US Department of the Interior
Bureau of Land Management

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessment

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CENTRAL OREGON

MARCH 2015

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ACRONYMS AND ABBREVIATIONS

	Full Phrase
BBD	breeding bird densities
BLM	United States Department of the Interior, Bureau of Land Management
COFMS	Central Oregon Fire Management Service
COT	Conservation Objectives Team
DSL	Oregon Department of State Lands
EIS	environmental impact statement
ESR	emergency stabilization and rehabilitation
FIAT	fire and invasives assessment tool
Forest Service	United States Department of Agriculture, Forest Service
FRCC	fire regime condition class
GRSG	Greater Sage-Grouse
NEPA	National Environmental Policy Act of 1969
NOC	BLM National Operations Center
NRCS	Natural Resource Conservation Service
ODF	Oregon Department of Forestry
ODFW	Oregon Department of Fish and Wildlife
PAC	priority areas for conservation
PPA	project planning area
RAC	Redmond Air Center
RFPA	Rangeland Fire Protection Association
RMPA	resource management plan amendment
R&R	resistance and resilience
TNC	The Nature Conservancy
USFWS	United States Fish and Wildlife Service
WAFWA	Western Association of Fish and Wildlife Agencies

SECTION 1
INTRODUCTION AND ASSESSMENT OBJECTIVES

1.1 EXECUTIVE OVERVIEW

This assessment was developed using methods described in the FIAT Report (Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessment, 2014). This process is designed to identify strategies that ameliorate threats to Greater Sage-Grouse (*Centrocercus urophasianus)* and their habitats. It incorporates emerging science, regional findings, and local data to identify management opportunities that counter detrimental ecological trends in wildfire, invasive annual grasses, and conifer expansion.

The Central Oregon Fire and Invasives Assessment Tool (FIAT) identifies 97 miles of potential linear fuels treatments, 554,824 acres of potential conifer treatment, 526,109 acres of potential invasive plant treatments, and 372,594 acres of post-fire rehabilitation. The FIAT also identifies site-appropriate management strategies for fire operations and post-fire decisions.

(FIAT is also used interchangeably to describe the written report, the science-based process, and the analysis tools used.)

1.2 BACKGROUND

The purpose of this assessment is to identify potential project areas and management strategies in highly valued sage-grouse (GRSG) habitats, which, if implemented, would reduce the threats to GRSG. The Conservation Objectives Team (COT) report (USFWS 2013) and other scientific publications identify two primary threats to the sustainability of GRSG in the western portion of the species range: wildfire and conversion of sagebrush habitat to invasive annual grass-dominated vegetative communities. For the purposes of this assessment, invasive species are limited to and hereafter are referred to as invasive annual grasses. Conifer expansion (also called encroachment) is also addressed in this assessment.

To address these concerns, the Bureau of Land Management (BLM) and United States Forest Service (USFS) have committed to completing GRSG wildfire, invasive annual grasses, and conifer expansion assessments (see Greater Sage-Grouse Land Use Plan Amendments, BLM Instruction Memorandum WO-2014-134).

The objective of FIAT assessments is to identify priority habitat areas and management strategies to reduce the threats to GRSG from invasive annual grasses, wildfires, and conifer expansion. In addition, these assessments are designed to provide the United States Fish and Wildlife Service (USFWS) with regulatory certainty on the extent, location, and rationale for management opportunities to address significant threats to GRSG.

In early 2013, an interagency team of wildlife, vegetation, fire, and fuels managers was assembled to develop the FIAT assessment protocols. The FIAT process designed by this team involves two steps:

1. Establish the regional context for priority GRSG habitats and threat factors
2. Incorporate local data with Step 1 findings to identify potential project areas, treatment opportunities, and management strategies to ameliorate threats to GRSG.

FIAT Step 1 was completed from February 2013 to August 2014; Step 2 was initiated in September 2014 and concludes at the end of February 2015. This assessment represents the final product and signals completion of FIAT Step 2.

1.2.1 Identification of FIAT Assessment Areas

FIAT assessment areas roughly correspond to select priority areas for conservation (PACs), which were identified in the COT report (USFWS 2013). In FIAT Step 1, the following five assessment areas were identified:

1. Central Oregon
2. Northern Great Basin
3. Snake/Salmon/Beaverhead
4. Southern Great Basin
5. Western Great Basin/Warm Springs Valley

These were identified at a regional scale using the following criteria:

- PACs, as identified in the 2013 USFWS COT report (USFWS 2013)
- State-scale breeding bird density (BBD; Doherty 2010)
- Sagebrush landscape cover (after Knick 2011)

- Patterns of resistance to annual grass invasion and resilience following disturbance (after Chambers et al. 2014)
- Relative risk of wildfire occurrence (FPA 2014)
- Degree of conifer expansion (as modeled by Manier et al. 2013)

1.3 STATEMENT OF OBJECTIVES

The objectives originally stated in the FIAT report are the following:

- Identify important GRSG-occupied habitats and baseline data layers important in defining and prioritizing habitats
- Assess the resistance to invasive annual grasses and resilience after disturbance and prioritizing emphasis areas for conservation and restoration
- Identify geospatially explicit management strategies to conserve GRSG habitats

The Oregon Sage-Grouse Environmental Impact Statement/Resource Management Plan Amendment (EIS/RMPA) describes the FIAT process and the reasoning for using it. FIAT looks at wildfire, invasive annual grasses, and conifer encroachment. It provides priorities for wildfire, fuels, sagebrush, and juniper treatments through the use of fire and invasives assessments. These assessments follow the strategic approach detailed in Chambers et al. (2014).

This strategic approach for conserving sagebrush ecosystems and GRSG focuses on threats to GRSG habitat caused by invasive annual grasses and altered fire regimes. It focuses on the sagebrush ecosystems and their resilience to disturbance and resistance to invasive annual grasses. Additionally, it considers the distribution, relative abundance, and persistence of GRSG populations in order to develop conservation strategies at both broad landscape and site-specific scales.

A GRSG habitat matrix links the relative resilience and resistance of sagebrush ecosystems with GRSG habitat requirements. The purpose is to help land managers assess the relative risks and determine the appropriate management strategies to mitigate those risks. Emphasis areas for management actions are prioritized by overlaying matrix components with GRSG PACs, BBDs, and specific habitat threats. Decision tools are included to help determine the most appropriate management treatments for each of the emphasis areas that are identified.

The Central Oregon PACs were included in FIAT primarily due to the risk of conifer encroachment degrading GRSG habitat. The other PACs included in the FIAT assessments primarily focus on wildfire and invasive annual grasses. This makes the Central Oregon PACs unique in some ways among the other PACs in the FIAT assessment.

1.4 ISSUES, ASSUMPTIONS, AND CONSIDERATIONS COMMON TO ALL ASSESSMENTS

The following list denotes elements that are common to all five FIAT assessments:

- **Assessments must be revisited as landscape conditions change.** Because landscape conditions are highly dynamic, management needs will change over time. The management opportunities and priorities identified in this assessment are relevant **for today's landscape conditions.** As disturbances such as wildfire occur in the assessment area, it is imperative that the priorities and management themes be revisited and redefined. This form of adaptive management is integrated into the Sage-Grouse Monitoring Strategy described in Section 5.
- **Additional analysis will be required.** Most potential treatments identified in this assessment will require further National Environmental Policy Act (NEPA) analysis. During NEPA analysis, the exact location and extent of treatment may be adjusted, based on more refined local information. Summary tables presented in Section 4 denote if NEPA is completed, has begun, or is needed for potential treatments. Consequently, many potential treatments detailed in Section 4 are subject to change as a result of refinement during NEPA.
- **Proper management is required.** The assumption is that for treatments to be effective once implemented, proper management of ongoing land uses will occur. Such land uses as grazing, wild horses and burros, and off-highway vehicles, are potential impediments to successful implementation of FIAT-identified treatments. In order for these treatments to be successful, proper management of land uses must occur at the time of treatment, which may require rest or exclusion from use, and following treatment, such as the proper intensity and location of uses.
- **Identifying potential treatments was highly collaborative.** FIAT teams used the data and science from the FIAT Report and General Technical Report RMRS-GTR-326 (Chambers et al. 2014) to identify potential treatment opportunities. In addition, guidance in the FIAT report directed teams to "use the best available local information" and engage in collaboration with agency partners. These partners included the Natural Resources Conservation Service, US Fish and Wildlife Service, and state fish and wildlife agencies. As a result, **potential treatments identified in this assessment were strongly influenced by local data not present in the FIAT report: lek locations, seasonal habitats, and projects identified in other collaborative settings.**

1.5 FIRE OPERATIONS PRIORITIES

The 1st, 2nd, and 3rd order priorities identified for fire operations integrate guidance from the FIAT report, General Technical Report RMRS-GTR-326, wildfire potential, and local data. Fire operations priorities are consistent with guidance established in the BLM's Fire Operations Action Plan Instruction Memorandum (IM No. FA IM-2015-016) and Secretarial Order No. 3336. In addition to these data sources, FIAT fire operations priorities were established using local information, such as fire spread patterns and barriers, ignition frequency, and fire history. Fire operations priorities identified in this assessment are specific to the BLM.

1.6 COLLABORATION

The FIAT process requires partnership with cooperators, agencies, and others involved in land or wildlife management in the FIAT assessment areas. Central Oregon FIAT meetings were held in Prineville on September 29 and 30, October 28, and December 2 and 4, 2014, and on January 6 and February 24, 2015.

Collaboration in Central Oregon consisted of having the following agencies and partners at all five of the Central Oregon FIAT meetings: the BLM, USFWS, Oregon Department of Fish and Wildlife (ODFW), Oregon Department of Forestry (ODF), The Nature Conservancy (TNC), US Department of Agriculture Natural Resource Conservation Service (NRCS), Oregon Sage Grouse Conservation Partnership (SageCon), and the US Forest Service (Forest Service).

Meetings attendees participated in the following:

- Reviewed FIAT Step 1 data for accuracy
- Incorporated refined local information, such as lek[1] location, BBD density, telemetry, vegetation, fire occurrence, and other data to augment Step 1 findings
- Identified project planning areas (PPAs), potential treatments, and appropriate management strategies in the four program areas
- Documented the rationale and local factors influencing the identification of management strategies

In addition to attending the key meetings, the Central Oregon FIAT Team Leader, Craig Goodell, and representatives of SageCon and TNC met. They discussed the best available local data in Oregon that could add value to the FIAT assessment. They shared data that proved to be very valuable in Step 2 of the FIAT assessment protocols. Additionally, an e-mail list was created that included all Central Oregon FIAT partners. Any information relevant to the

[1]A lek is patch of ground used by male GRSGs for communal display during breeding season.

FIAT in Central Oregon was shared with this group throughout the assessment process.

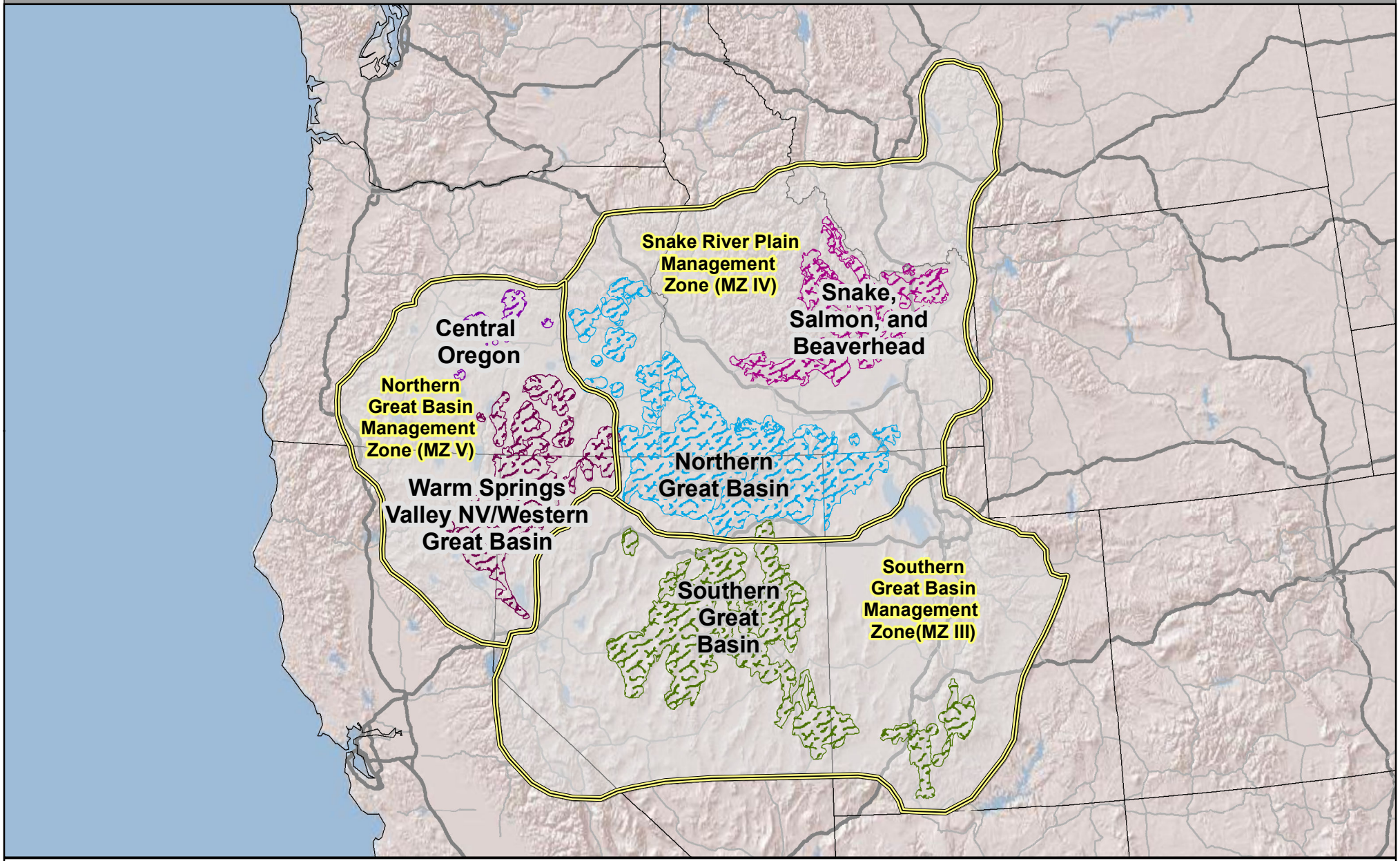
1.6.1 Meetings

The Central Oregon FIAT meetings were all held in Prineville to make it easy for local area partners to attend. Meeting attendees were the BLM, NRCS, ODFW, SageCon, TNC, USFWS, and ODF. The Forest Service did not participate in the meetings, but its staff were consulted about portions of the Malheur, Ochoco, and Deschutes National Forests that intersect with the Hay Creek, Paulina, and Brothers PPAs. For more detail on Central Oregon meeting attendance, see Appendix D.

Assesment Areas in Relation to Management Zones

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

All Assessment Areas
Bureau of Land Management
U.S. Department of the Interior



WAFWA SG Management Zones
Central Oregon
Northern Great Basin
Snake, Salmon, and Beaverhead
Southern Great Basin
Warm Springs Valley NV/Western Great Basin

1:8,000,000
March 2015
Date Saved: 3/24/2015
Data Sources: Bureau of Land Management, ESRI Basedata

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SECTION 2
DATA MANAGEMENT AND STEP-DOWN PROCESS

The first component of the Wildfire and Invasive Annual Grasses Assessment describes the factors that collectively provide the GRSG landscape context. The Greater Sage-Grouse Wildfire, Invasive Annual Grasses and Conifer Expansion Assessment (Fire and Invasive Assessment Team 2014) provides this context. The assessment includes a discussion of PACs and BBD, as well as the following:

- Soil temperature and moisture regimes (indicators of resistance to annual grasses and resilience after disturbance)
- Landscape sagebrush cover
- Conifer expansion

See Chambers et al. (2014) for a detailed description of invasive annual grass and wildfire threats to GRSG habitat. Priority PACs and emphasis areas are derived from examining this GRSG landscape context.

2.1 EXAMINATION OF FIAT STEP 1 FINDINGS

In Central Oregon, the collaborating agencies and partners examined the FIAT Step 1 findings during the first meeting in Prineville on September 29 and 30, 2014.

The following four criteria were used for identifying priority PACs in the FIAT Step 1 process:

1. High density of GRSG. Seventy-five percent BBD was selected, based on Doherty et al. (2010). The intent was to use habitat criteria and a static data set that could be compared across PACs. Downfalls noted were that this would not capture habitat outside of

nesting and strutting periods (e.g., winter habitat) and that it uses 2009 data, which do not include recent fires.

2. Sufficient sagebrush cover. Landscape cover has a strong correlation to GRSG persistence (Knick 2013). There are three classes of sagebrush cover: 0 to 25 percent, 26 to 65 percent, and 66 to 100 percent. Existing data is derived from LANDFIRE using 2000 imagery. Using local data in Step 2 of the FIAT assessment protocols will greatly benefit the understanding of existing cover. There is a good correlation between where sagebrush is and where GRSG are found.

3. Soil temperature and moisture regimes. Areas at greatest risk are warm-dry sites. Their degree of resistance and resilience is strongly correlated to the number of invasive species (Chambers et al. 2014). Native perennial grasses take longer to become reestablished in hotter and drier soils after being disturbed.

4. Conifer expansion. This is derived from the Baseline Environmental Report (Manier et al. 2013). Step 2 of the FIAT assessment protocols will inform more specific classifications of juniper distribution across the landscape and will identify where the best work could be completed.

2.1.1 Determination of Emphasis Areas in Central Oregon

Emphasis areas for the Central Oregon PACs were determined by using Figure 1, page 5, of the Greater Sage-Grouse Wildfire, Invasive Annual Grasses and Conifer Expansion Assessment (Fire and Invasive Assessment Team 2014). The right side of the flow chart under Conifer Expansion Threat was consulted, then the Central Oregon PACs were examined, using the data layers identified in the flow chart, as follows:

- PACs
- 75 percent BBD areas
- Sagebrush landscape cover
- Conifer expansion map

By doing this Step 1 exercise, the following PACs were identified that did not meet the criteria to be included in this FIAT assessment:

- The Brothers Wagon Tire and Picture Rock PACs did not meet the 75 percent BBD requirement
- The Brothers Hampton, 12 Mile, and Hay Creek PACs did meet the emphasis area criteria in FIAT Step 1

2.1.2 Step 2 Data Management and Development in Central Oregon

Once the emphasis areas for the Central Oregon PACs were determined, the available data in Oregon was looked at. This was done to assist with a more detailed assessment of the landscape elements and conditions in and next to those PACS in the context of the following:

- GRSG habitat
- Resistance and resilience of the vegetation systems to disturbance
- Wildfires
- Conifer encroachment
- Invasive annual grasses

The BLM worked with the BLM Prineville District and its partners, especially the NRCS, TNC, ODFW and SageCon, to identify the best available local data that would inform the FIAT Step 2 assessment process.

Through this, several data sets were identified that provided significant additional information during the Step 2 assessment. These data layers are listed below.

Table 2-1
FIAT Data Layers

Data Layer Name	Data Source	Data Available Range-Wide?	Data Gaps?	Notes
Sage-Grouse Priority Areas for Conservation	NOC	Yes	No	This polygon data set represents the GRSG PACs identified in the USFWS COT Report (2013).
Soil Moisture Temperature Regimes	NOC	Yes	Yes	Soil moisture and temperature regime data are from the Landscape Conservation Management and Analysis Portal.
SMA [Surface Management Agency] & SPP [Special Public Purpose] Data - Clipped to the 15 Mile Buffered FIAT Boundaries	NOC	Yes	No	Clipped to the 15-mile buffered, Step 2-approved, FIAT region boundaries.
FIAT Region Boundary	NOC	Yes	No	These data are approved to use in the Step 2 assessment. These boundaries have been modified from the COT-based PAC boundaries and include USFWS-recommended PACs.
Individual State Sage-Grouse Breeding Density Area	NOC	Yes	Yes	The GRSG BBD Mapping Project model is run on the spatial extent of the data, so the results of dissolving this state data together is not equivalent to the range-wide GRSG breeding density area.
5 Class Burn Probability Map Derived from FSIM Modeling	NOC	Yes	No	—
Aspect Data from the 30m NED	NOC	Yes	No	—
Elevation Data from the 30m NED	NOC	Yes	No	—
FIAT Resistance Resilience Matrix	NOC	Yes	Yes	FIAT. Intersect soil moisture temperature regimes sagebrush cover classes to create a spatial depiction of the Sage Grouse Habitat Matrix in Chambers et al. (2014).
FIAT Step 1 Conifer Expansion Model	NOC	Yes	Yes	—
FIAT Step 1 Sagebrush Cover Model (3 Class)	NOC	Yes	Yes	—
Fire Occurrence Areas	NOC	Yes	No	Regionally leveled fire occurrence areas from the Westwide Risk Assessment
Fire Threat Index	NOC	Yes	No	Regionally leveled fire threat index from the Westwide Risk Assessment
GeoMAC Fire Perimeters	NOC	Yes	No	Extracted from GeoMAC for 2000 through 2013. For each assessment area, all fire perimeters were extracted that intersect the 15-mile buffer.

Table 2-1
FIAT Data Layers

Data Layer Name	Data Source	Data Available Range-Wide?	Data Gaps?	Notes
Suppression Difficulty Rating	NOC	Yes	No	Regionally leveled suppression difficulty rating from the Westwide Risk Assessment
Westwide Risk Assessment Regionally Leveled Expected Flame Length	NOC	Yes	No	—
Westwide Risk Assessment Regionally Leveled Expected Rate of Spread	NOC	Yes	No	—
ILAP Current Vegetation Data SEOR_Current Veg_BLM_SageCC	ORSO	Yes	Yes	Built using the ILAP current vegetation data. Information summarized at <5%, 5-10%, 10-25%, and >25%. This is based on sagebrush cover exceeding 25%, native grasses starting to decline, and invasive annual grasses starting to increase. The data could be helpful to assess where fuels and restoration treatments might be most appropriate.
Annual Grasses	ORSO	No	Yes	The data source is BLM Oregon Office employee, Maria Fiorella. This coverage was created by the Institute for Natural Resources as part of the Integrated Landscape Assessment Project.
Soils FIAT Table 2 (Chambers et al. 2014) RR	BLM PRD	No	Yes	Jenni Moffitt, Local Prineville Soils Data. Local soils data includes RAIL, which is a draft soil survey of Crook, Wheeler, and Grant Counties and 620, which is the soil survey for upper Deschutes County. The soil moisture and temperature regimes were then combined with the sagebrush dominance layer to produce a more refined, localized resistance/resilience matrix.
Sage Grouse Priority (Fire Operations)	BLM PRD	No	No	Kristy Swartz and Dan Ridenour with assistance from Monte Kuk, in conjunction with Healthy Lands Initiative, Local Prineville Data. Provides priority fire response information to dispatch and the local duty officers.
Healthy Lands Initiative	BLM PRD	No	No	Healthy Lands Initiative project areas on the Prineville District were identified. These project

Table 2-1
FIAT Data Layers

Data Layer Name	Data Source	Data Available Range-Wide?	Data Gaps?	Notes
				areas focused on identifying treatment needs in priority GRSG habitat.
Roads (GTRN_PUB_ROADS_ARC)	ORSO	Yes	No	—
NTM Tree Cover	TNC	No	Yes	Used for the Refined conifer encroachment model for Oregon: Tree cover for trees ≥7 feet in height; 30-meter resolution, with a 10-meter resolution data product pending. Tied to 2013 NAIP and LandSat imagery. Method also uses LiDAR where available.
Oregon Greater Sage Grouse Leks Point (grsg_leks_or_point)	ORSO	Yes	Yes	—
Fire History	ORSO	Yes	Yes	—
Weed Infestation (WeedInfestationLocation)	ORSO	Yes	Yes	From NISIMS
30 Mile Response Area	BLM PRD	No	No	Dan Ridenour, Local Prineville Data. This is a 30-mile radius from all Prineville fire guard stations located near GRSG habitat. Areas in the 30-mile buffer are considered to be within a reasonable response time, determined to be a maximum of two hours.
Sage Grouse Connectivity	TNC	No	Yes	The BLM worked with TNC, ODFW, and others to identify potential connectivity habitats. Several products were produced following a method similar to that used in Washington. For this effort, the lek kernel and least cost pathways were analyzed.
Ecological Site Inventory	BLM PRD	No	Yes	Jenni Moffitt, Local Prineville Data. The ecological site inventory method uses soils information to map ecological sites and plant communities and the collection of natural resource and vegetation attributes. Local data collected over the last 10 years were used to identify vegetative conditions and species composition.

2.2 INCORPORATION OF LOCAL DATA FOR CENTRAL OREGON STEP 2 ASSESSMENT

2.2.1 Rationale for Selection

The following data layers were selected to further inform the FIAT Step 2 process in Central Oregon.

- The TNC Sage Grouse Connectivity layer was used to determine if there were important habitat connectivity areas next to the emphasis areas that should be included in the PPAs.
- The NTM Tree Cover was developed especially for conifer encroachment issues in Oregon and is much more robust than the national data sets. This data provided excellent information to help determine priorities for conifer treatments.
- The Soils R&R Layer was developed locally by Prineville District employee Jenni Moffitt, with refined local soil survey data. It provided a much more fine-scale resolution for the soil moisture and temperature regimes and resistance/resilience information than the national data. This aided the team in making better decisions about proposed restoration and rehabilitation projects and fire operations priorities.
- The RFPA apparatus data layer will aid in cooperative fire response. Locations and types of RFPA apparatus data will be loaded into the dispatch computer-aided design (CAD) system to facilitate an appropriate multiagency response to wildfires.
- The Sage Grouse Priority data layer was developed locally to prioritize areas of high value GRSG habitat for fire suppression response. The 30-Mile Response data layer was developed to depict initial attack response times, which relate directly to the probability of successful fire suppression. This data indicate that additional stations should be staffed in Central Oregon.
- Local invasive species data were used to increase the accuracy of the invasive species data in the emphasis areas. Restoration and rehabilitation decisions were then made using this data, along with on-the-ground knowledge from local specialists.

The data layers above were used to help inform the FIAT Step 2b management questions and determine the associated management strategies and proposed treatments in the PPAs and emphasis areas.

2.3 NATIONAL DATA LAYERS

2.3.1 Breeding Bird Density

Sources: Individual state GRSG Breeding Density Area from the BLM National Operations Center and data from the GRSG BBD Mapping Project.

The model is run on the spatial extent of the data, so the result of dissolving this state data together is not equivalent to the Range-Wide Sage-Grouse Breeding Density Area Conifer Expansion.

2.3.2 Wildfire Threats

Sources:

- 5 Class Burn Probability derived from FSIM modeling
- Fire Occurrence Areas (Regionally Leveled Fire Occurrence Areas) from Westwide Risk Assessment
- Fire Threat Index (Regionally Leveled Fire Threat Index) from Westwide Risk Assessment
- Suppression Difficulty Rating (Regionally Leveled Suppression Difficulty Rating) from Westwide Risk Assessment
- Westwide Risk Assessment Regionally Leveled Expected Flame Length
- Westwide Risk Assessment Regionally Leveled Expected Rate of Spread

2.3.3 Soil Moisture/Temperature Regime

Sources: Soil Moisture Temperature Regimes Data from the BLM National Operations Center and Soil Moisture and Temperature Regime Data from the Landscape Conservation Management and Analysis Portal

2.3.4 Sagebrush Landscape Cover

Sources: Sagebrush Distribution from LANDFIRE and Sagebrush Distribution and Percent Landscape Cover from the Landscape Conservation Management and Analysis Other Data Layers

2.3.5 Other Data Layers Used

Conifer Expansion Model

Piñon-Juniper and Conifer Encroachment (derived) Depicts the combined piñon-juniper and conifer interface in the GRSG study area that is within 120 meters of the sagebrush land cover data gaps identified

GRSG Data

The 2013 COT GRSG population shape file was produced by the 2013 GRSG Conservation Objectives Team. The GRSG PACs polygon data set represents the GRSG PACs identified in the 2013 GRSG COT Report.

Other Geographies

- The Western Association of Fish and Wildlife Agencies (WAFWA) Management Zones contains the original WAFWA Management Zones shape file. This data set depicts a preliminary version of the

1 management zone boundaries for GRSG and Gunnison Sage-Grouse
2 in the western United States and Canada.

3 • National Table 2 Sagebrush Soil Regime Overlay Calculation.

4 • FIAT Region Boundaries (November 18, 2014 cleaned version)
5 includes all five official region boundaries. These data are approved
6 to use in the Step 2 assessment. The boundaries have been modified
7 from the COT-base PAC boundaries and include USFWS
8 recommended PACs.

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SECTION 3
ASSESSMENT AREA CHARACTERIZATION

3.1 CENTRAL OREGON ASSESSMENT AREA

The Central Oregon assessment area (see **Figure 3-1**) encompasses the entirety of the Central Oregon GRSG population. The ODFW made the following observations in its 2011 Greater Sage-Grouse Conservation Assessment and Strategy for Oregon:

- The Central Oregon GRSG population has declined the most in Oregon.
- Juniper and sage-juniper are the two largest risks.
- The Central Oregon population is at the northern edge of the GRSG range, so connectivity in this region is especially important.
- The BLM-administered lands and private lands are nearly equal in the region, thus requiring additional efforts to identify cooperative conservation projects.

The ODFW identified four PACs, totaling 813,764 acres in the Central Oregon GRSG population. Landownership in the PACs consists of intermixed private, state, and public lands, with roughly 60 percent administered by the BLM. Through this FIAT process, 559,736 acres (68.7 percent) were identified as PPAs. Risks to these habitats were identified as primarily conifer expansion and annual grasses. The remaining 254,028 acres in the PACs and those areas outside of them were not identified as PPAs, primarily because they did not meet the 75 percent BBD requirement.

In Central Oregon, juniper is a natural component of the vegetation landscape. Historically, juniper was restricted mostly to rocky ridgelines and areas that did not see fire for long intervals. With successful fire suppression, juniper has spread from its historical range into sagebrush areas, which would have burned too frequently to support juniper woodlands. In Central Oregon, the greatest

threat to GRSG habitat is this conifer encroachment. Wildfire and invasive annual grasses still pose a significant threat in Central Oregon but not to the extent that they do across much of the rest of the Great Basin.

As **Table 3-1** shows, 90 percent of the landscape in the Central Oregon PACs is in the moderate to high R&R categories, with moderate to high sagebrush landscape cover. Central Oregon PACs have relatively high quality habitat that are also relatively resistant to invasive annual grasses and relatively resilient to disturbances such as fire. This makes Central Oregon unique among the other FIAT areas, with R&R not being quite as big a driver in the process of management strategies and priority setting (See **Figures 3-2 through 3-4**).

The BLM used the sage-grouse habitat matrix to help inform decisions, establish emphasis areas (see **Table 3-2** and **Figure 4-1**), and set priorities but also used additional data and local expert knowledge to make these decisions. This is the reason that some of the management activity priorities, such as fire operations, do not follow the sage-grouse habitat matrix precisely. The BLM also chose to use passive restoration for ES&R in many areas that had high R&R and currently showed limited presence of invasive species. The BLM also considered fire history in this process (see **Table 3-3** and **Figure 3-5**).

Table 3-1
GRSG Habitat Matrix Categories

Matrix Category	1A	1B	1C	2A	2B	2C	3A	3B	3C
Percent of Central Oregon PPAs	3	18	13	1	6	53	<1	1	1

Table 3-2
Emphasis Area Acreage in Project Planning Areas in the Central Oregon Basin Landscape

PPA	Acres of Emphasis Area in PPA	Percentage of Emphasis Area in PPA	Total Acres in the PPA
Brothers	205,237.48	94.39	217,440.10
Hay Creek	34,738.96	97.22	35,731.63
Paulina	55,620.17	59.31	93,784.56
12 Mile	156,158.44	73.39	212,779.80
Total for all PPAs	**451,755.05**	**80.71**	**559,736.09**

Table 3-3
Fire History In Central Oregon's PPAs

Year	Acres	Number of Fires
1999	2,030.76	3
2000	0.00	0
2001	0.00	0
2002	385.16	1

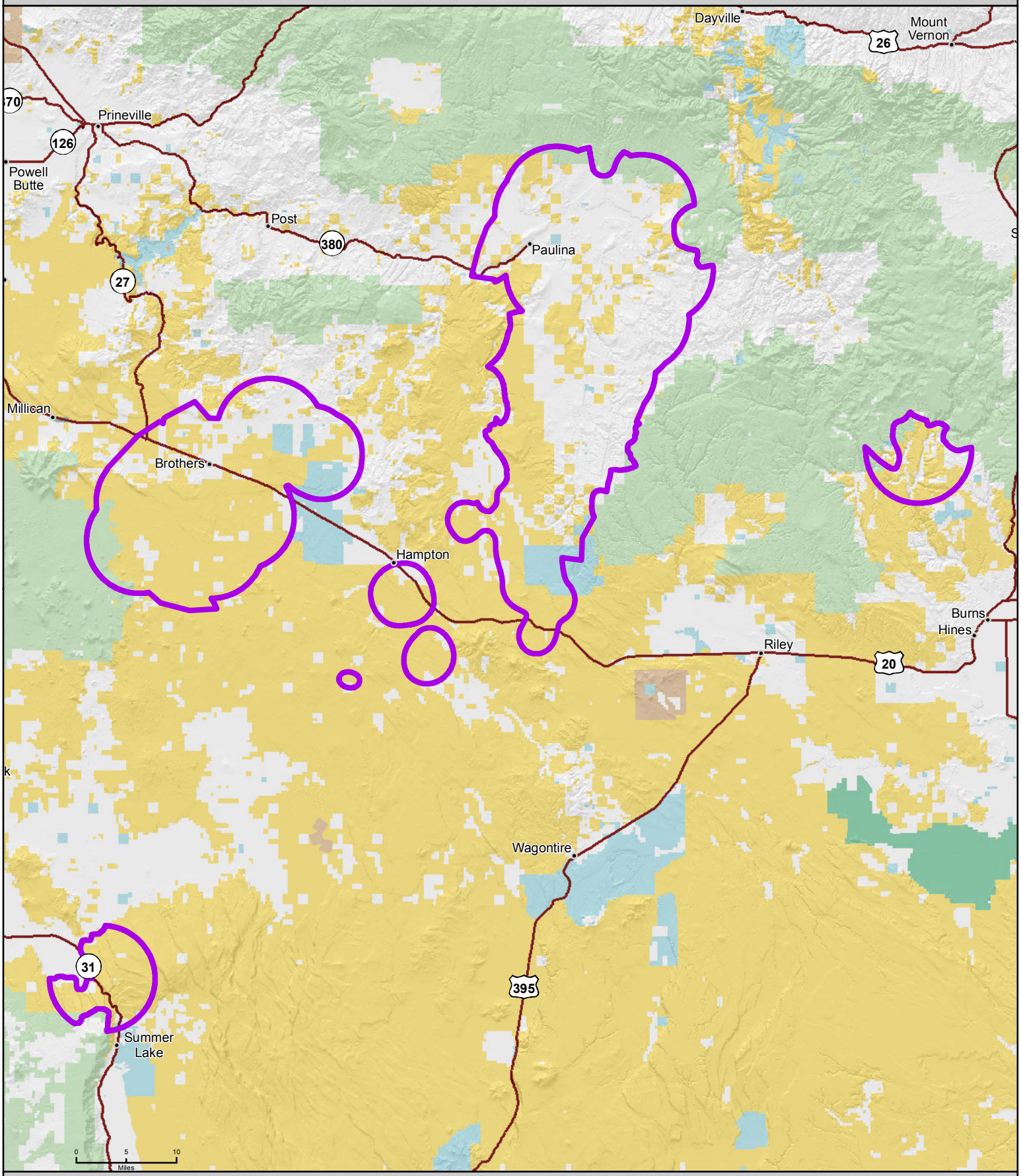
Table 3-3
Fire History In Central Oregon's PPAs

Year	Acres	Number of Fires
2003	0.00	0
2004	0.00	0
2005	307.28	1
2006	1,929.75	1
2007	119.19	2
2008	4,039.54	2
2009	0.00	0
2010	0.00	0
2011	0.00	0
2012	5,584.66	2
2013	30.60	1
2014	26.96	1
Total	**14,453.90**	**14**

Central Oregon Assessment Area

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



No Warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.

N

Map Location
Oregon

Central Oregon Assessment Area
Cities
Highways

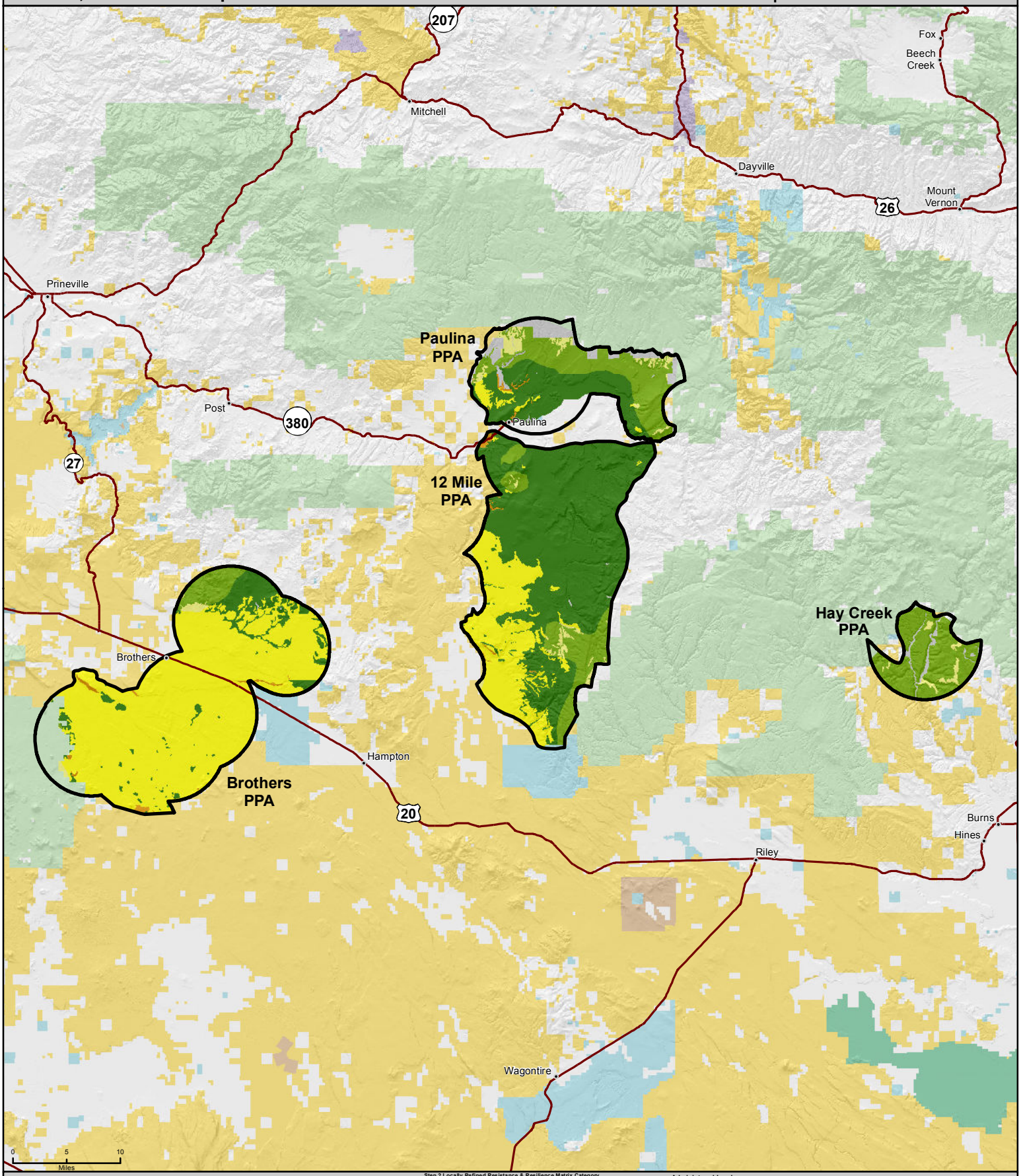
Administered Lands
Bureau of Land Management
U.S. Forest Service
National Park Service
U.S. Fish and Wildlife
Other Federal
State
Local Government
Private/Unknown

March 2015
Date Saved: 3/16/2015
Data Sources: BLM
1:801,919

Central Oregon Step 2 Locally Refined Resistance & Resilience Matrix

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



No Warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.

Map Location
Oregon

Step 2 Locally Refined Resistance & Resilience Matrix Category

- 1A: < 25% Sagebrush, High Resistance and Resilience
- 1B: 26% - 65% Sagebrush with Cool/Cold and Moist Soils
- 1C: > 65% Sagebrush with Cool/Cold and Moist Soils
- 2B: 26% - 65% Sagebrush with Warm and Moist Soils
- 2C: > 65% Sagebrush with Warm and Moist Soils
- 3B: 26% - 65% Sagebrush with Warm/Cool and Dry Soils
- 3C: > 65% Sagebrush with Warm/Cool and Dry Soils
- NA

Administered Lands

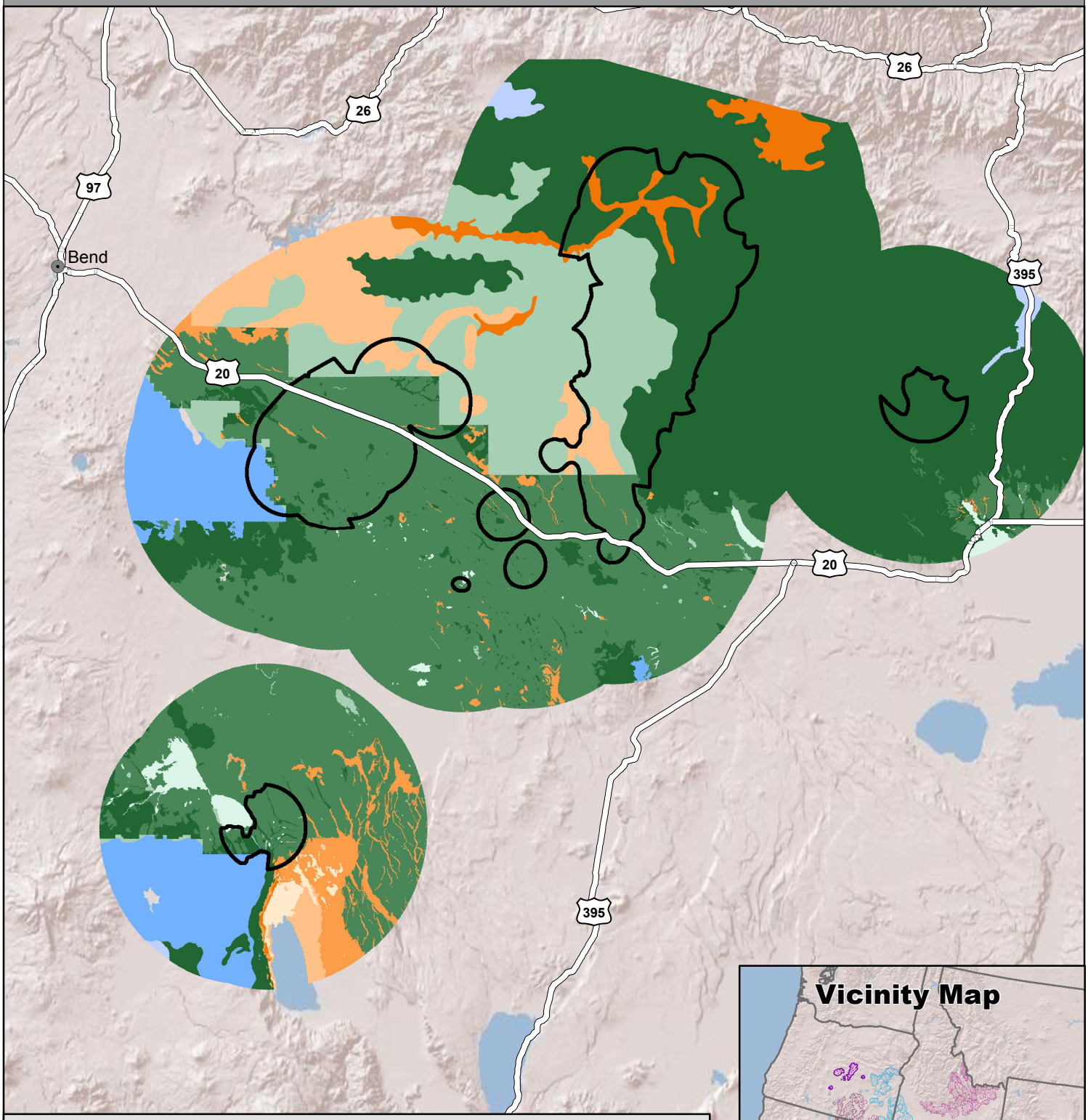
- Bureau of Land Management
- U.S. Forest Service
- National Park Service
- U.S. Fish and Wildlife
- Other Federal
- State
- Local Government
- Private/Unknown
- FIAT Project Planning Area

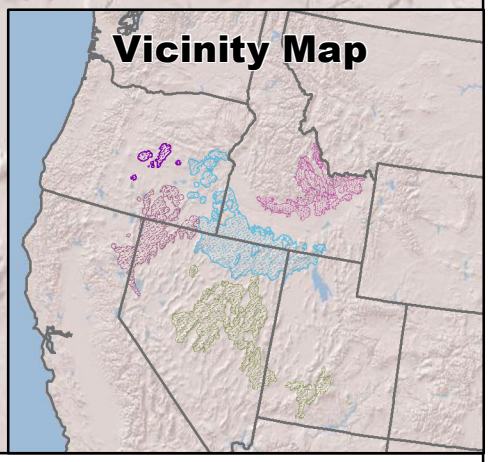
March 2015
Date Saved: 3/16/2015
Data Sources: BLM
1:750,000

Soil Moisture Temperature Regime

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior





- Cities
- Central Oregon Assessment Area

Soil_Moist

- Cryic-Aquic
- Cryic-Xeric
- Frigid-Aquic
- Frigid-Aridic
- Frigid-Aridic (torric)
- Frigid-Aridic (torric)
- Frigid-Xeric
- Mesic-Aquic
- Mesic-Aridic
- Mesic-Aridic (torric)
- Mesic-Xeric

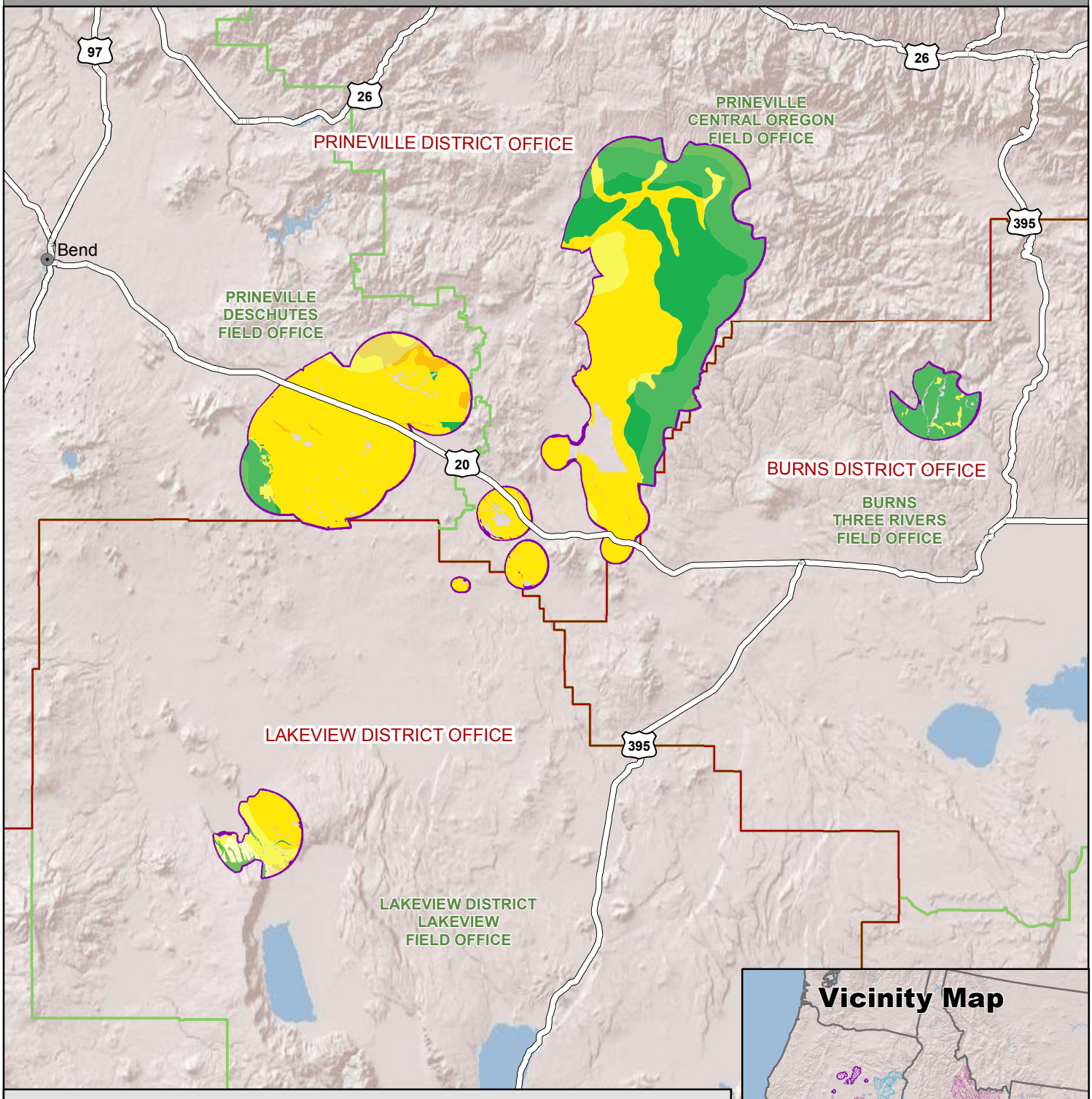
N

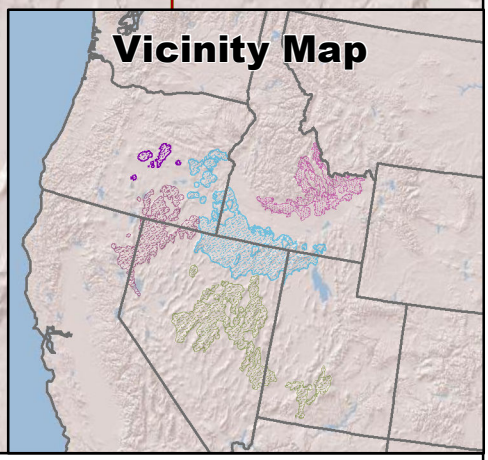
March 2015
Date Saved: 3/16/2015
Data Sources: BLM, NRCS, ESRI
1:1,500,000

Sage-Grouse Habitat Matrix

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior





- Cities
- Central Oregon Assessment Area

Resistance & Resiliency Classes

- 1A - High and <25% sagebrush cover
- 1B - High and 25-65% sagebrush cover
- 1C - High and >65% sagebrush cover
- 2A - Moderate and <25% sagebrush cover
- 2B - Moderate and 25-65% sagebrush cover
- 2C - Moderate and >65% sagebrush cover
- 3A -Low and <25% sagebrush cover
- 3B - Low and 25-65% sagebrush cover
- 3C - Low and >65% sagebrush cover

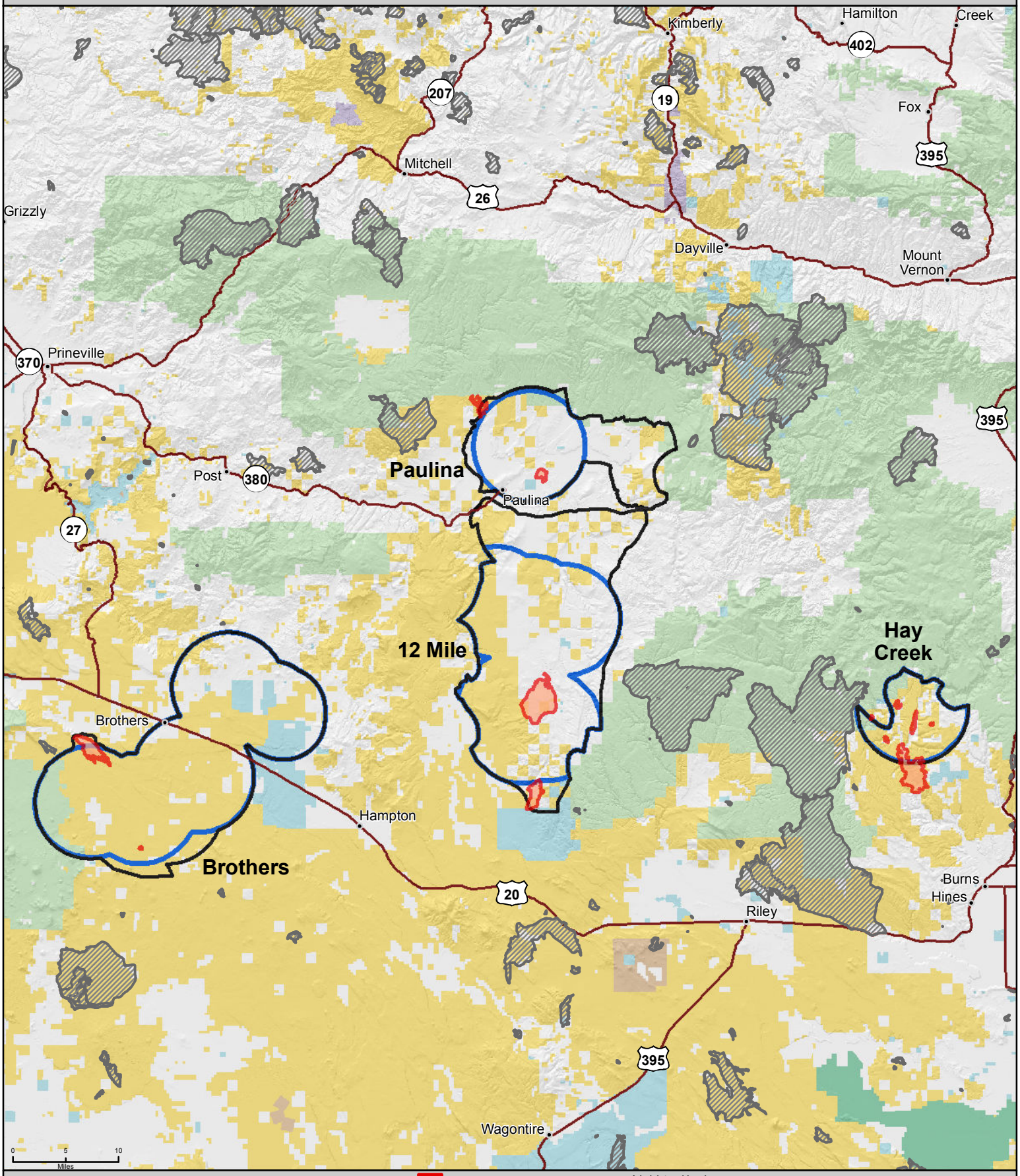
N

March 2015
Date Saved: 3/6/2015
Data Sources: Bureau of Land Management, ESRI
1:1,467,805

Central Oregon Fire History and Emphasis Areas

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



No Warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.

Map Location: Oregon

- Fire History Within PPA 1999 - 2014
- Fire History Central Oregon 1999 - 2014
- FIAT Emphasis Area
- FIAT Project Planning Area

Administered Lands

- Bureau of Land Management
- U.S. Forest Service
- National Park Service
- U.S. Fish and Wildlife
- Other Federal
- State
- Local Government
- Private/Unknown

March 2015
Date Saved: 3/16/2015
Data Sources: BLM
1:760,000

SECTION 4
EMPHASIS AREA AND PROJECT PLANNING AREAS

4.1 EMPHASIS AREA AND PROJECT PLANNING AREAS

4.1.1 Emphasis Areas Overview

Chambers et al. (2014) illustrates a step-down approach for identifying and assessing priority GRSG habitats across large landscapes and provides guidelines to identify effective management strategies/actions and habitat restoration needs across four primary federal agency program areas: fuels management, fire operations, habitat restoration/recovery, and post-fire-rehabilitation. The approach is based on widely available data, described in Section 2.3, to provide consistency across millions of acres and includes: (1) PACs, (2) BBDs, (3) habitat suitability as indicated by the landscape cover of sagebrush (not foliar cover), (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.

Using this approach, development and review teams were identified and tasked with initiating the FIAT process in an effort to reduce threats to GRSG resulting from impacts from invasive annual grasses, wildfires, and conifer expansion. Step 1 FIAT team members included individuals from federal agencies that administer the four federal program areas that are the focus of the assessment. They used this approach to identify priority habitat areas, further referred to as focal habitats. Emphasis areas (see **Figure 4-1**) are the portions of a PAC with important habitat characteristics and bird populations that are most impacted by the previously identified threats. See *Greater Sage-Grouse Wildlife, Invasive Annual Grasses & Conifer Expansion Assessment (2014)* for further Step 1 details. The results of Step 1 of the FIAT process, including geospatial data, were made available as the starting point for the assessment teams identified for Step 2 of the FIAT process.

4.1.2 Project Planning Areas Overview

As part of the FIAT Step 2 process, the Central Oregon assessment team assessed and identified Project Planning Areas (PPAs) (see **Figure 4-2**, Project Planning Areas and **Figure 4-3**, Project Planning Areas and District Boundries) and associated proactive and reactive management strategies and associated vegetation treatments focused on the four program areas (fuels management, fire operations, habitat restoration and recovery, and post-fire rehabilitation management). The team used emphasis areas as the spatial starting point and through the Step 2 process, identified 4 unique PPAs (see **Table 4-1** and **Table 4-2**).

Each PPA contains at least one emphasis area (see **Figure 4-3**). For most PPAs, management strategies/actions and treatments were identified outside of emphasis areas based on local knowledge that these areas are crucial to the long-term viability of GRSG populations in the PPA.

The team subsequently used a series of worksheet templates prepared for each program area to identify treatment opportunities for the four program areas in each PPA. Team members participated in four in-person workshops to discuss and complete the assessment for each PPA. In order to consider the broadest spectrum of possible treatment opportunities, the team did not consider landownership when conducting these assessments. Additionally, the team restricted potential fuelbreaks to existing roads in order to minimize further disturbance, fragmentation, and reduce the likelihood of increasing invasive annual grass abundance.

Table 4-1
Location of Central Oregon Project Planning Areas

Project Planning Area Name	BLM District Office
Paulina PPA	Prineville District
Brothers PPA	Prineville District
12 Mile PPA	Prineville District
Hay Creek PPA	Burns District

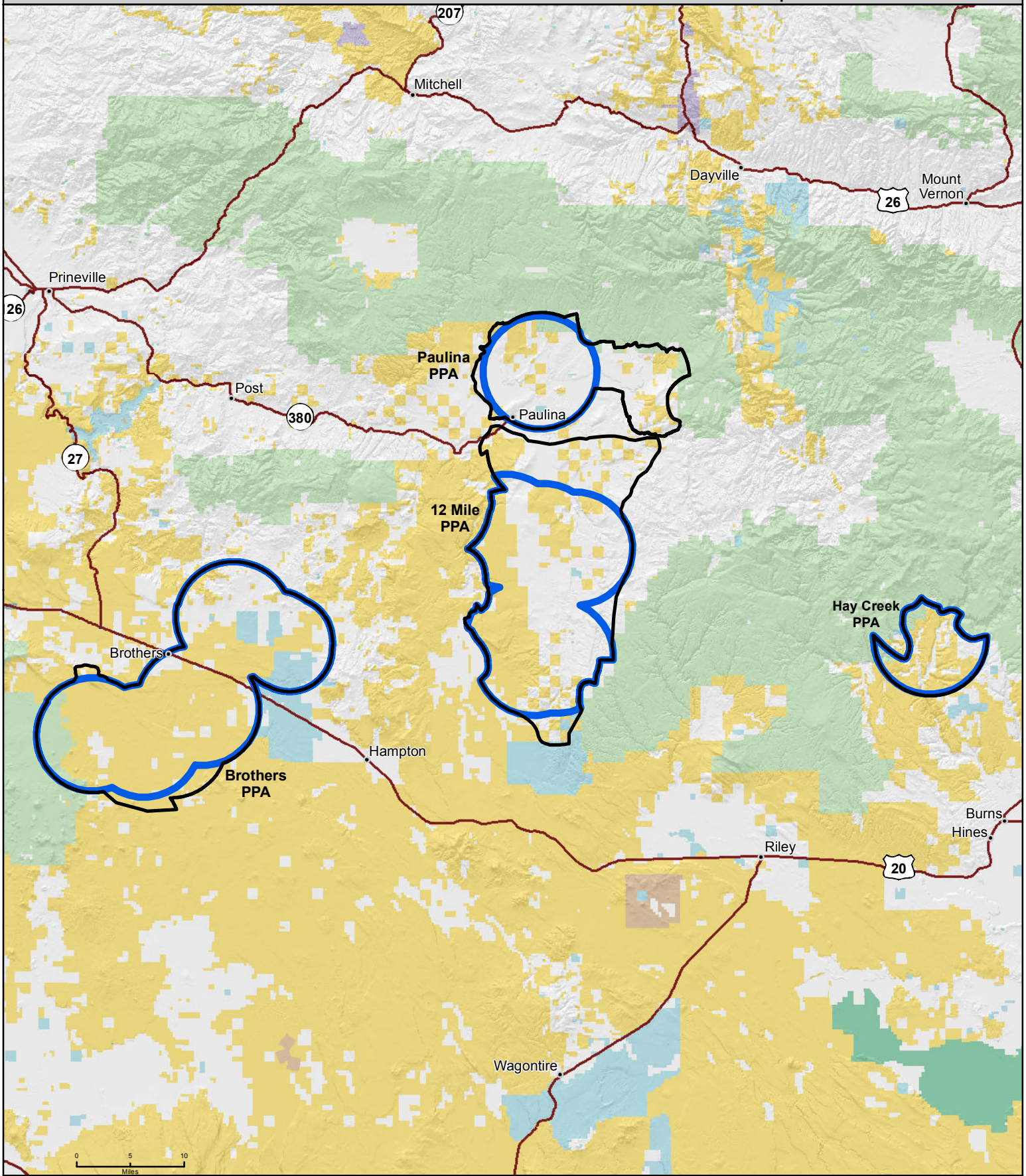
Table 4-2
Size of Central Oregon PPAs

PPA Name	Total Acres
Paulina	93,784.56
12 Mile	212,779.80
Brothers	217,440.10
Hay Creek	35,731.63
Total	559,736.09

Central Oregon Emphasis Areas and Project Planning Areas

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



Map Location Oregon

FIAT Project Planning Area
FIAT Emphasis Area
Cities
Highways

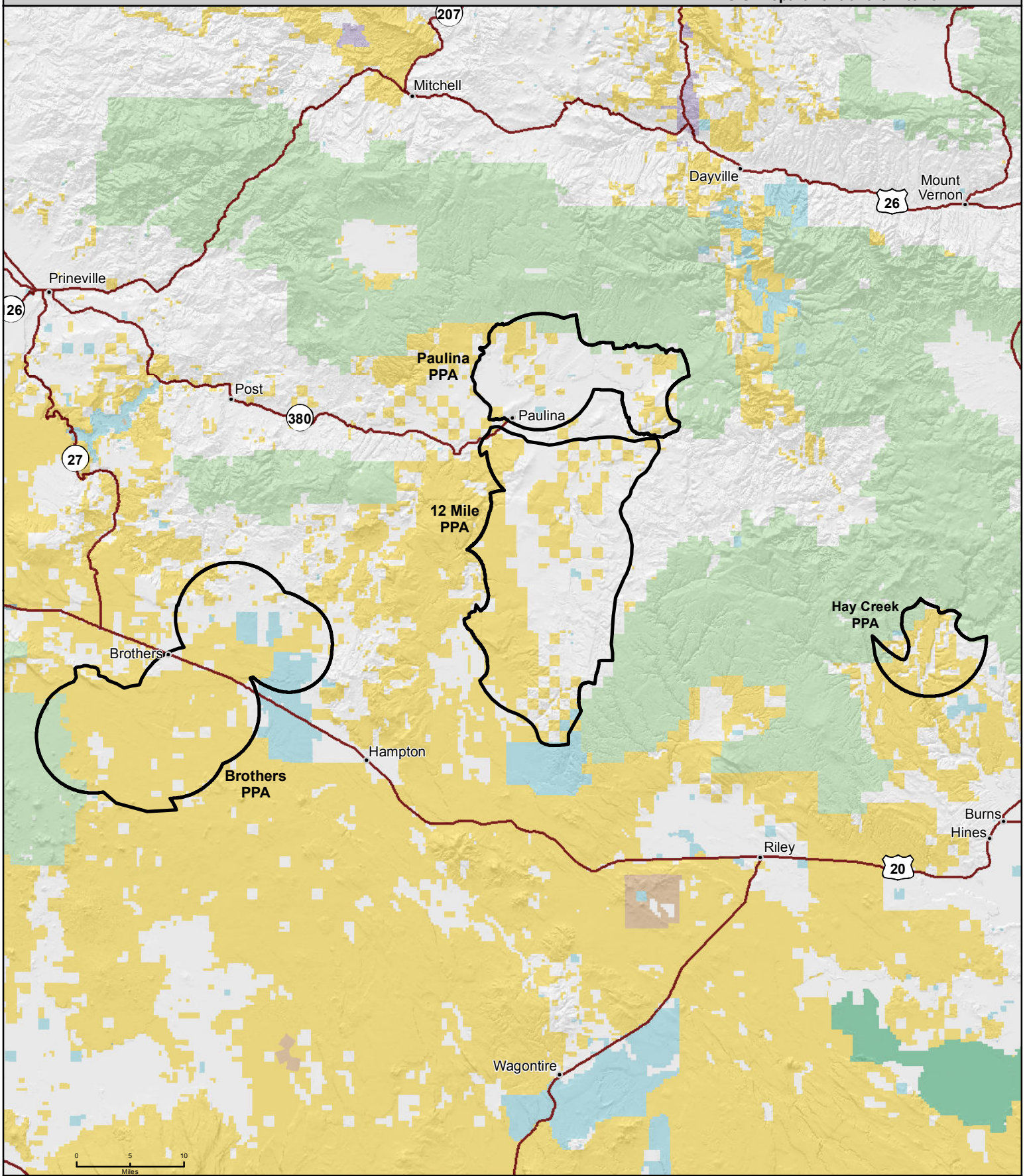
Administered Lands
Bureau of Land Management
U.S. Forest Service
National Park Service
U.S. Fish and Wildlife
Other Federal
State
Local Government
Private/Unknown

March 2015
Date Saved: 3/16/2015
Data Sources: BLM
1:750,000

Central Oregon Project Planning Areas

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



N

Map Location
Oregon

FIAT Project Planning Area
Cities
Highways

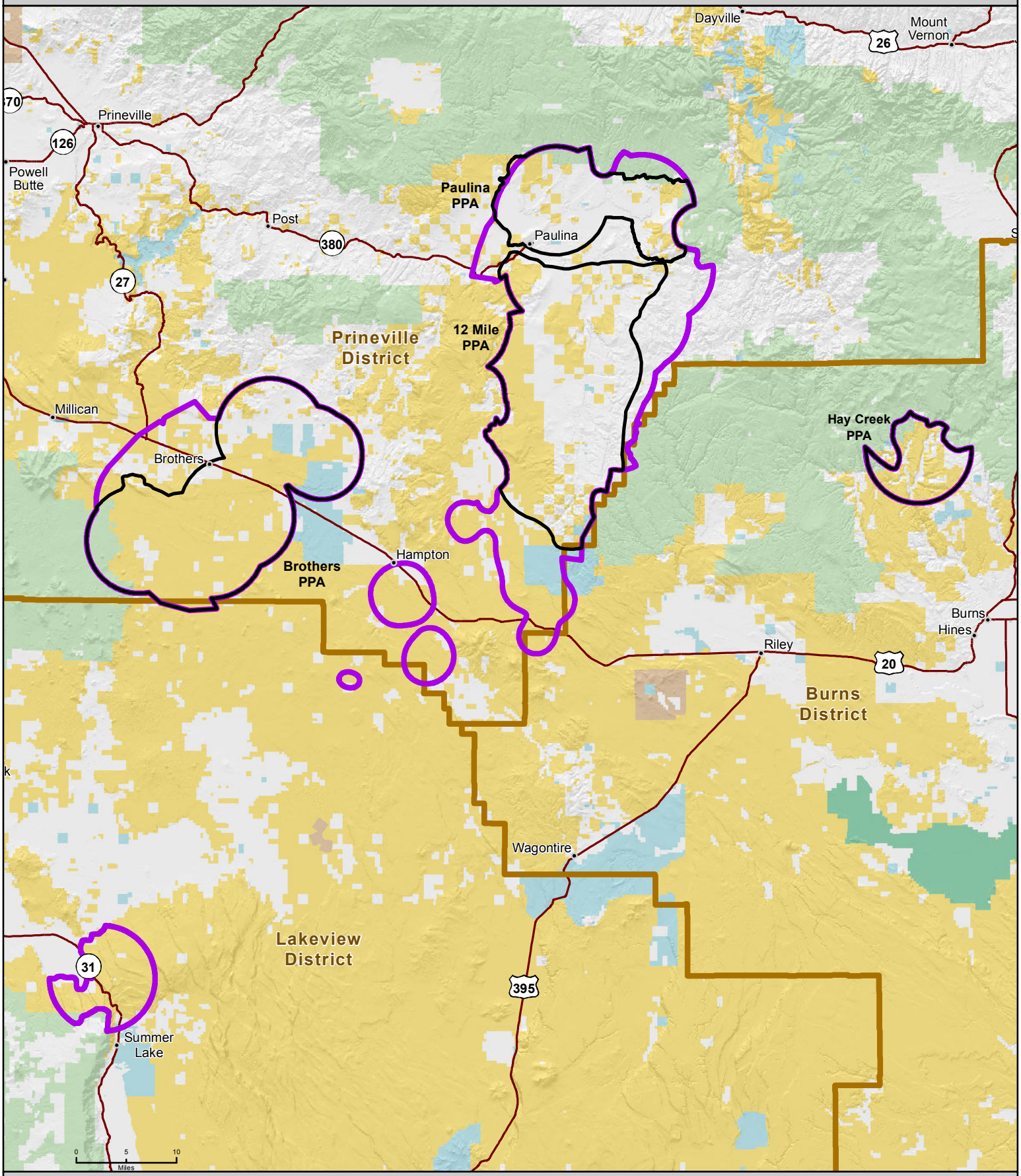
Administered Lands
- Bureau of Land Management
- U.S. Forest Service
- National Park Service
- U.S. Fish and Wildlife
- Other Federal
- State
- Local Government
- Private/Unknown

March 2015
Date Saved: 3/16/2015
Data Sources: BLM
1:750,000

Central Oregon Assessment Area and Project Planning Areas

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



No Warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.

Map Location: Oregon

- Central Oregon Assessment Area
- FIAT Project Planning Area
- BLM District Boundary
- Cities
- Highways

Administered Lands

- Bureau of Land Management
- U.S. Forest Service
- National Park Service
- U.S. Fish and Wildlife
- Other Federal
- State
- Local Government
- Private/Unknown

March 2015
Date Saved: 3/16/2015
Data Sources: BLM
1:801,919

4.2 CENTRAL OREGON PROJECT PLANNING AREAS

Below are descriptions of each of the PPAs in the Central Oregon Assessment Area. Each PPA description includes the following:

- A characterization of the PPA landscape
- Examination of the proposed management strategies in the PPA
- Spatial depiction of the proposed treatments

Additional supporting information is in the appendices.

Common to All PPAs in the Prineville District (Paulina, 12 Mile, and Brothers)

Fire Operations

Fire operations are implemented across all three PPAs (see **Figure 4-4**) on the Prineville District by both public and private organizations. There are no unprotected lands in any of the PPAs. Mutual aid agreements exist between all the organizations involved, whose suppression responsibilities are as follows:

- All federal lands in the Prineville District PPAs are protected by the Central Oregon Fire Management Service, (COFMS), which is comprised of the Prineville District BLM and the Ochoco and Deschutes National Forests assets.
- All private lands in the PPAs in the Oregon Department of Forestry, protection boundary, and any Oregon Department of State Lands (DSL) are protected by COFMS under either an offset or suppression agreement.
- All private lands not described above in the Paulina and 12 Mile PPAs are protected by the Post-Paulina RFPA; all the Brothers PPA private lands are protected by the Brothers-Hampton RFPA.

Fire operation considerations to protect all emphasis areas are as follows:

- Load PPA data into the CAD system at the Central Oregon Interagency Dispatch Center. Create new fire operation protocol for GRSG focal and emphasis areas to best protect habitat.
- During years with heavy annual grass fuel loading or optimal perennial grass growth, large fire potential risk increases significantly in all the emphasis areas. Add resources and preposition resources specifically identified to protect GRSG habitat through use of "step-up" plans that are tied to the unit's Fire Danger Operating Plan, based on local and regional preparedness levels, the potential for ignitions, or key weather events.

- Update resource advisor kits with treatment areas, and site data of GRSG landscape and advise line officers, fire managers, and incident commanders (ICs) of areas more and less resilient and resistant. Provide knowledge to better prioritize localized incident suppression action (extended attack).
- In accordance with the standards in the Interagency Standards for Fire and Aviation Operations, (Redbook), wash vehicles used in or around sites with known weed populations to reduce the spread of weeds. In the occurrence of any large fires (greater than Type 4), install a weed wash station.
- To the extent feasible, locate base camps, spike camps, drop points, staging areas, helicopter bases, and other temporary wildfire infrastructure in areas where habitat disturbance can be minimized.

Where are priority fire management areas (spatially defined polygons having the highest need for preparedness and suppression action)?

In conjunction with IM No. 2013-128, Sage-Grouse Conservation in Fire Operations and Fuels Management, before the FIAT assessment, the BLM developed a priority response map based on habitat (also see **Table 4-3**). COFMS uses the map to prioritize fire response by habitat in order of priority:

1. Primary Priority Habitat (PPH) that is the Prineville District's identification of the best habitats in the PAC
2. PPH
3. Areas within four miles of a lek outside of PPH
4. Primary general habitat

Table 4-3
Prineville District Fire Operations Management Strategies

Priority	Priority 1	Priority 2	Priority 3	Total
Paulina Acres	36,780.53	57,004.40	0.00	93,784.93
Percent of Paulina PPA	39.22	60.78	0.00	100.00
12 Mile Acres	135,897.30	76,879.77	0.00	212,777.07
Percent of 12 Mile PPA	63.87	36.13	0.00	100.00
Brothers Acres	144,068.42	73,285.72	0.00	217,354.14
Percent of Brothers PPA	66.26	33.70	0.00	100.00

Where are the greatest wildfire risks to emphasis areas, considering trends in fire occurrence and fuel conditions?

Fire frequently occurs across all the PPAs and is a natural part of the ecosystem. The fire return intervals for similar fuel types are about 16 years (Martin 1982). Three factors that govern whether a fire will become large and further degrade

existing GRSG habitat conditions are fuel amount and continuity, weather, and topography. Of these, the BLM can affect only fuel amount and continuity.

Fire regime condition class (FRCC) is intended to provide a general assessment of the threat wildfire may pose to ecological function and integrity, based on the degree of departure from reference conditions. In the case of FRCC, reference conditions are defined as the mix of successional, or structure, classes that theoretically existed before 1850 (NIFTT 2010). The hazardous fuels program is designed to reduce those risks.

The risks in the PPAs are as follows:

- Invasive cheatgrass increasing fuel loading and creating a more homogenous fuel bed by infilling the spaces between perennial grasses and sagebrush
- Western Juniper expansion increasing fire intensity and creating greater ember generation and increased spot fires in front of the main fire

The Brothers emphasis area arguably has the best public access of the four areas assessed. This is because it is bisected by US Highway 20 and has the highest percentage of public domain. This fact coupled with its proximity to Bend, Oregon, and the recreation culture of Central Oregon in general gives it the potential to experience more human-caused fires.

Where do opportunities exist that could enhance or improve suppression capability in and around emphasis areas?

All the emphasis areas in the Prineville District lie at the frontier of the current operational radius for SEAT (see **Figure 4-5**) aircraft to attack fires or to support firefighters. Reestablishing the Prineville SEAT base, either as a dedicated base or a reload base at the municipal airport, will facilitate rapid response to new fires or to support ongoing operations in any of the focal areas. While the Redmond Air Center (RAC) is well situated to attack and support fires in the Emphasis Areas, it is not configured to reload SEAT aircraft, nor are there any water-only fill options available. Roberts Field, the host location for RAC, is a primary commercial service airport, thus forcing SEATs into managed takeoff, holding and landing time, and priorities in conjunction with large air tankers and commercial and private air traffic.

The Paulina emphasis area lies outside the frontier of the current effective attack radius for Dayville Guard Station. The 12 Mile and Brothers emphasis areas lie outside current effective attack radius of any COFMS Guard Station. Reestablishing either or both the Paulina and Hampton Guard Stations (see **Figure 4-6**) will facilitate rapid response to new fires and will support ongoing operations in any of the emphasis areas. In lieu of reestablishing the stations,

there is an opportunity to reacquire apparatus and position them at Prineville and Dayville to respond to fires that occur in the emphasis areas.

The BLM should continue to work with each RFPA to further develop their training, capacity, and infrastructure needs, refine the RFPA asset location and pre-attack spatial data and include that information in the COFMS pre-attack spatial data, and further coordinate with the RFPAs to identify the priority response areas and include GRSG suppression guidelines in the specific agreement annual operating plans.

New water wells are being developed in the Brothers emphasis area. The wells will be fitted with equipment that can connect to refill apparatus. The RFPAs are also developing or refitting water developments to include the same capability. Any new developments or existing developments scheduled for refurbishment need to have the same capacity installed.

Should wildfire be managed in accordance with land use plan objectives for improving emphasis areas (e.g., reducing conifer expansion), and if so where and under what conditions?

Current BLM LUP/FMPs allow for prescribed fire through both wildland fires and wildfires in all the emphasis areas. The Brothers emphasis area is included in the Brothers Wildland Fire Use Plan.

How can fire management be coordinated across jurisdictional boundaries to reduce risk or to improve emphasis areas?

This area is under BLM, National Forest, and DSL administration and private ownership. Opportunities exist, agreements are in place, and working relationships are developed for assisted fire responses.

Fire Operations Asset Acquisition Prioritization

The priority and rationale for asset acquisition cover all of the PPAs in the Prineville District. The proposal is to reacquire or reestablish assets that were previously in place in the district. These assets would help protect the areas in and next to the FIAT PPAs, as well as other critical GRSG habitat in Central Oregon.

Based on historical fire occurrence data, the risk of habitat loss in Central Oregon is more likely from numerous smaller fires rather than a few large fires. However, large fires can and do occur, although they are not as likely here when compared to other areas with GRSG habitat. Protection from this type of habitat loss requires having additional fire management assets available, ready, and strategically located to meet a consistent and rapid response objective for fires in and next to the PPAs.

Priority 1—Reacquiring the fire engines and providing requisite staffing. The key to successful fire operation in the context of FIAT identified project planning areas and surrounding habitat is the ability to consistently respond to fires. All of the Central Oregon PPAs are a mixture of public and private domain. For the 12 mile and Paulina Project Planning Areas, the amount of private domain is significant.

Partnerships and the required formal agreements exist between the BLM and state and private agencies that respond to fires in the subject areas. While the entities involved in these partnerships and agreements can and do work across boundaries to suppress fires, each organization has its own jurisdictional responsibility; thus, each organization's first priority is to suppress fires in their jurisdiction.

A more effective model of interagency fire response is being developed with multiple partners in central and eastern Oregon; however, until this model is fully implemented, each agency must have the ability to adequately respond to its own fires.

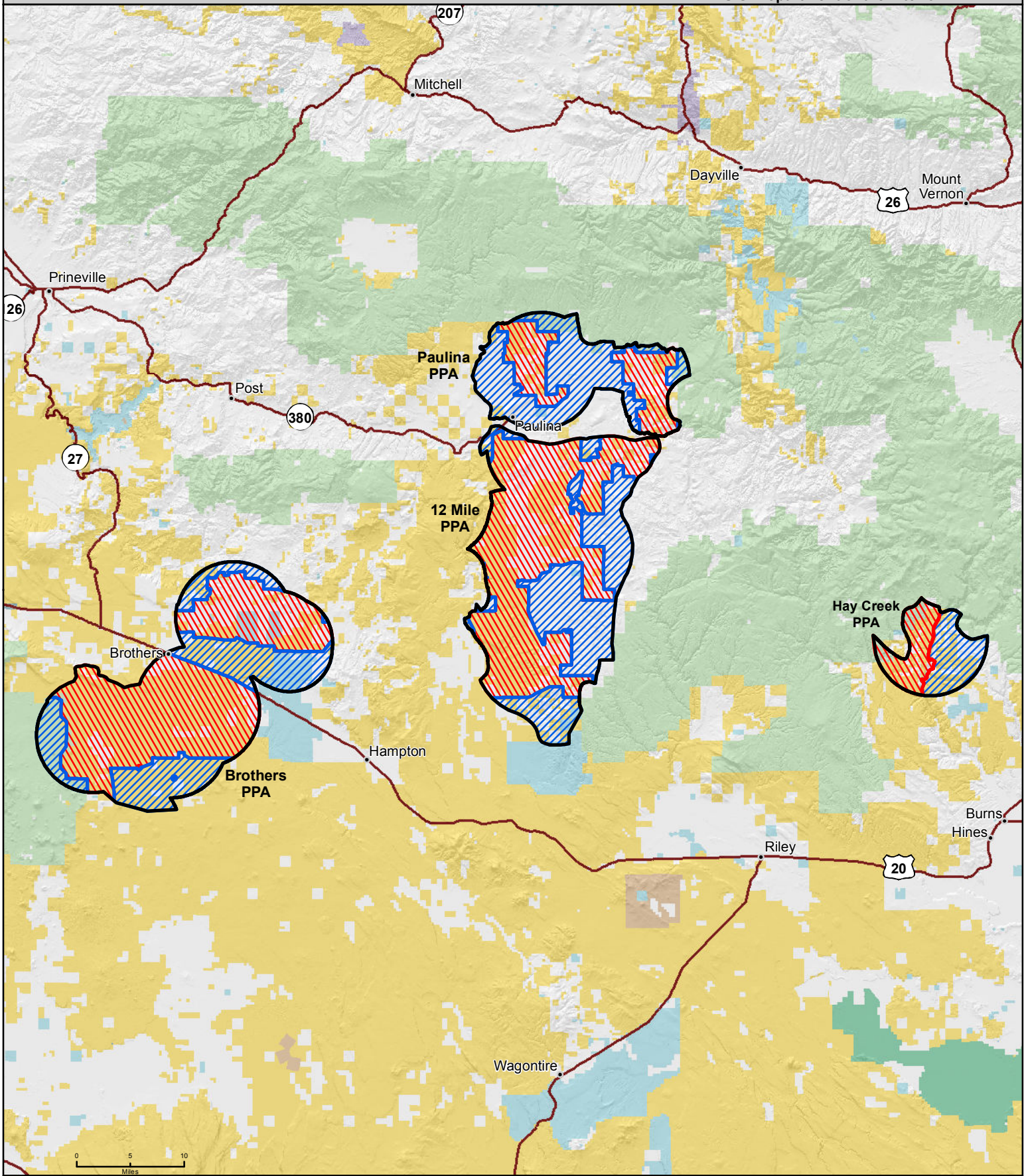
Priority 2—Reestablishing the Prineville SEAT base. The key to successful fire operations in the context of FIAT identified project planning areas is the ability to rapidly respond to fires, such as those that have occurred in the subject areas. This requires having a rapid and effective response available and ready to meet the stated rapid response objective to fires in or next to the PPAs; this is to minimize habitat losses to wildfire. Currently, none of the partner agencies have this capacity in their asset inventories.

Priority 3—Reestablishing the Hampton and Paulina Guard Stations. As stated above, having these two stations reestablished and staffed will facilitate a consistent and rapid response. It will allow them to meet the stated consistent rapid response objective to fires and to minimize habitat loss by positioning fire assets close to the PPAs. This is the third priority because reestablishing stations is futile if assets are unavailable. In addition, even though the PPAs are distant from the staffed guard stations, the District currently has the ability to station additional operational resources in the event lightning strikes and to patrol the PPAs during other times of elevated fire danger.

Central Oregon Fire Operations Management Strategies

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



No Warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.

Map Location
Oregon

Fire Operations Management Strategy
- Priority 1
- Priority 2

FIAT Project Planning Area
Cities
Highways

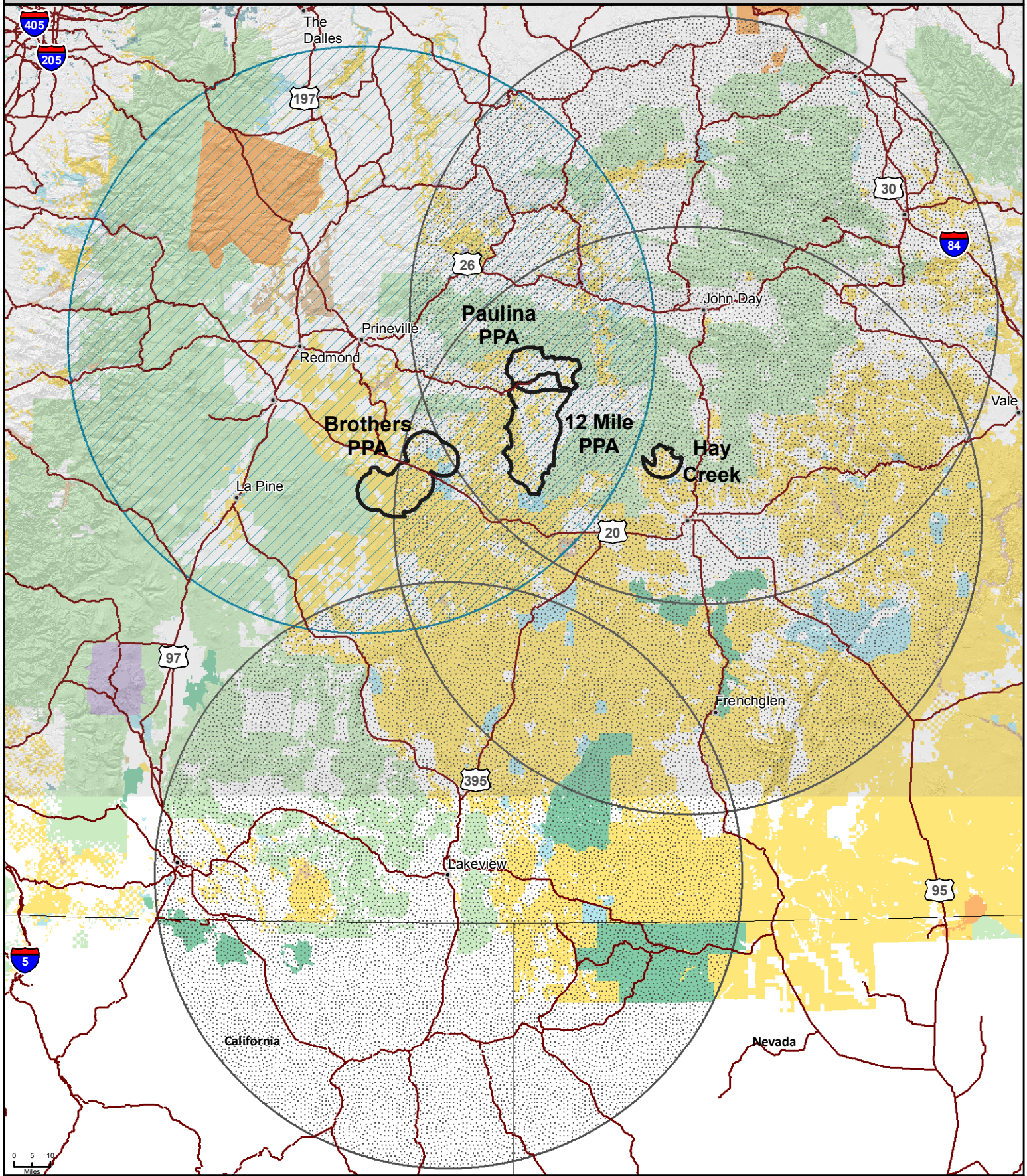
Administered Lands
- Bureau of Land Management
- U.S. Forest Service
- National Park Service
- U.S. Fish and Wildlife
- Other Federal
- State
- Local Government
- Private/Unknown

March 2015
Date Saved: 3/16/2015
Data Sources: BLM
1:750,000

Seat Response Area: 80 Mile Radius

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



No Warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.

Map Location: Oregon, California, Nevada

Cities
- Cities
- Highways
- FIAT Project Planning Areas

Seat Response Area: 80 Mile Radius
- Current Operating Area
- Proposed Operating Area

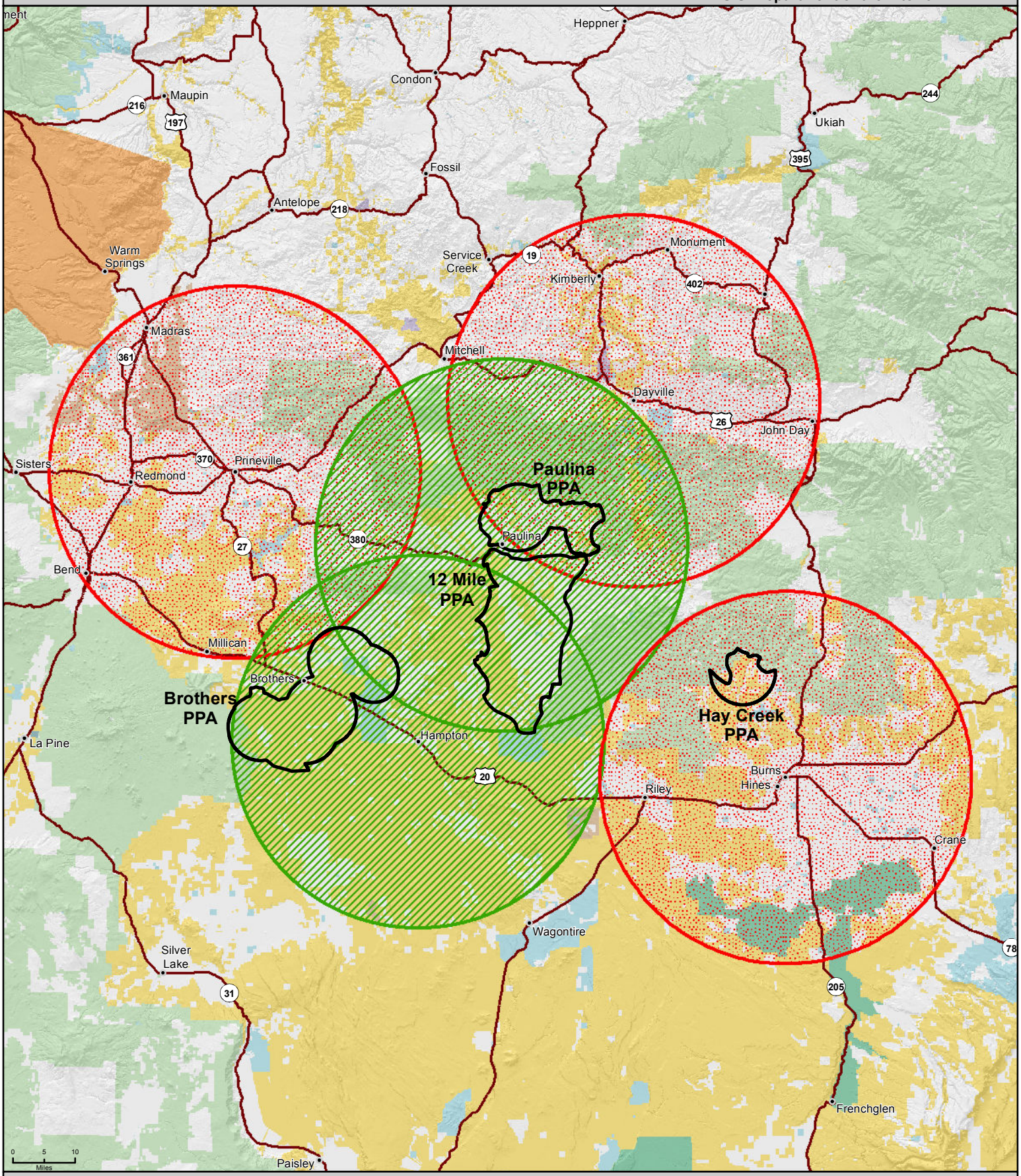
Administered Lands
- Bureau of Land Management
- U.S. Forest Service
- National Park Service
- U.S. Fish and Wildlife Service
- Bureau of Indian Affairs
- Other Federal
- State
- Local Government
- Private/Unknown

January 2015
Date Saved: 1/20/2015
Data Sources: BLM, ESRI
1:2,200,000

Central Oregon Guard Station Response Areas: 30 Mile Radius

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



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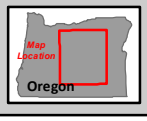

Guard Station Response Area: 30 Mile Radius
- Current Operating Area
- Proposed Operating Area
- FIAT Project Planning Area

Administered Lands
- Bureau of Land Management
- U.S. Forest Service
- National Park Service
- U.S. Fish and Wildlife
- Bureau of Indian Affairs
- Other Federal
- State
- Local Government
- Private/Unknown
- Cities
- Highways

March 2015
Date Saved: 3/16/2015
Data Sources: BLM
1:1,296,209

4.2.1 Brothers Project Planning Area

The Brothers PPA is approximately 40 miles south and east of Prineville. The planning area borders the Deschutes National Forest on the southwest and extends north across Oregon State Highway 20 directly east of Brothers. Of the 293,461 total acres in the Brothers North Wagon Tire PAC there are 272,218 acres of potential sagebrush habitat. The BLM manages most land in this PPA; the northern portions are primarily private and state lands. There is a small area of the Deschutes National Forest in the southwest, most of which is a forested habitat and not suitable GRSG habitat. Most of Brother's PPA has cool-dry soils with cool-moist soils in the far northern portion and far southern portion in the Deschutes National Forest. See **Table 4-4**.

Table 4-4
GRSG Habitat Matrix Categories

Matrix Category	No Data	1A	1B	1C	2A	2B	2C	3A	3B	3C
Acres	65.89	0.00	8,830.50	19,141.75	0.00	1,534.64	173,020.09	0.00	0.00	1,743.06
Percent of PPA	0.03	0.00	4.06	8.80	0.00	0.71	79.57	0.00	0.00	0.80

The primary treatment objectives are to reduce conifer cover and improve understory conditions. This will be done by reducing the amount and extent of annual grasses in the north and south and to treat phase I and 2 juniper around the flats where it has not yet fully invaded; this will increase the extent, quality, and continuity of the GRSG habitat (see **Table 4-5** and **Table 4-6**).

Table 4-5
Vegetation Categories

Vegetation Category	Big Sagebrush Shrubland	Black/Low Sagebrush	Grassland	Invasives	Riparian	Salt Desert Scrub	Woodland	Other
Acres	112,792.70	0.00	52,526.51	672.69	1,509.29	0.00	6,963.51	42,829.30
Percent of PPA	51.87	0.00	24.16	0.31	0.69	0.00	3.20	19.70

Table 4-6
Brothers Summary of Burn Probability

High and very high burn probability in PPA (acres)	139,019.59
High and very high burn probability in PPA (percent)	63.93

Two large NEPA analyses have already been completed, which cover all proposed juniper treatments. Private landowners have been treating some juniper in the northern portions recently under the Mule Deer Initiative. For the last few years the BLM has been treating juniper in the southern portion of the PPA.

Historically, large fire is not a frequent occurrence on this landscape (see **Table 4-6**). Most current fires are human caused. Additional efforts in fire prevention and education could prove to reduce the number of human-caused fires and thus reduce the risk to the GRSG habitat in this area. Closing roads is one management approach to reducing the number of human-caused ignitions. This would need to be addressed through travel management. Several major roads were identified as potential fuelbreaks where the objective is to treat annual grasses and junipers along the roadways.

Invasive annual grass treatments were identified in the northern portion of the PPA. The objective is to contain the distribution to this area and begin to reduce the overall impacts through such treatments as spraying and seeding. Integrated vegetation management techniques would be used to reduce the spread of nonnative species while restoring native vegetation. Multiple treatments may be necessary to meet objectives.

Emergency stabilization and rehabilitation (ESR) treatments would be considered for use throughout the PPA; however, areas in the north are in poorer condition, with a potential greater need for restoration following a fire. In general the remainder of the PPA is in relatively good condition, with fair resiliency; for this reason, each fire would have to be assessed based on its size, intensity, and location to determine the extent and type of ESR treatments needed.

Fuels Management

In order to reduce risk to focal habitats in the Brothers PPA, fuels management consists mainly of improving several main access roads as linear fuelbreaks (see **Table 4-7**).

Table 4-7
Brothers Fuels Management Potential Treatments

Priority	Priority 1	Priority 2	Priority 3	Total
Fuelbreaks miles	25.66	31.90	9.13	66.69
Sagebrush thinning acres	430.59	0.00	0.00	430.59
Percent of PPA	0.20	0.00	0.00	0.03

Main roads in the Brothers PPA present opportunities for use as fuelbreaks across critical habitats throughout the emphasis area. The area available for treatment is approximately 812 acres. Treatment types include maintaining road rights-of-way to be clear of vegetation, mowing a fuelbreak to clear vegetation (width dictated by fuel type), removing conifers, and following up with chemical and seed applications where appropriate.

From a fuels management and restoration perspective, prescribed fire would be appropriate in the higher resistance and resilience areas. Smaller fires are rarer now; fires tend to be larger and more intense. For example, the Buck Creek fire area is now cheatgrass. The next fire will burn that area and into surrounding

areas. Prescribed fire could be a viable option for treatment in this PPA, but suitability will be site specific. No areas were identified for prescribed fire treatments in this assessment, with the understanding that suitability of this type of treatment will be addressed in the Step 3 planning process.

Two small areas with dense sagebrush canopies are proposed for experimental sagebrush thinning. This is to reduce the height of the canopy, thus reducing the potential for fire spread. Additionally, opening up the dense canopy will provide opportunities for native grasses and forbs to become reestablished.

Shrub densities are at or above the 30 percent canopy cover level in portions of both the Brothers and 12 Mile PPAs. This density limits important GRSG forage production. Because of this, there is an interest in conducting test mowing to modify and improve decadent sagebrush, thereby encouraging understory growth.

Due to the thick shrub canopy cover, the use of small chemical treatments or mowing projects would be researched. These types of treatments would reduce canopy cover and allow native grasses and forbs to become reestablished either naturally or through reseeding and planting. Test locations selected are classified as moderate resistance and resilience (2C) in areas with landscape shrub percentages in the high category (greater than 65 percent). Because there is a risk that this disturbance could lead to additional annual grass expansion, these treatments may be accompanied by post-treatment seeding or herbicide application.

Fuels management and habitat restoration are being coordinated across ownership lines with the BLM, private/NRCS, and Forest Service in this PPA.

Biological fuels management, such as allowing livestock to graze on fine fuels, will be considered as a possible treatment where it can be used and still meet GRSG habitat goals and grazing permittee needs.

Habitat Restoration and Recovery

There are opportunities for habitat restoration treatments in this PPA to protect, enhance, and maintain GRSG habitat. Management will be employed to reduce conifers. The entire project planning area has been identified as needing some level of conifer treatments. Priorities have been determined based on the stage of encroachment and whether the treatment is in the emphasis area.

There is an opportunity to improve habitat in the southern portion of the PPA east of Dickerson Well Road, but land managers will need to be prepared to work with larger juniper. (For all potential treatments in this PPA, see **Table 4-8**.) Healthy Lands Initiative treatments have been identified and were considered in identifying the FIAT polygons and priorities. North of Highway 20, there are ongoing opportunities for inter-organizational cooperation.

Table 4-8
Brothers Habitat Restoration Potential Treatments

Priority	Priority 1	Priority 2	Priority 3	Total
Conifer treatment acres	53,436.34	59,858.44	104,128.90	217,423.68
Percent of PPA	24.58	27.53	47.89	100
Invasives treatment acres	178,086.57	28,122.58	11,245.64	217,454.79
Percent of PPA	81.90	12.93	5.17	100

An integrated vegetation management approach will be used to manage invasive species. The sage-grouse habitat matrix shows this PPA to be moderately to highly resistant and resilient; therefore, a combination of both passive and active restoration will be used, based on the presence or absence of invasive species. Where invasive species are present, a more active approach will be used. Invasives treatments include a small portion in the northern part of the PPA, in the cool-moist soil zone, where there are weed issues based on the annual grasses layer.

The annual grasses treatment polygon is mostly private and has mostly noxious knapweed with cheatgrass. Proposed treatments include a tiered approach of burn, spray, and seed. Cheatgrass is causing substantial soil erosion in this area. The consensus was that a passive restoration approach would be used throughout the rest of the PPA.

Existing Treatments

The Brothers PPA is in the project boundaries of the High Desert Shrub Steppe Restoration Environmental Assessment (xxxxx 2011). There are several past fuels management and habitat restoration projects in the Brothers PPA that have improved GRSG habitat removing conifers in encroached and expanding areas. Major emphasis is placed on returning these sites to resilient sagebrush landscapes for GRSG use.

To date, the BLM Prineville District has completed conifer thinning on 15,414 acres and has completed prescribed jackpot (i.e., localized, non-piled) burning on 4,579 of those acres. Another 3,752 of those acres is planned to be jackpot burned in 2015; the rest will be burned over the following two years if conditions allow.

Initial monitoring of these projects is showing improvement in GRSG habitat, but their maintenance will be essential to keep meeting GRSG habitat objectives. Some juniper cutting on private lands and associated with the Mule Deer Initiative has been completed in recent years, in the PPA's northern portion.

Post-Fire Rehabilitation Management

The entire PPA area will be considered for ESR treatments. The BLM and partners will determine site-specific treatments in the larger polygons. This PPA is cool-dry and is likely to be moderately resilient.

There was a recent 30- to 40-acre fire, and grass recovery has been strong. The overall response in the northern portion of the PPA following treatments has been mixed; some areas have returned as cheatgrass, others have not. There is good perennial grass coverage. There may be some spots where restoration is needed, but in general, recovery should be strong through passive restoration.

Planting plugs of sagebrush may be an option south of Highway 20; grass seeding would likely not be necessary. Restoration for ES&R will be prioritized in areas where invasive species are already present. See **Table 4-9**.

Table 4-9
Brothers Post-Fire Rehabilitation Management Strategies

Priority	Priority 1	Priority 2	Priority 3	Total
Acres	178,076.50	28,124.26	11,243.86	217,444.62
Percent of PPA	81.90	12.93	5.17	100

Use of some form of ground preparation, such as drill seeding or harrowing, is warranted and feasible on valley bottoms designated as 2C and 3C. Areas appropriate for drill seeding and equipment use first need to be inventoried to remove archaeological constraints for prompt treatment. Herbicide treatments to suppress cheatgrass growth and favor seeded species should be considered as a portion of the ESR treatment plan. Also consider using erosion control structures in areas with high burn severity or high risk for erosion (that is, areas with phase 3 juniper encroachment).

Additionally, there needs to be significant effort and funding put toward the development of local seed sources and storing enough of a supply to meet the needs for restoration and rehabilitation.

Proposed Management

See **Table 4-10** for projects that have been identified presently within the NEPA planning process. See **Figures 4-7** through **4-13** for a graphic depiction of the proposed treatments and strategies in the PPA.

4.2.2 Hay Creek Project Planning Area

The Hay Creek PPA is along the north edge of the BLM Burns District and addresses the entirety of the Burns PAC. It is approximately 15 miles northwest of Burns, Oregon, and falls in the Three Rivers Resource Area.

The Hay Creek PPA is 35,777 acres, comprised of 21,737 acres of BLM-administered land, 9,435 acres of private land, 4,603 acres of Forest Service land, and two acres of Oregon state land. The northern section of the PPA is in the Malheur National Forest; it is managed as a forested habitat and is not suitable for GRSG. The BLM also manages small sections of land in the southwestern portion of the PPA as forest habitat, which also is unsuitable for GRSG.

Table 4-10
Brothers Project Planning Area Treatment Summary Table

Treatment Description		Priority			Threats Addressed				NEPA			Treatments			
Name/ Type	Acres/ Miles											Time Frame		Certainty of Effectiveness[1]			
All projects listed are conifer control, unless listed otherwise.	All amounts are acres, unless noted otherwise.	1st	2nd	3rd	Conifer (C)	Invasive annual grasses (I)	Riparian (R)	Wildfire (W)	Initiated (I)	Completed (C)	Needed (N)	Pending Funding (P)[1]	Implementing (I)[1]	Likely	Unlikely	Maintenance Time Frame (Years)[2]	Completion Time Frame (0-2, 3-5, 5+ years)[3]
2015 BLM	22	X			C			W		C			I	I		20+	0-2
2015 BLM	13		X		C			W		C			I	I		20+	0-2
2015 NRCS	14		X		C			W		C			I	I		20+	0-2
2016 BLM	14,466	X			C			W		C		P		I		20+	0-2
2016 BLM	4,022		X		C			W		C		P		I		20+	0-2
2016 BLM	8			X	C			W		C		P		I		20+	0-2
2018 BLM	1,124	X			C			W		C		P		I		20+	3-5
2018 BLM	4,678		X		C			W		C		P		I		20+	3-5
2020 BLM	78		X		C			W		C		P		I		20+	3-5
2020 BLM	3,077			X	C			W		C		P		I		20+	3-5
2021 BLM	5,287		X		C			W		C		P		I		20+	5+
2022 BLM	144		X		C			W		C		P		I		20+	5+
2016 Invasive	465	X				I		W	I			P		I		5+	0-2
2016 Invasive	58		X			I		W	I			P		I		5+	0-2
2019 Invasive	213	X				I		W	I			P		I		5+	3-5
2023 Invasive	465	X				I		W	I			P		I		5+	5+
2023 Invasive	858		X			I		W	I			P		I		5+	5+
2016 Fuelbreak*	26 miles	X						W			N	P		I		5+	0-2
2016 Fuelbreak*	32 miles		X					W			N	P		I		5+	0-2
2016 Fuelbreak*	9 miles			X				W			N	P		I		5+	0-2
2017 Sagebrush thinning	429	X						W			N	P		I		30+	0-2

[1]States that if treatment, once completed, is likely or unlikely to be effective and provide rationale using these codes:
1 = site conditions (soils, resilience, species composition, disturbances) make treatment effectiveness likely
2 = site conditions (soils, resilience, species composition, disturbances) make treatment effectiveness unlikely
3 = continued current management (grazing, recreation, or other land uses) make likelihood of effectiveness low
4 = based on professional opinion, treatment is likely to be effective

[2]This describes the frequency of maintenance necessary to continue effectiveness (years).

[3]This identifies the potential treatment completion time frame, considering NEPA adequacy, relative priority, and local ranking factors.

The Silvies River bisects the PPA north to south and is joined by a number of smaller streams, including Hay Creek and Emigrant Creek, creating high quality brood-rearing habitat.

The Hay Creek PPA supports a relatively isolated population of GRSG, which is composed of two active leks and one inactive lek (see **Table 4-11**). Because there are only two years of data, the lek count is inadequate to properly establish a general trend in GRSG population for this PPA.

Conifer Encroachment is the major threat to GRSG in this PPA and is identified as the primary treatment objective. The PPA contains predominantly high resistant and resilient habitat types, characterized by generally cool-moist soils (see **Table 4-12**). For this reason, the PPA should respond favorably to juniper control treatments.

Table 4-11
Hay Creek PPA Lek Status

Lek Name/ODFW Site ID	Conservation Status
Hay Creek #1 (HA1042-01)	Occupied pending
Hay Creek #2 (HA1042-02)	Occupied pending
Mosquito Flat (HA0024-01)	Unoccupied pending

Table 4-12
Hay Creek GRSG Habitat Matrix Categories

Matrix Category	No Data	1A	1B	1C	2A	2B	2C	3A	3B	3C
Acres	2,050.48	986.54	30,796.34	0.00	0.00	1,899.25	0.00	0.00	0.00	0.00
Percent of PPA	5.74	2.76	86.19	0.00	0.00	5.32	0.00	0.00	0.00	0.00

NEPA analysis has been completed to address conifer encroachment for 10,950 acres and a Determination of NEPA Adequacy (DNA) is being initiated to cover an additional 10,787 acres in the PPA (see **Table 4-13**).

Table 4-13
Hay Creek Vegetation Categories

Vegetation Category	Big Sagebrush Shrubland	Black/Low Sagebrush	Grassland	Invasives	Riparian	Salt Desert Scrub	Woodland	Other
Acres	17,644.33	0.00	6,435.65	414.59	707.54	0.00	964.26	9,484.75
Percent of PPA	49.38	0.00	18.01	1.16	1.98	0.00	2.70	26.54

Two CCAs are in progress, which include the BLM lands in this PPA. The CCAs may be a vehicle to generate funding and in-kind contributions involving juniper

and ponderosa pine management. Such efforts would increase the prioritization of this PPA.

Fire history in the boundary of the Hay Creek PPA indicates that seven fires have burned 1,567 acres since 1980. This figure does not properly identify the potential risk to the PPA (see **Table 4-14**), especially when considering its small size and the recent history of large wildfires in the surrounding area.

Table 4-14
Hay Creek Summary of Burn Probability

High and very high burn probability in PPA (acres)	35,279.28
High and very high burn probability in PPA (percent)	98.73

A network of fuelbreaks (ultimately to develop fire and invasive resistant green strips) have been identified for establishment and are associated with the limited roadway system, both inside and outside this PPA boundary. All roads associated with these fuelbreaks will be maintained or improved to facilitate rapid initial attack for fire operations. Establishing these fuelbreaks is to keep a single wildfire from burning the entire Hay Creek PPA.

Invasive annual grass treatments were not identified and are not a priority for this PPA. This is due to the high resistance and resilience of the habitat and the limited and sporadic nature of the invasion. Annual grasses will be addressed using the best available techniques during conifer maintenance treatments.

ESR treatments would be considered throughout the PPA. In general the PPA's high resilience will allow for natural recovery, thus each fire would be assessed based on its size, intensity, and location to determine the extent and type of ESR treatments needed.

Fuels Management

In order to reduce the risk of habitat conversion to focal areas in the Hay Creek PPA, fuels management consists of improving the limited roadways into linear fuelbreaks (see **Table 4-15**).

Table 4-15
Hay Creek Fuels Management Potential Treatments

Priority	Priority 1	Priority 2	Priority 3	Total
Miles	9.13	0.00	4.83	13.96

Using the road systems in and outside the perimeter of the Hay Creek PPA, a network of fuelbreaks has been identified. Their purpose is to compartmentalize and establish anchor points for firefighters to safely engage any wildfires in this area. Treatment types in these areas include keeping road rights-of-way clear of vegetation, mowing a fuelbreak clear of woody vegetation, removing conifers, and following up with chemical and seeding applications where appropriate.

Roads identified for establishing fuelbreaks next to the Hay Creek PPA are Silvies River Road and an unnamed road in the northwest that connects to Forest Service Road 37.

There is no one fuel reduction technique that will be most effective throughout the area and in the acceptable impact ranges of GRSG populations. Nevertheless, combinations of such techniques as biological thinning and prescribed fire in higher resistant and resilience areas could reduce the risk of catastrophic wildfire.

Biological thinning (livestock grazing to reduce fine fuels) is a valid option. It directs livestock to areas in need of fine fuel reduction, while preventing overall use from exceeding 50 percent for desirable perennial species. At the same time, this option allows for maximum consumption of targeted invasive annual grasses. Biological thinning is authorized under 43 CFR, Part 4190.1; it allows a full force and effect decision to be made when the BLM determines that vegetation, soil, or other resources on the public lands are at substantial risk of wildfire due to such factors as drought and fuels buildup.

Recent wildfires have been increasing in size and intensity, causing large-scale habitat conversion. Prescribed fire is a viable option to build a more mosaic landscape and create variability in fuel loads, which can slow the rate of spread, aiding suppression efforts. It can also be used as a habitat restoration treatment in areas with phase I or phase II juniper encroachment. It is addressed in more detail in the habitat restoration and recovery section.

Fire Operations

All roads identified for establishment of fuelbreaks and green strips will be maintained or improved. This will be done to facilitate faster response times for initial attack resources to help minimize the size of any wildfire occurrence in or near the PPA. Roads identified for maintenance or improvement are Silvies River Road and an unnamed road in the northwest that connects to FS 37.

Fire operations priority is separated east/west using the previously identified Silvies River Road. It gives priority 1 to the western section of the PPA. The western section of the PPA contains both active leks and, based on fire spread history (typically driven by westerly winds), has a high potential of spreading to the eastern portion. This effectively removes all habitat with a single fire. The remainder of the PPA will have a lower priority since a wildfire has a lower potential of destroying the entire PPA, based on fire spread history. See **Table 4-16**.

Table 4-16
Hay Creek Fire Operations Management Strategies

Priority	Priority 1	Priority 2	Priority 3	Total
Acres	17,206.39	18,572.00	0.00	35,778.39
Percent of PPA	48.00	52.00	0.00	100.00

Other fire operation considerations to protect this PPA are as follows:

- Wash vehicles used in or around sites with known weed populations in order to reduce the spread of weeds. In the case of any large fires (greater than Type 4), a weed wash station will be installed.
- Add resources and station resources specifically identified to protect GRSG habitat through use of "step-up" plans that are tied to the unit fire danger operating plan; this will be based on local and regional preparedness levels, ignition potential, and key weather events.
- Load PAC areas into CAD system at Dispatch. Front load this resource value and set it as a priority area for action and notifications. Look at existing dispatch protocols to modify or create new protocols for GRSG PAC areas to best provide for habitat protection.
- For type 3 to 5 IC designations, clarify the leader's intent to ICs and first responders that supports the land management plan and the fire management plan direction, as it pertains to GRSG habitat protection; for example, "To the extent it can safely be performed, retain unburned fingers and islands that do not pose a significant threat of escape."
- Update resource advisor kits for treatment areas, site data of GRSG landscape, and ability to advise fire manages and ICs of areas more and less resilient and resistant. Provide knowledge to better prioritize localized incident suppression action (extended attack).
- Familiarize duty officers with priority areas in GRSG habitat that are more or less resistant and resilient, any pre-attack plan generated for a specific area, treatment locations, and advantages on the landscape engineered to aid in containment (initial attack prioritization and efficiency).
- Improve and maintain roads in the PAC to provide for more efficient response, suppression action, control lines, logistical support for incident, and post incident treatment and recovery.
- Within PPA boundaries, prioritize the fire suppression initial attack to areas with big sagebrush over low sage. Also prioritize dry-lower

elevation sites (Wyoming big sagebrush sites) for action over moist-high elevation sites (mountain big sagebrush sites).

Habitat Restoration and Recovery

Changes in the historical fire regime are observed throughout the Hay Creek PPA. In the high elevation sagebrush steppe habitats of the Northern Great Basin, fire frequency reduction has converted the dominant vegetation from mountain big sagebrush/perennial grass communities to juniper woodlands. Active management will be used to reduce conifers throughout the entire PPA, with 13,466 acres of juniper encroachment currently observed from the conifer encroachment layer. Future treatments have been identified and much of the NEPA analysis has already been completed for the Hay Creek PPA.

Conifer treatments would occur in areas determined appropriate by an interdisciplinary team of experts. Actions may include cutting, limbing, brush beating, machine piling or hand piling, pile burning, and using prescribed fire, depending on site conditions and the ability to remove fuel in a safe and effective manner.

Chemical treatments will continue to be used, specifically in treating annual grasses and noxious weeds following pile burning. Other treatments may be used as they become available or meet the needs of specific sites.

Using combinations of these treatments (see **Table 4-17**) and having the ability to use the best available tool for each area should improve the overall effectiveness of habitat restoration. Continued management will be done post-treatment to help maintain desirable vegetation and historical fire regimes.

Table 4-17
Hay Creek Habitat Restoration Potential Treatments

Priority	Priority 1	Priority 2	Priority 3	Total
Conifer treatment acres	17,517	3,840	380	21,737
Percent of PPA	49	11	2	60
Invasives treatment acres	0.00	0.00	0.00	0.00
Percent of PPA	0.00	0.00	0.00	0.00

The BLM Burns District is working through the CCA process with many permittees to ensure healthy land use in grazing allotments, which will promote GRSG habitat. The CCAs will generate permittee labor and possibly outside funding for conifer removal projects. Also, ongoing small-scale juniper removal projects to the south of the PPA may spread into the PPA as interest and permittee agreements with the USFWS develop.

Sagebrush and perennial grasses will be seeded on the areas affected by juniper removal. The total area seeded will depend on the treatment method used (e.g., pile versus broadcast burn). Seeding can be used in areas where fire is not an

aspect of the treatment if there is no adequate amount of desirable herbaceous vegetation due to the severity of juniper encroachment.

Post-Fire Rehabilitation Management

Due to the small size of the Hay Creek PPA, post-fire rehabilitation will be prioritized for the entire area. ESR will be done on a site-by-site basis, with an overall goal of establishing perennial bunch grass and sagebrush communities (see **Table 4-18**). About 98 percent of the Hay Creek PPA is in the high resistance and resilience category and will likely recover with minimal vegetative assistance. However, regions exposed to severe wildfire conditions or that have lost herbaceous understory due to juniper encroachment will need to be identified and treated.

Table 4-18
Post-Fire Rehabilitation Management Strategies

Priority	Priority 1	Priority 2	Priority 3	Total
Acres	35,778.39	0.00	0.00	35,778.39
Percent of PPA	100	0.00	0.00	100

Additionally, significant effort and funding should be put toward developing local seed sources and storing enough of a supply to meet restoration and rehabilitation project needs.

Proposed Management

See **Table 4-19** for projects that have been identified presently within the NEPA planning process. See **Figures 4-14** through **4-20** for a graphic depiction of the proposed treatments and strategies in the PPA.

Table 4-19
Hay Creek Project Planning Area Treatment Summary Table

Treatment Description		Priority			Threats Addressed				NEPA			Treatments				
Name/ Type	Acres/ Miles	1st	2nd	3rd	Conifer (C)	Invasive annual grasses (I)	Riparian (R)	Wildfire (W)	Initiated (I)	Completed (C)	Needed (N)	Time Frame: Pending Funding (P)[1]	Time Frame: Implementing (I)[1]	Certainty of Effectiveness[1]: Likely	Certainty of Effectiveness[1]: Unlikely	Maintenance Time Frame (Years)[2]	Completion Time Frame (0-2, 3-5, 5+ years)[3]
All projects listed are conifer control, unless listed otherwise.	All amounts are acres, unless noted otherwise.																
E. Silvies Rangeland Restoration EA	6,730	X			C	I	R	W		C		P		X; I		10-15	0-2

Table 4-19
Hay Creek Project Planning Area Treatment Summary Table

Treatment Description		Priority			Threats Addressed				NEPA			Treatments			
Name/ Type	Acres/ Miles											Time Frame		Certainty of Effectiveness[1]			
All projects listed are conifer control, unless listed otherwise.	All amounts are acres, unless noted otherwise.	1st	2nd	3rd	Conifer (C)	Invasive annual grasses (I)	Riparian (R)	Wildfire (W)	Initiated (I)	Completed (C)	Needed (N)	Pending Funding (P)[1]	Implementing (I)[1]	Likely	Unlikely	Maintenance Time Frame (Years)[2]	Completion Time Frame (0-2, 3-5, 5+ years)[3]
Slickear Creek. Claw Creek EA	3,840		X		C		R	W		C		P		X; 1		10-15	3-5
SES Forest and Woodland Restoration	380			X	C		R	W		C		P		X;1		10-15	3-5
Hay Creek PPA Restoration DNA	10,787	X			C	1	R	W	1			P		X; 1		10-15	3-5
Hay Creek Fuelbreaks																	

[1]States that if treatment, once completed, is likely or unlikely to be effective and provide rationale using these codes:
1 = site conditions (soils, resilience, species composition, disturbances) make treatment effectiveness likely
2 = site conditions (soils, resilience, species composition, disturbances) make treatment effectiveness unlikely
3 = continued current management (grazing, recreation, or other land uses) make likelihood of effectiveness low
4 = based on professional opinion, treatment is likely to be effective
[2]This describes the frequency of maintenance necessary to continue effectiveness (years).
[3]This identifies the potential treatment completion time frame, considering NEPA adequacy, relative priority, and local ranking factors.

4.2.1 Paulina Project Planning Area

The Paulina PPA located approximately 40 miles southeast of Prineville and is next to the town of Paulina. The Paulina PPA extends north and east from Paulina to the Ochoco National Forest. It encompasses 19 percent of the 12 Mile PAC. Of the 431,001 total acres in the 12 Mile PAC, 402,149 acres are potential sagebrush habitat (see **Table 4-20**).

Most of the landownership in the PPA is private, with scattered BLM-administered land and small amounts of Forest Service land. The boundary of the PPA was adjusted outside the emphasis area in order to include existing leks, GRSG habitat, and planned treatments to the east of the emphasis area.

The management objective is to reduce juniper canopy cover. Much of the juniper cover in this PPA has reached phase II, so a combination of treatments is possible, such as seeding, cutting, and pile burning.

Table 4-20
Paulina Vegetation Categories

Vegetation Category	Big Sagebrush Shrubland	Black/Low Sagebrush	Grassland	Invasives	Riparian	Salt Desert Scrub	Woodland	Other
Acres	23,004.55	0.00	39,694.33	2,760.41	4,067.78	0.00	2,494.08	21,475.69
Percent of PPA	24.53	0.00	42.33	2.94	4.34	0.00	2.66	22.90

Containing annual grass populations and restoring native understories in the stiff sagebrush flats is an important component of restoration, especially in the northern portions of the PPA.

Although three specific areas were identified for ESR priority, all wildfires in this PPA should be evaluated because of nearby annual grass issues and the reduced resilience of the sites, based on current vegetative conditions (see **Table 4-21**).

Table 4-21
Paulina Summary of Burn Probability

High and very high burn probability in PPA (acres)	83,903.83
High and very high burn probability in PPA (percent)	89.46

Fuels Management

No fuelbreak treatments are identified in the Paulina PPA due to the extent of agricultural lands that can be used as natural fuelbreaks.

From a fuels management and restoration perspective, small prescribed fires would be appropriate in the higher resistance and resilience areas. Smaller fires are rarer now; fires tend to be larger and more intense. Prescribed fire could be a viable option for treatment in this PPA, but suitability would be very site specific. No areas were identified for prescribed fire treatments in this assessment, with the understanding that suitability of this type of treatment will be addressed in the Step 3 planning process.

Land in Paulina PPA is under BLM administration or is Oregon Department of State lands and private lands. Opportunities exist to implement fuel treatments across all jurisdictional boundaries.

Habitat Restoration and Recovery

Habitat restoration in the Paulina PPA consists mainly of removing conifers, focusing on recovering sagebrush steppe habitat for GRSG enhancement. Total area available for treatment is approximately 86,721 acres. Treatment types are mastication, chipping, grapple piling, hand thinning, and prescribed burning (swamper, jackpot, or hand pile), combined with follow-up seeding and chemical treatments as necessary. NRCS has been working with private landowners to cut juniper in the east and northeastern portions of the PPA.

An integrated vegetation management approach will be used to manage invasive species. The sage-grouse habitat matrix shows this PPA to be moderately to highly resistant and resilient (see **Table 4-22**); therefore, a combination of both passive and active restoration will be used, based on the presence or absence of invasive species. Where invasive species are present, a more active approach will be used.

Table 4-22
Paulina Sage-Grouse Habitat Matrix Categories

Matrix Category	No Data	1A	1B	1C	2A	2B	2C	3A	3B	3C
Acres	10,031.10	0.00	31,934.71	33,236.40	0.00	5,037.21	2,886.20	0.00	32.48	666.44
Percent of PPA	10.70	0.00	34.05	35.44	0.00	5.37	3.08	0.00	0.03	0.71

Two polygons were identified for invasives treatments using the invasives density layer. Invasives are medusahead, cheatgrass, and Japanese brome. Rocky soils characterize the area. Containing invasives is challenging, given livestock and wildlife prevalence in this area. Annual or biannual spraying may be a treatment option in the lower resistance and resilience areas. This would need to be a coordinated process among the various responsible agencies and landowners. Possible treatment could be to thin the overstory, but response would be bare rock with possible invasives (see **Table 4-23**).

Table 4-23
Paulina Habitat Restoration Potential Treatments

Priority	Priority 1	Priority 2	Priority 3	Total
Conifer treatment acres	48,556.60	38,164.32	0.00	86,720.92
Percent of PPA	51.77	40.69	0.00	92.47
Invasives treatment acres	31,513.93	6,248.50	56,021.99	93,784.42
Percent of PPA	33.60	6.66	59.73	100.00

This PPA is mostly cool-moist and is relatively resilient, but there is weed prevalence in stiff sage and big sage areas. Gaps between perennial grasses are often filled with annuals.

An active restoration option is to identify satellite locations (small isolated patches of approximately five acres) and spot spray them using an early detection and rapid response priority area method.

Areas outside these polygons were determined to be more resilient and were not as high a priority for treatment.

Integrated vegetation management will be used throughout the Paulina PPA.

Post-Fire Rehabilitation

There are more post-fire active restoration options in this PPA (see **Table 4-24**). Areas of high priority for post-fire rehabilitation are mainly all high-density weed areas. The remainder of the PPA would be conducive to passive recovery; in any case, seeding would be challenging, due to rocky soils.

Table 4-24
Paulina Post-Fire Rehabilitation Management Strategies

Priority	Priority 1	Priority 2	Priority 3	Total
Acres	31,513.93	6,248.50	0.00	37,762.43
Percent of PPA	33.60	6.66	0.00	40.27

The prevalence of highly desirable, moderate resiliency habitat (2B and 2C) elevates the need for prompt fire rehabilitation, with an emphasis on establishing sagebrush cover and limiting cheatgrass establishment post-fire in this area. Cheatgrass expansion and ecosystem state conversion is a high concern in this focal area.

First priority treatments would be centered on the valley bottoms designated 2C and any impacted fuels or restoration treatments. Second priority treatments would be 2B-designated habitat on the lower third of the slope and alluvial fans around the Mountain Ranges. High elevation fires in the focal area may become a priority for treatment as erosion potential to impact habitat values appears to be a significant risk.

Treatment considerations are as follows:

- Targeted seeding on north- and east-facing microclimates in the areas designated as 2B and 2C would enhance the probability of successful establishment.
- Some form of ground preparation, such as drill seeding or harrowing, is warranted and feasible on valley bottom areas designated as 2C.
- Areas appropriate for drill seeding and equipment use first need to be inventoried to remove archaeological constraints for prompt treatment.
- Herbicide treatments to suppress cheatgrass growth and favor seeded species should be considered as a portion of the ESR treatment plan.
- Erosion control structures should be placed in areas with high burn severity or high risk for erosion, that is areas with phase 3 juniper encroachment.

Additionally, significant effort and funding needs to be put toward developing local seed sources and storing enough of a supply to meet the needs for restoration and rehabilitation projects.

Proposed Management

See **Table 4-25** for projects that have been identified presently within the NEPA planning process. See **Figures 4-21** through **4-27** for a graphic depiction of the proposed treatments and strategies in the PPA.

Table 4-25
Paulina Project Planning Area Treatment Summary Table

Treatment Description		Priority			Threats Addressed				NEPA			Treatments			
Name/ Type	Acres/ Miles	1st	2nd	3rd	Conifer (C)	Invasive annual grasses (I)	Riparian (R)	Wildfire (W)	Initiated (I)	Completed (C)	Needed (N)	Time Frame: Pending Funding (P)[1]	Time Frame: Implementing (I)[1]	Certainty of Effectiveness[1]: Likely	Certainty of Effectiveness[1]: Unlikely	Maintenance Time Frame (Years)[2]	Completion Time Frame (0-2, 3-5, 5+ years)[3]
All projects listed are conifer control, unless listed otherwise.	All amounts are acres, unless noted otherwise.																
2015 BLM	2,263		X		C			W		C			I	I		20+	0-2
2015 NRCS	3,556	X			C			W		C			I	I		20+	0-2
2015 NRCS	1,880		X		C			W		C			I	I		20+	0-2
2016 NRCS	2,576	X			C			W		C		P		I		20+	0-2
2016 NRCS	560		X		C			W		C		P		I		20+	0-2
2017 BLM	4,110	X			C			W		C		P		I		20+	0-2
2017 BLM	1,227		X		C			W		C		P		I		20+	0-2
2017 NRCS	24		X		C			W		C		P		I		20+	0-2
2023 BLM	99		X		C			W		C		P		I		20+	5+
2016 Invasive	41	X				I		W	I			P		I		5+	0-2
2016 Invasive	17		X			I		W	I			P		I		5+	0-2
2016 Invasive	6			X		I		W	I			P		I		5+	0-2
2019 Invasive	2566	X				I		W	I			P		I		5+	3-5
2023 Invasive	41	X				I		W	I			P		I		5+	5+
2023 Invasive	17		X			I		W	I			P		I		5+	5+

Table 4-25
Paulina Project Planning Area Treatment Summary Table

Treatment Description		Priority			Threats Addressed				NEPA			Treatments					
Name/ Type	Acres/ Miles	1st	2nd	3rd	Conifer (C)	Invasive annual grasses (I)	Riparian (R)	Wildfire (W)	Initiated (I)	Completed (C)	Needed (N)	Time Frame: Pending Funding (P)[1]	Time Frame: Implementing (I)[1]	Certainty of Effectiveness[1]: Likely	Certainty of Effectiveness[1]: Unlikely	Maintenance Time Frame (Years)[2]	Completion Time Frame (0-2, 3-5, 5+ years)[3]
All projects listed are conifer control, unless listed otherwise.	All amounts are acres, unless noted otherwise.																
2023 Invasive	1606			X		I		W	I			P		I		5+	5+

[1]States that if treatment, once completed, is likely or unlikely to be effective and provide rationale using these codes:
1 = site conditions (soils, resilience, species composition, disturbances) make treatment effectiveness likely
2 = site conditions (soils, resilience, species composition, disturbances) make treatment effectiveness unlikely
3 = continued current management (grazing, recreation, or other land uses) make likelihood of effectiveness low
4 = based on professional opinion, treatment is likely to be effective
[2]This describes the frequency of maintenance necessary to continue effectiveness (years).
[3]This identifies the potential treatment completion time frame, considering NEPA adequacy, relative priority, and local ranking factors.

4.2.2 12 Mile Project Planning Area

The 12 Mile PPA is roughly 53 miles east-southeast of Prineville and next to Paulina. It extends in a north-south direction from Paulina south to within eight miles of State Highway 20 near Hampton. The 12 Mile PPA encompasses 48 percent of the 12 Mile PAC. Of the 431,001 total acres in the 12 Mile PAC there are 402,149 acres of potential sagebrush habitat (see **Table 4-26**). The PPA has slightly more private lands than those administered by the BLM, most of which runs north-south on the western flank. Public access is limited due to the amount of private lands, but there is one main county route running through the PPA.

Table 4-26
12 Mile Vegetation Categories

Vegetation Category	Big Sagebrush Shrubland	Black/Low Sagebrush	Grassland	Invasives	Riparian	Salt Desert Scrub	Woodland	Other
Acres	37,778.96	0.00	110,478.36	6,715.42	3,382.68	0.00	2,504.61	51,360.34
Percent of PPA	17.75	0.00	51.92	3.16	1.59	0.00	1.18	24.14

The entire emphasis area is defined as the PPA and its boundaries have been expanded to include additional GRSG habitat that did not meet the emphasis area criteria. This adjustment was made as a result of input from the NRCS and ODFW. It was based on the area's abundance of active leks and key conifer treatment projects associated with those leks.

There is a distinct mesic/xeric break in the southern portion of the PPA, which helped to define the types and locations of its treatments. It is an east-west break: west is cool-dry, generally associated with Wyoming big sage, and east is cool-moist, generally associated with Mountain big sage (see **Table 4-27**).

Table 4-27
12 Mile Sage-Grouse Habitat Matrix Categories

Matrix Category	No Data	1A	1B	1C	2A	2B	2C	3A	3B	3C
Acres	129.67	0.00	20,269.04	137,326.04	0.00	2,937.31	50,483.54	0.00	0.00	1,164.93
Percent of PPA	0.06	0.00	9.53	64.54	0.00	1.38	23.73	0.00	0.00	0.55

Table 4-28
12 Mile Summary of Burn Probability

High and very high burn probability in PPA (acres)	210,287.86
High and very high burn probability in PPA (percent)	98.83

Fuels Management

Fuels management in the 12 Mile PPA consists mainly of conifer removal, focusing on recovering sagebrush steppe habitat for GRSG enhancement. The area available for treatment is approximately 214,900 acres. Treatment types are mastication, chipping, grapple piling, hand thinning, and prescribed burning (jackpot or hand pile using a swamper), combined with follow-up seeding and chemical treatments as necessary.

Main roads in the 12 Mile PPA present opportunities for use as fuelbreaks to slow fire progression across critical habitats throughout the emphasis area. The area available for treatment is approximately 198 acres (see **Table 4-29**). Treatment types in these areas include maintaining road rights-of-way clear of vegetation, mowing a fuelbreak clear of vegetation (width dictated by fuel type), removing conifers, and following up chemical and seeding applications where appropriate.

Table 4-29
12 Mile Fuels Management Potential Treatments

Priority	Priority 1	Priority 2	Priority 3	Total
Fuelbreaks miles	16.34	0.00	0.00	16.34
Sagebrush thinning acres	141.42	0.00	0.00	141.42
Percent of PPA	0.07	0.00	0.00	0.07

Land in this PPA is under BLM administration or is Oregon Department of State lands or private lands. Opportunities exist to implement fuelbreaks across all jurisdictional boundaries. One fuelbreak has been identified to separate most of the lower resistance and resilient habitats from the rest of the PPA. The

fuelbreak strategy is to treat annual grasses and reduce junipers to reduce fire intensity and the probability of spotting potential along the main county road.

This is a high resistance and resilience landscape that may afford the opportunity to use prescribed fire as a fuels management and restoration treatment. Scattered areas in the PPA are under BLM administration and may be large enough to support smaller burns of 300- to 600-acres.

One small area with dense sagebrush canopy is proposed for experimental sagebrush thinning to reduce the horizontal continuity of the canopy, thus reducing the potential for fire spread. Additionally, opening up the dense canopy will provide opportunities for native grasses and forbs to become reestablished.

Shrub densities are at or above the 30 percent canopy cover level in portions of both the Brothers and 12 Mile PPAs. This density of shrubs limits important GRSG forage production. Because of this there is an interest to conduct test mowing to modify and improve decadent sagebrush and encourage understory growth.

Due to the thick shrub canopy cover, small chemical treatments or mowing projects would be researched. These types of treatments would reduce canopy cover and allow native grasses and forbs to become reestablished either naturally or through reseeding and planting. Test locations selected are classified as moderate resistance and resilience (2C) in areas with landscape shrub percentages in the high category (greater than 65 percent). Because there is a risk that this disturbance may lead to additional annual grass expansion these treatments may be accompanied by post-treatment seeding or herbicide application.

Habitat Restoration and Recovery

Most of the PPA has been identified for conifer control. NRCS has been working with private landowners in the areas to control juniper, and the BLM has identified treatment blocks on almost all acres it manages. NEPA analysis has been completed for a large portion of the BLM's proposed treatments. The two primary objectives are to treat juniper stands that will immediately be good habitat after treatment and to treat large blocks to reduce juniper fragmentation and predator perch sites.

Conifer treatments in the southern portion of the project planning area forms a doughnut shape to capture areas with high tree canopy density and existing treatments; it excludes areas with lower tree canopy density, where treatments have already been completed.

Treatment area boundaries were defined at the landscape level regardless of ownership. Specific treatments by landownership will be coordinated later. A second treatment area in the northern portion of the project planning area captures areas with high tree density (as depicted using tree canopy layer) and

incorporates existing and planned treatments. A third treatment area is small and next to the wilderness, with small juniper encroachment areas. There is likely more phase 1 juniper present than what is shown on the tree canopy layer.

There may be an opportunity to coordinate with the Forest Service regarding the Dove Project south of Suplee with juniper treatments in the northeast portion of the 12 Mile PPA.

Invasives Treatments

A full range of integrated vegetation management techniques will be used to reduce the threat of invasives in the PPA. Two large annual grass treatment areas were identified with the objective of containing the invasives populations by treating along roads and denser stands (see **Table 4-30**).

Table 4-30
12 Mile Habitat Restoration Potential Treatments

Priority	Priority 1	Priority 2	Priority 3	Total
Conifer treatment acres	119,057.91	54,312.73	41,531.90	214,902.54
Percent of PPA	55.95	25.53	19.52	101.00
Invasives treatment acres	56,590.66	36,261.79	119,926.20	212,778.65
Percent of PPA	26.60	17.04	56.36	100.00

Areas in warm-dry soil zones will be targeted for habitat restoration, even though there are not significant annual grass issues. These areas will be less resistant and resilient and therefore slower to recover post-fire. Areas in the cool-moist zones will be more resilient and quicker to recover. The priority treatment area is in the western portion of the PPA, with an additional treatment area in the southern portion.

A possible treatment consideration would be to reduce the Wyoming big sage canopy cover. There are areas where the sagebrush canopy cover is too dense; this precludes a healthy herbaceous component on the landscape, which reduces the overall resistance and resilience. A general description of landscape conditions could be developed to identify where canopies could be reduced.

Existing Treatments

The 12 Mile PPA is in the project boundaries of the High Desert Shrub Steppe Restoration Environmental Assessment (April 2011). In fall 2014, the BLM Prineville District has began removing 16,053 acres of conifers, and the project is planned to be completed in 2016. This will improve GRSG habitat by removing conifers in encroached and expanding areas. Major emphasis is placed on returning these sites to sagebrush for GRSG use. Maintaining these projects will be essential to keep meeting GRSG habitat objectives. The NRCS has been working with local landowners and has been aggressively treating juniper on private lands for the past few years.

Post-Fire Rehabilitation

ESR treatments would be considered throughout the PPA, but the southwest portion was identified as a priority area for ESR. This is because the sites are less resilient and likely would require more active management to fully recover, such as seeding.

Possible proactive measures can be used so that if or when the area burns it will recover without regime shift; these are spraying the roads (roads are mainly private) and adapting the grazing system to enhance the habitat (CED shows that efforts have been made to adapt grazing in response to GRSG). Pre-fire treatment in the southwest would be a good place to start; this area is mostly cheatgrass, whereas the invasives treatment area in the north includes other species, such as medusahead. ESI is available for subsequent site-specific planning. This will need to be broken out as a treatment in FIAT Step 3.

The prevalence of highly desirable, medium resiliency habitat (2B and 2C) elevates the need for prompt fire rehabilitation, with an emphasis on establishing sagebrush cover and limiting cheatgrass establishment post-fire in this emphasis area. Cheatgrass expansion and ecosystem state conversion is a high concern in this focal area.

First order treatment priority would be centered on the valley bottoms designated as 2C and any impacted fuels or restoration treatments. Second order treatment priorities would be designating as 2B habitat on the lower third of the slope and alluvial fans around the mountain ranges.

High elevation fires in the focal area may become a priority for treatment as erosion potential to impact habitat values appears to be a significant risk (see **Table 4-31**). Passive restoration treatments will be used where there is less risk of invasives becoming established and native species have a higher likelihood of reestablishing themselves. Integrated vegetation management techniques will be used during all fuels restoration and rehabilitation.

Table 4-31
12 Mile Post-Fire Rehabilitation Management Strategies

Priority	Priority 1	Priority 2	Priority 3	Total
Acres	56,590.66	36,261.79	119,926.20	212,778.65
Percent of PPA	26.60	17.04	56.36	100.00

Treatment considerations are as follows:

- Targeted seeding on north- and east-facing microclimates in the areas designated 3B and 3C would enhance the probability of successful establishment.

- Use of some form of ground preparation, such as drill seeding and harrowing, is warranted and feasible on valley bottoms designated as 2C.
- Areas appropriate for drill seeding and equipment use first need to be inventoried to remove archaeological constraints for prompt treatment.
- Herbicide treatments to suppress cheatgrass growth and favor seeded species should be considered as a portion of the ESR treatment plan.
- Erosion control structures should be placed in areas with high burn severity or high risk for erosion (that is, areas with phase 3 juniper encroachment).

Additionally, significant effort and funding needs to be put toward the development of local seed sources and storing enough of a supply to meet restoration and rehabilitation needs.

Proposed Management

See **Table 4-32** for projects that have been identified presently within the NEPA planning process. See **Figures 4-29** through **4-34** for a graphic depiction of the proposed treatments and strategies in the PPA.

Table 4-32
12 Mile Project Planning Area Treatment Summary Table

Treatment Description		Priority			Threats Addressed				NEPA			Treatments				
Name/ Type	Acres/ Miles											Time Frame		Certainty of Effectiveness[1]		
All projects listed are conifer control, unless listed otherwise.	All amounts are acres, unless noted otherwise.	1st	2nd	3rd	Conifer (C)	Invasive annual grasses (I)	Riparian (R)	Wildfire (W)	Initiated (I)	Completed (C)	Needed (N)	Pending Funding (P)[1]	Implementing (I)[1]	Likely	Unlikely	Maintenance Time Frame (Years)[2]	Completion Time Frame (0-2, 3-5, 5+ years)[3]
2015 BLM	13,323	X			C			W		C			I	I		20+	0-2
2015 BLM	3,087		X		C			W		C			I	I		20+	0-2
2015 BLM	42			X	C			W		C			I	I		20+	0-2
2015 NRCS	6,290	X			C			W		C			I	I		20+	0-2
2015 NRCS	4,267		X		C			W		C			I	I		20+	0-2
2015 NRCS	4,652			X	C			W		C			I	I		20+	0-2
2016 BLM	790	X			C			W		C		P		I		20+	0-2
2016 BLM	1,721		X		C			W		C		P		I		20+	0-2
2016 BLM	54			X	C			W		C		P		I		20+	0-2
2016 NRCS	771	X			C			W		C		P		I		20+	0-2
2016 NRCS	1,111		X		C			W		C		P		I		20+	0-2
2016 NRCS	1,564			X	C			W		C		P		I		20+	0-2
2017 BLM	13,062	X			C			W		C		P		I		20+	0-2

Table 4-32
12 Mile Project Planning Area Treatment Summary Table

Treatment Description		Priority			Threats Addressed				NEPA			Treatments				
Name/ Type	Acres/ Miles	1st	2nd	3rd	Conifer (C)	Invasive annual grasses (I)	Riparian (R)	Wildfire (W)	Initiated (I)	Completed (C)	Needed (N)	Time Frame: Pending Funding (P)[1]	Time Frame: Implementing (I)[1]	Certainty of Effectiveness[1]: Likely	Certainty of Effectiveness[1]: Unlikely	Maintenance Time Frame (Years)[2]	Completion Time Frame (0-2, 3-5, 5+ years)[3]
All projects listed are conifer control, unless listed otherwise.	All amounts are acres, unless noted otherwise.																
2017 BLM	4,978		X		C			W		C		P		I		20+	0-2
2017 BLM	67			X	C			W		C		P		I		20+	0-2
2017 NRCS	4,442		X		C			W		C		P		I		20+	0-2
2018 BLM	2,182	X			C			W		C		P		I		20+	3-5
2018 BLM	153		X		C			W		C		P		I		20+	3-5
2018 BLM	472			X	C			W		C		P		I		20+	3-5
2020 BLM	18,046	X			C			W			N	P		I		20+	3-5
2020 BLM	6,539		X		C			W			N	P		I		20+	3-5
2020 BLM	318			X	C			W			N	P		I		20+	3-5
2016 Invasive	175	X				I		W	I			P		I		5+	0-2
2016 Invasive	58		X			I		W	I			P		I		5+	0-2
2016 Invasive	87			X		I		W	I			P		I		5+	0-2
2019 Invasive	3822		X			I		W	I			P		I		5+	3-5
2023 Invasive	175	X				I		W	I			P		I		5+	5+
2023 Invasive	2618		X			I		W	I			P		I		5+	5+
2023 Invasive	3959			X		I		W	I			P		I		5+	5+
2016 Fuelbreak*	16 miles	X						W			N	P		I		5+	0-2
2017 Sage Brush thinning	141	X						W			N	P		2		30+	0-2

[1]States that if treatment, once completed, is likely or unlikely to be effective and provide rationale using these codes:
1 = site conditions (soils, resilience, species composition, disturbances) make treatment effectiveness likely
2 = site conditions (soils, resilience, species composition, disturbances) make treatment effectiveness unlikely
3 = continued current management (grazing, recreation, or other land uses) make likelihood of effectiveness low
4 = based on professional opinion, treatment is likely to be effective
[2]This describes the frequency of maintenance necessary to continue effectiveness (years).
[3]This identifies the potential treatment completion time frame, considering NEPA adequacy, relative priority, and local ranking factors.

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SECTION 5
LOOKING AHEAD: IMPLEMENTATION, NEPA, AND MONITORING

5.1 IMPLEMENTATION STRATEGY

Management strategies identified in this assessment are consistent with broader land use plan direction. FIAT Assessments are referenced in the appendices of each sub-regional environmental impact statement. As such, the potential implementation of all FIAT management strategies are fully subject to all direction and constraints in the overarching land use plans and treatment level NEPA analysis. Topics such as noxious weed control and native seed use for habitat restoration projects are included in this section. These assessments are to assist land managers in selecting appropriate treatments (Step 2) and subsequently develop site-specific treatments and conduct the appropriate NEPA analyses (Step 3).

The planning, implementation, and monitoring cycle for FIAT strategies are a multi-year process. In or near the focal habitats in the FIAT assessment areas, the identified management strategies occur across the spectrum of the planning process. Planning is completed for some FIAT management strategies; they are NEPA compliant and are ready for implementation. Others are beyond the NEPA scoping phase, but planning is not yet complete. Finally, many potential treatments identified in this assessment were conceptualized in FIAT workshops; in these cases planning has not begun.

Prioritizing the sequence of project/treatment implementation is an important process. NEPA compliance, budgeting, unit capacity, and other factors may be considered, such as immediacy of the threat to GRSG. Furthermore, this prioritization is a necessary step in order to produce an out-year program of work.

This program of work is scheduled to follow the completion of FIAT Step 2 assessments. The program of work will portray the years for implementation,

the scale of treatment, and the type of treatment for each program/management strategy area.

The graphic below illustrates the sequence of FIAT steps, project implementation, and monitoring.

FIAT assessments were not designed to address project area practices; examples are specific changes in management to promote habitat recovery, the types of seed mixtures to use, or whether to address invasive species other than the invasive annual grasses. These activities are fully subject to all direction and constraints in the overarching land use plans and treatment level NEPA; however, the following suggestions are provided to assist in the transition from FIAT Step 2 to the project planning and NEPA stage (See **Figure 5-1** and **Table 5-1**).

Figure 5-1: FIAT Process

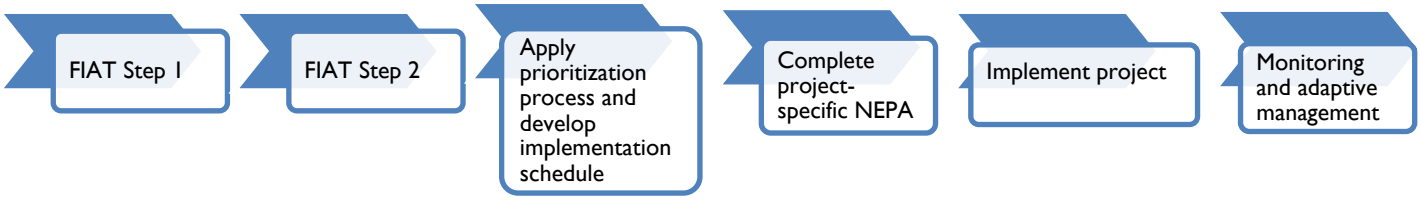


Table 5-1
Central Oregon Assessment Area Treatment Summary

Treatment Type	Acres				Miles			
	1st Priority	2nd Priority	3rd Priority	Total	1st Priority	2nd Priority	3rd Priority	Total
Habitat restoration	523,016	222,965	332,854	**1,078,835**	0	0	0	**0**
Fuels treatments	571	0	0	**571**	51	32	14	**97**
Fire operations	333,951	559,692	0	**893,643**	0	0	0	**0**
Post-fire treatments (ESR)	301,957	70,634	131,169	**503,760**	0	0	0	**0**

5.1.1 Fuels Management

A proactive strategy is fuels management, which is designed to reduce wildfire behavior by changing the size, arrangement, and loading (amount) of live and dead vegetation. Its purpose is to aid fire suppression and to reduce fire expansion. The focus of the FIAT Step 2 process was very specific to the identified habitats and the associated buffers of these areas (See **Table 5-2**).

Table 5-2
Fuels Management Potential Treatment Areas in Project Planning Areas in Central Oregon

PPA	Total Acres of Fuels Management Treatments	Total Miles of Potential Fuelbreaks
12 Mile	141	16
Brothers	431	67
Paulina	0	0
Hay Creek	0	14
Total	**571**	**97**

In the vegetation types being addressed, fire growth can cross large tracts of ground in very short time frames. Due to the focus on the habitats and buffers, many types of treatments, existing or planned, were not addressed in this process.

Areas outside of the PPAs will need to be addressed in the future. This is because they are often the only option available to minimize fires entering the planning areas and the identified leks. Future efforts should also include fuels and restoration types of treatments outside of the areas identified. That is because these areas will be critical for increasing habitat and for connecting the identified areas.

5.1.2 Habitat Restoration and Recovery

All natural systems vary in space and time; in many cases, restoring a range of target vegetative conditions may be desirable. Where historic processes are not likely to become reestablished, full restoration may not be possible. However, site resilience can be leveraged to increase ecological function over time, assuming proper post-disturbance management does not continue to bring a site back to a ruderal successional state.

Habitat restoration and recovery are two approaches to rebuilding or maintaining GRSG habitats. Active habitat restoration treatments are on-the-ground activities (e.g., seeding and controlling invasive annual grasses and conifer expansion), whereas passive habitat recovery involves changing management practices. Opportunities for passive restoration include changing livestock grazing management to improve GRSG habitat, applying appropriate wild horse and burro management, spot-treating weed infestations in treatment areas, and limiting or mitigating soil-disturbing activities, such as off-road vehicle use. These types of management changes were not specifically identified nor prioritized in the FIAT Step 2 stage.

Habitat restoration is expensive and requires time for plant establishment and recovery. Livestock grazing exclusion is a common practice to promote vegetation recovery or establishment after a surface-disturbing treatment or disturbance. Appropriate exclusion periods after habitat restoration should be considered and incorporated into the project planning/NEPA process. Similar

consideration also should be given to such resources and uses as wild horses and burros and recreation.

It is also important to institute appropriate long-term management strategies that will maintain habitat restoration projects into the future. For example, livestock grazing management should be evaluated and changes implemented to ensure that species diversity in a successful restoration seeding is maintained over time.

Habitat restoration (also includes post-fire rehabilitation treatments) may need to be repeated if projects initially fail to meet restoration objectives. Therefore, retreatment options should be considered in all proposed actions and implemented if needed. This is especially true in warm-dry soil temperature/moisture regimes where climatic conditions are often problematic for new plant establishment or recovery.

By further defining the restoration continuum, treatments can in turn be further defined and prioritized at finer local scales (see **Table 5-3** for treatment area acres in each PPA for conifer encroachment, invasive annual grasses, and habitat restoration).

Table 5-3
Habitat Restoration and Recovery Potential Treatment Areas in Central Oregon

PPA	Total Acres of Potential Conifer Encroachment Potential Treatments	Percent of PPA	Total Acres of Invasive Annual Grasses Potential Treatments	Percent of PPA	Total Acres of Other Potential Habitat Restoration and Recovery Potential Treatments	Percent of PPA
12 Mile	214,902	100	214,902	100	0	0
Brothers	217,423	100	217,423	100	0	0
Paulina	86,721	92.5	93,784	100	0	0
Hay Creek	35,778	100	0	0	0	0
Total	**554,824**	**99.1**	**526,109**	**94.0**	**0**	**0**

Habitat restoration is a proactive strategy that includes several types of treatments. The following are considerations for habitat restoration and recovery project planning, project implementation, and NEPA analysis:

- Reduce phase 1 and phase 2 conifer vegetation generally through mechanical treatment
- Manage invasive annual grasses, generally through the use of herbicide
- Seed and plant sagebrush

Other types of treatments can be used, with the primary goal of restoring or enhancing native plant species and vegetation structure in the native sagebrush steppe ecosystem; this may include removing undesirable plant species.

Invasive Species other than Invasive Annual Grasses

FIAT assessments address two categories of invasive species: invasive annual grasses and conifer species expanding into sagebrush habitats. This does not negate the importance of controlling other noxious plants in sagebrush habitat, but the FIAT assessment was not designed to address other invasive plants, including noxious plants. Therefore, locating infestations, decreasing propagule[2] pressure (especially along roadside areas), treating satellite infestations, and preventing future infestations in focal habitats have not been addressed nor prioritized in these assessments.

Noxious weed risk is especially high in areas undergoing FIAT treatments that may disturb the soil or remove competitive vegetation. Accordingly, noxious weed management is an important consideration for all land treatments originating from the FIAT assessment. Weed management in these treatment areas can be funded to include noxious weed inventories during the planning process, subsequent weed treatments (preferably before project implementation), and subsequent monitoring and follow-up weed treatments following project implementation.

Use of Native Species for Habitat Restoration and Post-Fire Rehabilitation

The use of adapted, native plant seed in restoration and post-fire rehabilitation projects is addressed in land use plans. To the extent practical and in concert with the appropriate land use plans, the use of locally adapted seeds and native plant materials appropriate to the location is recommended, along with conditions and management objectives for managing and restoring vegetation, including strategic sourcing for acquiring, storing, and using genetically appropriate seeds and other plant materials.

Under certain circumstances nonnative species may be needed to achieve site stabilization, fire breaks, and weed control and as transitional species for sequential restoration and to meet restoration objectives (2015 Draft of the National Seed Strategy and Implementation Plan: 2015-2020).

5.1.3 Fire Operations

Fire operations include preparedness, prevention, and suppression activities. As opposed to proactive, site-specific planned treatments, fire operations and post-fire rehabilitation treatments are reactive responses to random wildfires. See **Table 5-4** for areas of first and second priority suppression areas in each PPA.

[2]Part of a plant that can become detached to form a new plant, e.g. a bud or spore

Table 5-4
Fire Operations Potential Treatment Areas In Project Planning Areas in Central Oregon

PPA	Total Acres of 1st Priority Fire Suppression Areas	Percent of 1st Priority in PPA	Total Acres of 2nd Priority Fire Suppression Areas	Percent of 2nd Priority in PPA
12 Mile	135,897	63.9	76,879	36.1
Brothers	144,068	66.3	73,285	33.7
Paulina	36,780	39.2	50,004	57.6
Hay Creek	35,778	100	18,572	52.0
Total	**352,523**	**63.8**	**68,740**	**12.3**

5.1.4 Post-Fire Rehabilitation

Post-fire rehabilitation (**Table 5-5**) includes the BLM's ESR Program and the Forest Service's Burned Area Emergency Response Program. Program policies limit available funding from one to three years.

Table 5-5
Post-Fire Rehabilitation Potential Treatment Areas in Project Planning Areas in Central Oregon

PPA	Total Acres of 1st Priority Post-Fire Rehabilitation Areas	Percent of 1st Priority in each PPA	Total Acres of 2nd Priority Post-Fire Rehabilitation Areas	Percent of 2nd Priority in each PPA	Total acres of 1st and 2nd Priority Post-Fire Rehabilitation Areas	Total Percent of 1st and 2nd Priority Post-Fire Rehabilitation Areas
12 Mile	56,591	26.6	36,262	17	92,853	43.6
Brothers	178,076	81.9	28,124	12.9	206,200	94.8
Paulina	31,514	33.6	6,249	6.7	37,763	40.3
Hay Creek	35,778	100	0	0	35,778	100
Total	**301,959**	**53.9**	**70,635**	**12.6**	**372,594**	**66.6**

5.2 MONITORING AND ADAPTIVE MANAGEMENT

Once implemented, projects and treatments identified in this assessment will follow the same monitoring protocols as non-FIAT management actions, in accordance with overarching guidance in land use plans. Specifically, monitoring that evaluates the implementation and effectiveness of FIAT management strategies will follow The Greater Sage-Grouse Monitoring Framework (BLM/USFS 2014).

In this framework, monitoring and evaluating the individual FIAT actions, as with all projects designed to enhance or restore GRSG habitats, will use the approved fine- and site-scale monitoring methods of the BLM Core Terrestrial Indicators and Methods (from the AIM-Monitoring: A component of the Assessment, Inventory, and Monitoring [AIM] Strategy), Interpreting Indicators of Rangeland Health (BLM Technical Reference 1734-6) and the Sage-Grouse Habitat Assessment Framework (HAF-BLM Technical Reference 6710-1, in press).

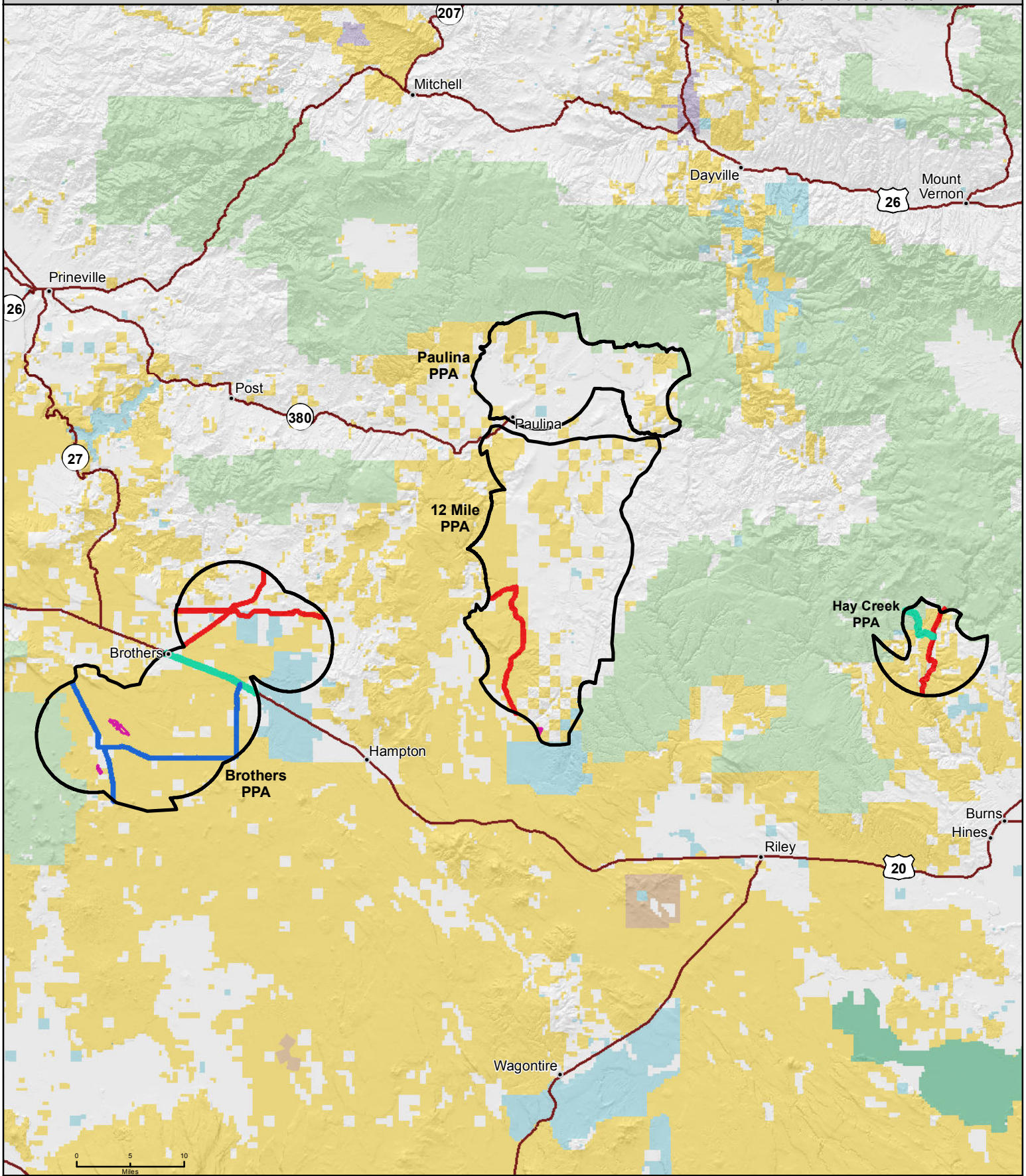
During the annual broad- and mid-scale monitoring of GRSG habitats, the FIAT actions will be assessed as they relate to GRSG habitat measures of sagebrush availability, human disturbance levels, and sagebrush conditions. Monitoring results from the implemented FIAT actions can provide information to adapt future actions if necessary to enhance and restore GRSG habitats.

Wildfires will be evaluated at the end of the fire season to determine if they have occurred in FIAT focal habitats and if so, if they have affected the prioritization or potential implementation of previously identified management strategies. For example, fuelbreak locations may need to be adjusted if a wildfire were to occur in an area previously identified as high priority for sagebrush maintenance. Surrounding areas with intact sagebrush stands may now be a higher priority for fuelbreaks than the burned area.

Central Oregon Fuels Management Potential Treatments

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



Map Location
Oregon

Fuels Management Potential Treatment

Fuel Break
- Priority 1
- Priority 2
- Priority 3

Sagebrush Thinning
- Priority 1

- FIAT Project Planning Area
- Cities
- Highways

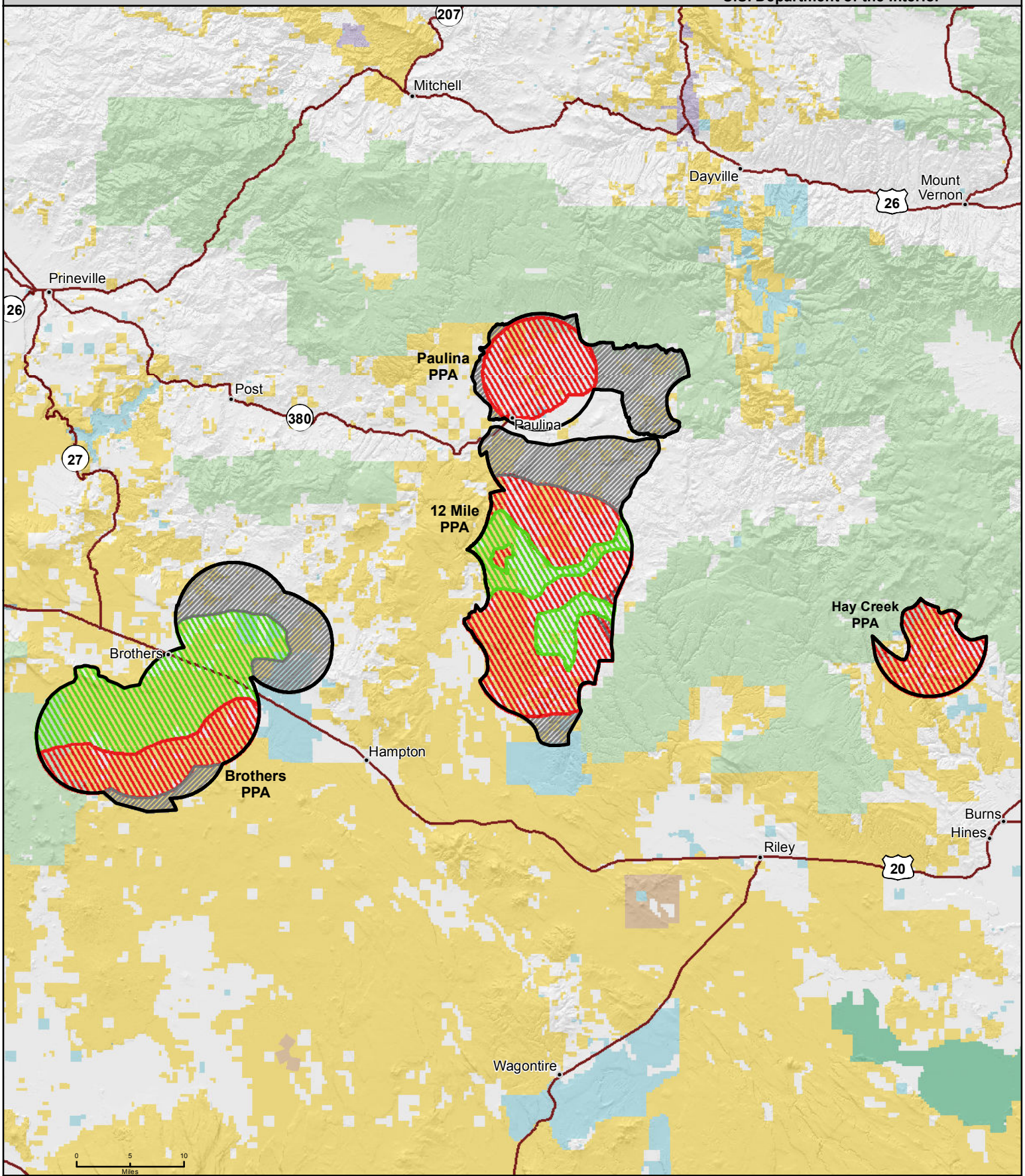
Administered Lands
- Bureau of Land Management
- U.S. Forest Service
- National Park Service
- U.S. Fish and Wildlife
- Other Federal
- State
- Local Government
- Private/Unknown

March 2015
Date Saved: 3/16/2015
Data Sources: BLM
1:750,000

Central Oregon Habitat Restoration Potential Treatments: Conifer

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



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Map Location
Oregon

Habitat Restoration Potential Treatment
Conifer
- Priority 1
- Priority 2
- Priority 3

- FIAT Project Planning Area
- Cities
- Highways

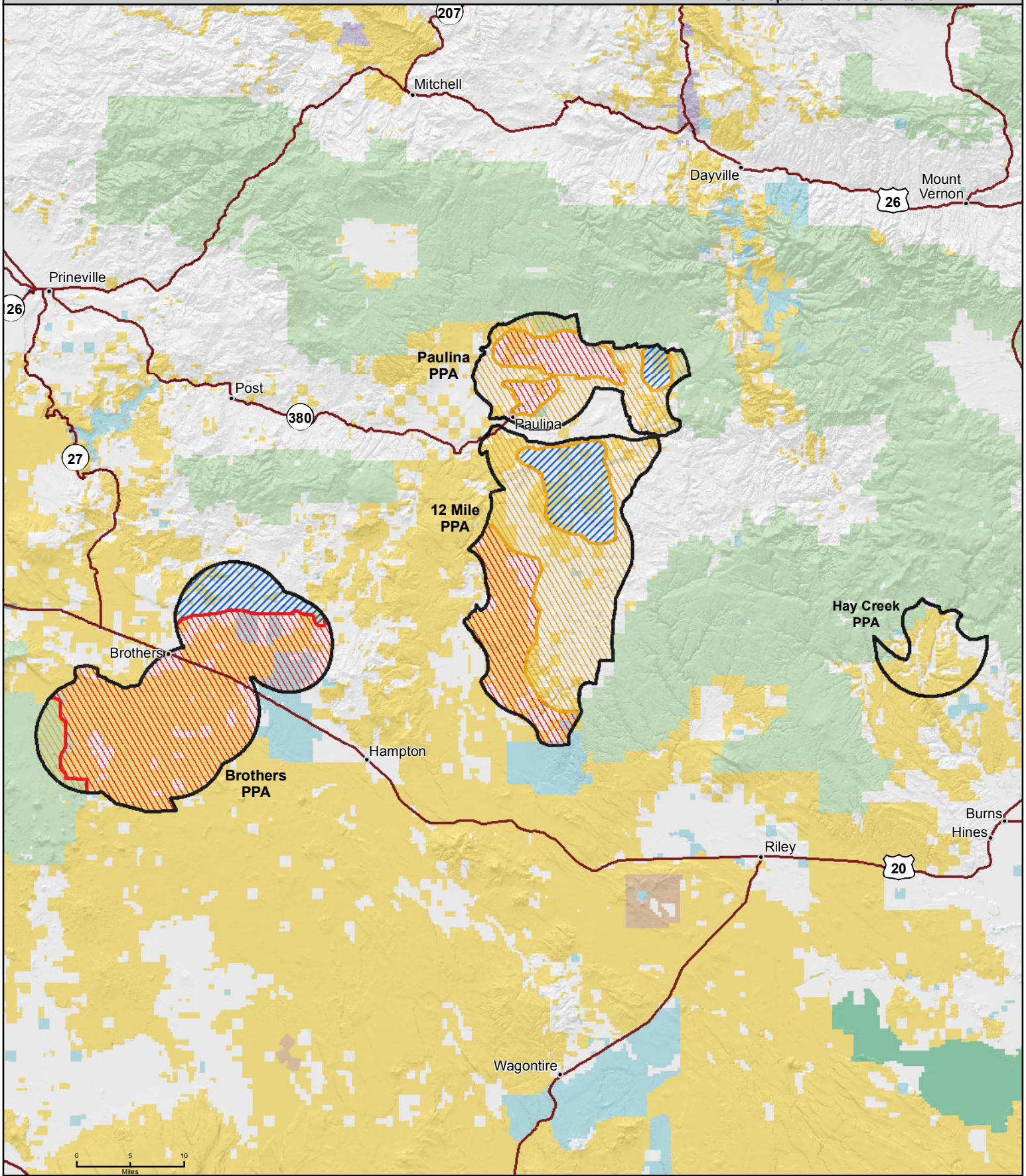
Administered Lands
- Bureau of Land Management
- U.S. Forest Service
- National Park Service
- U.S. Fish and Wildlife
- Other Federal
- State
- Local Government
- Private/Unknown

March 2015
Date Saved: 3/16/2015
Data Sources: BLM
1:750,000

Central Oregon Habitat Restoration Potential Treatments: Invasives

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



Map Location: Oregon

Habitat Restoration Potential Treatment
Invasives
- Priority 1
- Priority 2
- Priority 3

- FIAT Project Planning Area
- Cities
- Highways

Administered Lands
- Bureau of Land Management
- U.S. Forest Service
- National Park Service
- U.S. Fish and Wildlife
- Other Federal
- State
- Local Government
- Private/Unknown

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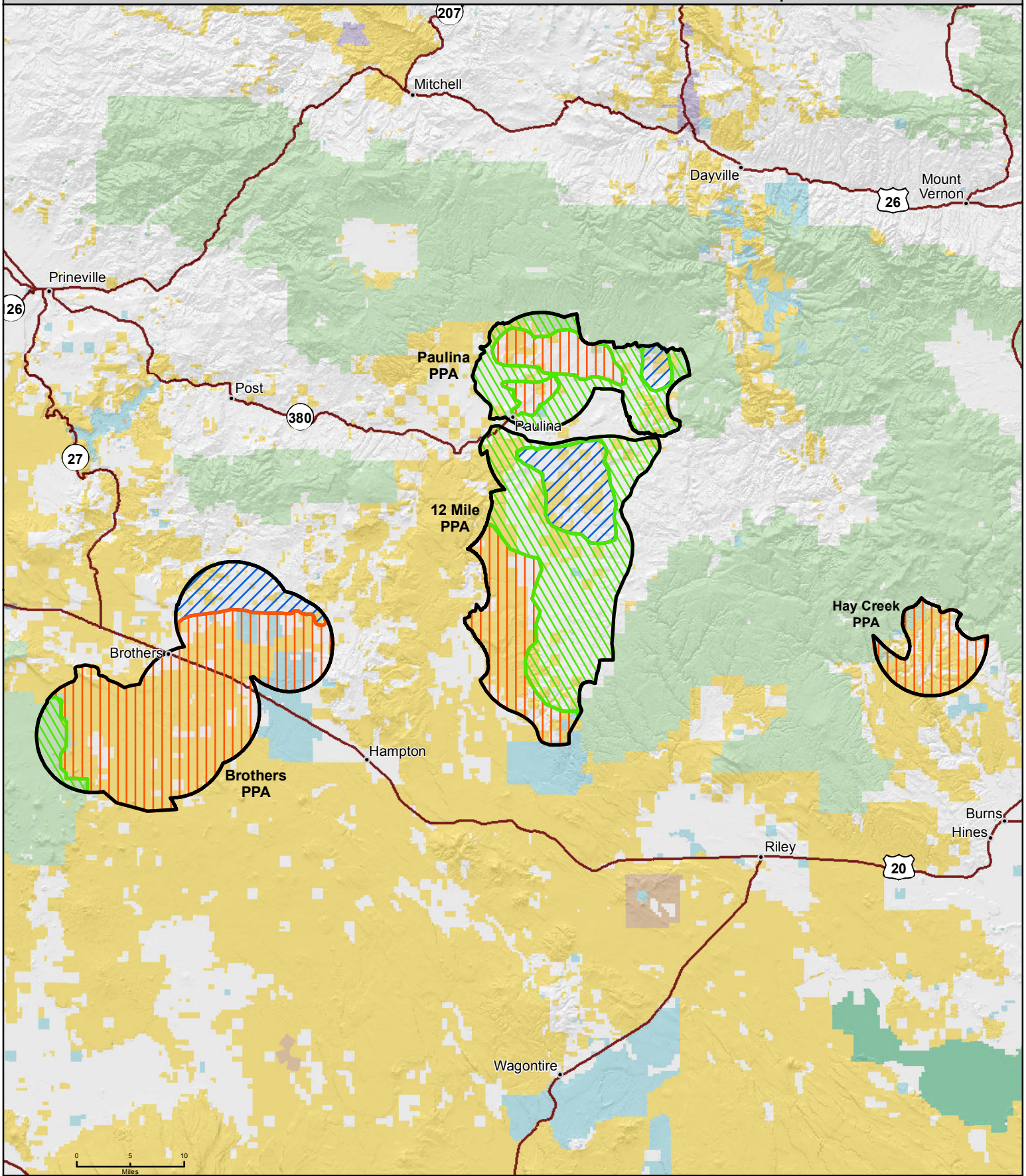
Central Oregon Post-Fire Rehabilitation Management Strategies

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



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Map Location
Oregon

Post-Fire Rehabilitation Management Strategy
- Priority 1
- Priority 2
- Priority 3

- FIAT Project Planning Area
- Cities
- Highways

Administered Lands
- Bureau of Land Management
- U.S. Forest Service
- National Park Service
- U.S. Fish and Wildlife
- Other Federal
- State
- Local Government
- Private/Unknown

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SECTION 6
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CHAPTER 7
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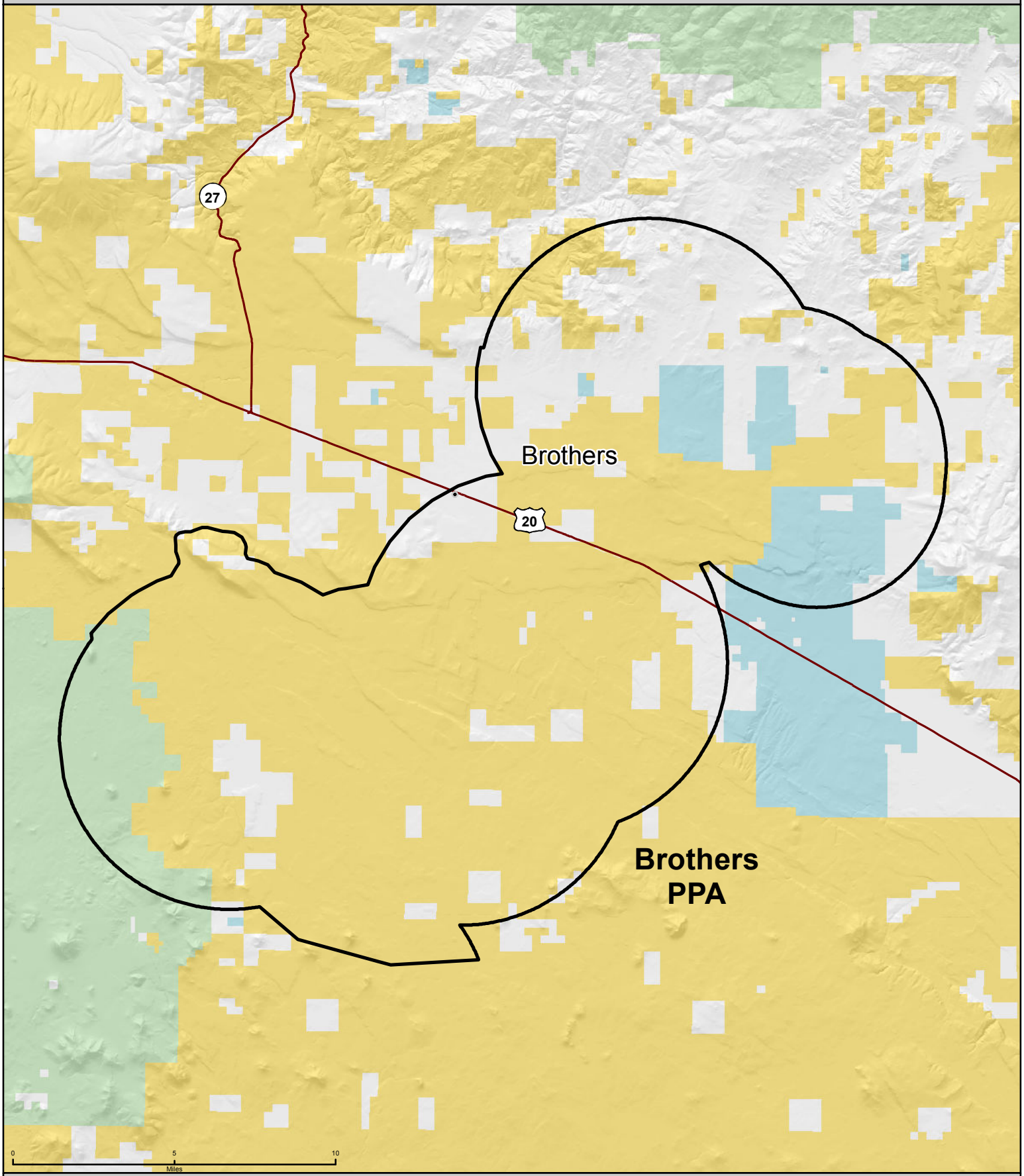
Appendix A
Maps

When viewed electronically, hyperlinks embedded throughout this document allow readers to navigate directly to the maps below.

Project Planning Areas - Brothers PPA

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



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FIAT Project Planning Area
Cities
Highways

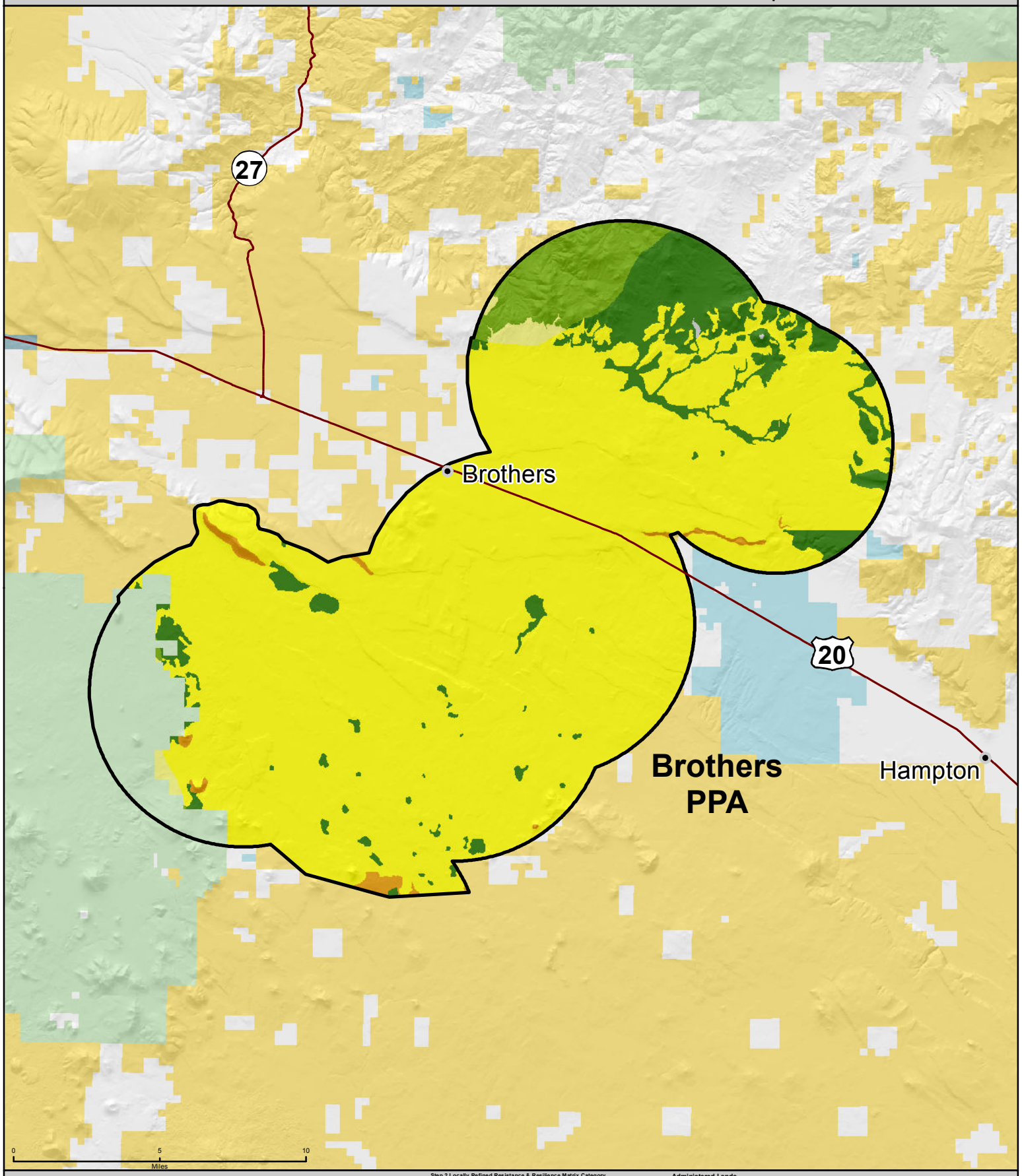
Administered Lands
Bureau of Land Management
U.S. Forest Service
State
Private/Unknown

March 2015
Date Saved: 3/16/2015
Data Sources: BLM
1:250,000

Sage-Grouse Habitat Matrix Categories - Brothers PPA

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



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Map Location
Oregon

Step 2 Locally Refined Resistance & Resilience Matrix Category

- 1B: 26% - 65% Sagebrush with Cool/Cold and Moist Soils
- 1C: > 65% Sagebrush with Cool/Cold and Moist Soils
- 2B: 26% - 65% Sagebrush with Warm and Moist Soils
- 2C: > 65% Sagebrush with Warm and Moist Soils
- 3B: 26% - 65% Sagebrush with Warm/Cool and Dry Soils
- 3C: > 65% Sagebrush with Warm/Cool and Dry Soils
- NA

Administered Lands

- Bureau of Land Management
- U.S. Forest Service
- National Park Service
- U.S. Fish and Wildlife
- Other Federal
- State
- Local Government
- Private/Unknown
- FIAT Project Planning Area

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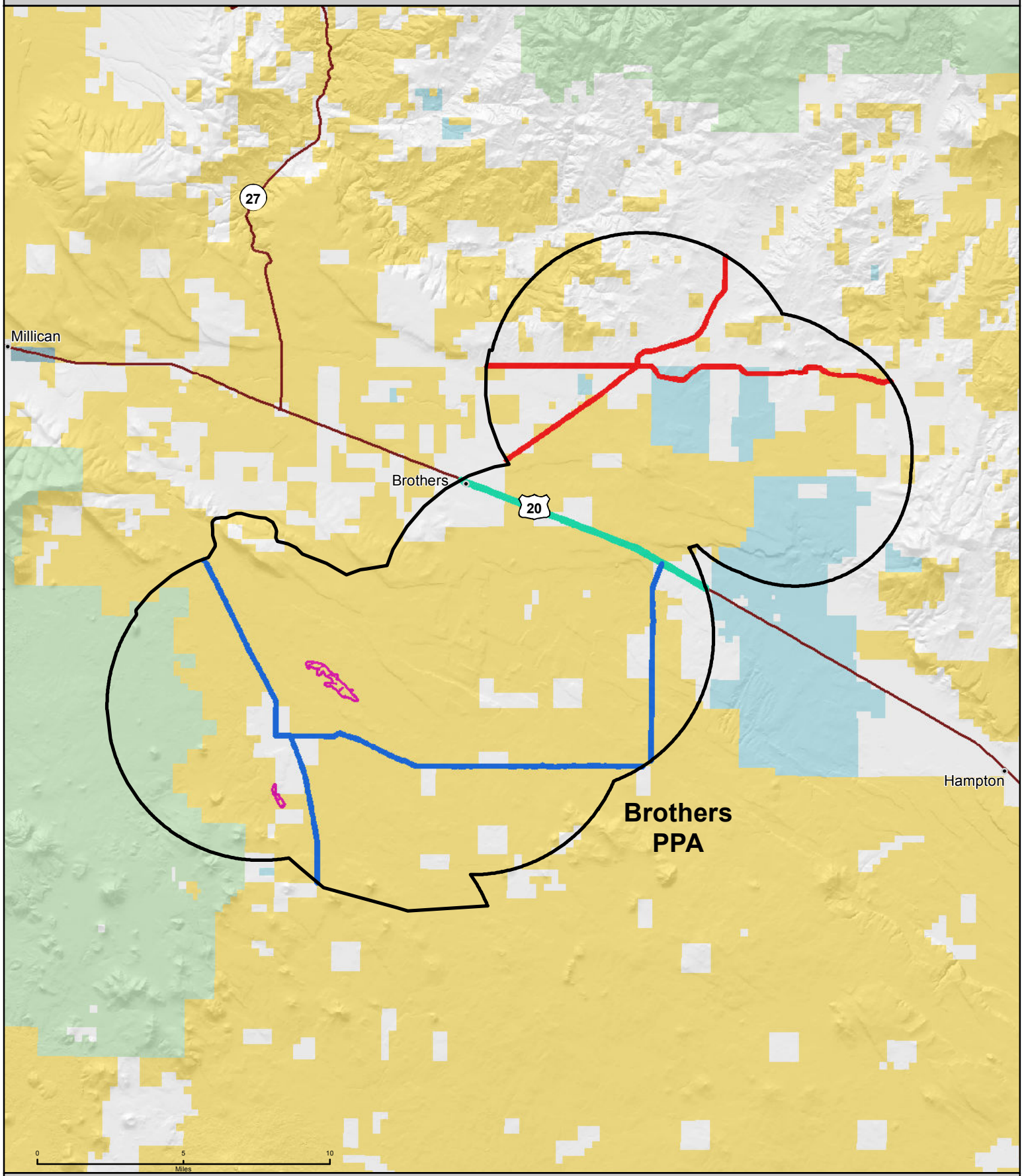
Fuels Management Potential Treatments - Brothers PPA

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



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Fuels Management Potential Treatment

Fuel Break
- Priority 1
- Priority 2
- Priority 3

Sagebrush Thinning
- Priority 1

- FIAT Project Planning Area
- Cities
- Highways

Administered Lands
- Bureau of Land Management
- U.S. Forest Service
- State
- Local Government
- Private/Unknown

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Date Saved: 3/16/2015
Data Sources: BLM
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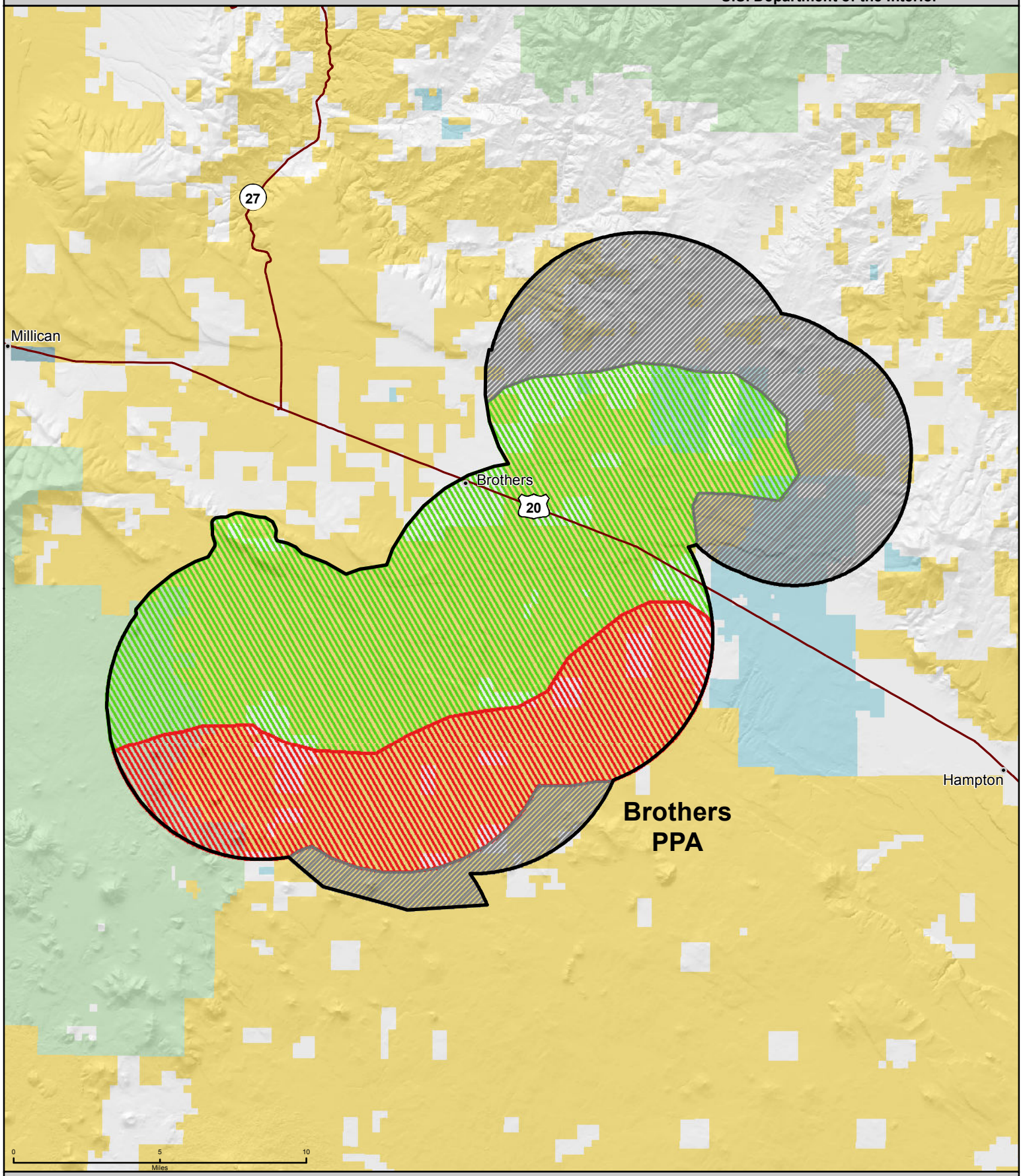
Habitat Restoration Potential Treatments: Conifer - Brothers PPA

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



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Habitat Restoration Potential Treatment
Conifer
- Priority 1
- Priority 2
- Priority 3

- FIAT Project Planning Area
- Cities
- Highways

Administered Lands
- Bureau of Land Management
- U.S. Forest Service
- State
- Local Government
- Private/Unknown

March 2015
Date Saved: 3/14/2015
Data Sources: BLM
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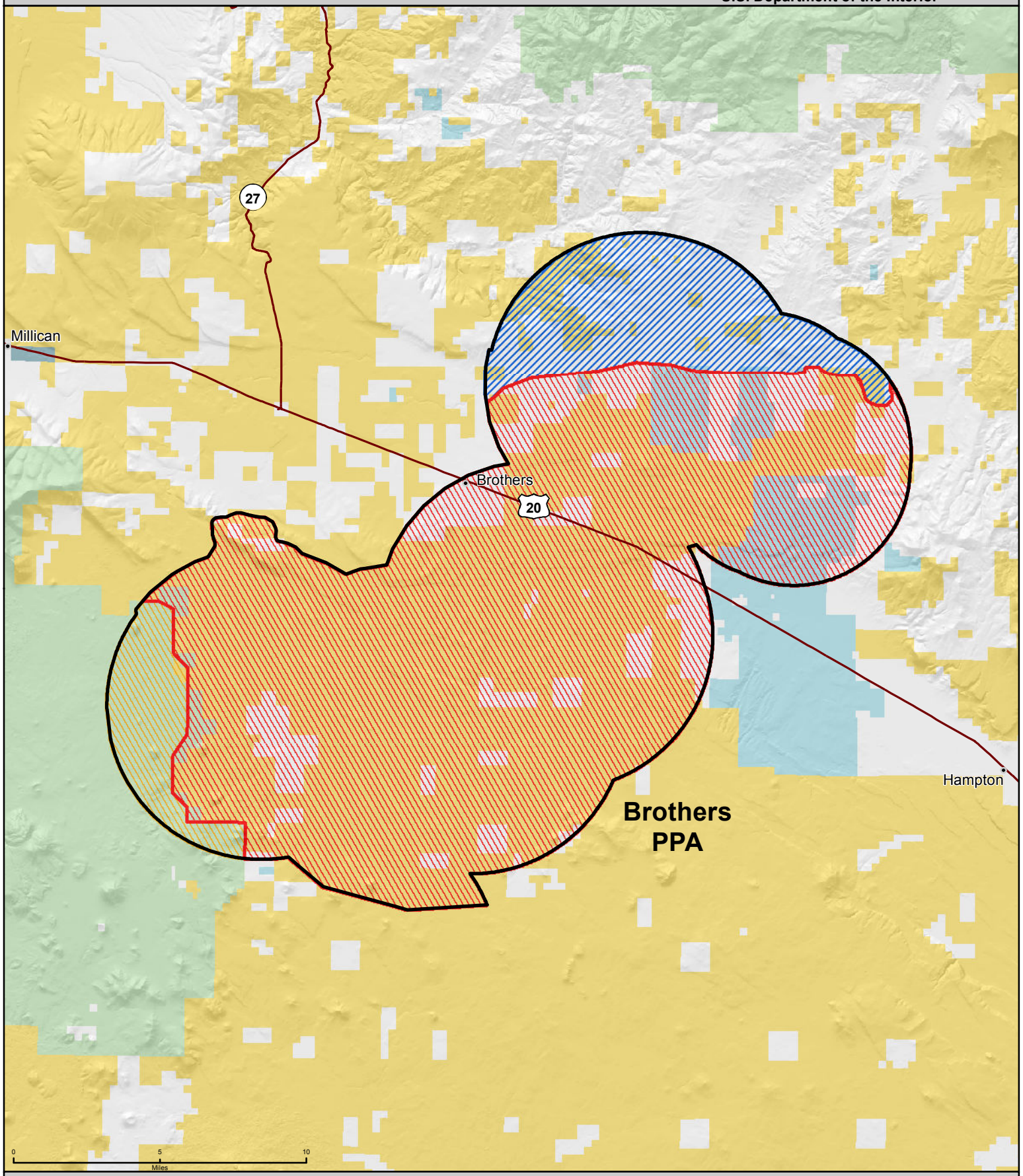
Habitat Restoration Potential Treatments: Invasives - Brothers PPA

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



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Oregon Map Location

Habitat Restoration Potential Treatment
Invasives
- Priority 1
- Priority 2
- Priority 3

- FIAT Project Planning Area
- Cities
- Highways

Administered Lands
- Bureau of Land Management
- U.S. Forest Service
- State
- Local Government
- Private/Unknown

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Date Saved: 3/16/2015
Data Sources: BLM
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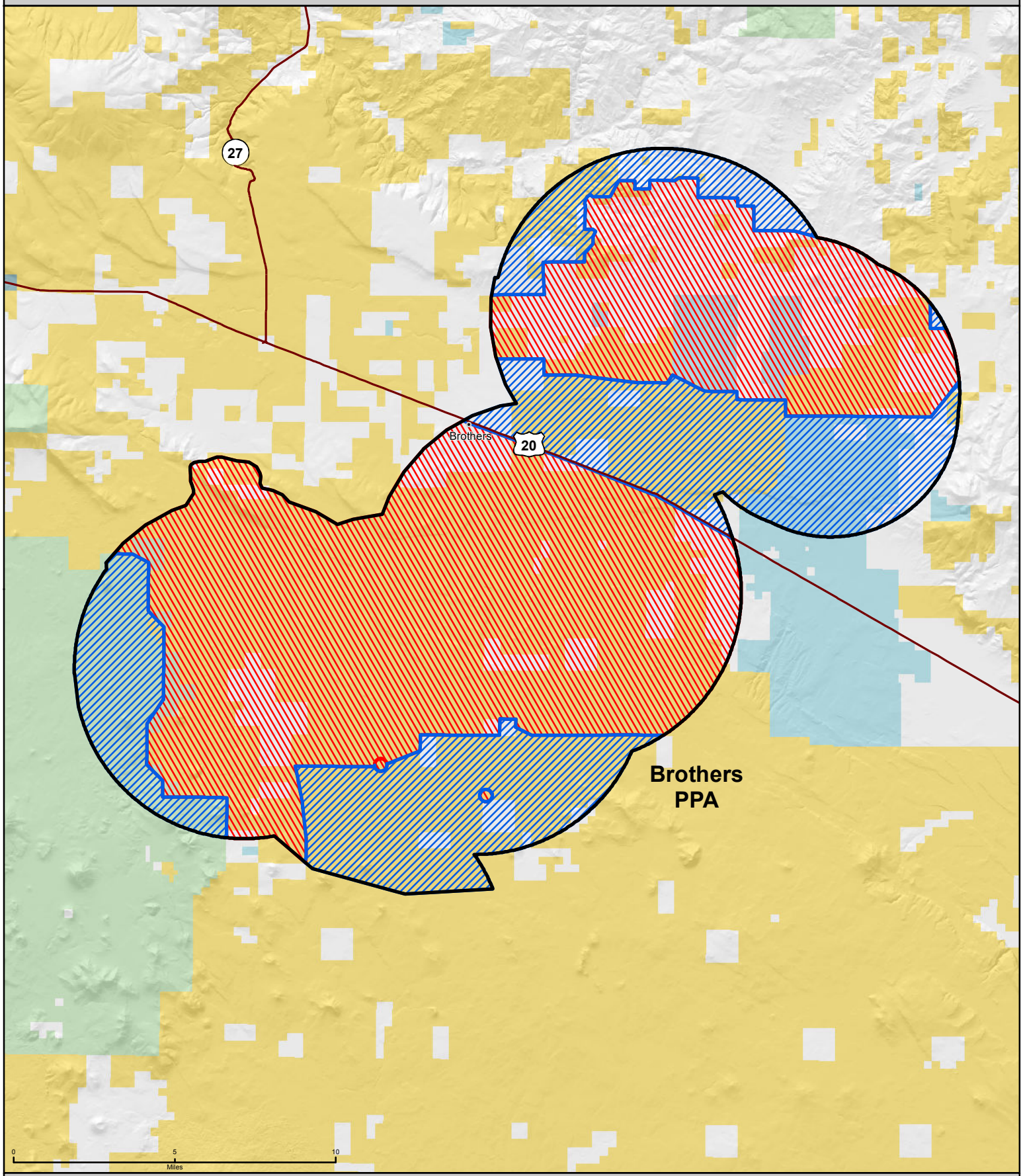
Fire Operations Management Strategies - Brothers PPA

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



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Map Location
Oregon

Fire Operations Management Strategy
- Priority 1
- Priority 2
- FIAT Project Planning Area

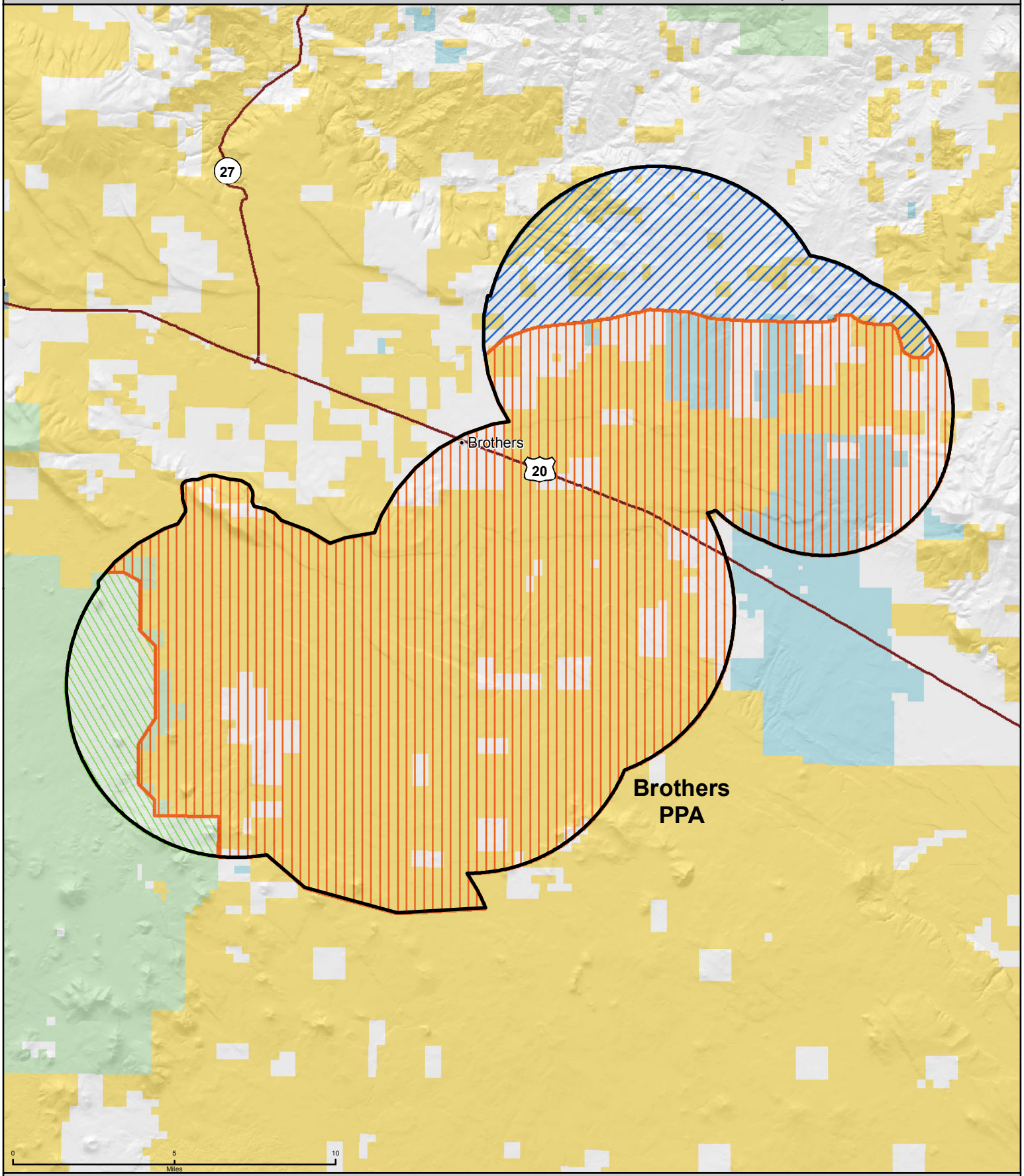
Administered Lands
- Bureau of Land Management
- U.S. Forest Service
- State
- Private/Unknown

March 2015
Date Saved: 3/16/2015
Data Sources: BLM
1:250,000

Post-Fire Rehabilitation Management Strategies - Brothers PPA

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



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Oregon
Map Location

Post-Fire Rehabilitation Management Strategy
- Priority 1
- Priority 2
- Priority 3

- FIAT Project Planning Area
- Cities
- Highways

Administered Lands
- Bureau of Land Management
- U.S. Forest Service
- State
- Private/Unknown

March 2015
Date Saved: 3/16/2015
Data Sources: BLM
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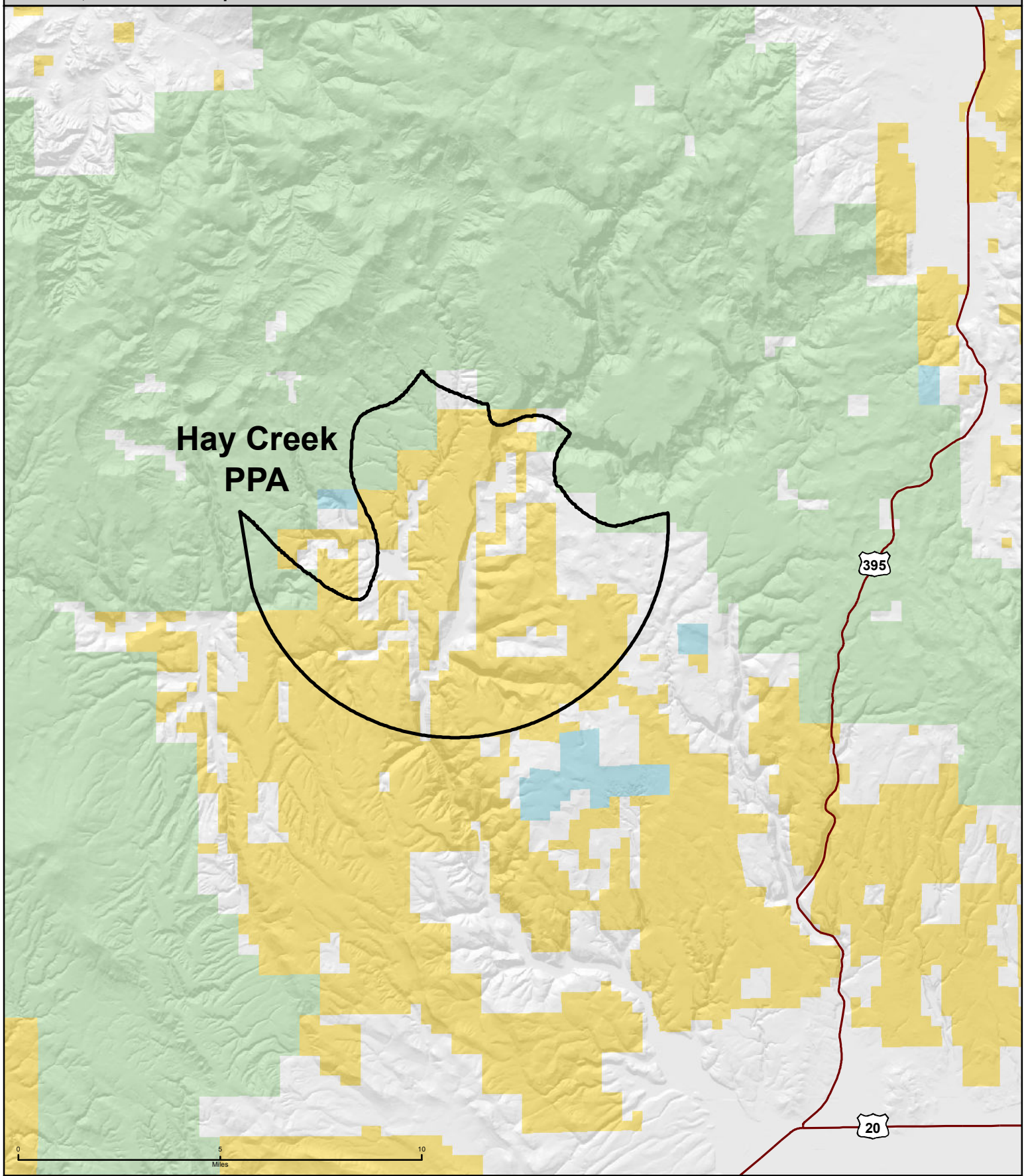
Project Planning Areas - Hay Creek PPA

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



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Oregon Location

FIAT Project Planning Area
Cities
Highways

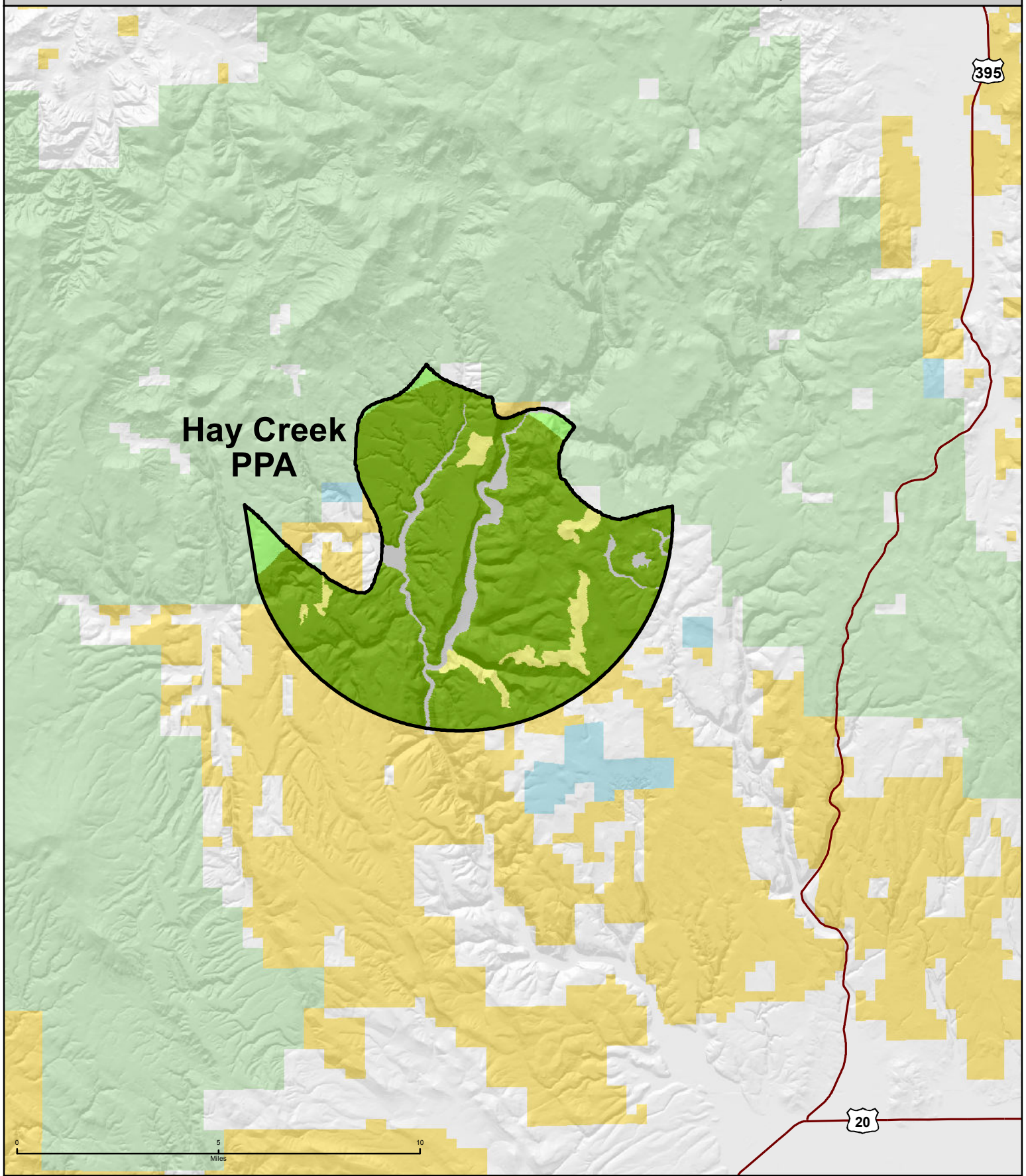
Administered Lands
Bureau of Land Management
U.S. Forest Service
State
Private/Unknown

March 2015
Date Saved: 3/16/2015
Data Sources: BLM
1:200,000

Sage-Grouse Habitat Matrix Categories - Hay Creek PPA

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



No Warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.

Resistance & Resilience Category: Table 2

- 1A: < 25% Sagebrush, High Resistance and Resilience
- 1B: 25% - 65% Sagebrush, High Resistance and Resilience
- 2B: 25% - 65% Sagebrush, Moderate Resistance and Resilience
- NA

Administered Lands

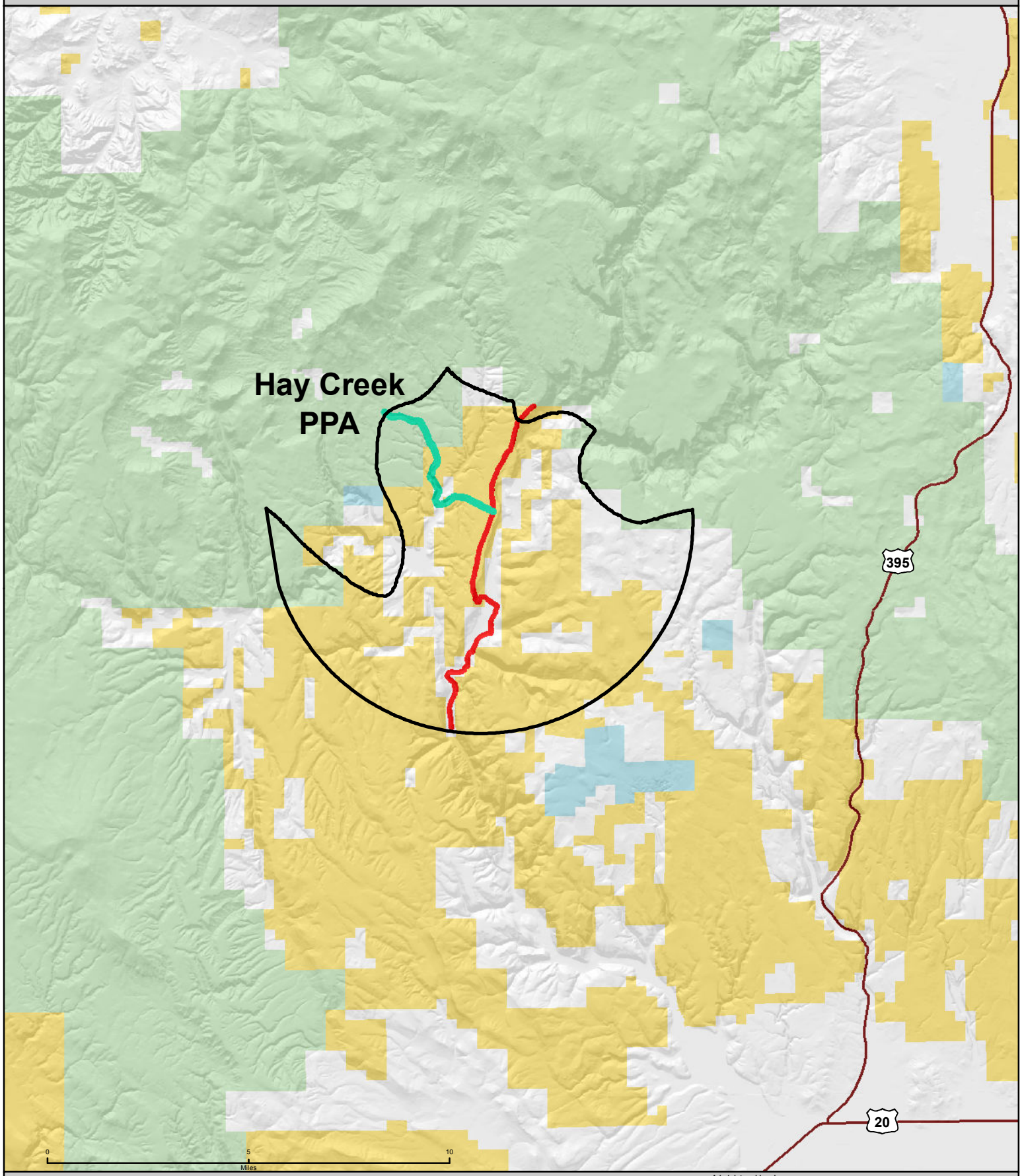
- Bureau of Land Management
- U.S. Forest Service
- National Park Service
- U.S. Fish and Wildlife
- Other Federal
- State
- Local Government
- Private/Unknown
- FIAT Project Planning Area

March 2015
Date Saved: 3/16/2015
Data Sources: BLM
1:200,000

Fuels Management Potential Treatments - Hay Creek PPA

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



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Map Location
Oregon

Fuels Management Potential Treatment

Fuel Break
- Priority 1
- Priority 2
- Priority 3

Sagebrush Thinning
- Priority 1

- FIAT Project Planning Area
- Cities
- Highways

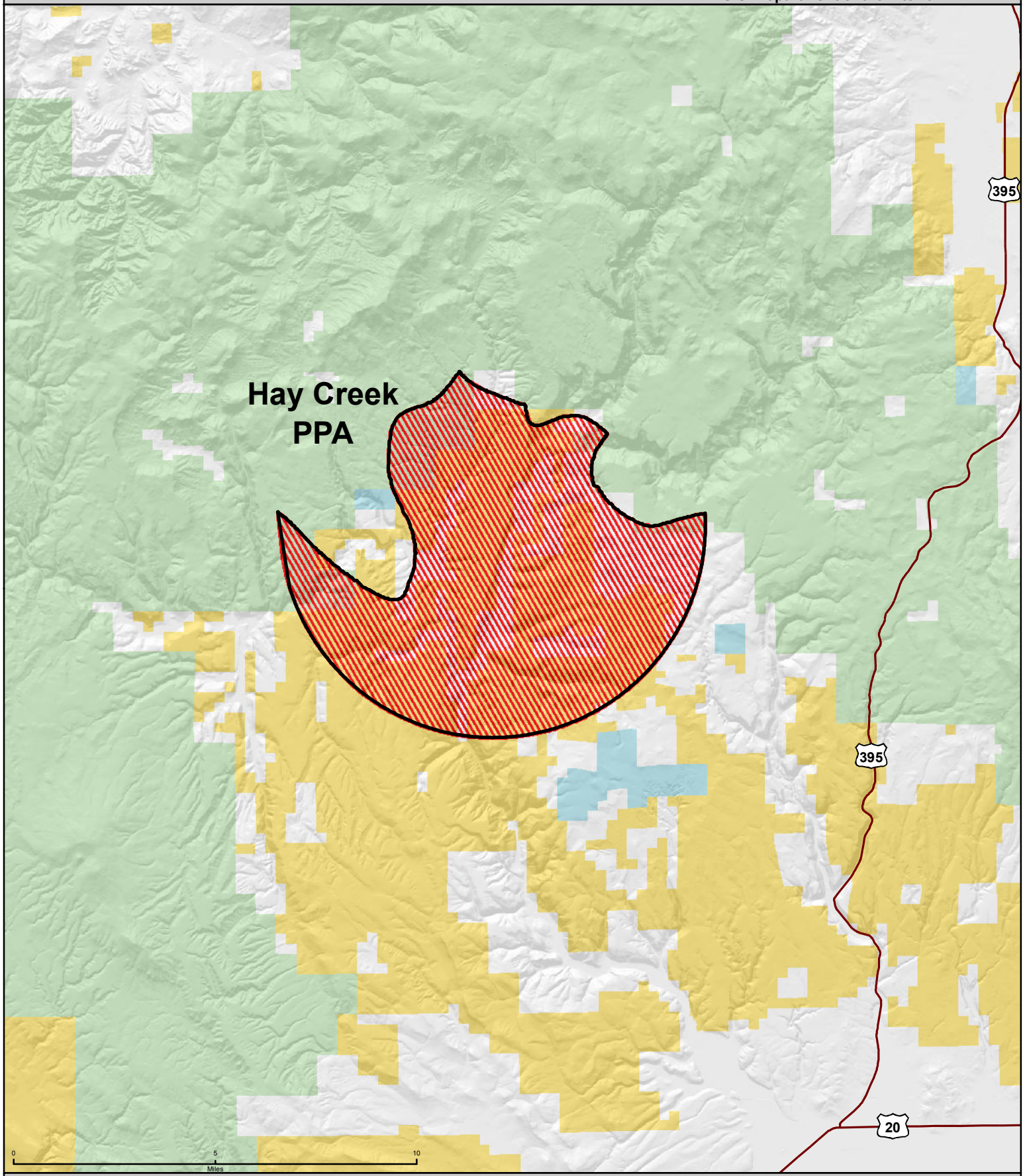
Administered Lands
- Bureau of Land Management
- U.S. Forest Service
- State
- Local Government
- Private/Unknown

March 2015
Date Saved: 3/16/2015
Data Sources: BLM
1:200,000

Habitat Restoration Potential Treatments: Conifer - Hay Creek PPA

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



No Warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.

Map Location
Oregon

Habitat Restoration Potential Treatment
Conifer
- Priority 1
- Priority 2
- Priority 3

- FIAT Project Planning Area
- Cities
- Highways

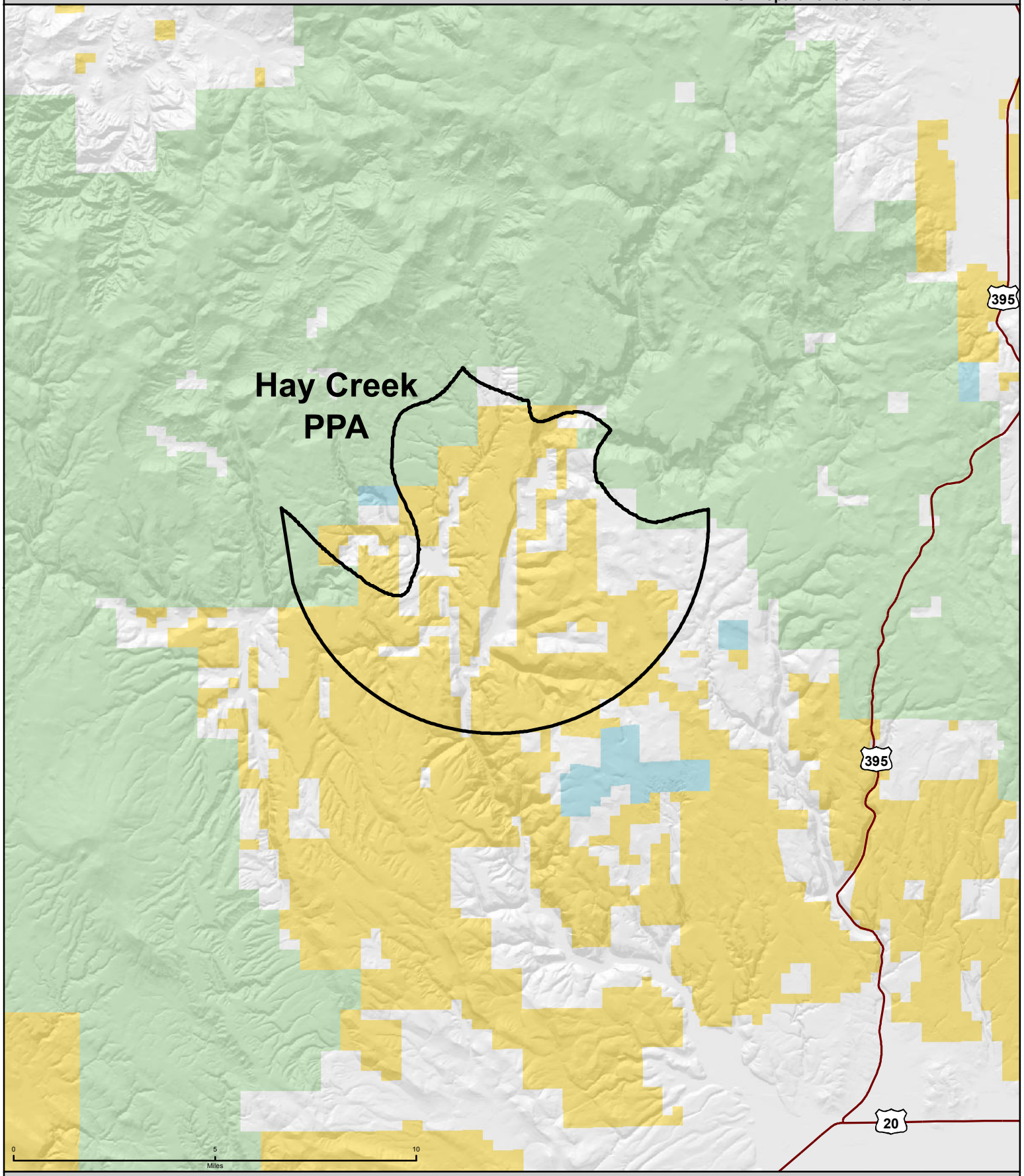
Administered Lands
- Bureau of Land Management
- U.S. Forest Service
- State
- Local Government
- Private/Unknown

March 2015
Date Saved: 3/15/2015
Data Sources: BLM
1:200,000

Habitat Restoration Potential Treatments: Invasives - Hay Creek PPA

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



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Map Location
Oregon

Habitat Restoration Potential Treatment
Invasives
- Priority 1
- Priority 2
- Priority 3

- FIAT Project Planning Area
- Cities
- Highways

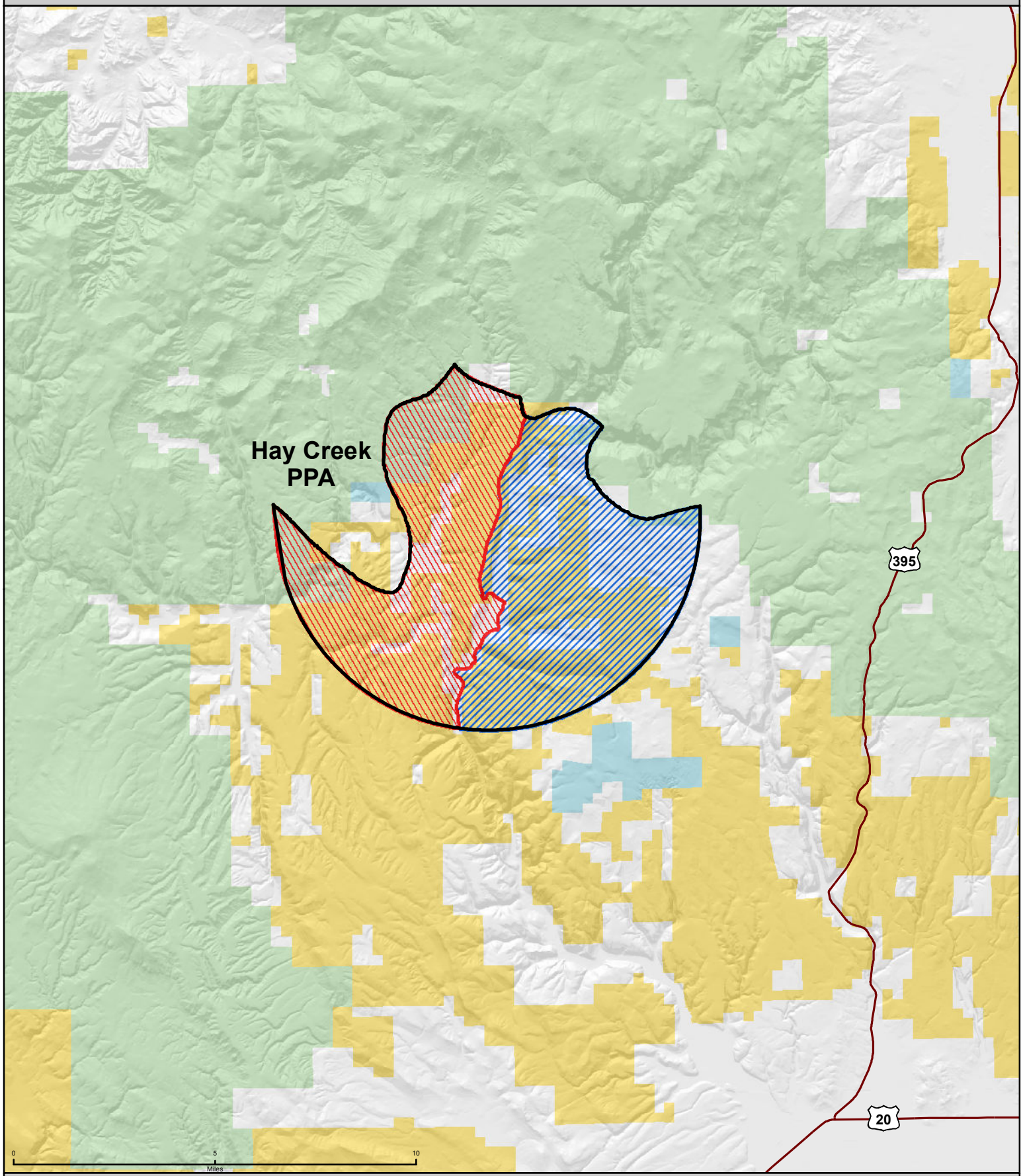
Administered Lands
- Bureau of Land Management
- U.S. Forest Service
- State
- Local Government
- Private/Unknown

March 2015
Date Saved: 3/16/2015
Data Sources: BLM
1:200,000

Fire Operations Management Strategies - Hay Creek PPA

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



No Warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.

Fire Operations Management Strategy
- Priority 1
- Priority 2
- FIAT Project Planning Area

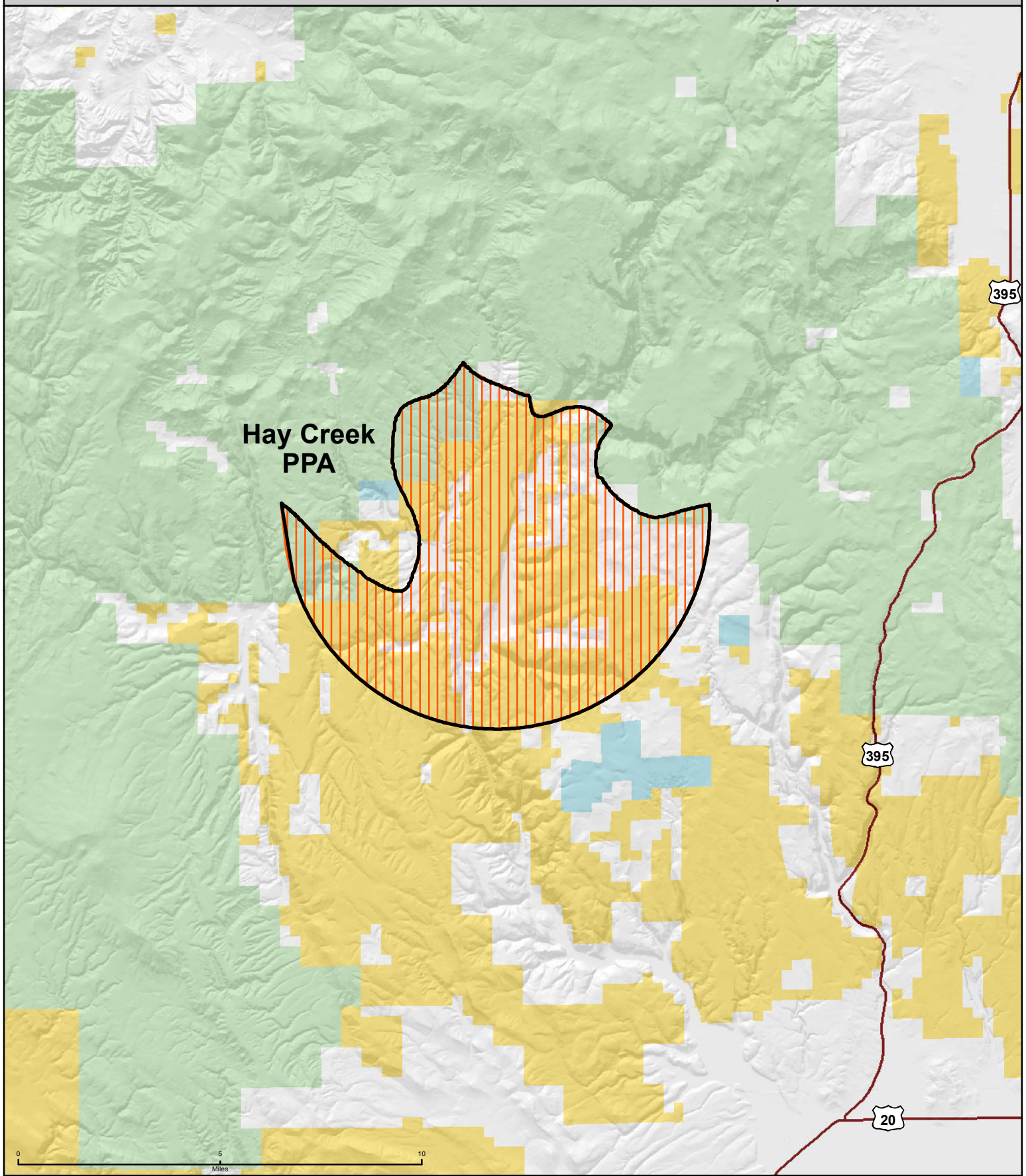
Administered Lands
- Bureau of Land Management
- U.S. Forest Service
- State
- Private/Unknown

March 2015
Date Saved: 3/16/2015
Data Sources: BLM
1:200,000

Post-Fire Rehabilitation Management Strategies - Hay Creek PPA

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



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Map Location
Oregon

Post-Fire Rehabilitation Management Strategies
- Priority 1
- Priority 2
- Priority 3

- FIAT Project Planning Area
- Cities
- Highways

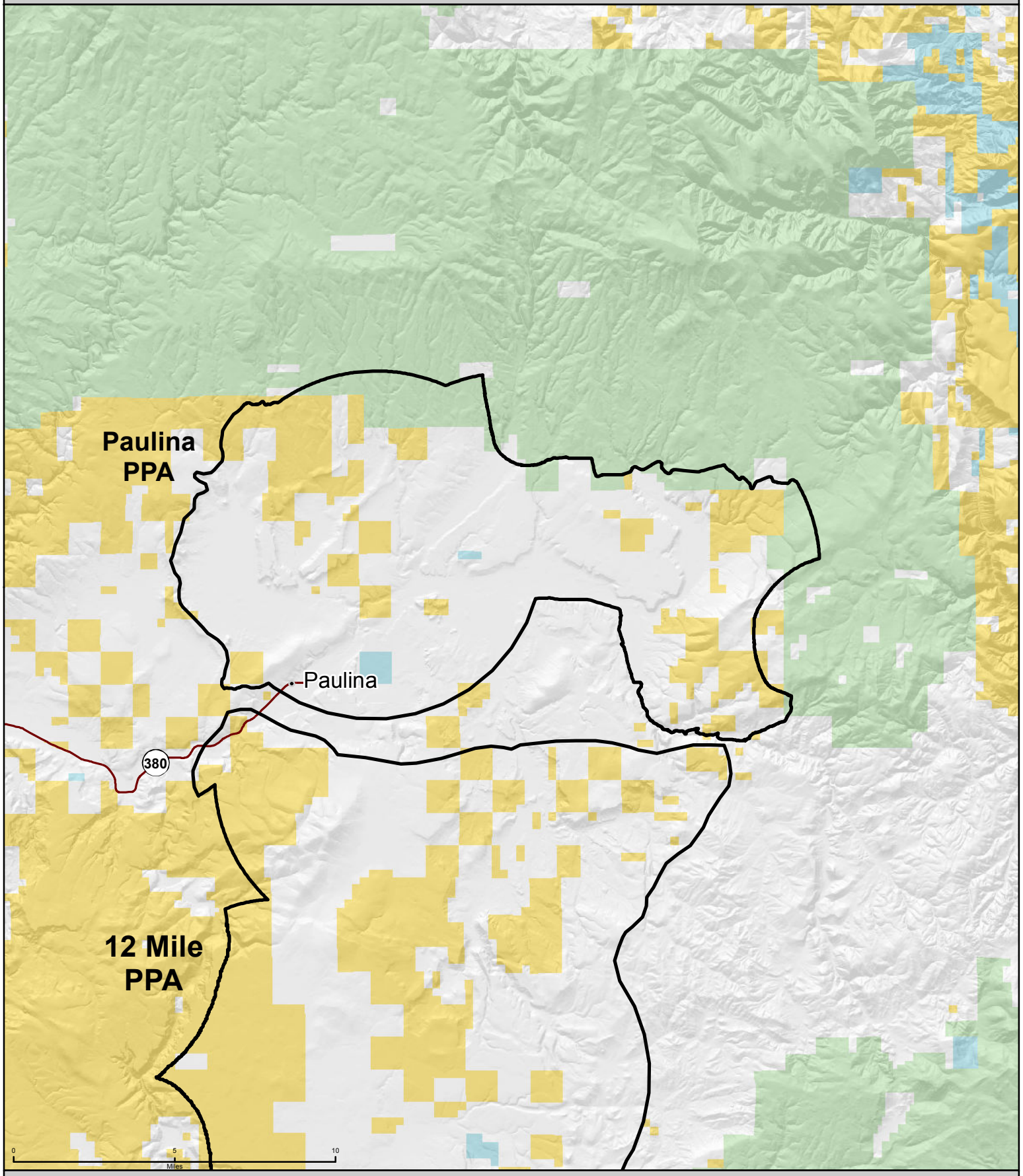
Administered Lands
- Bureau of Land Management
- U.S. Forest Service
- State
- Private/Unknown

March 2015
Date Saved: 3/16/2015
Data Sources: BLM
1:200,000

Project Planning Areas - Paulina PPA

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



No Warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.

Map Location
Oregon

FIAT Project Planning Area
Cities
Highways

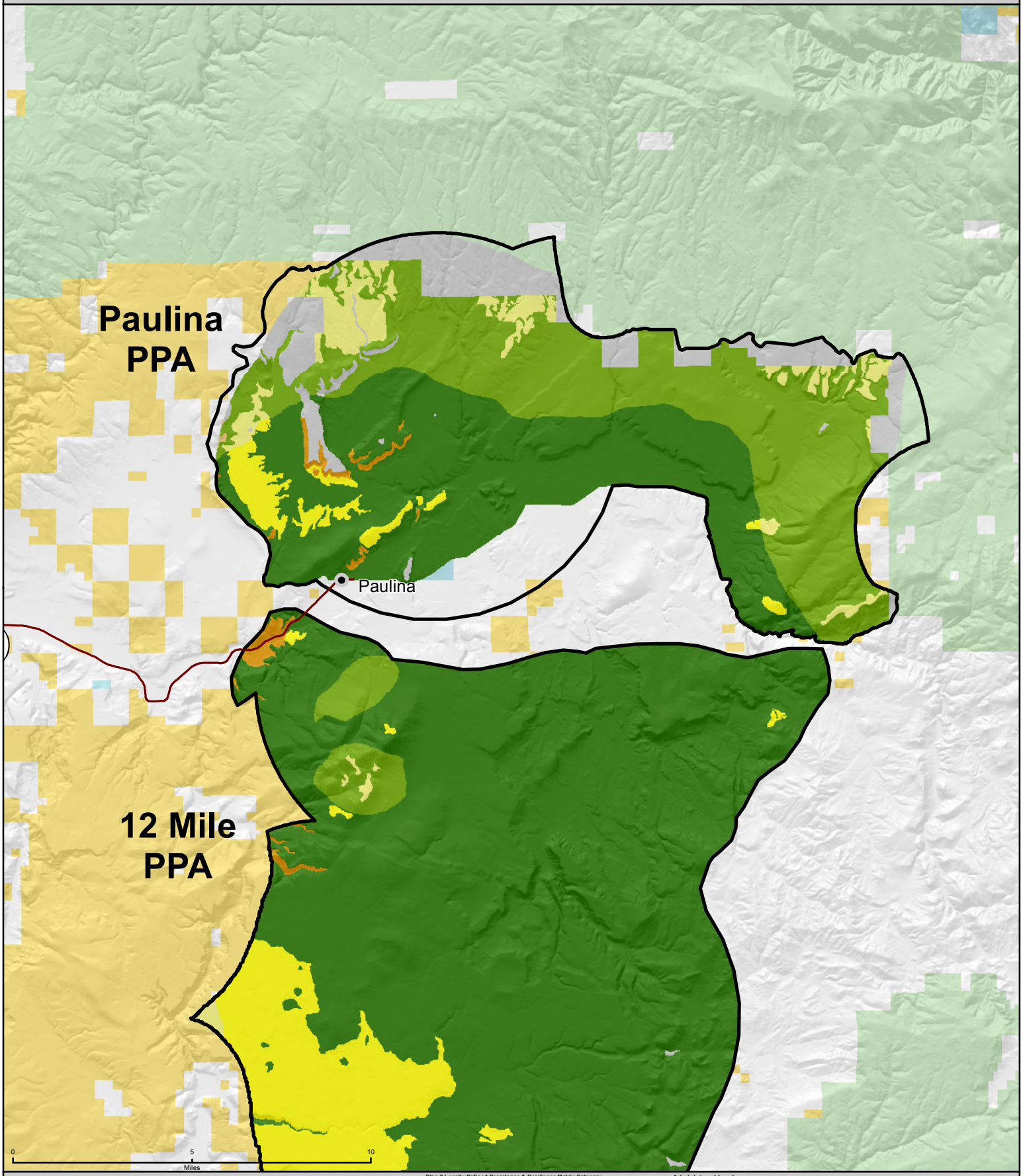
Administered Lands
Bureau of Land Management
U.S. Forest Service
State
Private/Unknown

March 2015
Date Saved: 3/16/2015
Data Sources: BLM
1:250,000

Sage-Grouse Habitat Matrix Categories - Paulina PPA

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



No Warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.

Step 2 Locally Refined Resistance & Resilience Matrix Category

- 1B: 26% - 65% Sagebrush with Cool/Cold and Moist Soils
- 1C: > 65% Sagebrush with Cool/Cold and Moist Soils
- 2B: 26% - 65% Sagebrush with Warm and Moist Soils
- 2C: > 65% Sagebrush with Warm and Moist Soils
- 3B: 26% - 65% Sagebrush with Warm/Cool and Dry Soils
- 3C: > 65% Sagebrush with Warm/Cool and Dry Soils
- NA

Administered Lands

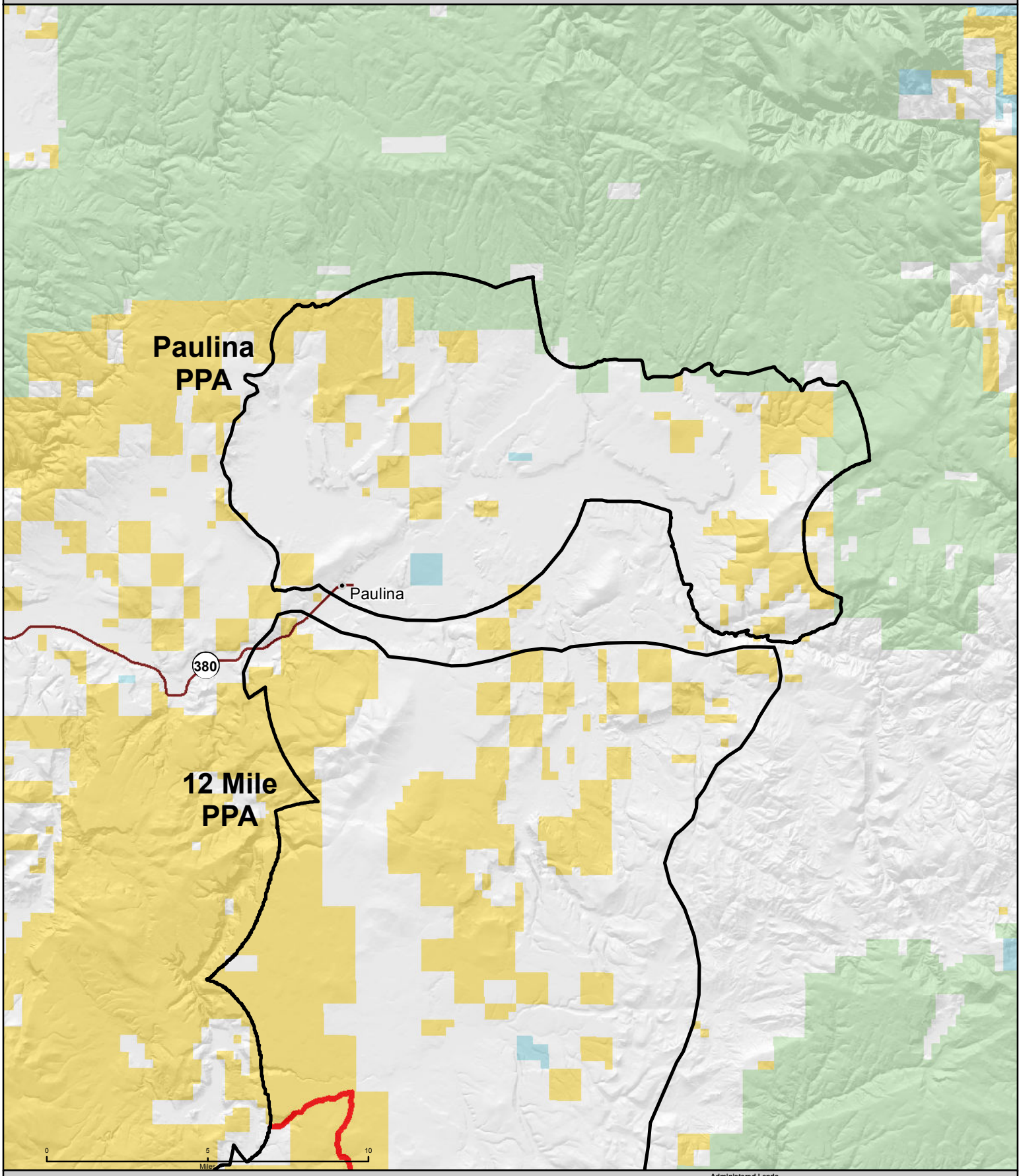
- Bureau of Land Management
- U.S. Forest Service
- National Park Service
- U.S. Fish and Wildlife
- Other Federal
- State
- Local Government
- Private/Unknown
- FIAT Project Planning Area

March 2015
Date Saved: 3/16/2015
Data Sources: BLM
1:225,000

Fuels Management Potential Treatments - Paulina PPA

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



No Warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.

Map Location
Oregon

Fuels Management Potential Treatment

Fuel Break
- Priority 1
- Priority 2
- Priority 3

Sagebrush Thinning
- Priority 1

- FIAT Project Planning Area
- Cities
- Highways

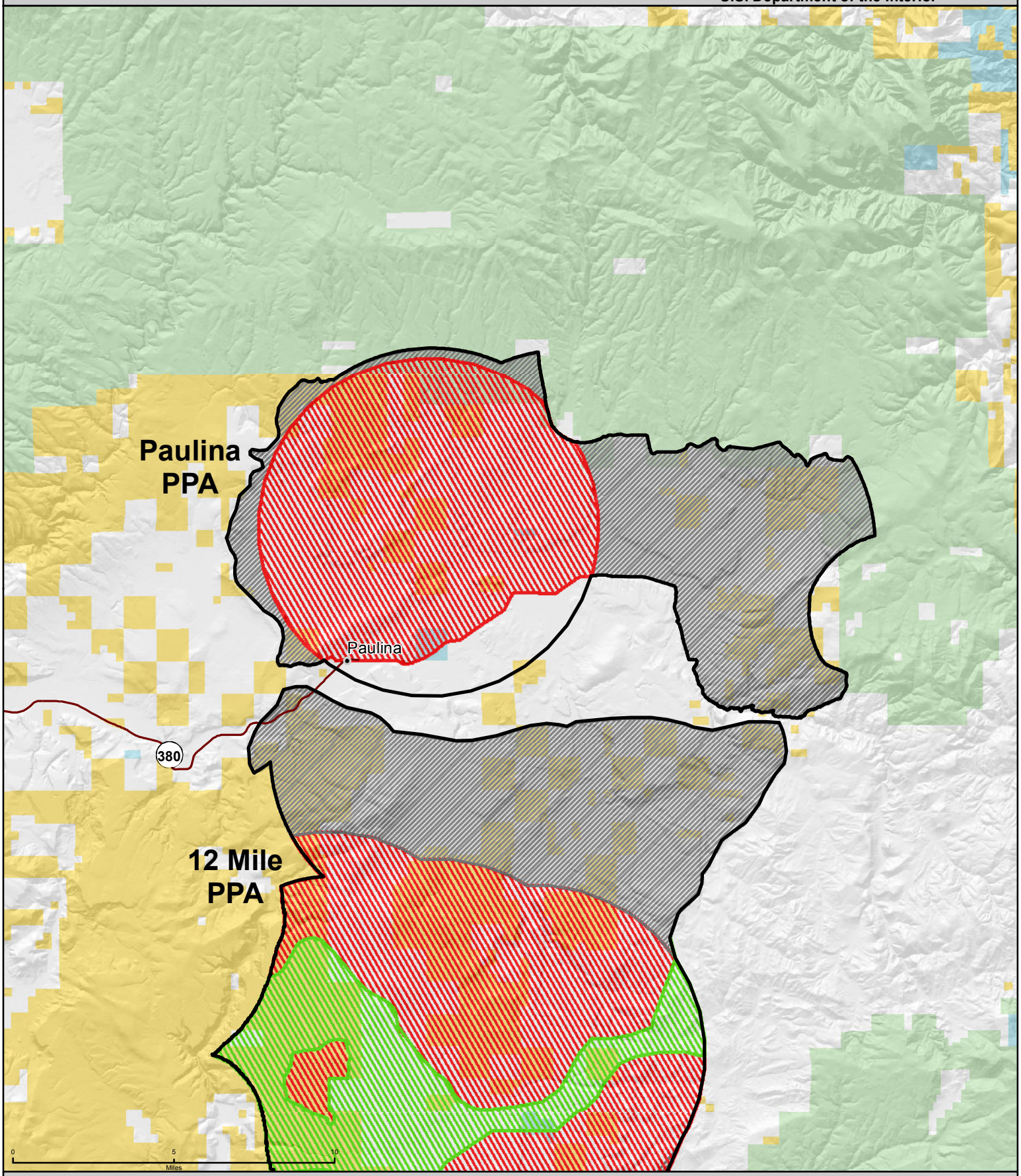
Administered Lands
- Bureau of Land Management
- U.S. Forest Service
- State
- Local Government
- Private/Unknown

March 2015
Date Saved: 3/16/2015
Data Sources: BLM
1:250,000

Habitat Restoration Potential Treatments: Conifer - Paulina PPA

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



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Map Location
Oregon

Habitat Restoration Potential Treatment
Conifer
- Priority 1
- Priority 2
- Priority 3

- FIAT Project Planning Area
- Cities
- Highways

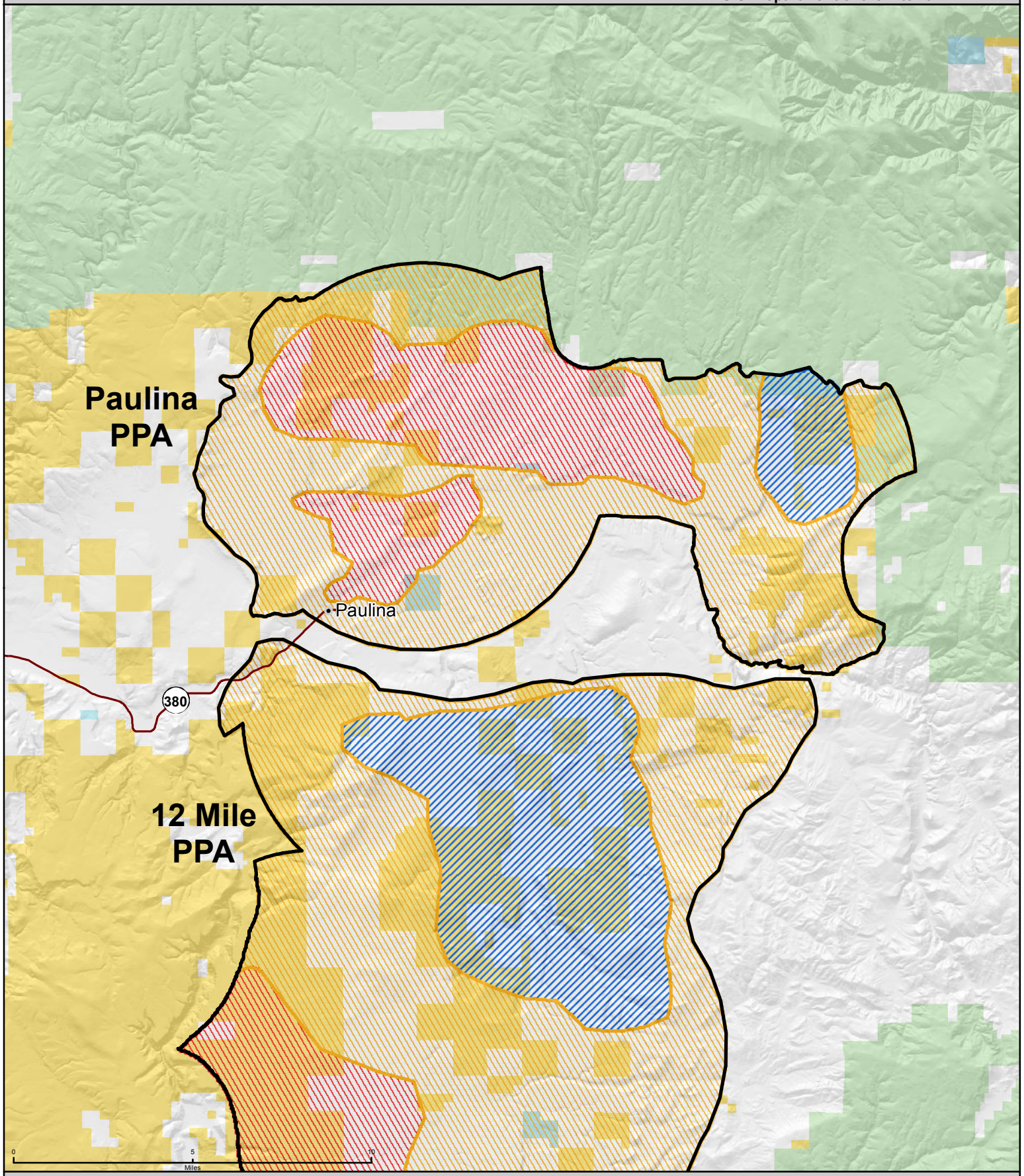
Administered Lands
- Bureau of Land Management
- U.S. Forest Service
- State
- Local Government
- Private/Unknown

March 2015
Date Saved: 3/15/2015
Data Sources: BLM
1:250,000

Habitat Restoration Potential Treatments: Invasives - Paulina PPA

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



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Map Location
Oregon

Habitat Restoration Potential Treatment
Invasives
- Priority 1
- Priority 2
- Priority 3

- FIAT Project Planning Area
- Cities
- Highways

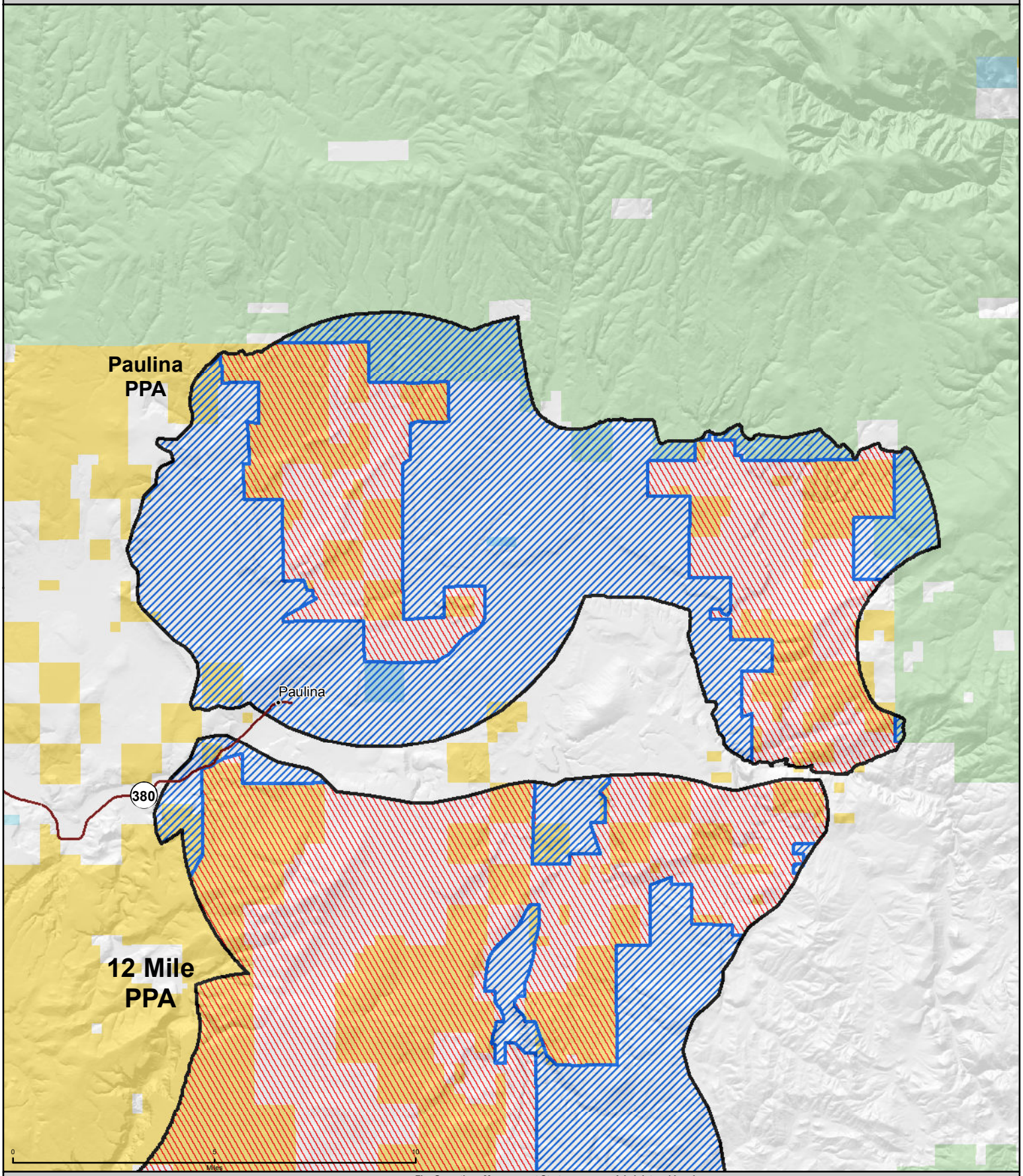
Administered Lands
- Bureau of Land Management
- U.S. Forest Service
- State
- Local Government
- Private/Unknown

March 2015
Date Saved: 3/16/2015
Data Sources: BLM
1:225,000

Fire Operations Management Strategies - Paulina PPA

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



No Warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.

Fire Operations Management Strategy
- Priority 1
- Priority 2
- FIAT Project Planning Area

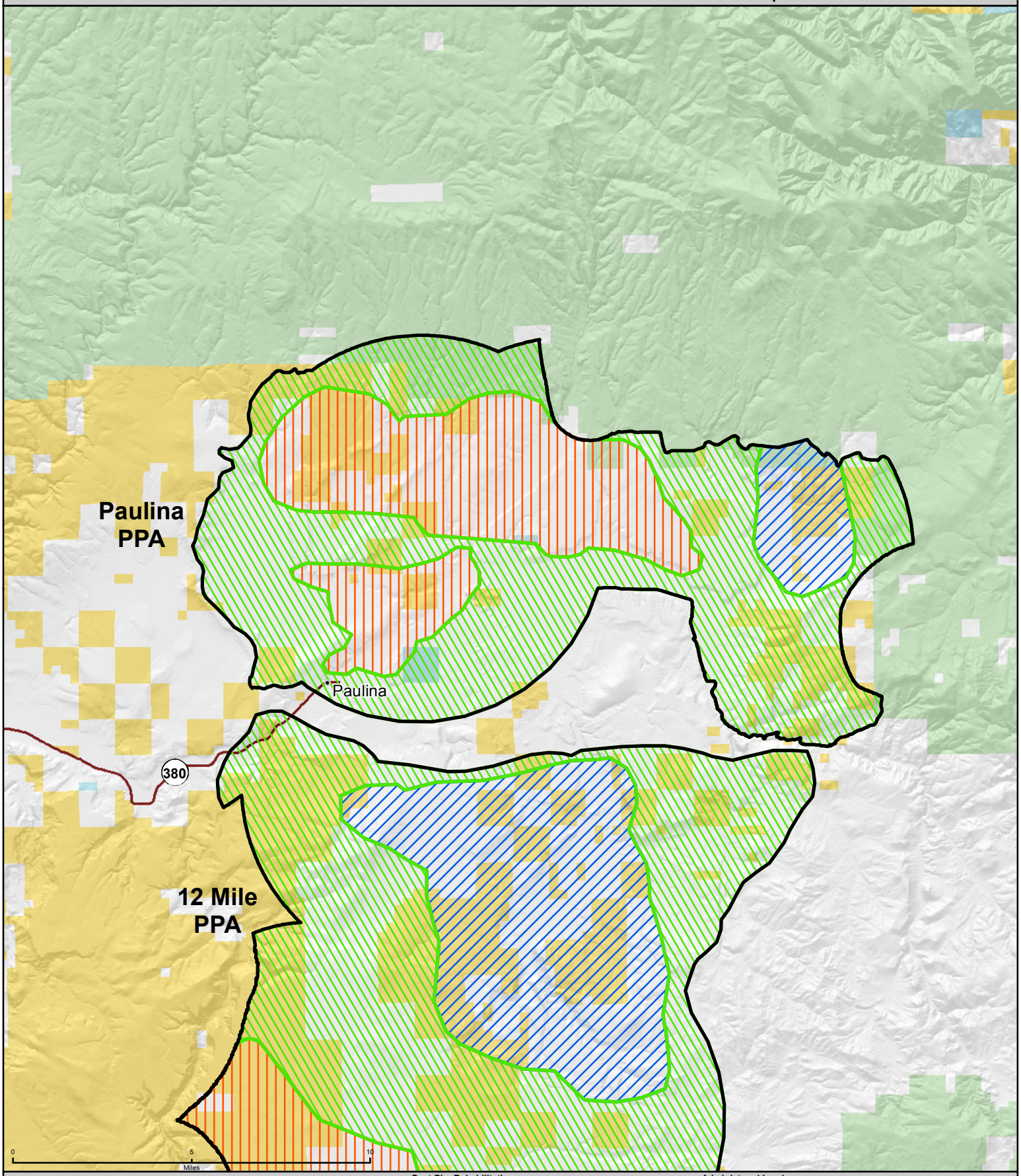
Administered Lands
- Bureau of Land Management
- U.S. Forest Service
- State
- Private/Unknown

March 2015
Date Saved: 3/16/2015
Data Sources: BLM
1:200,000

Post-Fire Rehabilitation Management Strategies- Paulina PPA

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



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Map Location
Oregon

Post-Fire Rehabilitation Management Strategy
- Priority 1
- Priority 2
- Priority 3

- FIAT Project Planning Area
- Cities
- Highways

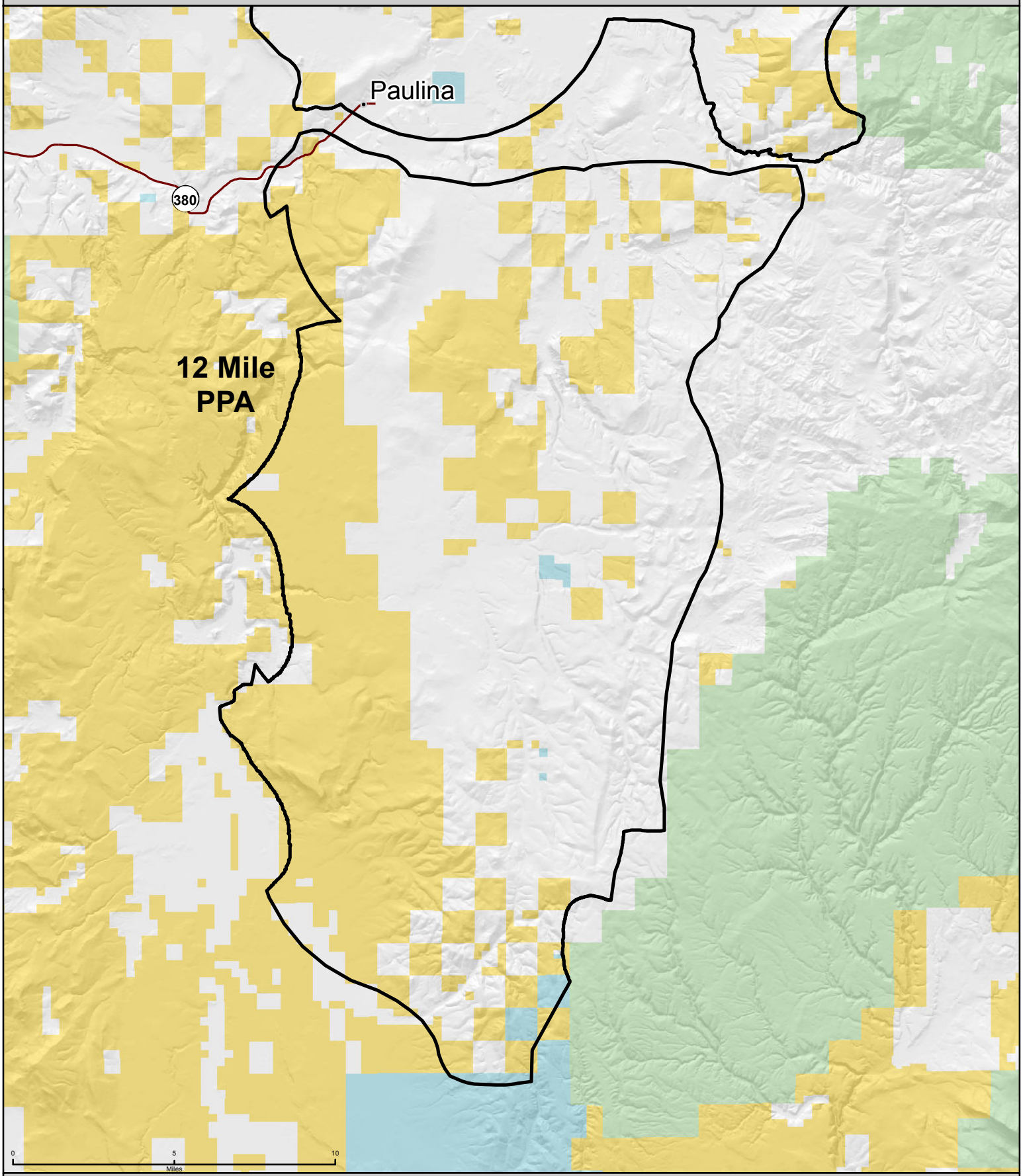
Administered Lands
- Bureau of Land Management
- U.S. Forest Service
- State
- Private/Unknown

March 2015
Date Saved: 3/16/2015
Data Sources: BLM
1:225,000

Project Planning Areas - 12 Mile PPA

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



No Warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.

N

Map Location
Oregon

FIAT Project Planning Area
Cities
Highways

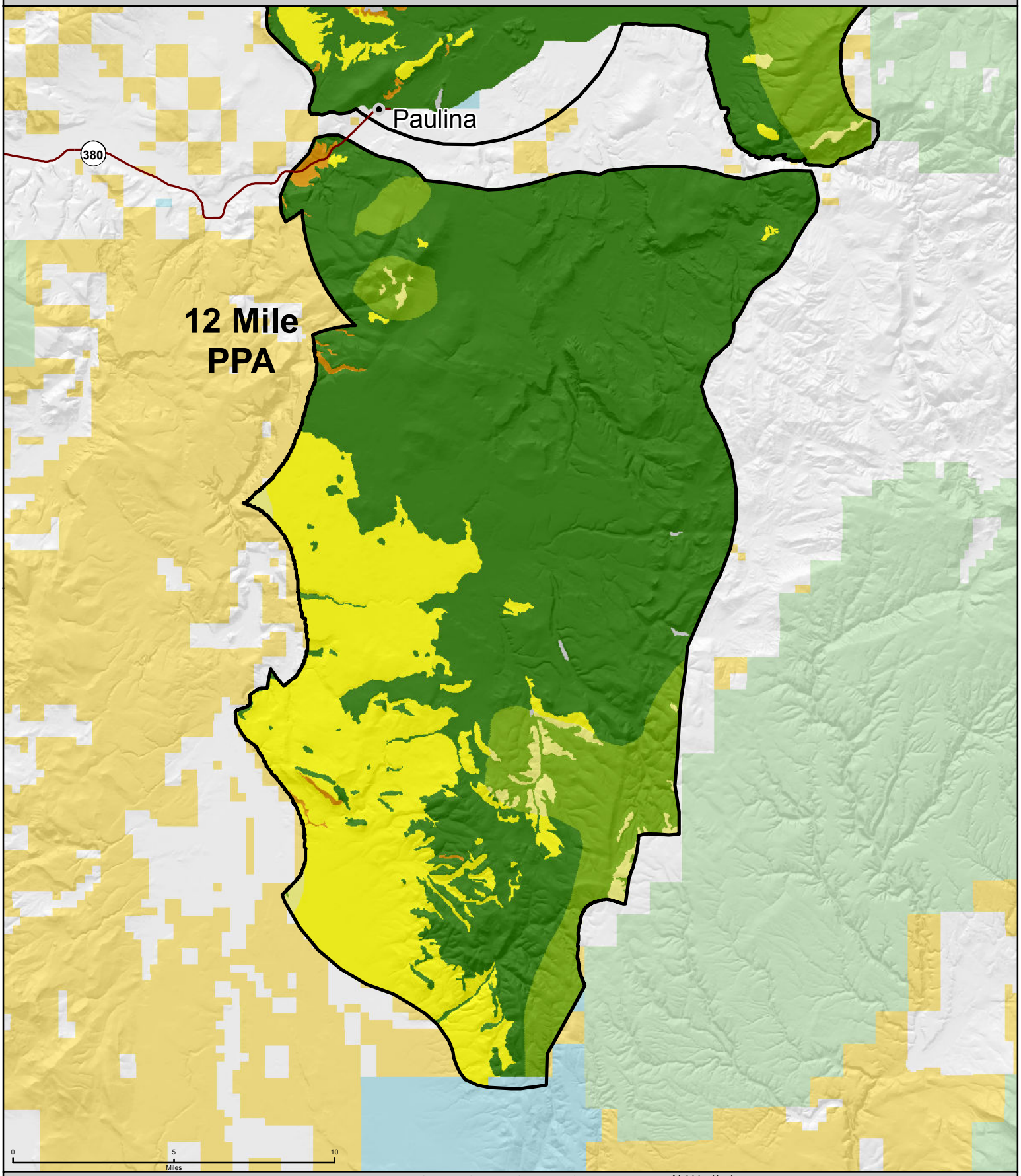
Administered Lands
Bureau of Land Management
U.S. Forest Service
State
Private/Unknown

March 2015
Date Saved: 3/16/2015
Data Sources: BLM
1:250,000

Sage-Grouse Habitat Matrix Categories - 12 Mile PPA

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



No Warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.

Map Location
Oregon

Step 2 Locally Refined Resistance & Resilience Matrix Category

- 1B: 26% - 65% Sagebrush with Cool/Cold and Moist Soils
- 1C: > 65% Sagebrush with Cool/Cold and Moist Soils
- 2B: 26% - 65% Sagebrush with Warm and Moist Soils
- 2C: > 65% Sagebrush with Warm and Moist Soils
- 3B: 26% - 65% Sagebrush with Warm/Cool and Dry Soils
- 3C: > 65% Sagebrush with Warm/Cool and Dry Soils
- NA

Administered Lands

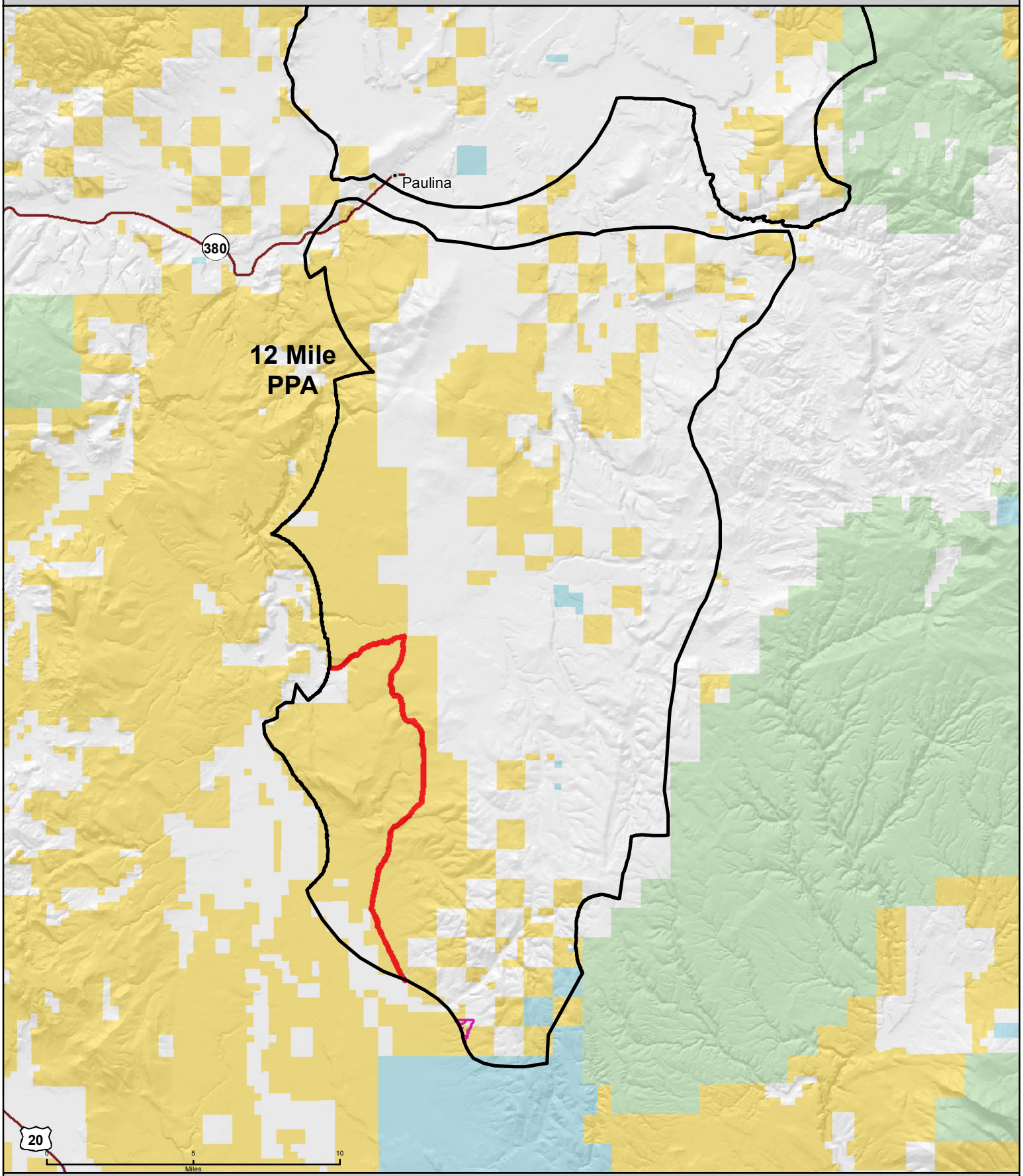
- Bureau of Land Management
- U.S. Forest Service
- National Park Service
- U.S. Fish and Wildlife
- Other Federal
- State
- Local Government
- Private/Unknown
- FIAT Project Planning Area

March 2015
Date Saved: 3/16/2015
Data Sources: BLM
1:250,000

Fuels Management Potential Treatments - 12 Mile PPA

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



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Map Location
Oregon

Fuels Management Potential Treatment

Fuel Break
- Priority 1
- Priority 2
- Priority 3

Sagebrush Thinning
- Priority 1

- FIAT Project Planning Area
- Cities
- Highways

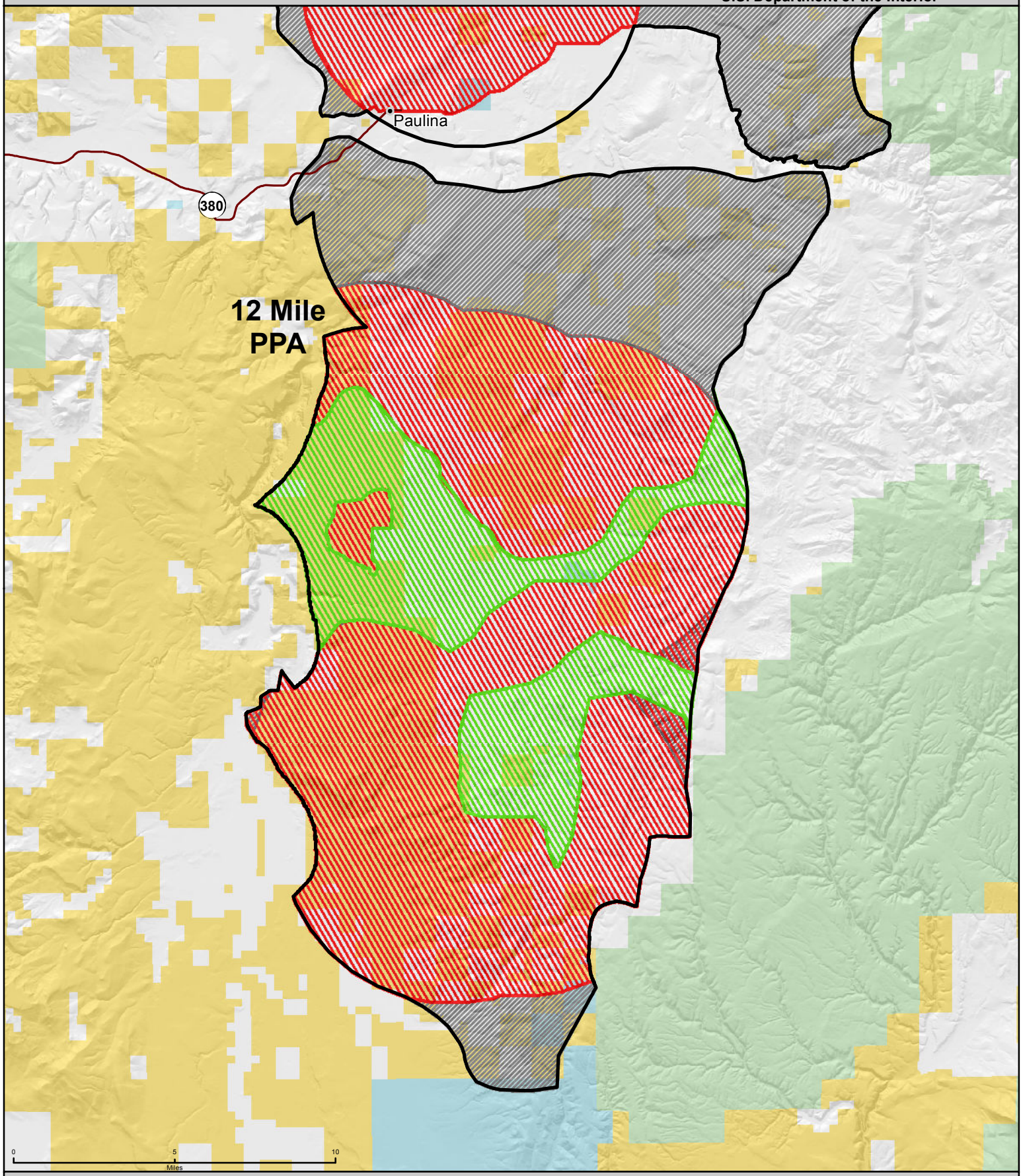
Administered Lands
- Bureau of Land Management
- U.S. Forest Service
- State
- Local Government
- Private/Unknown

March 2015
Date Saved: 3/16/2015
Data Sources: BLM
1:275,000

Habitat Restoration Potential Treatments: Conifer - 12 Mile PPA

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



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Habitat Restoration Potential Treatment
Conifer
- Priority 1
- Priority 2
- Priority 3

- FIAT Project Planning Area
- Cities
- Highways

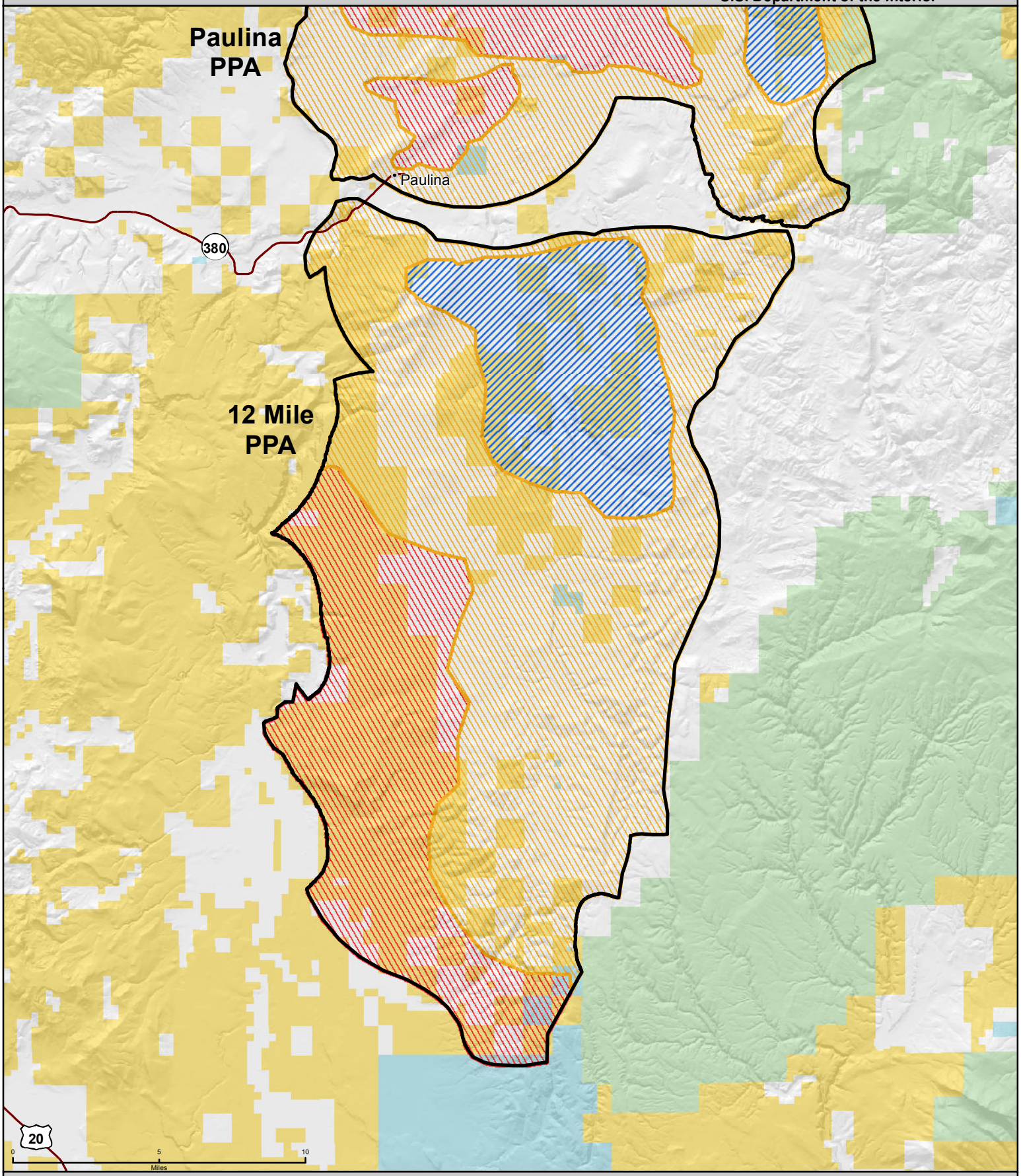
Administered Lands
- Bureau of Land Management
- U.S. Forest Service
- State
- Local Government
- Private/Unknown

March 2015
Date Saved: 3/15/2015
Data Sources: BLM
1:250,000

Habitat Restoration Potential Treatments: Invasives - 12 Mile PPA

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



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Map Location
Oregon

Habitat Restoration Potential Treatment
Invasives
- Priority 1
- Priority 2
- Priority 3

- FIAT Project Planning Area
- Cities
- Highways

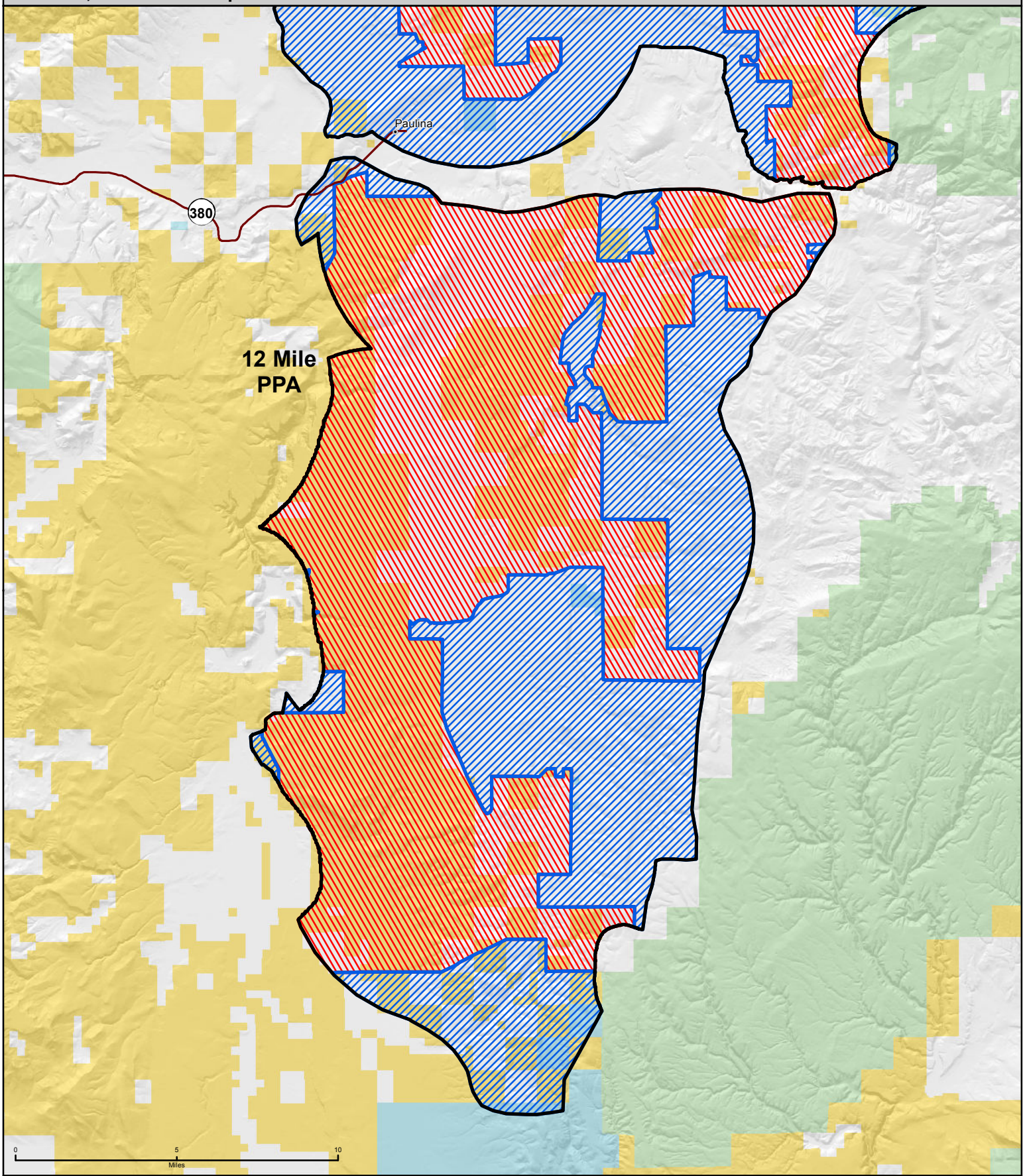
Administered Lands
- Bureau of Land Management
- U.S. Forest Service
- State
- Local Government
- Private/Unknown

March 2015
Date Saved: 3/16/2015
Data Sources: BLM
1:275,000

Fire Operations Management Strategies - 12 Mile PPA

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



No Warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data.

N

Map Location
Oregon

Fire Operations Management Strategy
- Priority 1
- Priority 2
- FIAT Project Planning Area

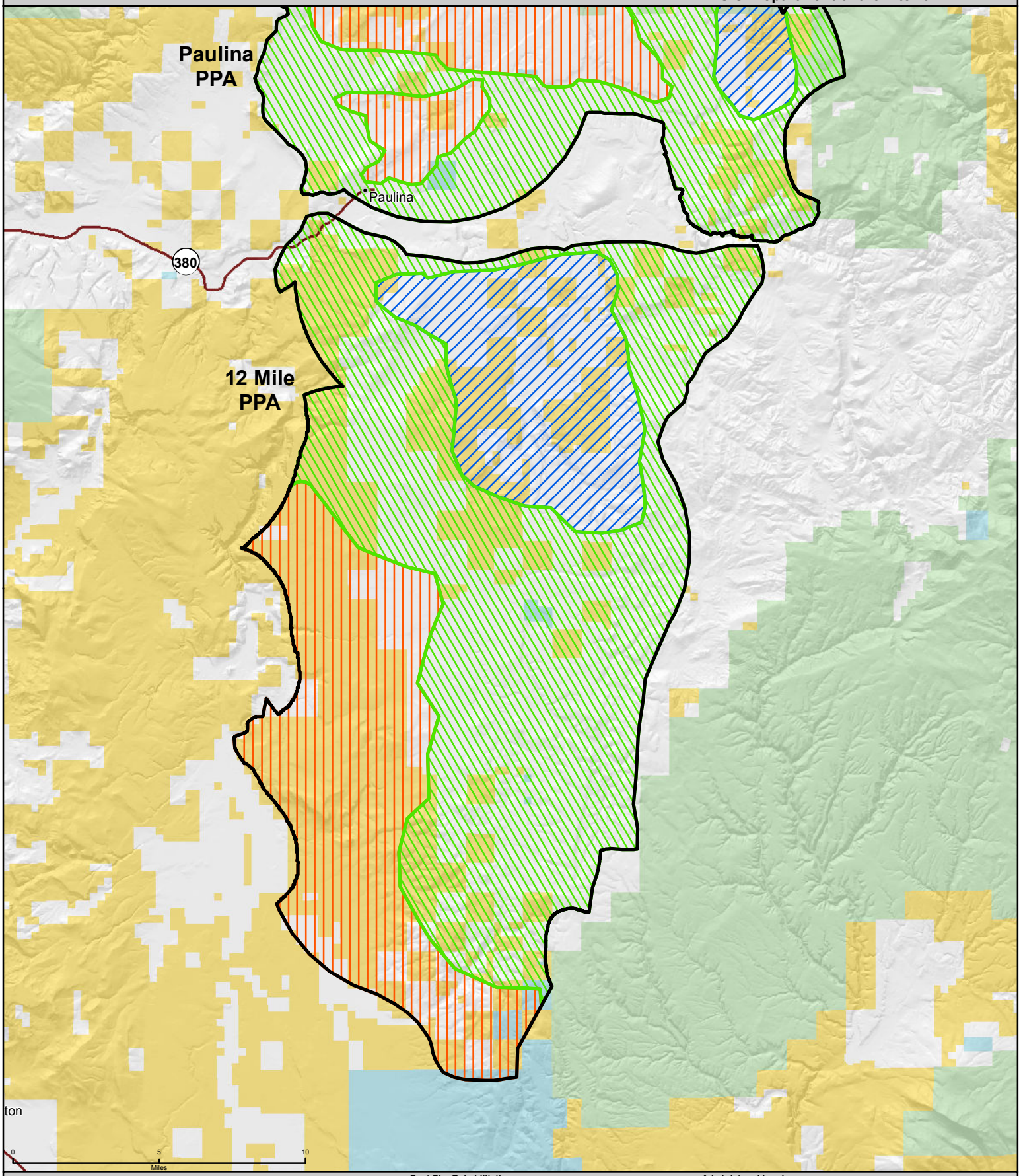
Administered Lands
- Bureau of Land Management
- U.S. Forest Service
- State
- Private/Unknown

March 2015
Date Saved: 3/16/2015
Data Sources: BLM
1:250,000

Post-Fire Rehabilitation Management Strategies - 12 Mile PPA

Greater Sage-Grouse Wildfire, Invasive Annual Grasses, and Conifer Expansion Assessments

Central Oregon Assessment Area
Bureau of Land Management
U.S. Department of the Interior



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Map Location
Oregon

Post-Fire Rehabilitation Management Strategy
- Priority 1
- Priority 2
- Priority 3

- FIAT Project Planning Area
- Cities
- Highways

Administered Lands
- Bureau of Land Management
- U.S. Forest Service
- State
- Private/Unknown

March 2015
Date Saved: 3/16/2015
Data Sources: BLM
1:275,000

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Appendix B

GIS Data

Data Sources for Maps

Dataset	Description	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.	http://pubs.er.usgs.gov/publication/ds612
WFDSS fire perimeters	Butler, B. B.; Bailey, A. 2013. Disturbance history (Historical wildland fires). Updated 8/9/2013. Wildland Fire Decision Support System. Online: https://wfdss.usgs.gov/wfdss/WFDSS_Home. shtml [Accessed 5 March 2014].	https://wfdss.usgs.gov/wfdss/WFDSS_Home.shtml or https://wfdss.usgs.gov/wfdss/WFDSSData_Downloads.sht
Piñon and juniper land cover	U.S. Geological Survery (USGS) National Gap Analysis Program. 2004. Provisional digital land cover map for the southwestern United States. Version 1.0. Logan, UT: Utah State University, College of Natural Resources, RS/ GIS Laboratory.	http://earth.gis.usu.edu/swgap/landcover. html
Piñon and juniper land cover	U.S. Geological Survey (USGS). 2013: LANDFIRE 1.2.0 Existing Vegetation Type layer. Updated 3/13/2013. Washington, DC: U.S. Department of the Interior, Geological Survey. Online: http:// landfire.cr.usgs.gov/viewer/. [Accessed 13 March, 2015]	http://www.landfire.gov/NationalProductDescriptions21.php
Soil data (SSURGO)	Soil Survey Staff. 2014a. Soil Survey Geographic (SSURGO) Database. United States Department of Agriculture, Natural Resources Conservation Service. Online: http://sdmdataaccess.nrcs.usda. gov/. [Accessed 3 March 2014a].	http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/?cid=nrcs142p2_053627
Soil data (STATSGO)	Soil Survey Staff. 2014b. U.S. General Soil Map (STATSGO2) Database. United States Department of Agriculture, Natural Resources Conservation Service.	http://sdmdataacc ess.nrcs.usda.gov / . [Accessed 3
GeoMac Fire Perimeters	Extracted from GeoMAC for the years 2000-2013. For each assessment area, extracted all fire perimeters that intersect the 15mile buffer. Note for FIAT teams: the data is not clip the data to the assessment area, any multi-part polygon associated with a given fire may include a feature outside the AOI, so assessment teams can decide to clip or use entire polygons.	fire_perim2000-2013_sgb.zip
SW-ReGAP	Geological Survey, Gap Analysis Program (GAP). May 2011. National Land Cover, Version 2US	http://gapanalysis.usgs.gov/gaplandcover/data/
Fuel_Breaks	Step 2 priority areas for fuels breaks based upon resistance and resilience and roads	

BLM WFMI Fire Occurrence data	Used in step 2 for years 2013 and 2014. This data was merged with FPA FOD.	https://www.nifc.blm.gov/cgi/Wfmi Home.cgi
Fuels_Management	Step 2 priority areas for fuels management actions based upon resistance and resilience	
Habitat_Restoration_Recovery	Step 2 priority areas for habitat restoration and fuels management actions based upon resistance and resilience	
Post_Fire_Rehabilitation	Step 2 priority areas for post fire actions based upon resistance and resilience	
Breeding Bird Density 75 pct	25%, 50%(buffered to 6.4km) and 75% and 100% population kernel based on the Doherty model, buffered to 8.5km. Male lek counts (strutting field: YEARAV) were averaged to create a population percentage for the Subregion and the Population/Sub-population areas	
Contours 100_Focal_Habitat	This dataset is maintained by the NOC for all BLM usage.	
Fire Perimeters MTSB 1984to 2014	Data collected from the MTBS (monitoring Trends in Burn Severity) website. http://www.mtbs.gov/nationalregional/intro.html	
Interface Int Dis	Sage-grouse Planning effort west-wide (baseline) cumulative effects analysis (CEA). Source datasets were acquired from numerous sources	
	BLM State Offices responding to the WO 300 data call from November 2011 through May 2012, BLM and USFS data stewards, various state and federal agencies, and other sources outside the BLM.	
	National Operations Center, Bureau of Land Management	
	Soil_Sage is Temperature and Moisture and Sage brush cover combined for Resilience/resistance 1A- 3C These data are intended to portray soil moisture and temperature regimes across the greater sage-grouse distribution. The data was derived from NRCS SSURGO data and where gaps NRCS STATSGO – Credits Chambers et al. 2014	

Vegetation_Treatment_Acres completed	Summary The boundaries of vegetation treatments performed by the BLM, are important to the fire community, land health, range improvements, forest management, invasive species control, emergency stabilization, and to the BLM as a whole. They provide the locations of actions that have been taken to meet land health objectives whether through fuels reduction, emergency stabilization, and burned area rehabilitation, changing vegetation composition or controlling weeds. This data will provide the standard template for storage of treatment polygons representing the tract of land where a unique treatment is completed. Description This data set will be a warehouse of completed vegetation treatment areas and associated attributes.	
Vegetation_Treatment_Acres Proposed	NFPORS and other local perimeter data developed from other programs	
National SMA	SurfaceManagementAgency: The Surface Management Agency (SMA) Geographic Information System (GIS) dataset depicts Federal land for the United States and classifies this land by its active Federal surface managing agency. The SMA feature class covers the continental United States, Alaska, Hawaii, Puerto Rico, Guam, American Samoa and the Virgin Islands. A Federal SMA agency refers to a Federal agency with administrative jurisdiction over the surface of Federal lands. Jurisdiction over the land is defined when the land is either: Withdrawn by some administrative or legislative action, or Acquired or Exchanged by a Federal Agency. This layer is a dynamic assembly of spatial data layers maintained at various federal and local government offices. The GIS data contained in this dataset represents the polygon features that show the boundaries for Surface Management Agency and the surface extent of each Federal agency's surface administrative jurisdiction. SMA data depicts current withdrawn areas for a particular agency and (when appropriate) includes land that was acquired or exchanged and is located outside of a withdrawal area for that agency. The SMA data do not illustrate land status ownership pattern	

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Appendix C

Soil Temperature and Moisture Regime Attribute Table

Soil temperature and moisture regime with moisture subclass	Common Name	Original FIAT R&R Categories	Revised FIAT R&R Categories
Cryic/Aridic-Typic	Cold/dry		2
Cryic/Aridic bordering on Xeric	Cold/dry bordering on moist		1
Cryic/Ustic-Typic	Cold/summer moist		1
Cryic/Xeric	Cold/moist	1	1
Cryic/Xeric-Typic	Cold/moist		1
Cryic/Xeric bordering on Aridic	Cold/moist bordering on dry		1
Frigid/Aridic	Cool/dry	3	2
Frigid/Aridic-Typic	Cool/dry		2
Frigid/Aridic bordering on Ustic	Cool/dry bordering on summer moist		2
Frigid/Aridic bordering on Xeric	Cool/dry bordering on moist		2
Frigid/Xeric	Cool/moist	1	1
Frigid/Xeric-Typic	Cool/moist		1
Frigid/Xeric bordering on Aridic	Cool/moist bordering on dry		2
Frigid/Ustic bordering on aridic	Cool/summer moist bordering on dry		2
Frigid/Ustic-Typic	Cool/summer moist	1	1
Mesic/Aridic	Warm/dry	3	3
Mesic/Aridic-Typic	Warm/dry		3
Mesic/Aridic bordering on Ustic	Warm/dry bordering on summer moist		3
Mesic/Aridic bordering on Xeric	Warm/dry bordering on moist		3
Mesic/Ustic bordering on Aridic	Warm/summer moist bordering on dry		3
Mesic/Xeric	Warm/moist	2	2
Mesic/Xeric-Typic	Warm/moist		2
Mesic/Xeric bordering on Aridic	Warm/moist bordering on dry		3

The above table of soil attributes (soil temperature/moisture regimes) and Resistance/Resilience assignments were used in the original and revised FIAT reports. Soil survey spatial and tabular data were obtained for the Project Planning Areas from 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. Where SSURGO data were unavailable, gaps were filled in using the State Soil Geographic database (STATSGO2). The attributes of the soil component with the highest component percentage (dominant component) were used to characterize the temperature and moisture regime. Only temperature and moisture regimes applicable to sagebrush ecosystems were displayed. For additional details, see Chambers et al. 2014, and Maestas and Campbell 2014.

Fact Sheet

Mapping Potential Ecosystem Resilience and Resistance across Sage-Grouse Range using Soil Temperature and Moisture Regimes

A cool and moist (frigid/xeric) mountain big sagebrush site in Nevada (left) compared to a warm and dry (mesic/aridic) Wyoming big sagebrush site in Oregon (right) illustrates the natural variability in site potential across sagebrush ecosystems. Mapping soil temperature and moisture regimes can help depict this gradient and indicate potential ecosystem resilience and resistance. Photos: Jeremy Maestas

Background

Our ability to address threats to sage-grouse and the sagebrush steppe can be greatly enhanced by understanding ecosystem resilience to disturbance and resistance to invasive species (Chambers et al. 2014a,b). A recent breakthrough in the practical application of resilience and resistance concepts has been linking *soil temperature and moisture regimes* to sagebrush ecosystem responses to disturbance and annual grass invasion.

Potential resilience and resistance to invasive annual grasses reflect the biophysical conditions of an area, and soil temperature and moisture regimes provide a useful indicator of these conditions at multiple scales. Resilience to disturbance typically increases with higher resource availability and more favorable environmental conditions for plant growth and reproduction. Thus areas with warm *(mesic)* soil temperature and dry *(aridic)* soil moisture regimes typically have low potential resilience, while those with cool *(frigid)* to moderately cold (*cryic*) soil temperature and relatively moist (*xeric* to *ustic*) soil moisture regimes have high potential resilience. Resistance to exotic annual grasses, like cheatgrass, is strongly influenced by climate suitability for establishment and persistence. Cheatgrass germination, growth and reproduction appear to be optimal under relatively warm and dry to moist regimes (*mesic/aridic* or *xeric),* limited by low and sporadic precipitation under dry regimes (*aridic),* and generally constrained by colder regimes (*frigid* to *cryic).* These relationships are modified

by effects of: (1) elevation, landform, slope, aspect, soil characteristics, and resulting vegetation composition and structure, and (2) the ecological condition of an area (Figure 1. Chambers et al. 2014a,b)

Soil climate data (temperature and moisture) are fundamentally important in classifying and mapping soils, and as such, are widely collected as part of the National Cooperative Soil Survey program. This provides us with the ability to map temperature and moisture regimes across the range of sage-grouse to better understand potential resilience and resistance along a diverse environmental gradient.

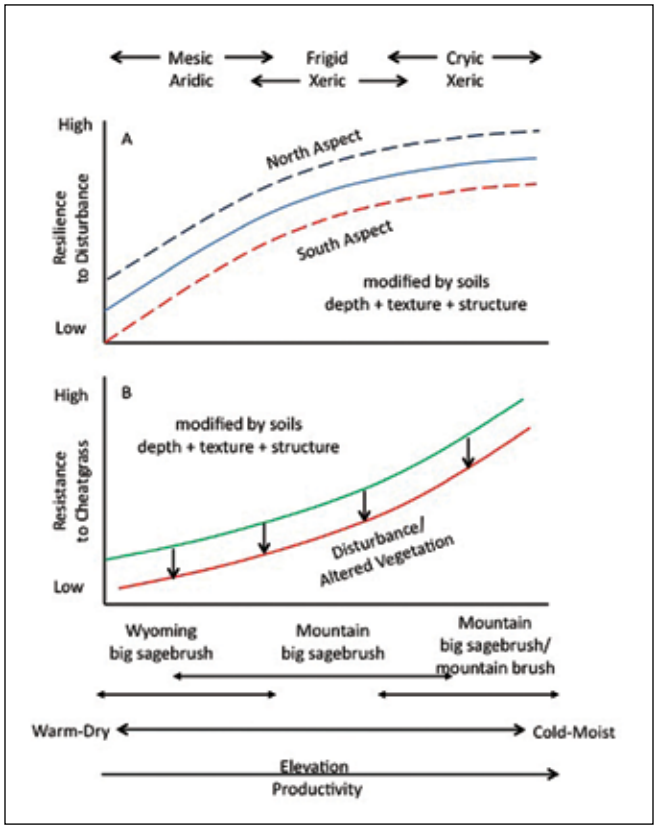

Figure 1. Example of resilience to disturbance (A) and resistance to cheatgrass (B) over a soil temperature and moisture regime gradient in the western portion of the sagebrush ecosystem. Dominant ecological types occur along a continuum from Wyoming big sagebrush communities on warm and dry sites to mountain big sagebrush/mountain brush communities on cold and moist sites (modified from Chambers et al. 2014a,b).

Resilience is the capacity of an ecosystem to regain its fundamental structure, processes and functioning when altered by stressors like drought, and disturbances like altered fire regimes. It is a measure of the ability of an ecosystem to *recover* after stress or disturbance.

Resistance is the capacity of an ecosystem to retain its fundamental structure, processes and functioning despite stresses, disturbances or invasive species, or to remain largely unchanged.

Resistance to invasion is the capacity of an ecosystem to limit the establishment and population growth of an invading species.

New product assembles available data for rangewide use

While soil temperature and moisture regimes can be found in published soil surveys, a single dataset aggregating all available data was compiled to facilitate broad scale analyses and to provide a simple decision support tool for field practitioners. Available soils data from across Sage-Grouse Management Zones (Stiver et al. 2006) were compiled from two primary sources: 1) completed and interim soil surveys (SSURGO), and 2) state soils geographic databases (STATSGO2).

SSURGO – Soil Survey Geographic Database

SSURGO is the most detailed soil survey product produced by the National Cooperative Soil Survey. Information was collected through field inventory and interpretation at scales ranging from 1:12,000 to 1:63,360, with 1:24,000 being the most common. SSURGO datasets consist of spatial data, tabular data, and information about how the data were created. Soil survey maps are linked in the database to information about the component soils and properties for each soil map unit.

For this rangewide product, Gridded Soil Survey Geographic (gSSURGO) file geodatabases were used to display a 10-meter raster dataset. State gSSURGO datasets were then clipped to the extent of the Sage-Grouse Management Zones and merged.

STATSGO2 – State Soil Geographic Database

The Digital General Soil Map of the United States or STATSGO2 is a broad-based inventory of soils and non-soil areas that occur in a repeatable pattern on the landscape and that can be cartographically shown at a scale of 1:250,000. The dataset was created by generalizing more detailed soil survey maps. Where more detailed soil survey maps were not available, data on geology, topography, vegetation, and climate were assembled and related to Land Remote Sensing Satellite (LANDSAT) images. Soils of similar areas were studied, and the probable classification and extent of the soils were determined. STATSGO2 was used in areas of the Sage-Grouse Management Zones where more detailed SSURGO was currently not available.

Where can I access the product?

The aggregated soils data product can be downloaded free-of-charge on the Landscape Conservation Management and Analysis Portal (LCMAP):

https://www.sciencebase.gov/catalog/folder/538e5aa9e4b09202b547e56c

How to work with the files in a Geographic Information System (GIS)

Rangewide layer for rapid application

The data product includes a file geodatabase named *SoilMoistureTemperatureRegimes.gdb* that contains a single raster dataset merging best available SSURGO and STATSGO2 across Sage-Grouse Management Zones. The attribute table includes the temperature and moisture regime for the map unit dominant condition. A layer file named *SoilMoistTempLayer.lyr* can be used to quickly create a fully symbolized map with a legend of the predominant temperature and moisture regimes across sagebrush ecosystems (Figure 2).

Detailed data for more in-depth analyses

Separate geodatabases providing more detailed information are also available for both SSURGO and STATSGO2 data. These products allow users to explore the data in more depth at finer scales. An example of how to work with one of the geodatabases is provided here.

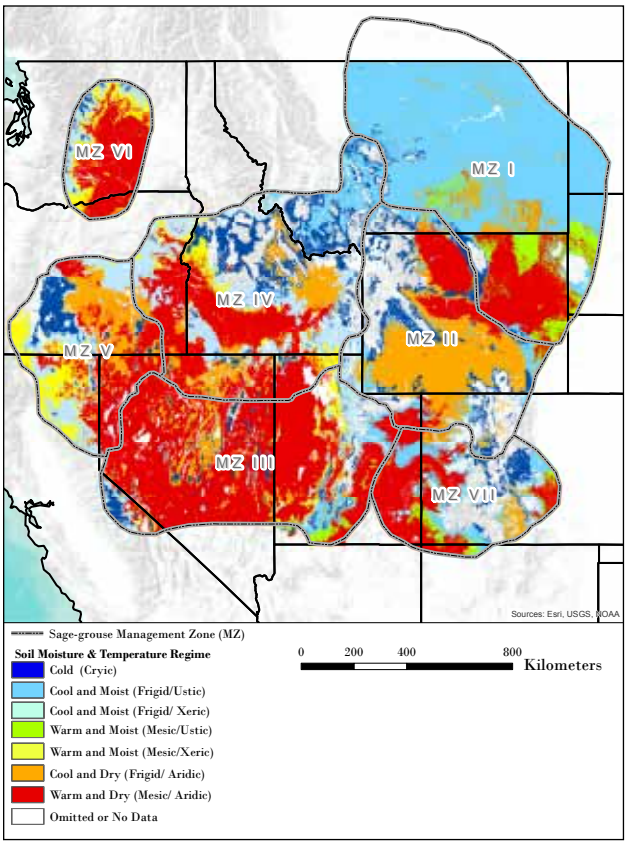

Figure 2. New soils product provides ability to depict potential ecosystem resilience and resistance across the range of sage-grouse using soil temperature and moisture regimes. For more information on interpretation, see Chambers et al. 2014b.

The file geodatabase named *SGMZ_SSURGO_temp_moist_regimes_v2.gdb* contains a raster dataset with all the SSURGO spatial data that is currently available in the Sage-Grouse Management Zones. There are two tables in this file geodatabase that can be joined to the raster dataset using the common mukey field. The table named *SSURGO_SGMZ_temp_moist_dom_cond_v2* contains the temperature and moisture regime and moisture subclass for the dominant condition in each map unit. The table named *SSURGO_SGMZ_temp_moist_components_v2* has data for each major component, including things like soil type, precipitation range, temperature-moisture regimes and subclasses, and ecological sites. When this table is joined to the raster dataset, the data for the dominant component will be in the attribute table. The *Identify* tool in ArcGIS can be used to display many attributes of the dominant component.

For an even finer grain look, the *SSURGO_SGMZ_temp_moist_components_v2* table can be opened to determine the ecological site and temperature and moisture regimes that are associated with each component in a map unit, rather than just the dominant component.

For More Information

Data Contact

Steve Campbell, USDA-NRCS Soil Scientist, 503-273-2421, steve.campbell@por.usda.gov

Background on SSURGO and STATSGO data: http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/survey/geo/

Access to soil surveys: http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

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Suggested Citation

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Stiver, S. J.; Apa, A. D.; Bohne, J. R.; Bunnell, S. D.; Deibert, P. A.; Gardner, S. C.; Hilliard, M. A.; McCarthy, C. W.; Schroeder, M. A. 2006. Greater Sage-grouse Comprehensive Conservation Strategy. Unpublished report on file at: Western Association of Fish and Wildlife Agencies, Cheyenne, WY.

Displaying Dominant Condition Vs. Dominant Component

It is important to understand some fundamental concepts in how soils are mapped in order to properly interpret information provided. Soils and their properties change over a continuous gradient but soils are described in map units. Soil map units commonly contain more than one "component" (soil types or miscellaneous areas such as rock outcrops) with unique data associated with each component. When spatially displaying soil survey information, a decision has to be made as to how to aggregate the component data to the map unit. The two most common aggregation methods are to display either *dominant component* or *dominant condition.* The example below illustrates the difference between these two methods:

Soil map unit: Alpha-Beta-Gamma complex, 8 to 30 percent slopes

Component Name	% of Map unit	Temperature/ Moisture Regime	Aggregation Method
Alpha	45	Warm and Dry (Mesic/Aridic)	Dominant Component
Beta	30	Cool and Dry (Frigid/Aridic)	Dominant Condition
Gamma	25	Cool and Dry (Frigid/Aridic)	

This map unit is on highly dissected hill slopes with a complex pattern of northerly and southerly aspects. The Alpha component is on southerly aspects and the Beta and Gamma components are on cooler northerly aspects. The temperature and moisture regime for the dominant component is Warm and Dry (mesic/aridic) since the Alpha component comprises the highest percentage of the map unit. The dominant condition is Cool and Dry (frigid/aridic) since the Beta and Gamma components cumulatively comprise 55 percent of the map unit, exceeding the 45 percent of the Alpha component. For the majority of soil map units, but not all, the dominant component and dominant condition results are identical. This product provides aggregated data in both dominant condition and component tables to allow users access to advantages of each approach.

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Appendix D

Meeting Locations and Participants

Meeting Place	Date	Attendees	Agency
Prineville, OR	9/29/2014 through 9/30/2014 and 12/02/2014 and 12/04/2014 and 1/06/2015		
		Sean Cottle	EMPSi
		Peter Gower	EMPSi
		Craig Goodell	BLM
		Ken Collum	BLM
		Guy Chamness	BLM
		Bob Crumrine	BLM
		David Probasco	BLM
		Andy Daniels	BLM
		Bill Dragt	BLM
		John Owens	BLM
		Grace Haskins	BLM
		Michael Tripp	BLM
		Jenni Moffitt	BLM
		Al Crouch	BLM
		Bill Lutjens	BLM
		Douglas Kile	BLM
		Ralph Falsetto	BLM
		Molly Galbraith	BLM
		Monte Kuk	BLM
		Dan Ridenour	BLM
		Casey O'Connor	BLM
		Jeremy Maestas	BLM
		Chad Rott	BLM
		Brian Watts	BLM
		Corey Heath	ODFW
		Matt Keenan	ODFW
		Greg Jackle	ODFW
		Jackie Couples	ODFW
		Gordon Foster	ODF EOA
		Jay Kerby	TNC
		Angela Sitz	USFWS

		Dawn Davis	USFWS
		Theresa Burcsu	INR/Sagecon
		Chris Mundy	NRCS
		Jeremy Maestas	NRCS

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