.0ac (1.2ha) | BLM WO-300 |
| **Energy (solar)** | Fields/Power Plants | Platts (power plants) | 7.3ac (3.0ha)/MW | NREL |
| **Energy (geothermal)** | Wells | IHS | 3.0ac (1.2ha) | BLM WO-300 |
| | Power Plants | Platts (power plants) | Polygon area (digitized) | Esri Imagery |
| **Mining** | Locatable Developments | InfoMine | Polygon area (digitized) | Esri Imagery |
| **Infrastructure (roads)** | Surface Streets (Minor Roads) | Esri StreetMap Premium | 40.7ft (12.4m) | USGS |
| | Major Roads | Esri StreetMap Premium | 84.0ft (25.6m) | USGS |
| | Interstate Highways | Esri StreetMap Premium | 240.2ft (73.2m) | USGS |
| **Infrastructure (railroads)** | Active Lines | Federal Railroad Administration | 30.8ft (9.4m) | USGS |
| **Infrastructure (power lines)** | 1-199kV Lines | Platts (transmission lines) | 100ft (30.5m) | BLM WO-300 |
| | 200-399 kV Lines | Platts (transmission lines) | 150ft (45.7m) | BLM WO-300 |
| | 400-699kV Lines | Platts (transmission lines) | 200ft (61.0m) | BLM WO-300 |
| | 700+kV Lines | Platts (transmission lines) | 250ft (76.2m) | BLM WO-300 |
| **Infrastructure (communication)** | Towers | Federal Communications Commission | 2.5ac (1.0ha) | BLM WO-300 |

**Table E-2**
**The seven site scale features considered threats to sage-grouse included in the disturbance calculation for project authorizations.**

| |
|---|
| 1. Coalbed Methane Ponds<br>2. Meteorological Towers<br>3. Nuclear Energy Facilities<br>4. Airport Facilities and Infrastructure<br>5. Military Range Facilities & Infrastructure<br>6. Hydroelectric Plants<br>7. Recreation Areas Facilities and Infrastructure<br>Definitions:<br>**1. Coalbed Methane and other Energy-related Retention Ponds –** The footprint boundary will follow the fenceline and includes the area within the fenceline surrounding the impoundment. If the pond is not fenced, the impoundment itself is the footprint. Other infrastructure associated with the containment ponds (roads, well pads, etc.) will be captured in other disturbance categories.<br>**2. Meteorological Towers** – This feature includes long-term weather monitoring and temporary meteorological towers associated with short-term wind testing. The footprint boundary includes the area underneath the guy wires.<br>**3. Nuclear Energy Facilities** – The footprint boundary includes visible facilities (fence, road, etc.) and undisturbed areas within the facility's perimeter.<br>**4. Airport Facilities and Infrastructure (public and private)** –The footprint boundary of will follow the boundary of the airport or heliport and includes mowed areas, parking lots, hangers, taxiways, driveways, terminals, maintenance facilities, beacons and related features. Indicators of the boundary, such as distinct land cover changes, fences and perimeter roads, will be used to encompass the entire airport or heliport.<br>**5. Military Range Facilities & Infrastructure** – The footprint boundary will follow the outer edge of the disturbed areas around buildings and includes undisturbed areas within the facility's perimeter.<br>**6. Hydroelectric Plants** – The footprint boundary includes visible facilities (fence, road, etc.) and undisturbed areas within the facility's perimeter.<br>**7. Recreation Areas & Facilities –** This feature includes all sites/facilities larger than 0.25 acres in size. The footprint boundary will include any undisturbed areas within the site/facility. |

measures into an alternative. If the disturbance density is greater than an average of 1 facility per 640 acres, the proposed project will either be deferred until the density of energy and mining facilities is less than the cap or co-located it into existing disturbed area (subject to applicable laws and regulations, such as the 1872 Mining Law, valid existing rights, etc.). Facilities included in the density calculation (**Table E-3**) are:

- Energy (oil and gas wells and development facilities)
- Energy (coal mines)
- Energy (wind towers)
- Energy (solar fields)
- Energy (geothermal)
- Mining (active locatable, leasable, and saleable developments)

### E.2.3 Project Analysis Area Method for Permitting Surface Disturbance Activities

- Determine potentially affected occupied leks by placing a four mile boundary around the proposed area of physical disturbance related to the project. All occupied leks located within the four mile project boundary and within PHMA will be considered affected by the project.
- Next, place a four mile boundary around each of the affected occupied leks.
- The PHMA within the four mile lek boundary and the four mile project boundary creates the project analysis area for each individual project. If there are no occupied leks within the four-mile project boundary, the project analysis area will be that portion of the four-mile project boundary within the PHMA.
- Digitize all existing anthropogenic disturbances identified in **Table E-1** and the 7 additional features that are considered threats to sage-grouse (**Table E-2**). Using 1 meter resolution NAIP imagery is recommended. Use existing local data if available.
- Calculate percent existing disturbance using the formula above. If existing disturbance is less than 3%, proceed to next step. If existing disturbance is greater than 3%, defer the project.
- Add proposed project disturbance footprint area and recalculate the percent disturbance. If disturbance is less than 3%, proceed to next step. If disturbance is greater than 3%, defer project.
- Calculate the disturbance density of energy and mining facilities (listed above). If the disturbance density is less than 1 facility per 640 acres, averaged across project analysis area, proceed to the NEPA analysis incorporating mitigation measures into an alternative. If the disturbance density is greater than 1 facility per 640 acres, averaged across the project analysis area, either defer the proposed project or co-locate it into existing disturbed area.

**Table E-3**
**Relationship between the 18 threats and the three habitat disturbance measures for monitoring and disturbance calculations.**

| USFWS Listing Decision Threat | Sagebrush Availability | Habitat Degradation | Energy and Mining Density |
|---|---|---|---|
| Agriculture | X | | |
| Urbanization | X | | |
| Wildfire | X | | |
| Conifer encroachment | X | | |
| Treatments | X | | |
| Invasive Species | X | | |
| Energy (oil and gas wells and development facilities) | | X | X |
| Energy (coal mines) | | X | X |
| Energy (wind towers) | | X | X |
| Energy (solar fields) | | X | X |
| Energy (geothermal) | | X | X |
| Mining (active locatable, leasable, and saleable developments) | | X | X |
| Infrastructure (roads) | | X | |
| Infrastructure (railroads) | | X | |
| Infrastructure (power lines) | | X | |
| Infrastructure (communication towers) | | X | |
| Infrastructure (other vertical structures) | | X | |
| Other developed rights-of-way | | X | |

- If a project that would exceed the degradation cap or density cap cannot be deferred due to valid existing rights or other existing laws and regulations, fully disclose the local and regional impacts of the proposed action in the associated NEPA.

The following data sets would ***not*** be used to calculate anthropogenic disturbance, but would be used in the habitat baseline to estimate habitat availability or the amount of sagebrush on the landscape within biologically significant units.

1. Habitat treatments
2. Wildfire
3. Invasive plants
4. Conifer encroachment
5. Agriculture
6. Urbanization, Ex-urban and rural development

***Travel and Transportation Disturbance in Sage-Grouse Habitat***

The following would count as disturbance (see Part V for definitions):

Linear transportation features identified as roads that have a maintenance intensity of 3 or 5

Linear transportation features identified as primitive roads, temporary routes, or administrative routes that have a functional classification and a maintenance intensity of level 3 or 5

*Non-Disturbance*

The following items would not count as disturbance:

Linear transportation features identified as trails.

Linear transportation features identified as primitive roads, temporary routes, or administrative routes that have a maintenance intensity of either level 0 or 1.

Linear transportation features identified as primitive routes.

Linear disturbances.

***Derivation of the Disturbance Formula -***

There is no definitive and scientifically proven formula to determine impact to GRSG from disturbance described in current research. However, Knick et al. (2013) did describe certain relationships between GRSG and anthropogenic disturbance that have been used, in conjunction with specific assumptions to describe a mathematical relationship between human disturbance footprint, effective GRSG habitat and effects to GRSG.

The variables in the equation are defined as:

Acres of a Biologically Significant Unit (BSU)

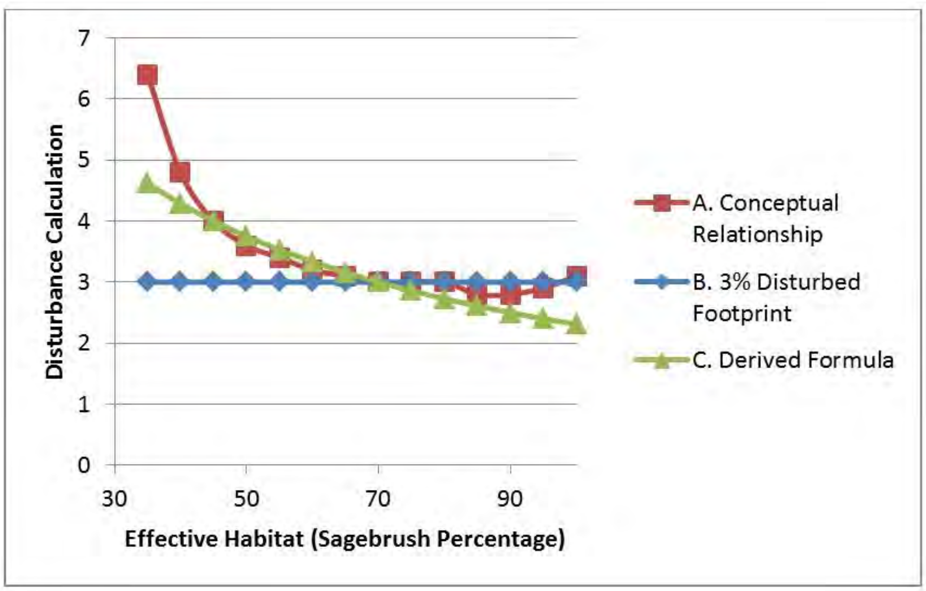
Acres of Anthropogenic Development within the BSU

Acres of Effective GRSG Habitat (sagebrush) within the BSU

Knick et al. (2013) defined their unit of comparison (analogous to a biologically significant unit) as an area within 5 km of the lek. Within this area they also found that 79% of this area contained sagebrush (analogous to effective GRSG habitat). Results of the study show that "Ninety-nine percent of active leks were in landscapes with <3% developed". This shows that when areas within 5 km of a lek containing 79% sagebrush were 3% developed there was a measurable effect on the presence of GRSG – this defines a disturbance threshold of 3% at which point GRSG are affected. Knick et al. developed a habitat similarity relationship between the proportion of leks and percent of sagebrush which shows the highest proportion of leks when sagebrush percentage is between 70-90% (Knick et al. 2013, Figure 5, Connelly et al. 2000, Wisdom et al. 2011). Above 90% and below 70% the proportion of leks is reduced. This helps define the optimum range for sagebrush at between 70-90% and also indicates that the disturbance threshold of 3% is also dependent upon and varies with the percent of sagebrush present (effective habitat).

These findings from Knick et al. (2013) help define some mathematical parameters to define a modeled relationship between disturbance, effective habitat and effects to GRSG. **Figure E-2** illustrates three different 'disturbance curves' that reflect the relationship between disturbance (y-axis) and effective habitat (sagebrush percentage) (x-axis) when the footprint disturbed is equivalent to 3% of the area. The red boxes (A) represent the conceptual relationship between disturbance and effective habitat as described and interpreted from Knick et al. (2013). The blue diamonds (B) represent a simple calculation based only on disturbance footprint, without regard to effective habitat. The green triangles (C) represent the derived formula to model the relationship.

**Figure E-2. Disturbance Relationships**




The 'A' disturbance curve shows that when the disturbance footprint is 3% of the area and the sagebrush percentage is between 70-90% the disturbance calculation would be 3. When sagebrush percent falls below 70% or rises above 90%, the change in habitat, even without a change in disturbed footprint would begin to affect the presence of GRSG. As the amount of sagebrush declines while disturbance remains the same there would be an increasing effect to GRSG presence. This disturbance curve is conceptual and Knick et al. (2013) does not explicitly define this relationship, although this relationship does reflect numerical the observations described in Knick et al. (2013).

The 'B' disturbance curve is a straight calculation based only on disturbed footprint over a specified area. It does not account for variability of sagebrush percentage, and the only variable is the acres of disturbance. For an area that is 3% disturbed the relationship 'curve' is a flat line at 3, regardless of sagebrush percentage. This 'curve' or calculation would match the conceptual curve when sagebrush percentage is between 70 and 90%. This calculation would not account for changes in effective habitat due to loss through fire or gain through restoration and rehabilitation.

The 'C' disturbance curve models and approximates the conceptual relationship described in Knick et al. (2013). It accounts for changes in effective habitat that would translate into variable effects to GRSG based on loss or gain of habitat. It includes the ability to consider habitat loss such as from fire and to consider habitat gain such as from rehabilitation efforts including conifer removal. The model matched the conceptual relationship in the range of 70% sagebrush and approximates the conceptual relationship in areas with more or less sagebrush cover. The conceptual relationship assumes a more exponential relationship to GRSG effects from loss of habitat, while the derived formula assumes a more linear relationship. There are no available scientific studies that more clearly define the nature of the relationship. The derived formula and the conceptual relationship are substantially similar from 35-90% sagebrush percentage to validate the derived formula's relative approximation of the relationship.

***Development of the Modeled Formula:***

In order to manage and apply a defined disturbance cap it is necessary to take the findings of the appropriate scientific research and utilize them as appropriately as possible to develop management strategies and evaluation techniques consistent with the management objective. Most scientific research is not completed with the intent to develop specific management objectives or approaches; however, it is through the management approaches that the scientific findings utilized to inform management.

Development of the modeled formula began by describing the simplest relationship of disturbance across a defined area by defining the disturbance percentage as:

$$\%\,Disturbance = \left(\frac{Footprint\ Acres\ from\ Anthropogenic\ Disturbance}{Acres\ within\ Area\ of\ Concern}\right) * 100$$

This accounts for disturbance, but does not account for changes in effective habitat or sagebrush percentage as described in Knick et al. (2013). To account for effective habitat the formula needs to include a term that adjusts the resulting calculation with regard to effective habitat. This should be reflected as an adjustment to the denominator (acres within area of concern). The denominator would be weighted based on the amount of effective habitat. In mathematical terms this would give a denominator of:

$$(Acres\ within\ Area\ of\ Concern) * (Adjustment\ Based\ on\ Effective\ Habitat)$$

The adjustment term must equal 1.0 when the effective habitat is somewhere between 70-90% as described in Knick et al. (2013). Assuming the adjustment term is related to the relative percentage of sagebrush or effective habitat then the *Adjustment Based on Effective Habitat* could be expressed as:

$$\frac{Acres\ of\ Effective\ Habitat\ within\ the\ Area\ of\ Concern}{Acres\ within\ the\ Area\ of\ Concern}$$

However, this term does not equal 1.0 when effective habitat is less than 100%. In order to meet the requirement of equaling 1.0 a constant must be added. This constant, when added to the percentage calculated in the previous term must equal 1.0 when the *Acres of Effective Habitat within the Area of Concern* is somewhere between 70-90%. In the Idaho and Southwestern Montana Subregional Plan an objective of 70% effective habitat has been defined, which is consistent with Knick et al. (2013). If the objective is 70% then the constant that must be added to this term is 0.3 in order to meet the requirement of equaling 1.0 at 70% effective habitat. This defines the following derived formula that approximates the conceptual relationship described in Knick et al. (2013).

$$Disturbance\ Percentage = \left(\frac{\text{Footprint Acres from Anthropogenic Disturbance within Area of Concern}}{\text{Acres within the Area of Concern} * \left(\frac{Acres\ of\ Effective\ Habitat\ within\ the\ Area\ of\ Concern}{Acres\ within\ the\ Area\ of\ Concern} + 0.3\right)}\right) \text{X } 100$$

***Scale:***

The particular scale for which this formula is calculated is defined by the Area of Concern. The Knick et al. (2013) used a study area defined by the area within 5 km of an individual lek. The disturbance relationships described previously are applicable at this scale and begin to break down or lose their integrity at greater distances from the lek (18 km). This concern, coupled with limited availability of consistent data across broader areas undermines the reliability and accuracy of the calculation when including areas more distant from the lek.

From a management perspective there is a need to address concerns at the broader scale to help manage those threats before they become a concern at the site specific scale. In Idaho, nesting location data collected by Idaho Department of Fish and Game (IDFG), shows that most nesting habitat occurs within 6.2 miles (10 km) of the lek. IDFG has also collected telemetry data on GRSG movements and used this data to help define wintering areas. Nesting and wintering areas are the most limited and seasonal habitats in Idaho and additional disturbance in those areas could have impacts to GRSG presence. For these reasons the Area of Concern, referred to as the Biologically Significant Unit have been delineated to include nesting and wintering habitats. This results in areas that include more acres than just those associated within a 5 km area of an individual lek as described by Knick et al. (2013), but that are associated (within 6.2 miles or 10 km) with leks. While the Knick et al. (2013) study did not include winter habitat, because of their relative importance they have also been included as part of the BSU since conceivably disturbances that would cause lek abandonment would also likely cause abandonment or avoidance of other seasonal habitat areas. Using other administratively defined areas not delineated or based on specific GRSG use may undermine the utility and integrity of the disturbance relationship and calculation.

This approach, built upon the findings in Knick et al. (2013), uses those findings to help inform management at a broader scale that would help determine management actions based on disturbance evaluations. Using the BSU as the Area of Concern is a scale larger than described in Knick et al. (2013), but still within the predictive bounds described in that study. The formula can be used to calculate disturbance at the BSU scale to help inform a disturbance cap, and it can also be used at the site or project scale to help inform specific project activities.

### E.2.4 Additional Questions and Answers Regarding the Idaho Disturbance Calculation

The measurement and application of a disturbance threshold with regard to a species using the various locations of the landscape for different parts of its life history is extremely complicated. The previous discussion is a description of the derivation of that calculation and application. What follows are specific responses to questions that have arisen based on the previous discussion. While all of the following answers are supported in the previous discussion they are not necessary described as explicitly there as they are below.

***Question: Why has Idaho BLM developed a calculation apart from the rest of the Great Basin planning areas when USFWS has been looking for a consistent approach to the extent possible?***

**Response:** The alternative included in the Draft EIS's describing the National Technical Team Report (Alternative B in the Idaho and Southwestern Montana DEIS) included a management action to apply a 3% disturbance cap. However, there was no description of how this would be applied, calculated or implemented in subsequent management. The Preferred Alternatives (D & E) did not include a disturbance cap since disturbance was not identified as a major concern causing loss of habitat in Idaho or Southwestern Montana and its measurement and applicability was not defined and deemed highly problematic to implement in a meaningful way. During the early 2014 Federal Family Meeting (FFM) USFWS indicated that inclusion of such a disturbance threshold was necessary in order for USFWS to have the assurance and certainty necessary when assessing GRSG listing. At that point, outside of Wyoming's Disturbance Density Calculation Tool there was no developed approach to measure or calculate disturbance to evaluate a disturbance cap against.

Idaho BLM invited Dr. Steve Knick to discuss his study regarding disturbance (the only known scientific research describing a disturbance cap). Also as a result of that FFM the BLM's NOC began working on developing a disturbance calculation process that was not as intensive as the Wyoming DDCT approach, based on BLM guidance that anthropogenic disturbance measurement would not follow that approach in other states due the intensive and workload associated with that approach would not be feasible to implement in other states.

Idaho BLM followed the provided guidance to develop biologically significant units (BSUs). The NOC developed 3 equations to try and relate disturbance and habitat. These equations were specifically applicable to broad scales but not applicable to site specific scales. Idaho

BLM took the information and built a simple equation measuring and evaluating absolute disturbance to compare against the cap. That equation was defined as:

$$\frac{Acres\ of\ Anthropogenic\ Disturbance\ within\ the\ BSU}{Acres\ within\ the\ BSU}$$

At the time of the August Federal Family Meeting the Idaho BLM had further refined the previous equation to more accurately reflect the findings in Knick's research. Disturbance was discussed at that meeting and it was evident that there was no other clear guidance from either the WO, the NOC or efforts from other states in this subject. Idaho was the only state to have put effort into the need identified by USFWS and the only effort to have a reasonable, scientifically based approach. Idaho did not intentionally deviate from consistent approaches being developed apart from the other Great Basin planning areas; and in fact until late 2014 Idaho is the only Great Basin planning effort to have put an approach together.

***Why is the Idaho calculation important or relevant given that an anthropogenic disturbance cap is not likely to be hit?***

***Response:*** Loss of habitat from anthropogenic disturbance is not a major issue in Idaho and Southwestern Montana; however, that does not mean that measurement and evaluation of a disturbance cap can be arbitrary, or any less supportable, or inconsistent with the scientific research available if that research can help inform the conditions and evaluation appropriately.

That is why the Idaho disturbance calculation is defined consistent with the scientific research making it reflective of the known effects to GRSG and supportable to base management decisions upon.

***Is loss of habitat from fire considered in the Idaho calculation?***

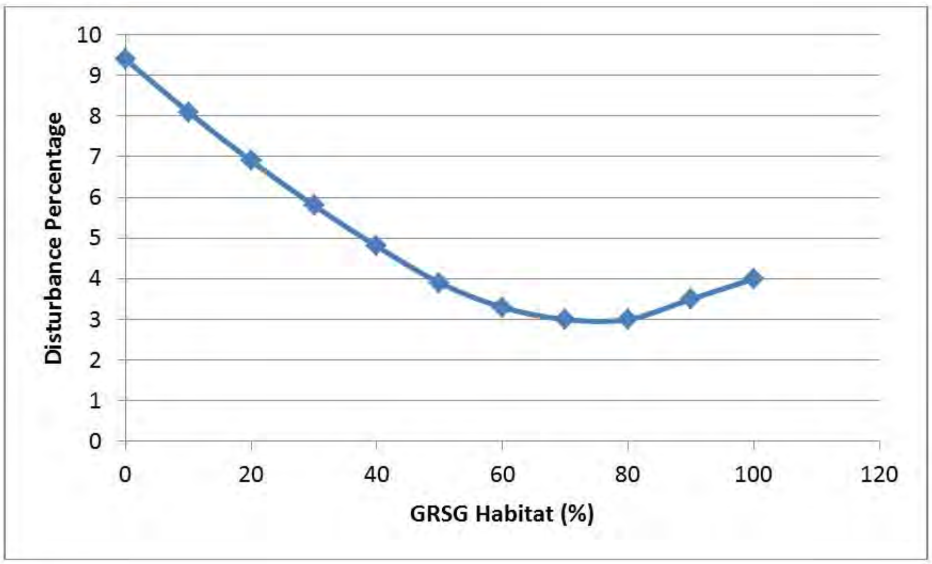
***Response:*** The Idaho calculation does consider the effect fire has on the habitat and includes loss of habitat from fire as part of the calculation by weighting the denominator based on the actual habitat available to the GRSG. The rationale described is in direct reference to the original equation Idaho BLM used:

$$\frac{Acres\ of\ Anthropogenic\ Disturbance\ within\ the\ BSU}{Acres\ within\ the\ BSU}$$

which does not account for changes in habitat due to loss through fire or gain through restoration. As stated previously Idaho's approach was not developed as a deviation or in comparison to other planning effort attempts at calculating the disturbance cap because such attempts did not yet exist when Idaho's approach was completed.

***Why does the Idaho calculation include two terms which seem to complicate the evaluation (the entire area of the BSU and the constant)?***

***Response:*** The two terms at issue here are precisely what make the equation relevant and scientifically accurate and supportable, they may make the calculation more complex but natural systems are complex and mathematical equations developed to describe those systems may be somewhat complex. That they are difficult to interpret does not invalidate their inclusion and their value, in numerical description, which those terms contribute to describing a complex situation. The actual relationship described in Knick et al., when graphed would resemble:




This graph shows the conceptual relationship curve of anthropogenic disturbance suggested by Knick et al. In that research it was shown that when anthropogenic disturbance reached 3% within an area surrounding leks (5-18km) then lek attendance was impacted through fewer birds attending on leks. In the graph above the curve assumes that the area described has 3% of its acres under some sort of anthropogenic developed. According to Knick et al. when 70-80 percent of an area is effective habitat for GRSG then anthropogenic development totaling 3% of that area will start to reduce lek attendance. That research also shows that if the effective habitat percentage within that area is over 90% or less than 70% lek attendance is affected when less than 3% of the area contains anthropogenic development. This relationship would mathematically be described using a parabolic (as opposed to a linear) equation, making it a much more accurate reflection of a complex system but also making it even more complex and difficult to interpret. In addition, while Knick et al. suggests this relationship, and defines the effects at a 3% anthropogenic disturbance level in conjunction with 70-80% effective habitat. Knick et al., and we are aware of no other scientific studies, does not describe the trajectory of the curve above 80% or below 60%, so actually developing a more accurate, parabolic formula, is not possible at this time.

The Idaho equation is:

$$Disturbance\ Percentage\ =\ \left(\frac{\text{Footprint Acres from Anthropogenic Disturbance in the BSU}}{\text{Acres within the BSU}*\left(\frac{Acres\ of\ Effective\ Habitat\ within\ the\ BSU}{Acres\ within\ the\ BSU}+0.3\right)}\right)\ \mathrm{X}\ 100$$

This equation is meant to describe a spatially reality, for that reason it is imperative that the terms be linked with that spatially reality. Without this link any equation descriptive of a spatial reality would become meaningless to the reality it is trying to describe. The purpose of a disturbance cap and a supporting disturbance calculation is to measure and evaluate anthropogenic disturbance over a given area. For the purposes of application this area is defined as the biologically significant unit or BSU. For Idaho the BSU was delineated consistent with BLM guidance and reflective of the Knick et al. research. Idaho's BSU are defined as: all of the modeled nesting and delineated winter habitat, which is based on 2011 data, occurring within Priority and/or Important Habitat Management Areas within individual Conservation Areas for all land ownerships. Modeled nesting habitat is defined as a 10 km area around leks. Based on Idaho Department of Fish and Wildlife surveys and monitoring information this area around leks encompasses a vast majority of the nesting habitat (i.e. IDFG data show that over 90% of nesting occurs within 10 km of the lek). This 10 km is within the 5-18 km range for which Knick et al. identified their research was applicable. Knick communicated to the Idaho ID Team that beyond 18 km the disturbance relationship to lek attendance described in his research was not discernable). The equation calculates a disturbance value within that BSU area by totaling the acres of disturbance within that area and dividing by that area appropriately adjusted by effective habitat within that area to reflect a higher impact of disturbance when effective habitat is lower than the low end of the 70-80% optimum range (This optimum range is also supported by Connelly et al. 2000 (80%) and the BLM's National Technical Team Report (70%)). The equation does not accurately depict the disturbance relationship when effective habitat is greater than 80%. This is due to the fact the equation is linear as opposed to parabolic (discussed earlier) and that the areas within Idaho of most concern for continued presence of GRSG and impacts from anthropogenic disturbance do not exceed 80% effective habitat. Areas of effective habitat greater than 80%, only occurs in the Mountain Valleys Conservation Area where existing disturbance is well below 2%. Therefore the applicability of the equation to these conditions is limited.

Anthropogenic disturbance is being measured and evaluated within the entire BSU, not just the effective habitat area, which is why it is important to define the denominator across the BSU scale, not just a portion of the BSU, which is where the spatial link becomes critical. How the denominator is described mathematically defines the scale over which the numerator is measured; changing that scale would also require adjustments to the numerator to be mathematically correct and maintain the spatial link critical for using a numeric equation to describe a spatial effect.

The presence of the constant (0.3) is a mathematical necessity that defines the relationship, it is neither irrelevant, nor is it a 'correction' factor. Correction implies there is something incorrect or erroneous in the equation. The effective habitat denominator adjustment term:

$$\left(\frac{Acres\ of\ Effective\ Habitat\ within\ the\ BSU}{Acres\ within\ the\ BSU} + 0.3\right)$$

This entire term, in order to accurately reflect Knick et al. (see previous conceptual curve graph), must equal 1 when effective habitat within the BSU represents 70% of the BSU. Without the constant 0.3 added to the effective habitat proportion this term would not equal 1 when effective habitat is at 70%, it would not be a mathematical correct approximation of the disturbance relationship, it would lose its spatial link since this term needs to account for 100% of the acres in the BSU at the 70% habitat/3% disturbance intercept and would therefore become meaningless with respect to the spatial relationship that is being approximated.

***Does the Idaho equation allow for more disturbance before hitting the cap than other calculations?***

**Response:** This conclusion would need to be qualified based on the validity of the equation being used for comparison. For example and equation represented by the disturbance relationship expressed as:

$$\frac{Acres\ of\ Disturbance}{Effective\ Habitat}$$

This equation has the benefit of simplicity; however there are several fundamental flaws with this simple calculation which without further refinement to link the spatial reality with the mathematical formula make any comparisons invalid. This equation does not appropriately address: 1) spatial representation; 2) scale of the calculation; 3) consistency with known science; or 4) multiple considerations of single disturbances (i.e. double counting, which links back to the spatial representation aspect of the equation).

When using mathematical equations to describe real-world conditions it is imperative that the link between the spatial conditions and the mathematical representation of those conditions be understood and maintained. Otherwise any comparison does not have an appropriate foundation for comparison and is ultimately of limited, if any, use. To help illustrate this equation would more accurately be written:

$$\frac{\text{(Acres of Disturbance within Effective Habitat + Acres of Disturbance outside Effective Habitat)}}{\text{(Acres of Concern (BSU) – Acres outside Effective Habitat)}}$$

While more complicated, this equation is more accurate in depicting the actual formula used in a spatially representative way. This is further described when all the acres within the Area of Concern or BSU are Effective Habitat; Acres outside Effective Habitat would be zero, effectively eliminating that term and similarly Acres of Disturbance outside Effective Habitat would be zero since there are no acres outside Effective Habitat, therefore eliminating that term as well; leaving the original simplified version of this equation. However, when there are no Acres outside Effective Habitat within the Acres of Concern is the ONLY condition where this simplified equation actually represents and links to the real-world spatial conditions which are being described. So it is ONLY at this point (when the BSU contains 100% Effective Habitat) that the Idaho methodology and this simple equation can be appropriately compared. As described earlier the Idaho methodology (equation) does not accurately reflect the spatial conditions (according to Knick et al.) above 80% Effective Habitat (See previous discussion regarding why this is not a significant issue in need of resolution). Below 70% Effective Habitat where the Idaho methodology reflects the scientific relationships comparisons; the simple equation loses its spatial link and comparisons are not valid or appropriate.

***So why is the spatial link lost?***

***Response:*** A key principle in translating spatial conditions to mathematical equations is, in this instance, each acre of either disturbance, within effective or outside effective habitat in the equation represents a real acre of disturbance, a real acre within effective habitat or a real acre outside effective habitat. If there are acres outside Effective Habitat within the Area of Concern the more accurate equation described above shows that those acres are REMOVED through subtraction from the denominator. This changes the scale of the calculation effectively redefining the spatial extent over which the Acres of Disturbance appropriate to the new scale/denominator can be measured. So this equation redefines the spatial extent for comparison through removing acres from the denominator, while at the same time it includes acres of disturbance in the numerator. The spatial representation is lost when the same acres are both included in the numerator but removed from the denominator.

***Why is the Idaho calculation not applied more broadly, i.e. within other planning areas?***

***Response:*** Using Idaho's methodology in other states will be problematic because the site-specific data available in the Key Habitat Map needed to support Idaho's methodology are not readily available in other states. Idaho has collected, reviewed and updated on an annual basis for 12+ years a GRSG Key Habitat Map. This map tracks effective habitat, effects to that habitat from fire, restoration efforts and use by GRSG. This is the data utilized in the adjustment factor for the denominator and it is critical to the use of the equation, without this data actual meaningful application of the equation would not be possible or relevant.

***How is effective habitat defined?***

***Response:*** For Idaho's methodology effective habitat is taken to be the Key Habitat areas described by the Idaho Key Habitat Map. Key habitat includes areas of generally intact sagebrush that provide sage-grouse habitat during some portion of the year. This map also identifies areas that could provide GRSG habitat or currently provide habitat at less than optimum levels. These areas are also spatially depicted and as described as: R1 – perennial grass areas with limited sagebrush presence; R2 – annual grassland areas with limited perennial grasses or sagebrush presence; and R3- juniper encroachment within areas previously dominated by sagebrush.

### E.2.5 Example 1 – Anthropogenic Disturbance

In the Southern Conservation Area the Priority BSU was delineated to include 784,958 acres and the Important BSU was delineated to include 1,036,455 acres, which represent the acres of the Biologically Significant Unit to be used in the denominator. The acres of Effective Habitat in the Priority BSU are 424,656 and in the Important BSU are 447,497. This sets up two equations – one for Priority Habitat Management Areas and one for Important Habitat Management Areas.

The existing footprint acres of disturbance within the Priority BSU are 17,661 acres and the footprint acres of disturbance within the Important BSU are 12,748 acres.

This gives the following two equations to define the baseline disturbance condition in the BSUs:

$$Priority = \frac{17661}{(784958 * (\left(\frac{424656}{784958}\right) + 0.3)} * 100$$

$$\text{Or} \quad (\frac{17661}{784958 * \left((0.54) + 0.3\right)}) * 100$$

$$\text{Or} \quad \left(\frac{17661}{784958 * (0.84)}\right) * 100$$

Yielding a percent disturbance in the Priority BSU of 2.68%

$$Important = \frac{12748}{(1036455 * (\left(\frac{447497}{1036455}\right) + 0.3)} * 100$$

Yielding the percent disturbance in the Important BSU of 1.68%

If by 2015 we project additional development within the Priority BSU to be 2120 acres (a 12% increase) and development within the Important BSU to be 4000 acres (a 30% increase) then the Priority footprint acres becomes 20,161 acres and the Important footprint acres becomes 16,748 acres. The resulting evaluation for this cumulative disturbance is calculated by:

$$Priority = \frac{19781}{(784958 * (\left(\frac{424656}{784958}\right) + 0.3)} * 100 \quad Important = \frac{16748}{(1036455 * (\left(\frac{447497}{1036455}\right) + 0.3)} * 100$$

Yielding the percent disturbance as: Priority = 3.00% and Important = 2.21%

In the examples, given the existing disturbance footprint it would require development of an additional 2,120 acres in the Priority BSU and an additional 10,005 acres in the Important BSU before the 3% cap would be engaged.

## E.3 Part III – Montana Disturbance Calculation

Montana will use a 3% disturbance cap until the state of Montana strategy, similar to WY's Core Area Strategy that uses a 5% disturbance cap for all lands and all disturbances, is fully implemented. BLM MT will develop, and include in their plans, the conditions to be met prior to the change in the disturbance cap.

I. Use of west-wide habitat degradation data as well as the use of locally collected disturbance data to determine the level of existing disturbance:

   a) In the GRSG Priority Habitat Management Areas in any given Biologically Significant Unit, use the west-wide data at a minimum and/or locally collected disturbance data as available (e.g., DDCT) for the anthropogenic disturbance types listed in **Table E-4**.

II. Use of locally collected disturbance data for project authorizations:

   a) In a proposed project analysis area, digitize all existing anthropogenic disturbances identified in the GRSG Monitoring Framework and the 7 additional features that are considered threats to sage-grouse (**Table E-5**). Using 1 meter resolution NAIP imagery is recommended. Use local data if available.

III. Fire-burned and habitat treatment areas will not be included in the project scale degradation disturbance calculation for managing sage-grouse habitat under a disturbance cap. These areas will be considered part of a sagebrush availability when rangewide, consistent, interagency fine- and site-scale monitoring has been completed and the areas have been determined to meet sage-grouse habitat requirements. These and other disturbances identified in **Table E-4** will be part of a sagebrush availability evaluation and will be considered along with other local conditions that may affect sage-grouse during the analysis of the proposed project area.

IV. Planning units are directed to use a density cap related to the density of energy and mining facilities (listed below) during project scale authorizations. If the disturbance density in a proposed project area is on average less than 1/ 640 acres, proceed to the NEPA analysis incorporating mitigation measures into an alternative. If the disturbance density is greater than an average of 1/ 640 acres, either defer the proposed project or co-locate it into existing disturbed area *(subject to applicable laws and regulations, such as the 1872 Mining Law, valid existing rights, etc.)*.

- Energy (oil and gas wells and development facilities)
- Energy (coal mines)
- Energy (wind towers)

- Energy (solar fields)
- Energy (geothermal)
- Mining (active locatable, leasable, and saleable developments)

V. Planning units are directed to continue using the baseline data from the 2013 USGS Baseline Environmental Report (BER) in the Affected Environment section of the proposed plans/ FEISs. West-wide sagebrush availability and habitat degradation data layers will be used for the Priority Habitat Management Areas in each population for monitoring (see the GRSG Monitoring Framework in the Monitoring Appendix of the EIS) and management purposes as the LUPs are being implemented. The BER reported on individual threats across the range of sage-grouse while the west-wide disturbance calculation consolidated the anthropogenic disturbance data into a single measure using formulas from the GRSG Monitoring Framework. These calculations will be completed on an annual basis by the BLM's National Operation Center. Planning units will be provided the 2014 baseline disturbance calculation derived from the west-wide data once the RODs are signed that describe the Priority Habitat Management Areas.

VI. Planning units are directed to use the three measures (sagebrush availability, habitat degradation, density of energy and mining) in conjunction with other information during the NEPA process to most effectively site project locations, such as by clustering disturbances and/or locating facilities in already disturbed areas. Although locatable mine sites are included in the degradation calculation, mining activities under the 1872 mining law may not be subject to the 3% disturbance cap. Details about locatable mining activities should be fully disclosed and analyzed in the NEPA process to assess impacts to sage-grouse and their habitat as well as to BLM goals and objectives, and other BLM programs and activities.

## Additional Information/Formulas

Disturbance Calculations for the BSUs and for the Project Analysis Areas:

- For the BSUs: **% Degradation Disturbance = (combined acres of the 12 degradation threats*) ÷ (acres of all lands within the PHMAs in a BSU) x 100.**
- For the Project Analysis Area: **% Degradation Disturbance = (combined acres of the 12 degradation threats[1] plus the 7 site scale threats[2]) ÷ (acres of all lands within the project analysis area in the PHMA) x 100.**

  [1] see **Table E-6**. [2] see **Table E-5**

**Table E-4**
**Anthropogenic disturbance types for disturbance calculations. Data sources are described for the west-wide habitat degradation estimates**
**(Table copied from the GRSG Monitoring Framework)**

| Degradation Type | Subcategory | Data Source | Direct Area of Influence | Area Source |
|---|---|---|---|---|
| **Energy (oil & gas)** | Wells | IHS; BLM (AFMSS) | 5.0ac (2.0ha) | BLM WO-300 |
| | Power Plants | Platts (power plants) | 5.0ac (2.0ha) | BLM WO-300 |
| **Energy (coal)** | Mines | BLM; USFS; Office of Surface Mining Reclamation and Enforcement; USGS Mineral Resources Data System | Polygon area (digitized) | Esri/ Google Imagery |
| | Power Plants | Platts (power plants) | Polygon area (digitized) | Esri Imagery |
| **Energy (wind)** | Wind Turbines | Federal Aviation Administration | 3.0ac (1.2ha) | BLM WO-300 |
| | Power Plants | Platts (power plants) | 3.0ac (1.2ha) | BLM WO-300 |
| **Energy (solar)** | Fields/Power Plants | Platts (power plants) | 7.3ac (3.0ha)/MW | NREL |
| **Energy (geothermal)** | Wells | IHS | 3.0ac (1.2ha) | BLM WO-300 |
| | Power Plants | Platts (power plants) | Polygon area (digitized) | Esri Imagery |
| **Mining** | Locatable Developments | InfoMine | Polygon area (digitized) | Esri Imagery |
| **Infrastructure (roads)** | Surface Streets (Minor Roads) | Esri StreetMap Premium | 40.7ft (12.4m) | USGS |
| | Major Roads | Esri StreetMap Premium | 84.0ft (25.6m) | USGS |
| | Interstate Highways | Esri StreetMap Premium | 240.2ft (73.2m) | USGS |
| **Infrastructure (railroads)** | Active Lines | Federal Railroad Administration | 30.8ft (9.4m) | USGS |
| **Infrastructure (power lines)** | 1-199kV Lines | Platts (transmission lines) | 100ft (30.5m) | BLM WO-300 |
| | 200-399 kV Lines | Platts (transmission lines) | 150ft (45.7m) | BLM WO-300 |
| | 400-699kV Lines | Platts (transmission lines) | 200ft (61.0m) | BLM WO-300 |
| | 700+kV Lines | Platts (transmission lines) | 250ft (76.2m) | BLM WO-300 |
| **Infrastructure (communication)** | Towers | Federal Communications Commission | 2.5ac (1.0ha) | BLM WO-300 |

**Table E-5**
**The seven additional features to include in the disturbance calculation at the project scale**

1. Coalbed Methane Ponds
2. Meteorological Towers
3. Nuclear Energy Facilities
4. Airport Facilities and Infrastructure
5. Military Range Facilities & Infrastructure
6. Hydroelectric Plants
7. Recreation Areas Facilities and Infrastructure

**Table E-6**
**Relationship between the 18 threats and the three habitat disturbance measures for monitoring and disturbance calculations.**

| USFWS Listing Decision Threat | Sagebrush Availability | Habitat Degradation | Energy and Mining Density |
|---|---|---|---|
| Agriculture | X | | |
| Urbanization | X | | |
| Wildfire | X | | |
| Conifer encroachment | X | | |
| Treatments | X | | |
| Invasive Species | X | | |
| Energy (oil and gas wells and development facilities) | | X | X |
| Energy (coal mines) | | X | X |
| Energy (wind towers) | | X | X |
| Energy (solar fields) | | X | X |
| Energy (geothermal) | | X | X |
| Mining (active locatable, leasable, and saleable developments) | | X | X |
| Infrastructure (roads) | | X | |
| Infrastructure (railroads) | | X | |
| Infrastructure (power lines) | | X | |
| Infrastructure (communication towers) | | X | |
| Infrastructure (other vertical structures) | | X | |
| Other developed rights-of-way | | X | |

<u>Project analysis area method for permitting surface disturbance activities:</u>

- Determine potentially affected occupied leks by placing a four mile boundary around the proposed area of physical disturbance related to the project. All occupied leks located within the four mile project boundary and within PHMA will be considered affected by the project.
- Next, place a four mile boundary around each of the affected occupied leks.
- The PHMA within the four mile lek boundary and the four mile project boundary creates the project analysis area for each individual project. If there are no occupied leks within the four-mile project boundary, the project analysis area will be that portion of the four-mile project boundary within the Priority Habitat Management Area.
- Map disturbances or use locally available data. Use of NAIP imagery is recommended. In Wyoming, burned areas are included in this step.
- Calculate percent existing disturbance using the formula above. If existing disturbance is less than 3%, proceed to next step. If existing disturbance is greater than 3%, defer the project.
- Add proposed project disturbance footprint area and recalculate the percent disturbance. If disturbance is less than 3%, proceed to next step. If disturbance is greater than 3%, defer project.
- Calculate the disturbance density of energy and mining facilities (listed above). If the disturbance density is less than 1 facility per 640 acres, averaged across project analysis area, proceed to the NEPA analysis incorporating mitigation measures into an alternative. If the disturbance density is greater than 1 facility per 640 acres, averaged across the project analysis area, either defer the proposed project or co-locate it into existing disturbed area.
- If a project that would exceed the degradation cap or density cap cannot be deferred due to valid existing rights or other existing laws and regulations, fully disclose the local and regional impacts of the proposed action in the associated NEPA.

### E.3.1 Background

In the USFWS's 2010 listing decision for sage-grouse, the USFWS identified 18 threats contributing to the destruction, modification, or curtailment of the sage-grouse's habitat or range (75 FR 13910 2010). In April 2014, the Interagency GRSG Disturbance and Monitoring Sub-Team finalized the Greater Sage-Grouse Monitoring Framework (hereafter, framework) to track these threats. The 18 threats have been aggregated into three measures to account for whether the threat predominantly removes sagebrush or degrades habitat. The three measures are:

Measure 1: Sagebrush Availability (percent of sagebrush per unit area)
Measure 2: Habitat Degradation (percent of human activity per unit area)
Measure 3: Density of Energy and Mining (facilities and locations per unit area)

The BLM is committed to monitoring the three disturbance measures and reporting them to the FWS on an annual basis. However, for the purposes of calculating the amount of disturbance to provide information for management decisions and inform the success of the sage-grouse planning effort, the data depicting the location and extent of the 12 anthropogenic types of threats will be used at a minimum in the BSUs and those same 12 anthropogenic and the additional 7 types of features that are threats to sage-grouse will be used in the project analysis areas.

| | | Scales | | |
|---|---|---|---|---|
| | | **Broad/Mid (Populations)** | **Intermediate (BSU)** | **Local/Project (Seas. Hab.)** |
| **Habitat Degradation** | **Unit:** | WAFWA Populations | Biologically Significant Unit | Project/Local Habitat Area[6] |
| | **Area of Interest:** | PHMAs | PHMAs | PHMAs |
| | **Data:** | Westwide degradation data | Westwide[2], State, Local | State, Local |
| | **Formula (Measure 2a):** | 12 Degradation Threats / PHMAs in Populations | 12 Degradation Threats / PHMAs in BSUs | 12 Degradation Threats + 7[7] / PHMAs in Proj.[6] |
| | **Management:** | Internal BLM & FS estimates | 3% Cap, Adapt. Mgmt[4] | 3% Disturbance Cap |
| | **All Lands:** | Yes | Yes | Yes |
| | **Fire Included:** | No | No | No |
| | **Who:** | BLM NOC | BLM NOC[5] or State Offices | State Offices or Field Offices |
| **Sagebrush Availability** | **Unit:** | WAFWA Populations | Biologically Significant Unit | n/a |
| | **Area of Interest:** | PHMAs | PHMAs | |
| | **Data:** | LANDFIRE Updated EVT | Updated EVT or State data | |
| | **Formula (Measure 1a):** | Existing Updated Sagebrush / PHMAs in Populations | Existing Updated Sagebrush / PHMAs in BSUs | |
| | **Management:** | Internal BLM & FS estimates | Adaptive Management[4] | |
| | **All Lands:** | Yes | Yes | |
| | **Fire Included:** | Yes | Yes | |
| | **Who:** | BLM NOC | BLM NOC[5] or State Offices | |
| **Energy and Mining** | **Unit:** | WAFWA Populations | n/a | Project Area & Seasonal Hab. |
| | **Area of Interest:** | PHMAs | | PHMAs |
| | **Data:** | Westwide well & mine data | | Westwide[2], State data |
| | **Formula (Measure 3):** | Well Pads and Mines[1] / Square Mile | | Well Pads and Mines[1] / Square Mile |
| | **Management:** | Internal BLM & FS estimates | | Project Authorization |
| | **All Lands:** | Yes | | Yes |
| | **Fire Included:** | No | | No |
| | **Who:** | BLM NOC | | BLM NOC or SOs or FOs |

***ACRONYMS***

*PHMA = Priority Habitat Management Area* | *BSU = Biologically Significant Unit*
*EVT = Existing Vegetation Type* | *BpS = Areas of Biotic Potential*

*[1] Only mines with a Plan of Operation (>5 acres of disturbance) will be included.*
*[2] Westwide data will be used only if state or local data are not available.*
*[3] This footnot was removed from the table. January 2015.*
*[4] This may be one of several variables used to inform Adaptive Management. The BSU is the scale at which Adaptive Management will be applied.*
*[5] A moving window analysis will be conducted at this scale by the NOC using westwide data. If available, state and local data/analysis should be used for Adaptive Management*
*[6] The project analysis area will be based on a 4-mile radius project boundary combined with a 4-mile lek boundary for leks within the 4mi project boundary in PHMA (DDCT methodology).*
*[7] See Table 2*

## E.4 Part IV - Adaptive Management

### E.4.1 Adaptive Management Habitat Trigger-Idaho

The specific formula for the change in habitat for the habitat trigger is defined by the following

Within Idaho and Utah all factors are measured within the modeled nesting and wintering habitat within Priority or Important Habitat Management Areas (calculated separately) by Conservation Area; in Southwest Montana all factors are measured within the Priority Habitat Management Area.

In simple description the adaptive management habitat trigger calculation is the percentage of Effective Habitat (defined as areas of generally intact sagebrush that provide Greater sage-grouse habitat during some portion of the year) within modeled nesting and wintering areas within Priority or Important Habitat Management Areas by Conservation Area within a particular year when compared to the Effective Habitat within modeled nesting and wintering areas within Priority or Important Habitat Management Areas by Conservation Area as of the 2011 baseline. Using Effective Habitat as the metric of comparison removes non-habitat acres from the calculation. The calculation is evaluated within both Priority and Important Habitat Management Areas separately within each of the 10 BSUs.

For purposes of evaluating the adaptive management habitat triggers, Effective Habitat in Idaho is tracked using the Key Habitat Map which is updated annually by BLM in coordination with IDFG, Forest Service, US FWS and Local Working Groups and tracks the areas of generally intact sagebrush providing Greater sage-grouse habitat during some portion of the year. Effective habitat equates to areas described as Key Habitat on the Key Habitat Map. Appendix F contains a description of the Key Habitat Map maintenance and update process including the inclusion of disturbances from fire and temporary disturbances and habitat restoration/rehabilitation.

Factors:

EHP(Y) – where Y is the year and EHC is the acres of Effective Habitat for that year within the baseline 2011 nesting and wintering areas within the <u>Priority Habitat Management Area</u> by Conservation Area

EHI(Y) - where Y is the year and EHI is the acres of Effective Habitat for that year within the baseline 2011 nesting and wintering areas within the <u>Important Habitat Management Area</u> by Conservation Area

ADP(Y) – where Y is the year and AD is the acres of anthropogenic disturbance within Effective Habitat for that year within the 2011 nesting and wintering areas within the <u>Priority Habitat Management Area</u> by Conservation Area

ADI(Y) – where Y is the year and AD is the acres of anthropogenic disturbance within Effective Habitat for that year (Y) within the baseline 2011 nesting and wintering areas within the Important Habitat Management Area by Conservation Area

EHP(2011) – the Effective Habitat within the baseline 2011 nesting and wintering areas within the Priority Habitat Management Area by Conservation Area

EHI(2011) - the Effective Habitat within the baseline 2011 nesting and wintering areas within the Important Habitat Management Area by Conservation Area

ADP(2011) – the acres of anthropogenic disturbance within Effective Habitat within the baseline 2011 nesting and wintering areas within the Priority Habitat Management Area by Conservation Area

ADI(2011) – the acres of anthropogenic disturbance within Effective Habitat within the baseline 2011 nesting and wintering areas within the Important Habitat Management Area by Conservation Area

Formulas:

$$\text{Priority Habitat Management Area} = 100 - \left(\frac{EHP(Y) - ADP(Y)}{EHP(2011) - ADP(2011)}\right) * 100$$

$$\text{Important Habitat Management Area} = 100 - \left(\frac{EHI(Y) - ADI(Y)}{EHI(2011) - ADI(2011)}\right) * 100$$

When this calculation equals or exceeds 10 then an adaptive trigger has been engaged as per AM-7 & AM-8.

### E.4.2 Example 2 – Adaptive Management – Habitat

In the Southern Conservation Area the Priority BSU was delineated to include 784,958 acres, of which 424,656 acres were Effective habitat; therefore EHP(2011) is equal to 424,656 acres. Development within the Effective Habitat in 2011 was measured at 10,074 acres; therefore ADP(2011) is equal to 10,074 acres.

If in 2015 we project a cumulative loss of 42,000 Effective habitat acres due to wildfire (10% loss) and an additional 1000 acres of anthropogenic development (10% increase), then EHP(2015) is equal to 424,656 – 42,000 or 382,656 and ADP(2015) is equal to 10,074+1000 or 11,074. The evaluation for the adaptive management trigger is calculated by:

$$100 - \left(\frac{382656 - 11074}{424656 - 10074}\right) * 100$$

This simplifies to: $100 - \left(\frac{371582}{414582}\right) * 100$

Or $100 - (0.896 * 100)$

Or 100 - 89.6

Or 10.4 – equivalent to 10.4%

This evaluation shows a loss of greater than 10 percent and less than 20 percent which would engage the soft habitat trigger as described in AM-8 and not the hard habitat trigger described in AM-7.

### E.4.3 Soft Trigger Considerations and Implementation Actions

The Sage-Grouse Implementation Task Force, in coordination with BLM and Forest Service would utilize monitoring information to assess when triggers have been tripped. When information indicates that the soft habitat or population trigger may have been tripped, a Sage-Grouse Implementation Task Force, in coordination with BLM and Forest Service - aided by the technical expertise of IDF&G - would assess the factor(s) leading to the decline and identify potential management actions. The Sage-Grouse Implementation Task Force may consider and recommend to BLM possible changes in management to the PHMA. As to the IHMA, the Sage-Grouse Implementation Team may review the causes for decline and potential management changes only to the extent those factors significantly impair the state's ability to meet the overall management objective. It is anticipated IDF&G will collect data annually and will make recommendations to the Implementation Team by August 31st for population triggers and January 15th for habitat triggers.

Only where the monitoring information indicates the cause(s) of the decline is not a primary threat will the Sage-Grouse Implementation Task Force would analyze the secondary threats to the species and determine whether further management actions are needed.

### E.4.4 Population & Habitat Trigger Justification

***Triggers***

Because unexpected events (e.g., wildfire, West Nile Virus) may result in a substantial loss of habitat or decline in sage-grouse populations, adaptive management triggers have been developed. These triggers are intended to improve sage-grouse population trends, protect the overall baseline population, preserve a buffer population, and conserve sage-grouse habitat.

The triggers have both population and habitat components. Population components consider population growth and change in lek size. The habitat component considers loss of breeding and/or winter habitat. Lek size has been related to population change in numerous studies (Connelly and Braun 1997, Connelly et al. 2004, Baumgart 2011, Garton et al. 2011). Garton et al. (2011) used both characteristics as well as number of active leks to assess change for sage-grouse populations throughout the west. A variety of researchers (Swensen et al. 1987, Connelly et al. 2000a, Miller et al. 2011) have shown that loss of winter or breeding habitats resulted in decreased sage-grouse populations. The adaptive management triggers set at a lambda value less than one, a 20% decline in males counted on lek routes, and a 20% loss of breeding or winter habitat as break points that would initiate a population or habitat trigger.

***Population Growth (Finite Rate of Change)***

Although populations cannot be accurately estimated, lek counts of males provide a robust method for assessing population trend and estimating population growth (**$\lambda$**) in an unbiased fashion. Calculating **$\lambda$** (finite rate of change) between successive years for a sage-grouse population is described in Garton et al. (2011). The ratio of males counted in a pair of successive years estimates the finite rate of change (**$\lambda_t$**) at each lek site in that one-year interval. These ratios can be combined across leks within a population for each year to estimate **$\lambda_t$** for the entire population (or Conservation Zone) or combined across all leks to estimate **$\lambda_t$** for the state between successive years as:

$$\lambda(t) = \frac{\sum_{i=1}^{n} M_i(t+1)}{\sum_{i=1}^{n} M_i(t)}$$

where $M_i(t)$ = number of males counted at lek *i* in year *t*, across *n* leks counted in both years *t* and *t+1*. Ratio estimation under classic probability sampling designs—simple random, stratified, cluster, and probability proportional to size (PPS)—assumes the sample units (leks counted in two successive years in this case) are drawn according to some random process but the strict requirement to obtain unbiased estimates is that the ratios measured represent an unbiased sample of the ratios (i.e., finite rates of change) from the population or other area sampled. This assumption seems appropriate for leks and the possible tendency to detect (or count) larger leks than smaller leks does not bias the estimate of **$\lambda_t$** across a population or region (Garton et al. 2011), but makes it analogous to a PPS sample showing dramatically increased precision over simple random samples (Scheaffer et al. 1996). Also precision can be estimated for **$\lambda$**.

Because small game populations (including sage-grouse) typically fluctuate among years due to weather and other environmental variables, a **$\lambda_t$** for any given year is not very meaningful. However, a series of years where **$\lambda_t$** remains at or above 1.0 indicates a stable to increasing population. Moreover, this situation would also provide strong evidence of the effectiveness of conservation actions that may have been employed.

Definition of "Significance" for Hard Population Trigger:

The Governor's Alternative (E) did not define criteria for "significantly less than 1.0". For purposes of the Plan, IDFG proposes to use a 90% confidence interval around lambda over a three-year period. to evaluate whether λ is significantly less than 1.0. If the 90% confidence interval is less than and does not include 1.0, than λ is significantly less than 1.0.

The $\lambda$ and variance will be calculated following Garton et al. (2011). A 90% confidence interval is justified because:

1. Under a 90% confidence interval the probability of making a false conclusion is 10%, however, the error will be on the conservative side; i.e., the error would benefit the sage-grouse population.

2. The $\lambda$ criteria would not be used alone; as stated in the ADPP, $\lambda$ would be used in concert with trend in maximum number of males.

### *Males Counted on Leks*

Lek attendance by males has been used as an indicator of population trend in some areas since at least the early 1950s. For many years it was the only indicator used to assess status of sage-grouse populations. However, recent research has shown that male attendance at leks can be affected by severity of the previous winter, weather, timing of counts during spring, and a variety of other factors (Emmons and Braun 1984, Hupp 1987, Baumgart 2011). Baumgart (2011) indicated the probability of male sage-grouse attending leks in south-central Idaho varied among years and appeared to be tied to winter severity. Although lek data provide a powerful data set for assessing population trends over time (Garton et al. 2011), counts for a single year may not reflect trends very well. Thus using lek counts as a trigger must consider the inherent variation in these counts. Moreover, males counted on leks appear to have the most value for assessing population change when used in conjunction with other indicators of population status (e.g., finite rate of change).

Emmons and Braun (1984) reported that lek attendance rates varied from 86% for yearling males to 92% for adult males. These rates were pooled over 5 day periods and may have overestimated attendance (Connelly et al. 2011). In contrast, Walsh et al. (2004) reported average daily male attendance rates of 42% (range = 7-85%) and 19% (range = 0-38%) for adult and yearling sage-grouse, respectively but these rates were not adjusted for detection rate and were likely biased low (Connelly et al. 2011). Moreover, this study involved very small sample sizes (17 adult males, 9 yearling males over 15 leks) and only one breeding season and it was not clear whether all leks in the study area were known and sampled. Preliminary data from Utah (D. Dahlgren, personal communication) indicated that in a study area about 30 miles south of Idaho male sage-grouse lek attendance rates varied from roughly 60% at the beginning of April to about 90% at the end of the month. Recent findings in Idaho (Baumgart 2011) predicted the probability of lek attendance for an adult male following an "average" winter would range from 0.894 (SE = 0.025) on week 3 (~1 April) to 0.766 (SE = 0.040) on week 8 (~ 5 May). Published information suggests that a change in maximum number of males counted on leks of say 10-15% cannot confidently be considered a reflection of population status. However, a 20% decline in maximum number of males counted on leks would likely not be related to lek attendance patterns but instead would reflect a population decline. Thus, the trigger was set at 20%.

### *Habitat Trigger*

Numerous studies have documented the negative effects of habitat loss including fire and energy development on sage-grouse (Connelly et al. 2000b, Fischer et al. 1996, Nelle et al. 2000, Doherty et al. 2008), but few studies have related the amount of sagebrush habitat lost to population change. In a Montana study area with a non-migratory sage-grouse population, there was a 73% decline in breeding males after 16% of the study area was plowed (Swenson et al. 1987). Walker et al. (2007) indicated that the lowest probability for lek persistence within a landscape occurred where, within 6.4 km of a lek center, the area has < 30% sagebrush. Similarly, Wisdom et al. (2011) reported sage-grouse occupying landscapes with <27% sagebrush as dominant cover would have a low probability of persistence. Connelly et al. (2000a) showed that a fire in 1989 that removed 58% of the sagebrush cover in sage-grouse breeding and winter habitat led to an almost 95% decline in the breeding population a few years later. Similarly, a fire that removed about 30% of breeding/winter habitat resulted in substantial population declines over the next few years (J. W. Connelly, unpublished data; **Table E-7**). A 30% loss of breeding and winter habitat is thus far the lowest amount of habitat loss for which a population response could be detected and landscapes with < 30% area in sagebrush within 6.4 km of lek center have the lowest probability of lek persistence. Idaho is taking a more conservative approach than suggested by the literature. A soft trigger is set at a 10% loss of breeding or winter habitat in Core or Important management zones of a Conservation Area, which initiates a review of the management approach. A hard trigger is set at a 20% loss of breeding or winter habitat within a Core Habitat Zone of a Conservation Area, which automatically causes a change in management status of the corresponding Important Habitat Zone.

**Table E-7**
**Nest success (%) in SE Idaho study areas before and after a fire in the Table Butte study area. The fire occurred in August 2000.**

| Year | Area | |
|---|---|---|
| | Table Butte | Upper Snake |
| 1999 | 54 | |
| 2000 | 45 | 61 |
| 2001[a] | 18 | 56 |
| 2002 | 20 | 65 |

### E.4.5 Adaptive Management Habitat Trigger-Montana

Adaptive management is a decision process that promotes flexible resource management decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. Careful monitoring of these outcomes both advances scientific understanding and helps with adjusting resource management directions as part of an iterative learning process. Adaptive management also recognizes the importance of natural variability in contributing to ecological resilience and productivity. It is not a 'trial and error' process, but rather emphasizes learning while doing. Adaptive management does not represent an end in itself, but rather a means to more effective decisions and enhanced benefits.

In relation to the BLM National Greater Sage-grouse Planning Strategy, adaptive management will help identify if sage grouse conservation measures presented in this EIS contain the needed level of certainty for effectiveness. Principles of adaptive management are incorporated into the conservation measures in the plan to ameliorate threats to a species, thereby increasing the likelihood that the conservation measure and plan will be effective in reducing threats to that species. The following provides the BLM's adaptive management strategy for the MCFO PRMP/FEIS.

This Proposed RMP/FEIS contains a monitoring framework plan (GRSG Monitoring Framework Appendix) that includes an effectiveness monitoring component. The BLM intends to use the data collected from the effectiveness monitoring to identify any changes in habitat condition related to the goals and objectives of the plan and other range-wide conservation strategies (US Department of the Interior 2004; Striver et al. 2006; US Fish and Wildlife Service 2013). The information collected through the Monitoring Framework Plan outlined in the GRSG Monitoring Framework Appendix would be used by the BLM to determine when adaptive management hard and soft triggers (discussed below) are met. The GRSG adaptive management plan provides regulatory assurance that the means of addressing and responding to unintended negative impacts to greater sage-grouse and its habitat before consequences become severe or irreversible.

### E.4.6 Adaptive Management Triggers

Adaptive management triggers are essential for identifying when potential management changes are needed in order to continue meeting GRSG conservation objectives. The BLM will use soft and hard triggers.

***Soft Triggers:***
Soft triggers are indicators that management or specific activities may not be achieving the intended results of conservation action. The soft trigger is any negative deviation from normal trends in habitat or population in any given year, or if observed across two to three consecutive years. Metrics include, but are not limited to, annual lek counts, wing counts, aerial surveys, habitat monitoring, and DDCT evaluations. BLM field offices, local Montana Fish, Wildlife and Parks (FWP) offices, and GRSG working groups will evaluate the metrics. The purpose of these strategies is to address localized GRSG population and habitat changes by providing the framework in which management will change if monitoring identifies negative population and habitat anomalies.

Each major project (EIS level) will include adaptive management strategies in support of the population management objectives for GRSG set by the State of Montana, and will be consistent with this GRSG Adaptive Management Plan. These adaptive management strategies will be developed in partnership with the State of Montana, project proponents, partners, and stakeholders, incorporating the best available science.

If the BLM finds that the State of Montana is implementing a GRSG Habitat Conservation Program that is effectively conserving the GRSG, the BLM will review the management goals and objectives to determine if they are being met and whether amendment of the BLM plan is appropriate to achieve consistent and effective conservation and GRSG management across all lands regardless of ownership. In making amendments to this plan, the BLM will coordinate with the USFWS as BLM continues to meet its objective of conserving, enhancing and restoring GRSG habitat by reducing, minimizing or eliminating threats to that habitat.

***Soft Triggers Response:***
Soft triggers require immediate monitoring and surveillance to determine causal factors and may require curtailment of activities in the short- or long-term, as allowed by law. The project level adaptive management strategies will identify appropriate responses where the project's activities are identified as the causal factor. The BLM and the adaptive management group will implement an appropriate response strategy to address causal factors not addressed by specific project adaptive management strategies, not attributable to a specific project, or to make adjustments at a larger regional or state-wide level.

***Hard Triggers:***
Hard triggers are indicators that management is not achieving desired conservation results. Hard triggers would be considered an indicator that the species is not responding to conservation actions, or that a larger-scale impact is having a negative effect.

Hard triggers are focused on three metrics: 1) number of active leks, 2) acres of available habitat, and 3) population trends based on annual lek counts.

Within the context of normal population variables, hard triggers shall be determined to take effect when two of the three metrics exceeds 60% of normal variability for the BSU in a single year, or when any of the three metrics exceeds 40% of normal variability for a three year time period within a five-year range of analysis. A minimum of three years is used to determine trends, with a five- year period preferred to allow determination of three actual time periods (Y1-2-3, Y2-3-4, Y3-4-5). Baseline population estimates are established by pre-disturbance surveys, reference surveys and account for regional and statewide trends in population levels.

Population count data in Montana are maintained by Montana Fish, Wildlife, and Parks (FWP). Estimates of population are determined based upon survey protocols determined by FWP, and are implemented consistently throughout the state. Population counts are tracked for individual leks and are then summarized for each Priority Habitat Management Area (PHMA).

***Hard Trigger Response:***
Hard triggers represent a threshold indicating that immediate action is necessary to stop a severe deviation from GRSG conservation objectives set forth in the BLM plans. As such, the Proposed Plan/Final EIS includes a "hard-wired" plan-level response; that is, it provides that, upon reaching the trigger, a more restrictive alternative, or an appropriate component of a more restrictive alternative analyzed in the EIS will be implemented without further action by the BLM. Specific "hard-wired" changes in management are identified in **Table E-8**, Specific Management Responses.

In addition to the specific changes identified in Table 2-3, the BLM will review available and pertinent data, in coordination with GRSG biologists and managers from multiple agencies including the USFWS, NRCS, and the State of Montana, to determine the causal factor(s)

**Table E-8**
**Specific Management Responses**

| Program | Adaptive Management Response[1] |
|---|---|
| Sage-Grouse Management | Areas within and adjacent to PHMA where a hard trigger has been reached would be the top priority for regional mitigation habitat restoration and fuels reduction treatments. |
| Vegetation Management | PHMA would be the top priority for regional mitigation, habitat restoration and fuels reduction treatments. |
| Wildland Fire Management | Reassess GRSG habitat needs to determine if priorities for at risk habitats, fuels management areas, preparedness, suppression and restoration have changed. |
| Livestock Grazing | For areas not achieving the GRSG habitat objectives due to grazing, apply adjustments to livestock grazing to achieve objectives. |
| Rights of Way – Existing Corridors | Retain the corridors as mapped, but limit the size of new lines within the corridors to same as existing structures, or not larger than 138kV. |
| Wind Energy Development | No change from Proposed Plan. |
| Industrial Solar | No change from Proposed Plan. |
| Comprehensive Travel and Transportation Management | If travel management planning has not been completed within GRSG habitat, PHMA areas where the hard trigger was met would be the highest priority for future travel management planning efforts.<br><br>If travel management has been completed within GRSG habitat in the PHMA where the hard trigger was met, re-evaluate designated routes to determine their effects on GRSG. If routes are found to be causing population-level impacts, revise their designation status to reduce the effect. |
| Fluid Minerals | No change from Proposed Plan. |
| Locatable Minerals | No change from Proposed Plan. |
| Salable Minerals | No change from Proposed Plan. |
| Nonenergy Leasable Minerals | No change from Proposed Plan. |

and implement a corrective strategy. The corrective strategy would include the changes identified in **Table E-8** and could also include the need to amend or revise the RMP to address the situation and modify management accordingly.

When a hard trigger is hit in a BSU including those that cross state lines, the WAFWA Management Zone Greater Sage-Grouse Conservation Team will convene to determine the causal factor, put project-level responses in place, as appropriate and discuss further appropriate actions to be applied. (BSU for this Proposed RMP/Final EIS is the total of all the PHMA within a GESG population delineated in the COT report.) Adoption of any further actions at the plan level may require initiating a plan amendment process.

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### E.4.7 Potential Implementation Level Actions to Consider in the Event Soft Trigger Criteria are Met

- Increase monitoring and evaluation of sage-grouse populations in Priority Habitat Management Area (area of concern).
- Implement Priority Habitat Management Area management strategy in corresponding Important Habitat Management Area of the same Conservation Area.
- Implement Priority Habitat Management Area RDFs in corresponding Important Habitat Management Area of the same Conservation Area.

- Not allow any new (large) infrastructure development within the Priority Habitat Management Area (no exceptions allowed).
- Reallocate resources to focus on primary threats in the Priority Habitat Management Area (e.g. direct resources from other parts of the state to the area of concern).
- Reallocate resources to focus on secondary threats in the Priority Habitat Management Area (e.g. direct resources from other parts of the state to the area of concern).
- Apply Priority Habitat Management Area criteria for all primary threats, and/or all secondary threats to the Important Habitat Management Area.
- Reallocate resources to focus on primary threats in the Important Habitat Management Area (e.g. direct resources from other parts of the state to the area of concern).
- Reallocate resources to focus on secondary threats in the Important Habitat Management Area (e.g. direct resources from other parts of the state to the area of concern).

### E.4.8 Adaptive Grazing Management Response

Improperly managed livestock grazing generally affects seasonal sage-grouse habitat at the site level. Therefore, the specific issues contributing to tripping an adaptive management trigger would need to be defined. Generally, these might be nesting cover from perennial grasses in breeding/nesting habitat, condition and forb availability in brood rearing habitat, and possibly sagebrush cover in winter habitat.

BLM would focus resources to accelerate land health assessments and/or assessment of specific habitat metrics in the areas where deficiencies in site-level habitat metrics are suspected to be a causal factor in tripping a soft or hard trigger. If it is identified that one or more site-level habitat objectives is not being met due to livestock, and an imminent likelihood of resource damage may occur from continued grazing, decisions could be issued in accordance with 4110.3-3(b) to provide immediate protection of resources while a full review of the grazing allotments and grazing permits is conducted. BLM would then focus resources at the state level to accelerate the grazing permit renewal in the area where the trigger has been tripped in order to expedite progress towards meeting land health standards.

**Adaptive management response for livestock grazing**

## E.5 Part V - Travel and Transportation Management Definitions for Use in Anthropogenic Disturbance Calculation

**Roads** are linear routes managed for use by low clearance vehicles having four or more wheels, and are maintained for regular and continuous use.

**Primitive Roads** are linear routes managed for use by four-wheel drive or high-clearance vehicles. They do not normally meet any design standards.

**Trails** are linear routes managed for human-powered, stock, or OHV forms of transportation or for historical or heritage values. Trails are not generally managed for use by four-wheel drive or high-clearance vehicles.

**Linear Disturbances** are human-made linear features that are not part of the designated transportation network are identified as "Transportation Linear Disturbances." These may include engineered (planned) as well as unplanned single and two-track linear features that are not part of the BLM's transportation system.

**Primitive Routes** are any transportation linear feature located within a WSA or lands with wilderness characteristics designated for protection by a land use plan and not meeting the wilderness inventory road definition.

**Temporary routes** are short-term overland roads, primitive roads or trails which are authorized or acquired for the development, construction or staging of a project or event that has a finite lifespan. Temporary routes are not intended to be part of the permanent or designated transportation network and must be reclaimed when their intended purpose(s) has been fulfilled. Temporary routes should be constructed to minimum standards necessary to accommodate the intended use; the intent is that the project proponent (or their representative) will reclaim the route once the original project purpose or need has been completed. Temporary routes are considered emergency, single use or permitted activity access. Unless they are specifically intended to accommodate public use, they should not be made available for that use. A temporary route will be authorized or acquired for the specific time period and duration specified in the written authorization (permit, ROW, lease, contract etc.) and will be scheduled and budgeted for reclamation to prevent further vehicle use and soil erosion from occurring by providing adequate drainage and re-vegetation.

**Administrative routes** are those that are limited to authorized users (typically motorized access). These are existing routes that lead to developments that have an administrative purpose, where the agency or permitted user must have access for regular maintenance or operation. These authorized developments could include such items as power lines, cabins, weather stations, communication sites, spring

***Maintenance Intensities***

**Level 0**

Maintenance Description:

> Existing routes that will no longer be maintained and no longer be declared a route. Routes identified as Level 0 are identified for removal from the Transportation System entirely.

Maintenance Objectives:

- No planned annual maintenance.
- Meet identified environmental needs.
- No preventative maintenance or planned annual maintenance activities.

**Level 1**

Maintenance Description:

> Routes where minimum (low intensity) maintenance is required to protect adjacent lands and resource values. These roads may be impassable for extended periods of time.

Maintenance Objectives:

- Low (Minimal) maintenance intensity.
- Emphasis is given to maintaining drainage and runoff patterns as needed to protect adjacent lands. Grading, brushing, or slide removal is not performed unless route bed drainage is being adversely affected, causing erosion.
- Meet identified resource management objectives.
- Perform maintenance as necessary to protect adjacent lands and resource values.
- No preventative maintenance.
- Planned maintenance activities limited to environmental and resource protection.
- Route surface and other physical features are not maintained for regular traffic.

**Level 3**

Maintenance Description:

> Routes requiring moderate maintenance due to low volume use (for example, seasonally or year-round for commercial, recreational, or administrative access). Maintenance Intensities may not provide year-round access but are intended to

generally provide resources appropriate to keep the route in use for the majority of the year.

Maintenance Objectives:

- Medium (Moderate) maintenance intensity.
- Drainage structures will be maintained as needed. Surface maintenance will be conducted to provide a reasonable level of riding comfort at prudent speeds for the route conditions and intended use. Brushing is conducted as needed to improve sight distance when appropriate for management uses. Landslides adversely affecting drainage receive high priority for removal; otherwise, they will be removed on a scheduled basis.
- Meet identified environmental needs.
- Generally maintained for year-round traffic.
- Perform annual maintenance necessary to protect adjacent lands and resource values.
- Perform preventative maintenance as required to generally keep the route in acceptable condition.
- Planned maintenance activities should include environmental and resource protection efforts, annual route surface.
- Route surface and other physical features are maintained for regular traffic.

**Level 5**

Maintenance Description:

Route for high (maximum) maintenance due to year-round needs, high volume of traffic, or significant use. Also may include route identified through management objectives as requiring high intensities of maintenance or to be maintained open on a year-round basis.

Maintenance Objectives:

- High (Maximum) maintenance intensity.
- The entire route will be maintained at least annually. Problems will be repaired as discovered. These routes may be closed or have limited access due to weather conditions but are generally intended for year-round use.
- Meet identified environmental needs.
- Generally maintained for year-round traffic.
- Perform annual maintenance necessary to protect adjacent lands and resource values.

- Perform preventative maintenance as required to generally keep the route in acceptable condition.
- Planned maintenance activities should include environmental and resource protection efforts, annual route surface.
- Route surface and other physical features are maintained for regular traffic.

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# Appendix F

## Mitigation

# F. Mitigation

## F.1 Part I – Regional Mitigation Strategy

### F.1.1 General

In undertaking BLM/USFS management actions, and, consistent with valid existing rights and applicable law, in authorizing third party actions that result in habitat loss and degradation, the BLM/USFS will require and ensure mitigation that provides a net conservation gain to the species including accounting for any uncertainty associated with the effectiveness of such mitigation. This will be achieved by avoiding, minimizing, and compensating for impacts by applying beneficial mitigation actions. Mitigation will follow the regulations from the White House Council on Environmental Quality (CEQ) (40 CFR 1508.20; e.g. avoid, minimize, and compensate), hereafter referred to as the mitigation hierarchy. If impacts from BLM/USFS management actions and authorized third party actions that result in habitat loss and degradation remain after applying avoidance and minimization measures (i.e. residual impacts), then compensatory mitigation projects will be used to provide a net conservation gain to the species. Any compensatory mitigation will be durable, timely, and in addition to that which would have resulted without the compensatory mitigation (see glossary).

The BLM/USFS, via the WAFWA Management Zone Greater Sage-Grouse Conservation Team, will develop a WAFWA Management Zone Regional Mitigation Strategy that will inform the NEPA decision making process including the application of the mitigation hierarchy for BLM/USFS management actions and third party actions that result in habitat loss and degradation. A robust and transparent Regional Mitigation Strategy will contribute to greater sage-grouse habitat conservation by reducing, eliminating, or minimizing threats and compensating for residual impacts to greater sage-grouse and its habitat.

The BLM's Regional Mitigation Manual MS-1794 serves as a framework for developing and implementing a Regional Mitigation Strategy. The following sections provide additional guidance specific to the development and implementation of a WAFWA Management Zone Regional Mitigation Strategy.

*Developing a WAFWA Management Zone Regional Mitigation Strategy*

The BLM/USFS, via the WAFWA Management Zone Greater Sage-Grouse Conservation Team, will develop a WAFWA Management Zone Regional Mitigation Strategy to guide the application of the mitigation hierarchy for BLM/USFS management actions and third party actions that result in habitat loss and degradation. The Strategy should consider any State-level greater sage-grouse mitigation guidance that is consistent with the requirements identified in this Appendix. The Regional Mitigation Strategy should be developed in a transparent manner, based on the best science available and standardized metrics.

As described in Chapter 2, the BLM/USFS will establish a WAFWA Management Zone Greater Sage-Grouse Conservation Team (hereafter, Team) to help guide the conservation of greater sage-grouse, within 90 days of the issuance of the Record of Decision. The Strategy will be developed within one year of the issuance of the Record of Decision.

The Regional Mitigation Strategy should include mitigation guidance on avoidance, minimization, and compensation, as follows:

- Avoidance
    - Include avoidance areas (e.g. right-of-way avoidance/exclusion areas, no surface occupancy areas) already included in laws, regulations, policies, and/or land use plans (e.g. Resource Management Plans, Forest Plans, State Plans); and,
    - Include any potential, additional avoidance actions (e.g. additional avoidance best management practices) with regard to greater sage-grouse conservation.
- Minimization
    - Include minimization actions (e.g. required design features, best management practices) already included in laws, regulations, policies, land use plans, and/or land-use authorizations; and,
    - Include any potential, additional minimization actions (e.g. additional minimization best management practices) with regard to greater sage-grouse conservation.
- Compensation
    - Include discussion of impact/project valuation, compensatory mitigation options, siting, compensatory project types and costs, monitoring, reporting, and program administration. Each of these topics is discussed in more detail below.
        - Residual Impact and Compensatory Mitigation Project Valuation Guidance
            - A common standardized method should be identified for estimating the value of the residual impacts and value of the compensatory mitigation projects, including accounting for any uncertainty associated with the effectiveness of the projects.
            - This method should consider the quality of habitat, scarcity of the habitat, and the size of the impact/project.
            - For compensatory mitigation projects, consideration of durability (see glossary), timeliness (see glossary), and the potential for failure (e.g. uncertainty associated with effectiveness) may require an upward adjustment of the valuation.
            - The resultant compensatory mitigation project will, after application of the above guidance, result in proactive

conservation measures for Greater Sage-grouse (consistent with BLM Manual 6840 – Special Status Species Management, section .02).

- Compensatory Mitigation Options
    - Options for implementing compensatory mitigation should be identified, such as:
- Utilizing certified mitigation/conservation bank or credit exchanges.
- Contributing to an existing mitigation/conservation fund.
- Authorized-user conducted mitigation projects.
    - For any compensatory mitigation project, the investment must be additional (i.e. additionality: the conservation benefits of compensatory mitigation are demonstrably new and would not have resulted without the compensatory mitigation project).
- Compensatory Mitigation Siting
    - Sites should be in areas that have the potential to yield a net conservation gain to the greater sage-grouse, regardless of land ownership.
    - Sites should be durable (see glossary).
    - Sites identified by existing plans and strategies (e.g. fire restoration plans, invasive species strategies, healthy land focal areas) should be considered, if those sites have the potential to yield a net conservation gain to greater sage-grouse and are durable.
- Compensatory Mitigation Project Types and Costs
    - Project types should be identified that help reduce threats to greater sage-grouse (e.g. protection, conservation, and restoration projects).
    - Each project type should have a goal and measurable objectives.
    - Each project type should have associated monitoring and maintenance requirements, for the duration of the impact.
    - To inform contributions to a mitigation/conservation fund, expected costs for these project types (and their monitoring and maintenance), within the WAFWA Management Zone, should be identified.

- Compensatory Mitigation Compliance and Monitoring
  - Mitigation projects should be inspected to ensure they are implemented as designed, and if not, there should be methods to enforce compliance.
  - Mitigation projects should be monitored to ensure that the goals and objectives are met and that the benefits are effective for the duration of the impact.
- Compensatory Mitigation Reporting
  - Standardized, transparent, scalable, and scientifically-defensible reporting requirements should be identified for mitigation projects.
  - Reports should be compiled, summarized, and reviewed in the WAFWA Management Zone in order to determine if greater sage-grouse conservation has been achieved and/or to support adaptive management recommendations.
- Compensatory Mitigation Program Implementation Guidelines
  - Guidelines for implementing the State-level compensatory mitigation program should include holding and applying compensatory mitigation funds, operating a transparent and credible accounting system, certifying mitigation credits, and managing reporting requirements.

### *Incorporating the Regional Mitigation Strategy into NEPA Analyses*
The BLM/USFS will include the avoidance, minimization, and compensatory recommendations from the Regional Mitigation Strategy in one or more of the NEPA analysis' alternatives for BLM/USFS management actions and third party actions that result in habitat loss and degradation and the appropriate mitigation actions will be carried forward into the decision.

### *Implementing a Compensatory Mitigation Program*
The BLM/USFS need to ensure that compensatory mitigation is strategically implemented to provide a net conservation gain to the species, as identified in the Regional Mitigation Strategy. In order to align with existing compensatory mitigation efforts, this compensatory mitigation program will be managed at a State-level (as opposed to a WAFWA Management Zone, a Field Office, or a Forest), in collaboration with our partners (e.g. Federal, Tribal, and State agencies).

To ensure transparent and effective management of the compensatory mitigation funds, the BLM/USFS will enter into a contract or agreement with a third-party to help manage the State-level compensatory mitigation funds, within one year of the issuance of the Record of Decision. The selection of the third-party compensatory mitigation administrator will conform to all relevant laws, regulations, and policies. The BLM/USFS will remain responsible for making decisions that affect Federal lands.

### F.1.2 Glossary Terms

**Additionality:** The conservation benefits of compensatory mitigation are demonstrably new and would not have resulted without the compensatory mitigation project. (adopted and modified from BLM Manual Section 1794).

**Avoidance mitigation:** Avoiding the impact altogether by not taking a certain action or parts of an action. (40 CFR 1508.20(a)) (e.g. may also include avoiding the impact by moving the proposed action to a different time or location.)

**Compensatory mitigation**: Compensating for the (residual) impact by replacing or providing substitute resources or environments. (40 CFR 1508.20)

**Compensatory mitigation projects:** The restoration, creation, enhancement, and/or preservation of impacted resources (adopted and modified from 33 CFR 332), such as on-the-ground actions to improve and/or protect habitats (e.g. chemical vegetation treatments, land acquisitions, conservation easements). (adopted and modified from BLM Manual Section 1794).

**Compensatory mitigation sites:** The durable areas where compensatory mitigation projects will occur. (adopted and modified from BLM Manual Section 1794).

Durability (protective and ecological): the maintenance of the effectiveness of a mitigation site and project for the duration of the associated impacts, which includes resource, administrative/legal, and financial considerations. (adopted and modified from BLM Manual Section 1794).

**Minimization mitigation:** Minimizing impacts by limiting the degree or magnitude of the action and its implementation. (40 CFR 1508.20 (b))

**Residual impacts:** Impacts that remain after applying avoidance and minimization mitigation; also referred to as unavoidable impacts.

**Timeliness:** The lack of a time lag between impacts and the achievement of compensatory mitigation goals and objectives (BLM Manual Section 1794).

## F.2 Part II – Idaho Mitigation Framework

**Framework for Mitigation of Impacts From Infrastructure Projects On Sage-Grouse And Their Habitats**

**Sage-Grouse Mitigation Subcommittee of the Idaho Sage-Grouse State Advisory Committee**[1]

**December 6, 2010**

### F.2.1 Introduction

The Conservation Plan for Greater Sage-grouse in Idaho (Idaho Sage-Grouse Advisory Committee 2006; as amended in 2009) calls for the development of a "proposal for a mitigation and crediting program for sagebrush steppe habitats in Idaho and recommendations for policy consideration" (Measure 6.2.4.). In early 2010, the Idaho Sage-grouse Advisory Committee (SAC) established the Mitigation Subcommittee to complete this task.1 The Mitigation Subcommittee met several times from the late spring, through the fall of 2010 and found broad areas of agreement among its diverse participants.

This report presents the Mitigation Subcommittee's consensus recommendations for the creation of an Idaho-based program to compensate for the impacts of infrastructure projects on sagegrouse and their habitats. This program – called the Mitigation Framework – would serve as a science-based "mitigation module" that project developers and government regulators could use to achieve compensatory mitigation objectives called for in project plans and permits. While compensatory mitigation may help offset certain impacts arising from infrastructure projects, mitigation should not be considered a substitute for first avoiding and then minimizing impacts.

In addition, it is important to recognize that federal and state regulatory or land-management agencies, and county or local governments may also require additional stipulations, conditions of approval or other requirements as well as on-site mitigation, in accordance with applicable law, regulation or policy.

This document proposes a general outline or "skeleton" of policies and procedures for such a program. The Mitigation Framework is designed to be transparent, inclusive, and accountable to defined objectives. The Subcommittee's purpose is to describe the program in enough detail to foster a dialogue among SAC members, spot important issues and points of agreement, and assess the level of support for developing a functioning mitigation program for Idaho sagegrouse and their habitats.

[1] Subcommittee participants: John Robison and Lara Rozzelle, Idaho Conservation League; Brett Dumas, Idaho Power Company; Paul Makela and Tom Rinkes, BLM; Don Kemner, Idaho Department of Fish and Game; Will Whelan and Trish Klahr, The Nature Conservancy; Rich Rayhill, Ridgeline Energy, LLC; Lisa LaBolle and Kirsten Sikes, Idaho Office of Energy Resources; Nate Fisher, Idaho Office of Species Conservation; John Romero, Citizen at Large.

### F.2.2 Executive Summary

The state of Idaho is seeing an increasing number of infrastructure projects, such as transmission lines and wind energy facilities, proposed in the state's sagebrush steppe ecosystems. Where federal permits are required, the environmental review process for these projects will analyze how these projects affect sage-grouse and will consider a range of potential mitigation measures to avoid, minimize, or offset any impacts. It is likely that the environmental review process will lead at least some developers and agencies to implement compensatory mitigation.

Compensatory mitigation consists of compensating for residual project impacts that are not avoided or minimized by providing substitute resources or habitats, often at a different location than the project area. For sage-grouse, this would include, among other things, protecting and restoring sagebrush habitats to offset habitat losses and other effects of infrastructure projects.

This framework describes the general outline for a sage-grouse compensatory mitigation program in Idaho. This program would employ an "in-lieu fee" approach to compensatory mitigation through which a project developer would pay funds into an account managed by the mitigation program for performance of mitigation actions that provide measureable benefits for sage-grouse and their habitats within Idaho.

The Mitigation Framework does not alter the legal standards or procedures for review and approval of infrastructure projects. Rather, it offers an option that project developers and/or regulators may choose for implementing mitigation plans and agency permit conditions. It should be emphasized that this program would not relieve project developers and permitting agencies of their obligation to avoid and minimize environmental impacts through appropriate project siting, design and implementation.

Although the initial focus is on sage-grouse, the Mitigation Framework can be readily adapted to provide compensatory mitigation for other sagebrush obligate and associated species. The suitability of the Framework for other species and natural features has not been evaluated.

The objectives of the Mitigation Framework include:

- Provide a credible, efficient, transparent, and flexible mechanism to implement compensatory mitigation;
- Ensure that sage-grouse impacts are offset by actions that benefit the affected species and habitats;
- Provide increased certainty for developers and agencies;
- Involve private and public partners in crafting solutions;
- Provide developers the opportunity to offset the impacts of project development and operation on sage-grouse and sage-grouse habitat, and provide a consistent

mechanism to offset impacts to the species that can be evaluated in future reviews of the species' status; and

- Evaluate issues based on best available scientific information, while acknowledging and responding to scientific uncertainty.

The Mitigation Framework would be established through a memorandum of agreement (MOA) among entities that have the capacity and commitment to assist in its implementation. Such parties may include land and wildlife management agencies, counties, tribes, participating private infrastructure development companies, and non-governmental organizations. The MOA would define the specific roles and responsibilities, procedures, and tasks needed to operate an Idaho-based compensatory mitigation program.

The Mitigation Framework envisions a program with the following attributes: (1) a Mitigation Team and program administrator to steer the mitigation program and ensure strong oversight; (2) technically sound and transparent guidelines for estimating compensatory mitigation costs; (3) a science-based statewide strategy to guide the selection of mitigation actions that will receive funding; (4) provisions that the costs of operating the program will be borne by infrastructure developers that use the Mitigation Framework to deliver compensatory mitigation; (5) monitoring the implementation and effectiveness of mitigation actions funded by the Mitigation Framework program; (6) a system to track benefits provided by the Mitigation Framework to sage-grouse habitat in Idaho; and (7) periodic evaluation and adaptation of the Mitigation Framework program.

This framework provides only a general outline of a proposed Idaho-based compensatory mitigation program. It is intended to assess the level of support for crafting the agreements and completing the technical tasks needed to bring the Mitigation Framework into being.

### F.2.3 Discussion

**I. The Role of Compensatory Mitigation in Infrastructure Development and Sage-grouse Conservation**

*A. Mitigation Basics*

Broadly defined, "mitigation" refers to a wide range of measures that are taken to avoid, minimize, rectify, reduce, or compensate for the adverse impacts of actions affecting the environment. See 40 C.F.R. § 1508.20 (definition of "mitigation" in National Environmental Policy Act (NEPA) rules). In this general sense, mitigation should be an integral part of all phases of project planning and implementation.

The focus of this report is on compensatory mitigation – also known as "biodiversity offsets" or "offsite mitigation." Compensatory mitigation consists of compensating for residual project impacts that are not avoided or minimized by providing substitute resources or habitats, often at a different location than the project area. For instance, a project developer may fund the restoration of a particular type of habitat in order to replace or "offset" similar habitat that is lost as a result of project construction.

This Framework adopts an "in-lieu fee" approach to compensatory mitigation. Under this approach, a project developer provides funding to a compensatory mitigation program administrator who then distributes the funds to the appropriate government agency, foundation or other organization for performance of mitigation actions. In an in-lieu fee program, the responsibility for actually delivering the compensatory mitigation is transferred from the developer to the program administrator once the developer provides the necessary funds to the in-lieu fee program. It is important to emphasize that compensatory mitigation does not relieve project developers and permitting agencies of their obligation to avoid and minimize environmental impacts. This Framework endorses the principle known as the "mitigation hierarchy," which holds that decision makers should consider the elements of environmental mitigation in the following order of priority:

1. Avoid environmental impacts through project siting and design;
2. Minimize the impacts during construction, operation. maintenance, and decommissioning by implementing appropriate conservation measures related to timing and conduct of project activities;
3. Restore areas that have been disturbed or otherwise rectify on-site project-related impacts to the greatest extent practicable; and
4. Compensate for residual impacts (direct and indirect effects that are not mitigated on-site) by providing replacement habitats or other benefits.

This means that compensatory mitigation is addressed only after efforts to avoid, minimize, and mitigate the impacts have been addressed. It also should be noted that significant impacts to habitat areas that support special functions and values for sage-grouse may simply not be replaceable through mitigation and therefore the best course may be to avoid those areas altogether.

### *B. Need for an Idaho Compensatory Mitigation Program*

In recent years, the state of Idaho has seen an increase in the number of major infrastructure projects proposed in the state's sagebrush steppe ecosystems. Several current proposals involve high voltage transmission lines that would cross over hundreds of miles of sage-grouse habitat. Large scale energy infrastructure projects such as wind farms may also affect large areas of sagegrouse habitat. Where these projects are located at least partially on federally managed public lands they will be required by federal law to go through an extensive environmental review process under NEPA before relevant federal permits are issued. The NEPA process requires the permitting agencies to consider the projects' environmental effects (both positive and negative), alternatives, and potential mitigation measures. Impacts on sage-grouse will be one of the topics analyzed in the NEPA process.

Even after efforts are taken to avoid and minimize impacts, it is possible that some of these infrastructure projects will degrade some sage-grouse habitat, cause direct sage-grouse mortality, or lead to indirect effects such as avoidance of previously occupied habitat. The extent to which project developers and regulators adopt compensatory mitigation as a means to offset these impacts is not fully known. However, it is likely that at least some developers and regulators will seek to implement compensatory mitigation to benefit sage-grouse and their habitats. Energy companies and other developers face daunting challenges in carrying out compensatory mitigation for sage-grouse habitat. Just identifying specific mitigation actions requires a major effort. Actually implementing sagebrush restoration and enhancement projects is even more difficult and expensive – typically involving years of effort and a significant risk of failure. Delivering this type of technically complex environmental mitigation may be well outside the core business of many infrastructure developers.

### *C. Advantages of the Mitigation Framework*

The Mitigation Framework proposes to respond to these challenges by creating a statewide program to deliver scientifically sound compensatory mitigation for multiple projects. Project developers and regulators would no longer have to design, fund and implement their own mitigation programs. Instead, they would have the option of contributing money to a central fund overseen by agencies with expertise in habitat management and non-governmental partners with similar experience. This approach to compensatory mitigation offers three major advantages. The first advantage stems from the increased efficiency of an Idaho-wide mitigation program compared with fragmented, project-by-project mitigation programs. Mitigation efforts require a significant investment in planning, administration, project oversight, and monitoring. The Mitigation Framework would consolidate these functions, thus avoiding needless duplication. The second advantage is that a state mitigation fund can be used for sage-grouse conservation more strategically and at a greater scale than project-by-project mitigation. As described in more detail below, the Mitigation Framework would fund sage-grouse habitat protection and restoration projects in accordance with a statewide strategy that uses landscape-scale analyses to identify the specific measures and habitats that will provide the greatest benefit for Idaho sagegrouse populations. This Idaho-based mitigation strategy will be integrated with other conservation strategies throughout the range of sage-grouse to ensure that actions taken in Idaho benefit the species as a whole. Third, this method can engage the capacity and competence of natural resources agencies, local governments, private companies, and non-governmental organizations. The Mitigation Framework proposes to enlist these entities in shaping Idaho's strategy, developing criteria for use of the fund, and proposing and implementing habitat protection and restoration projects. The benefits of the Mitigation Framework can be summarized as follows:

*Benefits for Project Developers:*
An efficient and reliable mechanism for meeting compensatory mitigation objectives and permit conditions; and increased certainty regarding project costs.

*Benefits for Regulatory Agencies:*
Increased certainty that in-lieu fees will result in strategic "on-the-ground" mitigation actions that benefit sage-grouse.

*Benefits for Sage-Grouse:*
Increased certainty that scientifically sound mitigation actions that benefit sage-grouse and offset impacts and habitat losses associated with infrastructure development will be implemented.

### *D. Ensuring Accountability*

In-lieu fee compensatory mitigation does pose one potentially significant drawback that must be acknowledged and addressed: a poorly designed program may lack accountability for delivering meaningful on-the-ground benefits for sage-grouse. Simply having a project developer contribute to an in-lieu fee mitigation account does not by itself compensate for the sage-grouse impacts caused by the project. Actual mitigation is possible only after well-conceived habitat protection and restoration projects are planned, funded, implemented, monitored, and successful in achieving stated objectives. The Mitigation Framework seeks to ensure accountability by adopting a series of rigorous and transparent procedures. As described below, the Framework would: (1) ensure that program administration and monitoring functions are adequately funded; (2) provide technically sound guidelines for estimating the costs of delivering compensatory mitigation; (3) establish a science-based statewide strategy to guide the program; (4) develop project selection criteria and a request for proposals based on the strategy; (5) require monitoring of the implementation and effectiveness of mitigation actions funded by the program; (6) track benefits the Mitigation

Framework program provides to sage-grouse in Idaho; and (7) require periodic evaluation of the program. Taken together, these procedures provide a high degree of certainty that the Mitigation Framework will be able to turn in-lieu fee payments into tangible, lasting compensatory mitigation for sage-grouse. As described in greater detail in Section E, below, project developers that seek to use the Mitigation Framework will need to show two things. First, they will need to show that their projects' impacts on sage-grouse and their habitats have been evaluated using a scientifically sound process. Second, they will need to show that their contributions to the mitigation fund reflect the Mitigation Framework's compensation guidelines to ensure that funding will be adequate to offset project impacts. Having demonstrated those things, the project developers should then be able to rely on their in-lieu fee contribution to the mitigation account as satisfying their compensatory mitigation objectives or obligations.

## II. Core Elements of Idaho Sage-Grouse Mitigation Program

### *A. Program Objectives*

- Provide a credible, efficient, transparent, and flexible mechanism to implement compensatory mitigation;
- Ensure that sage-grouse impacts are offset by mitigation actions that benefit the sage-grouse and their habitats;
- Provide increased certainty for developers and agencies;
- Involve private and public partners in crafting solutions;
- Provide developers the opportunity to offset project impacts on sage-grouse and sage-grouse habitat, and provide a consistent mitigation mechanism that can be evaluated in future reviews of the species' status; and
- Evaluate issues based on best available scientific information while acknowledging and responding to scientific uncertainty.

***B. Scope***
The Mitigation Framework proposes to mitigate for impacts to Idaho sage-grouse and their habitats in Idaho. The initial focus of the Mitigation Framework is on sage-grouse. However, this program can be readily adapted to provide compensatory mitigation for other sagebrush obligate and associate species, such as pygmy rabbits, if project developers and regulators call for such mitigation.

Whether this Framework is suited for mitigation of impacts to a broader suite of species or natural features has not been evaluated. It should be noted that some subcommittee members expect to advocate in other forums that compensatory mitigation should extend beyond sagegrouse. The Mitigation Framework focuses on infrastructure projects because this type of development is the most likely to give rise to compensatory mitigation under existing environmental policies. As used here, the term "infrastructure" refers to building structures that significantly disturb sage-grouse habitat, including but not limited to projects for electricity transmission, energy generation, pipeline conveyance, transportation, communications, and similar purposes. The Mitigation Framework is not intended to apply to existing projects that are not changing in scope or to the renewal of on-going activities, such as grazing permits. In addition, the Framework is not suited to projects with minor impacts because their contributions to the mitigation program would be too small to justify the effort needed to establish and administer inlieu fee payments.

***C. Integration with Environmental Review Procedures***
The Mitigation Framework does not alter the legal standards or procedures for review and approval of infrastructure projects. Rather, the Framework offers an option that project developers and/or regulators may choose for implementing mitigation plans and agency permit conditions. The Mitigation Framework is intended to complement the environmental review process conducted pursuant to NEPA and other federal environmental laws as well as county land use planning authorities. Many energy and other infrastructure projects undergo review and approval at the county level. The issues examined and the level of environmental analysis varies widely among individual counties and individual developers. If a county or developer decides to address sage-grouse impacts, it will be able to use the Mitigation Framework as a mechanism for meeting compensatory mitigation objectives that may arise from the county permitting process.

***D. Mitigation Strategy***
The next step focuses on the Mitigation Team's task of developing a statewide, science-based strategy that will guide the use of the mitigation fund. The mitigation program strategy would establish priorities for the use of compensatory mitigation funding based on factors/risks identified in the U.S. Fish and Wildlife Service's 12-Month Findings for Petitions to List Greater Sage-Grouse (*Centrocercus urophasianus*) as Threatened or Endangered (USFWS 2010) and in the Conservation Plan for Greater Sage-grouse in Idaho (2006). The strategy sets mitigation priorities with a landscape view of sage-grouse needs and highlights mitigation opportunities in Idaho based on best available science. In setting priorities, the strategy considers species and community size, landscape condition, and regional context. The strategy is responsive to the threats and risks described in the sage-grouse 12- month

findings. The strategy will also generally describe the types of mitigation actions, project specifications, and best practices that are likely to produce measureable benefits for sage-grouse habitat. Finally, the strategy addresses both implementation and effectiveness monitoring requirements for mitigation actions funded through the program. The Mitigation Framework's strategy will draw heavily from the State of Idaho's sage-grouse conservation plan but has a narrower focus. It is intended to provide the specific guidance on program priorities, accepted mitigation measures, and geographic areas of emphasis that potential mitigation project sponsors will need to know when they apply for funds. The strategy plays a crucial role in steering mitigation funding to those activities and places that can provide the most effective benefits for Idaho sage-grouse populations consistent with strategies to increase the viability of the species throughout its range. To this end, the strategy will address one of the major policy questions that arise in the design of compensatory mitigation systems: how closely should the mitigation actions be linked to the type and location of the habitat that was originally affected by the infrastructure project. Stated in the alternative, does removal of the mitigation action from the area of impact improve the effectiveness of or benefit from the action. Some compensatory mitigation systems place a heavy emphasis on this link by favoring "in-kind" and "on-site" compensatory mitigation over "out-of-kind" and "off-site" compensatory mitigation. The subcommittee members generally favor an approach that allows funding to flow to the projects and locations within Idaho that will provide the greatest overall positive impact on sage-grouse populations. The Mitigation Framework calls for a monitoring program that would assess habitat gains provided by mitigation actions and compare them with the mitigation objectives of the participating infrastructure projects. The nature and purpose of this monitoring is described more fully in Mitigation Program Step 4, below.

Once the strategy is complete, the Mitigation Team will develop project ranking criteria and procedures that will guide the selection of the mitigation actions that will receive funding. The goal is to fund projects that provide high quality, lasting benefits based on landscape scale analyses that actually compensate for project impacts.

### *E. Compensation Guidelines*

The Mitigation Framework Program will develop guidelines that may be used by developers and/or regulators to determine the cost of meeting their compensatory mitigation objectives. These compensatory mitigation objectives determine the extent of compensatory mitigation for each project and are generally incorporated into project plans or permits. The compensation guidelines will provide transparent, technically sound principles for determining how much it costs to deliver habitat mitigation for sage-grouse. In other words, the guidelines will represent best estimates of the true cost of implementing the mitigation actions needed to meet each project's compensatory mitigation objectives. The guidelines may be used by the project developer and the Mitigation Framework Program Administrator to establish the in-lieu fee that the developer will contribute to the mitigation fund. Specific valuation methods will be developed at a later time and will likely draw from compensatory mitigation systems used elsewhere in the West. Although the details have yet to be worked out, the following outline illustrates the core concepts and principles (shown in bold lettering) that are likely to be employed by the MOA parties in setting the Mitigation Framework's in-lieu fee structure.

- A common unit of measurement would be established for describing and tracking both the project impacts and the benefits of any compensatory mitigation actions. This unit of measurement can be a physical unit such as "acres impacted" or more specifically "acres of summer brood rearing habitat impacted" or "habitat units" lost.
- While the "common unit of measurement" noted above addresses the area of habitat impacted and mitigated, habitat compensation ratios are used to address the quality of the habitat affected by the infrastructure project. These ratios could specify the number of acres of mitigation required per acre of impacted habitat based on the size, habitat quality/condition and function of the impacted habitat; for more critical or important habitat, more mitigation acres might be required. Thus, habitats with higher quality and importance could have higher compensation ratios.
- Several factors are taken into account in calculating how much it will cost to actually compensate for the acres or habitat units. The recommended approach is to evaluate on the costs of implementing a conceptual portfolio of potential mitigation actions or offset activities that provide benefits for sage-grouse. This portfolio of model projects would include a balanced mix of accepted habitat protection and restoration measures reflecting the types of projects expected to be funded by the mitigation program (in accordance with the strategy discussed above). Examples of projects in this portfolio may include such actions as restoring sagebrush canopy and a native understory on recently burned land, improving riparian areas and wet meadows in early brood-rearing habitat, conservation easements to prevent habitat loss, and land management practices that improve sage-grouse habitat. Project costs include the full range of expenses needed to complete all phases of the mitigation action, including administration and monitoring. The average costs of these model mitigation actions per acre or habitat unit is the foundation of the in-lieu fee calculation.
- In addition, the in-lieu fee should also be adjusted to take into consideration the issue of lag time –the time between when habitat is lost at the impacted site relative to when habitat functions are gained at the compensation site.
- The fee also needs to account for contingencies associated with delivering compensatory mitigation, including an estimate of the risk of failure (i.e., the probability that offsite mitigation will not result in any measureable conservation outcomes) for each mitigation site or project.
- In addition to the fee calculated above, costs for establishing and operating the program, including travel, technical consultation and monitoring of program effectiveness must be included. This overhead fee could range from 5-15% depending on the size and complexity of the proposed mitigation program.

## *F. Program Structure and Oversight*

The Mitigation Framework would be established through a memorandum of agreement (MOA) among the entities that would participate in its implementation. The MOA would define the specific roles and responsibilities, procedures, and tasks needed to operate an Idaho-based compensatory mitigation program. The MOA would serve as a joint powers agreement for state and local government parties. The MOA would establish the following administrative structure for the Mitigation Framework:

**1. Core Team:** A core group would oversee the Mitigation Framework program and provide policy-level guidance for the Science Team and Fund Administrator, described below. The Core Team would be composed of three to seven representatives of diverse perspectives among the MOA signatories.

**2. Science Team:** A team of experts drawn from MOA signatories and other targeted organizations will administer the science-based and technical aspects of the program. The Science Team would consist of several individuals with expertise in relevant areas such as habitat protection and restoration, landscape ecology/spatial analysis, wildlife biology, sage-grouse ecology, project development, and mitigation policy.

The Team would focus on developing the policies and statewide strategy that will guide the program, making requests for mitigation project proposals (RFPs), ranking mitigation proposals that will receive funding, tracking monitoring reports and project benefits, and evaluating program success.

**3. Program Administrator:** A program administrator will be responsible for fund management and administrative tasks. The program administrator will provide administrative support for the Mitigation Team, manage the mitigation account, and administer grants, contracts, and other agreements.

**4. Advisory Committee:** A broader advisory committee consisting of agencies, companies and organizations with the skills and commitment that will provide useful advice to the Core Team regarding the implementation of the Mitigation Framework. The specific make up of each of these groups will be determined at a later time. Potential participants in the Mitigation Framework include but are not limited to representatives of:

*State of Idaho:*
Department of Fish and Game
Office of Energy Resources
Office of Species Conservation
Idaho Department of Lands

*United States:*
Bureau of Land Management
U.S. Fish and Wildlife Service
U.S. Forest Service
Natural Resources Cons. Service

*Energy Companies:*
Idaho Power
Ridgeline Energy
Idaho Tribes
Idaho Sage-Grouse Advisory Committee
Sage-Grouse Local Working Groups

*Non-Governmental Organizations:*
Idaho Conservation League
The Nature Conservancy
Idaho Counties
Public Land Users (e.g., grazing interests)

### *G. Funding the Mitigation Program*

The costs of administering the program will be sustained by the project developers that seek compensatory mitigation. Therefore, a portion of the in-lieu fee that project developers contribute to the mitigation account will be applied for program administration. As noted above, protecting and restoring sagebrush habitats are time consuming and expensive undertakings. Ensuring that these activities are conducted with strong oversight should be viewed as an exceptionally wise investment.

## III. Mitigation Program Steps

The Mitigation Framework envisions a five-step process for developing, implementing, and monitoring compensatory mitigation.

### *A. Step 1 – Assessment of Project Impacts and Development of Mitigation Objectives*

Assessment of project impacts should be undertaken by the project developers proposing new infrastructure projects and the government agencies that conduct environmental reviews of those projects. Although the Mitigation Framework process is not responsible for this step, it is nevertheless crucial to the integrity of the mitigation program. Specifically, the Framework's success in achieving its goal of offsetting major infrastructure project impacts on sage-grouse depends on an accurate accounting of those impacts. For many projects, this analysis will be done as part of the environmental review procedures required by NEPA. As noted above, NEPA requires federal agencies to address the full range of direct, indirect and cumulative impacts of the proposed project, alternatives to the proposed action, and potential mitigation before they act on permit applications. Once impacts have been assessed and compensatory mitigation objectives set, the project developer is ready to engage the Mitigation Framework, starting with determining the developer's in-lieu fee contribution.

### *B. Step 2 – Determine the In-lieu Fee Contribution*

The goal of Step 2 is to use valuation techniques, such as the guidelines presented above, to convert the complex range of project impacts, including direct, indirect and cumulative impacts, into monetary terms that become the basis for the in-lieu fee payment. The accepted in-lieu fee compensatory mitigation plan could be a condition of the instrument approving the project (FONSI, ROD, right-of-way grant, conditional use permit, etc.) and thus legally requires the project developer comply with the approved mitigation plan.

### *C. Step 3 – Commitment of Mitigation Funds by Project Developer*

Infrastructure project developers can employ the Mitigation Framework by entering into an agreement with the program administrator with regard to a specific infrastructure project. This project agreement sets forth the parties' respective responsibilities, including the project developer's commitment to pay the in-lieu fee. Importantly, the agreement provides that the project developer's funds can only be used for the purposes set forth in the Mitigation Framework. The agreement may also include "conditions" as requested by regulatory agencies or project developers. For instance, the agreement might provide that the in lieu fee will be used to fund mitigation actions in specific geographic areas in order to meet permit requirements. The program administrator, based on consultation with the MOA parties, may decline to enter into an agreement that is inconsistent with the Mitigation Framework principles or includes conditions that are burdensome or unworkable. Once the agreement specifying the payment structure and schedule is signed, the project developer makes the required in-lieu fee deposits to an interest bearing account managed by the program administrator. After the completion of this step, the project developer is no longer engaged in the Mitigation Framework – unless it has decided to participate as a MOA party.

### *D. Step 4 – Issue Request for Proposals (RFP) and Select, Implement, and Monitor Mitigation Actions*

At least at annual intervals, the Mitigation Team will issue an RFP that invite private companies, non-governmental organizations, and agencies to submit proposals for sage-grouse habitat protection, restoration, and/or enhancement actions. The RFP will provide guidance to mitigation project sponsors on program priorities and criteria. These priorities and criteria will be drawn from the mitigation program strategy including identification of geographic areas where mitigation might provide the greatest benefits as well as identification of the threats that present the highest risk to the species or its core habitat. The Mitigation Team should also reach out to federal, state, and local agencies, non-governmental organizations and the general public in order to facilitate discussion, engage stakeholders, raise awareness of the program and generate responses to the RFP. The RFP will solicit project proposals that contain an operation or implementation plan and address at least the following elements:

- Geographic area;
- Threats addressed and how the mitigation action project will offset impacts resulting from those threats;
- An analysis of current sage-grouse conditions in the area;
- Resource goals and objectives the mitigation action project will seek to provide;
- A description of any coordination with federal, state, tribal and local resource management and regulatory authorities or other stakeholder involvement required to complete the mitigation action (e.g., requirement for NEPA compliance or county permit);
- A description of recent or proposed projects and events in the vicinity of the proposed project, if any, such as fire rehabilitation treatments, restoration or enhancement treatments or other activities that complement the effectiveness or intent of the proposed, mitigation action;
- A description of the long term protection, management, stewardship for the project being implemented, and the entity responsible for these activities; and
- A commitment to periodic evaluation and reporting on the progress of the project in meeting stated goals and objectives, including a process for adaptively redirecting the project if necessary.

When selecting projects, the Mitigation Team will estimate the biological benefits of the projects activities, the likely success of those activities, the duration of benefit expected and measure those benefits in relation to the strategy and RFP objectives. Mitigation Team and the program administrator will work together on continuing program administration and oversight including annual reporting of program activities, expenditures, and benefits. An annual program report will describe program activities, budget, and assessment of whether the mitigation strategy and associated projects are benefitting sage-grouse and at what level or scale. The Mitigation Team and/or Program Administrator should implement a monitoring program to measure and validate whether project-specific objectives have been met. Monitoring is required of all compensatory mitigation actions to determine if the project is meeting its performance standards and objectives. As mentioned above, at regular intervals, the total habitat and/or population gains provided by the programs will be compared with the habitat/population losses associated with the participating infrastructure projects. The purpose of this comparison is to evaluate the mitigation program and make any necessary program adjustments – particularly if the monitoring shows that the mitigation benefits are not compensating for habitat losses. This comparison will not be a basis for imposing new, unexpected requirements on the infrastructure project developers.

### F.2.4 Conclusion

The framework of policies, principles and procedures outlined above are meant to start a dialogue among parties engaged in sage-grouse conservation and infrastructure development. If these parties agree with the Mitigation Subcommittee that there is great value in establishing an Idaho-based compensatory mitigation program, then this framework will mark the beginning of an inclusive effort to fill in the details and complete the tasks needed to bring such a program into being. We have confidence in our collective ability to create a compensatory mitigation program that will benefit infrastructure developers, agencies, conservation interests, and – not least – Idaho's sage-grouse.

## F.3 Part III – Idaho - Net Conservation Gain Process

### F.3.1 Introduction

The Net Conservation Gain strategy is a means of assuring that proposed anthropogenic activities, when approved and implemented will not result in long-term degradation of Greater Sage-Grouse habitat or population and will have a net conservation benefit to the species. The steps below describe a screening process for review of proposed anthropogenic activities. The goal of the process is to provide a consistent approach regardless of the administrative location of the project and to ensure that authorization of these projects will not contribute to the decline of the species. Though the initial Steps (1-6) are done prior to initiating the NEPA process, the authorized officer must ensure that appropriate documentation regarding the rationale and conclusion for each is included in the administrative record.

The flow chart provides for a sequential screening of proposals. However, Steps 2-6 can be done concurrently.

### F.3.2 Step 1

This screening process is initiated upon formal submittal of a proposal for authorization for use of federal lands (BLM or Forest Service). The actual documentation would include, at a minimum, a description of the location, scale of the project, and timing of the disturbance and would be consistent with existing protocol and procedures for the specific type of use. It is anticipated that the proposals would be submitted by a third party.

### F.3.3 Step 2

This initial review would evaluate whether the proposal would be allowed as prescribed in the Greater-Sage-Grouse Land Use Plan Amendment. For example, certain activities are prohibited in suitable habitat, such as wind or solar energy development. If the proposal is an activity that is specific prohibited, the submitter would be informed that the proposal is being rejected since it would not be consistent with the Land Use Plan, regardless of the design of the project.

In addition to consistency with program allocations, the Land Use Plan identifies a limit on the amount of disturbance that is allowed within a 'biological significant unit' (BSU). If current disturbance within the affected unit exceeds this threshold, the project should be deferred until such time as the amount of disturbance within the area has been reduced, through restoration or other management actions.

### F.3.4 Step 3

In reviewing a proposal, determine if the project will have a direct or indirect impact on population or habitat (PPH or PGH). This can be done by:

1. Reviewing Greater Sage-Grouse Habitat maps.
2. Reviewing the 'Base Line Environment Report' (USGS) which identifies the area of direct and indirect effects for various anthropogenic activities.
3. Consultation with agency, Fish and Wildlife Service, or State Agency wildlife biologist.
4. Reviewing the standard and guidelines in the plan amendments (such as buffer distances for the proposed activity).
5. Other methods

If the proposal will not have a direct or indirect impact on either the habitat or population, proceed with the appropriate process for review, decision, and implementation of the project.

### F.3.5 Step 4

If the project could have a direct or indirect impact of sage-grouse habitat or population, evaluate whether the proposal can be relocated so as to not have the indirect or direct impact and still achieve the intent of the proposal. This Step does not consider redesign of the project as a means of not having direct or indirect impacts but rather authorization of the project in a physical location that will not impact Greater Sage-grouse. If the project can be relocated so as to not have an impact on sage-grouse and still achieve objectives of the proposal, inform applicant and proceed with the appropriate process for review, decision, and implementation of the relocated project.

### F.3.6 Step 5

If the preliminary review of the proposal concludes that there may be impacts to sage-grouse habitat and/or population, and the project cannot be effectively relocated to eliminate these impacts; evaluate whether the agency has the authority to modify or deny the project. If the agency does NOT have the discretionary authority to modify or deny the proposal, proceed with the authorization process (NEPA) and include appropriate mitigation requirements that avoid, minimize, or compensate for impacts to sage-grouse habitat and/or populations. Mitigations could include a combination of actions such as timing of disturbance, design modifications of the proposal, site disturbance restoration, and compensatory mitigation actions.

### F.3.7 Step 6

If the agency has the discretionary authority to deny the project and after careful screening of the proposal (Steps 1-4) has determined that direct and indirect impacts cannot be eliminated, evaluate the proposal to determine if the adverse impacts can be reduced, minimized or compensated. If the impacts cannot be effectively reduced, minimized or compensated within the BSU, reject or defer the proposal. The criteria for determining this situation would include but not limited to:

- Natural disturbance within the BSU is significant and additional activities within the area would adversely impact the species.
- The current trend within the BSU is down and additional impacts, whether mitigated or not, could lead to further decline of the species or habitat.
- The proposed compensatory mitigation has proven to be ineffective or is unproven is terms of science based approach.
- The additional impacts, after applying effective compensatory mitigation, would exceed the disturbance threshold for the BSU.
- The project would impact habitat that has been determined, through monitoring, to be a limiting factor for species sustainability within the BSU.
- Other site specific criteria that determined the project would lead to a downward trend to the current species population or habitat with the BSU.

If compensatory mitigation can be applied to provide for a net conservation benefit to the species, proceed with the design of the compensatory mitigation plan and authorization (NEPA) of the Project. The authorization process could identify issues that may require additional mitigation or denial/deferring of the project based on site specific impacts to the Greater Sage-grouse.

# Appendix G

## Fluid Mineral Lease Stipulations, Waivers, Modifications, and Exceptions

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# G. Fluid Mineral Lease Stipulations, Waivers, Modifications, and Exceptions

This appendix lists surface use stipulations for new fluid mineral (oil and gas, and geothermal) leases referred to throughout this Proposed Land Use Plan Amendment (LUPA) and analyzed in various places in the Final Environmental Impact Statement (FEIS). This Appendix brings the waivers, modifications and exceptions to one location to simplify plan implementation.

Surface-disturbing activities are those that normally result in more than negligible disturbance to public lands. These activities normally involve disturbance to soils and vegetation to the extent that reclamation is required. They include, but are not limited to, the use of mechanized earth-moving equipment; truck-mounted drilling equipment; certain geophysical exploration activities; off-road vehicle travel in areas designated as limited or closed to off-highway vehicle (OHV) use; placement of surface facilities such as utilities, pipelines, structures, and geothermal and oil and gas wells; new road construction; and use of pyrotechnics, explosives, and hazardous chemicals. Surface-disturbing activities would not include cross-country hiking or driving on designated routes.

## G.1 Description of Lease Stipulations

**Table G.1** shows the lease stipulations for the Proposed Plan, including exceptions, modifications, and waivers. Three types of surface use stipulations could be applied to fluid mineral leases: (1) no surface occupancy (NSO), (2) timing limitations (TL), and (3) controlled surface use (CSU). All stipulations for other resources, besides Greater Sage-Grouse (sage-grouse or GRSG), included in the existing land use plans would still be applicable.

In areas identified as subject to NSO, surface-disturbing activities would not be allowed.

In areas identified as subject to CSU, proposed actions would be required to comply with the controls or constraints specified. The controls would be applicable to all surface-disturbing activities in those areas.

In areas identified as subject to TL, surface-disturbing activities would not be allowed during identified time frames. TL areas would remain open to operational and maintenance activities, including associated vehicle travel, during the restricted time period unless otherwise specified in the stipulation.

## G.2 Relief from Stipulations

With regards to fluid minerals, surface use stipulations could have exceptions, modifications, or waivers applied with approval by the authorized officer.

### G.2.1 Exception

A site-specific, one-time exception to a surface use stipulation may be granted by the authorized officer only with the concurrence of the State Director, in consultation with the appropriate state agency (IDFG), if the operator submits a plan that demonstrates that impacts from the proposed action:

i. Would not have direct, indirect, or cumulative effects on GRSG or its habitat; or,

ii. Is proposed to be undertaken as an alternative to a similar action occurring on a nearby parcel, and would provide a clear conservation gain to GRSG. For those leases that occur on National Forest System lands, the Forest Service authorized officer would consult with the appropriate state agency to determine if the submitted plan demonstrates that impacts from the proposed action meet the net conservation gain threshold, are minimal, or have no direct, indirect, or cumulative effects on GRSG habitat. The Forest Service authorized officer would recommend to the BLM authorized officer to deny or accept the proposed exception.

### G.2.2 Modification

The boundaries of the stipulated area may be modified if the authorized officer, in consultation with the appropriate state agency (IDWR), determines that portions of the area can be occupied without adversely affecting GRSG population or habitat, or the area no longer contains GRSG use and habitat. The dates for timing limitations may be modified if new information indicates the dates are not valid for the leasehold.

For those leases that occur on National Forest System lands, the Forest Service authorized officer would consult with the appropriate state agency to determine if portions of the area can be occupied without adversely affecting GRSG population or habitat, or the area no longer contains GRSG use and habitat. The Forest Service authorized officer would recommend to the BLM authorized officer to deny or accept the proposed modification.

### G.2.3 Waiver

The stipulation may be waived if the authorized officer, in consultation with the appropriate state agency (IDWR), determines that the entire leasehold no longer contains suitable habitat nor is used by GRSG.

For those leases that occur on National Forest System lands, the Forest Service authorized officer would consult with the appropriate state agency to determine if determines that the entire leasehold no longer contains suitable habitat nor is used by GRSG. The Forest Service authorized officer would recommend to the BLM authorized officer to deny or accept the proposed waiver.

### G.2.4 Inclusion in Environmental Analysis

The environmental analysis document prepared for site-specific proposals such as fluid minerals (oil and gas, and geothermal) development (i.e., operations plans for geothermal drilling permit or master development plans for applications for permit to drill or sundry notices) also would need to address proposals to exempt, modify, or waive a surface use stipulation.

On National Forest System lands, this process would follow regulatory requirements at 36 CFR 228.104. This process includes ensuring compliance with NEPA, and assessing if the action would be consistent with applicable federal laws, the current land and resource management plan, and meet management objectives.

On BLM-administered lands, to exempt, modify, or waive a stipulation, the environmental analysis document would have to show that (1) the circumstances or relative resource values in the area had changed following issuance of the lease, (2) less restrictive requirements could be developed to protect the resource of concern, and (3) operations could be conducted without causing unacceptable impacts.

## G.3 Standard Terms and Conditions

All surface-disturbing activities are subject to the standard terms and conditions of an oil and gas or geothermal lease. These include the stipulations that are required for proposed actions in order to comply with the Endangered Species Act and with the Cultural Resources Protection Act. The standard terms and conditions of a fluid mineral lease provide for relocation of proposed operations up to 200 meters and for prohibiting surface-disturbing operations for a period not to exceed 60 days.

**Table G.1**
**Proposed Plan –Fluid Mineral Stipulations for Greater Sage-Grouse Habitat**

| | |
|---|---|
| **Language from Land Use Plan Amendment** | Idaho and Montana: Sagebrush Focal Areas – Managed as No Surface Occupancy (NSO), without waiver, exception, or modification, for fluid mineral leasing (oil, gas, and geothermal). |
| **Objective** | To protect Greater Sage-Grouse habitat within the Sagebrush Focal Areas (SFAs). |
| **Stipulation Type** | Major Constraint |
| **Stipulation** | No Surface Occupancy is allowed. |
| **Exception** | None |
| **Modification** | None |
| **Waiver** | None |
| | |
| **Language from Land Use Plan Amendment** | Priority Habitat Management Areas (PHMA) and Important Habitat Management Areas (IHMA) outside of Sagebrush Focal Areas would be open to mineral leasing and development and geophysical exploration subject to NSO with a limited exception. |
| **Objective** | To protect Greater Sage-Grouse habitat in Priority Habitat Management Areas (PHMA) |
| **Stipulation Type** | Major Constraint |
| **Stipulation** | No Surface Occupancy is allowed. |
| **Exception** | The Authorized Officer may grant an exception to a fluid mineral lease NSO stipulation only where the proposed action:<br>i. Would not have direct, indirect, or cumulative effects on GRSG or its habitat; or,<br>ii. Is proposed to be undertaken as an alternative to a similar action occurring on a nearby parcel, and would provide a clear conservation gain to GRSG.<br><br>Exceptions based on conservation gain (ii) may only be considered in (a) PHMAs of mixed ownership where federal minerals underlie less than fifty percent of the total surface, or (b) areas of the public lands where the proposed exception is an alternative to an action occurring on a nearby parcel subject to a valid Federal fluid mineral lease existing as of the date of this RMP amendment. Exceptions based on conservation gain must also include measures, such as enforceable institutional controls and buffers, sufficient to allow the BLM to conclude that such benefits will endure for the duration of the proposed action's impacts.<br><br>Any exceptions to this lease stipulation may be approved by the Authorized Officer only with the concurrence of the State Director. The Authorized Officer may not grant an exception unless the applicable state wildlife agency, the USFWS, and the BLM unanimously find that the proposed action satisfies (i) or (ii). Such finding shall initially be made by a team of one field biologist or other GRSG expert from each respective agency. In the event the initial finding is not unanimous, the finding may be elevated to the appropriate BLM State Director, USFWS State Ecological Services Director, and state wildlife agency head for final resolution. In the event their finding is not unanimous, the exception will not be granted. Approved exceptions will be made publically available at least quarterly. |
| **Modification** | None |
| **Waiver** | None |

**Table G.1**
**Proposed Plan –Fluid Mineral Stipulations for Greater Sage-Grouse Habitat**

| | |
|---|---|
| **Language from Land Use Plan Amendment** | In General habitat Management Areas (GHMA), parcels would not be offered for lease if buffers and restrictions (including RDFs) preclude development in the leasing area. |
| **Objective** | To avoid disturbance to lekking and roosting sage-grouse in higher elevations, as determined locally. |
| **Stipulation Type** | Controlled Surface Use and Timing Limitations |
| **Stipulation** | Parcels would not be offered for lease if buffers and restrictions (including RDFs) preclude development in the leasing area. |
| **Exception** | RDFs are continuously improving as new science and technology become available and therefore are subject to change. All variations in RDFs would require that at least one of the following be demonstrated in the NEPA analysis associated with the project/activity:<br>• A specific RDF is documented to not be applicable to the site-specific conditions of the project/activity (e.g. due to site limitations or engineering considerations). Economic considerations, such as increased costs, do not necessarily require that an RDF be varied or rendered inapplicable;<br>• An alternative RDF is determined to provide equal or better protection for GRSG or its habitat;<br>• A specific RDF will provide no additional protection to GRSG or its habitat. |
| **Modification** | None. |
| **Waiver** | None. |
| | |
| **Language from Land Use Plan Amendment** | In General habitat Management Areas (GHMA), parcels would not be offered for lease if buffers and restrictions (including RDFs) preclude development in the leasing area. |
| **Objective** | To protect Greater Sage-Grouse leks |
| **Stipulation Type** | Controlled Surface Use (Buffers) |
| **Stipulation** | Activities will be avoided within the following distances from a sage grouse lek:<br>• linear features (roads) within 3.1 miles of leks<br>• infrastructure related to energy development within 3.1 miles of leks.<br>• tall structures (e.g., communication or transmission towers, transmission lines) within 2 miles of leks.<br>• low structures (e.g., fences, rangeland structures) within1.2 miles of leks.<br>• surface disturbance (continuing human activities that alter or remove the natural vegetation) within 3.1 miles of leks.<br>• noise and related disruptive activities including those that do not result in habitat loss (e.g., motorized recreational events) at least 0.25 miles from leks. |
| **Exception** | The BLM may approve actions in GHMA that are within the applicable lek buffer distance identified above only if-<br>• It is not possible to relocate the project outside of the applicable lek buffer-distance(s) identified above;<br>• the BLM determines that a lek buffer-distance other than the applicable distance identified above offers the same or a greater level of protection to GRSG and its habitat, including conservation of seasonal habitat outside of the analyzed buffer area, based on best available science, landscape features, |

**Table G.1**
**Proposed Plan –Fluid Mineral Stipulations for Greater Sage-Grouse Habitat**

| | |
|---|---|
| | and other existing protections, (e.g., land use allocations, state regulations); or<br>• the BLM determines that impacts to GRSG and its habitat are minimized such that the project will cause minor or no new disturbance (ex. co-location with existing authorizations); and<br>• any residual impacts within the lek buffer-distances are addressed through compensatory mitigation measures sufficient to ensure a net conservation gain, as outlined in the Mitigation Strategy (Appendix X). |
| **Modification** | None |
| **Waiver** | None |

# Appendix H

# Fire and Invasives Assessment Tool (FIAT)

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## H. Fire and Invasives Assessment Tool (FIAT)

In the Great Basin Region (WAFWA Management Zones III, IV, and V), the US Fish and Wildlife Service (2013) identified wildfire as a primary threat to Greater Sage-Grouse (GRSG) and its habitat. In particular, it identified wildfire in response to invasive annual grasses and conifer expansion. The Fire and Invasives Assessment Tool (FIAT) provides the BLM and other land management agencies with a framework for prioritizing wildfire management and GRSG habitat conservation.

Supported by US Forest Service General Technical Report 326 (Chambers et. al. 2014; see **Attachment 1**), FIAT provides the BLM and other agencies with a mechanism to identify and prioritize areas within GRSG habitat for potential treatment based on their resistance and resilience characteristics. In the cold desert ecosystem typical throughout the Great Basin, soil moisture and temperature fundamentally influence a landscape's ability to resist environmental change. These factors also influence the landscape's ability to be resilient after long-term ecosystem shifts following a disturbance event, such as wildfire. Low resistance and resilient landscapes are typically characterized by low elevations, south-facing slopes, and porous soils. These areas will likely respond differently to fuels management, wildfire, and subsequent rehabilitation compared to more resistant and resilient landscapes, such as those at higher elevations or on north-facing slopes.

At the resource management planning level, FIAT consists of the following parts:

- The identification of areas at the landscape level, based on national datasets and scientific literature, where the threat to GRSG and its habitat from conifer expansion and wildfire/invasive annual grass is highest
- The identification of regional and local areas where focused wildfire and habitat management is critical to GRSG conservation efforts
- The identification of overarching management strategies for conifer expansion and invasive annual grasses in the areas of habitat recovery/restoration, fuels management, fire operations, and post-fire rehabilitation/emergency stabilization and rehabilitation (ESR)

**Attachment 2** outlines the FIAT landscape-level framework and describes the anticipated process for implementing the resource management strategies in the BLM district office and National Forest Unit. Ultimately, the outcomes of the FIAT process will provide land managers with spatially defined priorities and management protocols for the following:

- Operational decision-making during fires
- Implementation of NEPA projects for invasive annual grass and conifer reduction, fuel breaks, and ESR efforts in GRSG habitat

**Attachment 1**—Chambers et al. 2014 report

**Attachment 2**—Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessment

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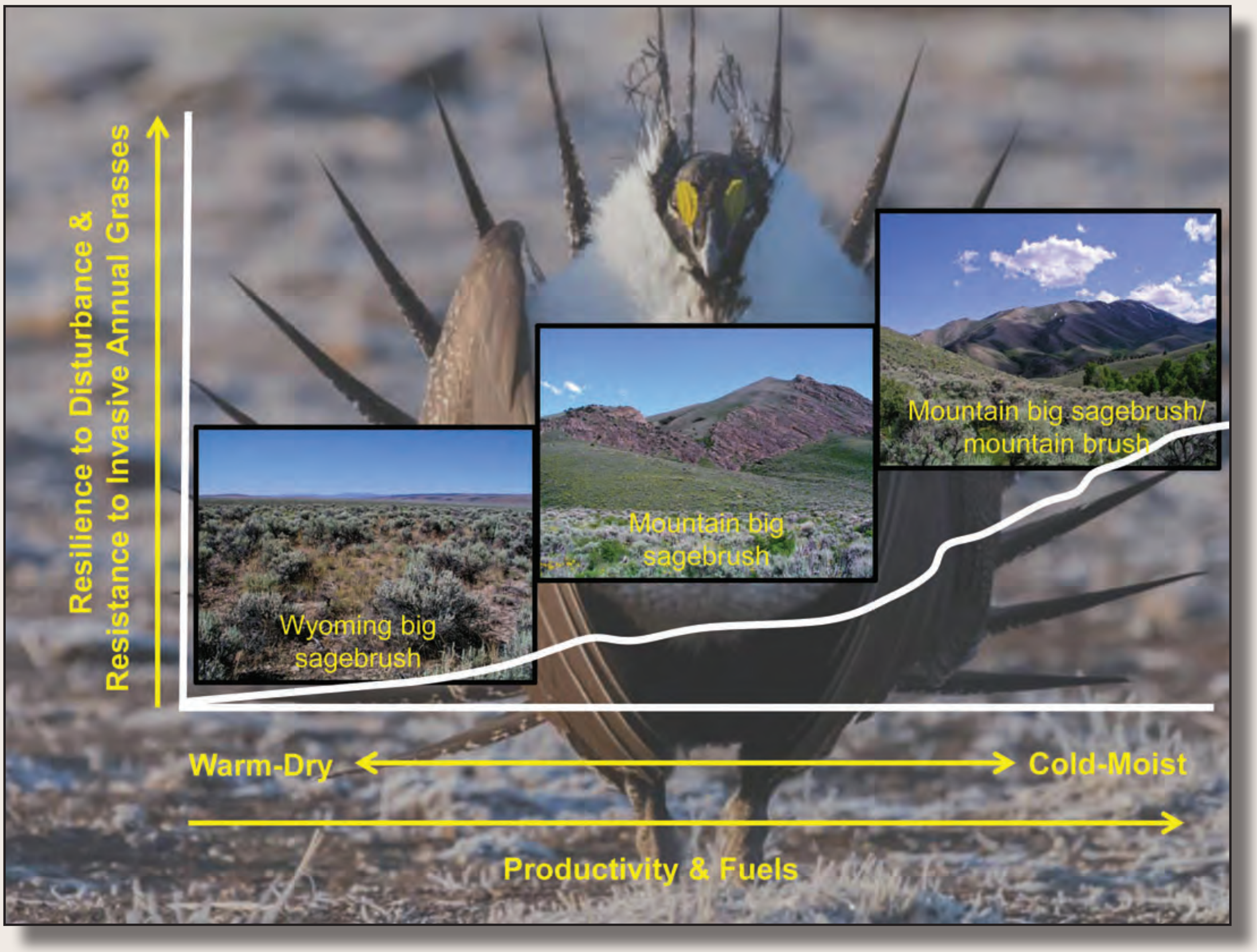
USDA United States Department of Agriculture

# Using Resistance and Resilience Concepts to Reduce Impacts of Invasive Annual Grasses and Altered Fire Regimes on the Sagebrush Ecosystem and Greater Sage-Grouse: A Strategic Multi-Scale Approach

Jeanne C. Chambers, David A. Pyke, Jeremy D. Maestas, Mike Pellant, Chad S. Boyd, Steven B. Campbell, Shawn Espinosa, Douglas W. Havlina, Kenneth E. Mayer, and Amarina Wuenschel




Forest Service Rocky Mountain Research Station General Technical Report RMRS-GTR-326 September 2014

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## Abstract

This Report provides a strategic approach for conservation of sagebrush ecosystems and Greater Sage-Grouse (sage-grouse) that focuses specifically on habitat threats caused by invasive annual grasses and altered fire regimes. It uses information on factors that influence (1) sagebrush ecosystem resilience to disturbance and resistance to invasive annual grasses and (2) distribution, relative abundance, and persistence of sage-grouse populations to develop management strategies at both landscape and site scales. A sage-grouse habitat matrix links relative resilience and resistance of sagebrush ecosystems with sage-grouse habitat requirements for landscape cover of sagebrush to help decision makers assess risks and determine appropriate management strategies at landscape scales. Focal areas for management are assessed by overlaying matrix components with sage-grouse Priority Areas for Conservation (PACs), breeding bird densities, and specific habitat threats. Decision tools are discussed for determining the suitability of focal areas for treatment and the most appropriate management treatments.

**Keywords:** sagebrush habitat, Greater Sage-Grouse, fire effects, invasive annual grasses, management prioritization, conservation, prevention, restoration

***Cover photos:*** *Greater Sage-grouse photo by Rick McEwan; sagebrush habitat photos by Jeanne Chambers.*

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# Using Resistance and Resilience Concepts to Reduce Impacts of Invasive Annual Grasses and Altered Fire Regimes on the Sagebrush Ecosystem and Greater Sage-Grouse: A Strategic Multi-Scale Approach

**Jeanne C. Chambers, David A. Pyke, Jeremy D. Maestas, Mike Pellant, Chad S. Boyd, Steven B. Campbell, Shawn Espinosa, Douglas W. Havlina, Kenneth E. Mayer, and Amarina Wuenschel**

## Introduction

An unprecedented conservation effort is underway across 11 States in the western United States to reduce threats to Greater Sage-Grouse (*Centrocercus urophasianus*; hereafter, sage-grouse) and the sagebrush ecosystems on which they depend (fig. 1). Recent efforts were accelerated by the March 2010 determination that sage-grouse warrant protection under the Federal Endangered Species Act, and by increased emphasis on broad collaboration among state and Federal partners to proactively identify and implement actions to reverse current trends (USFWS 2010, 2013). Conservation success hinges on being able to achieve "the long-term conservation of sage-grouse and healthy sagebrush shrub and native perennial grass and forb communities by maintaining viable, connected, and well-distributed populations and habitats across their range, through threat amelioration, conservation of key habitats, and restoration activities" (USFWS 2013). While strides are being made to curtail a host of threats across the range, habitat loss and fragmentation due to wildfire and invasive plants remain persistent challenges to

**Figure 1.** Greater Sage-Grouse (*Centrocercus urophasianus*) (photo by Charlotte Ganskopp).

achieving desired outcomes – particularly in the western portion of the range (Miller et al. 2011; USFWS 2010; 2013). Management responses to date have not been able to match the scale of this problem. Natural resource managers are seeking coordinated approaches that focus appropriate management actions in the right places to maximize conservation effectiveness (Wisdom and Chambers 2009; Murphy et al. 2013).

Improving our ability to manage for resilience to disturbance and resistance to invasive species is fundamental to achieving long-term sage-grouse conservation objectives. Resilient ecosystems have the capacity to ***regain*** their fundamental structure, processes, and functioning when altered by stressors like drought and disturbances like inappropriate livestock grazing and altered fire regimes (Holling 1973; Allen et al. 2005). Species resilience refers to the ability of a species to recover from stressors and disturbances (USFWS 2013), and is closely linked to ecosystem resilience. Resistant ecosystems have the capacity to ***retain*** their fundamental structure, processes, and functioning when exposed to stresses, disturbances, or invasive species (Folke et al. 2004). Resistance to invasion by nonnative plants is increasingly important in sagebrush ecosystems; it is a function of the abiotic and biotic attributes and ecological processes of an ecosystem that limit the population growth of an invading species (D'Antonio and Thomsen 2004**)**. A detailed explanation of the factors that influence resilience and resistance in sagebrush ecosystems is found in Chambers et al. 2014.

In general, species are likely to be more resilient if large populations exist in large blocks of high quality habitat across the full breadth of environmental variability to which the species is adapted (Redford et al. 2011). Because sage-grouse are a broadly distributed and often wide-ranging species that may move long-distances between seasonal habitats (Connelly et al. 2011a,b), a strategic approach that integrates both landscape prioritization and site-scale decision tools is needed. This document develops such an approach for the conservation of sagebrush habitats across the range of sage-grouse with an emphasis on the western portion of the range. In recent years, information and tools have been developed that significantly increase our understanding of factors that influence the resilience of sagebrush ecosystems and the distribution of sage-grouse populations, and that allow us to strategically prioritize management activities where they are most likely to be effective and to benefit the species. Although the emphasis of this Report is on the western portion of the sage-grouse range, the approach has management applicability to other sagebrush ecosystems.

In this report, we briefly review causes and effects of invasive annual grasses and altered fire regimes, and then discuss factors that determine resilience to disturbances like wildfire and resistance to invasive annual grasses in sagebrush ecosystems. We illustrate how an understanding of resilience and resistance, sagebrush habitat requirements for sage-grouse, and consequences that invasive annual grasses and wildfire have on sage-grouse populations can be used to develop management strategies at both landscape and site scales. A sage-grouse habitat matrix is provided that links relative resilience and resistance with habitat requirements for landscape cover of sagebrush to both identify priority areas for management and determine effective management strategies at landscape scales. An approach for assessing focal areas for sage-grouse habitat management is described that overlays Priority Areas for Conservation (PACs) and breeding bird densities with resilience and resistance and habitat suitability to spatially link sage-grouse populations with habitat conditions and risks. The use of this approach is illustrated for the western portion of the range and for a diverse area in the northeast corner of Nevada. It concludes with a discussion of the tools available for determining the suitability of focal areas for treatment and the most appropriate management treatments. Throughout the document, the emphasis is on using this approach to guide and assist fire operations, fuels management, post-fire rehabilitation, and habitat restoration activities to maintain or enhance sage-grouse habitat.

# Threats of Invasive Annual Grasses and Altered Fire Regimes to Sagebrush Ecosystems and Sage-Grouse

## Effects on Sagebrush Ecosystems

Sage-grouse habitat loss and fragmentation due to wildfire and invasive plants are widely recognized as two of the most significant challenges to conservation of the species, particularly in the western portion of the range (Miller et al. 2011; USFWS 2010, 2013). During pre-settlement times, sagebrush-dominated ecosystems had highly variable fire return intervals that ranged from decades to centuries (Frost 1998; Brown and Smith 2000; Miller et al. 2011). At coarse regional scales, fire return intervals in sagebrush ecological types were determined largely by climate and its effects on fuel abundance and continuity. Consequently, fire frequency was higher in sagebrush types with greater productivity at higher elevations and following periods of increased precipitation than in lower elevation and less productive ecosystems (West 1983b; Mensing et al. 2006). At local scales within sagebrush types, fire return intervals likely were determined by topographic and soil effects on productivity and fuels and exhibited high spatial and temporal variability (Miller and Heyerdahl 2008).

Euro-American arrival in sagebrush ecosystems began in the mid-1800s and initiated a series of changes in vegetation composition and structure that altered fire regimes and resulted in major changes in sagebrush habitats. The first major change in fire regimes occurred when inappropriate grazing by livestock led to a decrease in native perennial grasses and forbs and effectively reduced the abundance of fine fuels (Knapp 1996; Miller and Eddleman 2001; Miller et al. 2011). Decreased competition from perennial herbaceous species, in combination with ongoing climate change and favorable conditions for woody species establishment at the turn of the twentieth century, resulted in increased abundance of shrubs (primarily *Artemisia* species) and trees, including juniper (*Juniperus occidentalis*, *J. osteosperma*) and piñon pine (*Pinus monophylla*), at mid to high elevations (Miller and Eddleman 2001; Miller et al. 2011). The initial effect of these changes in fuel structure was a reduction in fire frequency and size. The second major change in fire regimes occurred when non-native annual grasses (e.g., *Bromus tectorum*, *Taeniatherum caput-medusa*) were introduced from Eurasia in the late 1800s and spread rapidly into low to mid-elevation ecosystems with depleted understories (Knapp 1996). The invasive annual grasses increased the amount and continuity of fine fuels in many lower elevation sagebrush habitats and initiated annual grass/fire cycles characterized by shortened fire return intervals and larger, more contiguous fires (fig. 2; D'Antonio and Vitousek 1992; Brooks et al. 2004). Since settlement of the region, cheatgrass came to dominate as much as 4 million hectares (9.9 million acres) in the states of Nevada and Utah alone (fig. 3; Bradley and Mustard 2005). The final change in fire regimes occurred as a result of expansion of juniper and piñon pine trees into sagebrush types at mid to high elevations and a reduction of the grass, forb, and shrub species associated with these types. Ongoing infilling of trees is increasing woody fuels, but reducing fine fuels and resulting in less frequent fires (fig. 4; Miller et al. 2013). Extreme burning conditions (high winds, high temperatures, and low relative humidity) in high density (Phase III) stands are resulting in large and severe fires that result in significant losses of above- and below-ground organic matter (sensu Keeley 2009) and have detrimental ecosystem effects (Miller et al. 2013). Based on tree-ring analyses at several Great Basin sites, it is estimated that the extent of piñon and/or juniper woodland increased two to six fold since settlement, and most of that area will exhibit canopy closure within the next 50 years (Miller et al. 2008).

**Figure 2.** A wildfire that burned through a Wyoming big sagebrush ecosystem with an invasive annual grass understory in southern Idaho (top) (photo by Douglas J. Shinneman), and a close-up of a fire in a Wyoming big sagebrush ecosystem (bottom) (photo by Scott Schaff).

**Figure 3.** A wildfire that started in invasive annual grass adjacent to a railroad track and burned upslope into a mountain big sagebrush and Jeffrey pine ecosystem in northeast Nevada (top). A big sagebrush ecosystem that has been converted to invasive annual grass in north central Nevada (bottom) (photos by Nolan E. Preece).

**Figure 4.** Expansion of Utah juniper trees into a mountain big sagebrush ecosystem in east central Utah (top) that is resulting in progressive infilling of the trees and exclusion of native understory species (bottom) (photos by Bruce A. Roundy).

## Effects on Sage-Grouse Habitat Selection and Population Dynamics

Understanding the effects of landscape changes on sage-grouse habitat selection and population dynamics can help managers apply more strategic and targeted conservation actions to reduce risks. Two key land cover shifts resulting from invasive annual grasses and altered fire regimes are affecting the ability to achieve the range-wide goal of stable-to-increasing population trends − large-scale reduction of sagebrush cover and conversion of sagebrush ecosystems to annual grasslands.

Sage-grouse are true sagebrush obligates that require large and intact sagebrush landscapes. Consequently, wildfires occurring at the extremes of the natural range of variability that remove sagebrush, even temporarily, over large areas and over short time periods often have negative consequences for sage-grouse. Several range-wide studies have identified the proportion of sagebrush-dominated land cover as a key indicator of sage-grouse population persistence and, importantly, have revealed critical levels of sagebrush landscape cover required by sage-grouse (see Appendix 2 for a description of landscape cover and how it is derived). Knick et al. (2013) found that 90% of active leks in the western portion of the range had more than 40% landscape cover of sagebrush within a 5-km (3.1-mi) radius of leks. Another range-wide analysis documented a high risk of extirpation with <27% sagebrush landscape cover and high probability of persistence with >50% sagebrush landscape cover within 18-km (11.2-mi) of leks (Wisdom et al. 2011). Similarly, Aldridge et al. (2008) found long-term sage-grouse persistence required a minimum of 25%, and preferably at least 65%, sagebrush landscape cover at the 30-km (18.6-mi) scale. Considered collectively, cumulative disturbances that reduce the cover of sagebrush to less than a quarter of the landscape have a high likelihood of resulting in local population extirpation, while the probability of maintaining persistent populations goes up considerably as the proportion of sagebrush cover exceeds two-thirds or more of the landscape. Reduction of sagebrush cover is most critical in low to mid elevations where natural recovery of sagebrush can be very limited within timeframes important to sage-grouse population dynamics (Davies et al. 2011).

Nonnative annual grasses and forbs have invaded vast portions of the sage-grouse range, reducing both habitat quantity and quality (Beck and Mitchell 2000; Rowland et al. 2006; Miller et al. 2011; Balch et al. 2013). Due to repeated fires, some low- to mid-elevation native sagebrush communities are shifting to novel annual grassland states resulting in habitat loss that may be irreversible with current technologies (Davies et al. 2011; Miller et al. 2011; Chambers et al. 2014). At the broadest scales, the presence of non-native annual grasslands on the landscape may be influencing both sage-grouse distribution and abundance. In their analysis of active leks, Knick et al. (2013) found that most leks had very little annual grassland cover (2.2%) within a 5-km (3.1-mi) radius of the leks; leks that were no longer used had almost five times as much annual grassland cover as active leks. Johnson et al. (2011) found that lek use became progressively less as the cover of invasive annual species increased at both the 5-km (3.1-mi) and 18-km (11.2-mi) scales. Also, few leks had >8% invasive annual vegetation cover within both buffer distances.

Patterns of nest site selection also suggest local impacts of invasive annual grasses on birds. In western Nevada, Lockyer (2012) found that sage-grouse selected large expanses of sagebrush-dominated areas and, within those areas, sage-grouse selected microsites with higher shrub canopy cover and lower cheatgrass cover. Average cheatgrass cover at selected locations was 7.1% compared to 13.3% at available locations. Sage-grouse hens essentially avoided nesting in areas with higher cheatgrass cover. Kirol et al. (2012) also found nest-site selection was negatively correlated with the presence of cheatgrass in south-central Wyoming.

Sage-grouse population demographic studies in northern Nevada show that recruitment and annual survival also are affected by presence of annual grasslands at larger scales. Blomberg et al. (2012) analyzed land cover within a 5-km (3.1-mi) radius of leks and found that leks impacted by annual grasslands experienced lower recruitment than non-impacted leks, even following years of high precipitation. Leks that were not affected by invasive annual grasslands exhibited recruitment rates nearly twice as high as the population average and nearly six times greater than affected leks during years of high precipitation.

Piñon and juniper expansion at mid to upper elevations into sagebrush ecosystems also has altered fire regimes and reduced sage-grouse habitat availability and suitability over large areas with population-level consequences (Miller et al. 2011; Baruch-Mordo et al. 2013; Knick et al. 2013). Conifer expansion results in non-linear declines in sagebrush cover and reductions in perennial native grasses and forbs as conifer canopy cover increases (Miller et al. 2000) and this has direct effects on the amount of available habitat for sagebrush-obligate species. Sites in the late stage of piñon and juniper expansion and infilling (Phase III from Miller et al. 2005) have reduced fire frequency (due to decreased fine fuels), but are prone to higher severity fires (due to increased woody fuels) which significantly reduces the likelihood of sagebrush habitat recovery (fig. 5) (Bates et al. 2013). Even before direct habitat loss occurs, sage-grouse avoid or are negatively associated with conifer cover during all life stages (i.e., nesting, brood-rearing, and wintering; Doherty et al. 2008, 2010a; Atamian et al. 2010; Casazza et al. 2011). Also, sage-grouse incur population-level impacts at a very low level of conifer encroachment. The ability to maintain active leks is severely compromised when conifer canopy exceeds 4% in the immediate vicinity of the lek (Baruch-Mordo et al. 2013), and most active leks average less than 1% conifer cover at landscape scales (Knick et al. 2013).

**Figure 5.** A post-burn, Phase III, singleleaf piñon and Utah juniper dominated sagebrush ecosystem in which soils are highly erosive and few understory plants remain (photo by Jeanne C. Chambers).

## Resilience to Disturbance and Resistance to Invasive Annual Grasses in Sagebrush Ecosystems

Our ability to address the changes occurring in sagebrush habitats can be greatly enhanced by understanding the effects of environmental conditions on resilience to stress and disturbance, and resistance to invasion (Wisdom and Chambers 2009; Brooks and Chambers 2011; Chambers et al. 2014). In cold desert ecosystems, resilience of native ecosystems to stress and disturbance changes along climatic and topographic gradients. In these ecosystems, Wyoming big sagebrush (*Artemisia tridentata* spp. *wyomingensis*), mountain big sagebrush (*A. t.* spp. *vaseyana*), and mountain brush types (e.g., mountain big sagebrush, snowberry [*Symphorocarpus* spp.], bitterbrush [*Purshia tridentata*]) occur at progressively higher elevations and are associated with decreasing temperatures and increasing amounts of precipitation, productivity, and fuels (fig. 6; West and Young 2000). Piñon pine and juniper woodlands are typically associated with mountain big sagebrush types, but can occur with relatively cool and moist Wyoming big sagebrush types and warm and moist mountain brush types (Miller et al. 2013). Resilience to disturbance, including wildfire, has been shown to increase along these elevation gradients (fig. 7A) (Condon et al. 2011; Davies et al. 2012; Chambers et al. 2014; Chambers et al. *in press*). Higher precipitation and cooler temperatures, coupled with greater soil development and plant productivity at mid to high elevations, can result in greater resources and more favorable environmental conditions for plant growth and reproduction (Alexander et al. 1993; Dahlgren et al. 1997). In contrast, minimal precipitation and high temperatures at low elevations result in lower resource availability for plant growth (West 1983a,b;

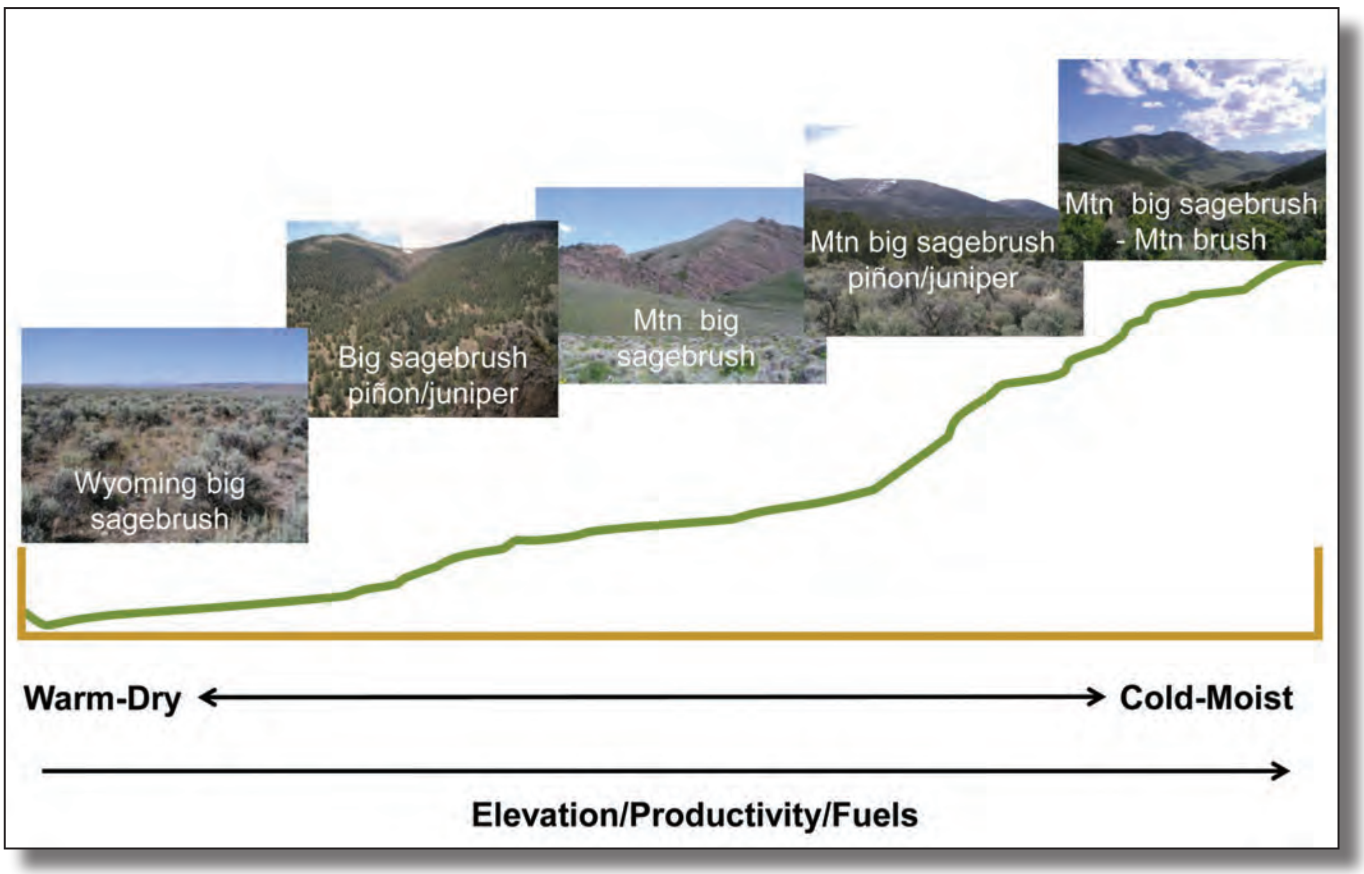


**Figure 6**. The dominant sagebrush ecological types that occur along environmental gradients in the western United States. As elevation increases, soil temperature and moisture regimes transition from warm and dry to cold and moist and vegetation productivity and fuels become higher.

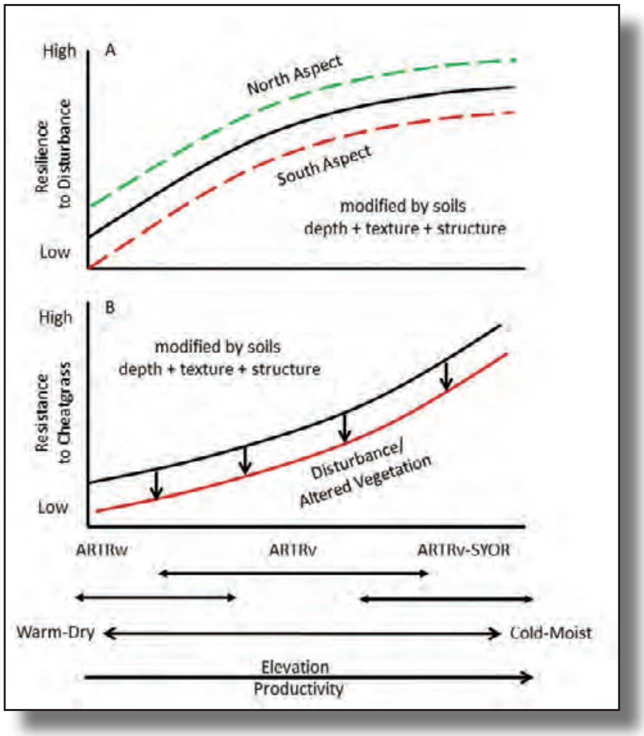


**Figure 7**. (**A)** Resilience to disturbance and (**B)** resistance to cheatgrass over a typical temperature/precipitation gradient in the cold desert. Dominant ecological sites occur along a continuum that includes Wyoming big sagebrush on warm and dry sites, to mountain big sagebrush on cool and moist sites, to mountain big sagebrush and root-sprouting shrubs on cold and moist sites. Resilience increases along the temperature/precipitation gradient and is influenced by site characteristics like aspect. Resistance also increases along the temperature/precipitation gradient and is affected by disturbances and management treatments that alter vegetation structure and composition and increase resource availability (modified from Chambers et al. 2014; Chambers et al. *in press*).

Smith and Nowak 1990). These relationships also are observed at local plant community scales where aspect, slope, and topographic position affect solar radiation, erosion processes, effective precipitation, soil development and vegetation composition and structure (Condon et al. 2011; Johnson and Miller 2006).

Resistance to invasive annual grasses depends on environmental factors and ecosystem attributes and is a function of (1) the invasive species' physiological and life history requirements for establishment, growth, and reproduction, and (2) interactions with the native perennial plant community including interspecific competition and response to herbivory and pathogens. In cold desert ecosystems, resistance is strongly influenced by soil temperature and moisture regimes (Chambers et al. 2007; Meyer et al. 2001). Germination, growth, and/or reproduction of cheatgrass is physiologically limited at low elevations by frequent, low precipitation years, constrained at high elevations by low soil temperatures, and optimal at mid elevations under relatively moderate temperature and water availability (fig. 7B; Meyer et al. 2001; Chambers et al. 2007). Slope, aspect, and soil characteristics modify soil temperature and moisture and influence resistance to cheatgrass at landscape to plant community scales (Chambers et al. 2007; Condon et al. 2011; Reisner et al. 2013). Genetic variation in cheatgrass results in phenotypic traits that increase survival and persistence in populations from a range of environments, and is likely contributing to the recent range expansion of this highly inbreeding species into marginal habitats (Ramakrishnan et al. 2006; Merrill et al. 2012).

The occurrence and persistence of invasive annual grasses in sagebrush habitats is strongly influenced by interactions with the native perennial plant community (fig. 7B). Cheatgrass, a facultative winter annual that can germinate from early fall through early spring, exhibits root elongation at low soil temperatures, and has higher nutrient uptake and growth rates than most native species (Mack and Pyke 1983; Arredondo et al. 1998; James et al. 2011). Seedlings of native, perennial plant species are generally poor competitors with cheatgrass, but adults of native, perennial grasses and forbs, especially those with similar growth forms and phenology, can be highly effective competitors with the invasive annual (Booth et al. 2003; Chambers et al. 2007; Blank and Morgan 2012).

Also, biological soil crusts, which are an important component of plant communities in warmer and drier sagebrush ecosystems, can reduce germination or establishment of cheatgrass (Eckert et al. 1986; Kaltenecker et al. 1999). Disturbances or management treatments that reduce abundance of native perennial plants and biological soil crusts and increase the distances between perennial plants often are associated with higher resource availability and increased competitive ability of cheatgrass (Chambers et al. 2007; Reisner et al. 2013; Roundy et al. *in press*).

The type, characteristics, and natural range of variability of stress and disturbance strongly influence both resilience and resistance (Jackson 2006). Disturbances like overgrazing of perennial plants by livestock, wild horses, and burros and more frequent or more severe fires are typically outside of the natural range of conditions and can reduce the resilience of sagebrush ecosystems. Reduced resilience is triggered by changes in environmental factors like temperature regimes, abiotic attributes like water and nutrient availability, and biotic attributes such as vegetation structure, composition, and productivity (Chambers et al. 2014) and cover of biological soil crusts (Reisner et al. 2013). Resistance to an invasive species can change when changes in abiotic and biotic attributes result in increased resource availability or altered habitat suitability that influences an invasive species' ability to establish and persist and/or compete with native species. Progressive losses of resilience and resistance can result in the crossing of abiotic and/or biotic thresholds and an inability of the system to recover to the reference state (Beisner et al. 2003; Seastedt et al. 2008).

Interactions among disturbances and stressors may have cumulative effects (Chambers et al. 2014). Climate change already may be shifting fire regimes outside of the natural range of occurrence (i.e., longer wildfire seasons with more frequent and longer duration wildfires) (Westerling et al. 2006). Sagebrush ecosystems generally have low productivity, and the largest number of acres burned often occurs a year or two after warm, wet conditions in winter and spring that result in higher fine fuel loads (Littell et al. 2009). Thus, annual grass fire cycles may be promoted by warm, wet winters and a subsequent increase in establishment and growth of invasive winter annuals. These cycles may be exacerbated by rising atmospheric $CO_2$ concentrations, N deposition, and increases in human activities that result in soil surface disturbance and invasion corridors (Chambers et al. 2014). Modern deviations from historic conditions will likely continue to alter disturbance regimes and sagebrush ecosystem response to disturbances; thus, management strategies that rely on returning to historical or "pre-settlement" conditions may be insufficient, or even misguided, given novel ecosystem dynamics (Davies et al. 2009).

## Integrating Resilience and Resistance Concepts With Sage-Grouse Habitat Requirements to Manage Wildfire and Invasive Annual Grass Threats at Landscape Scales

The changes in sagebrush ecosystem dynamics due to invasive annual species and longer, hotter, and drier fire seasons due to a warming climate make it unlikely that these threats can be ameliorated completely (Abatzoglou and Kolden 2011; USFWS 2013). Consequently, a strategic approach is necessary to conserve sagebrush habitat and sage-grouse (Wisdom et al. 2005; Meinke et al. 2009; Wisdom and Chambers 2009; Pyke 2011). This strategic approach requires the ability to (1) identify those locations that provide current or potential habitat for sage-grouse and (2) prioritize management actions based on the capacity of the ecosystem to respond in the desired manner and to effectively allocate resources to achieve desired objectives. Current understanding of the relationship of landscape cover of sagebrush to sage-grouse habitat provides the capacity to identify those locations on the landscape that have a high probability of sage-grouse persistence (Aldridge et al. 2008; Wisdom et al. 2011; Knick et al. 2013). Similarly, knowledge of the relationships of environmental characteristics, specifically soil temperature and moisture regimes, to ecological types and their inherent resilience and resistance gives us the capacity to prioritize management actions based on probable effectiveness of those actions (Wisdom and Chambers 2009; Brooks and Chambers 2011; Miller et al. 2013; Chambers et al. 2014; Chambers et al. *in press*,).

In this section, we discuss the use of landscape cover of sagebrush as an indicator of sage-grouse habitat, and the use of soil temperature and moisture regimes as an indicator of resilience to disturbance, resistance to invasive annual grasses and, ultimately, the capacity to achieve desired objectives. We then show how these two concepts can be coupled in a sage-grouse habitat matrix and used to determine potential management strategies at the landscape scales on which sage-grouse depends.

## Landscape Cover of Sagebrush as an Indicator of Sage-Grouse Habitat

Landscape cover of sagebrush is closely related to the probability of maintaining active sage-grouse leks, and is used as one of the primary indicators of sage-grouse habitat potential at landscape scales (Aldridge et al. 2008; Wisdom et al. 2011; Knick et al. 2013). Landscape cover of sagebrush less than about 25% has a low probability of sustaining active sage-grouse leks (Aldridge et al. 2008; Wisdom et al. 2011; Knick et al. 2013). Above 25% landscape cover of sagebrush, the probability of maintaining active sage-grouse leks increases with increasing sagebrush landscape cover. At landscape cover of sagebrush ranging from 50 to 85%, the probability of sustaining sage-grouse leks becomes relatively constant (Aldridge et al. 2008; Wisdom et al. 2011; Knick et al. 2013). For purposes of prioritizing landscapes for sage-grouse habitat management, we use 25% as the level below which there is a low probability of maintaining sage-grouse leks and 65% as the level above which there is little additional increase in the probability of sustaining active leks with further increases of landscape cover of sagebrush (fig. 8; Knick et al. 2013). Between about 25% and 65% landscape sagebrush cover, increases in landscape cover of sagebrush have a constant positive relationship with sage-grouse lek probability (fig. 8; Knick et al. 2013). Restoration and management activities that result in an increase in the amount of sagebrush dominated landscape within areas of pre-existing landscape cover between 25% and 65% likely will result in a higher probability of sage-grouse persistence, while declines in landscape cover of sagebrush likely will result in reductions in sage-grouse (Knick et al. 2013). It is important to note that

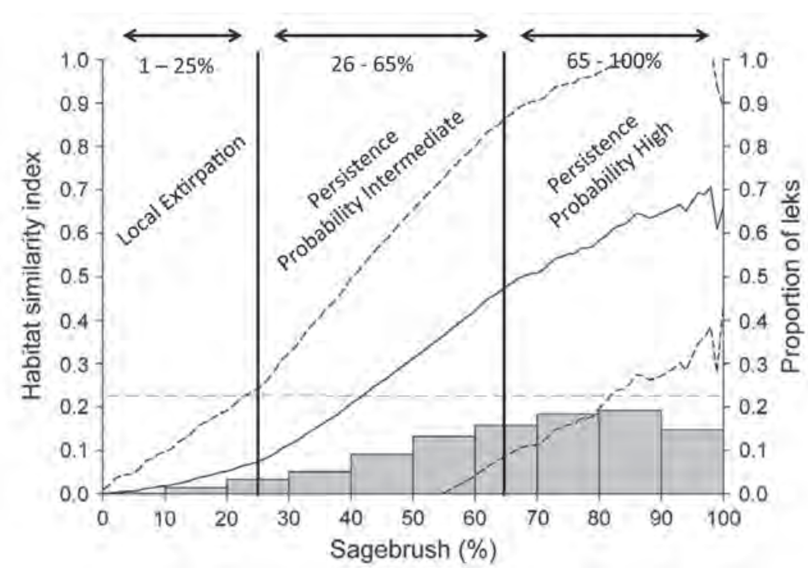


**Figure 8.** The proportion of sage-grouse leks and habitat similarity index (HSI) as related to the percent landscape cover of sagebrush. The HSI indicates the relationship of environmental variables at map locations across the western portion of the range to minimum requirements for sage-grouse defined by land cover, anthropogenic variables, soil, topography, and climate. HSI is the solid black line ± 1 SD (stippled lines). Proportion of leks are the grey bars. Dashed line indicates HSI values above which characterizes 90% of active leks (0.22). The categories at the top of the figure and the interpretation of lek persistence were added based on Aldridge et al. 2008; Wisdom et al. 2011; and Knick et al. 2013 (figure modified from Knick et al. 2013).

these data and interpretations relate only to persistence (i.e., whether or not a lek remains active) and it is likely that higher proportions of sagebrush cover or improved condition of sagebrush ecosystems may be required for population growth.

For the purposes of delineating sagebrush habitat relative to sage-grouse requirements for landscape cover of sagebrush, we calculated the percentage landscape sagebrush cover within each of the selected categories (1-25%, 26-65%, >65%) for the range of sage-grouse (fig. 9, 10). An explanation of how landscape cover of sagebrush is derived is in Appendix 2. Large areas of landscape sagebrush cover >65% are found primarily in Management Zones (MZ) II (Wyoming Basin), IV (Snake River Plains), and V (Northern Great Basin). In contrast, relatively small areas of landscape sagebrush cover >65% are located in MZ I (Great Plains), III (Southern Great Basin), VI (Columbia Basin), and VII (Colorado Plateau). Sagebrush is naturally less common in the Great Plains region compared to other parts of the range and previous work suggested that sage-grouse populations in MZ I may be more vulnerable to extirpation with further reductions in sagebrush cover (Wisdom et al. 2011). In the western portion of the range, where the threat of invasive annual grasses and wildfire is greatest, the area of sagebrush cover >65% differs among MZs. MZ III is a relatively arid and topographically diverse area in which the greatest extent of sagebrush cover >65% is in higher elevation, mountainous areas. MZs IV and V have relatively large extents of sagebrush cover >65% in relatively cooler and wetter areas, and MZs IV and VI have lower extents of sagebrush cover >65% in warmer and dryer areas and in areas with significant agricultural development. These differences in landscape cover of sagebrush indicate that different sets of management strategies may apply to the various MZs.

## Soil Temperature and Moisture Regimes as Indicators of Ecosystem Resilience and Resistance

Potential resilience and resistance to invasive annual grasses reflect the biophysical conditions that an area is capable of supporting. In general, the highest potential resilience and resistance occur with ***cool*** to ***cold*** (frigid to cryic) soil temperature regimes and relatively ***moist*** (xeric to ustic) soil moisture regimes, while the lowest potential resilience and resistance occur with ***warm*** (mesic) soil temperatures and relatively ***dry*** (aridic) soil moisture regimes (Chambers et al. 2014, Chambers et al. *in press*). Definitions of soil temperature and moisture regimes are in Appendix 3. Productivity is elevated by high soil moisture and thus resilience is increased (Chambers et al. 2014); annual grass growth and reproduction is limited by cold soil temperatures and thus resistance is increased (Chambers et al. 2007). The timing of precipitation also is important because cheatgrass and many other invasive annual grasses are particularly well-adapted to Mediterranean type climates with cool and wet winters and warm and dry summers (Bradford and Lauenroth 2006; Bradley 2009). In contrast, areas that receive regular summer precipitation (ustic soil moisture regimes) often are dominated by warm and/or cool season grasses (Sala et al. 1997) that likely create a more competitive environment and result in greater resistance to annual grass invasion and spread (Bradford and Lauenroth 2006; Bradley 2009).

Much of the remaining sage-grouse habitat in MZs I (Great Plains), II (Wyoming Basin), VII (Colorado Plateau), and cool-to-cold or moist sites scattered across the range, are characterized by moderate to high resilience and resistance as indicated by soil temperature and moisture regimes (fig. 11). Sagebrush habitats across MZ I are unique from a range-wide perspective because soils are predominantly cool and ustic, or bordering on ustic as a result of summer precipitation; this soil moisture regime appears to result in higher resilience and resistance (Bradford and Lauenroth 2006).

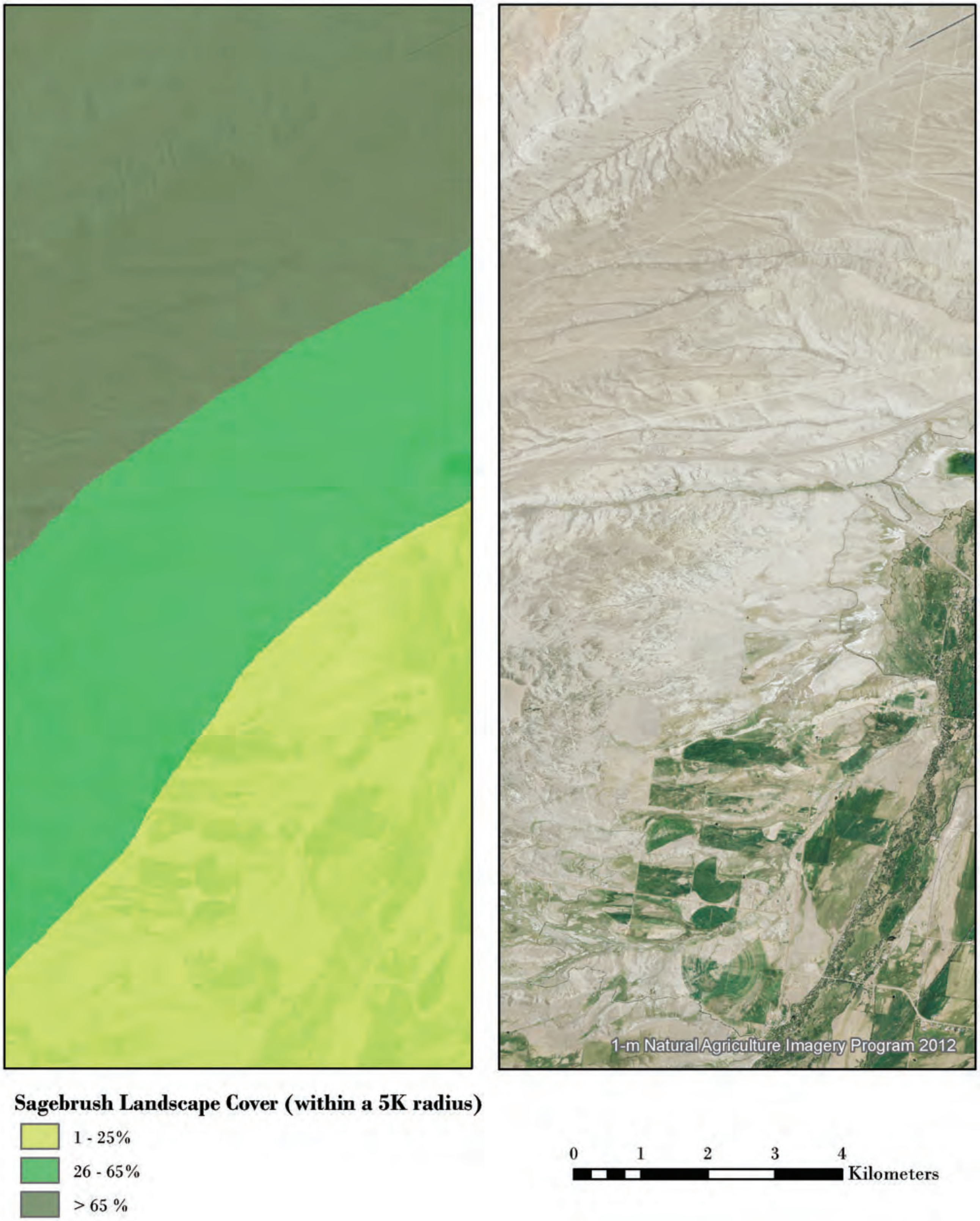


**Figure 9.** Landscape cover of sagebrush from 1-m National Agricultural Imagery (right) and the corresponding sagebrush landscape cover for the 1-25%, 26-65%, and >65% categories (left). See Appendix 2 for an explanation of how the categories are determined.

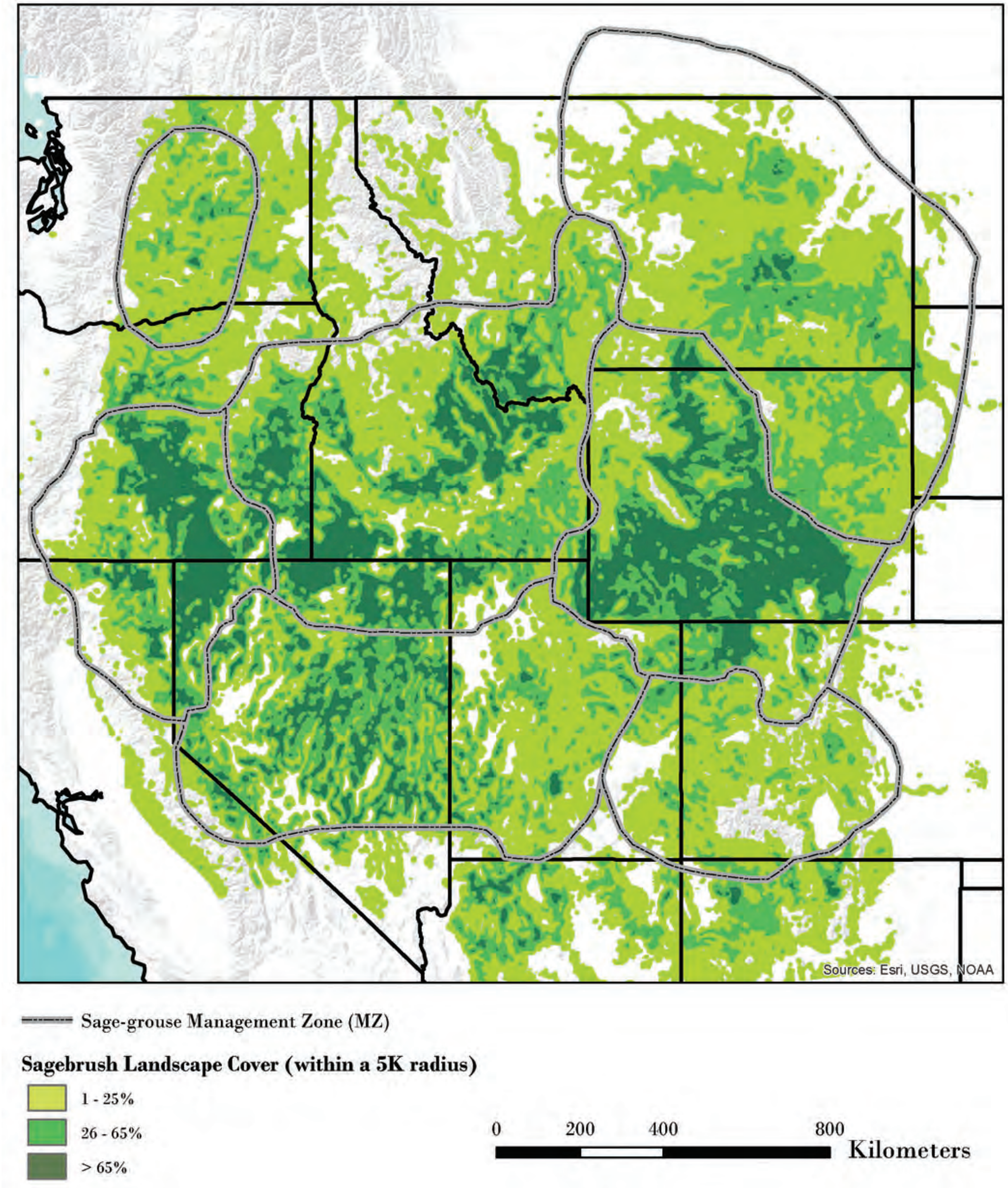


**Figure 10.** The landscape cover of sagebrush within each of three selected categories (1-25%, 26-65%, >65%) for the range of sage-grouse (Management Zones I – VII; Stiver et al. 2006). The proportion of sagebrush (USGS 2013) within each of the categories in a 5-km (3.1-mi) radius surrounding each pixel was calculated relative to other land cover types for locations with sagebrush cover.

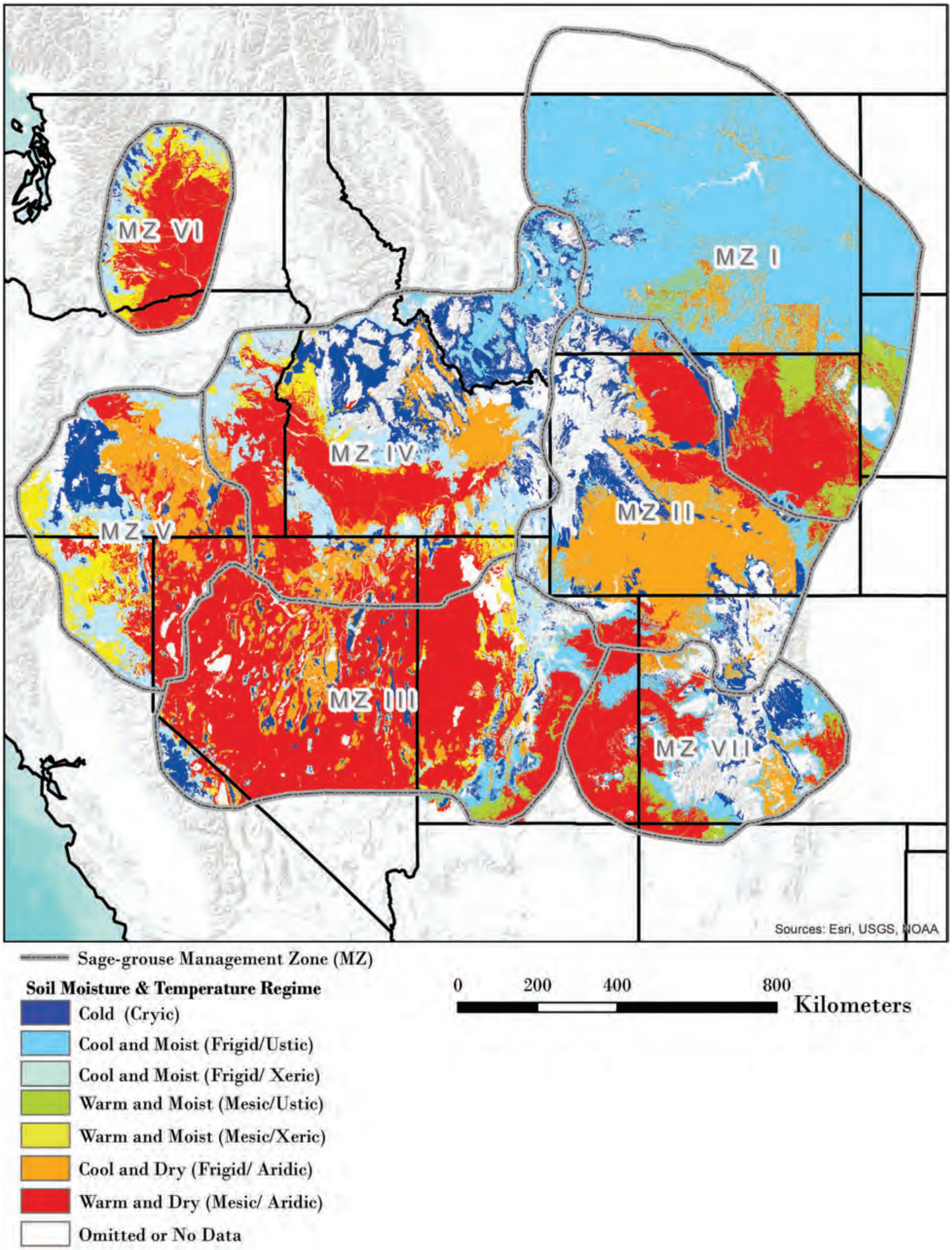


**Figure 11.** The soil temperature and moisture regimes for the range of sage-grouse (Management Zones I – VII; Stiver et al. 2006). Soil temperature and moisture classes were derived from the Natural Resources Conservation Service (NRCS) Soil Survey Geographic Database (SSURGO) (Soil Survey Staff 2014a). Gaps in that dataset were filled in with the NRCS State Soil Geographic Database (STATSGO) (Soil Survey Staff 2014b).

However, significant portions of MZs III (Southern Great Basin), much of IV (Snake River Plains), V (Northern Great Basin), and VI (Columbia Basin) are characterized largely by either warm and dry, or warm to cool and moist ecological types with moderate to low resilience and resistance (fig. 11; table 1). Areas within these MZs that have warm and dry soils are typically characterized by Wyoming big sagebrush ecosystems with low to moderately low resilience and resistance and are currently of greatest concern for sage-grouse conservation (fig. 12A). Areas with warm to cool soil temperature regimes and moist precipitation regimes are typically characterized by either Wyoming or mountain big sagebrush, have moderate to moderately low resilience and resistance,

**Table 1.** Predominant sagebrush ecological types in Sage-Grouse Management Zones III, IV, V, and VI based on soil temperature and soil moisture regimes, typical characteristics, and resilience to disturbance and resistance to invasive annual grasses (modified from Miller et al. 2014 a,b). Relative abundance of sagebrush species and composition of understory vegetation vary depending on Major Land Resource Area and ecological site type.

| Ecological type | Characteristics | Resilience and resistance |
|---|---|---|
| Cold and Moist (Cryic/Xeric) | Ppt: 14 inches +<br>Typical shrubs: *Mountain big sagebrush, snowfield sagebrush, snowberry, serviceberry, silver sagebrush, and/or low sagebrushes* | *Resilience* – **Moderately high**. Precipitation and productivity are generally high. Short growing seasons can decrease resilience on coldest sites.<br>*Resistance*– **High**. Low climate suitability to invasive annual grasses |
| Cool and Moist (Frigid/Xeric) | Ppt: 12-22 inches<br>Typical shrubs: *Mountain big sagebrush, antelope bitterbrush, snowberry, and/or low sagebrushes*<br><br>Piñon pine and juniper potential in some areas | *Resilience* – **Moderately high**. Precipitation and productivity are generally high. Decreases in site productivity, herbaceous perennial species, and ecological conditions can decrease resilience.<br>*Resistance* – **Moderate**. Climate suitability to invasive annual grasses is moderate, but increases as soil temperatures increase. |
| Warm and Moist (Mesic/Xeric) | Ppt: 12-16 inches<br>Typical shrubs: *Wyoming big sagebrush, mountain big sagebrush, Bonneville big sagebrush, and/or low sagebrushes*<br><br>Piñon pine and juniper potential in some areas | *Resilience* – **Moderate**. Precipitation and productivity are moderately high. Decreases in site productivity, herbaceous perennial species, and ecological conditions can decrease resilience.<br>*Resistance* – **Moderately low**. Climate suitability to invasive annual grasses is moderately low, but increases as soil temperatures increase. |
| Cool and Dry (Frigid/Aridic) | Ppt: 6-12 inches<br>Typical shrubs: *Wyoming big sagebrush, black sagebrush, and/or low sagebrushes* | *Resilience* – **Low**. Effective precipitation limits site productivity. Decreases in site productivity, herbaceous perennial species, and ecological conditions further decrease resilience.<br>*Resistance* – **Moderate**. Climate suitability to invasive annual grasses is moderate, but increases as soil temperatures increase. |
| Warm and Dry (Mesic/Aridic, bordering on Xeric) | Ppt: 8-12 inches<br>Typical shrubs: *Wyoming big sagebrush, black sagebrush and/or low sagebrushes* | *Resilience* – **Low.** Effective precipitation limits site productivity. Decreases in site productivity, herbaceous perennial species, and ecological conditions further decrease resilience. Cool season grasses susceptibility to grazing and fire, along with hot dry summer fire conditions, promote cheatgrass establishment and persistence.<br>*Resistance* – **Low.** High climate suitability to cheatgrass and other invasive annual grasses. Resistance generally decreases as soil temperature increases, but establishment and growth are highly dependent on precipitation. |

and have the potential for piñon and juniper expansion (Miller et al. 2014a; Chambers et al. *in press*). Many of these areas also are of conservation concern because piñon and juniper expansion and tree infilling can result in progressive loss of understory species and altered fire regimes (Miller et al. 2013). In contrast, areas with cool to cold soil temperature regimes and moist precipitation regimes have moderately high resilience and high resistance and are likely to recover in a reasonable amount of time following wildfires and other disturbances (Miller et al. 2013) (fig. 12B)

**Figure 12.** A Wyoming big sagebrush ecosystem with warm and dry soils in southeast Oregon (top) (photo by Richard F. Miller), compared to a mountain big sagebrush ecosystem with cool and moist soils in central Nevada (bottom) (photo by Jeanne C. Chambers).

## Management Strategies Based on Landscape Cover of Sagebrush and Ecosystem Resilience and Resistance: The Sage-Grouse Habitat Matrix

Knowledge of the potential resilience and resistance of sagebrush ecosystems can be used in conjunction with sage-grouse habitat requirements to determine priority areas for management and identify effective management strategies at landscape scales (Wisdom and Chambers 2009). The sage-grouse habitat matrix (table 2) illustrates the relative resilience to disturbance and resistance to invasive annual grasses of sagebrush ecosystems in relation to the proportion of sagebrush cover on the landscape. As resilience and resistance go from high to low, as indicated by the rows in the matrix, decreases in sagebrush regeneration and abundance of perennial grasses and forbs progressively limit the capacity of a sagebrush ecosystem to recover after fire or other disturbances. The risk of annual invasives increases and the ability to successfully restore burned or otherwise disturbed areas decreases. As sagebrush cover goes from low to high within these same ecosystems, as indicated by the columns in the matrix, the capacity to provide adequate habitat cover for sage-grouse increases. Areas with less than 25% landscape cover of sagebrush are unlikely to provide adequate habitat for sage-grouse; areas with 26-65% landscape cover of sagebrush can provide habitat for sage-grouse but are at risk if sagebrush loss occurs without recovery; and areas with >65% landscape cover of sagebrush provide the necessary habitat conditions for sage-grouse to persist. Potential landscape scale management strategies can be determined by considering (1) resilience to disturbance, (2) resistance to invasive annuals, and (3) sage-grouse land cover requirements. Overarching management strategies to maintain or increase sage-grouse habitat at landscape scales based on these considerations are conservation, prevention, restoration, and monitoring and adaptive management (table 3; see Chambers et al. 2014). These strategies have been adapted for each of the primary agency programs including fire operations, fuels management, post-fire rehabilitation, and habitat restoration (table 4). Because sagebrush ecosystems occur over continuums of environmental conditions, such as soil temperature and moisture, and have differing land use histories and species composition, careful assessment of the area of concern always will be necessary to determine the relevance of a particular strategy (Pyke 2011; Chambers et al. 2014; Miller et al. 2014 a, b). The necessary information for conducting this type of assessment is found in the "Putting It All Together" section of this report.

Although the sage-grouse habitat matrix (table 2) can be viewed as partitioning land units into spatially discrete categories (i.e., landscapes or portions thereof can be categorized as belonging to one of nine categories), it is not meant to serve as a strict guide to spatial allocation of resources or to prescribe specific management strategies. Instead, the matrix should serve as a decision support tool for helping managers implement strategies that consider both the resilience and resistance of the landscape and landscape sagebrush cover requirements of sage-grouse. For example, low elevation Wyoming big sagebrush plant communities with relatively low resilience and resistance may provide important winter habitat resources for a given sage-grouse population. In a predominantly Wyoming big sagebrush area comprised of relatively low sagebrush landscape cover, a high level of management input may be needed to realize conservation benefits for sage-grouse. This doesn't mean that management activities should not be undertaken if critical or limiting sage-grouse habitat resources are present, but indicates that inputs will be intensive, potentially more expensive, and less likely to succeed relative to more resilient landscapes. It is up to the user of the matrix to determine how such tradeoffs influence management actions.

**Table 2.** Sage-grouse habitat matrix based on resilience and resistance concepts from Chambers et al. 2014, and sage-grouse habitat requirements from Aldridge et al. 2008, Wisdom et al. 2011, and Knick et al. 2013. Rows show the ecosystems relative resilience to disturbance and resistance to invasive annual grasses derived from the sagebrush ecological types in table 1 (1 = high resilience and resistance; 2 = moderate resilience and resistance; 3 = low resilience and resistance). Columns show the current proportion of the landscape (5-km rolling window) dominated by sagebrush (A = 1-25% land cover; B = 26-65% land cover; 3 = >65% land cover). Use of the matrix is explained in text. Overarching management strategies that consider resilience and resistance and landscape cover of sagebrush are in table 3. Potential management strategies specific to agency program areas, including fire operations, fuels management, post-fire rehabilitation, and habitat restoration are in table 4.

**Proportion of Landscape Dominated by Sagebrush**

| Ecosystem Resilience to Disturbance and Resistance to Invasive Annual Grasses | Low 1-25% | Moderate 26-65% | High >65% |
|---|---|---|---|
| | Too little sagebrush on the landscape significantly threatens likelihood of sage-grouse persistence. | Sage-grouse are sensitive to the amount of sagebrush remaining on the landscape and populations could be at-risk with additional disturbances that remove sagebrush. | Sufficient sagebrush exists on the landscape and sage-grouse are highly likely to persist. |
| High | **1A** Natural sagebrush recovery is likely to occur, but if large, contiguous areas lack sagebrush, the time required for recovery may be too great. | **1B** Natural sagebrush recovery is likely to occur, but certain areas may lack connectivity. | **1C** Natural sagebrush recovery is likely to occur. |
| | Perennial herbaceous species are typically sufficient for recovery. Risk of annual invasives is low. Seeding/transplanting success is high. Recovery following inappropriate livestock use is often possible given changes in management. | | |
| Moderate | **2A** Natural sagebrush recovery is likely on cooler and moister sites, but if large, contiguous areas lack sagebrush, the time required for recovery may be too great. | **2B** Natural sagebrush recovery is likely on cooler and moister sites, but certain areas may lack connectivity. | **2C** Natural sagebrush recovery is likely on cooler and moister sites. |
| | Perennial herbaceous species are usually adequate for recovery on cooler and moister sites. Risk of annual invasives is moderately high on warmer and drier sites. Seeding-transplanting success depends on site characteristics, and more than one intervention may be required especially on warmer and drier sites. Recovery following inappropriate livestock use depends on site characteristics and management. | | |
| Low | **3A** Natural sagebrush recovery is not likely. | **3B** Natural sagebrush recovery may occur, but the time required will likely be too great and certain areas may lack connectivity. | **3C** Natural sagebrush recovery may occur, but the time required will likely be too great. |
| | Perennial herbaceous species are typically inadequate for recovery. Risk of annual invasives is high. Seeding/transplanting success depends on site characteristics, annual invasives, and post-treatment precipitation but is often low. More than one intervention likely will be required. Recovery following inappropriate livestock use is unlikely. | | |

**Table 3.** Potential management strategies based on resilience to disturbance, resistance to annual grass invasion, and sage-grouse habitat requirements based on Aldridge et al. 2008; Wisdom et al. 2011; and Knick et al. 2013 (adapted from Chambers et al. 2014).

| | |
|---|---|
| ***Conserve – maintain or increase resilience to disturbance and resistance to invasive annuals in areas with high conservation value*** | |
| Priorities | • Ecosystems with low to moderate resilience to fire and resistance to invasive species that still have large patches of landscape sagebrush cover and adequate perennial grasses and forbs – *ecological types with warm and dry and cool and dry soil temperature/moisture regimes.*<br>• Ecosystems with a high probability of providing habitat for sage-grouse, especially those with >65% landscape cover of sagebrush and adequate perennial herbaceous species – *all ecological types.* |
| *Objective* | • Minimize impacts of current and future human-caused disturbances and stressors. |
| *Activities* | • Immediately suppress fire in moderate to low resilience and resistance sagebrush and wooded shrublands to prevent an invasive annual grass-fire cycle. Large sagebrush patches are high priority for protection from wildfires.<br>• Implement strategic fuel break networks to provide anchor points for suppression and reduce losses when wildfires escape initial attack.<br>• Manage livestock grazing to prevent loss of perennial native grasses and forbs and biological soil crusts and allow natural regeneration.<br>• Limit anthropogenic activities that cause surface disturbance, invasion, and fragmentation. (e.g., road and utility corridors, urban expansion, OHV use, and mineral/energy projects).<br>• Detect and control new weed infestations. |
| ***Prevent – maintain or increase resilience and resistance of areas with declining ecological conditions that are at risk of conversion to a degraded, disturbed, or invaded state*** | |
| *Priorities* | • Ecosystems with moderate to high resilience and resistance – *ecological types with relatively cool and moist soil temperature and moisture regimes*.<br>○ Prioritize landscape patches that exhibit declining conditions due to annual grass invasion and/or tree expansion (e.g., at risk phase in State and Transition Models).<br>• Ecosystems with a moderate to high probability of providing sage-grouse habitat, especially those with 26-65% landscape cover of sagebrush and adequate perennial native grasses and forbs – *all ecological types*. |
| *Objectives* | • Reduce fuel loads and decrease the risk of high intensity and high severity fire.<br>• Increase abundance of perennial native grasses and forbs and of biological soil crusts where they naturally occur.<br>• Decrease the longer-term risk of annual invasive grass dominance. |
| *Activities* | • Use mechanical treatments like cut and leave or mastication to remove trees, decrease woody fuels, and release native grasses and forbs in warm and moist big sagebrush ecosystems with relatively low resistance to annual invasive grasses that are in the early to mid-phase of piñon and/or juniper expansion.<br>• Use prescribed fire or mechanical treatments to remove trees, decrease woody fuels, and release native grasses and forbs in cool and moist big sagebrush ecosystems with relatively high resistance to annual invasive grass that are in early to mid-phase of piñon and/or juniper expansion.<br>• Actively manage post-treatment areas to increase perennial herbaceous species and minimize secondary weed invasion.<br>• Consider the need for strategic fuel breaks to help constrain fire spread or otherwise augment suppression efforts. |
| ***Restore – increase resilience and resistance of disturbed, degraded, or invaded areas*** | |
| *Priorities* | • Areas burned by wildfire – *all ecological types*<br>○ Prioritize areas with low to moderate resilience and resistance, and that have a reasonable expectation of recovery.<br>○ Prioritize areas where perennial grasses and forbs have been depleted.<br>○ Prioritize areas that experienced high severity fire. |

(continued)

**Table 3.** (Continued).

| | |
|---|---|
| | • Sage-grouse habitat – *all ecological types*<br>○ Prioritize areas where restoration of sagebrush and/or perennial grasses is needed to create large patches of landscape cover of sagebrush or connect existing patches of sagebrush habitat.<br>○ Prioritize areas with adequate landscape cover of sagebrush where restoration of perennial grasses and forbs is needed.<br>• Areas affected by anthropogenic activities that cause surface disturbance, invasion, and fragmentation. (e.g., road and utility corridors, urban expansion, OHV use, and mineral/energy projects) – *all ecological types.* |
| *Objectives* | • Increase soil stability and curtail dust.<br>• Control/suppress invasive annual grasses and other invasive plants.<br>• Increase landscape cover of sagebrush.<br>• Increase perennial grasses and forbs and biological soil crusts where they naturally occur.<br>• Reduce the risk of large fires that burn sage-grouse habitat. |
| *Activities* | • Use integrated strategies to control/suppress annual invasive grass and other annual invaders.<br>• Establish and maintain fuel breaks or greenstrips in areas dominated by invasive annual grasses that are adjacent to areas with >25% landscape sagebrush cover and adequate perennial native grasses and forbs.<br>• Seed perennial grasses and forbs that are adapted to local conditions to increase cover of these species in areas where they are depleted.<br>• Seed and/or transplant sagebrush to restore large patches of sagebrush cover and connect existing patches.<br>• Repeat restoration treatments if they fail initially to ensure restoration success especially in warm and dry soil temperature moisture regimes where weather is often problematic for establishment.<br>• Actively manage restored/rehabilitated areas to increase perennial herbaceous species and minimize secondary weed invasion. |
| ***Monitoring and Adaptive Management– implement comprehensive monitoring to track landscape change and management outcomes and provide the basis for adaptive management*** | |
| *Priorities* | • Regional environmental gradients to track changes in plant community and other ecosystem attributes and expansion or contraction of species ranges – *all ecological types.*<br>• Assess treatment effectiveness – *all ecological types.* |
| *Objectives* | • Understand effects of wildfire, annual grass invasion, piñon and juniper expansion, climate change and other global stressors in sagebrush ecosystems<br>• Increase understanding of the long- and short-term outcomes of management treatments. |
| *Activities* | • Establish a regional network of monitoring sites that includes major environmental gradients.<br>• Collect pre- and post-treatment monitoring data for all major land treatments activities.<br>• Collect data on ecosystem status and trends (for example, land cover type, ground cover, vegetation cover and height [native and invasive], phase of tree expansion, soil and site stability, oddities).<br>• Use consistent methods to monitor indicators.<br>• Use a cross-boundary approach that involves all major land owners.<br>• Use a common data base for all monitoring results (e.g., Land Treatment Digital Library; http://greatbasin.wr.usgs.gov/ltdl/).<br>• Develop monitoring products that track change and provide management implications and adaptations for future management.<br>• Support and improve information sharing on treatment effectiveness and monitoring results across jurisdictional boundaries (e.g., Great Basin Fire Science Delivery Project; www.gbfiresci.org). |

**Table 4.** Specific management strategies by agency program area for the cells within the sage-grouse habitat matrix (table 2). The rows indicate relative resilience and resistance (numbers) and the columns indicate landscape cover of sagebrush by category (letters). Resilience and resistance are based on soil temperature and moisture regimes (fig. 11) and their relationship to ecological types (table 1). Percentage of the landscape dominated by sagebrush is based on the capacity of large landscapes to support viable sage-grouse populations over the long term (fig. 8). Note that these guidelines are related to the sage-grouse habitat matrix, and do not preclude other factors from consideration when determining management priorities for program areas. The "Fire Operations" program area includes preparedness, prevention, and suppression activities.

| | |
|---|---|
| **High Resilience to Disturbance and Resistance to Invasive Annual Grasses (1A, 1B, 1C)** | |
| Natural sagebrush recovery is likely to occur. Perennial herbaceous species are sufficient for recovery. Risk of invasive annual grasses is typically low. | |
| ***Fire Operations*** | • Fire suppression is typically third order priority, but varies with large fire risk and landscape condition (cells 1A, 1B, 1C). Scenarios requiring higher priority may include:<br>○ Areas of sagebrush that bridge large, contiguous expanses of sagebrush and that are important for providing connectivity for sage-grouse (cells 1B, 1C).<br>○ Areas where sagebrush communities have been successfully reestablished through seedings or other rehabilitation investments (cells 1A, 1B, 1C)<br>○ Areas with later phase (Phase III) post-settlement piñon and juniper that have high resistance to control, are subject to large and/or severe fires, and place adjacent sage-grouse habitat at risk (cells 1A, 1B).<br>○ All areas when critical burning environment conditions exist. These conditions may be identified by a number of products including, but not limited to: Predictive Services 7-Day Significant Fire Potential Forecasts; National Weather Service Fire Weather Watches and Red Flag Warnings; fire behavior forecasts or other local knowledge. |
| ***Fuels Management*** | • Fuels management to reduce large sagebrush stand losses is a second order priority, especially in cells 1B and 1C. Management activities include:<br>○ Strategic placement of fuel breaks to reduce loss of large sagebrush stands by wildfire. Examples include linear features or other strategically placed treatments that serve to constrain fire spread or otherwise augment suppression efforts.<br>○ Tree removal in early to mid-phase (Phases I, II), post-settlement piñon and juniper expansion areas to maintain shrub/herbaceous cover and reduce fuel loads.<br>○ Tree removal in later phase (Phase III), post-settlement piñon and juniper areas to reduce risks of large or high severity fires. Because these areas represent non-sage-grouse habitat, prescribed fire may be appropriate on cool and moist sites, but invasive plant control and restoration of sagebrush and perennial native grasses and forbs may be necessary. |
| ***Post-Fire Rehabilitation*** | • Post-fire rehabilitation is generally low priority (cells 1A, 1B, 1C). Areas of higher priority include:<br>○ Areas where perennial herbaceous cover, density, and species composition is inadequate for recovery.<br>○ Areas where seeding or transplanting sagebrush is needed to maintain habitat connectivity for sage-grouse.<br>○ Steep slopes and soils with erosion potential. |
| ***Habitat Restoration and Recovery*** | • Restoration is typically passive and designed to increase or maintain perennial herbaceous species, biological soil crusts and landscape cover of sagebrush (cells 1A, 1B, 1C). Areas to consider for active restoration include:<br>○ Areas where perennial herbaceous cover density, or composition is inadequate for recovery after surface disturbance.<br>○ Areas where seeding or transplanting sagebrush is needed to maintain habitat connectivity for sage-grouse. |
| **Moderate Resilience to Disturbance and Resistance to Invasive Annuals (2A, 2B, 2C)** | |
| Natural sagebrush recovery is likely to occur on cooler and moister sites, but the time required may be too great if large, contiguous areas lack sagebrush. Perennial herbaceous species are usually adequate for recovery on cooler and moister sites. Risk of invasive annual grasses is moderately high on warmer and drier sites. | |
| **Fire Operations** | • Fire suppression is typically second order priority (cells 2A, 2B, 2C). Scenarios requiring higher priority may include:<br>○ Areas of sagebrush that bridge large, contiguous expanses of sagebrush and that are important for providing connectivity for sage-grouse (cells 2B, 2C). |

(continued)

**Table 4.** (Continued).

- ○ Areas where sagebrush communities have been successfully reestablished through seedings or other rehabilitation investments (cells 2A, 2B, 2C)
- ○ Areas with later phase (Phase III), post-settlement piñon and juniper that have high resistance to control, are subject to large and/or severe fires, and place adjacent sage-grouse habitat at risk (cells 2A, 2B).
- ○ Areas where annual grasslands place adjacent sage-grouse habitat at risk (cell 2A).
- ○ All areas when critical burning environment conditions exist. These conditions may be identified by a number of products including, but not limited to: Predictive Services 7-Day Significant Fire Potential Forecasts; National Weather Service Fire Weather Watches and Red Flag Warnings; fire behavior forecasts or other local knowledge.

***Fuels Management***

- Fuels management to reduce large sagebrush stand losses is a first order priority, especially in cells 2B and 2C. Management activities include:
  - ○ Strategic placement of fuel breaks to reduce loss of large sagebrush stands by wildfire. Examples include linear features or other strategically placed treatments that serve to constrain fire spread or otherwise augment suppression efforts.
  - ○ Tree removal in early to mid-phase (Phase I, II), post-settlement piñon and juniper expansion areas to maintain shrub/herbaceous cover and reduce fuel loads.
  - ○ Tree removal in later phase (Phase III), post-settlement piñon and juniper areas to reduce risks of large or high severity fires. Because these areas represent non-sage-grouse habitat, prescribed fire may be appropriate on cool and moist sites, but restoration of sagebrush and perennial native grasses and forbs may be necessary.

***Post-Fire Rehabilitation***

- Post-fire rehabilitation is generally low priority (cells 2A, 2B, 2C) in cooler and moister areas. Areas of higher priority include:
  - ○ Areas where perennial herbaceous cover, density, and species composition is inadequate for recovery.
  - ○ Areas where seeding or transplanting sagebrush is needed to maintain habitat connectivity for sage-grouse.
  - ○ Relatively warm and dry areas where annual invasives are expanding.
  - ○ Steep slopes with erosion potential.

***Habitat Restoration and Recovery***

- Restoration is typically passive on cooler and moister areas and is designed to increase or maintain perennial herbaceous species, biological soil crusts, and landscape cover of sagebrush (cells 2A, 2B, 2C). Areas to consider for active restoration include:
  - ○ Areas where perennial herbaceous cover, density, and species composition is inadequate for recovery after surface disturbance.
  - ○ Areas where seeding or transplanting sagebrush is needed to maintain habitat connectivity for sage-grouse.
  - ○ Relatively warm and dry areas where annual invasives are expanding.

**Low Resilience to Disturbance and Resistance to Invasive Annuals (3A, 3B, 3C)**

Natural sagebrush recovery is not likely. Perennial herbaceous species are typically inadequate for recovery. Risk of invasive annual grasses is high.

**Fire Operations**

- Fire suppression priority depends on the landscape cover of sagebrush:
  - ○ Areas with <25% landscape cover of sagebrush are typically third order priority (cell 3A). These areas may be a higher priority if they are adjacent to intact sage-grouse habitat or are essential for connectivity.
  - ○ Areas with 26-65% landscape cover of sagebrush are typically second order priority (cell 3B). These areas are higher priority if they have intact understories and if they are adjacent to sage-grouse habitat.
  - ○ Areas with >65% landscape cover of sagebrush are first order priority (cell 3C).
  - ○ Areas where sagebrush communities have been successfully reestablished through seedings or other rehabilitation investments (cells 3A, 3B, 3C).

(continued)

**Table 4.** (Continued).

| | |
|---|---|
| ***Fuels Management*** | • Fuels management priority and management activities depend on the landscape cover of sagebrush:<br>○ Areas with <25% landscape cover of sagebrush are typically third order priority (cell 3A). Strategic placement of fuel breaks may be needed to reduce loss of adjacent sage-grouse habitat by wildfire. Examples include linear features or other strategically placed treatments that serve to constrain fire spread or otherwise augment suppression efforts.<br>○ Areas with 26-65% landscape cover of sagebrush are typically second order priority (cell 3B). These areas are higher priority if they have intact understories and if they are adjacent to sage-grouse habitat. Strategic placement of fuel breaks may be needed to reduce loss of large sagebrush stands by wildfire.<br>○ Areas with >65% landscape cover of sagebrush are first order priority (cell 3C). Strategic placement of fuel breaks may be needed to reduce loss of large sagebrush stands by wildfire.<br>○ Areas where sagebrush communities have been successfully reestablished through seedings or other rehabilitation investments (cells 3A, 3B, 3C). Strategic placement of fuel breaks may be needed to protect investments from repeated loss to wildfire. |
| ***Post-Fire Rehabilitation*** | • Post-fire rehabilitation priority and management activities depend on the landscape cover of sagebrush:<br>○ Areas with <25% landscape cover of sagebrush are typically third order priority (cell 3A). Exceptions include (1) sites that are relatively cool and moist and (2) areas adjacent to sage-grouse habitat where seeding can be used to increase connectivity and prevent annual invasive spread. In highly invaded areas, integrated strategies that include seeding of perennial herbaceous species and seeding and/or transplanting sagebrush will be required. Success will likely require more than one intervention due to low and variable precipitation.<br>○ Areas with 26-65% landscape cover of sagebrush are typically second order priority (cell 3B). Exceptions include (1) sites that are relatively cool and moist or that are not highly invaded, and (2) areas adjacent to sage-grouse habitat where seeding can be used to increase connectivity and prevent annual invasive spread. Seeding of perennial herbaceous species will be required where cover, density and species composition of these species is inadequate for recovery. Seeding and/or transplanting sagebrush as soon as possible is necessary for rehabilitating sage-grouse habitat. Success will likely require more than one intervention due to low and variable precipitation.<br>○ Areas with >65% landscape cover of sagebrush are first order priority, especially if they are part of a larger, contiguous area of sagebrush (cell 3C). Seeding of perennial herbaceous species will be required where cover, density and species composition of these species is inadequate for recovery. Seeding and/or transplanting sagebrush as soon as possible is necessary for rehabilitating sage-grouse habitat. Success will likely require more than one intervention due to low and variable precipitation. |
| ***Habitat Restoration and Recovery*** | • Restoration priority and management activities depends on the landscape cover of sagebrush:<br>○ Areas with <25% landscape cover of sagebrush are typically third order priority. Exceptions include (1) surface disturbances and (2) areas adjacent to sage-grouse habitat where seeding can be used to prevent annual invasive spread (cell 3A). In highly invaded areas, integrated strategies that include seeding of perennial herbaceous species and seeding and/or transplanting sagebrush will be required. Success will likely require more than one intervention due to low and variable precipitation.<br>○ Areas with 26-65% landscape cover of sagebrush are typically second order priority (cell 3B). Exceptions include (1) surface disturbances, (2) sites that are relatively cool and moist or that are not highly invaded, and (3) areas adjacent to sage-grouse habitat where seeding can be used to increase connectivity and prevent annual invasive spread. Seeding of perennial herbaceous species may be required where cover, density and species composition of these species is inadequate. Seeding and/or transplanting sagebrush as soon as possible is necessary for restoring sage-grouse habitat. Success will likely require more than one intervention due to low and variable precipitation.<br>○ Areas with >65% landscape cover of sagebrush are first order priority, especially if they are part of a larger, contiguous area of sagebrush (cell 3C). Seeding of perennial herbaceous species may be required where cover, density, and species composition of these species is inadequate. Seeding and/or transplanting sagebrush as soon as possible is necessary for restoring sage-grouse habitat. Success will likely require more than one intervention due to low and variable precipitation. |

Another important consideration is that ecological processes such as wildfire can occur either within or across categories in the sage-grouse habitat matrix and it is necessary to determine the appropriate spatial context when evaluating management opportunities based on resilience and resistance and sage-grouse habitat. For example, if critical sage-grouse habitat occurs in close proximity to landscapes comprised mainly of annual grass-dominated plant communities, then fire risk to adjacent sage-grouse habitat can increase dramatically (Balch et al. 2013). In this scenario, management actions could include reducing the influence of invasive annual grasses with a strategic fuel break on the perimeter of intact sagebrush. Thus, management actions may have value to sustaining existing sage-grouse habitat, even if these measures are applied in locations that are currently not habitat; the spatial relationships of sagebrush and invasive annual grasses should be considered when prioritizing management actions and associated conservation measures.

## Informing Wildfire and Fuels Management Strategies to Conserve Sage-Grouse

Collectively, responses to wildfires and implementation of fuels management projects are important contributors to sage-grouse conservation. Resilience and resistance concepts provide a science-based background that can inform fire operations and fuels management strategies and allocation of scarce assets during periods of high fire activity. In fire operations, firefighter and public safety is the overriding objective in all decisions. In addition, land managers consider numerous other values at risk, including the Wildland-Urban Interface (WUI), habitats, and infrastructure when allocating assets and prioritizing efforts. Resilience and resistance concepts are especially relevant for evaluating tradeoffs related to current ecological conditions and rates of recovery and possible ecological consequences of different fire management activities. For example, prioritizing initial attack efforts based on ecological types and their resilience and resistance at fire locations is a possible future application of resilience and resistance concepts. Also, fire prevention efforts can be concentrated where human ignitions have commonly occurred near intact, high quality habitats that also have inherently low resilience and resistance.

Fuels management projects are often applied to (1) constrain or minimize fire spread; (2) alter species composition; (3) modify fire intensity, severity, or effects; or (4) create fuel breaks or anchor points that augment fire management efforts (fig. 13). These activities are selectively used based on the projected ecosystem response, anticipated fire patterns, and probability of success. For example, in areas that are difficult to restore due to low to moderate resilience, fuel treatments can be placed to minimize fire spread and conserve sagebrush habitat. In cooler and moister areas with moderate to high resilience and resistance, mechanical or prescribed fire treatments may be appropriate to prevent conifer expansion and dominance. Given projected climate change and longer fire seasons across the western United States, fuels management represents a proactive approach for modifying large fire trends. Fire operations and fuels management programs contribute to a strategic, landscape approach when coupled with data that illustrate the likelihood of fire occurrence, potential fire behavior, and risk assessments (Finney et al. 2010; Oregon Department of Forestry 2013). In tandem with resilience and resistance concepts, these data can further inform fire operations and fuels management decisions.

**Figure 13.** Fuel breaks may include roads, natural features, or other management imposed treatments intended to modify fire behavior or otherwise augment suppression efforts at the time of a fire. Such changes in fuel type and arrangement may improve suppression effectiveness by modifying flame length and fire intensity, and allow fire operations to be conducted more safely. The top photo shows a burnout operation along an existing road to remove available fuels ahead of an oncoming fire and constrain overall fire growth (photo by BLM Idaho Falls District). The bottom photo shows fuel breaks located along a road, which complimented fire control efforts when a fire intersected the fuel break and road from the right (photo by Ben Dyer, BLM).

## Putting it all Together

Effective management and restoration of sage-grouse habitat will benefit from a collaborative approach that prioritizes the best management practices in the most appropriate places. This section describes an approach for assessing focal areas for sage-grouse habitat management based on widely available data, including (1) Priority Areas for Conservation (PACs), (2) breeding bird densities, (3) habitat suitability as indicated by the landscape cover of sagebrush, (4) resilience and resistance and dominant ecological types as indicated by soil temperature and moisture regimes, and (5) habitat threats as indicated by cover of cheatgrass, cover of piñon and juniper, and by fire history. Breeding bird density data are overlain with landscape cover of sagebrush and with resilience and resistance to spatially link sage-grouse populations with habitat conditions and risks. We illustrate the use of this step-down approach for evaluating focal areas for sage-grouse habitat management across the western portion of the range, and we provide a detailed example for a diverse area in the northeast corner of Nevada that is comprised largely of PACs with mixed land ownership. The sage-grouse habitat matrix (table 2) is used as a tool in the decision process, and guidelines are provided to assist in determining appropriate management strategies for the primary agency program areas (fire operations, fuels management, post-fire rehabilitation, habitat restoration) for each cell of the matrix.

We conclude with discussions of the tools available to aid in determining the suitability of an area for treatment and the most appropriate management treatments such as ecological site descriptions and state and transition models and of monitoring and adaptive management. Datasets used to compile the maps in the following sections are in Appendix 4.

### Assessing Focal Areas for Sage-Grouse Habitat Management: Key Data Layers

**Priority areas for conservation:** The recent identification of sage-grouse strongholds, or Priority Areas for Conservation (PACs), greatly improves the ability to target management actions towards habitats expected to be critical for long-term viability of the species (fig. 14; USFWS 2013). Understanding and minimizing risks of large-scale loss of sagebrush and conversion to invasive annual grasses or piñon and juniper in and around PACs will be integral to maintaining sage-grouse distribution and stabilizing population trends. PACs were developed by individual states to identify those areas that are critical for ensuring adequate representation, redundance, and resilience to conserve sage-grouse populations. Methods differed among states; in general, PAC boundaries were identified based on (1) sage-grouse population data including breeding bird density, lek counts, telemetry, nesting areas, known distributions, and sightings/observations; and (2) habitat data including occupied habitat, suitable habitat, seasonal habitat, nesting and brood rearing areas, and connectivity areas or corridors. Sage-grouse habitats outside of PACs also are important in assessing focal areas for management where they provide connectivity between PACs (genetic and habitat linkages), seasonal habitats that may have been underestimated due to emphasis on lek sites to define priority areas, habitat restoration and population expansion opportunities, and flexibility for managing habitat changes that may result from climate change (USFWS 2013). If PAC boundaries are adjusted, they will need to be updated for future analyses.

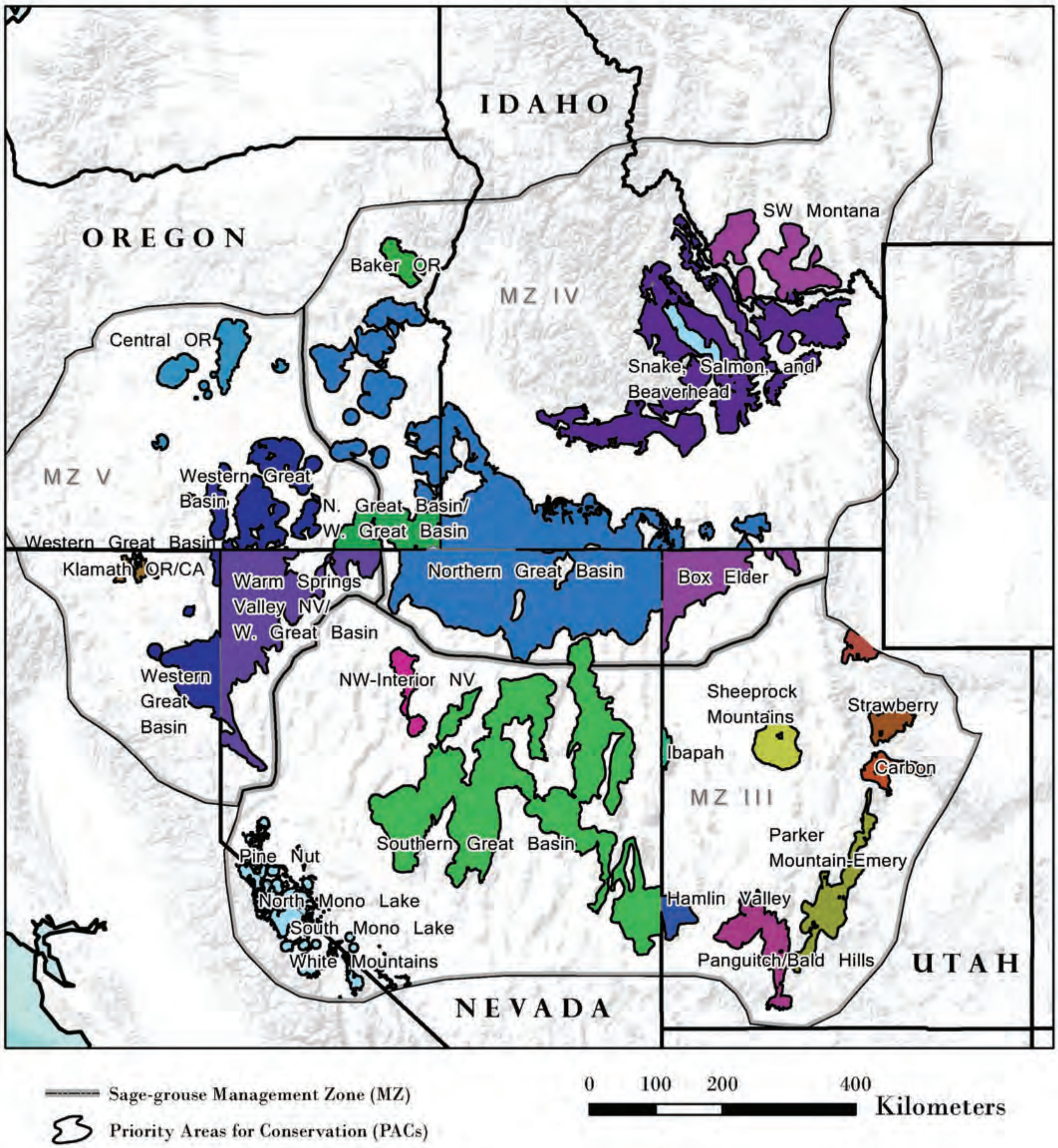


**Figure 14.** Priority Areas for Conservation (PACs) within the range of sage-grouse (USFWS 2013). Colored polygons within Management Zones delineate Priority Areas for Conservation (USFWS 2013).

**Breeding bird density:** Range-wide breeding bird density areas provide one of the few accessible data sets for further prioritizing actions within and adjacent to PACs to maintain species distribution and abundance. Doherty et al. (2010b) developed a useful framework for incorporating population data in their range-wide breeding bird density analysis, which used maximum counts of males on leks (n = 4,885) to delineate breeding bird density areas that contain 25, 50, 75, and 100% of the known breeding population (fig. 15). Leks were mapped according to these abundance values and buffered by a 6.4 to 8.5 km (4.0 to 5.3 mi) radius to delineate nesting areas. Findings showed that while sage-grouse occupy extremely large landscapes, their breeding distribution is highly aggregated in comparably smaller identifiable population centers; 25% of the known population occurs within 3.9% (2.9 million ha; 7.2 million ac) of the species range, and 75% of birds are within 27.0% of the species range (20.4 million ha; 50.4 million ac) (Doherty et al. 2010b). The Doherty et al. (2010b) analysis emphasized breeding habitats primarily because little broad scale data exist for summer and winter habitat use areas. Even though the current breeding bird density data provide the most comprehensive data available, they do not include all existing sage-grouse populations. Incorporating finer scale seasonal habitat use data at local levels where it is available will ensure management actions encompass all seasonal habitat requirements.

For this assessment, we chose to use State-level breeding bird density results from Doherty et al. (2010b) instead of range-wide model results to ensure that important breeding areas in MZs III, IV, and V were not underweighted due to relatively higher bird densities in the eastern portion of the range. It is important to note that breeding density areas were identified using best available information in 2009, so these range-wide data do not reflect the most current lek count information or changes in conditions since the original analysis. Also, breeding density areas should not be viewed as rigid boundaries but rather as the means to prioritize landscapes regionally where step-down assessments and actions may be implemented quickly to conserve the most birds.

**Landscape cover of sagebrush:** Landscape cover of sagebrush is one of the key determinants of sage-grouse population persistence and, in combination with an understanding of resilience to disturbance and resistance to invasive annuals, provides essential information both for determining priority areas for management and appropriate management actions (fig. 10; tables 2 and 3). Landscape cover of sagebrush is a measure of large, contiguous patches of sagebrush on the landscape and is calculated from remote sensing databases such as LANDFIRE (see Appendix 4). We used the three cover categories of sagebrush landscape cover discussed previously to predict the likelihood of sustaining sage-grouse populations (1-25%, 25-65%, >65%). The sagebrush landscape cover datasets were created using a moving window to summarize the proportion of area (5-km [3.1-mi] radius) dominated by sagebrush surrounding each 30-m pixel and then assigned those areas to the three categories (see Appendix 2). Because available sagebrush cover from sources such as LANDFIRE does not exclude recent fire perimeters, it was necessary to either include these in the analysis of landscape cover of sagebrush or display them separately. Although areas that have burned since 2000 likely do not currently provide desired sage-grouse habitat, areas with the potential to support sagebrush ecological types can provide conservation benefits in the overall planning effort especially within long-term conservation areas like PACs. The landscape cover of sagebrush and recent fire perimeters are illustrated for the western portion of the range (fig.16) and northeast Nevada (fig. 17).

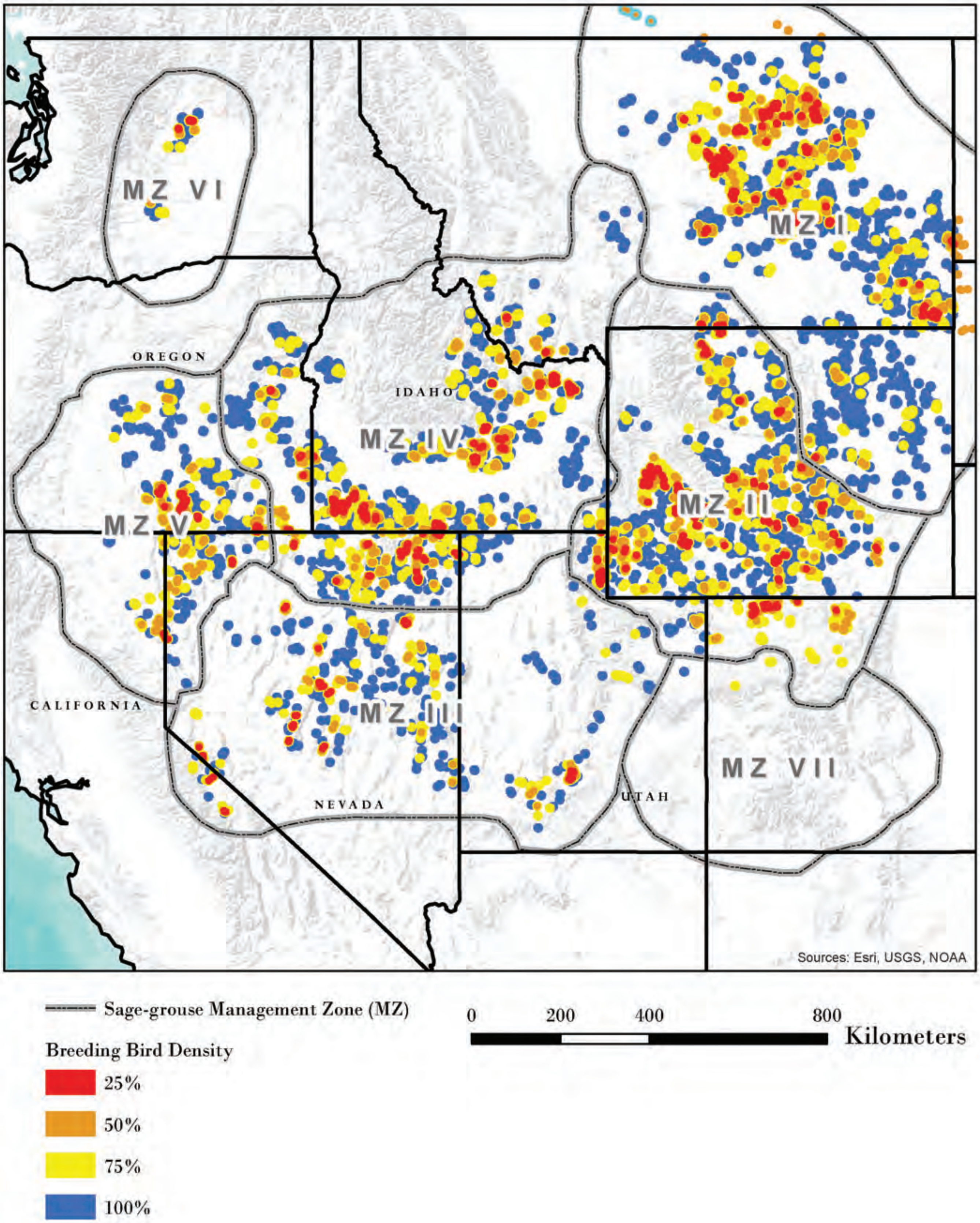


**Figure 15.** Range-wide sage-grouse breeding bird densities from Doherty et al. 2010. Points illustrate breeding bird density areas that contain 25, 50, 75, and 100% of the known breeding population and are based on maximum counts of males on leks (n = 4,885). Leks were mapped according to abundance values and buffered by 6.4 to 8.5 km (4.0 to 5.2 mi) to delineate nesting areas.

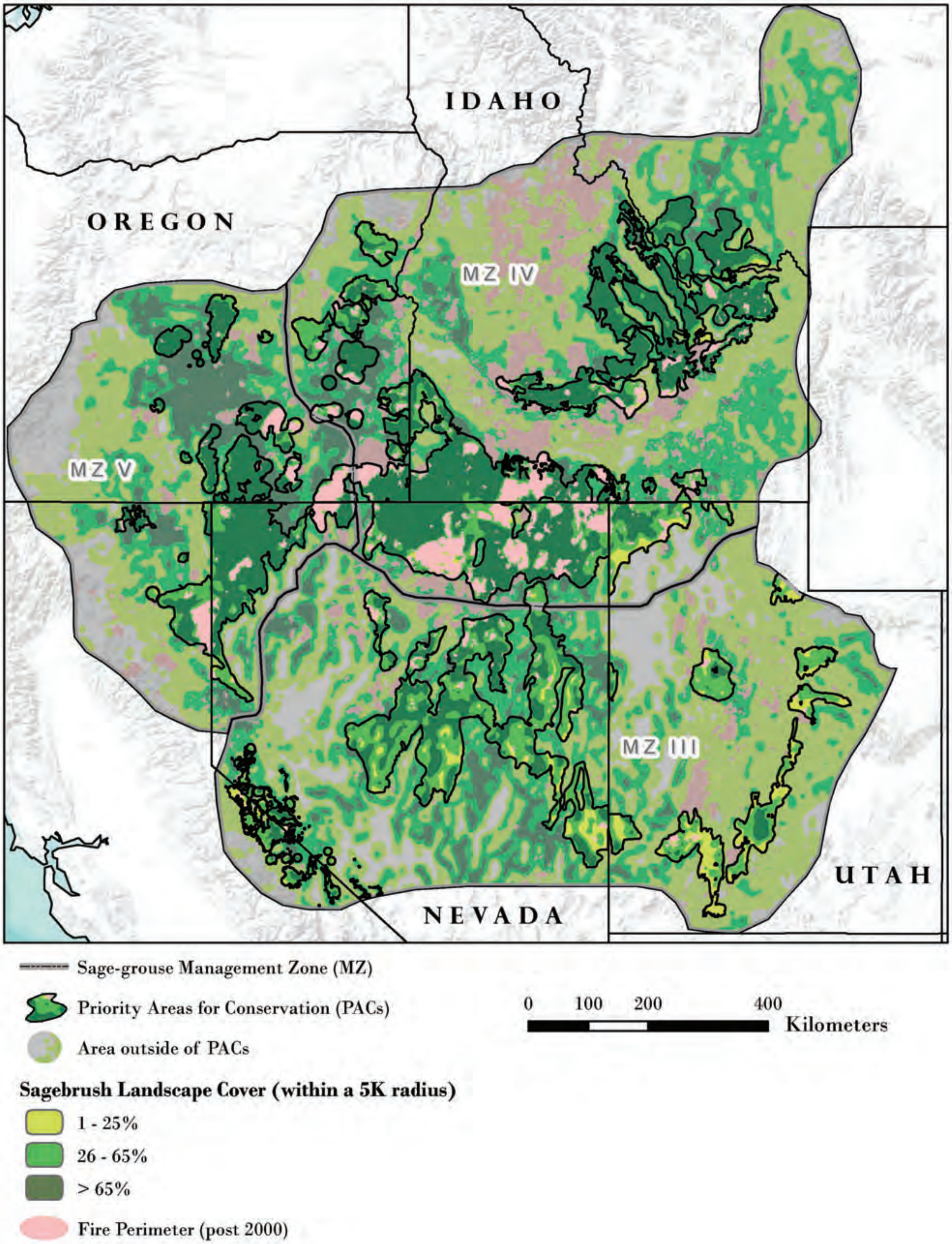


**Figure 16.** The landscape cover of sagebrush within each of three selected categories (1-25%, 26-65%, >65%) for Management Zones III, IV, and V (Stiver et al. 2006). The proportion of sagebrush (USGS 2013) within each of the categories in a 5-km (3.1-mi) radius surrounding each pixel was calculated relative to other land cover types for locations with sagebrush cover. Darker colored polygons within Management Zones delineate Priority Areas for Conservation (USFWS 2013).

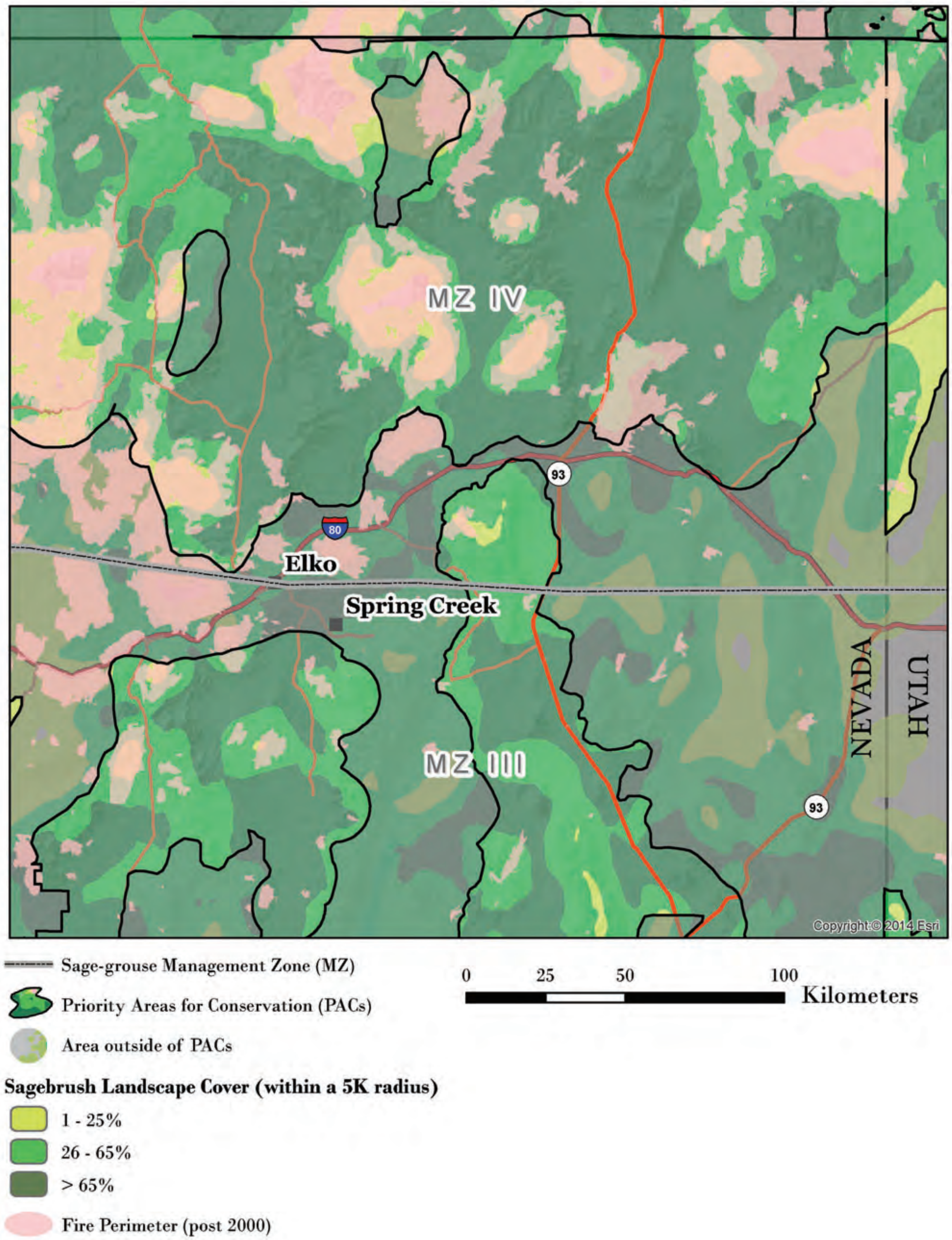


**Figure 17.** The landscape cover of sagebrush within each of the selected categories (1-25%, 26-65%, >65%) for the north-eastern portion of Nevada. The proportion of sagebrush (USGS 2013) within each of the categories in a 5-km (3.1-mi) radius surrounding each pixel was calculated relative to other land cover types for locations with sagebrush cover. Darker colored polygons delineate Priority Areas for Conservation (USFWS 2013).

**Resilience to disturbance and resistance to annuals**: Soil temperature and moisture regimes are a strong indicator of ecological types and of resilience to disturbance and resistance to invasive annual plants (fig. 11; table 1). Resilience and resistance predictions coupled with landscape cover of sagebrush can provide critical information for determining focal areas for targeted management actions (tables 2, 3, and 4). The available data for the soil temperature and moisture regimes were recently compiled to predict resilience and resistance (see Appendix 3). These data, displayed for the western portion of the range and northeast Nevada (figs. 18 and 19), illustrate the spatial variability within the focal areas. Soil temperature and moisture regimes are two of the primary determinants of ecological types and of more detailed ecological site descriptions, which are described in the section on "Determining the Most Appropriate Management Treatments at the Project Scale."

**Habitat threats:** Examining additional land cover data or models of invasive annual grasses and piñon and/or juniper, can provide insights into the current extent of threats in a planning area (e.g., Manier et al. 2013). In addition, evaluating data on fire occurrence and size can provide information on fire history and the rate and pattern of change within the planning area. Data layers for cheatgrass cover have been derived from Landsat imagery (Peterson 2006, 2007) and from model predictions based on species occurrence, climate variables, and anthropogenic disturbance (e.g., the Bureau of Land Management [BLM] Rapid Ecoregional Assessments [REAs]). The REAs contain a large amount of geospatial data that may be useful in providing landscape scale information on invasive species, disturbances, and vegetation types across most of the range of sage-grouse (http://www.blm.gov/wo/st/en/prog/more/Landscape_Approach/reas.html). Similarly, geospatial data for piñon and/or juniper have been developed for various States (e.g., Nevada and Oregon) and are becoming increasingly available rangewide. In addition, more refined data products are often available at local scales. Land managers can evaluate the available land cover datasets and select those land covers with the highest resolution and accuracy for the focal area. Land cover of cheatgrass and piñon and/or juniper and the fire history of the western portion of the range and northeast Nevada are in figures 20-25.

## Assessing Focal Areas for Sage-Grouse Habitat Management: Integrating Data Layers

Combining resilience and resistance concepts with sage-grouse habitat and population data can help land managers further gauge relative risks across large landscapes and determine where to focus limited resources to conserve sage-grouse populations. Intersecting breeding bird density areas with soil temperature and moisture regimes provides a spatial tool to depict landscapes with high bird concentrations that may have a higher relative risk of being negatively affected by fire and annual grasses (figs. 26, 27). For prioritization purposes, areas supporting 75% of birds (6.4 to 8.5 km [4.0 to 5.2 mi] buffer around leks) can be categorized as high density while remaining breeding bird density areas (75-100% category; 8.5-km [5.2-mi] buffer around leks) can be categorized as low density. Similarly, warm and dry types can be categorized as having relatively low resilience to fire and resistance to invasive species and all other soil temperature and moisture regimes can be categorized as having relatively moderate to high resilience and resistance. Intersecting breeding bird density areas with landscape cover of sagebrush provides another spatial component revealing large and intact habitat blocks and areas in need of potential restoration to provide continued connectivity (fig. 28).

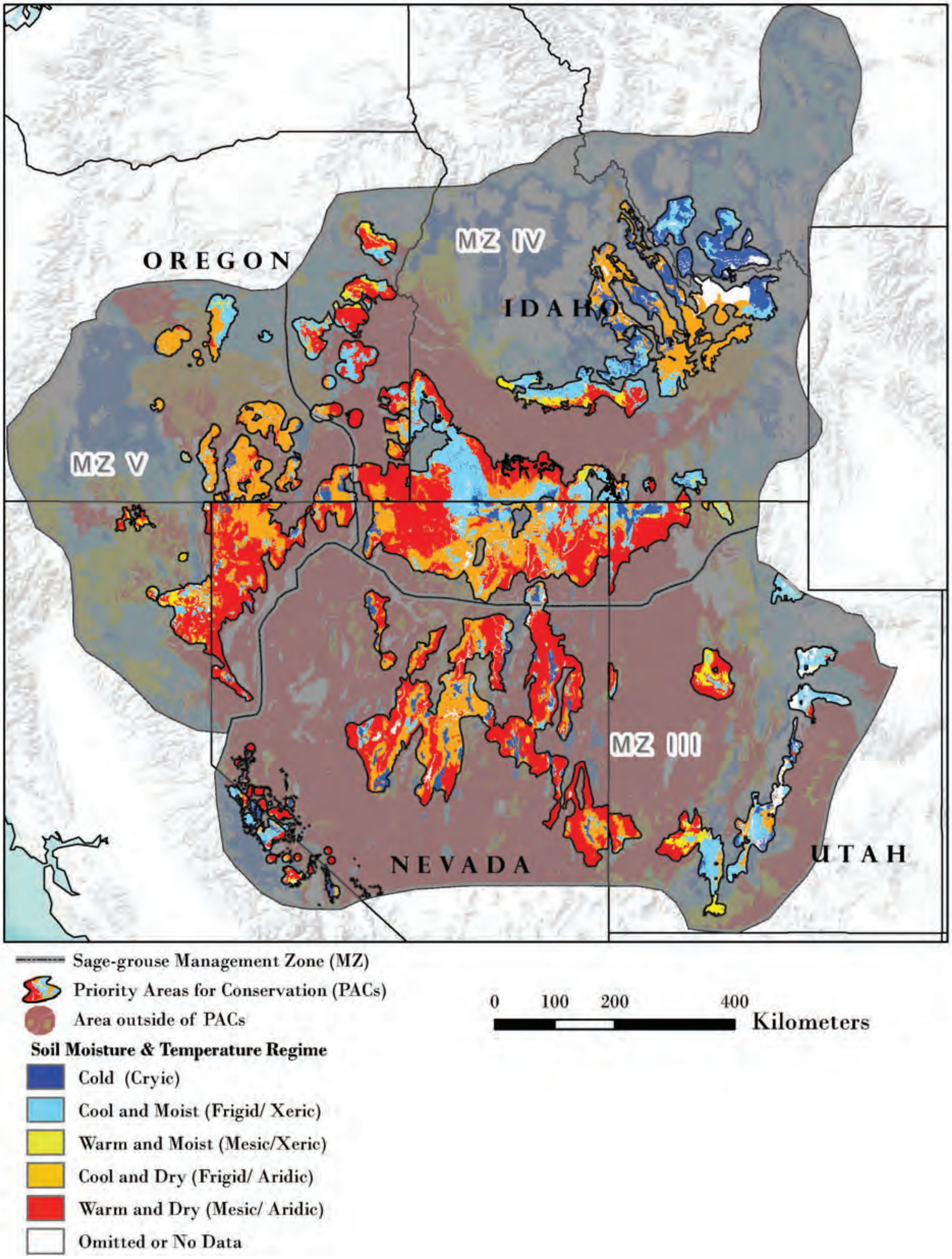


**Figure 18.** The soil temperature and moisture regimes within sage-grouse Management Zones III, IV, and V (Stiver et al. 2006). Soil temperature and moisture classes were derived from the Natural Resources Conservation Service (NRCS) Soil Survey Geographic Database (SSURGO) (Soil Survey Staff 2014a). Gaps in that dataset were filled in with the NRCS State Soil Geographic Database (STATSGO) (Soil Survey Staff 2014b). Darker colored polygons within Management Zones delineate Priority Areas for Conservation (USFWS 2013).

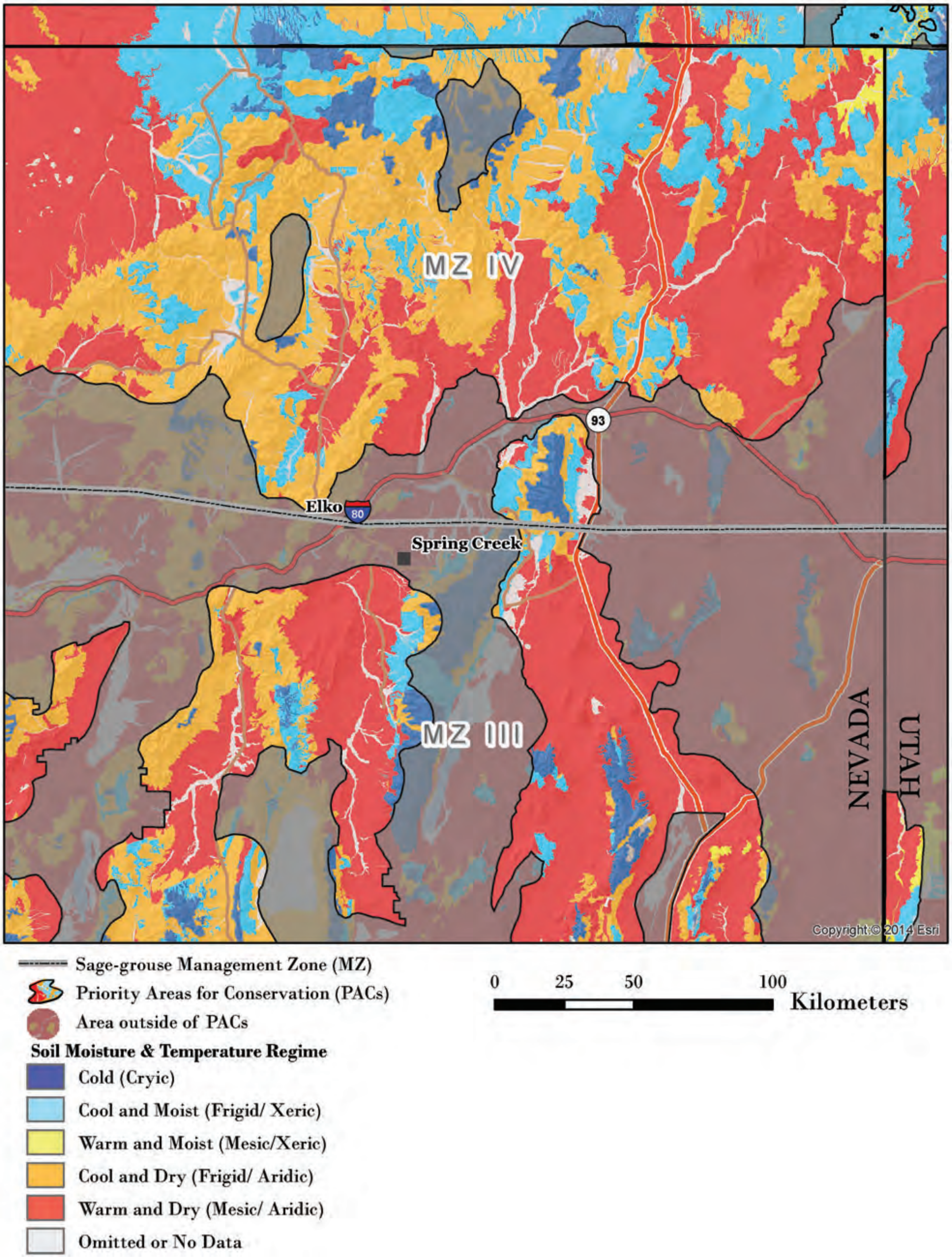


**Figure 19.** The soil temperature and moisture regimes for the northeast corner of Nevada. Soil temperature and moisture classes were derived from the Natural Resources Conservation Service (NRCS) Soil Survey Geographic Database (SSURGO) (Soil Survey Staff 2014a). Gaps in that dataset were filled in with the NRCS State Soil Geographic Database (STATSGO) (Soil Survey Staff 2014b). Darker colored polygons delineate Priority Areas for Conservation (USFWS 2013).

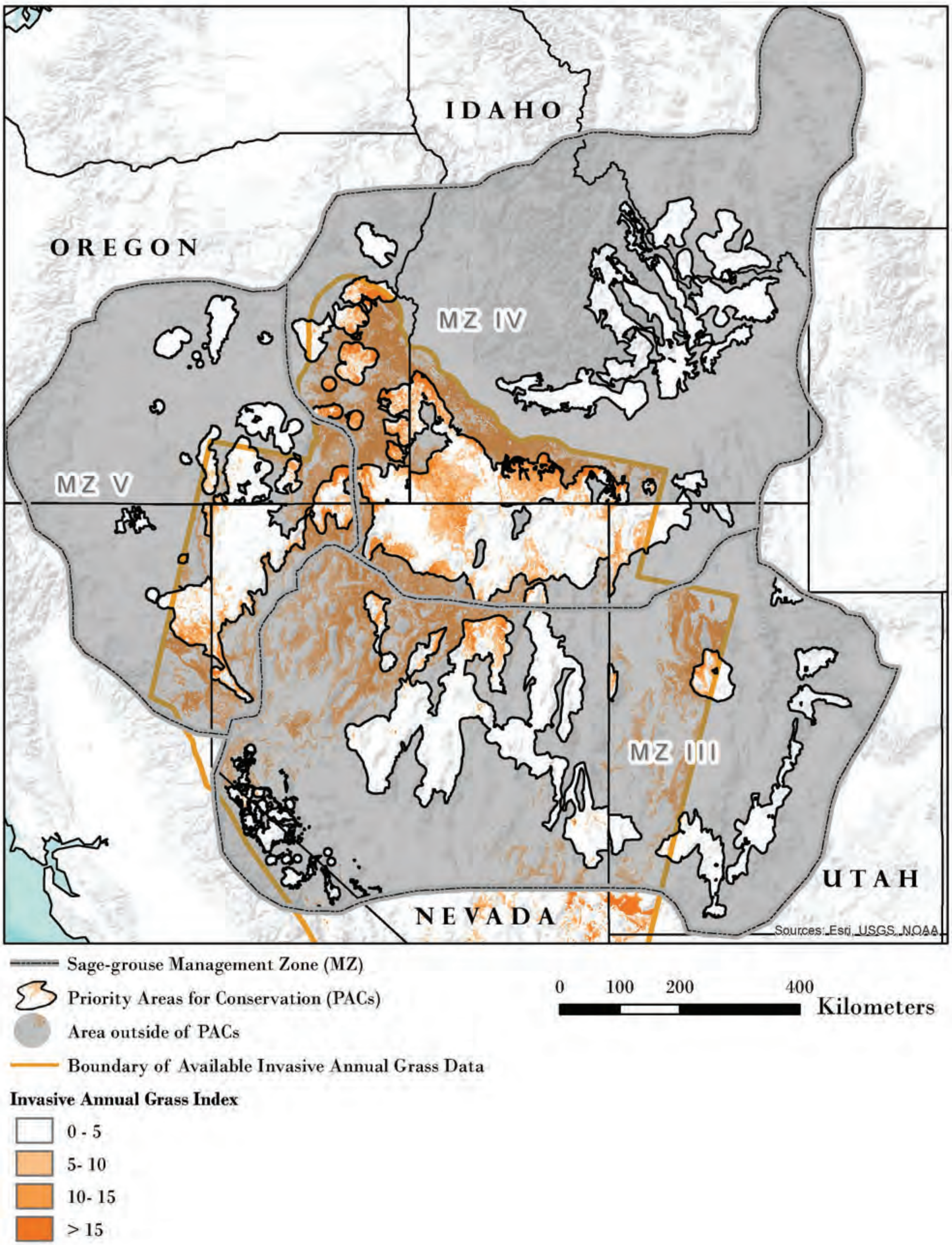


**Figure 20**. Invasive annual grass index for Nevada (Peterson 2006) and the Owhyee uplands (Peterson 2007) displayed for sage-grouse Management Zones III, IV, and V (Stiver et al. 2006). Lighter colored polygons within Management Zones delineate Priority Areas for Conservation (USFWS 2013).

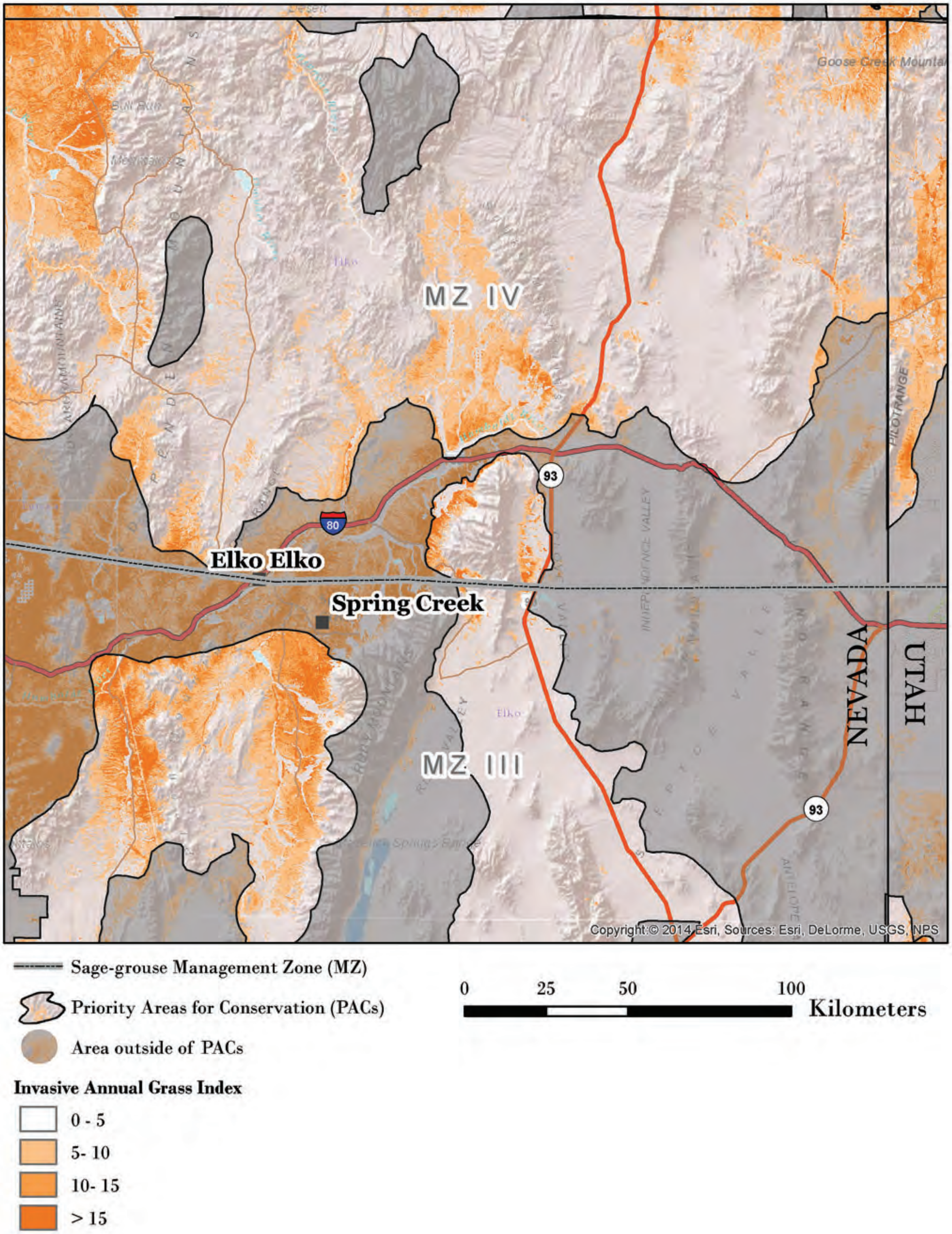


**Figure 21.** Invasive annual grass index for Nevada (Peterson 2006) and the Owhyee uplands (Peterson 2007) displayed for the northeast corner of Nevada. Lighter colored polygons delineate Priority Areas for Conservation (USFWS 2013).

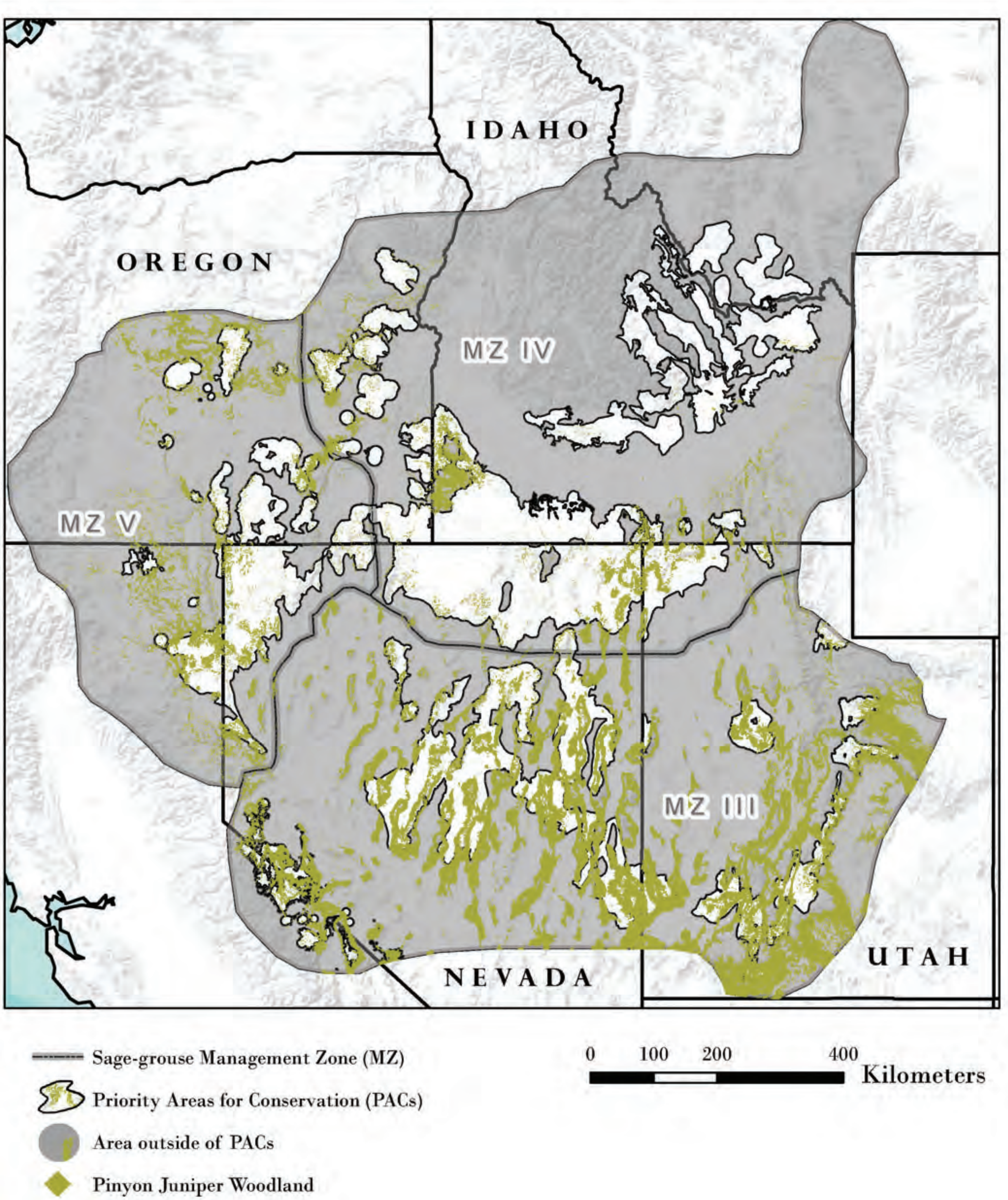


**Figure 22.** Piñon and/or juniper woodlands (USGS 2004; USGS 2013) within sage-grouse Management Zones III, IV, and V (Stiver et al. 2006). Lighter colored polygons within Management Zones delineate Priority Areas for Conservation (USFWS 2013).

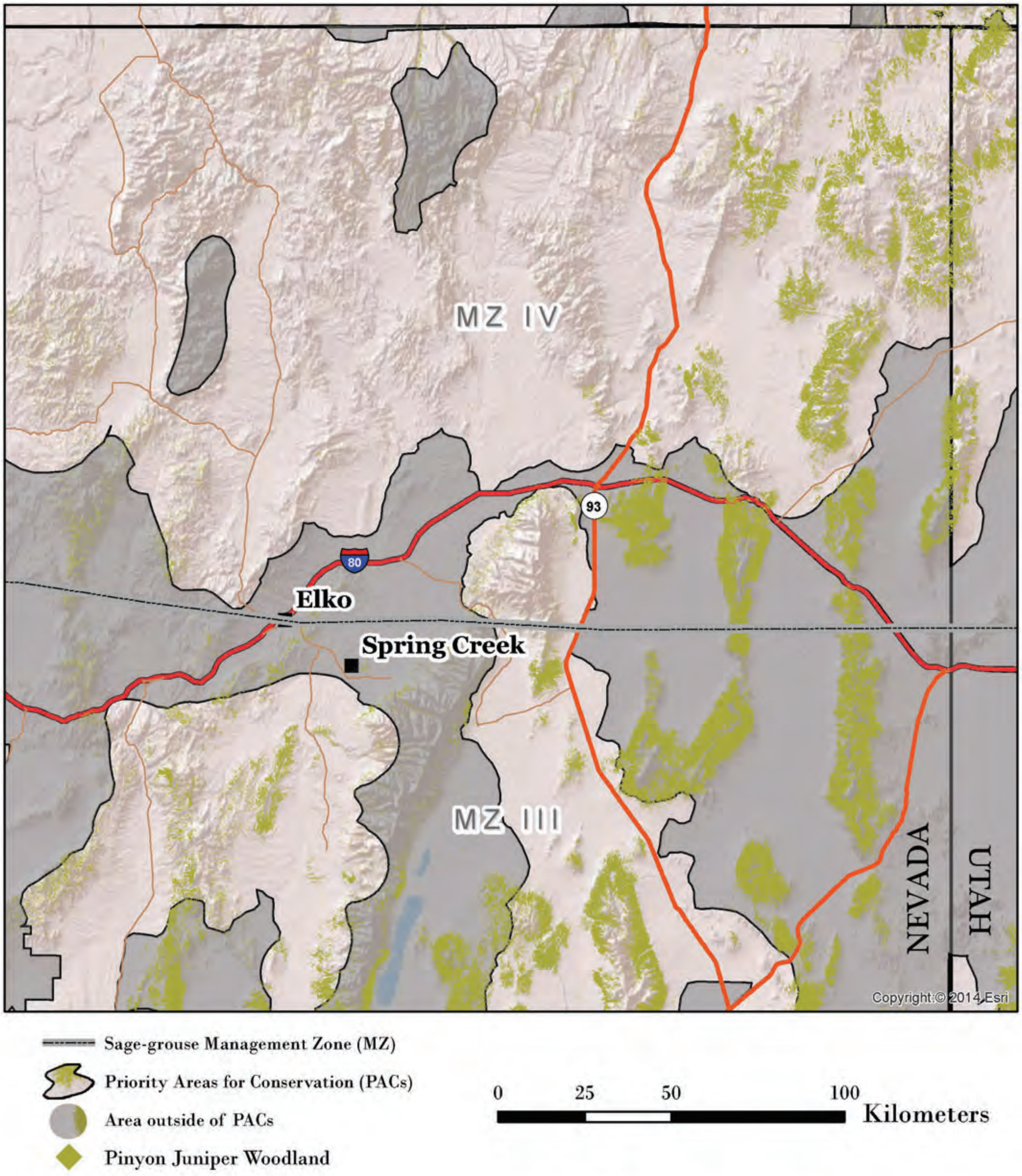


**Figure 23.** Piñon and/or juniper woodlands (USGS 2004; USGS 2013) within the northeast corner of Nevada. Lighter colored polygons delineate Priority Areas for Conservation (USFWS 2013).

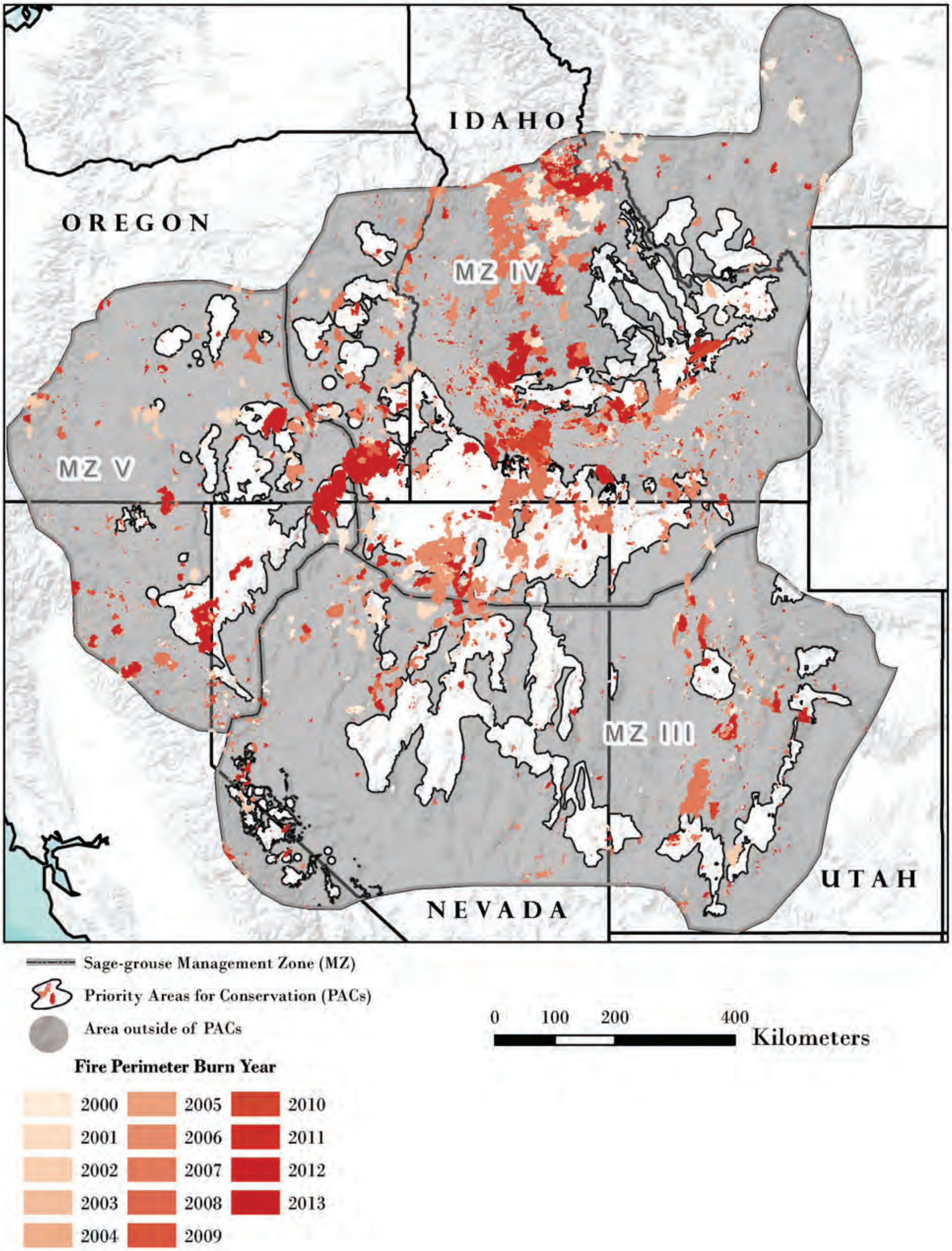


**Figure 24.** Fire perimeters (Walters et al. 2011; Butler and Bailey 2013) within sage-grouse Management Zones III, IV, and V (Stiver et al. 2006). Ligher colored polygons within Management Zones delineate Priority Areas for Conservation (USFWS 2013).

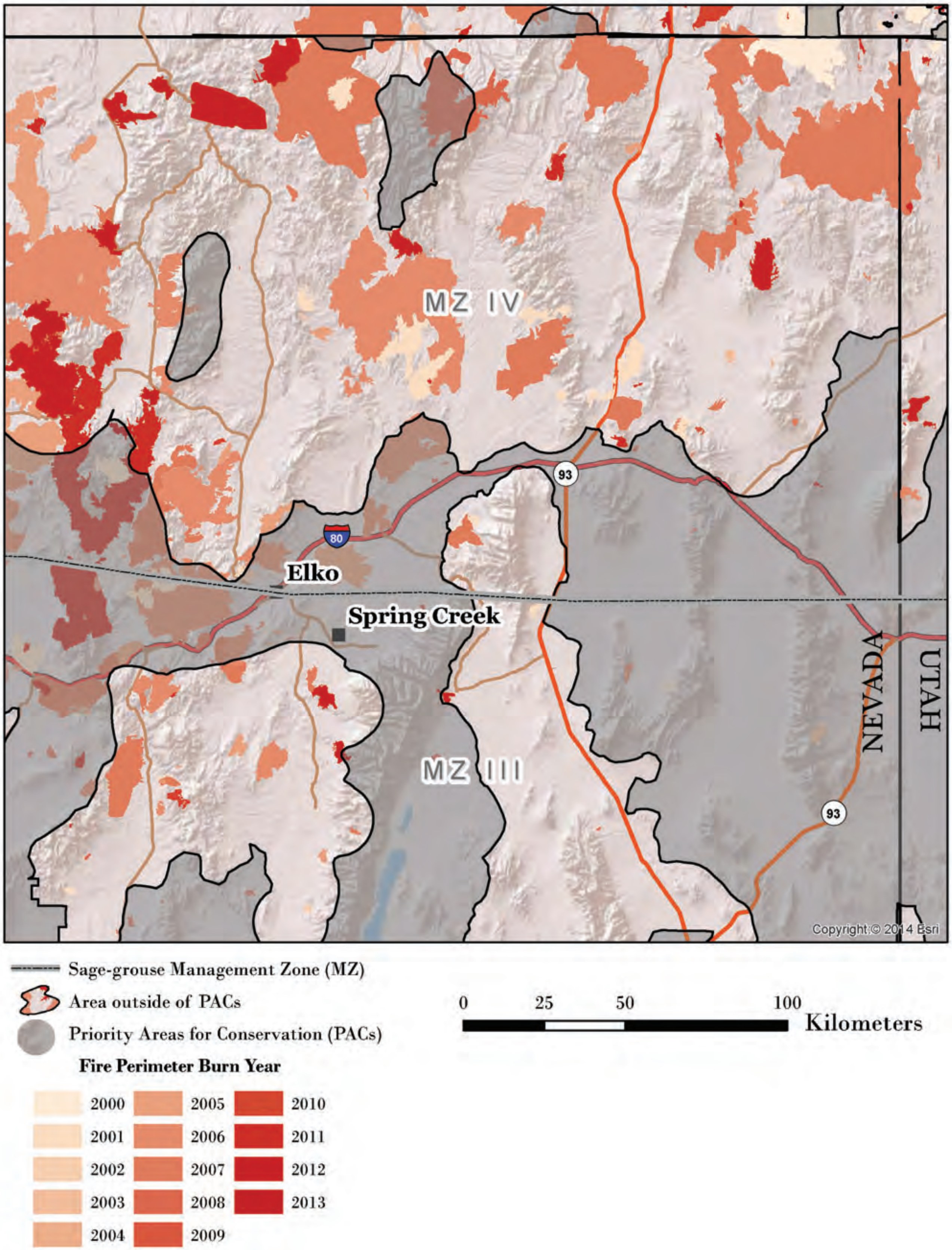


**Figure 25.** Fire perimeters (Walters et al. 2011; Butler and Bailey 2013) within the northeast corner of Nevada. Lighter colored polygons delineate Priority Areas for Conservation (USFWS 2013).

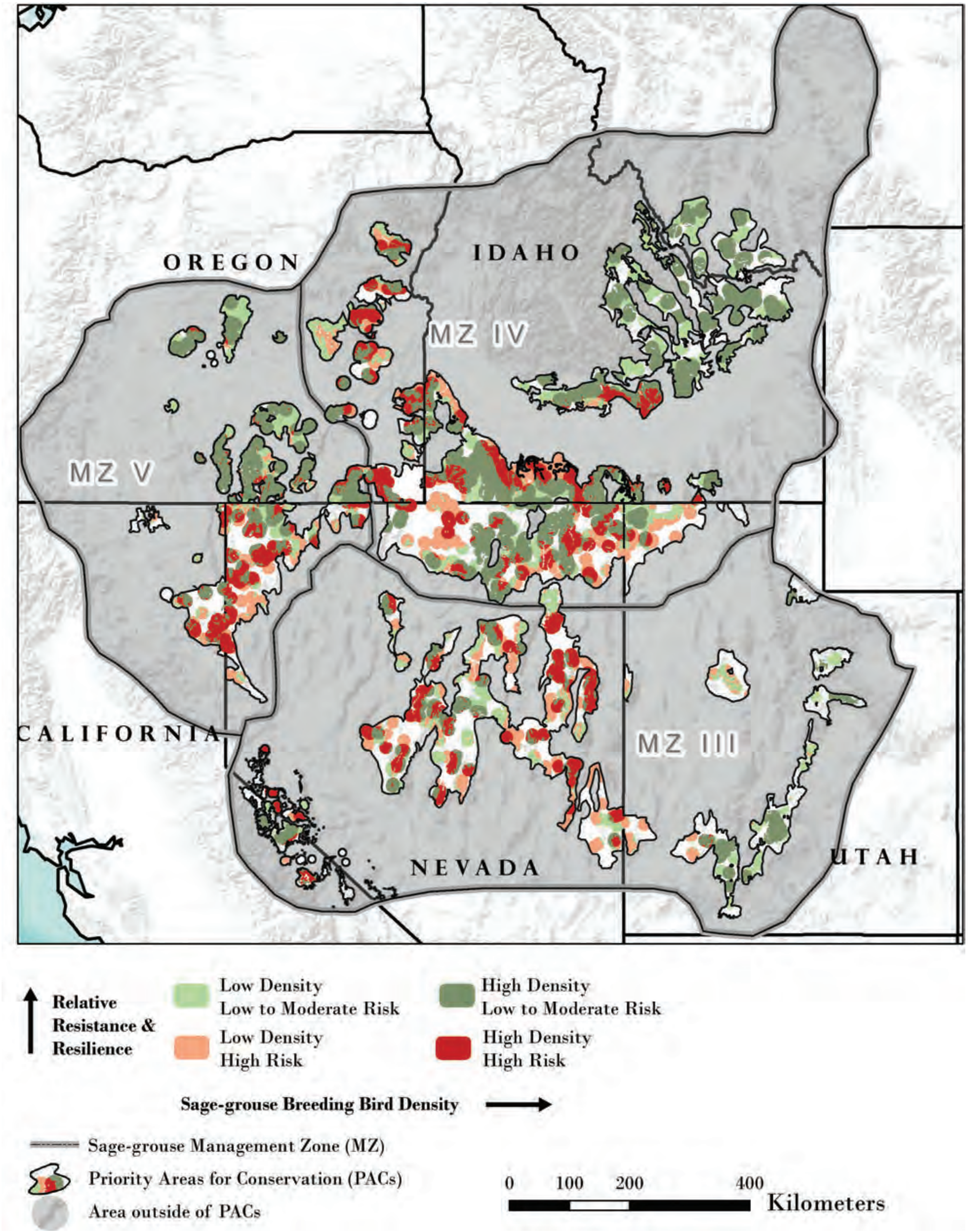


**Figure 26.** Sage-grouse breeding bird densities (Doherty et al. 2010) for high breeding bird densities (areas that contain 75% of known breeding bird populations) and low breeding bird densities (areas that contain all remaining breeding bird populations) relative to resilience and resistance within sage-grouse Management Zones III, IV, and V (Stiver et al. 2006). Relative resilience and resistance groups are derived from soil moisture and temperature classes (Soil Survey Staff 2014a, b) as described in text, and indicate risk of invasive annual grasses and wildfire. Lighter colored polygons within Management Zones delineate Priority Areas for Conservation (USFWS 2013).

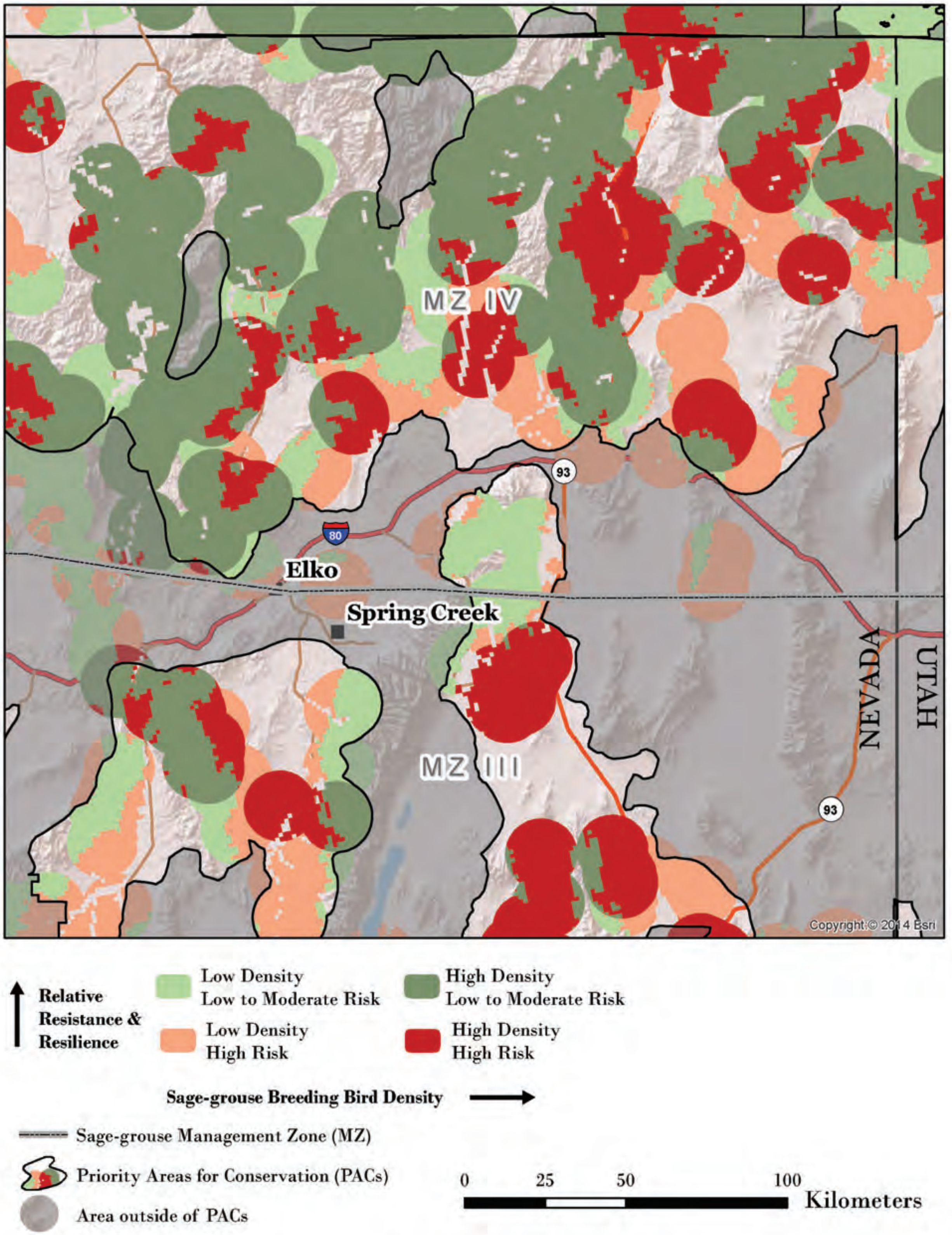


**Figure 27.** Sage-grouse breeding bird densities (Doherty et al. 2010) for high breeding bird densities (areas that contain 75% of known breeding bird populations) and low breeding bird densities (areas that contain all remaining breeding bird populations) relative to resilience and resistance in the northeast corner of Nevada. Relative resilience and resistance groups are derived from soil moisture and temperature classes (Soil Survey Staff 2014a, b) as described in text, and indicate risk of invasive annual grasses and wildfire. Lighter colored polygons within Management Zones delineate Priority Areas for Conservation (USFWS 2013).

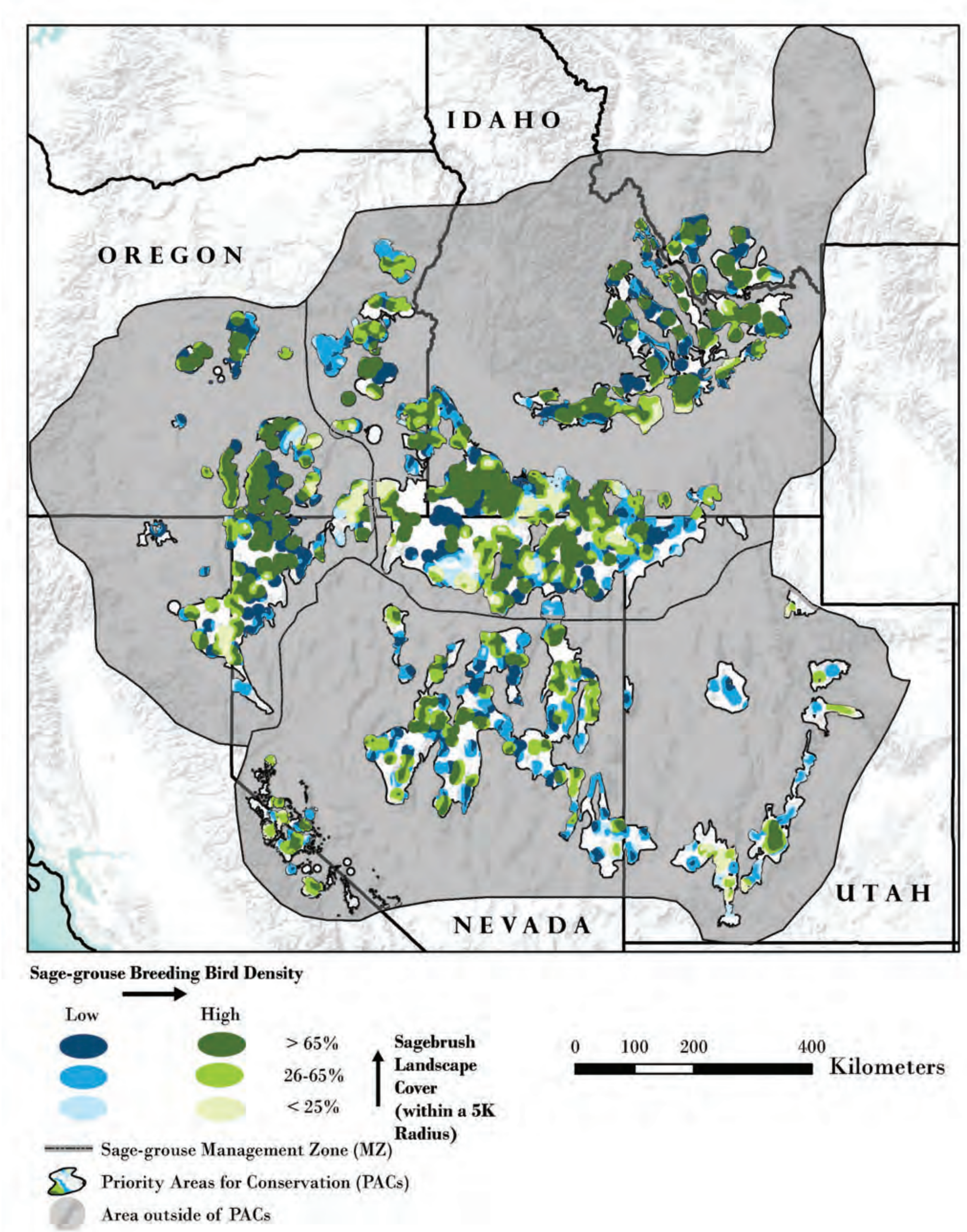


**Figure 28.** Sage-grouse breeding bird densities (Doherty et al. 2010) for high breeding bird densities (areas that contain 75% of known breeding bird populations) and low breeding bird densities (areas that contain all remaining breeding bird populations) relative to sagebrush cover. Lighter colored polygons within Management Zones delineate Priority Areas for Conservation (USFWS 2013).

Resilience and resistance and sagebrush cover combined with bird population density data provide land managers a way to evaluate trade-offs of particular management options at the landscape scale. For example, high density, low resilience and resistance landscapes with >65% sagebrush landscape cover may require immediate attention for conservation efforts because they currently support a high concentration of birds but have the lowest potential to recover to desired conditions post-fire and to resist invasive plants when disturbed. Similarly, high density but moderate-to-high resilience and resistance landscapes with 26-65% sagebrush cover may be priorities for preventative actions like conifer removal designed to increase the proportion of sagebrush cover and maintain ecosystem resilience and resistance. Mapping relative resilience and resistance and landscape cover of sagebrush for sage-grouse breeding areas should be viewed as a component of the assessment process that can help local managers allocate resources to accelerate planning and implementation.

## Interpretations at the Management Zone (MZ) Scale: Western Portion of the Range

An examination of land cover and additional data layers for the western portion of the range reveals large differences among Management Zones (MZs) III, IV and V. MZs IV and V have larger areas with sagebrush cover >65% than MZ III (fig. 16). This may be partly explained by basin and range topography in MZ III, which is characterized by large differences in both environmental conditions and ecological types over relatively short distances. However, the cover of piñon and juniper in and adjacent to PACs in MZ III also is higher than in either MZ IV or V (fig. 22). The greater cover of piñon and juniper in MZ III appears to largely explain the smaller patches of sagebrush cover in the 26-65% and >65% categories.

Our capacity to quantify understory vegetation cover using remotely sensed data is currently limiting, but a visual examination of estimates for invasive annual grass (fig. 20; Peterson 2006, 2007) suggests a higher index (greater cover) in areas with relatively low resistance (warm soil temperatures) in all MZs (see fig. 18). This is consistent with current understanding of resistance to cheatgrass (Chambers et al. 2014; Chambers et al. *in press*). It is noteworthy that the invasive annual grass index is low for most of the central basin and range (central Nevada). Several factors may be contributing to the low index for this area including climate, the stage of piñon and juniper expansion and linked decrease in fire frequency, the relative lack of human development, and the relative lack of management treatments in recent decades (Wisdom et al. 2005; Miller et al. 2011). Not surprisingly, areas with a high annual grass index are outside or on the periphery of current PACs. However, it is likely that invasive annual grasses are present on many warmer sites and that they may increase following fire or other disturbances. In areas with low resistance to invasive annual grasses, they often exist in the understory of sagebrush ecosystems and are not detected by remote sensing platforms such as Landsat.

The number of hectares burned has been highest in MZ IV, adjacent areas in MZ V, and in areas with relatively low resilience and resistance in the northern portion of MZ III that have a high invasive annual grass index (figs. 18, 20, 24). A total of over 1.1 million hectares (2.7 million acres) burned in 2000 and 2006, while over 1.7 million hectares (4.2 million acres) burned in 2007 and 2012 and almost three quarters of these acres were in MZ IV (table 5). In some cases, these fires appear to be linked to the annual invasive grass index, but in others it clearly is not. At this point, there appears to be little relationship between cover of piñon and juniper and wildfire. Mega-fires comprised of hundreds of thousands of acres have burned in recent years, especially in MZ IV. These fires have occurred primarily in areas with low to moderate resilience and resistance and during periods with extreme burning conditions.

**Table 5.** The number of hectares (acres) burned in Management Zones III, IV, and V each year from 2000 to 2013.

| Year | Management Zone III | | Management Zone IV | | Management Zone V | | Total | |
|---|---|---|---|---|---|---|---|---|
| 2000 | 155,159 | (383,405) | 868,118 | (2,145,165) | 88,871 | (219,606) | 1,112,148 | (2,748,176) |
| 2001 | 164,436 | (406,330) | 272,870 | (674,276) | 141,454 | (349,541) | 578,760 | (1,430,147) |
| 2002 | 85,969 | (212,433) | 100,308 | (247,867) | 113,555 | (280,601) | 299,833 | (740,902) |
| 2003 | 21,869 | (54,038) | 127,028 | (313,892) | 27,597 | (68,192) | 176,493 | (436,123) |
| 2004 | 20,477 | (50,600) | 11,344 | (28,032) | 13,037 | (32,216) | 44,858 | (110,847) |
| 2005 | 45,130 | (111,520) | 374,894 | (926,382) | 22,039 | (54,458) | 442,063 | (1,092,360) |
| 2006 | 198,762 | (491,150) | 860,368 | (2,126,014) | 117,452 | (290,230) | 1,176,582 | (2,907,394) |
| 2007 | 371,154 | (917,140) | 1,240,303 | (3,064,853) | 134,520 | (332,406) | 1,745,977 | (4,314,399) |
| 2008 | 14,015 | (34,632) | 109,151 | (269,717) | 43,949 | (108,599) | 167,115 | (412,949) |
| 2009 | 43,399 | (107,242) | 12,250 | (30,271) | 47,918 | (118,408) | 103,568 | (255,921) |
| 2010 | 31,597 | (78,078) | 280,662 | (693,531) | 21,940 | (54,216) | 334,200 | (825,825) |
| 2011 | 83,411 | (206,114) | 283,675 | (700,977) | 22,909 | (56,608) | 389,995 | (963,699) |
| 2012 | 203,680 | (503,303) | 946,514 | (2,338,885) | 574,308 | (1,419,144) | 1,724,501 | (4,261,331) |
| 2013 | 45,976 | (113,610) | 368,434 | (910,419) | 15,852 | (39,170) | 430,262 | (1,063,199) |
| **Total** | 1,485,034 | (3,669,595) | 5,855,920 | (14,470,281) | 1,385,400 | (3,423,396) | 8,726,354 | (21,563,271) |

Coupling breeding bird densities with landscape cover of sagebrush indicates that populations with low densities tend to occur in areas where sagebrush cover is in the 26-65% category, and few populations occur in areas with <25% sagebrush cover (fig. 27) (Knick et al. 2013). Combining the breeding bird densities with resilience and resistance indicates significant variability in risks among high density populations within PACs (fig. 26). A large proportion of remaining high density centers within PACs occurs on moderate-to-high resilience and resistance habitats, while low density/low resilience and resistance areas tend to occur along the periphery of PACs or are disproportionately located in MZ III and southern parts of MZ V.

Examination of other data layers suggests that different wildfire and invasive species threats exist across the western portion of the range, and that management should target the primary threats to sage-grouse habitat within focal areas. In MZs IV and V invasive annual grasses—especially on the periphery of the PACs—and wildfire are key threats. However, recent wildfires are not necessarily linked to invasive annual grasses. This suggests that management strategies for these MZs emphasize fire operations, fuels management focused on decreasing fire spread, and integrated strategies to control annual grasses and increase post-fire rehabilitation and restoration success. Differences in piñon and/or juniper landscape cover exist among MZs with 5,131,900 ha (12,681,202 ac) in MZ III, 528,377ha (1,305,649 ac) in MZ IV, and 558,880 ha (1,381,024 ac) in MZ V. Portions of MZs IV and V are still largely in early stages of juniper expansion indicating a need to address this threat before woodland succession progresses. Because of generally low resilience and resistance in MZ III, greater emphasis is needed on habitat conservation, specifically minimizing or eliminating stressors. Also, greater emphasis on reducing cover of piñon and juniper is needed to reduce woody fuels and increase sagebrush ecosystem resilience to fire by increasing the recovery potential of native understory species.

## Interpretations at Regional and Local Land Management Scales: Northeast Nevada Example

The same land covers and data layers used to assess focal areas for sage-grouse habitat within MZs in the western portion of the species range can be used to evaluate focal areas for management in regional planning areas and land management planning units. The emphasis at the scale of the land planning area or management planning unit is on maintaining or increasing large contiguous areas of sagebrush habitat with covers in the 26-65% and especially >65% category. Resilience to disturbance and resistance to invasive annual grasses as indicated by soil temperature and moisture regimes is used to determine the most appropriate activities within the different cover categories. The sage-grouse habitat matrix in table 2 describes the capacity of areas with differing resilience and resistance to recover following disturbance and resist annual invasive grasses and provides the management implications for each of the different cover categories. Table 4 provides potential management strategies for the different sagebrush cover and resilience and resistance categories (cells) in the sage-grouse habitat matrix by agency program areas (fire operations, fuels management, post-fire rehabilitation, habitat restoration). Note that the guidelines in table 4 are related to the sage-grouse habitat matrix, and do not preclude other factors from consideration when determining management priorities for program areas.

Here, we provide an example of how to apply the concepts and tools discussed in this report by examining an important region identified in the MZ scale assessment. The northeastern corner of Nevada was selected to illustrate the diversity of sage-grouse habitat within planning areas and the need for proactive collaboration both within agencies and across jurisdictional boundaries in devising appropriate management strategies (figs. 17, 19, 21, 23, 25). This part of Nevada has large areas of invasive annual grasses and areas with piñon and juniper expansion, and it has experienced multiple large fires in the last decade. It includes a BLM Field Office, Forest Service (FS) land, State land, multiple private owners, and borders two States (fig. 29), which results in both complex ownership and natural complexity.

In the northeast corner of Nevada, an area 5,403,877 ha (13,353,271 ac) in size, numerous large fires have burned in and around PACs (fig. 25). Since 2000, a total of 1,144,317 ha (2,827,669 ac) have burned with the largest fires occurring in 2000, 2006, and 2007. This suggests that the primary management emphasis be on retaining existing areas of sagebrush in the 26-65% and especially >65% categories and promoting recovery of former sagebrush areas that have burned. Fire suppression in and around large, contiguous areas of sagebrush and also in and around successful habitat restoration or post-fire rehabilitation treatments is a first order priority. Fuels management also is a high priority and is focused on strategic placement of fuel breaks to reduce loss of large sagebrush stands by wildfire without jeopardizing existing habitat quality. Also, in the eastern portion of the area, piñon and juniper land cover comprises 471,645 ha (1,165,459 ac) (fig. 23). In this area, management priorities include (1) targeted tree removal in early to mid-phase (Phase I and II), post-settlement piñon and juniper expansion areas to maintain shrub/herbaceous cover and reduce fuel loads, and (2) targeted tree removal in later phase (Phase III) post-settlement piñon and juniper areas to reduce risk of high severity fire. In areas with moderate to high resilience and resistance, post-fire rehabilitation focuses on accelerating sagebrush establishment and recovery of perennial native herbaceous species. These areas often are capable of unassisted recovery and seeding is likely needed only in areas where perennial native herbaceous species have been depleted (Miller et al. 2013). Seeding introduced species can retard recovery of native perennial grasses and forbs that are important to sage-grouse and should be avoided in these areas (Knutson et al. 2014). Seeding or transplanting of sagebrush may be needed to accelerate establishment in focal areas.

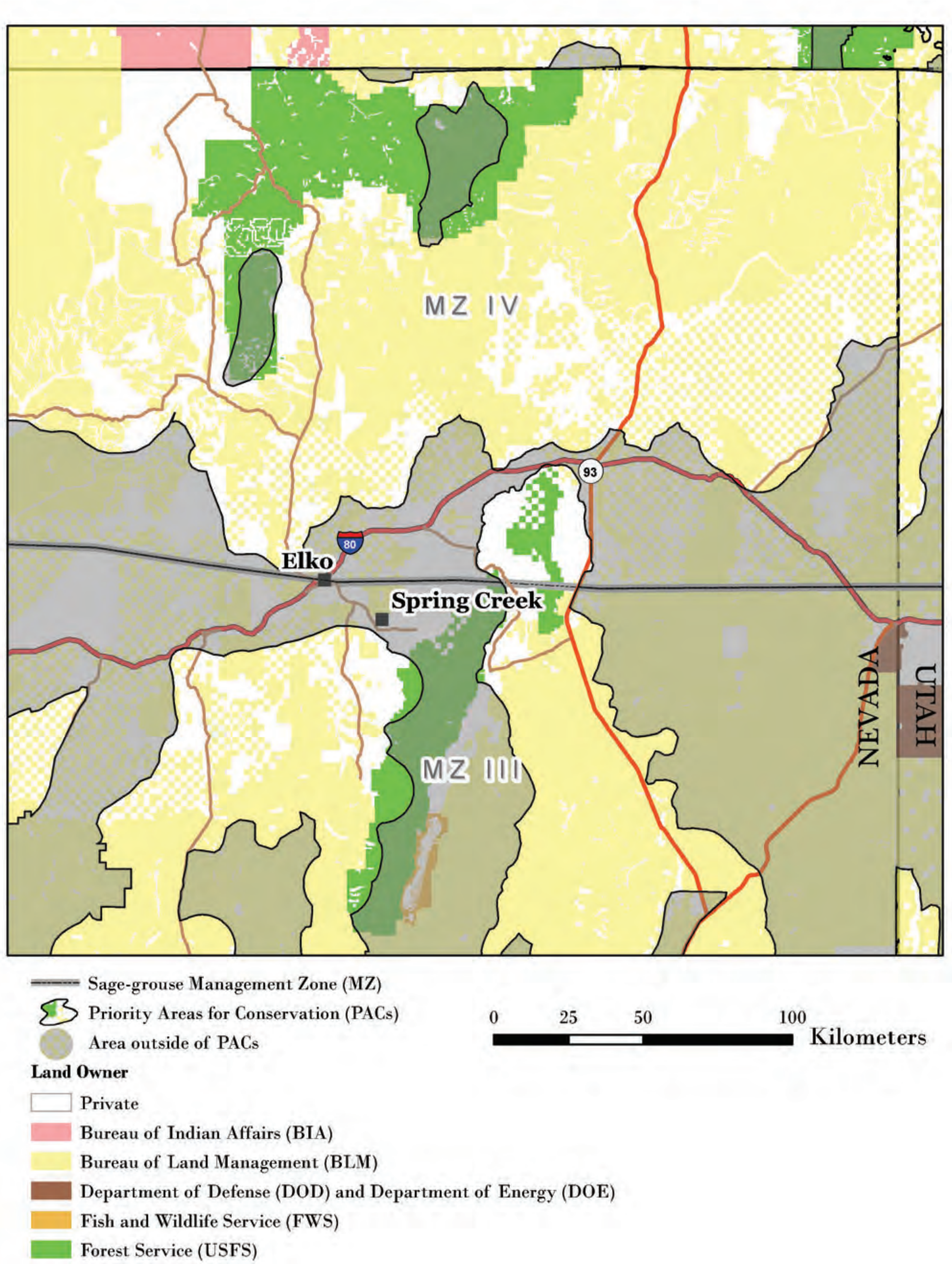


**Figure 29.** Land ownership for the northeast corner of Nevada. Lighter colored polygons delineate Priority Areas for Conservation (USFWS 2013).

In areas with lower resilience and resistance and high breeding bird densities, large, contiguous areas of sagebrush with intact understories are a high priority for conservation (figs. 17, 19, 27). In these areas, emphasis is on maintaining or increasing habitat conditions by minimizing stressors and disturbance. Post-fire rehabilitation and restoration activities focus on areas that increase connectivity among existing large areas of sagebrush. Because of low and variable precipitation, more than one intervention may be required to achieve restoration or rehabilitation goals. Appropriately managing livestock, wild horse and burro use (if applicable), and recreational use in focal areas is especially important to promote native perennial grass and forb growth and reproduction and to maintain or enhance resilience and resistance.

## Determining the Most Appropriate Management Treatments at the Project Scale

Once focal areas and management priorities have been determined, potential treatment areas can be assessed to determine treatment feasibility and appropriate treatment methods. Different treatment options exist (figs. 30, 31) that differ in both suitability for a focal area and likely effectiveness. Field guides for sagebrush ecosystems and piñon and juniper expansion areas that incorporate resilience and resistance concepts are being developed to help guide managers through the process of determining both the suitability of an area for treatment and the most appropriate treatment. These guides are aligned with the different program areas and emphasize (1) fuel treatments (Miller et al. 2014a), (2) post-fire rehabilitation (Miller et al. 2014b), and (3) restoration (Pyke et al., in preparation). Additional information on implementing these types of management treatments is synthesized in Monsen et al. (2004) and Pyke (2011); additional information on treatment response is synthesized in Miller et al. (2013). In this section, we summarize the major steps in the process for determining the suitability of an area for treatment and the most appropriate treatment. We then provide an overview of two of the primary tools in the assessment process – ecological site descriptions (ESDs) and state and transition models (STMs). We conclude with a discussion of the importance of monitoring and adaptive management.

**Steps in the process***:* Logical steps in the process of determining the suitability of an area for treatment and the most appropriate treatment(s) include (1) assessing the potential treatment area and identifying ecological sites, (2) determining the current successional state of the site, (3) selecting the appropriate action(s), and (4) monitoring and evaluation to determine post-treatment management. A general approach that uses questions to identify the information required in each step was developed (table 6). These questions can be modified to include the specific information needed for each program area and for treating different ecological sites. This format is used in the field guides described above.

**Figure 30**. Common vegetation treatments for sagebrush dominated ecosystems with relatively low resilience and resistance include seeding after wildfire in areas that lack sufficient native perennial grasses and forbs for recovery (top) (photo by Chad Boyd), and mowing sagebrush to reinvigorate native perennial grasses and forbs in the understory (bottom) (photo by Scott Schaff). Success of mowing treatments depends on having adequate perennial grasses and forbs on the site to resist invasive annual grasses and to promote recovery.

**Figure 31**. Vegetation treatments for sagebrush ecosystems exhibiting piñon and juniper expansion include cutting the trees with chainsaws and leaving them in place (top) (photo by Jeremy Roberts) and shredding them with a “bullhog” (middle) (photo by Bruce A. Roundy) on sites with relatively warm soils and moderately low resistance to cheatgrass. Prescribed fire (bottom) (photo by Jeanne C. Chambers) can be a viable treatment on sites with relatively cool and moist soils that have higher resilience to disturbance and resistance to invasive annual grasses. Treatment success depends on having adequate perennial grasses and forbs on the site to resist invasive annual grasses and promote recovery and will be highest on sites with relatively low densities of trees (Phase I to Phase II woodlands).

**Table 6.** General guidelines for conducting fuels management, fire rehabilitation, and restoration treatments (modified from Miller et al. 2007; Tausch et al. 2009; Pyke 2011; Chambers et al. 2013).

| Steps in the process | Questions and considerations |
|---|---|
| I. Assess potential treatment area and identify ecological sites | 1. Where are priority areas for fuels management, fire rehabilitation or restoration within the focal area? Consider sage-grouse habitat needs and resilience and resistance.<br>2. What are the topographic characteristics and soils of the area? Verify soils mapped to the location and determine soil temperature/moisture regimes. Collect information on soil texture, depth and basic chemistry for restoration projects.<br>3. How will topographic characteristics and soils affect vegetation recovery, plant establishment and erosion? Evaluate erosion risk based on topography and soil characteristics.<br>4. What are the potential native plant communities for the area? Match soil components to their correlated ESDs. This provides a list of potential species for the site(s). |
| II. Determine current state of the site | 5. Is the area still within the reference state for the ecological site(s)? |
| III. Select appropriate action | 6. How far do sites deviate from the reference state? How will treatment success be measured?<br>7. Do sufficient perennial shrubs and perennial grasses and forbs exist to facilitate recovery?<br>8. Are invasive species a minor component?<br>9. Do invasive species dominate the sites while native life forms are missing or severely under represented? If so, active restoration is required to restore habitat.<br>10. Are species from drier or warmer ecological sites present? Restoration with species from the drier or warmer sites should be considered.<br>11. Have soils or other aspects of the physical environment been altered? Sites may have crossed a threshold and represent a new ecological site type requiring new site-specific treatment/restoration approaches. |
| IV. Determine post-treatment management | 12. How long should the sites be protected before land uses begin? In general, sites with lower resilience and resistance should be protected for longer periods.<br>13. How will monitoring be performed? Treatment effectiveness monitoring includes a complete set of measurements, analyses, and a report.<br>14. Are adjustments to the approach needed? Adaptive management is applied to future projects based on consistent findings from multiple locations. |

**Ecological site descriptions:** ESDs and their associated STMs provide essential information for determining treatment feasibility and type of treatment. ESDs are part of a land classification system that describes the potential of a set of climate, topographic, and soil characteristics and natural disturbances to support a dynamic set of plant communities (Bestelmeyer et al. 2009; Stringham et al. 2003). NRCS soil survey data (http://soils.usda.gov/survey/), including soil temperature/moisture regimes and other soil characteristics, are integral to ESD development. ESDs have been developed by the NRCS and their partners to assist land management agencies and private land owners with making resource decisions, and are widely available for the Sage-grouse MZs except where soil surveys have not been completed (for a detailed description of ESDs and access to available ESDs see: http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/technical/ecoscience/desc/). ESDs assist managers to step-down generalized vegetation dynamics, including the concepts of resilience and resistance, to local scales. For example, variability in soil characteristics and the local environment (e.g., average annual precipitation as indicated by soil moisture regime) can strongly influence both plant community resilience to fire as well as the resistance of a plant community to invasive annual grasses after fire (table 1). Within a particular ESD, there is a similar level of resilience to disturbance and resistance to invasive annuals and this information can be used to determine the most appropriate management actions.

**State and transition models:** STMs are a central component of ecological site descriptions that are widely used by managers to illustrate changes in plant communities and associated soil properties, causes of change, and effects of management interventions (Stringham et al. 2003; Briske et al. 2005; USDA NRCS 2007) including in sagebrush ecosystems (Forbis et al. 2006; Barbour et al. 2007; Boyd and Svejcar 2009; Holmes and Miller 2010; Chambers et al. *in press*). These models use ***state*** (a relatively stable set of plant communities that are resilient to disturbance) and ***transition*** (the drivers of change among alternative states) to describe the range in composition and function of plant communities within ESDs (Stringham and others 2003; see Appendix 1 for definitions). The reference state is based on the natural range of conditions associated with natural disturbance regimes and often includes several plant communities (***phases***) that differ in dominant plant species relative to type and time since disturbance (Caudle et al. 2013). Alternative states describe new sets of communities that result from factors such as inappropriate livestock use, invasion by annual grasses, or changes in fire regimes. Changes or transitions among states often are characterized by ***thresholds*** that may persist over time without active intervention, potentially causing irreversible changes in community composition, structure, and function. ***Restoration pathways*** are used to identify the environmental conditions and management actions required for return to a previous state. Detailed STMs that follow current interagency guidelines (Caudle et al. 2013), are aligned with the ecological types (table 1), and are generally applicable to MZs III (Southern Great Basin), IV (Snake River Plains), V (Northern Great Basin), and VI (Columbia Basin) are provided in Appendix 5.

A generalized STM to illustrate the use of STMs is shown in figure 32 for the warm and dry Wyoming big sagebrush ecological type. This ecological type occurs at relatively low elevations in the western part of the range and has low to moderate resilience to disturbance and management treatments and low resistance to invasion (table 1). This type is abundant in the western portion of the range, but as the STM suggests, it is highly susceptible to conversion to invasive annual grass and repeated fire and is difficult to restore. Intact sagebrush areas remaining in the reference state within this ecological type are a high priority for conservation. Invaded states or locations with intact sagebrush that lack adequate native perennial understory are a high priority for restoration where they bridge large, contiguous areas of sagebrush. However, practical methods to accomplish this are largely experimental and/or costly and further development, including adaptive science and management, is needed.

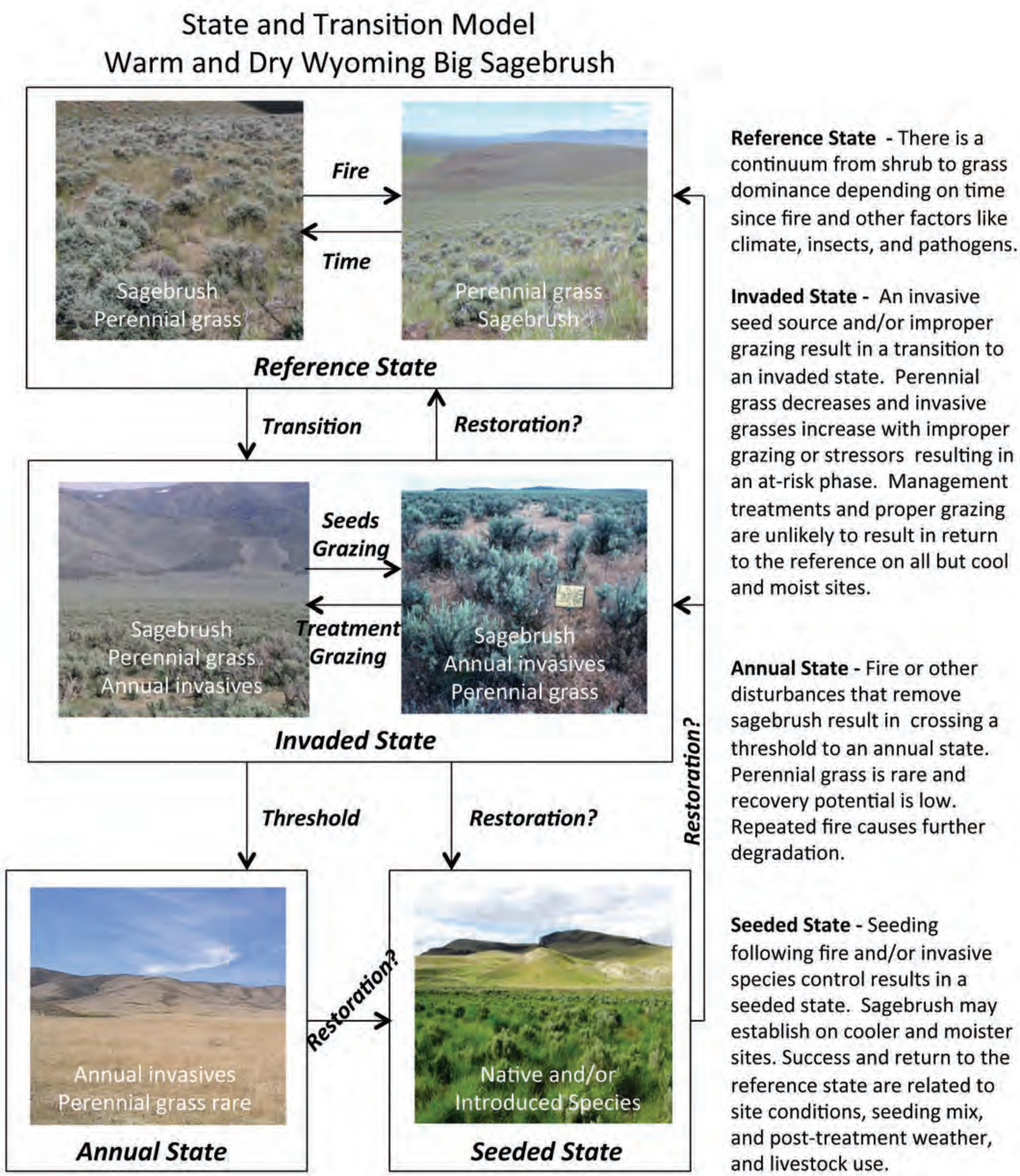


**Figure 32.** A state and transition model that illustrates vegetation dynamics and restoration pathways for the warm and dry, Wyoming big sagebrush ecological type. This ecological type occurs at relatively low elevations in the western part of the range and has low to moderate resilience to disturbance and management treatments and low resistance to invasion.

**Monitoring and adaptive management:** Monitoring programs designed to track ecosystem changes in response to both stressors and management actions can be used to increase understanding of ecosystem resilience and resistance, realign management approaches and treatments, and implement adaptive management (Reever-Morghan et al. 2006; Herrick et al. 2012). Information is increasing on likely changes in sagebrush ecosystems with additional stress and climate warming, but a large degree of uncertainty still exits. Currently, the NRCS National Resource Inventory is being used on private lands and is being implemented on public lands managed by BLM to monitor trends in vegetation attributes and land health at the landscape scale under the AIM (Assessment Inventory and Monitoring) strategy. Strategic placement of monitoring sites and repeated measurements of ecosystem status and trends (e.g., land cover type, ground cover, vegetation cover and height of native and invasive species, phase of tree expansion, soil and site stability, oddities) can be used to decrease uncertainty and increase effectiveness of management decisions. Ideally, monitoring sites span environmental/ productivity gradients and sagebrush ecological types that characterize sage-grouse habitat. Of particular importance are (1) ecotones between ecological types where changes in response to climate are expected to be largest (Loehle 2000; Stohlgren et al. 2000), (2) ecological types with climatic conditions and soils that are exhibiting invasion and repeated fires, and (3) ecological types with climatic conditions and soils that are exhibiting tree expansion and increased fire risk. Monitoring the response of sagebrush ecosystems to management treatments, including both pre- and post-treatment data, is a first order priority because it provides information on treatment effectiveness that can be used to adjust methodologies.

Monitoring activities are most beneficial when consistent approaches are used among and within agencies to collect, analyze, and report monitoring data. Currently, effectiveness monitoring databases that are used by multiple agencies do not exist. However, several databases have been developed for tracking fire-related and invasive-species management activities. The National Fire Plan Operations and Reporting System (NFPORS) is an interdepartmental and interagency database that accounts for hazardous fuel reduction, burned area rehabilitation and community assistance activities. To our knowledge, NFPORS is not capable of storing and retrieving the type of effectiveness monitoring information that is needed for adaptive management. The FEAT FIREMON Integrated (FFI; https://www.frames.gov/partner-sites/ffi/ffi-home/) is a monitoring software tool designed to assist managers with collection, storage and analysis of ecological information. It was constructed through a complementary integration of the Fire Ecology Assessment Tool (FEAT) and FIREMON. This tool allows the user to select among multiple techniques for effectiveness monitoring. If effectiveness monitoring techniques were agreed on by the agencies, FFI does provide databases with standard structures that could be used in inter-agency effectiveness monitoring. Also, the National Invasive Species Information Management System (NISIMS) is designed to reduce redundant data entry regarding invasive species inventory, management and effectiveness monitoring with the goal of providing information that can be used to determine effective treatments for invasive species. However, NISIMS is currently available only within the BLM.

Common databases can be used by agency partners to record and share monitoring data. The Land Treatment Digital Library (LTDL [USGS 2010]) provides a method of archiving and collecting common information for land treatments and might be used as a framework for data storage and retrieval. Provided databases are relational (maintain a common field for connecting them), creating single corporate databases is not necessary. However, barriers that hinder database access within and among agencies and governmental departments may need to be lowered while still maintaining adequate data security. The LTDL has demonstrated how this can work by accessing a variety of databases to populate useful information relating to land treatments.

For effectiveness of treatments to be easily useable for adaptive management, the agencies involved will need to agree on monitoring methods and a common data storage and retrieval system. Once data can be retrieved, similar treatment projects can be evaluated to determine how well they achieve objectives for sage-grouse habitat, such as the criteria outlined in documents like the Habitat Assessment Framework (Stiver et al. 2006). Results of monitoring activities on treatment effectiveness are most useful when shared across jurisdictional boundaries, and several mechanisms are currently in place to improve information sharing (e.g., the Great Basin Fire Science Delivery Project; www.gbfiresci.org).

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# Appendix 1. Definitions of Terms Used in This Document

**At-Risk Community Phase —** A community phase that can be designated within the reference state and also in alternative states. This community phase is the most vulnerable to transition to an alternative state (Caudle et al. 2013).

**Community Phase —** A unique assemblage of plants and associated soil properties that can occur within a state (Caudle et al. 2013).

**Ecological Site (ES) —** An Ecological Site (ES) is a conceptual division of the landscape that is defined as a distinctive kind of land based on recurring soil, landform, geological, and climate characteristics that differs from other kinds of land in its ability to produce distinctive kinds and amounts of vegetation and in its ability to respond similarly to management actions and natural disturbances (Caudle et al. 2013).

**Ecological Site Descriptions (ESD) —** The documentation of the characteristics of an ecological site. The documentation includes the data used to define the distinctive properties and characteristics of the ecological site; the biotic and abiotic characteristics that differentiate the site (i.e., climate, topography, soil characteristics, plant communities); and the ecological dynamics of the site that describes how changes in disturbance processes and management can affect the site. An ESD also provides interpretations about the land uses and ecosystem services that a particular ecological site can support and management alternatives for achieving land management (Caudle et al. 2013).

**Ecological Type —** A category of land with a distinctive (i.e., mappable) combination of landscape elements. The elements making up an ecological type are climate, geology, geomorphology, soils, and potential natural vegetation. Ecological types differ from each other in their ability to produce vegetation and respond to management and natural disturbances (Caudle et al. 2013).

**Historical Range of Variability —** Range of variability in disturbances, stressors, and ecosystem attributes that allows for maintenance of ecosystem resilience and resistance and that can be used to provide management targets (modified from Jackson 2006).

**Resilience —** Ability of a species and/or its habitat to recover from stresses and disturbances. Resilient ecosystems regain their fundamental structure, processes, and functioning when altered by stresses like increased $CO_2$ , nitrogen deposition, and drought and to disturbances like land development and fire (Allen et al. 2005; Holling 1973).

**Resistance —** Capacity of an ecosystem to retain its fundamental structure, processes and functioning (or remain largely unchanged) despite stresses, disturbances, or invasive species (Folke et al. 2004).

**Resistance to Invasion —** Abiotic and biotic attributes and ecological processes of an ecosystem that limit the population growth of an invading species (D'Antonio and Thomsen 2004).

**Restoration Pathways —** Restoration pathways describe the environmental conditions and practices that are required for a state to recover that has undergone a transition (Caudle et al. 2013).

**State** — A state is a suite of community phases and their inherent soil properties that interact with the abiotic and biotic environment to produce persistent functional and structural attributes associated with a characteristic range of variability (adapted from Briske et al. 2008).

**State-and-Transition Model —** A method to organize and communicate complex information about the relationships between vegetation, soil, animals, hydrology, disturbances (fire, lack of fire, grazing and browsing, drought, unusually wet periods, insects and disease), and management actions on an ecological site (Caudle et al. 2013).

**Thresholds —** Conditions sufficient to modify ecosystem structure and function beyond the limits of ecological resilience, resulting in the formation of alternative states (Briske et al. 2008).

**Transition —** Transitions describe the biotic or abiotic variables or events, acting independently or in combination, that contributes directly to loss of state resilience and result in shifts between states. Transitions are often triggered by disturbances, including natural events (climatic events or fire) and/or management actions (grazing, burning, fire suppression). They can occur quickly as in the case of catastrophic events like fire or flood, or over a long period of time as in the case of a gradual shift in climate patterns or repeated stresses like frequent fires (Caudle et al. 2013).

# Appendix 2. An Explanation of the Use of Landscape Measures to Describe Sagebrush Habitat

Understanding landscape concepts of plant cover relative to typical management unit concepts of plant cover is important for prioritizing lands for management of sage-grouse. Ground cover measurements of sagebrush made at a management unit (for example, line-intercept measurements) should not be confused for landscape cover and may not relate well to landscape cover since the areas of examination differ vastly (square meters for management units and square kilometers for landscapes).

A landscape is defined rather arbitrarily as a large area in total spatial extent, somewhere in size between sites (acres or square miles) and regions (100,000s of square miles). The basic unit of a landscape is a patch, which is defined as a bounded area characterized by a similar set of conditions. A habitat patch, for example, may be the polygonal area on a map representing a single land cover type. Landscapes are composed of a mosaic of patches. The arrangement of these patches (the landscape configuration or pattern) has a large influence on the way a landscape functions and for landscape species, such as sage-grouse, sagebrush habitat patches are extremely important for predicting if this bird will be present within the area (Connelly et al. 2011).

Remotely sensed data of land cover is typically used to represent landscapes. These data may combine several sources of data and may include ancillary data, such as elevation, to improve the interpretation of data. These data are organized into pixels that contain a size or grain of land area. For example, LandSat Thematic Mapper spectral data used in determining vegetation cover generally have pixels that represent ground areas of 900 $m^2$ (30- x 30-m). Each pixel's spectral signature can be interpreted to determine what type of vegetation dominates that pixel. Groups of adjacent pixels with the same dominant vegetation are clustered together into polygons that form patches.

Landscape cover of sagebrush is determined initially by using this vegetation cover map, but a 'rolling window' of a predetermined size (e.g., 5 $km^2$ or 5,556 pixels that are 30- by 30-m in size) is moved across the region one pixel at a time. The central pixel of the 'window' is reassigned a value for the proportion of pixels where sagebrush is the dominant vegetation. The process is repeated until pixels within the region are completely reassigned to represent the landscape cover of sagebrush within for the region drawn from a 5 $km^2$ window.

## Appendix 3. An Explanation of Soil Temperature and Moisture Regimes Used to Describe Sagebrush Ecosystems

Soil climate regimes (temperature and moisture) are used in Soil Taxonomy to classify soils; they are important to consider in land management decisions, in part, because of the significant influence on the amounts and kinds of vegetation that soils support. Soil temperature and moisture regimes are assigned to soil map unit components as part of the National Cooperative Soil Survey program. Soil survey spatial and tabular data for the Sage-grouse Management Zones (Stiver et al. 2006) were obtained for each State within the zones at the Geospatial Data Gateway (http://datagateway.nrcs.usda.gov/). Gridded Soil Survey Geographic (gSSURGO) file geodatabases were used to display a 10-meter raster dataset. Multiple soil components made up a soil map unit, and soil moisture and temperature regimes were linked to individual soil map components. Soil components with the same soil moisture and temperature class regime were aggregated, and the dominant soil moisture and temperature regime within each soil map unit was used to characterize the temperature and moisture regime. Only temperature and moisture regimes applicable to sagebrush ecosystems were displayed.

Abbreviated definitions of each soil temperature and moisture regime class are listed below. Complete descriptions can be found in *Keys to Soil Taxonsomy, 11th edition*, available at ftp://ftp-fc.sc.egov.usda.gov/NSSC/Soil_Taxonomy/keys/2010_Keys_to_Soil_Taxonomy.pdf.

| **Soil temperature regimes** | |
|---|---|
| Cryic (Cold) | Soils that have a mean annual soil temperature of <8 °C, and do not have permafrost, at a depth of 50 cm below the surface or at a restrictive feature, whichever is shallower. |
| Frigid (Cool) | Soils that have a mean annual soil temperature of <8 °C and the difference between mean summer and mean winter soil temperatures is >6 °C at a depth of 50 cm below the surface or at a restrictive feature, whichever is shallower. |
| Mesic (Warm) | Soils that have a mean annual soil temperature of 8-15 °C and the difference between mean summer and mean winter soil temperatures is >6 °C at a depth of 50 cm below the surface or at a restrictive feature, whichever is shallower. |
| **Soil moisture regimes** | |
| Ustic (summer precipitation) | Generally there is some plant-available moisture during the growing season, although significant periods of drought may occur. Summer precipitation allows presence of warm season plant species. |
| Xeric (Moist; generally mapped at >12 inches mean annual precipitation) | Characteristic of arid regions. The soil is dry for at least half the growing season and moist for less than 90 consecutive days. |
| Aridic (Dry; generally mapped at <12 inches mean annual precipitation) | Characteristic of arid regions. The soil is dry for at least half the growing season and moist for less than 90 consecutive days. |

Note: Soil moisture regimes are further divided into moisture subclasses, which are often used to indicate soils that are transitional to another moisture regime. For example, a soil with an Aridic moisture regime and a Xeric moisture subclass may be described as “Aridic bordering on Xeric.” Understanding these gradients becomes increasingly important when making interpretations and decisions at the site scale where aspect, slope, and soils affect the actual moisture regime on that site. More information on taxonomic moisture subclasses is available at http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/ref/?cid=nrcs142p2_053576.

# Appendix 4. Data Sources for the Maps in This Report

| Dataset | Citation | Link |
|---|---|---|
| Geomac fire perimeters | Walters, S.P.; Schneider, N.J.; Guthrie, J.D. 2011. Geospatial Multi-Agency Coordination (GeoMAC) wildland fire perimeters, 2008. Data Series 612. Washington, DC: U.S. Department of the Interior, U.S. Geological Survey.6 p. | http://pubs.er.usgs.gov/publication/ds612 |
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|---|---|---|
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## Appendix 5. State-and-transition models (STMs) for five generalized ecological types for big sagebrush (from Chambers et al. *in press*; Miller et al. 2014 a, b)

These STMs represent groupings of ecological sites that are characterized by Wyoming or mountain big sagebrush, span a range of soil moisture/temperature regimes (warm/dry to cold/moist), and characterize a large portion of Management Zones III (Southern Great Basin), IV (Snake River Plains), V (Northern Great Basin), and VI (Columbia Basin). Large boxes illustrate states that are comprised of community phases (smaller boxes). Transitions among states are shown with arrows starting with T; restoration pathways are shown with arrows starting with R. The "at risk" community phase is most vulnerable to transition to an alternative state. Precipitation Zone is designated as PZ.

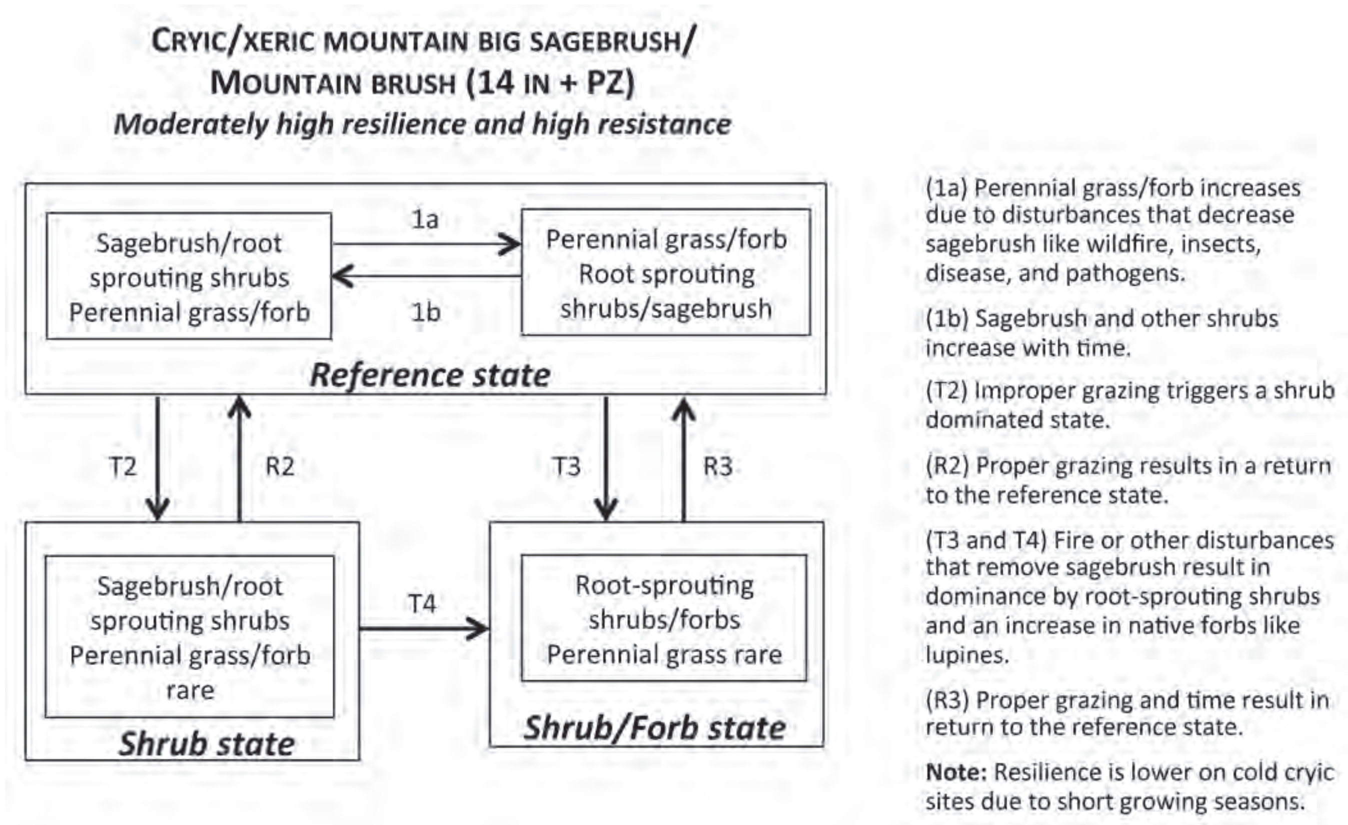
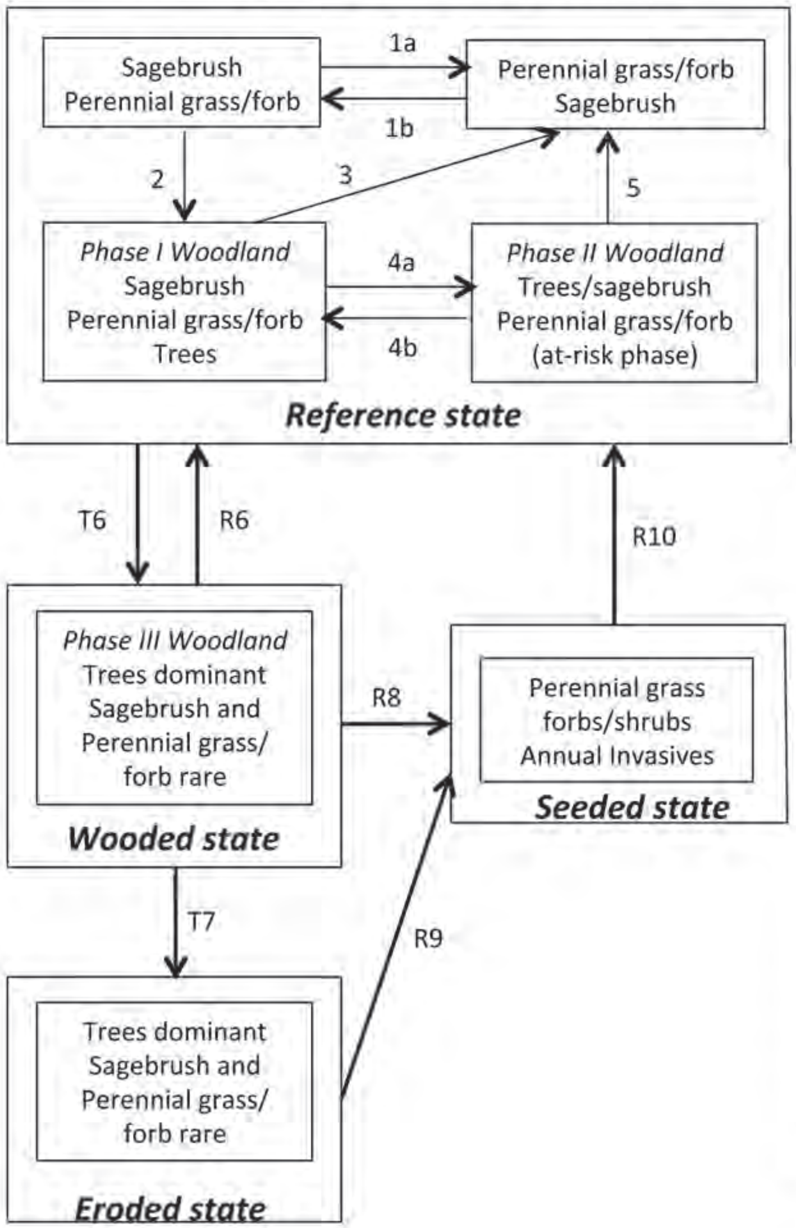



**Figure A.5A**. STM for a cryic/xeric mountain big sagebrush/mountain brush ecological type characterized by moderately high resilience and high resistance.

Cool frigid/xeric
Mountain big sagebrush (12 -14 in + PZ)
Piñon pine and/or juniper potential
***Moderately high resilience and resistance***




(1a) Disturbances such as wildfire, insects, disease, and pathogens result in less sagebrush and more perennial grass/forb.

(1b) Sagebrush increases with time .

(2) Time combined with seed sources for piñon and/or juniper trigger a Phase I Woodland.

(3 and 5) Fire and or fire surrogates (herbicides and/or mechanical treatments) that remove trees may restore perennial grass/forb and sagebrush dominance.

(4a) Increasing tree abundance results in a Phase II woodland with depleted perennial grass/forb and shrubs and an at-risk phase.

(4b) Fire surrogates (herbicides and/or mechanical treatments) that remove trees may restore perennial grass/forb and sagebrush dominance.

(T6) Infilling of trees and/or improper grazing can result in a biotic threshold crossing to a wooded state with increased risk of high severity crown fires .

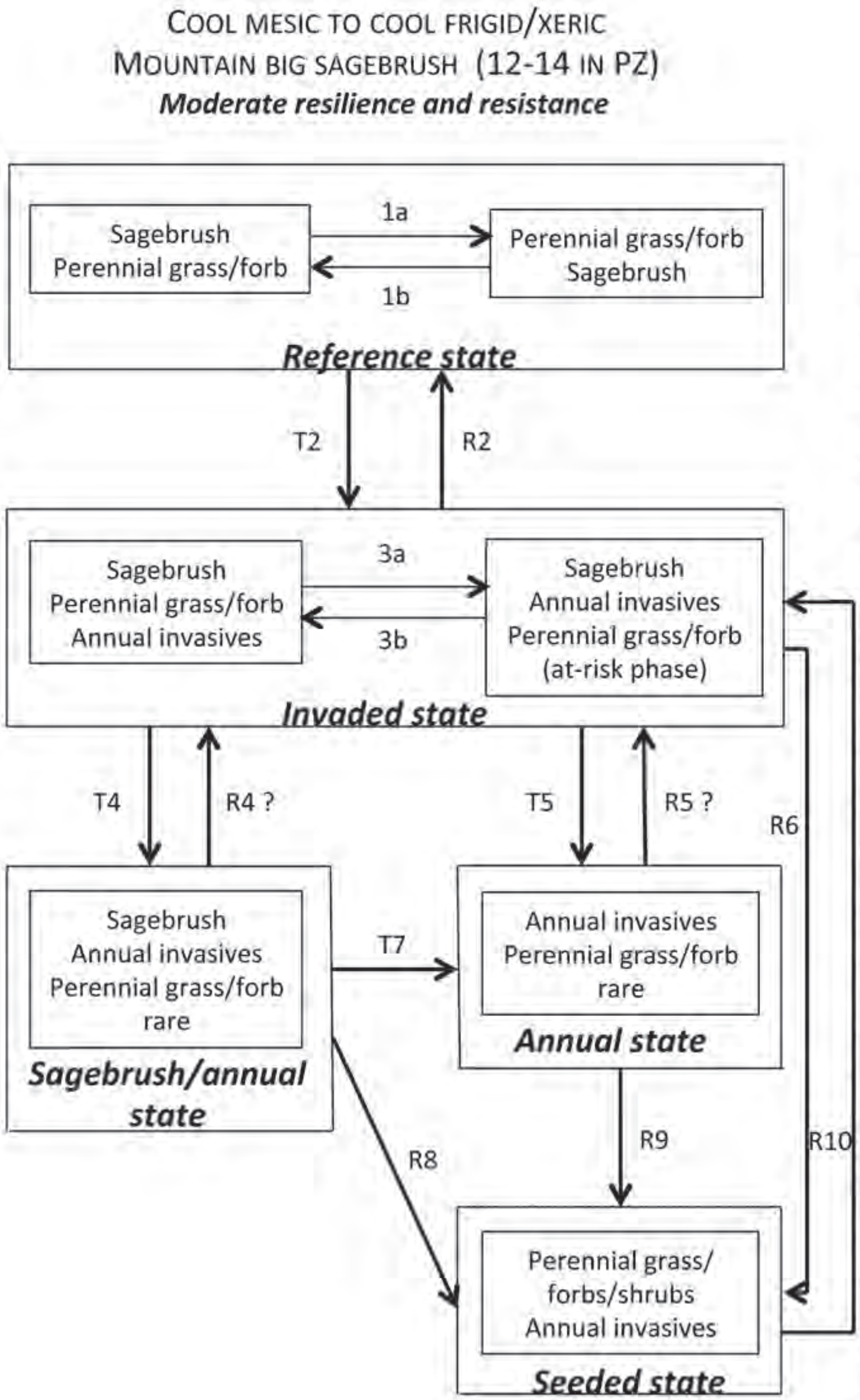
(R6) Fire, herbicides and/or mechanical treatments that remove trees may restore perennial grass/forb and sagebrush dominance.

(T7) An irreversible abiotic threshold crossing to an eroded state can occur depending on soils, slope, and understory species.

(R8 and R9) Seeding after fire may be required on sites with depleted perennial grass/forb, but seeding with aggressive introduced species can decrease native perennial grass/forb. Annual invasives are typically rare. Seeded eroded states may have lower productivity.

(R10) Depending on seed mix and grazing, return to the reference state may be possible if an irreversible threshold has not been crossed.

**Figure A.5B.** STM for a cool frigid/xeric mountain big sagebrush ecological type that has piñon pine and/or juniper potential and is characterized by moderately high resilience and resistance.




(1a) Perennial grass/forb increases due to disturbances that decrease sagebrush like wildfire, insects, disease, and pathogens.

(1b) Sagebrush increases with time .

(T2) An invasive seed source and/or improper grazing trigger an invaded state.

(R2) Proper grazing, fire, herbicides, and/ or mechanical treatments may restore perennial grass/forb and sagebrush dominance with few invasives.

(3a) Perennial grass/forb decreases and sagebrush and invasives increase with improper grazing by livestock resulting in an at-risk phase. Decreases in sagebrush due to insects, disease or pathogens can further increase invasives.

(3b) Proper grazing, herbicides, or mechanical treatments that reduce sagebrush may increase perennial grass/ forb and decrease invasives.

(T4) Improper grazing results in a sagebrush/annual state.

(R4) Proper grazing may facilitate return to the invaded state on cooler/wetter sites if sufficient grass/forb remains .

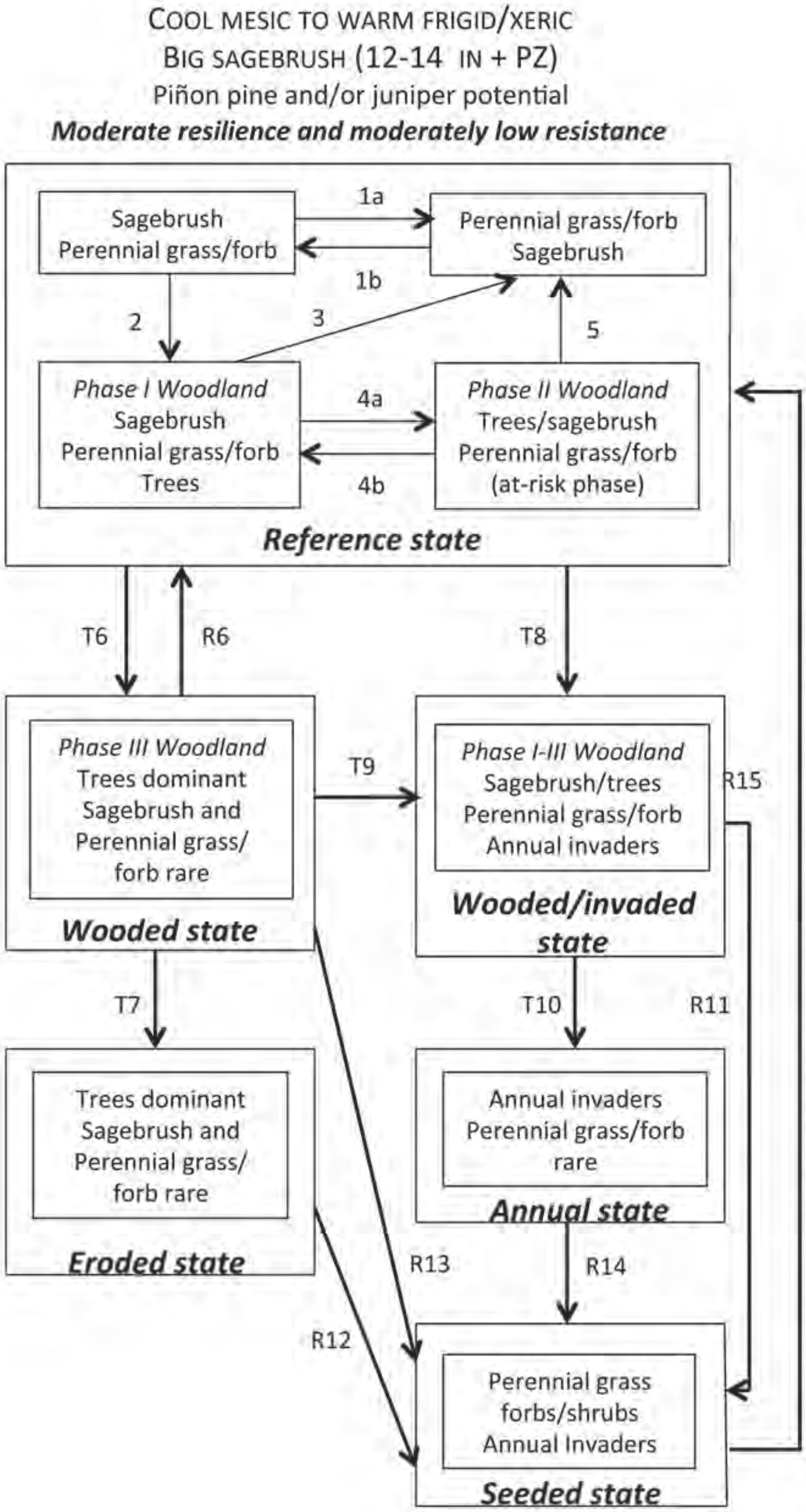
(T5 and T7) Fire or other disturbances that remove sagebrush result in an annual state. Perennial grass/forb are rare and recovery potential is reduced. Repeated fire can result in a biotic threshold crossing to annual dominance on warmer/drier sites, and root-sprouting shrubs may increase.

(R5) Cooler and wetter sites may return to the invaded or reference state with lack of fire, proper grazing, and favorable weather.

(R6, R8 and R9) Seeding following fire and/or invasive species control results in a seeded state. Sagebrush may recolonize depending on patch size, but annual invaders are still present.

(R10) Cooler and wetter sites may return to the invaded or possibly reference state depending on seeding mix, grazing and weather.

**Figure A.5C**. STM for a cool mesic to cool frigid/xeric mountain big sagebrush ecological type that is characterized by moderate resilience and resistance.




(1a) Disturbances such as wildfire, insects, disease, and pathogens result in less sagebrush and more perennial grass/forb.

(1b) Sagebrush increases with time .

(2) Time combined with seed sources for piñon and/or juniper trigger a Phase I Woodland.

(3 and 5) Fire and or fire surrogates (herbicides and/or mechanical treatments) that remove trees may restore perennial grass/forb and sagebrush dominance on cooler/wetter sites. On warmer/drier sites with low perennial grass/forb abundance resistance to invasion is moderately low.

(4a) Increasing tree abundance results in a Phase II woodland with depleted perennial grass/forb and shrubs and an at-risk phase.

(4b) Fire surrogates (herbicides and/or mechanical treatments) that remove trees may restore sagebrush and perennial grass/forb dominance .

(T6) Infilling of trees and improper grazing can result in a biotic threshold crossing to a wooded state with increased risk of high severity crown fires.

(R6) Fire, herbicides and/or mechanical treatments that remove trees may restore perennial grass/forb and sagebrush dominance on cooler/wetter sites.

(T7) An irreversible abiotic threshold crossing to an eroded state can occur depending on soils, slope, and understory species.

(T8 and T9) An invasive seed source and/or improper grazing can trigger a wooded/invaded state.

(T10) Fire or other disturbances that remove trees and sagebrush can result in a biotic threshold crossing to annual dominance on warmer/drier sites with low resilience.

(R11, R12, R13, and R14) Seeding after fire and/or invasive species control increases perennial grass/forb. Sagebrush may recolonize depending on seed sources, but annual invaders are still present. Seeded eroded states may have lower productivity.

(R15) Depending on seed mix , grazing, and level of erosion, return to the reference state may occur on cooler and wetter sites if an irreversible threshold has not been crossed.

**Figure A.5D**. STM for a cool mesic to warm frigid/xeric mountain big sagebrush ecological type type that has piñon pine and/or juniper potential and is characterized by moderate resilience and moderately low resistance.

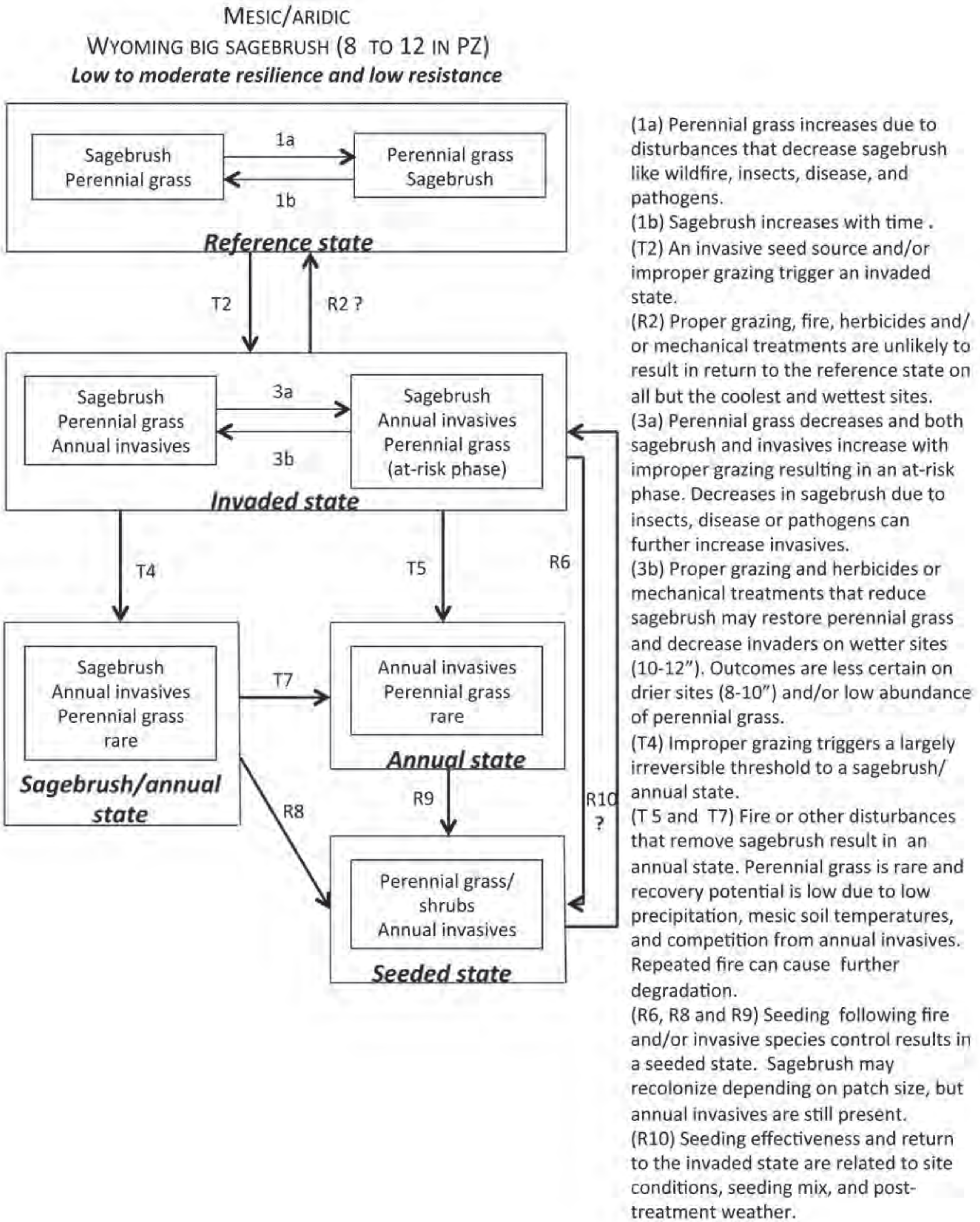



**Figure A.5E**. STM for a mesic/aridic Wyoming big sagebrush ecological type with low to moderate resilience and low resistance.

# Appendix H

# Wildfire and Invasive Species Assessments

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
WASHINGTON, D.C. 20240-0036
http://www.blm.gov

August 28, 2014

In Reply Refer To:
6711 (AD-200, FA-100) I

EMS TRANSMISSION 09/03/2014
Instruction Memorandum No. 2014-134
Expires:Â 09/30/2015

**To:** State Directors: CA, ID, NV, OR, UT

**From:** Assistant Director, Resources and Planning

**Subject:** Completion of Wildfire and Invasive Species Assessments in Greater Sage-Grouse Habitat DD: 9/8/2014 & 1/30/2015

**Program Areas:** Wildlife, Special Status Species, Range, Forestry, Emergency Stabilization and Rehabilitation, Riparian, Plant Conservation, Fire Operations, Fire Planning, and Fuels Management

**Purpose:** This Instruction Memorandum (IM) provides guidance for Bureau of Land Management (BLM) offices to cooperate with interagency partners to complete "Step 2" of the Wildfire and Invasive Species assessments (hereafter called FIAT assessments) for six priority landscapes in Greater sage-grouse (hereinafter "sage-grouse") habitats. These assessments will help to quantify future planned actions by the BLM to inform the US Fish and Wildlife Service's sage-grouse listing decision in 2015. The FIAT assessments are also consistent with the direction provided in the *Identification of Multi-year Funding Priorities and Consideration for Healthy Lands Focal Areas IM (WO IM-2014-124) and the Sage-Grouse Habitat and Wildland Fire Management IM (WO IM-2014-114)*.

**Policy/Action:** The FIAT assessments will be used to develop collaborative implementation plans that address threats to sage-grouse resulting from invasive annual grasses, wildfires, and conifer expansion in Priority Areas for Conservation (PACs). The completion of this first round of the PAC assessments within the Great Basin will inform the next phase of assessments as the BLM continues to expand into other sage-grouse habitat into 2015, including the Rocky Mountain

States as appropriate.

The State offices listed in Attachment 1 will complete "Step 2" of the FIAT assessments for six priority landscapes in cooperation with interagency partners following the schedule as defined in the Action Plan and a description of the collaboration process and team structure. Attachment 2 illustrates the names and locations of the PACs. The June 2014 FIAT Assessment (Attachment 3) completed "Step 1" of the FIAT assessment process and provides guidance for completing "Step 2".

The FIAT assessments are non-decisional in nature, and involve two steps:

> **Step 1:** This step has been completed and is documented in the June 2014 FIAT Assessment protocol (Attachment 3). Step 1 identified focal habitats where management strategies will be prioritized (within or near these important habitats), patterns of resistance to invasive annual grasses and resilience after disturbance, landscape sagebrush cover, and conifer expansion within the six PACs. In addition to presenting the regional context, outcomes of Step 1 included geospatial data which define focal habitats, high density sage-grouse populations, and their intersection with threat factors. This data will be provided to state offices and appropriate field offices to use in their assessments.
>
> **Step 2:** State and local offices will utilize Step 1 information and local data to conduct the FIAT assessments for the six PACs. As described in Attachment 3, offices will utilize Step 1 geospatial data supplemented with appropriate local data to best describe local conditions, treatment needs, and management priorities in or around focal habitats in the six PACs. Outcomes from Step 2 will include spatially identified conservation activities for the program areas of Fuels Management, Habitat Recovery/Restoration, Fire Operations, and Post-Fire Rehabilitation.

The PACs which have been identified for initial assessments include multiple land ownerships, jurisdictions, and in most cases, multiple states requiring a collaborative approach in carrying out the assessments. Partners who will contribute to FIAT assessments include, but are not limited to, National Forests, State wildlife agencies, the Natural Resources Conservation Service, the US Fish and Wildlife Service, tribes, and other local partners.

State Directors need to identify a State lead and the names of the core members of their team to Doug Havlina (dhavlina@blm.gov), the national lead for this effort, by September 8, 2014. The core team members are expected to participate in a training workshop in Reno, NV September 16-18. The purpose of the workshop is to familiarize team members with the FIAT process, describe the data requirements, and provide the teams with a consistent approach to complete FIAT assessments.

**Timeframe:** This IM is effective immediately. The FIAT assessments for the six initial PACs will be completed by January 30, 2015.

**Budget Impact:** Moderate; one-time costs will be incurred as field offices complete FIAT assessments with adjoining agencies.

**Background:** The FIAT assessment process was approved by BLM leadership at the 2013 sage-grouse Federal Family meetings in Denver, Colorado and Portland, Oregon. In addition, BLM's Sage-Grouse National Policy Team approved the process in June 2014.

Wildfires, invasive annual grasses, and conifer encroachment are identified as primary threats. These threats contribute to fragmentation of habitats, large scale conversion to unsuitable plant communities, and ultimately declining sage-grouse populations. The BLM is moving towards completion of Resource Management Plan (RMP) amendments and revisions by winter 2015 to address these and other threats. While RMPs describe goals, objectives, and management actions to conserve sage-grouse, they generally lack specificity related to project prioritization, extent and location. This information is important to the 2015 USFWS listing decision. As such, FIAT assessments fulfill a key role by providing quantified descriptions of future conservation actions to inform the sage-grouse listing decision.

This assessment relies in large part on concepts of resistance to invasive annual grasses and resilience following disturbance across sage steppe environmental gradients along with sage-grouse habitat landscape cover requirements (available as a U.S. Forest Service General Technical Report at:
http://www.fs.fed.us/rm/pubs/rmrs_gtr326.html

**Manual/Handbook Sections Affected:** None.

**Coordination:** This IM has been coordinated between Resources and Planning (WO200), Fire and Aviation (FA100), Fire Operations (FA300), and Fire Planning and Fuels Management (FA600).

**Contacts:** Questions may be directed to Douglas Havlina (dhavlina@blm.gov) Natural Resource Specialist - Fire Ecology, 208-387-5061.

Signed by:
Edwin L. Roberson
Assistant Director
Resources and Planning

Authenticated by:
Robert M. Williams
Division of IRM Governance,WO-860

3 Attachments:

1-Priority PACs for Initial Assessments/Fire and Invasives Assessment Action Plan (2 pp)
2-Map of PACs for FIAT Assessments in Management Zones III, IV, & V (1 p)
3-Greater Sage-Grouse Wildfire, Invasive Annual Grasses & Conifer Expansion Assessment - June 2014 (43 pp)

Priority PACs for Initial Assessments / Fire and Invasives Assessment Action Plan

| Priority PAC | BLM State Office Responsible for FIAT Completion | BLM District Offices which intersect priority PAC |
|---|---|---|
| Central Oregon | Oregon | Burns, OR<br>Lakeview, OR<br>Prineville, OR |
| Northern Great Basin (Includes Box Elder in Utah and Management Zone IV portion of the Northern Great Basin/Western Great Basin PAC in Southeast Oregon) | Idaho (in coordination w/ UT) | Boise, ID<br>Burns, OR<br>Elko, NV<br>Idaho Falls, ID<br>Twin Falls, ID<br>Vale, OR<br>West Desert, UT<br>Winnemucca, NV |
| Southern Great Basin (Includes Hamlin Valley in Utah) | Nevada (in coordination w/ UT) | Battle Mountain, NV<br>Carson City, NV<br>Color Country, UT<br>Elko, NV<br>Ely, NV |
| Snake, Salmon, and Beaverhead | Idaho | Boise, ID<br>Idaho Falls, ID<br>Twin Falls, ID |
| Western Great Basin and Warm Springs Valley NV/Western Great Basin (Includes Management Zone V portion of the Northern Great Basin/Western Great Basin PAC in Southeast Oregon) | California | Burns, OR<br>Carson City, NV<br>Lakeview, OR<br>North California, CA<br>Vale, OR<br>Winnemucca, NV |

Fire and Invasives Assessment Action Plan

| | |
|---|---|
| State Directors assign team members and coordinator for priority landscapes. | September 3, 2014 |
| Initial FIAT Process Coordination Call for State leads– Process Overview; Data Coordination; Report Template of What, Where, Why (Who, When, & How and Implementation); examples of expected deliverables; Training session logistics and details. | September 8, 2014 |
| Training Session for All *Core Team members – Nevada State Office | September 16-18, 2014 |
| Coordination Calls with Team Leaders | Every Two Weeks Starting October 1 |
| Initial Draft Assessment Coordination Webinar | January 5, 2015 |
| Final Draft for Great Basin Regional Management Team Review with State Directors | January 23, 2015 |
| Final Assessments Approved by State Directors | January 30, 2015 |

**Process for Collaboration**
Priority landscapes involve multiple ownerships, jurisdictions, and in most cases, multiple states. Consequently, the affected Bureau of Land Management (BLM) State Offices will work cooperatively to complete assessments. Partners which may contribute to FIAT assessments include National Forests managed by the U.S. Forest Service within priority landscapes, the Natural Resources Conservation Service, the USFWS, tribes, State wildlife agencies, and other local partners. A specific BLM State Office has been assigned as the lead for each of the six FIAT assessments (see above).

It is imperative that the assessment teams coordinate with the teams assessing adjacent priority landscapes and appropriate FIAT Development Team members. The Western Great Basin and Warm Springs Valley NV/Western Great Basin priority landscapes will be combined into one assessment for priority consistency across the areas and process efficiency. Similarly, the Northern Great Basin assessment will include the Box Elder PAC in Utah and the Management Zone IV portion of the Northern Great Basin/Western Great Basin PAC in Southeast Oregon. The Southern Great Basin PAC assessment will include the Hamlin Valley in Utah and the Management Zone V portion of the Northern Great Basin/Western Great Basin PAC in Southeast Oregon.

A FIAT training workshop will take place at Nevada State Office in Reno Nevada on September 16-18, 2014. The outcome of the training will be to familiarize designated team members with the FIAT process, understand the data requirements and provide the teams with a consistent approach to complete the FIAT assessment.

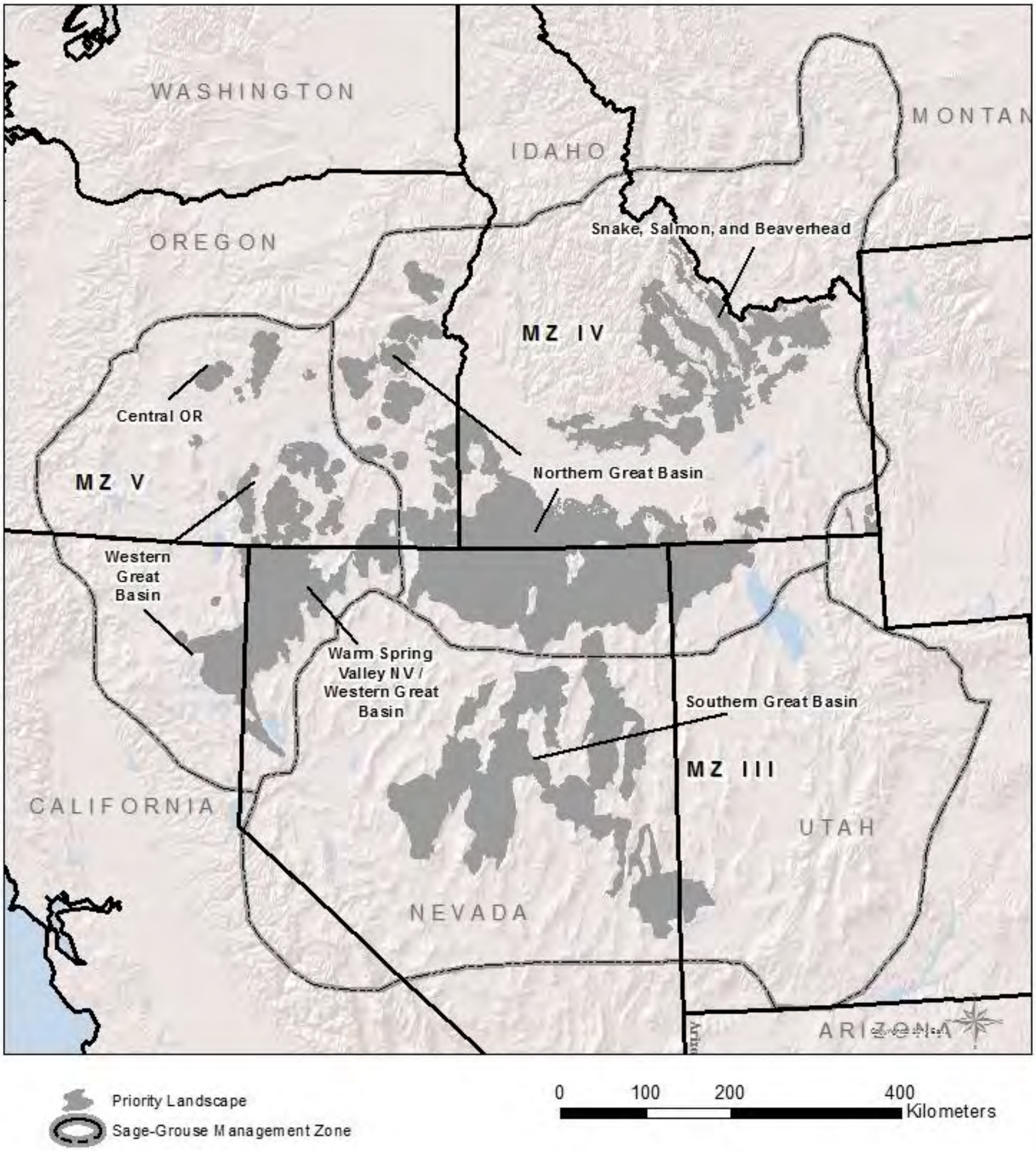
The employees required to attend the training will include the Sage Grouse Management Zone Project Team Lead, the project zone GIS Specialist, and two other team members designated by the Project Team Lead. The structure of this team may vary slightly given the requirements of each State. Select members of the FIAT Development Team will be involved in training, technical assistance, and review as assessments are conducted. State points-of-contact will coordinate attendance with Doug Havlina, meeting coordinator, at (208) 387-5061.

**Core Team Structure**
The State will determine the membership of their team(s). The suggested teams should include the following positions:

1. Team Lead *
2. GIS Specialist *
3. Fire Planner
4. Fuels Specialist
5. Vegetation (Restoration) Specialist
6. Wildlife Biologist
7. Ecologist
8. Forester/Woodland Management Specialist
9. Writer- Editor
10. FWS Liaison
11. FS Liaison (Management Zones III & IV)
12. State Agencies
13. NRCS Liaison

*Core team members

Map of PACs for FIAT Assessments in Management Zones III, IV, & V



# Greater Sage-Grouse Wildfire, Invasive Annual Grasses & Conifer Expansion Assessment

## June 2014

## Introduction and Background

The purpose of this assessment is to identify priority habitat areas and management strategies to reduce the threats to Greater Sage-Grouse resulting from impacts of invasive annual grasses, wildfires, and conifer expansion. The Conservation Objectives Team (COT) report (USFWS 2013) and other scientific publications identify wildfire and conversion of sagebrush habitat to invasive annual grass dominated vegetative communities as two of the primary threats to the sustainability of Greater Sage-Grouse (*Centrocercus urophasianus*, hereafter sage-grouse) in the western portion of the species range. For the purposes of this assessment protocol, invasive species are limited to, and hereafter referred to, as **invasive annual grasses** (e.g., primarily cheatgrass [*Bromus tectorum*]). Conifer expansion (also called encroachment) is also addressed in this assessment.

The United States Fish and Wildlife Service (USFWS) will consider the amelioration of impacts, location and extent of treatments, degree of fire risk reduction, locations for suppression priorities, and other proactive measures to conserve sage-grouse in their 2015 listing decision. This determination will be made based in part upon information contained in the United States (US) Department of the Interior, Bureau of Land Management (BLM) resource management plan (RMP) amendments and Forest Service land resource management plan (LRMP) amendments, including this assessment.

This assessment is based in part on National Resources Conservation Service (NRCS) soil surveys that include geospatial information on soil temperature and moisture regimes associated with resistance and resiliency properties (see following section on *Soil Temperature and Moisture Regimes)*. While this assessment is applicable across the range of sage-grouse, the analysis is limited to Western Association of Fish and Wildlife Management Agencies' (WAFWA) Management Zones III, IV, and V (roughly the Great Basin region) because of the significant issues associated with invasive annual grasses and the high level of wildfires in this region. The utility of this assessment process is dependent on incorporating improved information and geospatial data as it becomes available. Although the resistance and resilience concepts have broad applications (e.g., infrastructure development), this assessment is limited to developing strategies to reduce threats to sage-grouse habitat (e.g., invasive annual grasses and wildfires).

Draft Greater Sage-Grouse Environmental Impact Statements (EISs) contain a suggested framework in the appendices ("Draft Greater Sage-Grouse Wildland Fire and Invasive Species Assessment") that provided a consistent approach to conduct these assessments. The current protocol was developed by the Fire and Invasive Species Team (FIAT), a team of wildland fire specialists and other resource specialists and managers, to specifically incorporate resistance to invasive annual grasses and resilience after disturbance principles into the assessment protocol. In October 2013, the BLM, Forest Service, and USFWS agreed to incorporate this approach into the final EISs.

The cornerstone of the FIAT protocol is recent scientific research on resistance and resilience of Great Basin ecosystems (Chambers et al. *In press*) and the USFWS-sponsored project with the Western Association of Fish and Wildlife Agencies (WAFWA) to assemble an interdisciplinary team to provide additional information on wildland fire and invasive plants and to develop strategies for addressing these issues. This interagency collaboration between rangeland scientists, fire specialists, and sage-grouse biologists resulted in the development of a strategic, multi-scale approach for employing ecosystem resilience and resistance concepts to manage threats to sage-grouse habitats from wildfire and invasive annual grasses (Chambers et al. *In prep.* ). This paper is being published as a Forest Service Rocky Mountain Research Station General Technical Report and is available at www.__________. It serves as the reference and basis for the protocol described in this assessment.

The assessment process sets the stage for:

- Identifying important sage-grouse occupied habitats and baseline data layers important in defining and prioritizing sage-grouse habitats
- Assessing the resistance to invasive annual grasses and resilience after disturbance and prioritizing focal habitats for conservation and restoration
- Identifying geospatially explicit management strategies to conserve sage-grouse habitats

Management strategies are types of actions or treatments that managers typically implement to resolve resource issues. They can be divided into proactive approaches (e.g., fuels management and habitat recovery/restoration) and reactive approaches (e.g., fire operations and post-fire rehabilitation). Proactive management strategies can favorably modify wildfire behavior and restore or improve desirable habitat with greater resistance to invasive annual grasses and/or resilience after disturbances such as wildfires. Reactive management strategies are employed to reduce the loss of sage-grouse habitat from wildfires or stabilize soils and reduce impacts of invasive annual grasses in sage-grouse habitat after wildfires. Proactive management strategies will result in long-term sage-grouse habitat improvement and stability, while reactive management strategies are essential to reducing current impacts of wildfires on sage-grouse habitat, thus maintaining long-term habitat stability. Management strategies include:

**Proactive Strategies-**

1. **Fuels Management** includes projects that are designed to change vegetation composition and/or structure to modify fire behavior characteristics for the purpose of aiding in fire suppression and reducing fire extent.

2. **Habitat Restoration/Recovery**
    a. Recovery, referred to as passive restoration (Pyke 2011), is focused on changes in land use (e.g., improved livestock grazing practices) to achieve a desired outcome where the plant community has not crossed a biotic or physical threshold.
    b. Restoration is equivalent to active restoration (Pyke 2011) and is needed when desired species or structural groups are poorly represented in the community and reseeding, often preceded by removal of undesirable species, is required. Note: The Fuels Management program supports recovery/restoration projects through its objective to restore and maintain resilient landscapes.

**Reactive Strategies-**

3. **Fire Operations** includes preparedness, prevention, and suppression activities. When discussing specific components of fire operations, the terms fire preparedness, fire prevention and fire suppression are used.

4. **Post-Fire Rehabilitation** includes the BLM's Emergency Stabilization and Rehabilitation (ES&R) Program and the Forest Service's Burned Area Emergency Response (BAER) Program. Policy limits application of funds from 1 to 3 years, thus treatments to restore or enhance habitat after this period of time are considered habitat recovery/restoration.

The assessment process included two steps with sub-elements. First, important Priority Areas for Conservation (PACs) and focal habitats are identified (**Step 1a**). Second, potential management **strategies** (described above) are identified to conserve or restore focal habitats threatened by wildfires, invasive annual grasses, and conifer expansion (primarily pinyon pine and/or juniper species; **Step 1b**). Focal habitats are the portions of a PAC with important habitat characteristics, bird populations, and threats (e.g., wildfires, invasive annual grasses, and conifer expansion) where this assessment will be applied. Areas adjacent to or near the focal habitats can be considered for management treatments such as fire control and fuels management if these locations can reduce wildfire impacts to focal habitats. Soil temperature and moisture regimes are used to characterize capacity for resistance to invasive annual grasses and resilience after disturbance (primarily wildfires) within focal habitats to assist in identifying appropriate management strategies, especially in areas with good habitat characteristics that have low recovery potential following disturbance. Soil moisture and temperature regime relationships have not been quantified to the same degree as for conifer expansion; however, Chambers et al. (*In prep.*) discuss preliminary correlations between these two variables.

The results of Steps 1a and 1b, along with associated geospatial data files, are available to local management units to complete Step 2 of the assessment process. Step 2 is conducted by local management units to address wildfire, invasive annual grasses, and conifer expansion in or near focal habitat areas. First, local information and geospatial data are collected and evaluated to apply and improve on Step 1 focal habitat area geospatial data (**Step 2a**). Second, focal habitat activity and implementation plans are developed and include prioritized management **tactics and treatments** to implement effective, fuels management, habitat recovery/restoration, fire operations, and post-fire rehabilitation strategies (**Step 2b**). This assessment will work best if Step 2b is done across management units (internal and externally across BLM and Forest Service administrative units and with other entities). **Figure 1**, Assessment Flow Chart, contains an illustration of the steps in the assessment process.

This analysis does not necessarily address the full suite of actions needed to maintain the current distribution and connectivity of sage-grouse habitats across the Great Basin because resources available to the federal agencies are limited at this time. Future efforts designed to maintain and connect habitats across the range will be needed as current focal areas are addressed and additional resources become available.

### Step 1 – Sage-Grouse Landscape Context

#### Wildfire/Invasive Annual Grass Threat

- Priority Areas for Conservation
- 75% Breeding Bird Density Areas
- Sagebrush Landscape Cover
- Resistance to invasive annual grasses and resilience to disturbance

#### Conifer Expansion Threat

- Priority Areas for Conservation
- 75% Breeding Bird Density Areas
- Sagebrush Landscape Cover
- Conifer Expansion Map

### Step 1a - Select Priority Areas for Conservation and focal habitats

Priority Areas for Conservation: Figure 6, Tables 1 &2

Focal habitats: Figure 6 and Table 2

Emphasis areas are habitats where resistance to invasive annual grasses and resiliency after disturbance are low within and around focal habitats.

Priority Areas for Conservation: Figure 7, Tables 3&4

Focal habitats: Figure 7 and Table 4

Emphasis areas are conifer expansion in association with 75% Breeding Bird Density areas with landscape sagebrush cover greater tjam 25%

### Step 1b. Potential Management Strategies and Examples

Management Strategies to Address Wildfires and Invasive Annual Grasses

- Habitat Recovery/Restoration
- Fuels Management
- Fire Operations
- Post-Fire Rehabilitation

Utilize Table 4 in Chambers et al. (in prep.) to develop management strategies for each Priority Area for Conservation.

Management Strategies to Address Conifer Expansion

- Habitat Recovery/Restoration
- Fuels Management
- Fire Operations
- Post-Fire Rehabilitation

Utilize Table 4 in Chambers et al. (in prep) to develop management strategies for each Priority Area for Conservation.

### Step 2 – Management Unit Applications for Invasive Annual Grasses and Conifer Expansion

**Step 2a**

1) Evaluate the accuracy and utility of Step 1 geospatial layers and incorporate relevant local information.
2) Develop framework for incorporating management strategies to initiate implementation/activity plans.

**Step 2b**

Develop collaborative implementation/activity plans to address threats to focal habitats in Priority Areas for Conservation.

**Figure 1, Assessment Flow Chart**

# Step 1

The first component of the Wildfire and Invasive Annual Grasses Assessment describes the factors that collectively provide the sage-grouse landscape context. Step 1a provides this context by discussing PACs, breeding bird density (BBD), soil temperature and moisture regimes (indicators of resistance to annual grasses and resilience after disturbance), landscape sagebrush cover, and conifer expansion. See Chambers et al. (2014 in prep.) for a detailed description of Invasive Annual Grass and Wildfire threats to sage-grouse habitat. Priority PACs and focal habitats are derived from the information provided in this sage-grouse landscape context section.

**Step 1a- Sage-grouse landscape context**

This component of the assessment identifies important PACs and associated focal habitats where wildfire, invasive annual grasses, and conifer expansion pose the most significant threats to sage-grouse.

The primary focus of this assessment is on sage-grouse populations across the WAFWA Management Zones III, IV, and V (**Figure 2**, Current PACs for WAFWA Management Zones III, IV, and V). Sage-grouse are considered a landscape species that require very large areas to meet their annual life history needs. Sage-grouse are highly clumped in their distribution (Doherty et al. 2010), and the amount of landscape cover in sagebrush is an important predictor of sage-grouse persistence in these population centers (Knick et al. 2013). States have used this information combined with local knowledge to identify PACs to help guide long-term conservation efforts. FIAT used data sets that were available across the three management zones as an initial step for prioritizing selected PACs and identifying focal habitats for fire and invasive annual grasses and conifer expansion assessments. These data sets (also described in Chambers et al. *In prep.* ) include:

*Priority Areas for Conservation (PACs)*

PACs have been identified by states as key areas that are necessary to maintain redundant, representative, and resilient sage-grouse populations (USFWS 2013; see Figure 2). A primary objective is to minimize threats within PACs (e.g., wildfire and invasive annual grasses impacts) to ensure the long-term viability of sage-grouse and its habitats. A secondary priority is to conserve sage-grouse habitats outside of PACs since they may also be important for habitat connectivity between PACs (genetic and habitat linkages), habitat restoration and population expansion opportunities, and flexibility for managing habitat changes that may result from climate change. PACs have also been identified by the USFWS as one of the reporting geographic areas that will be considered during listing determinations for sage-grouse.

The combination of PACs with BBD data (described below) assists us in identifying connectivity between populations. PAC boundaries may be modified in the future requiring adjustments in focal habitat areas and management strategy priorities.

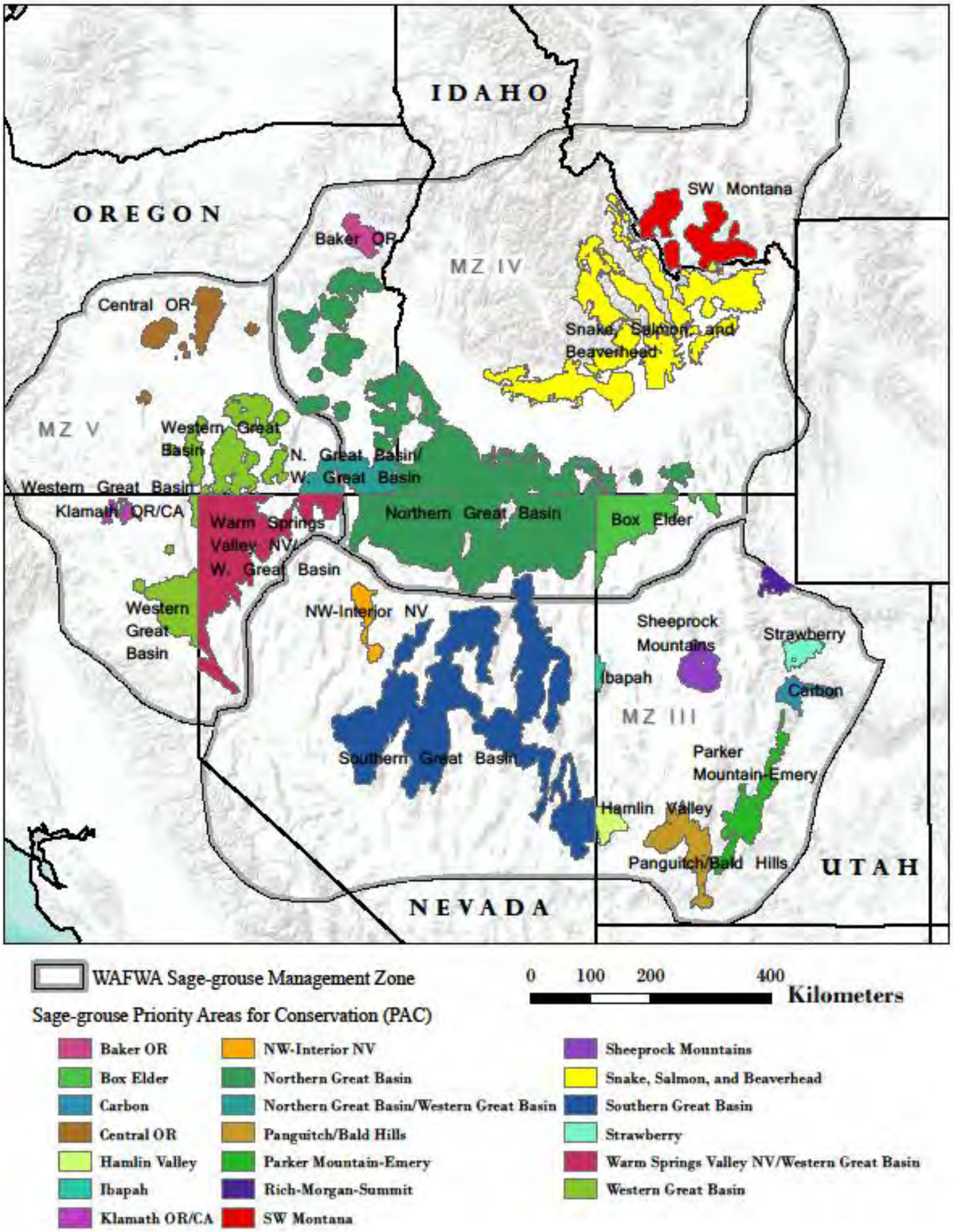



**Figure 2, Current PACs for WAFWA Management Zones III, IV, and V**. Bi-State sage-grouse populations were not included for this analysis and are being addressed in separate planning efforts.

*Breeding Bird Density*

Doherty et al. (2010) provided a useful framework for identifying population concentration centers in their range-wide BBD mapping. FIAT used maximum counts of males on leks (4,885 males) to delineate breeding bird density areas that contain 25, 50, 75, and 100 percent of the known breeding population. Leks were then mapped according to abundance values and buffered by 4 to 5.2 miles (6.4 to 8.5 kilometers) to delineate nesting areas. Findings showed that while sage-grouse occupy extremely large landscapes, their breeding distribution is highly aggregated in comparably smaller identifiable population centers; 25 percent of the known population occurs within 3.9 percent (7.2 million acres [2.92 million hectares]) of the species range, and 75 percent of birds are within 27 percent of the species range (50.5 million acres [20.4 million hectares]; Doherty et al. 2010). See **Figures 3**, Sage-Grouse Breeding Bird Density Thresholds.

This analysis places emphasis on breeding habitats because little broad/mid-scale data exists for associated brood-rearing (summer) and winter habitat use areas. Finer scale seasonal habitat use data should be incorporated (or, if not available studies, should be conducted) at local levels to ensure management actions encompass all seasonal habitat requirements. Federal administrative units should consult with state wildlife agencies for additional seasonal habitat information.

For this assessment, FIAT chose to use the 75 percent BBD as an indicator of high bird density areas that informed the approach used by state wildlife agencies to initially identify PACs. Range-wide BBD areas provide a means to further prioritize actions within relatively large PACs to maintain bird distribution and abundance. FIAT used state level BBD data from Doherty et al. (2010) instead of range-wide model results to ensure important breeding areas in Management Zones III, IV, and V were not underweighted due to relatively higher bird densities in the eastern portion of the range. BBD areas of 75 to 100 percent are included in Appendix 1 to provide context for local management units when making decisions concerning connectivity between populations and PACs.

Note that breeding density areas were identified using best available information in 2009, so this range-wide data does not reflect the most current lek count information and changes in conditions since the original analysis. Subsequent analysis should use the most current information available. Also, BBD areas should not be viewed as rigid boundaries but rather as a means to regionally prioritize landscapes where step down assessments and actions should be implemented quickly to conserve the most birds.

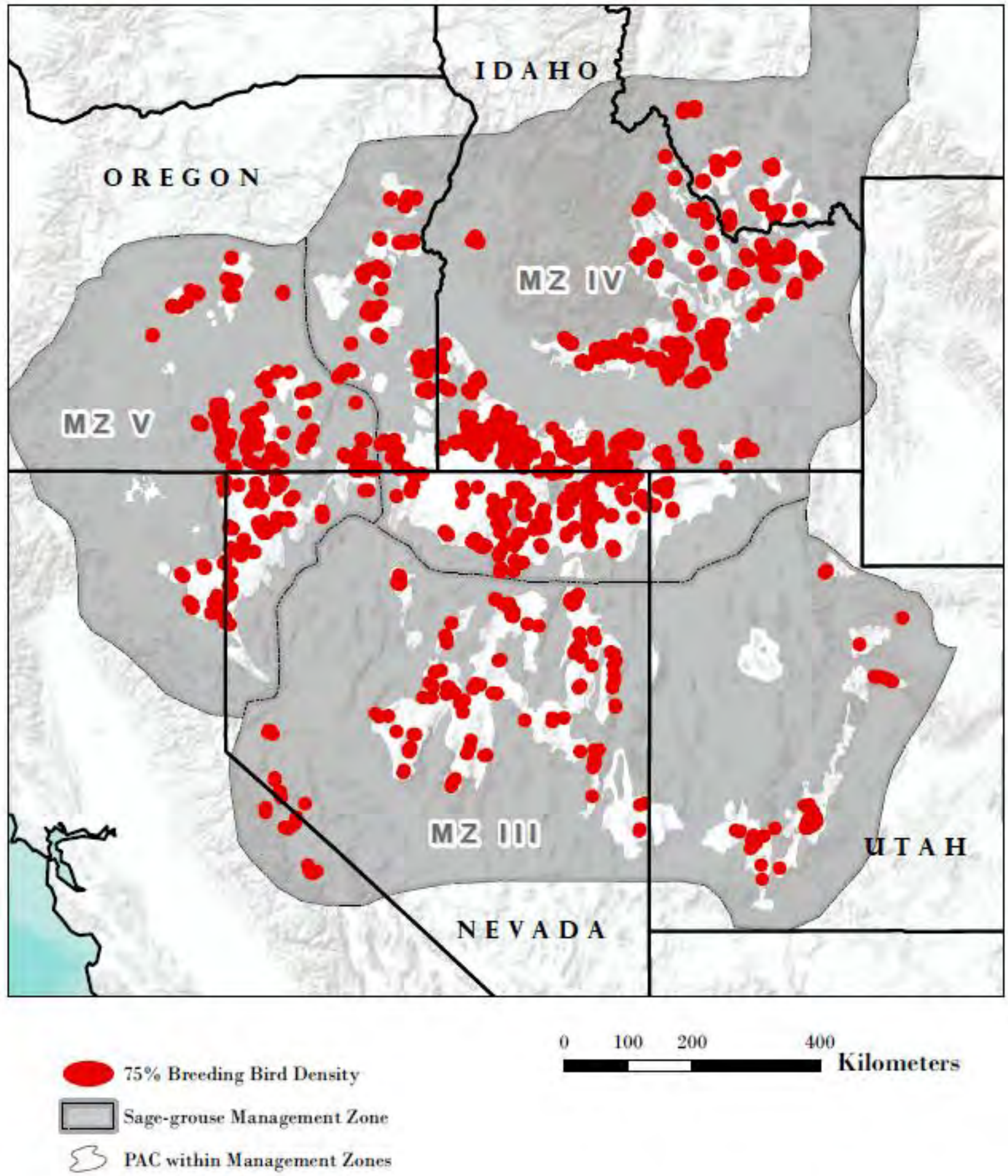



**Figure 3, Sage-Grouse Breeding Bird Density Thresholds** for 75% of the breeding birds, Management Zones, and PACs. Breeding bird density of 75 to 100% is shown in Appendix 1 to provide context for local management units when making decisions concerning connectivity between populations and PACs.

*Soil Temperature and Moisture Regimes*

Invasive annual grasses and wildfires can be tied to management strategies through an understanding of resistance and resilience concepts. Invasive annual grasses has significantly reduced sage-grouse habitat throughout large portions of its range (Miller et al. 2011). While abandoned leks were linked to increased nonnative annual grass presence, active leks were associated with less annual grassland cover than in the surrounding landscape (Knick et al. 2013). Invasive annual grasses also increases fire frequency, which directly threatens sage-grouse habitat and further promotes the establishment of invasive annual grasses (Balch et al. 2013). This nonnative annual grass and fire feedback loop can result in conversion from sagebrush shrublands to annual grasslands (Davies 2011).

In cold desert shrublands, vegetation community resistance to invasive annual grasses, especially cheatgrass, and resilience following disturbance is strongly influenced by soil temperature and moisture regimes (Chambers et al. 2007; Meyer et al. 2001). Generally, cooler and moister soil temperature/moisture regimes are associated with more resilient vegetation communities as indicated by increases in vegetation productivity and ability to compete and recover from disturbance along elevation gradients (Chambers et al. 2007; Chambers et al. *in press*). Also, colder soil temperatures are associated with more resistant communities due to limitations on invasive annual grass growth and reproduction. Thus, communities with warm and dry soil temperature and moisture regimes tend to have relatively low resilience and resistance. Communities with cool and dry soil temperature and moisture regimes also can have relatively low resilience and resistance with the degree of resistance to cheatgrass depending on soil temperature (see Figure 9 in Chambers et al. *In prep.*). A continuum in resistance and resilience exists across soil temperature and moisture regimes that will need to be considered when developing implementation or activity plans in Step 2. These relationships can be used to help prioritize management actions within sage-grouse habitat using broadly available data.

To capture relative resistance and resilience to disturbance and invasive annual grasses across the landscape, soil temperature and moisture regime information (described in greater detail in Chambers et al. *In prep.*) were obtained from the Natural Resources Conservation Service (NRCS) Soil Survey Geographic Database (SSURGO) data. Where gaps in this coverage existed, the NRCS US General Soil Map (STATSGO2) data was used (Soil Survey Staff 2014; see Appendix 1). The STATSGO2 database includes soils mapped at a 1:250,000-scale; the SSURGO database includes soils mapped at the 1:20,000 scale. Interpretations made from soil temperature and moisture regimes from the STATSGO2 database will not have the same level of accuracy as those made from the SSURGO database.

Areas characterized by warm and dry soil temperature and moisture regimes (low relative resistance and resilience) were intersected with sage-grouse breeding habitat and sagebrush landscape cover to identify candidate areas (emphasis areas) for potential management actions that mitigate threats from invasive annual grasses and wildfire (**Figure 4**, Soil Moisture and Temperature Regimes for Management Zones III, IV, and V, and **Figure 5**, Intersection of High Density (75% BBD) Populations). These data layers provide the baseline information considered important in prioritizing areas where conservation and management actions could be developed to address invasive annual grasses in a scientifically defensible manner (see Table 4 in Chambers et al. *In prep.*).

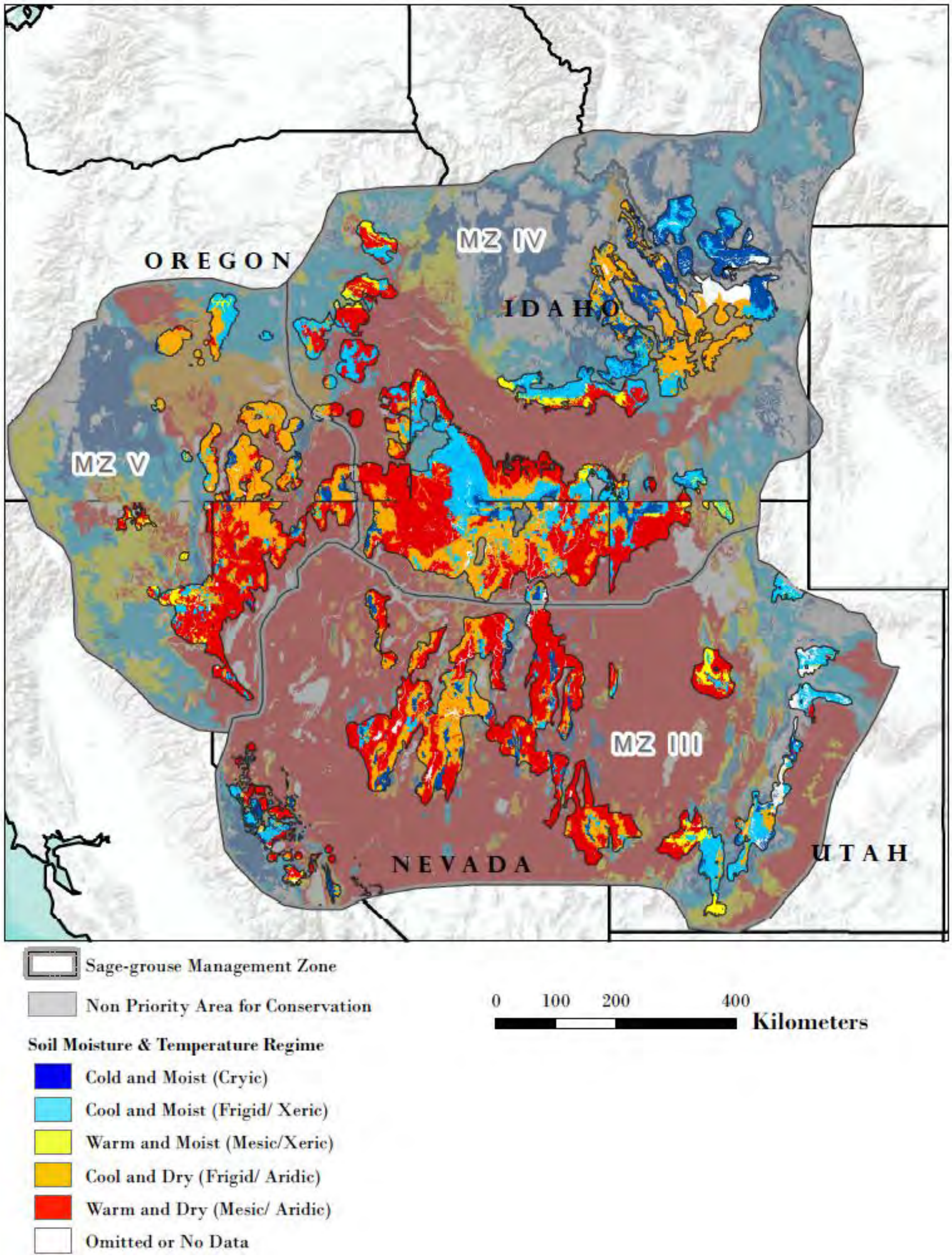



**Figure 4, Soil Moisture and Temperature Regimes for Management Zones III, IV, and V**

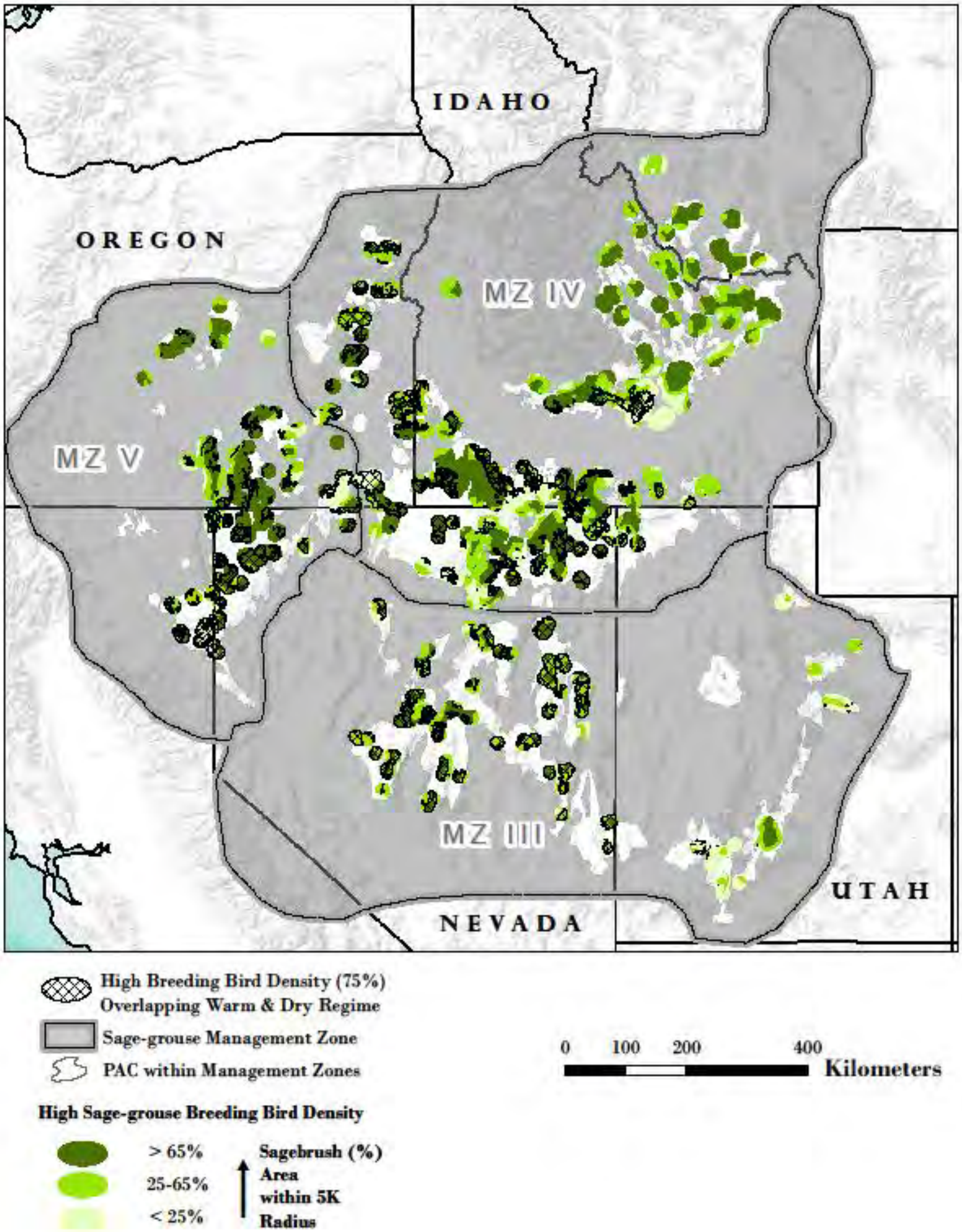



**Figure 5, Intersection of High Density (75% BBD) Populations.** The warm and dry sites and the proportion of these habitats in the three sagebrush landscape cover classes by management zone, and PACs within the Great Basin.

*Sagebrush Landscape Cover*

The amount of the landscape in sagebrush cover is closely related to the probability of maintaining active sage-grouse leks, and is used as one of the primary indicators of sage-grouse habitat potential at landscape scales (Aldridge et al. 2008; Wisdom et al. 2011; Knick et al. 2013). For purposes of prioritizing landscapes for sage-grouse habitat management, FIAT used less than or equal to 25 percent sagebrush landscape cover as a level below which there is a low probability of maintaining sage-grouse leks, and greater than or equal to 65 percent as the level above which there is a high probability of sustaining sage-grouse populations with further increases of landscape cover of sagebrush (Aldridge et al. 2008; Wisdom et al. 2011; Knick et al. 2013). Increases in landscape cover of sagebrush have a constant positive relationship with sage-grouse lek probability at between about 25 percent and 65 percent landscape sagebrush cover (Knick et al. 2013). It is important to note that these data and interpretations relate only to persistence (i.e., whether or not a lek remains active), and it is likely that higher proportions of sagebrush cover may be required for population growth.

For the purposes of delineating sagebrush habitat relative to sage-grouse requirements for landscape cover of sagebrush, FIAT calculated the percentage of landscape sagebrush cover (Landfire 2013) within a 3-mile (5-kilometer) radius of each 98-foot by 98-foot (30 meter by 30 meter) pixel in Management Zones III, IV, and V (see Appendix 2 in Chambers et al. (*In prep.*) for how landscape sagebrush cover was calculated). FIAT then grouped the percentage of landscape sagebrush cover into each of the selected categories (0 to 25 percent, 25 to 65 percent, 65 to 100 percent; **Figure 6**, Sagebrush Landscape Cover and Fire Perimeters for the Analysis Area). Landfire data was based on 2000 satellite imagery so wildfire perimeters after that date were incorporated into this layer to better reflect landscape sagebrush cover. Burned areas were assumed to fall into the 0 to 25 percent landscape cover class.

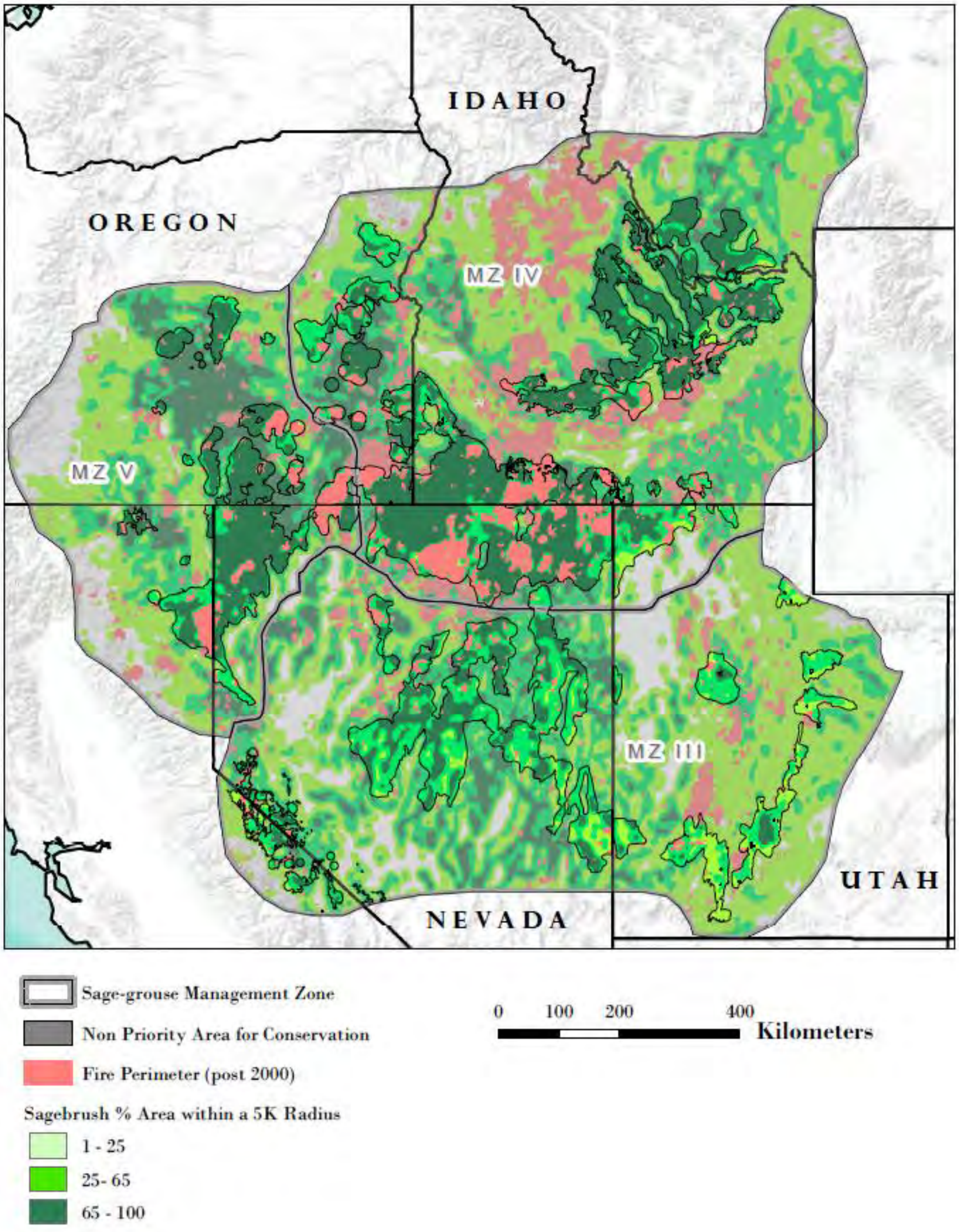



**Figure 6, Sagebrush Landscape Cover and Fire Perimeters (post-2000) for the Analysis Area**

*Conifer Expansion*

Conifer expansion into sagebrush landscapes also directly reduces sage-grouse habitat by displacing shrubs and herbaceous understory as well as by providing perches for avian predators. Conifer expansion also leads to larger, more severe fires in sagebrush systems by increasing woody fuel loads (Miller 2013). Sage-grouse populations have been shown to be impacted by even low levels of conifer expansion (Baruch-Mordo et al. 2013). Active sage-grouse leks persist in regions of relatively low conifer woodland and are threatened by conifer expansion (Baruch-Mordo et al. 2013; Knick et al. 2013).

To estimate where sage-grouse breeding habitat faces the largest threat of conifer expansion, FIAT used a risk model developed by Manier et al. (2013) that locates regions where sagebrush landscapes occur within 250 meters of conifer woodland (**Figure 7**, Modeled Conifer Expansion for PACs with Greater Than 25% Sagebrush Landscape Cover In and Around 75% BBD). Although the model is coarse, it is available for the entirety of the three sage-grouse management zones analyzed. FIAT encourages using more accurate conifer expansion data in Step 2.

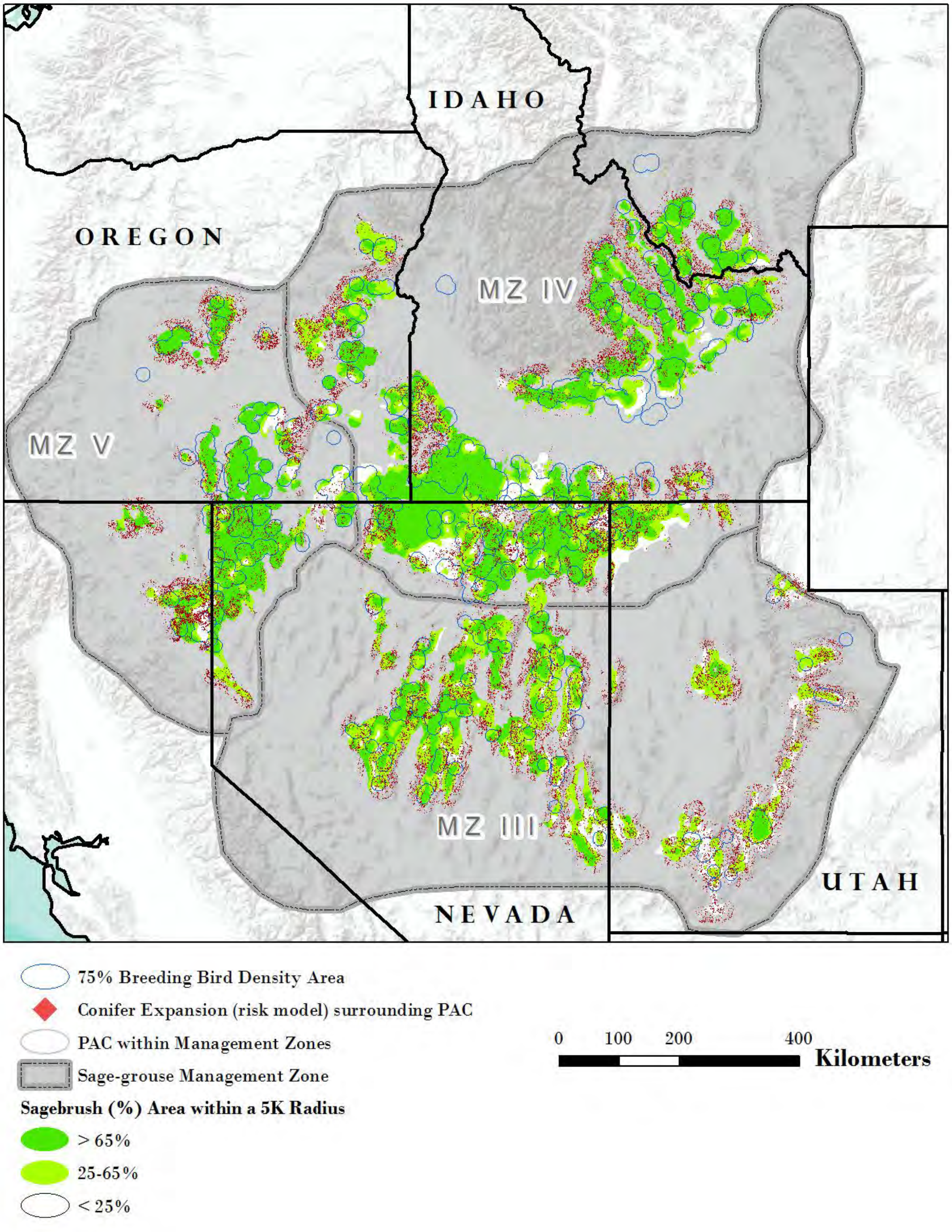



**Figure 7, Modeled Conifer Expansion for PACs with Greater Than 25% Sagebrush Landscape Cover In and Around 75% BBD**

## Step 1a. Identifying PACs and focal habitats

A primary goal for the conservation of sage-grouse populations is the identification of important habitats needed to ensure the persistence and recovery of the species. Loss of habitat, and by inference populations, in these habitats would likely imperil the species in the Great Basin. The first objective is to protect and restore those habitats that provide assurances for retaining large well connected populations.

PACs and the 75 percent BBD maps were used to provide a first-tier stratification (e.g., focal habitats) for prioritizing areas where conservation actions could be especially important for sage-grouse populations. Although these areas are a subset of the larger sage-grouse habitats, they are readily identifiable and include habitats (e.g., breeding and nesting habitats that are considered critical for survival; Connelly et al. 2000; Holloran et al. 2005; Connelly et al. 2011) and necessary for the recovery of the species across its range.

The prioritization of habitats for conservation purposes was based on the several primary threats to remaining sage-grouse populations in the Great Basin including the loss of sagebrush habitats to wildfire and invasive annual grasses, and conifer expansion. The first, and probably the most urgent threat for sage-grouse, is the loss of sagebrush habitat due to wildfire and invasive annual species (e.g., cheatgrass; See Figure 11 in Chambers et al. [*In prep.*]). Areas of highest concern are those with low resistance to cheatgrass and low resilience after disturbance (warm/dry and some cool/dry temperature and moisture regimes sites) that are either **within or in close proximity** to remaining high density populations of sage-grouse (Figure 5). Sagebrush habitats (greater than 25 percent sagebrush landscape cover) prone to conifer expansion, particularly pinyon pine and/or juniper, are also a management concern when within or adjacent to high density sage-grouse populations (Figure 7).

Because these two threats occur primarily at different points along an elevational gradient and are associated with different soil temperature and moisture regimes, separate approaches are used to select PACs and focal habitats for each.

**High Density Populations at Highest Risk from <u>Wildfire and Invasive Annual Grasses</u>**

PACs in Management Zones III, IV, and V. were evaluated on the basis of high density (75 percent) BBDs, sagebrush landscape cover, and soil temperature and moisture regimes to identify initial PACs that are a priority for assessments and associated focal habitats. **Figure 8**, High Priority PACs with High Density Sage-Grouse Populations (75% BBD), displays the results of the analysis focusing on the intersection of high density (75 percent BBD) populations, the warm and dry sites, and the proportion of these habitats in the three sagebrush landscape cover classes by management zone, and PACs within the Great Basin. **Table 1**, Relative Ranking of PACs Based on High Density (75% BBD) Populations, Warm/ Dry Sites, and Percentage of Habitat in Sagebrush Landscape Cover Classes, displays quantitative outputs of this analysis. The table allows a comparison of these data, and assists in selecting five PACs that provide the greatest contribution to high density sage-grouse populations, and the amounts (acres and proportion) within those PACs of sagebrush cover classes associated with warm and dry soil temperature and moisture regimes.

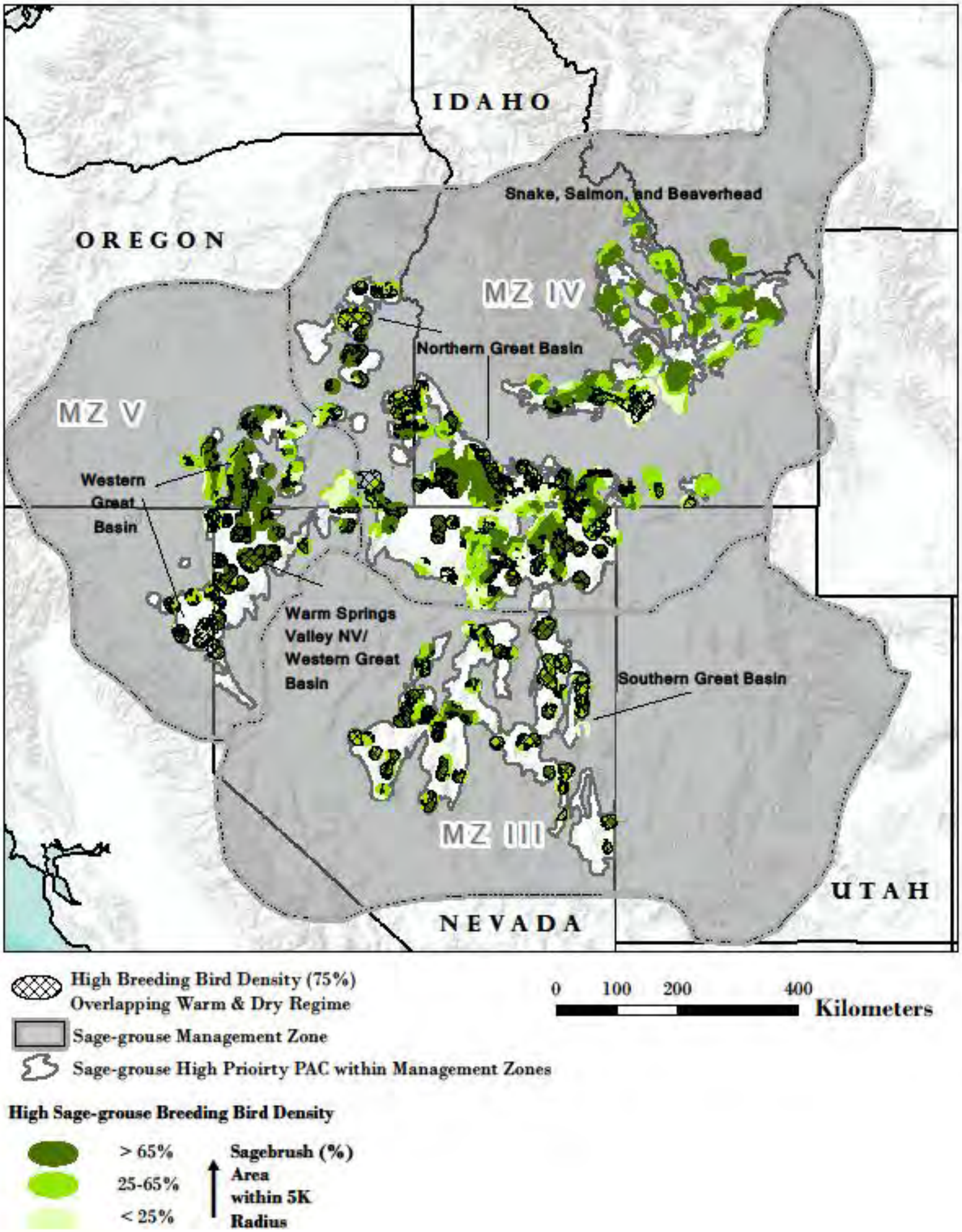



**Figure 8, High Priority PACs with High Density Sage-Grouse Populations (75% BBD)** sagebrush landscape cover classes, and areas with low resistance and resilience relative to wildfires and invasive annual species.

**Table 1**, Relative Ranking of PACs Based on High Density (75% BBD) Populations, Warm/ Dry Sites, and Percentage of Habitat in Sagebrush Landscape Cover Classes

| Sage-grouse Management Zone | Sage-grouse Priority Area for Conservation (PAC) Name | Total PAC Acres | Breeding Bird Density (75%) Acres | Percent of Breeding Bird Density (75%) Area within PAC | Warm and Dry Soil Moisture & Temperature Regime within Breeding Bird Density (75%) Acres* | | |
|---|---|---|---|---|---|---|---|
| | | | | | 0-25% Sagebrush Landscape Cover | 25%-65% Sagebrush Landscape Cover | 65%+ Sagebrush Landscape Cover |
| 4 | Northern Great Basin | 13045515 | 7383442 | 57% | 179551 (2%) | 674554 (9%) | 1745163 (24%) |
| 3 | Southern Great Basin | 9461355 | 3146056 | 33% | 42596 (1%) | 792780 (25%) | 1062091 (34%) |
| 4 | Snake, Salmon, and Beaverhead | 5477014 | 2823205 | 52% | 68107 (2%) | 89146 (3%) | 95970 (3%) |
| 5 | Western Great Basin | 3177253 | 2084626 | 66% | 149399 (7%) | 140141 (7%) | 202767 (10%) |
| 5 | Warm Springs Valley NV/Western Great Basin | 3520937 | 1558166 | 44% | 31458 (2%) | 207365 (13%) | 741353 (48%) |
| 4 | SW Montana | 1369076 | 659475 | 48% | 0 (0%) | 0 (0%) | 0 (0%) |
| 4 | Northern Great Basin/Western Great Basin | 1065124 | 624581 | 59% | 114222 (18%) | 85258 (14%) | 116513 (19%) |
| 5 | Central OR | 813699 | 451755 | 56% | 0 (0%) | 6211 (1%) | 16463 (4%) |
| 3 | Panguitch/Bald Hills | 1135785 | 352258 | 31% | 6883 (2%) | 5821 (2%) | 0 (0%) |
| 3 | Parker Mountain-Emery | 1122491 | 308845 | 28% | 0 (0%) | 127 (0%) | 0 (0%) |
| 4 | Box Elder | 1519454 | 292658 | 19% | 22 (0%) | 43325 (15%) | 23913 (8%) |
| 4 | Baker OR | 336540 | 184813 | 55% | 0 (0%) | 46459 (25%) | 36214 (20%) |
| 3 | NW-Interior NV | 371557 | 108256 | 29% | 576 (1%) | 17117 (16%) | 25173 (23%) |
| 3 | Carbon | 355723 | 97734 | 27% | 255 (0%) | 180 (0%) | 0 (0%) |
| 3 | Strawberry | 323219 | 52635 | 16% | 0 (0%) | 0 (0%) | 0 (0%) |
| 3 | Rich-Morgan-Summit | 217033 | 37005 | 17% | 0 (0%) | 0 (0%) | 0 (0%) |
| 3 | Hamlin Valley | 341270 | 3244 | 1% | 0 (0%) | 139 (4%) | 3105 (96%) |
| 3 | Ibapah | 98574 | 0 | 0% | 0 (NA) | 0 (NA) | 0 (NA) |
| 3 | Sheeprock Mountains | 611374 | 0 | 0% | 0 (NA) | 0 (NA) | 0 (NA) |
| 5 | Klamath OR/CA | 162667 | 0 | 0% | 0 (NA) | 0 (NA) | 0 (NA) |

* Numbers in parenthesis indicate the percent of acres relative to total acres of breeding bird density (75%)

These five PACs comprise 90 percent and 95 percent of remaining PAC sagebrush landscape cover in the 25 to 65 percent and greater than or equal to 65 percent sagebrush landscape cover classes, respectively, of the 75 percent BBD associated with low resistance/resilience habitats. The 75 percent BBD habitats in the Northern, Southern Great Basin, and Warm Spring PACs appear particularly important for two reasons. They represent a significant part of the remaining habitats for the Great Basin metapopulation, and they have the greatest amount of low resiliency habitat remaining that still functions as sage-grouse habitat.

An examination of the 5 selected PACs shows that the sum of the 75 percent BBD within these PACs is 16,995,496 acres (**Table 2**, PACs with the Highest Acres and Proportions of 75% BBD acres, and Acres and Proportions of 75% BBD Acres within the Warm/Dry Soil Temperature and Moisture Class). These are the **focal habitats**. These five PACs constitute 84 percent of the 75 percent BBD low resiliency habitats for all Management Zones III, IV, and V PACs. Within and immediately around these focal habitats, 5,751,293 acres are in high BBD areas with landscape sagebrush cover in the 25-65 percent and ≥ 65 percent classes and in the warm and dry soil temperature and moisture regimes. These are the habitats in the most danger to loss due to their low resistance to invasive annual grasses and low resilience following wildfire. Within the focal habitats in the high priority PACs, low resistance and resilience areas (cross-hatched areas in Figure 8) are a high priority (emphasis area) for implementing management strategies. Applying management strategies outside the emphasis areas are appropriate if the application of fire operations and fuels management activities will be more effective in addressing wildfire threats.

**Table 2, PACs with the Highest Acres and Proportions of 75% BBD acres, and Acres and Proportions of 75% BBD Acres within the Warm/Dry Soil Temperature and Moisture Class (see Figure 8)**

| PAC | PAC Acres | Acres of 75% BBD in PAC (**focal habitat**) | Proportion of 75% BBD within PACs | Warm & Dry Soils within 75% BBD by Sagebrush Landscape Cover Classes Greater Than 25%* | |
|---|---|---|---|---|---|
| | | | | 25-65% | >65% |
| Northern Great Basin | 13,045,515 | 7,383,442 | 0.57 | 674,517(9%) | 1,745,163(24%) |
| Southern Great Basin | 9,461,355 | 3,146,056 | 0.33 | 792,780(25%) | 1,062,091(34%) |
| Snake, Salmon, and Beaverhead | 5,477,014 | 2,823,205 | 0.52 | 89,146(3%) | 95,970(3%) |
| Warm Springs Valley NV/Western Great Basin | 3,520,937 | 1,558,166 | 0.44 | 207,365(13%) | 741,353(48%) |
| Western Great Basin | 3,177,253 | 2,084,626 | 0.66 | 140,141(7%) | 202,767(10%) |
| **Total for 5 PACS** | **34,682,074** | **16,995,496** | **0.49** | **1,903,949** | **3,847,344** |

***** This category represents the emphasis areas for applying appropriate management strategies in or near the focal habitats due to the lower probability of recovery after disturbance and higher probability of invasive annual grasses and existing wildfire threats.

**High Density Sage-Grouse Habitats at Risk from Conifer Expansion**

PACs, sagebrush landscape cover, and the 75 percent BBD data were also used in conjunction with the conifer expansion data (Mainer et al. 2013) to provide an initial stratification to determine PACs where conifer removal would benefit important sagebrush habitats. Conifer expansion threats are primarily western juniper in the northern Great Basin and pinyon pine/Utah juniper in the southern Great Basin.

Figure 7 displays results of the analysis focusing on the intersection of the 75 percent BBD, and modeled conifer expansion areas within two sagebrush landscape cover classes by management zone and PACs within the Great Basin. To identify high density sage-grouse areas affected by conifer expansion, the amount and proportion of acres estimated to be affected were calculated by sagebrush cover class to assist in the identification of the focal habitats (**Table 3)**. **Table 4**, displays quantitative outputs of this analysis using the 25 to 65 percent and greater than 65 percent landscape sagebrush cover classes for the PACs. Thus, **focal habitats** for addressing conifer expansion are the areas within and near conifer expansion in sagebrush landscape cover classes of 25 to 65 percent and greater than 65 percent. Conifer expansion in these two sagebrush landscape cover classes in the 75 percent BBD areas constitutes an emphasis area for treatments to address conifer expansion. Landscapes with less than 25 percent sagebrush cover may require significant additional management actions to restore sagebrush on those landscapes and therefore were considered a lower priority for this analysis. Focal habitats are identified in Table 4 and displayed in **Figure 9**.

Table 3 assists in identifying those PACs that provide the greatest contribution to high density sage-grouse populations, and the amounts (acres and proportion) within those PACs of sagebrush cover classes associated with modelled conifer expansion areas. Although there are uncertainties associated with the model, the results help managers identify specific geographic areas where treatments in conifer (pinyon and/or juniper) could benefit existing important sage-grouse populations.

The results of the screening revealed 5 PACs that contribute substantially to the 75 percent BBD habitats and are currently impacted most by conifer expansion (primarily pinyon pine and/or juniper; Table 4 and Figure 9). Four of the five PACs identified as high priority for conifer expansion treatments were also high priorities for wildfires and invasive annual grass threats. This is likely due to the size of the PACs and the relative importance of these PACs for maintaining the Great Basin sage-grouse meta-populations. As expected, the locations of high density sage-grouse habitats affected by conifer expansion differ spatially from those associated with low resilience habitats within and among the PACs, primarily due to differences in the biophysical settings (e.g., elevation and rainfall) that contribute to threats from invasive annual grasses and wildfires.

Three PACs (Snake/Salmon/Beaverhead, Southwest Montana, and Northern Great Basin/Western Great Basin) ranked high due to their relatively large proportion of high density breeding habitats (Table 3), but were not selected since the threat of conifer expansion was relatively low. One PAC, (Snake/Salmon/Beaverhead, was identified as a potential high priority area but was dismissed because results of the conifer expansion model likely overestimated impacts due to the adjacent conifer forests in this region. The COT Report also identified conifers as a “threat present but localized” in these areas, whereas, the top five PACs prioritized all have conifers identified as a widespread priority threat to address (USFWS 2013).

**Table 3, Relative Ranking of PACs Based on High Density (75% BBD) Populations, Modeled Conifer Expansion, and Percentage of Habitats in Sagebrush Landscape Cover Classes**

| Sage-grouse Management Zone | Sage-grouse Priority Area for Conservation (PAC) Name | PAC acres | Breeding Bird Density (75%) Acres | Relative Proportion of Breeding Bird Density Area within PAC | Conifer Expansion (Modeled) Acres* | | |
|---|---|---|---|---|---|---|---|
| | | | | | 0-25% Sagebrush Landscape Cover | 25%-65% Sagebrush Landscape Cover | 65%+ Sagebrush Landscape Cover |
| 4 | Northern Great Basin | 13045515 | 7383442 | 0.57 | 188502 (1%) | 512949 (4%) | 442480 (3%) |
| 3 | Southern Great Basin | 9461355 | 3146056 | 0.33 | 108657 (1%) | 738624 (8%) | 237828 (3%) |
| 4 | Snake, Salmon, and Beaverhead | 5477014 | 2823205 | 0.52 | 4209 (0%) | 92173 (2%) | 216803 (4%) |
| 5 | Western Great Basin | 3177253 | 2084626 | 0.66 | 87963 (3%) | 184618 (6%) | 126177 (4%) |
| 5 | Warm Springs Valley NV/Western Great I | 3520937 | 1558166 | 0.44 | 37148 (1%) | 107025 (3%) | 217101 (6%) |
| 4 | SW Montana | 1369076 | 659475 | 0.48 | 1428 (0%) | 34765 (3%) | 39215 (3%) |
| 4 | Northern Great Basin/Western Great Bas | 1065124 | 624581 | 0.59 | 12101 (1%) | 2247 (0%) | 6161 (1%) |
| 5 | Central OR | 813699 | 451755 | 0.56 | 3191 (0%) | 44937 (6%) | 59624 (7%) |
| 3 | Panguitch/Bald Hills | 1135785 | 352258 | 0.31 | 89141 (8%) | 75157 (7%) | 2563 (0%) |
| 3 | Parker Mountain-Emery | 1122491 | 308845 | 0.28 | 84719 (8%) | 83441 (7%) | 7469 (1%) |
| 4 | Box Elder | 1519454 | 292658 | 0.19 | 8531 (1%) | 114376 (8%) | 57645 (4%) |
| 4 | Baker OR | 336540 | 184813 | 0.55 | 945 (0%) | 15263 (5%) | 195 (0%) |
| 3 | NW-Interior NV | 371557 | 108256 | 0.29 | 7929 (2%) | 29440 (8%) | 11813 (3%) |
| 3 | Carbon | 355723 | 97734 | 0.27 | 15968 (4%) | 34446 (10%) | 283 (0%) |
| 3 | Strawberry | 323219 | 52635 | 0.16 | 7916 (2%) | 27340 (8%) | 1075 (0%) |
| 3 | Rich-Morgan-Summit | 217033 | 37005 | 0.17 | 11685 (5%) | 14280 (7%) | 238 (0%) |
| 3 | Hamlin Valley | 341270 | 3244 | 0.01 | 11321 (3%) | 29960 (9%) | 6243 (2%) |
| 3 | Ibapah | 98574 | 0 | 0.00 | 195 (0%) | 6770 (7%) | 1039 (1%) |
| 5 | Klamath OR/CA | 162667 | 0 | 0.00 | 1 (0%) | 1533 (1%) | 15302 (9%) |
| 3 | Sheeprock Mountains | 611374 | 0 | 0.00 | 16744 (3%) | 78580 (13%) | 11878 (2%) |

* Numbers in parenthesis indicate the proportion of acres relative to total PAC acres

**Table 4, PACS with the Highest Acres and Proportions of 75% BBD acres and Estimated Conifer Expansion within Sagebrush Landscape Cover Classes (25-65 percent and ≥65 percent; see Figure 9)**

| PAC | PAC Acres | Acres 75% BBD in PAC | Prop. 75% BBD within PACs | Conifer Expansion by Landscape Sagebrush Cover Classes 25-65% and ≥65%* Focal Habitat | |
|---|---|---|---|---|---|
| | | | | 25-65% | ≥65% |
| Northern Great Basin | 13,045,515 | 7,383,442 | 0.57 | 512,949 (4%) | 442,480 (3%) |
| Southern Great Basin | 9,461,355 | 3,146,056 | 0.33 | 738,624 (8%) | 237,828 (3%) |
| Warm Springs Valley NV/Western Great Basin | 3,520,937 | 1,558,166 | 0.44 | 107,025 (3%) | 217,101 (6%) |
| Western Great Basin | 3,177,253 | 2,084,626 | 0.66 | 184,618 (6%) | 126,177 (4%) |
| Central Oregon | 813,699 | 451,755 | 0.56 | 44,937 (6%) | 59,624 (7%) |
| **Total for 5 PACS** | **30,018,759** | **14,624,045** | **0.49** | **1,588,153 (5%)** | **1,083,210 (4%)** |

*Numbers in parenthesis represent the percent of total PAC acres for each class.

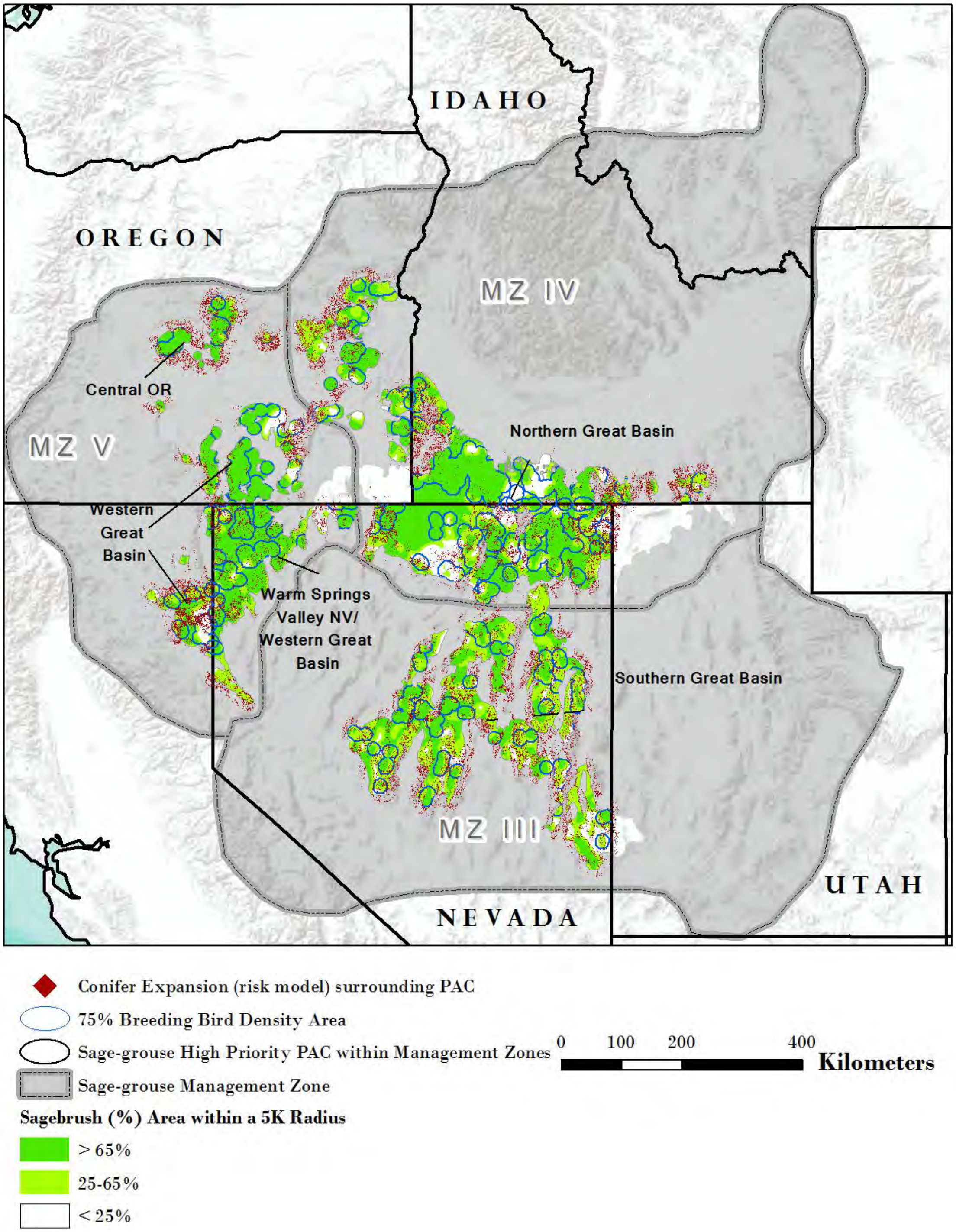



**Figure 9, Five PACs Significantly Impacted by Conifer Expansion** that contribute substantially to the 75% BBD and that have sagebrush landscape cover greater than 25%.

While the coarse-scale conifer expansion data used in this analysis likely over estimates the extent of the pinyon pine and/or juniper threat, results suggest that far fewer acres are currently affected by conifers than might be at risk from fire and invasive annual grasses impacts. Conifer expansion into sage-grouse habitats occurs at a slower rate, allowing more time for treatment, but early action may be needed to prevent population level impacts on sage-grouse (Baruch-Mordo et al. 2013). Furthermore, conifer expansion is primarily occurring on cooler and moister sites that are more resilient and where restoration is more likely to be effective (Miller et al. 2011), providing managers the opportunity to potentially offset at least some habitat loss expected to continue in less resilient ecosystems. While the available data set used to estimate conifer expansion provides only a coarse assessment of the problem, considerable efforts are currently underway to map conifers across sage-grouse range. These maps are expected to be available in the near future and should be used by land managers to better target project level conifer removal.

FIAT cautions against using the plotted locations of estimated conifer expansion for local management decisions due to the coarse-scale nature of this range-wide data set. Conifer expansion estimates are primarily provided here to aid in judging the relative scope of the threat in each PAC.

## Step 1b. Potential Management Strategies

Potential management **strategies** (e.g., fuels management, habitat recovery/restoration, fire operations, post-fire rehabilitation) to conserve or restore Step 1 focal habitats are described below to assist local management units to initiate Step 2. These examples are illustrative and do not contain the full range of management strategies that may be required to address wildfires, invasive annual grasses, and conifer expansion within PACs and associated focal habitats. In general, the priority for applying management strategies is to first maintain or conserve intact habitat and second to strategically restore habitat (after a wildfire or proactively to reconnect habitat). Management strategies will differ when applying the protocol to:

**Wildfire and Invasive Annual Grass**. (See PACs identified in Table 2 and focal habitats shown in Figure 8). Focal habitats, as they relate to wildfires and invasive annual grasses, are defined as sage-grouse habitat in priority PACs within 75 percent BBD. Within these focal habitats, sagebrush communities with low resilience to disturbance and resistance to invasive annual grasses (warm and dry soil temperature and moisture regimes) are an emphasis area for management actions. Appendix 5 (A) in Chambers et al. (*In prep.*) includes a generalized state and transition model with an invasive annual grass component and warm and dry soil temperature and moisture regime associated with 8 to 12 inches of annual precipitation. This state and transition models is useful in developing management strategies to deal with annual grass issues as it contains useful restoration pathways.

Burn Probability is another tool that can be used to assist managers to identify the relative likelihood of large fire occurrence across the landscape within PACs and focal habitats. Burn probability raster data were generated by the Missoula Fire Lab using the large fire simulator - FSim - developed for use in the national Interagency **Fire Program Analysis (FPA)** project. FSim uses historical weather data and LANDFIRE fuel model data to simulate fires burning. Using these simulated fires, an overall burn probability is returned by FSim for each 270m pixel. The burn probability data was overlaid spatially with PACs, soil data, and shrub cover data. The majority of the high and very high burn probability acres lie within the top 5 PACs and are within areas with >25% sagebrush cover. Several of the other PACs have a greater overall percentage of the warm/dry soil regime with high/very high burn probability (northern great basin, baker, and NW interior NV) but the total acres are relatively few. Areas identified with high and very high burn probability are most likely to experience large fires given fire history, fuels, weather and topography. Results are displayed in the table 5 and Figure 10.

**Table 5, Percentages of sage-grouse PAC areas with high and very high burn probability, 75% BBD within PAC, 75% BBD and warm dry/temperature regime, and 75% BBD and warm dry/temperature and warm dry/temperature with high and very high burn probability.**

| ***Sage Grouse Mangement Zone*** | *Sage-grouse Priority Area for Conservation (PAC) Name* | *Total PAC Acres* | *High, very high burn probability (percent of PAC acres)* | *75% BBD within PAC (percent PAC acres)* | *75% BBD and warm and dry soil/temperature regime ~~acres~~ (percent PAC acres)* | *75% BBD and warm and dry soil/temperature regime with high, very high burn probability (percent PAC acres)* |
|---|---|---|---|---|---|---|
| ***4*** | *Northern Great basin* | *13,045,415* | *86%* | *57%* | *19%* | *17%* |
| ***3*** | *Southern Great Basin* | *9,461,355* | *48%* | *33%* | *20%* | *9%* |
| ***4*** | *Snake, Salmon, and Beaverhead* | *5,477,014* | *68%* | *52%* | *5%* | *4%* |
| ***5*** | *Western Great Basin* | *3,177,253* | *61%* | *66%* | *15%* | *12%* |
| ***5*** | *Warm Springs Valley /Western Great Basin* | *3,520,937* | *30%* | *44%* | *28%* | *9%* |
| ***4*** | *SW Montana* | *1,369,076* | *1%* | *48%* | *0%* | *0%* |
| ***4*** | *Northern Great Basin/Western Great Basin* | *1,065,124* | *82%* | *59%* | *30%* | *22%* |
| ***5*** | *Central Oregon* | *813,699* | *71%* | *56%* | *3%* | *2%* |
| ***3*** | *Panguitch/Bald Hills* | *1,135,785* | *70%* | *31%* | *1%* | *1%* |
| ***3*** | *Parker Mountain-Emery* | *1,122,491* | *28%* | *28%* | *0%* | *0%* |
| ***4*** | *Box Elder* | *1,519,454* | *61%* | *19%* | *4%* | *2%* |
| ***4*** | *Baker Oregon* | *336,540* | *74%* | *55%* | *25%* | *21%* |
| ***3*** | *NW-Interior NV* | *371,557* | *99%* | *29%* | *12%* | *11%* |
| ***3*** | *Carbon* | *355,723* | *22%* | *27%* | *0%* | *0%* |
| ***3*** | *Strawberry* | *323,219* | *26%* | *16%* | *0%* | *0%* |
| ***3*** | *Rich-Morgan-Summit* | *217,033* | *79%* | *17%* | *0%* | *0%* |
| ***3*** | *Hamlin Valley* | *341,270* | *60%* | *1%* | *1%* | *0%* |
| ***3*** | *Ibapah* | *98,574* | *0%* | *0%* | *0%* | *0%* |
| ***3*** | *Sheeprock Mountains* | *611,374* | *98%* | *0%* | *0%* | *0%* |
| ***5*** | *Klamath OR/CA* | *162,667* | *98%* | *0%* | *0%* | *0%* |

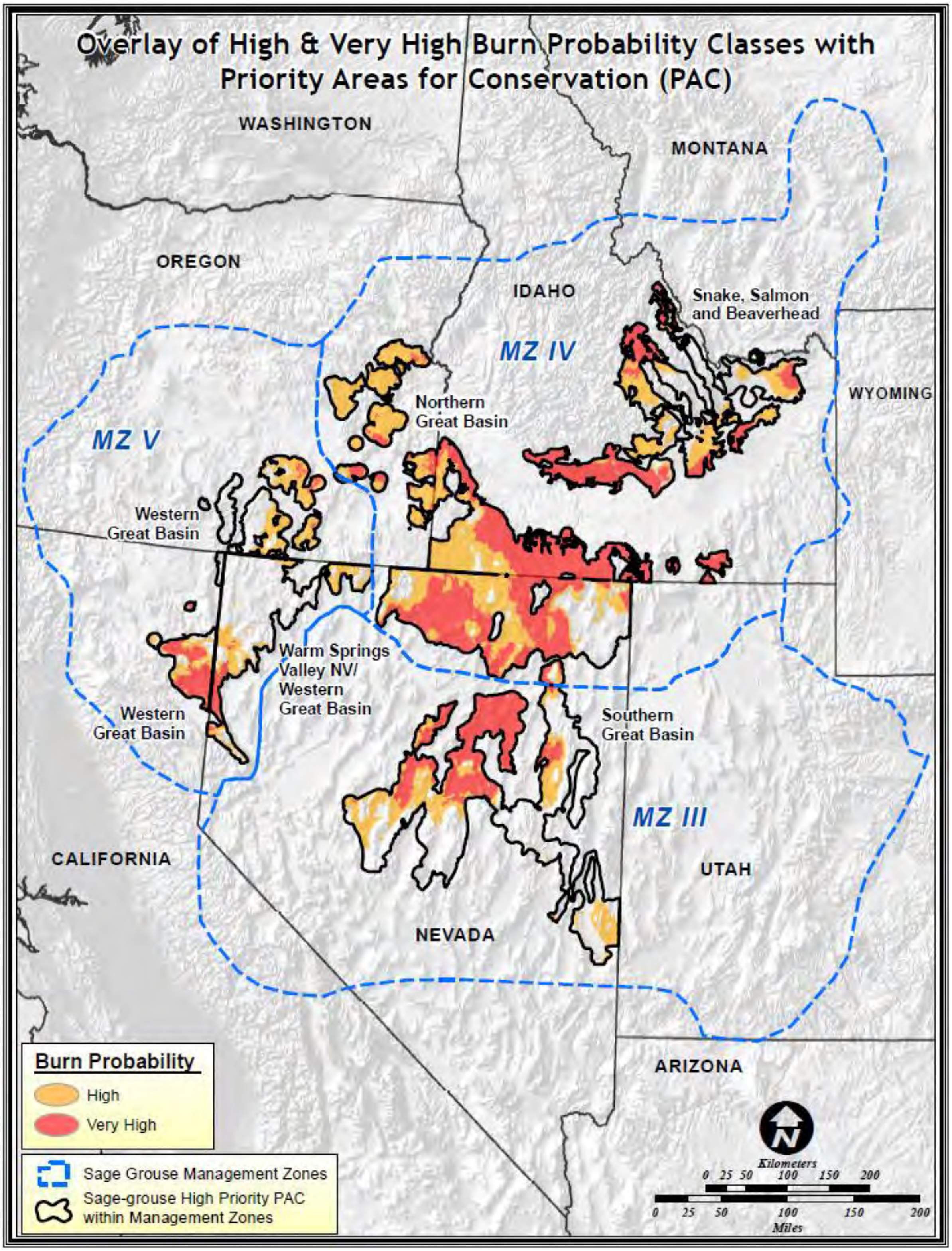



**Figure 10, Burn Probability (high and very high) in priority invasive annual grass and wildfire PACs.** .

**Conifer Expansion**. (See priority PACs for assessment identified in Table 4 and focal habitats shown in Figure 9). Focal habitats, as they relate to conifer expansion, are defined as sage-grouse habitat in a priority PAC with sagebrush landscape cover between 25 and 100 percent that is either near or in a conifer expansion area. The relationship between conifer expansion and resilience to disturbance and resistance to expansion is not documented to the same degree as with invasive annual grasses. However, Appendix 5 (D. and E.) in Chambers et al. (*In prep.*) includes two generalized state and transition models for conifer expansion with warm to cool and soil temperature regimes associated with precipitation ranges from 12 to 14 or more inches of annual precipitation. These state and transition models are useful in developing management strategies to deal with conifer expansion as they contain useful restoration pathways.

Chambers et al. (*In prep.*) is recommended for review at this point for information on applying resistance and resilience concepts along with sage-grouse habitat characteristics to develop management strategies to address wildfires, invasive annual grasses, and conifer expansion. The following tables are recommended for use in developing management strategies in or near focal habitats:

Table 1. Soil temperature and moisture regimes relationship to vegetation types and resistance and resilience.
Table 2. Sage-grouse habitat matrix showing the relationship between landscape sagebrush cover and resistance and resilience.
Table 3. Potential management strategies based on sage-grouse habitat requirements and resistance and resilience.
Table 4. Management strategies (fire suppression, fuels management, post-fire rehabilitation, and habitat restoration) associated with each cell in the sage-grouse habitat matrix (Table 2).

The "Putting it all together" section of the Chambers et al. (*In prep.*) also contains a case study from Northeast Nevada illustrating applications of management strategies to address the conservation, protection, and restoration of sage-grouse habitat.

To further assist in understanding Step 1b, examples of general priorities for management strategies are provided below and illustrated in Appendix 3 and 4:

1. Fuels Management: Projects that are designed to change vegetation composition and/or structure to modify potential fire behavior for the purpose of improving fire suppression effectiveness and limiting fire spread and intensity.
    a. Identify priorities and potential measures to reduce the threats to sage-grouse habitat resulting from changes in invasive annual grasses (primary focus on exotic annual grasses and conifer encroachment) and wildland fires. Place high priority on areas dominated by invasive annual grasses that are near or adjacent to low resistance and resilience habitats that are still intact.

b. Areas on or near perimeter of successful post-fire rehabilitation and habitat restoration projects where threats of subsequent fire are present are important for consideration.
c. Fuels management can be a high priority in large tracts of intact sagebrush if impacts on sage-grouse populations are minimal and outweighed by the potential benefits of reduced wildfire impacts in area being protected.

2. Habitat Recovery/Restoration Recovery (passive restoration) is a high priority in intact sagebrush stands to improve resistance and resilience before a disturbance. For example, where understory perennial herbaceous species are limited, improved livestock grazing practices can increase the abundance of these species and promote increased resistance to annual grasses.
    a. Habitat restoration is important where habitat connectivity issues are present within focal habitats.
    b. Pinyon pine and/or juniper removal in Phase I and II stands adjacent to large, contiguous areas of sagebrush (greater than 25 percent sagebrush landscape cover) is a priority.

3. Fire Operations (includes preparedness, prevention and suppression activities).
    a. Higher priority should be placed on areas with greater than 65 percent cover than on areas with 25 to 65 percent cover, followed by 0 to 25 percent cover (these categories are continuums not discrete thresholds).
    b. Higher priority should be placed on lower resistance/resilience habitats compared with higher resistance/resilience habitats.
    c. Fire operations in areas restored or post-fire rehabilitation treatment where subsequent wildfires can have detrimental effect on investment and recovery of habitat are important for consideration.
    d. Fire operations (suppression) are especially important in low elevation winter sagebrush habitat with low resistance and resiliency.
4. Post-Fire Rehabilitation
    a. High priority should be placed on supporting short-term natural recovery and long-term persistence in higher resistance and resiliency habitats (with appropriate management applied).
    b. High priority should be placed on reseeding in moderate to low resistance and resiliency habitats, but only if competition from invasive annual grasses, if present, can be controlled prior to seeding.

# Step 2

Step 2 is carried out by local management units using the Step 1 geospatial data, focal habitats, and the associated management strategies. Step 2 includes evaluating the availability and accuracy of local information and geospatial data used to develop local management strategies in or near focal habitats (Step 2a).

It also involves developing focal habitat activity/implementation plans that include prioritized management tactics and treatments to implement effective fuels management, habitat recovery/restoration, fire operations, and post-fire rehabilitation (Step 2b). These activity/implementation plans will serve as the basis for NEPA analysis of site-specific projects.

## Step 2a- Review of Step 1 Data and Incorporation of Local Information

Evaluate the accuracy and utility of Step 1 geospatial layers for focal habitats by incorporating more accurate or locally relevant:

- Vegetation maps (especially sagebrush cover)
- Updated or higher resolution conifer expansion layers (if applicable)
- Soil survey and ecological site descriptions
- Weather station, including Remote Automatic Weather Stations, data
- PACs, focal habitats, winter habitats, sage-grouse population distributions (i.e., more recent BBD surveys)
- Maps of cheatgrass and other invasive annual grasses that degrade sage-grouse habitat
- Wildfire polygons including perimeters and unburned islands within burn polygons
- Treatment locations and success (consult US Geological Survey Land Treatment Digital Library at http://ltdl.wr.usgs.gov/). The Land Treatment Digital Library allows the user to search on treatment results on an ecological site basis.
- Models and tools to help inform management strategies. For example, data which characterizes wildfire potential can help identify risk to focal habitats and help plan fire suppression and fuels management strategies to address these risks.
- Rapid Ecoregional Assessments
- Land Use Plans
- Appropriate monitoring or inventory information
- Any other geospatial data or models that could improve the accuracy of the assessment process

It is essential that subregional or local information and geospatial data be subjected to a quality control assessment to ensure that it is appropriate to use in developing Step 2b activity and implementation plans. Since PACs and focal habitats usually transcend multiple administrative boundaries, a collaborative approach is highly recommended for Step 2a.

A series of questions tied to the management strategies described in the Introduction section follows to assist managers in developing the framework to complete Step 2b (development of activity/implementation plans). The questions that follow apply to the focal habitats (and buffer areas around focal areas where management strategies may be more effectively applied) and will help in developing coordinated implementation/activity plans. These questions should not limit the scope of the assessment and additional questions relative to local situations are encouraged. These questions portray the minimum degree of specificity for focal habitats in order for offices to complete Step 2a.

**Fuels Management**

1. Where are the priority fuels management areas (spatially defined treatment opportunity areas that consider fire risk, fuels conditions, and focal habitats [including areas adjacent to focal habitats])?
2. Based on fire risk to focal habitats, what types of fuels treatments should be implemented to reduce this threat (for example, linear features that can be used as anchors during suppression operations)?
3. Considering resistance/resilience concepts and the landscape context from Step 1, where should treatments be applied in and around focal habitats to:
   a. Constrain fire spread?
   b. Reduce the extent of conifer expansion?
   c. Augment future suppression efforts by creating fuel breaks or anchors for suppression?
4. Based on opportunities for fire to improve/restore focal habitats, what types of fuels treatments should be implemented to compliment managed wildfire by modifying fire behavior and effects?
5. Are there opportunities to utilize a coordinated fuels management approach across jurisdictional boundaries?
6. What fuel reduction techniques will be most effective that are within acceptable impact ranges of local sage-grouse populations, including but not limited to grazing, prescribed fire, chemical, and biological and mechanical treatments? Will combinations of these techniques improve effectiveness (e.g., using livestock to graze fine fuels in a mowed fuel break in sagebrush)?

**Habitat Recovery/Restoration**

1. Are there opportunities for habitat restoration treatments to protect, enhance or maintain sage-grouse focal habitat especially to restore connectivity of focal area habitat?
2. Considering the resistance and resilience GIS data layer (Figure 4) and the Sage-Grouse Habitat Matrix (Chambers et al. *In prep.*; Table 2), where and why would passive or active restoration treatments be used?
3. What are the risks and opportunities of restoring habitat with low resistance and resilience including the warm/dry and cool/dry soil moisture/temperature regime areas?
4. Are there opportunities to utilize a coordinated approach across jurisdictional boundaries to effectively complete habitat restoration in focal habitats?

**Fire Operations**

1. Where are priority fire management areas (spatially defined polygons having the highest need for preparedness and suppression action)?

2. Where are the greatest wildfire risks to focal habitats considering trends in fire occurrence and fuel conditions (see Figure 10)?
3. Where do opportunities exist that could enhance or improve suppression capability in and around focal habitats?
    a) For example, increased water availability through installation of helicopter refill wells or water storage tanks.
    b) Decreased response time through pre-positioned resources or staffing remote stations.
4. Should wildfire be managed (per land use plan objectives) for improving focal habitat (e.g., reducing conifer expansion), and if so where, and under what conditions?
5. How can fire management be coordinated across jurisdictional boundaries to reduce risk or to improve focal habitats?

**Post-fire Rehabilitation**

1. Where are areas that are a high priority for post-fire rehabilitation to improve habitat connectivity if a wildfire occurs?
2. Which areas are more conducive (higher resistance and/or resilience) to recovery and may not need reseeding after a wildfire?
3. What opportunities to build in fire resistant fuel breaks to reduce the likelihood of future wildfires impacts on seeded or recovering areas?
4. Are there opportunities to utilize a coordinated approach across jurisdictional boundaries to implement rehabilitation practices?

The outcome of Step 2a is the assembly of the pertinent information and GIS layers to assist managers in developing implementation or activity plans to address wildfires, invasive annual grasses, and conifer expansion in focal habitats. Activity plans generally refer to plans where management of a resource is changed (livestock grazing plans) whereas implementation plans are generally associated with treatments.

## Step 2b- Preparation of Activity/Implementation Plans

Activity/implementation plans are prepared to implement the appropriate management strategies within and adjacent to focal habitats. Since focal habitats cross jurisdictional boundaries, it is especially important that a collaborative approach be used to develop implementation/activity plans. The process of identifying partners and creating collaborative teams to develop these plans is a function of state, regional, and local managers and is not addressed as part of this step.

Implementation/activity plans are required to:

1. Address issues in and around focal habitats related to wildfires, invasive annual grasses, and conifer expansion

2. Use resistance to invasive annual grasses and resilience after disturbance (where appropriate) as part of the selection process for implementing management strategies
3. Emphasize application of management strategies within or near focal habitats with low resistance and resilience (warm/dry and cool/dry soil moisture/temperature regimes) invasive annual grasses and wildfires
4. Use the best available local information to inform the assessment process
5. Encourage collaboration and coordination with focal habitats across jurisdictional boundaries
6. Be adaptive to changing conditions, disturbances, and modifications of PAC boundaries

FIAT recommends considering other factors, such as adaptive management for climate change, local sagebrush mortality due to aroga moth or other pests, and cheatgrass die-off areas in developing activity/implementation plans. The latter two factors could influence where and what kind of management strategies may be needed to address the loss of habitat or changes in fuel characteristics (e.g., load and flammability) associated with these mortality events.

The following recommendations are provided to assist in the preparation of activity/implementation plans:

**Fuels Management**

1. Spatially delineate priority areas for fuel management treatments per Step 2a information considering:
    a. Linear fuel breaks along roads
    b. Other linear fuel breaks to create anchor points
    c. Prescribed burning which would meet objectives identified in the Fish and Wildlife Service's Conservation Objectives Team (COT) report
    d. Mechanical (e.g., treatment of conifer expansion into sagebrush communities)
    e. Other mechanical, biological, or chemical treatments
    f. If they exist, spatially delineated areas where fuel treatments would increase the ability to use fire to improve/enhance focal habitats.
2. Identify coordination needed between renewable resource, fire management, and fuels management staff to facilitate planning and implementation of fuels treatments.
3. Quantify a projected level of treatment within or near focal habitats.
    a. Identify treatments (projects) to be planned within or near focal habitats.
    b. Include a priority and proposed work plan for proposed treatments.

**Habitat Recovery/Restoration**

1. Spatially delineate priority areas for restoration, using criteria established in Step 2a. Priority areas for restoration should be delineated by treatment methods:
    a. Seeding priority areas
    b. Invasive annual grasses priority treatment areas (herbicide, mechanical, biological, combination)

    c. Priority areas requiring combinations of treatments (e.g., herbicide followed by seeding).
    d. Include tables, maps or appropriate info.
2. Identify coordination needed between renewable resource, fire management, and fuels management staff to facilitate planning and implementation of restoration treatments.
3. Include a priority or implementation schedule for proposed restoration treatment

**Fire Operations**

1. Spatially delineate priority areas for fire suppression, based upon criteria established in Step 2a. Priority areas for fire operations should be delineated by type, such as:
    a. Initial attack priority areas
    b. Resource pre-positioning and staging priority areas
2. Spatially delineate areas where opportunities exist to enhance or improve suppression capability.
3. Spatially delineate areas where wildfire can be managed to achieve land use plan and COT objectives.

**Post-Fire Rehabilitation**

1. Spatially delineate priority areas for post-fire rehabilitation using criteria in Step 2a.
2. Priority areas for post-fire rehabilitation should be based on resistance and resiliency and pre-fire landscape sagebrush cover and include consideration of:
    a. Seeding priority areas
    b. Invasive annual grasses priority treatment areas (herbicide, mechanical, biological (herbivory or seeding),
    c. Priority areas requiring combinations of treatments (e.g., herbicide followed by seeding)
3. Identify coordination needed between renewable resource, fire management, and fuels management staff to facilitate planning and implementation of post-fire rehabilitation treatments.

This completes the assessment process and sets the stage for more detailed project planning and NEPA associated with implementing on-the-ground treatments and management changes.

Members of the FIAT Development and Review teams are listed in Appendix 5.

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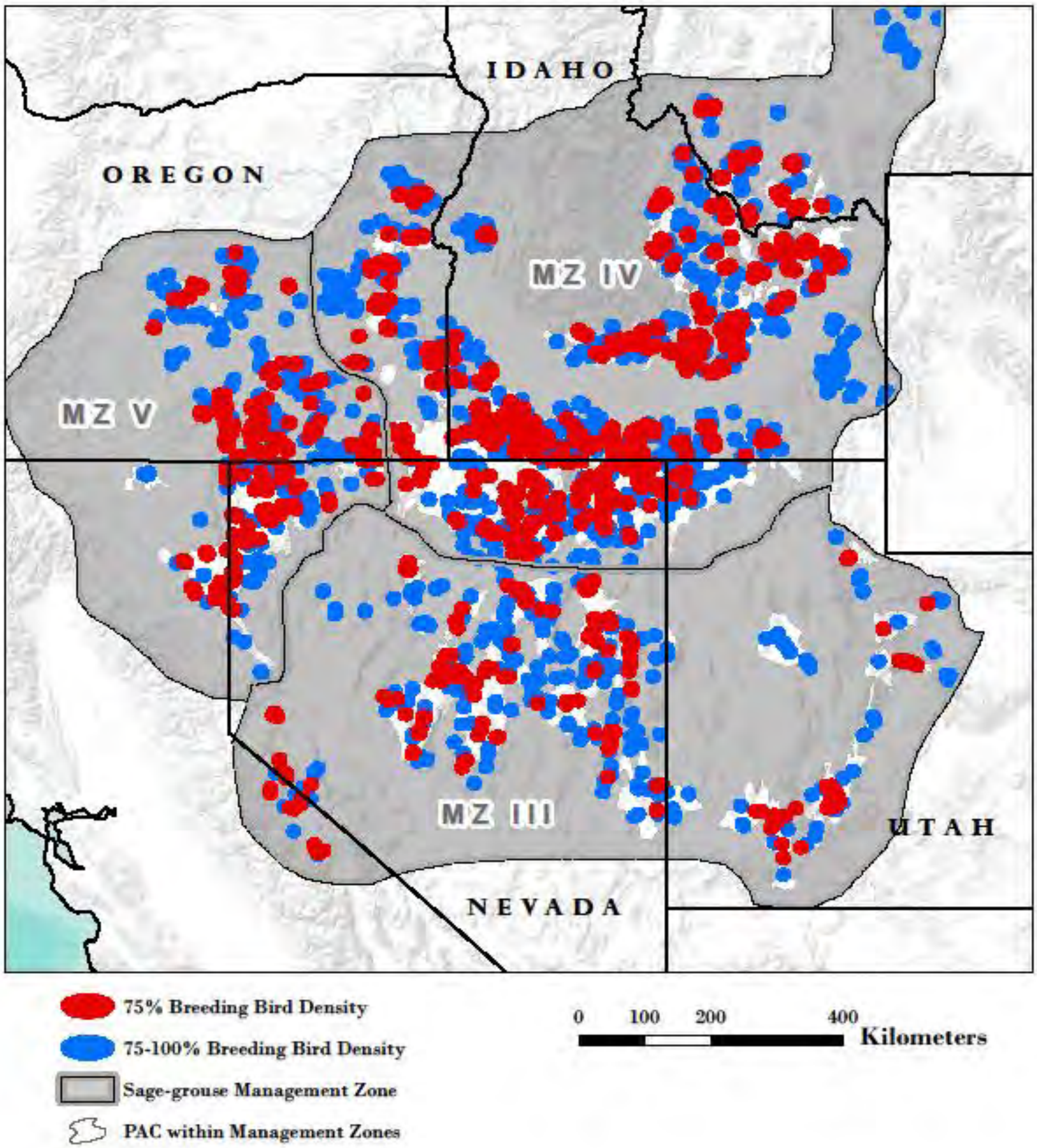
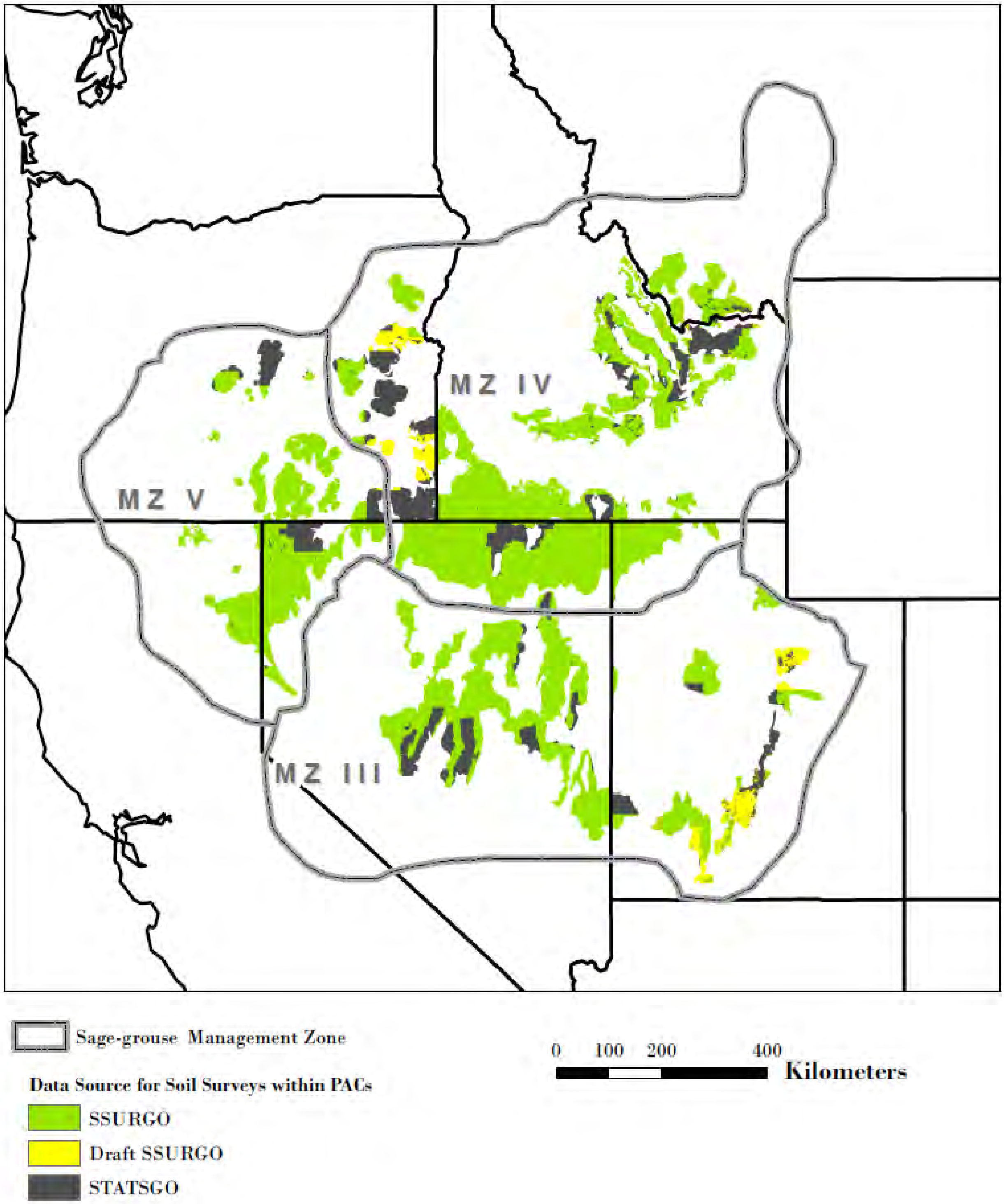
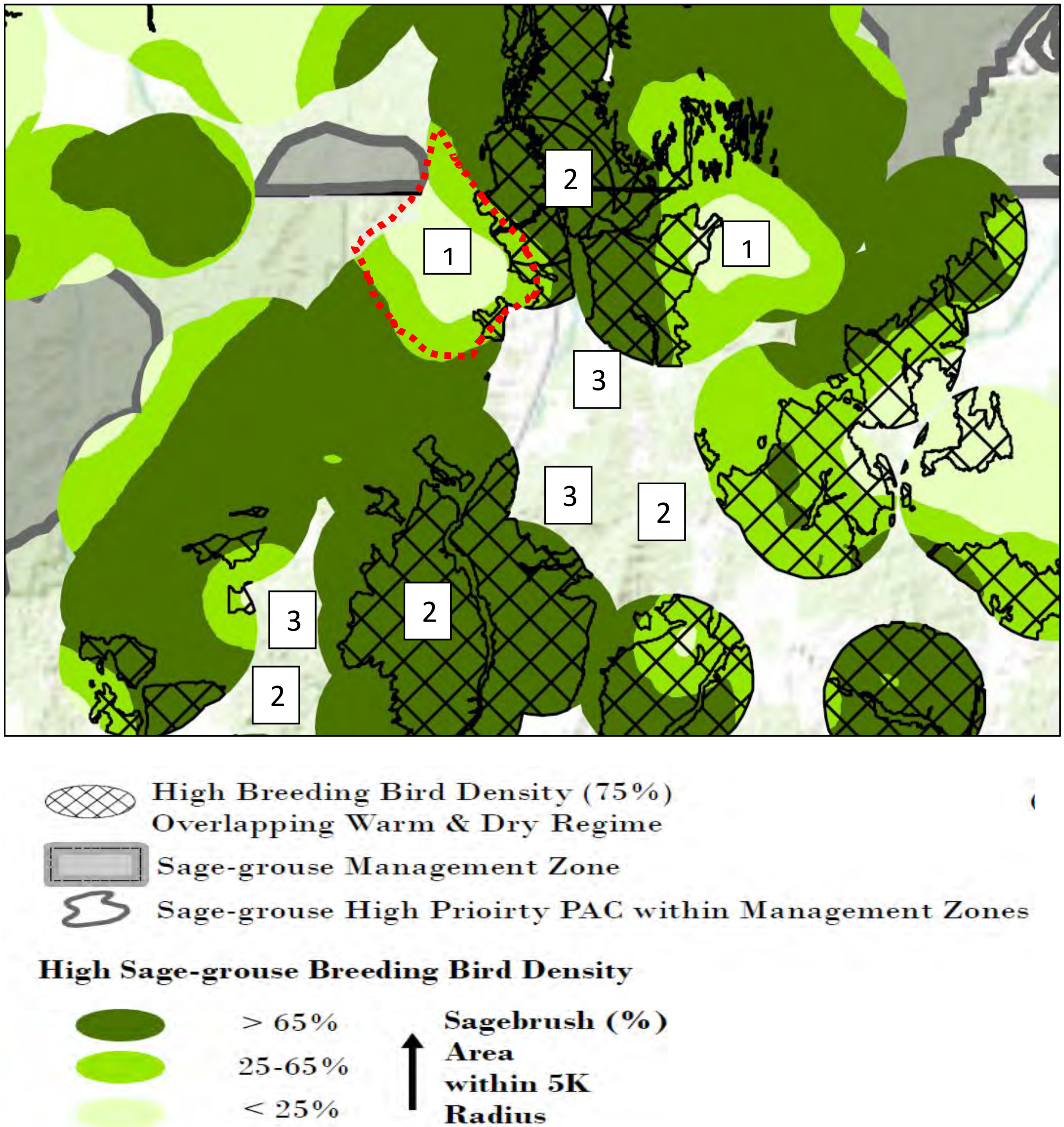
**Appendix 1.** Sage-grouse breeding bird density thresholds for 75% and 100% of the breeding birds, Management Zones, and PACs. Breeding bird density of 75 to 100% is included in this figure to provide context for local management units when making decisions concerning connectivity between populations and PACs.



**Appendix 2**. Gaps in SSURGO soil survey data in Management Zones III, IV, and V. STATSGO2 soil survey data used to fill these gaps.



**Appendix 3**. Example of potential management strategies applied to Wildfire/Invasive Annual Grass Scenario.

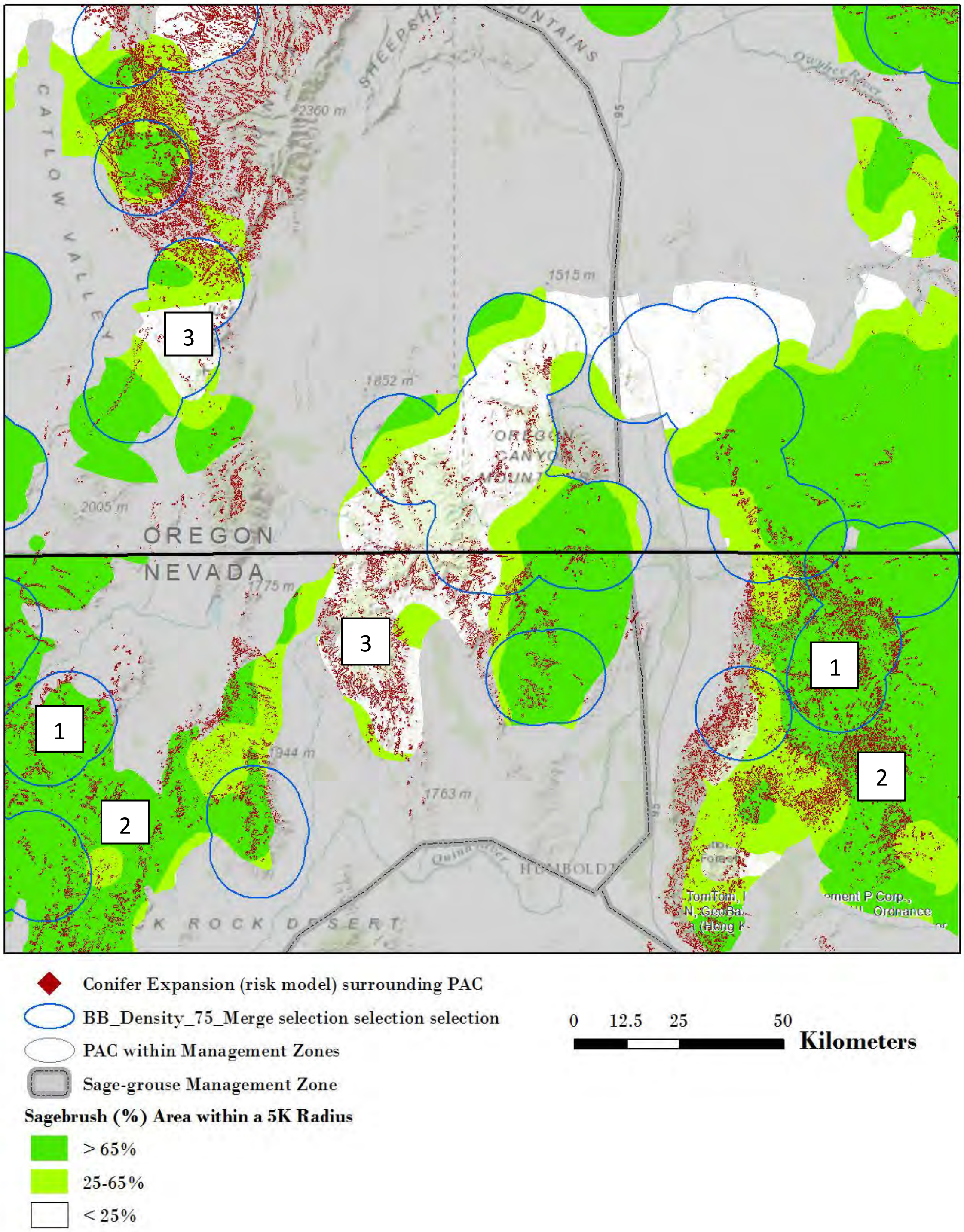



1 High priority for habitat restoration and post-fire rehabilitation to restore connectivity.

2 High priority for fire suppression within and around area given >65% sagebrush landscape cover and low resistance/resilience.

3 High priority for fuels management to reduce likelihood of wildfires in low resistance/resilience habitat with >65% landscape cover.

Appendix 4. Management strategy example for Western Juniper expansion.




1 High priority (emphasis area) for juniper control (>25% landscape sagebrush cover & 75% BBD)

2 Moderate priority (emphasis area) for juniper control (>25% landscape sagebrush cover)

3 Very low priority (<25% landscape sagebrush cover)

Appendix 5. Members of FIAT Development and Review Team

## Development Team

| | |
|---|---|
| Mike Pellant* | BLM, Team Lead, Boise, Idaho |
| Dave Pyke* | US Geological Survey, Scientist, Corvallis, Oregon |
| Jeanne Chambers* | RMRS, Scientist, Reno, Nevada |
| Jeremy Maestas* | NRCS, Wildlife Biologist |
| Chad Boyd* | ARS, Scientist, Burns, Oregon |
| Lou Ballard | USFWS, NIFC, Boise, Idaho |
| Randy Sharp | Forest Service Management (retired) |
| Doug Havlina | BLM, NIFC, NIFC Fire Ecologist |
| Tim Metzger | Forest Service Fire Management Specialist |
| Todd Hopkins | USFWS, Great Basin LCC, Reno, Nevada |
| Tom Rinkes | BLM (retired biologist), Boise, Idaho |
| Clint McCarthy | Forest Service, Biologist (retired) |
| Joe Tague | BLM Management Liaison, Reno, Nevada |
| Steve Knick | US Geological Survey, Team Technical Assistance, Boise, Idaho |
| Mina Wuenschel | BLM Great Basin LCC GIS Specialist, Reno, Nevada |
| Mike Gregg | USFWS, Biologist, Burbank, Washington |

* indicates member of the
WAWFA Resistance and Resilience team.

## Review Team

| | |
|---|---|
| Laurie Kurth | Forest Service Fire Ecologist, Washington, D.C. |
| Chris Theisen | Forest Service Deputy Forest Fire Mgt. Officer, Sparks, Nevada |
| Lauren Mermejo | BLM, Great Basin Sage-Grouse Project Manager, Reno, Nevada |
| Glen Stein | Forest Service National Sage Grouse Project Manager, Ogden, Utah |
| Jessie Delia | USFWS, Biologist (T&E), Portland, Oregon |
| Mike Ielimi | Forest Service, National Invasive Species Coordinator, Washington, D.C. |
| Tate Fisher/Krista Gollnick | BLM NIFC, Fire Planning, Boise, Idaho |
| Ken Collum | BLM, Eagle Lake Field Office Manager, Susanville, California |
| Chuck Mark | Forest Service Supervisor, Salmon-Challis Forest |
| Dave Repass | BLM, ES&R Coordinator, Washington Office |
| Peggy Olwell | BLM Native Plant Initiative, Washington Office |
| Don Major | BLM Landscape Ecologist, Boise, Idaho |
| Don Kemmer | Idaho Fish & Game, Boise, Idaho |

# Appendix I

# US Fish and Wildlife Service Concurrence Letter

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United States Department of the Interior
U.S. Fish and Wildlife Service
Idaho Fish and Wildlife Office
1387 S. Vinnell Way, Room 368
Boise, Idaho 83709
Telephone (208) 378-5243
http://www.fws.gov/idaho

JUN 11 2015

Memorandum

To: State Director, Idaho State Office, U.S. Bureau of Land Management, Boise, Idaho
Regional Forester, Region 1, U.S. Forest Service, Missoula, Montana
Regional Forester, Region 4, U.S. Forest Service, Ogden, Utah

From: Acting State Supervisor, Idaho Fish and Wildlife Office, U.S. Fish and Wildlife Service, Boise, Idaho

Subject: Idaho/Southwestern Montana Greater Sage-Grouse Land Use Plan Amendment and Environmental Impact Statement—Multiple Counties in Idaho and Southwestern Montana and Box Elder County, Utah—Concurrence
In Reply Refer To: 01EIFW00-2015-I-0502

This memorandum transmits the U.S. Fish and Wildlife Service's (Service) concurrence on the effects to species listed under the Endangered Species Act (Act) of 1973, as amended, from actions associated with the U.S. Bureau of Land Management's (Bureau) and U.S. Forest Service's (USFS) (collectively referred to as the action agencies) proposed Idaho/Southwestern Montana Greater Sage-Grouse Land Use Plan Amendment and Environmental Impact Statement (LUPA) which encompasses multiple counties in Idaho and Southwestern Montana[1] and Box Elder County, Utah. In a letter dated May 8, 2015, and received by the Service on May 12, the action agencies requested concurrence[2] with the determination, documented in the Biological Assessment (Assessment; USBLM and USFS 2015, entire), that implementation of the proposed LUPA may affect, and is not likely to adversely affect the grizzly bear (*Ursus arctos horribilis*) and *Spiranthes diluvialis* (Ute ladies'-tresses), both threatened species under the Endangered Species Act of 1973 (Act), as amended.

In addition, pursuant to the requirements of 7(a)(4) of the Act and CFR 402.10, the action agencies assessed the effects of the proposed actions and made non-jeopardy determinations for the proposed LUPA. The action agencies determined that the LUPA is not likely to jeopardize the continued existence of *Lepidium papilliferum* (slickspot peppergrass), a species currently proposed for listing as Endangered under the Act. The Bureau and USFS also determined that

[1] The LUPA planning area includes Ada, Blaine, Cassia, Camas, Canyon, Elmore, Gem, Gooding, Jerome, Lincoln, Minidoka, Oneida, Owyhee, Power, and Twin Falls counties in Idaho, and Beaverhead, Broadwater, Deer Lodge, Gallatin, Granite, Jefferson, Lewis & Clark, Madison, Park, Powell, and Silver Bow counties in southwestern Montana.

[2] Although the Bureau's memorandum was transmitted under Bureau letterhead and signature, the Bureau specifically stated that this request was also on behalf of the USFS.

the proposed LUPA is not likely to result in the destruction or adverse modification of proposed critical habitat for the slickspot peppergrass and the western yellow-billed cuckoo (*Coccyzus americanus*). Though Director (Service) concurrence is not required by 7(a)(4) or CFR 402.10, the inclusion of these determinations in the Assessment creates a need under CFR 402.12(k) for the Service's concurrence with these determinations. After reviewing the action agencies' Assessment, the Service concurs with these determinations, and pursuant to language at CFR 402.12(k), a conference is not required.

The action agencies also determined that implementation of the LUPA will have no effect on the Canada lynx (*Lynx canadensis*) and its designated critical habitat, the northern Idaho ground squirrel (*Spermophilis brunneus brunneus*), the red knot (*Calidris canutus rufa*), the western yellow-billed cuckoo, the bull trout (*Salvelinus confluentus*) and its designated critical habitat, the Banbury Springs lanx (*Lanx* spp.), the Bliss Rapids snail (*Taylorconcha serpenticola*), the Bruneau hot springsnail (*Pyrgulopsis bruneauensis*), and the Snake River physa (*Physa natricina*). The Service acknowledges these no effect determinations.

## Project Overview

The Bureau and USFS prepared amendments to their respective land use plans (LUPs) in response to the need to inform the Service's March 2010 "warranted, but precluded" listing decision for the greater sage-grouse (*Centrocercus urophasianus*, GRSG). These documents provide direction for the conservation of GRSG, and analyze the environmental effects that could result from implementing the proposed LUPA. There are two selected actions, one for the Bureau and one for the USFS. Overall, the two plans are the same, with some minor differences between the plans primarily due to agency land management planning terminology. Full details of the Bureau and the USFS proposed LUPA are provided in the Assessment (USBLM and USFS 2015, Appendices D and E).

The LUPA addresses GRSG habitat within Idaho, southwestern Montana, and that portion of the Sawtooth National Forest located within Box Elder County, Utah. The LUPA covers Bureau-administered lands in the Bruneau, Burley, Challis, Four Rivers, Jarbidge, Owyhee, Pocatello, Salmon, Shoshone, and Upper Snake Field Offices in Idaho and the Butte[3] and Dillon Field Offices in Montana. The LUPA covers National Forest System lands in the Boise, Caribou-Targhee, Salmon-Challis National Forests, and Curlew National Grassland in Idaho, the Beaverhead-Deerlodge National Forest in Montana, and that portion of the Sawtooth National Forest located in Utah. The Proposed LUPA focuses on addressing public comments and comments from the States of Idaho and Montana, while continuing to meet Bureau and USFS legal and regulatory mandates (USBLM and USFS 2015, pp. 7-8).

The purpose of the LUPA is to identify and incorporate appropriate conservation measures in LUPs to conserve, enhance, or restore GRSG habitat by reducing, eliminating, or minimizing threats to that habitat. The Assessment further states that changes in action agency management

[3] Butte Field Office-administered lands are not included as part of the analysis in the LUPA/EIS except as required in the GRSG cumulative effects analysis. For additional information, please see Chapter 1 of the Final Environmental Impact Statement for the LUPA.

of GRSG habitats are anticipated to have considerable benefits to present and future GRSG populations, and could reduce the need to list the GRSG as threatened or endangered under the Act (USBLM and USFS 2015, p. 8). The proposed LUPA incorporates the following GRSG goal: Conserve, enhance, and restore the sagebrush ecosystem upon which GRSG populations depend in an effort to maintain and/or increase their abundance and distribution, in cooperation with other conservation partners. GRSG habitat in Idaho is divided into three categories, listed here in order of higher to lower conservation value to GRSG: Priority Habitat Management Areas (PHMA), Important Habitat Management Areas (IHMA), and General Habitat Management Areas (GHMA). Only PHMA and GHMA are identified for GRSG in the southwestern Montana portion of this action (USBLM and USFS 2015, pp. 12-13).

The proposed action, a decision on direction for the conservation of the GRSG, is unlike a typical project in that it does not set in motion specific on the ground, environment-impacting activities. However since the LUPA does represent a final agency action, the Bureau and the USFS have reviewed the general nature of impacts that could potentially occur from the LUPA, including how they potentially affect listed species. At the LUP level, there is only sufficient information to generally evaluate the potential impacts of the LUPA on species protected under the Act and the circumstances or planning and operation constraints that may reduce those potential impacts. The same analytical constraints apply to the Assessment and to this Letter of Concurrence, especially since the LUPA does not specifically act as the decision document for site-specific future projects.

Programmatic plans are considered permissive in that they allow but do not authorize or approve any site-specific projects or actions. They are much like zoning ordinances under which future decisions are made. Decisions at the LUP level establish goals and objectives, identify the types of activities that are allowed or prohibited in specific areas, may specify management standards and minimum habitat condition goals either unit wide or for specific areas, and may establish a monitoring and evaluation program. The Assessment does not analyze site-specific actions, and specifically states that effects determinations should not be assumed to relate to site-specific projects. In the future, during project-level environmental planning and analysis, site-specific actions will continue to be analyzed to identify possible effects on listed species. Site-specific analysis of such actions may identify potential effects on listed species even when the programmatic Assessment determines no effect associated with GRSG management direction for LUP programs. As part of any future project-level environmental analysis, specific conservation measures and strategies to alleviate any potential adverse effects associated with GRSG management direction may be developed as the details of the future site-specific proposed actions become available (USBLM and USFS 2015, pp. 100-101).

The LUPA Assessment, associated section 7 consultation activities, and this Letter of Concurrence do not change the responsibility of the Bureau and the USFS to consult on site-specific projects as they are developed in the future. Even if those future actions are consistent with the LUPA, if those actions may affect any listed species, the Bureau and USFS bear the responsibility to consult with the Service under section 7 of the Act to ensure that their actions are not likely to jeopardize those species or adversely modify designated critical habitat.

This consultation on GRSG management and its LUPA direction is to be considered in the context of already existing LUPs and any consultations on those previous LUPs. This consultation does not substitute or replace any previous consultation on existing LUPs. The action agency's effects determinations and the Services concurrence have been made with this context in mind. The Service recommends that a copy of this memorandum be retained in agency overall LUP files with previously completed LUP consultations for future reference and to document that section 7 compliance for individual LUPs under the Act is complete.

## Basis for Service Concurrence by Species

The Bureau and USFS have determined, and the Service concurs, that the LUPA may affect, but is not likely to adversely affect two threatened species (the grizzly bear and the Ute ladies'-tresses). Service concurrence with Bureau and USFS determinations of effect for these listed species is based on the rationales highlighted below. In addition, the Bureau and USFS have determined, and the Service concurs, that the LUPA is not likely to jeopardize the continued existence of one species proposed for listing (the slickspot peppergrass) and will not destroy or adversely modify critical habitat proposed for two species (the slickspot peppergrass and the yellow-billed cuckoo) within some LUP units.

### Grizzly Bear

The Bureau and USFS determined that the LUPA decision and associated actions occurring on the Bureau's Bruneau, Burley, Challis, Jarbidge, Owyhee, Pocatello, Salmon, Shoshone, and Four Rivers Field Offices; the USFS's Boise, Salmon-Challis, or Sawtooth National Forests; and the USFS's Curlew National Grassland will have no effect on the grizzly bear because these field offices and national forests/grassland do not contain occupied habitat for grizzly bears. The Service acknowledges these no effect determinations for the grizzly bear.

Service concurrence with the determination that the LUPA may affect, but is not likely to adversely affect the grizzly bear within the Bureau's Upper Snake and Dillon Field Offices and the USFS's Beaverhead-Deerlodge and Caribou-Targhee National Forests, is based on the following rationales.

- Overall, a total of 173,581 acres of occupied grizzly bear habitat overlap with PHMA, 116,465 acres overlap with IHMA, and 81,673 acres of GHMA within the LUPA area (compiled from USBLM and USFS 2015, pp. 47, 50, 63, 69).
- GRSG LUPA decision goals, objectives, desired conditions, standards, and guidelines that could have any bearing on the major threats to grizzly bears—secure habitat, developed sites, food storage, livestock grazing, and four key food sources[4]—are expected to be neutral, result in beneficial effects, or minimal negative impacts. For example:

[4] Four seasonal foods have been identified as being important to the grizzly bear population: winter killed ungulates, spawning cutthroat trout, seeds of whitebark pine, and alpine moth aggregation sites. The LUPA action area has no overlap with habitats supporting these four seasonal foods (USBLM and USFS 2015, p. 87).

  - o Fuels treatments, habitat restoration, and vegetation management treatments in GRSG HMAs will maintain, improve, or restore sagebrush habitat, benefitting all species that use sagebrush habitat, including grizzly bears.
  - o For recreation and travel management and lands and realty and infrastructure management programs, the GRSG LUPA decision will not authorize new roads. Rather, it will limit new road construction and existing road use, which could benefit grizzly bears by increasing the available amount of secure habitat.

- There is the potential for some negative effects on listed species from direction provided within the LUPA. For example, fuels treatments using targeted grazing or plant species used for seeding proposed within occupied grizzly bear habitat have the potential to negatively impact grizzly bears. In addition, prohibiting construction of new recreation facilities or infrastructure within GRSG PHMA and IHMA could push the construction of developed sites into preferred grizzly habitat. However, site-specific analyses will determine the scope and scale of any likely impacts that may occur associated with project-level activities. Furthermore, significant effects from these site-specific projects will be highly unlikely due to avoidance or other mitigations based on current laws, agency regulations, and other conservation measures in place to protect the grizzly bear. Any possible effects from future proposed actions will be addressed in site-specific analysis at the project level when reasonably certain, explicit actions are identified and proposed. Therefore, potential effects of site-specific projects proposed under LUPA programs that may affect the grizzly bear are expected to be reduced to insignificant or discountable levels.

### Ute ladies'-tresses

The Bureau and USFS determined that the Idaho-Southwestern Montana LUPA decision and associated actions occurring on the Bureau's Bruneau, Burley, Challis, Four Rivers, Jarbidge, Owyhee, Salmon, and Shoshone Field Offices; the USFS's Boise and Beaverhead-Deerlodge National Forests; and the USFS's Curlew National Grassland will have no effect on the Ute ladies'-tresses as suitable habitat for the Ute ladies'-tresses is not suspected to occur in these field offices and national forests/grassland. The Service acknowledges these no effect determinations for the Ute ladies'-tresses.

Service concurrence with determination that the LUPA may affect, but is not likely to adversely affect, the Ute ladies'-tresses within the Bureau's Dillon, Pocatello, and Upper Snake Field Offices and within the USFS's Caribou-Targhee, Salmon-Challis, and Sawtooth National Forests, is based on the following rationales.

- There is no overlap between known Ute ladies'-tresses locations and GRSG HMAs. The closest known Ute ladies'-tresses location is over 0.6 mile from the IHMA located in Fremont County, Idaho.
- The areas most likely to support Ute ladies'-tresses populations (riparian areas along major river drainages) have mostly been excluded from GRSG HMAs. However, it is likely that suitable habitat for Ute ladies'-tresses is located within GRSG HMAs due to the inclusion of some wetland habitats.

- Because the proposed LUPA does not propose any specific ground-disturbing actions, no direct negative effects on Ute ladies'-tresses will occur from the LUPA action.
- Where travel management planning has not been completed or is in progress, and listed plant habitats are present, there may be a reduction of impacts from off-road vehicle use (BLM TM-1) in areas where Ute ladies'-tresses overlap with GRSG HMAs (pp. 102, 140). Restrictions for off-road vehicle use may provide a beneficial effect on listed plant species by reducing impacts from off road vehicle activities (plants crushed by tires). Thus, if any areas of occupied or suitable habitat for Ute ladies'-tresses within GRSG HMAs are currently open to off-road vehicle use, restrictions will be placed on vehicles to use only existing routes. This would provide a small and contemporaneous beneficial effect on Ute ladies'-tresses by reducing the likelihood of damage to Ute ladies'-tresses or its habitat from off-road vehicles.
- Proposed retrofitting of existing towers and structures consistent with required design features (RDFs) in the GRSG HMAs (BLM LR-12) to benefit GRSG has the potential to impact listed plants, including the Ute ladies'-tresses, if the plants are present in the right-of-way (ROW) corridors where retrofit activities are needed. Potential crushing of vegetation, including Ute ladies'-tresses, could occur due to parking vehicles off roads near each tower as well as foot traffic near the towers during retrofit activities. However, because towers, structures, and their access roads generally avoid riparian habitats, the Ute ladies'-tresses is not likely to be present on or directly adjacent to ROW roads or near existing towers. Therefore, potential effects of LUPA-related retrofitting of towers and structures on the Ute ladies'-tresses are extremely unlikely to occur, and therefore, are discountable.
- Although there is the potential for some negative effects on listed species from additional proposed actions associated with LUPA direction, significant effects will be highly unlikely due to avoidance or other mitigations based on current laws, agency regulations, and other conservation measures currently in place to protect listed plants. Any possible effects from future proposed actions will be addressed in site-specific analysis at the project level when reasonably certain, explicit actions are identified and proposed. Therefore, potential effects of site-specific projects proposed under LUPA programs that may affect the Ute ladies'-tresses are expected to be reduced to insignificant or discountable levels.

### Slickspot Peppergrass

The Bureau and USFS determined that the LUPA decision and associated actions occurring on the Bureau's Bruneau, Burley, Challis, Dillon, Owyhee, Pocatello, Salmon, Shoshone, or Upper Snake Field Offices, the USFS's Boise, Beaverhead-Deerlodge, Caribou-Targhee, Salmon-Challis, or Sawtooth National Forests, or the USFS's Curlew National Grassland will have no effect on the slickspot peppergrass as these field offices and national forests/grassland are not suspected to contain suitable habitats for the slickspot peppergrass. The Service acknowledges these no effect determinations for the slickspot peppergrass.

After reviewing the Bureau and USFS Assessment, the Service concurs with the Bureau and USFS determination that the LUPA is not likely to jeopardize the continued existence of the slickspot peppergrass within the Bureau's Four Rivers and Jarbidge Field Offices. As described above, pursuant to language at CFR 402.12(k), conference is not required for this Federal action agency non-jeopardy determination.

### Proposed Critical Habitat for the Slickspot Peppergrass

The Bureau and USFS determined that the LUPA decision and associated actions occurring on the Bureau's Bruneau, Burley, Challis, Dillon, Owyhee, Pocatello, Salmon, Shoshone, and Upper Snake Field Offices; the USFS's Boise, Beaverhead-Deerlodge, Caribou-Targhee, Salmon-Challis, and Sawtooth National Forests; and the USFS's Curlew National Grassland will have no effect on proposed critical habitat for the slickspot peppergrass as these field offices and national forests/grassland do not contain proposed critical habitat for the species. The Service acknowledges these no effect determinations for slickspot peppergrass proposed critical habitat.

After reviewing the Bureau and USFS Assessment, the Service concurs with the Bureau and USFS determination that the LUPA is not likely to destroy or adversely modify proposed critical habitat for the slickspot peppergrass within the Bureau's Four Rivers and Jarbidge Field Offices. As described above, pursuant to language at CFR 402.12(k), conference is not required for this Federal action agency no destruction or adverse modification determination.

### Proposed Critical Habitat for the Yellow-billed Cuckoo

The Bureau and USFS determined that the LUPA decision and associated actions occurring on the Bureau's Bruneau, Burley, Challis, Dillon, Four Rivers, Jarbidge, Owyhee, Pocatello, Salmon, and Upper Snake Field Offices, the USFS's Boise, Caribou-Targhee, Salmon-Challis, Sawtooth, and Beaverhead-Deerlodge National Forests, and the USFS's Curlew National Grassland will have no effect on the proposed critical habitat for the western yellow-billed cuckoo because these field offices and national forests/grassland do not contain western yellow-billed cuckoo proposed critical habitat that overlaps with LUPA actions. The Service acknowledges these no effect determinations for western yellow-billed cuckoo proposed critical habitat.

After reviewing the Bureau and USFS Assessment, the Service concurs with the Bureau and USFS determination that the LUPA is not likely to destroy or adversely modify proposed critical habitat for the yellow-billed cuckoo within the Bureau's Shoshone Field Office. As described above, pursuant to language at CFR 402.12(k), conference is not required for this Federal action agency no destruction or adverse modification determination.

## Conclusion

This concludes informal consultation on the proposed LUPA with the Bureau and the USFS under section 7 of the Act. Reinitiation of consultation on this action may be necessary if new information reveals effects of the action that may affect listed species or designated habitat in a manner or to an extent not considered in the assessment, the action is subsequently modified in a manner that causes an effect to listed species that was not considered in the analysis, or a new species is listed or critical habitat is designated that may be affected by the proposed action (CFR 402.16).

Thank you for your continued interest in threatened and endangered species conservation. Please contact Barbara Schmidt of my staff at (208) 378-5259 if you require additional information regarding this memorandum.

cc: BLM ISO, Boise (Hoefer, Makela)
BLM, WO, Washington (Tripp)
USFS, Caribou Targhee National Forest, Pocatello (Colt)
USFS, Ogden, UT (Stein)
FWS, EIFO, Chubbuck (Ohr, Fisher)
FWS, WFWO, Helena, MT (Bush)
FWS, IFWO, Boise (Hendricks)
FWS, UFWO, West Valley City, UT (Crist)
FWS, Region 1, Portland (Brown)
FWS, Region 6, Denver (Laye)
FWS, Region 6, Cheyenne (Deibert)

## References Cited

U.S. Bureau of Land Management and U.S. Forest Service (USBLM and USFS). 2015. Biological Assessment for the Idaho/Southwestern Montana Greater Sage-Grouse Land Use Plan Amendment and Environmental Impact Statement. May 11, 2015. Idaho State Office, Bureau of Land Management, Boise, Idaho. 140 pp. + appendices.

U.S. Bureau of Land Management and U.S. Fish and Wildlife Service (USBLM and USFWS). 2014. Conservation agreement for Idaho Bureau of Land Management existing land use plans. Agreement to provide land use plan level conservation measures for slickspot peppergrass for all applicable existing Idaho Bureau of Land Management land use plans signed September 15, 2014. 8 pp. + appendices.

U.S. Fish and Wildlife Service (USFWS). 2009. Biological Opinion for the Jarbidge Resource Management Plan, Kuna Management Framework Plan, Cascade Resource Management Plan, and Snake River Birds of Prey National Conservation Area Resource Management Plan for the Bureau of Land Management, Idaho. Tracking Number 14420-2010-F-0019. 57 pp. + appendices. Document available on-line at: http://www.fws.gov/idaho/publications/BOs/0019_BLMLEPA_2010.PDF (last accessed May 26, 2015).

# Appendix J

## Montana Action Screen and Mitigation Process

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## J. Montana Project/Action Screen and Mitigation Process

The BLM/USFS will ensure that any activities or projects in GRSG habitats would: 1) only occur in compliance with the Idaho and Southwestern Montana sub-region GRSG goals and objectives for PHMA and GHMA; and 2) maintain neutral or positive GRSG population trends and habitat by avoiding, minimizing, and compensating for unavoidable impacts to assure a conservation gain at the scale of this LUP and within GRSG population areas, State boundaries, and WAFWA Management Zones through the application of mitigation for implementation-level decisions. Impacts to GRSG could include loss or disturbance of nesting or wintering habitat as well as disruption of breeding activities at the lek site. The mitigation process will follow the regulations from the White House Council on Environmental Quality (CEQ) (40 CFR 1508.20; e.g. avoid, minimize, and compensate), hereafter referred to as the mitigation hierarchy, while also following Secretary of the Interior Order 3330 and consulting BLM, USFWS and other current and appropriate mitigation guidance. If it is determined that residual impacts to GRSG from implementation-level actions would remain after applying avoidance and minimization measures to the extent possible, then compensatory mitigation projects will be used to offset residual impacts, or the project may be deferred or denied if necessary to achieve the goals and objectives for PHMA and GHMA in the Idaho and Southwestern Montana Sub-region GRSG LUPA/EIS.

To ensure that impacts from activities proposed in GRSG PHMA and GHMA are appropriately mitigated, the BLM will apply mitigation measures and conservation actions and potentially modify the location, design, construction, and/or operation of proposed land uses or activities to comply with statutory requirements for environmental protection. The mitigation measures and conservation actions (**Appendix C**) for proposed projects or activities in these areas will be identified as part of the National Environmental Policy Act (NEPA) environmental review process, through interdisciplinary analysis involving resource specialists, project proponents, government entities, landowners or other Surface Management Agencies. Those measures selected for implementation will be identified in the Record of Decision (ROD) or Decision Record (DR) for those authorizations and will inform a potential lessee, permittee, or operator of the requirements that must be met when using BLM-administered public lands and minerals to mitigate, per the mitigation hierarchy referenced above, impacts from the activity or project such that sage-grouse goals and objectives are met. Because these actions create a clear obligation for the BLM to ensure any proposed mitigation action adopted in the environmental review process is performed, there is assurance that mitigation will lead to a reduction of environmental impacts in the implementation stage and include binding mechanisms for enforcement (CEQ Memorandum for Heads of Federal Departments and Agencies 2011).

To achieve the goals and objectives for PHMA and GHMA in the Idaho and Southwestern Montana Sub-region GRSG LUPA/EIS, the BLM will assess all proposed land uses or activities such as road, pipeline, communication tower, or powerline construction, fluid and solid mineral development, range improvements, and recreational activities proposed for location in GRSG PHMA and GHMA in a step-wise manner. The following steps identify a screening process for review of proposed activities or projects in these areas. This process will provide a consistent approach and ensure that authorization of these projects, if granted, will appropriately mitigate impacts and be consistent with the LUP goals and objectives for GRSG. The following steps provide for a sequential screening of proposals. However, Steps 2 through 6 can be done concurrently.

**Step 1 – Determine Proposal Adequacy**

This screening process is initiated upon formal submittal of a proposal for authorization for use of BLM lands. The actual documentation of the proposal would include at a minimum a description of the location, scale of the project and timing of the disturbance. The acceptance of the proposal(s) for review would be consistent with existing protocol and procedures for each type of use.

**Step 2 – Evaluate Proposal Consistency with LUP**

This initial review should evaluate whether the proposal would be allowed as prescribed in the LUP. For example, some activities or types of development are prohibited in PHMA or GHMA. Evaluation of projects will also include an assessment of the current state of the Adaptive Management hard and soft triggers. If the proposal is for an activity that is specifically prohibited, the applicant should be informed that the application is being rejected since it would not be allowed, regardless of the design of the project.

**Step 3 – Determine Proposal Consistency with Density and Disturbance Limitations**

If the proposed activity occurs within a PHMA, evaluate whether the disturbance from the activity exceeds the limit on the amount of disturbance allowed within the activity or project area (DDCT process). If current disturbance within the activity area or the anticipated disturbance from the proposed activity exceeds this threshold, the project would be deferred until such time as the amount of disturbance within the area has been reduced below the threshold, redesigned so as to not result in any additional surface disturbance (collocation) or redesigned to move it outside of PHMA.

**Step 4 – Determine Projected Sage-Grouse Population and Habitat Impacts**

Determine if the project will have a direct or indirect impact on GRSG populations or habitat within PHMA or GHMA. This will include:

- Reviewing GRSG Habitat delineation maps to initially assess potential impacts to GRSG. Use of the *USGS report Conservation Buffer Distance Estimates for Greater Sage-Grouse—A Review* to assess potential project impacts based upon the distance to the nearest lek, using the most recent active lek data available from the state wildlife agency. This assessment will be based upon the direction in **Appendix B**:
- Review and application of current science recommendations.
- Reviewing the 'Baseline Environment Report' (USGS) which identifies areas of direct and indirect effect for various anthropogenic activities.
- Consultation with agency or State Wildlife Agency biologist.

- Evaluating consistency with (at a minimum) State GRSG regulations
- Or other methods needed to provide an accurate assessment of impacts.

If the proposal will not have a direct or indirect impact on either the habitat or population, document the findings in the NEPA and proceed with the appropriate process for review, decision and implementation of the project.

**Step 5 –Apply Avoidance and Minimization Measures to Comply with Sage-Grouse Goals and Objectives**

If the project can be relocated so as to not have an impact on GRSG and still achieve objectives of the proposal and the disturbance limitations, relocate the proposed activity and proceed with the appropriate process for review, decision and implementation (NEPA and Decision Record). This step does not consider redesign of the project to reduce or eliminate direct and indirect impacts, but rather authorization of the project in a physical location that will not impact GRSG. If the preliminary review of the proposal concludes that there may be adverse impacts to GRSG habitat or populations in Step 4 and the project cannot be effectively relocated to avoid these impacts, proceed with the appropriate process for review, decision and implementation (NEPA and Decision Record) with the inclusion of appropriate mitigation requirements to further reduce or eliminate impacts to GRSG habitat and populations and achieve compliance with GRSG objectives. Mitigation measures could include disturbance buffer limits, timing of disturbance limits, noise restrictions, design modifications of the proposal, site disturbance restoration, post project reclamation, etc. (see **Appendix B** for a more complete list of measures). Compensatory or offsite mitigation may be required (Step 6) in situations where residual impacts remain after application of all avoidance and minimization measures.

**Step 6 – Apply Compensatory Mitigation or Reject / Defer Proposal**

If screening of the proposal (Steps 1 through 5) has determined that direct and indirect impacts cannot be eliminated through avoidance or minimization, evaluate the proposal to determine if compensatory mitigation can be used to offset the remaining adverse impacts and achieve GRSG goals and objectives. If the impacts cannot be effectively mitigated, reject or defer the proposal. The criteria for determining this situation could include but are not limited to:

- The current trend within PHMA is down and additional impacts, whether mitigated or not, could lead to further decline of the species or habitat.
- The proposed mitigation is inadequate in scope or duration, has proven to be ineffective or is unproven is terms of science based approach.
- The project would impact habitat that has been determined to be a limiting factor for species sustainability.
- Other site specific information and analysis that determined the project would lead to a downward change of the current species population or habitat and not comply with GRSG goals and objectives.

If, following application of available impact avoidance and minimization measures, the project can be mitigated to fully offset impacts and assure conservation gain to the species and comply with GRSG goals and objectives, proceed with the appropriate process for review, decision and implementation (NEPA and Decision Record).

The BLM/USFS, via the WAFWA Management Zone Greater Sage-Grouse Conservation Team, will develop a WAFWA Management Zone Regional Mitigation Strategy to guide the application of the mitigation hierarchy to address greater sage-grouse impacts within that Zone. The WAFWA Management Zone Regional Mitigation Strategy will be applicable to the States/Field Offices/Forests within the Zone's boundaries. Subsequently, the BLM Field Office/USFS Forest's NEPA analyses for implementation-level decisions, which have the potential to impact GRSG, will include analysis of mitigation recommendations from the relevant WAFWA Management Zone Regional Mitigation Strategy(ies).

Implementation of the Regional Mitigation Strategy may involve managing compensatory mitigation funds, implementing compensatory mitigation projects, certifying mitigation/conservation banks, and reporting on the effectiveness of those projects. These types of mitigation implementation actions may be most effectively managed at the State-level, in collaboration with partners. BLM State Office/USFS Region may find it most effective to enter into an agreement with a State-level program administrator (e.g. a NGO, a State-level entity) to help manage these aspects of mitigation. The BLM/USFS will remain responsible for making decisions that affect Federal lands.

The BLM's Regional Mitigation Manual MS-1794 serves as a framework for developing and implementing a Regional Mitigation Strategy. **Appendix F** provides additional guidance specific to the development and implementation of a WAFWA Management Zone Regional Mitigation Strategy.