PAC Causal Factor Analysis Worksheet

PAC Name:	Brothers/North Wagontire			
Date Started:	5/1/2017		**Date Completed:**	8/11/2017
Trigger Type:	Soft Trigger	Habitat ☐ Population ☒	Hard Trigger	Habitat ☐ Population ☐

Team Members		
Name	**Position**	**Agency/Tribe**
Stephanie McKinney	Wildlife Biologist	BLM
Emily Lent	Range Management Specialist	BLM
Kevin Weldon	Geologist	BLM
Michael Anderson	Recreation Specialist	BLM
Anna Smith	Hydrologist	BLM
Kristin Williams	Botanist/Weeds	BLM
Lawrence Ashton	Wildlife Biologist	BLM
Brenda Hallmark	Fuels Program Lead	BLM
Lee Foster	Sage Grouse Lead	ODFW
Gavin Hoban, Jeanne Keyes	GIS Specialist	BLM
Josef Porter	Wildlife Biologist	Lakeview BLM
Brock McCormick	Wildlife Biologist	US Forest Service
Emily Weidner	Consultation Biologist	US Fish and Wildlife Service

Applicable Threats
(Select all that are present)

Isolated/small size	☒	Sagebrush elimination	☐
Agriculture conversion	☐	Fire	☒
Conifers	☒	Weeds/annual grasses	☒
Energy	☒	Mining	☒
Infrastructure	☒	Grazing	☒
Free-roaming equids	☐	Recreation	☒
Urbanization	☐		
Other (describe):	☒	Drought/Mesic Habitat	
	☒	Predation	
	☒	Hunting	
	☒	West Nile Virus	

Situation Analysis

There has been a significant amount of work conducted in the Brothers/N. Wagontire Priority Area of Conservation (i.e. juniper treatments, prescribed fire, playa project, permit renewals, sage grouse telemetry, etc.). However, there was not a clear answer for the population decline. The team concluded that as the Prineville District and partners continue the coordinated surveys (lek, raven, and West Nile virus), monitoring (Assessment Inventory and Monitoring and Habitat Assessment Framework), and treatments (juniper and invasive weeds) we think the population should respond positively.

Recommended Management Responses

1. Prioritize juniper and invasive weed treatments in Brother's Priority Area of Conservation;
2. Start clearance work for vegetation treatments in FY18 as funding allows;
3. Continue to complete Standards & Guides for permit renewals;
4. Continue Assessment Inventory and Monitoring plots in PAC;
5. Continue to install flight diverters where appropriate and as funding allows; and
6. Initiate travel management with future implementation/activity level planning where feasible and as funding allows.

Monitoring Plan

West Nile Virus surveys have begun 2017.
AIM Monitoring
Raven Surveys to begin when Lek surveys occur Spring 2018

ANNUAL REVIEW

Date Completed: August 11, 2017		
Current Status of PAC Triggers	Population: Soft Trigger	Habitat:
Recommendations still valid:	Yes X No ☐	
New analysis needed:	Yes ☐ No X	
Actions taken to date: Flight Diverts, AIM plots, Lek Monitoring, CFA Analysis		
Approved by:	Dennis Teitzel District Manager	
	Name	Signature

Date Completed: Click here to enter a date.		
Current Status of PAC Triggers	Population:	Habitat:
Recommendations still valid:	Yes ☐ No ☐	
New analysis needed:	Yes ☐ No ☐	
Actions taken to date:		
Approved by:		
	Name	Signature

Date Completed: Click here to enter a date.		
Current Status of PAC Triggers	Population:	Habitat:
Recommendations still valid:	Yes ☐ No ☐	
New analysis needed:	Yes ☐ No ☐	
Actions taken to date:		
Approved by:		
	Name	Signature

Detailed Report

Problem Statement

The Oregon Greater Sage-Grouse Approved Resource Management Plan Amendment (ARMPA) (BLM 2015) identifies an adaptive management response (Appendix J) for habitat and population based thresholds. Exceeding an adaptive management threshold requires BLM to complete a Causal Factor Analysis. The purpose of this Causal Factor Analysis is to identify the most probable causes for tripping the population soft trigger for the Brothers/N. Wagontire Priority Area of Conservation (PAC) and provide the Prineville District, District Manager with a list of potential actions to ameliorate these factors with the goal of reversing the decline and bringing sage-grouse populations above the soft trigger threshold with an upward trend.

The soft trigger identifies an intermediate threshold indicating that management changes are needed at the implementation level to reduce the likelihood of tripping a hard trigger. In 2016 the PAC experienced a large (-23.2 percent) drop in annual population size. If this trend continues into 2017, it will likely cause a hard population trigger to be tripped. Table 1 shows population trigger thresholds for the PAC, and Table 2 shows habitat triggers.

Table 1: Population Trigger for Brothers/ N. Wagontire PAC

Soft Threshold	Hard Threshold	Estimated No. of Males	Percent Change: Annual	Percent Change: 5 YR Average	5 Year Average	Populations Trigger Tripped
149	128.7	106	-23.20	-10.9	146.6	Soft

Table 2: Habitat Trigger for Brothers/ N. Wagontire PAC

Total PAC (Acres)	Capable (Acres)	Baseline Existing Habitat 2012 (Acres)	Habitat Loss (Fire) 2012-2016 (Acres)	Habitat Gain (Juniper Treatments) 2012-2016 (Acres)	2016 Habitat Loss (Percent)	2016 Habitat (Percent)	Habitat Trigger Tripped

293,462	272,218	235,373	0	1,805	0	86.5	No

Description of the Area

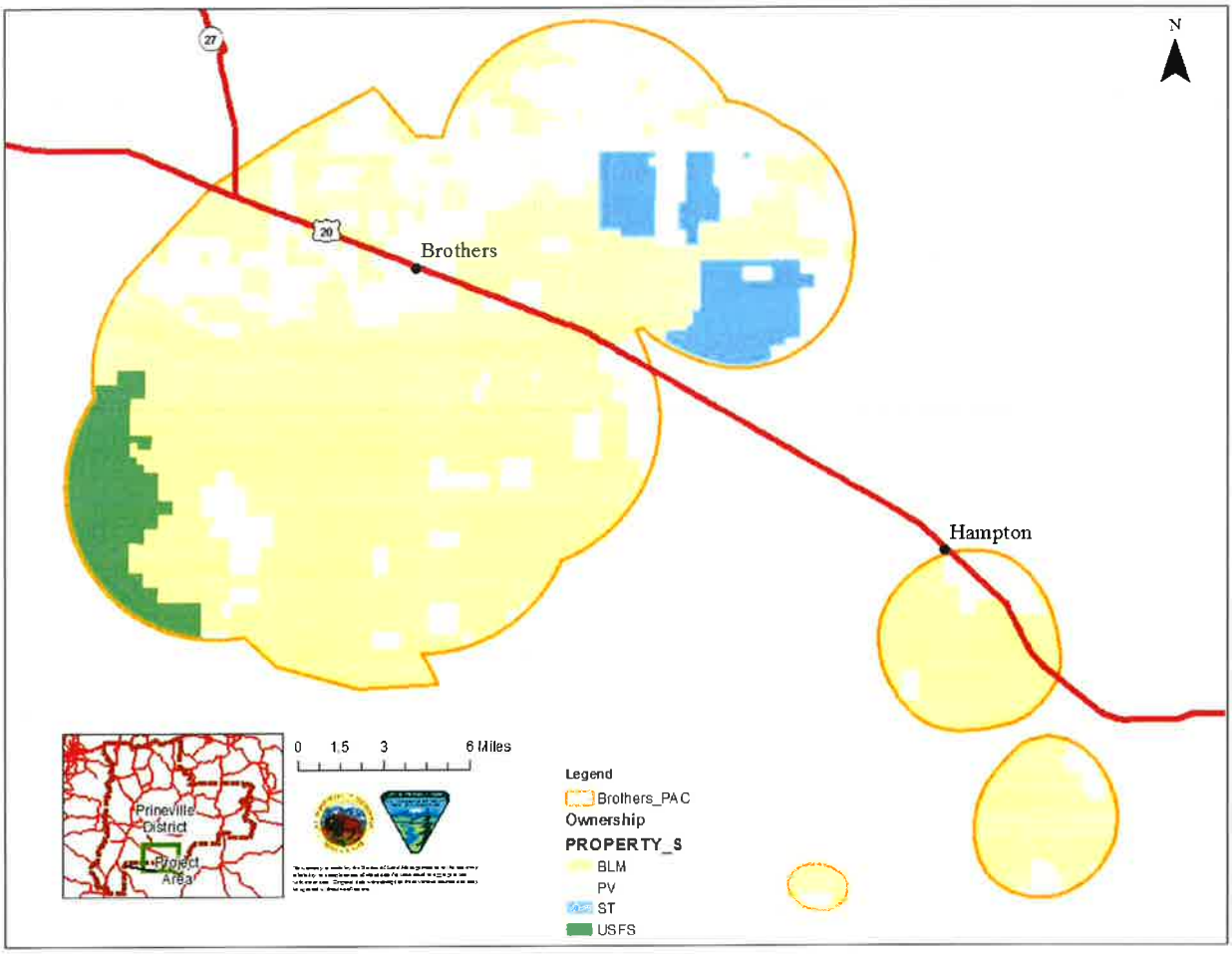
General Description

The Brothers/N. Wagontire PAC is approximately 40 miles south and east of Prineville. The area borders the Deschutes National forest on the southwest and extends north across Oregon State Highway 20 directly east of Brothers. The PAC is comprised of 293,461 acres of which the BLM manages 65% (191,086 acres) and Federal (USFS, BLM) or State Agencies collectively manage 74.4% of the PAC. See Table 3 for land status acres, and Figure 1 for an overview map. The PAC crosses BLM administrative units, with the majority on the Prineville District, and 1.95% (5,746 acres) on Lakeview District. The PAC is oriented with its long axis running southeast to northwest and ranges from 4,000 feet to 5,365 feet elevation at Plot Butte. Pine Mountain and Hampton Butte summits lie outside of the PAC but hillslopes/ridges are within. Climate data for the city of Brothers shows annual rainfall averaging 8.99 inches with the greatest amount of precipitation arriving in May, and an average annual temperature of 43.4 degrees Fahrenheit (Western Regional Climate Center data from 1959-2011).

Table 3: Land state, acres and percentage, for Brothers/N. Wagontire PAC

Land Status	BLM	Private	State	Forest Service	Total Acres
Acres	191,086	75,014	14,298	13,063	293,461
Percentage	65.1%	25.6%	4.9%	4.4%	100%

Figure 1: Ownership Map for Brothers/ N. Wagontire PAC



BLM Land Allocations

There are no Areas of Critical Environmental Concerns, Wilderness Study Area, or Research Natural Areas present within the PAC boundary. The PAC is primarily within Visual Resource Management (VRM) Class 3 and 4, with a small portion (965 acres in the unincorporated PAC boundary) in VRM Class 2.

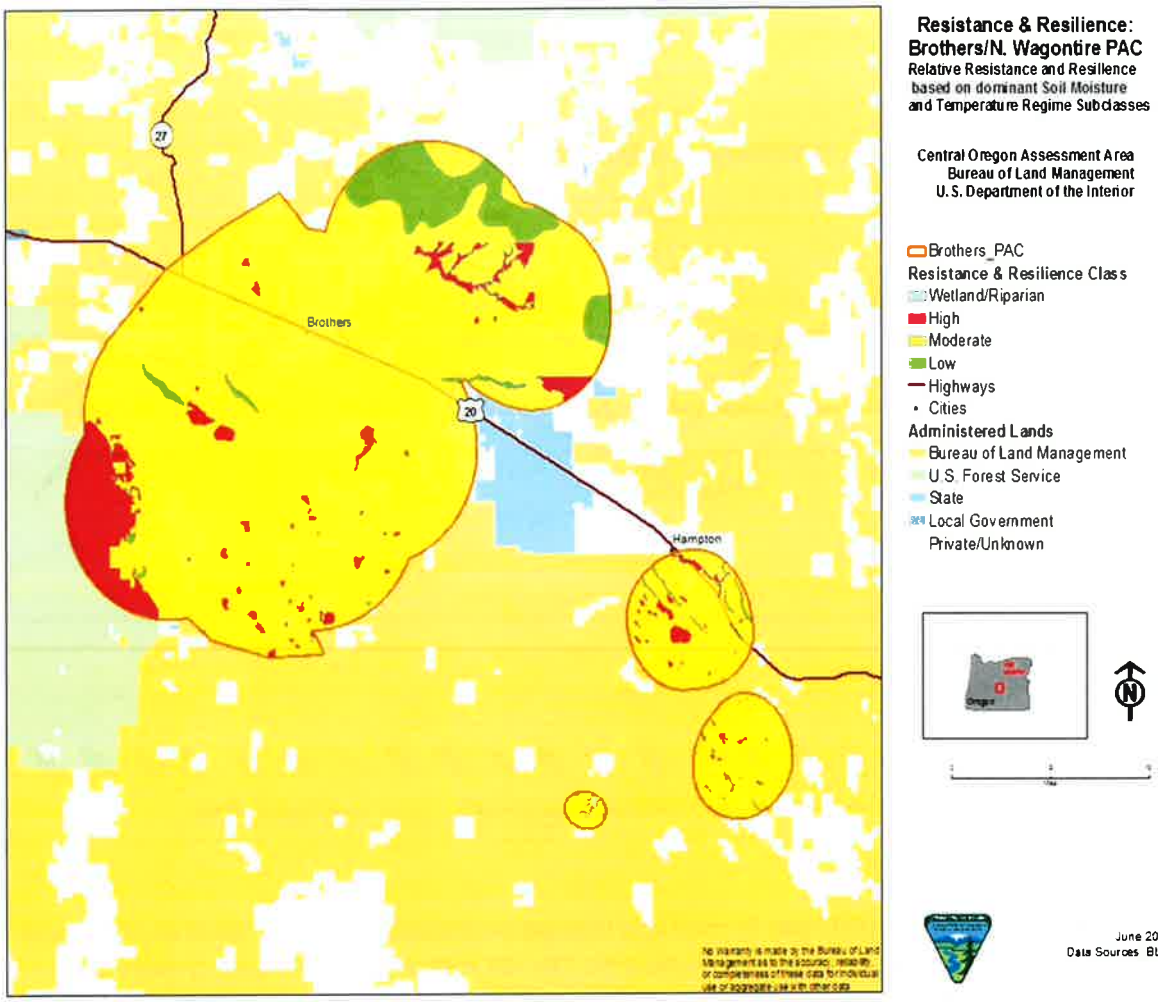
The PAC is primarily covered in the Brothers LaPine Resource Management Plan (RMP). There is a small section of 275 acres within the Upper Deschutes Resource Management Plan. The Brothers/La Pine RMP classified 194 acres within the PAC as Z-1 land tenure, which means the lands have been identified as having national or statewide significance. According to the Oregon Greater Sage-grouse Approved Resource Management Plan Amendment (September 2015) (ARMPA), all sage-grouse habitat (PHMA & GHMA) is now classified as Z-1. There are 7,114 inventoried acres that possess wilderness characteristics

within the PAC (Frederick Butte Wilderness Characteristics Inventory). Related to GRSG-ARMPA planning decisions and implementation actions, it is necessary to provide and document the rationale for protecting or not protecting an area found to contain wilderness characteristics.

Resistance and Resilience

The Natural Resource Conservation Service (NRCS), in coordination with sagebrush ecosystem scientists, has developed and refined the use of soil climate data to identify areas that differ in their resistance to invasion of cheat grass and resilience from disturbance (e.g. Chambers et al. 2014a, b, c). Within the Brothers/N. Wagontire PAC, approximately 7% of land is classified as high resistance, 87% moderate, 5% low, with the remaining area classified as wetland/riparian. Most of the area classified as low resistance and resilience is located near the northern boundary of the PAC around 5,000 foot elevation with steeper slope gradients than the rest of the PAC area (Figure 2). The area classified as high resistance and resilience occurs primarily in the southwest portion of the PAC on the Deschutes National Forest with other scattered patches dispersed throughout the PAC. The moderate resistance and resilience area occurs throughout the PAC, dispersed on both sides of Highway 20 within relatively flat terrain.

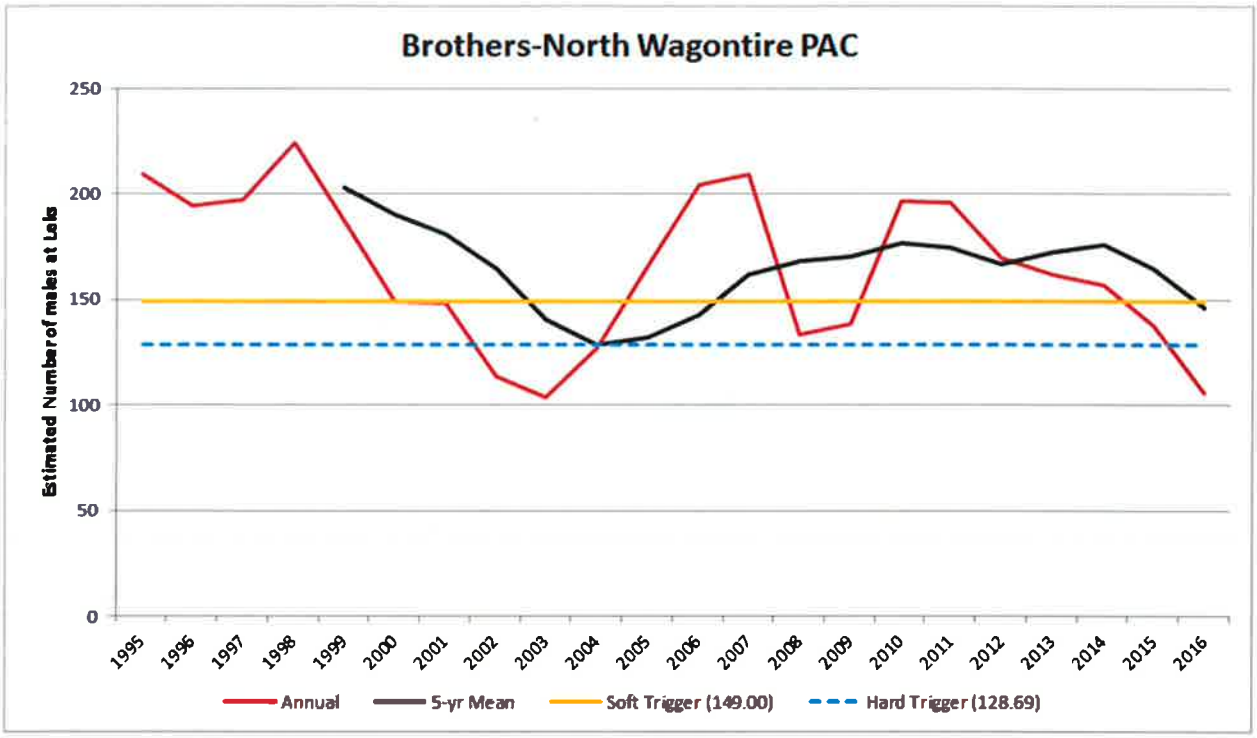
Figure 2: Resistance to invasion and resilience to disturbance classifications within Brothers/N. Wagontire PAC and vicinity.



Sage-Grouse Population and Trend

In 2016, the estimated 5-year running mean of estimated male sage-grouse lek attendance in the Brothers PAC declined to 147 males, which is below the soft trigger of 149 males. The male lek attendance estimate in 2016 was 106 individuals, the lowest estimated attendance in the PAC since 2003. The Brothers PAC has exhibited two full population cycles since 1995, when survey data became sufficient to reliably track population trend, exhibiting population peaks in 1998, 2007, and 2010 (224, 210, and 197 estimated males, respectively), and population troughs in 2003, and 2008 (103, and 134, estimated males, respectively; Figure 3). The population has consistently declined since 2010, with no upswing since 2013 as has characterized other populations in the state. As of June 2017, initial data indicates continued population decline during the 2017 breeding season. If estimated attendance in 2017 falls below 81 males, a hard population trigger will be tripped for the PAC. When population trend was analyzed at the scale of individual lek complexes, no clear patterns emerged, with attendance at the majority of lek complexes within the PAC declining at approximately the same rate as the population as a whole.

Figure 3. Annual and five-year trend in estimated male sage-grouse population in the Brothers/N. Wagontire PAC



Analysis Approach

A BLM Interdisciplinary Team (IDT) was formed and incorporated specialists that have knowledge and information of current and past conditions of the area. The IDT met and discussed the threats as identified in the COT report, compiling background information, discussing current/ongoing actions and management practices, and then identifying potential actions to address identified threats (Table 4). ODFW provided a summary on sage-grouse population and trend information and isolation/ small population. ODFW also reestablished the Local Implementation Team (LIT) to help gather interested stakeholders, and agencies who will help provide additional information.

The Central Oregon Fire Invasives Assessment Tool (FIAT) was completed in 2015 and incorporated into the analysis. The Brothers Proposed Project Area (PPA) covers the majority of the Brothers/ N. Wagontire PAC. Data on vegetation categories, juniper treatment acres, invasives, and potential fuel breaks are incorporated. Outside of the PPA, ESI data was analyzed and incorporated to classify vegetation in the rest of the PAC where available.

Potential threats eliminated from this analysis due to either a known lack of presence or only minimal presence included urbanization, agricultural conversion, free-roaming equids, and sagebrush elimination. Brothers and Hampton are very small communities within the PAC. Bend is located 40 miles west of the PAC with no opportunity to expand east. There are no free roaming equids. The team added West Nile virus, predation, drought, mesic resources and hunting to the list of possible threats.

Table 4: List of geospatial data types and sources with year the layer was compiled, where known.

Data Type	Source	Year(s)
Oregon Cropland Data	US Department of Agriculture	2016
Central Oregon FIAT	BLM	2015
Connectivity Model	The Nature Conservancy	
Corporate data- roads/trails, routes, lands with wilderness characteristics, ownership, playas, streams, grazing improvements, fire history, juniper treatments, allotment boundaries, ESI data, etc.	BLM Prineville District BLM Lakeview District	
Climate	US Climate Data	1961-1990
Mineral Material Sites (BLM, Private and Forest Service)	BLM Corporate, Oregon Department of Geology and Mineral Industries (DOGAMI) Mineral Information Layer for Oregon, release 2 (MILO-2), and U.S. Geological Survey Mineral Resource Data System (MRDS)	
Geothermal	BLM Corporate, Master Title Plats, Historic Indexes, Legacy Rehost 2000 (LR2000), and DOGAMI Geothermal Information Layer for Oregon, release 2 (GTILO-2)	
Oil and Gas	BLM Corporate, Master Title Plats, Historic Indexes, and Legacy Rehost 2000 (LR2000)	
Metallic/Locatable Minerals	Legacy Rehost 2000 (LR2000)	
Energy Solar and Wind	BLM Corporate Legacy Rehost 2000 (LR2000)	
Lek Complexes	Oregon Department of FIsh and Wildlife	2016
Fire History	US Forest Service Corporate Data	

Relevant Factors

Isolation/ Small Population Size

The Brothers PAC is situated in the Central Oregon sage-grouse population (Garton et al. 2011), at the most north-westerly extent of occupied sage-grouse habitat. This population was not considered to be under threat of isolation or small population size when analyzed by USFWS prior to the 2015 listing decision (USFWS 2013). The PAC has a slightly smaller than average area in comparison with all 20 PACs in the state (Brothers = 293,800 acres, Statewide Average = 328,000), and the 5th smallest population of any PAC in the state during 2016 (2016 Estimated Male Attendance: Brothers = 106, Statewide Average = 342). Should the population continue to decline, small population size may reinforce other threats to the PAC, however given that the PAC has rebounded from a lower population level in the past, if habitat quality recovers from suspected drought stressors sufficiently in the short term the population should

be able to respond.

Connectivity analysis indicates that sage-grouse leks separated by >8 – 11 miles from adjoining leks may be isolated through reduced probability of dispersal (Knick and Hanser 2011). The nearest healthy population to the Brothers PAC is the Paulina/12-mile PAC, approximately 15 miles to the east. The two PACs are separated by areas of Juniper woodland, as well as agricultural development, and Highway 20. An area of Low Density Habitat connects the two PACs, south of Highway 20, and lek-to-lek distance across this corridor do not exceed 10 miles. However, juniper encroachment is common in this corridor potentially inhibiting movement between the Brothers and Paulina/12-Mile PACs. The Nature Conservancy (TNC) connectivity model showed all but one lek/ lek clusters are connected to other PACs. The model also shows most of the PAC has moderate levels of cost weighted corridors that show structural connectivity between the Brothers and Paulina PACs.

Vegetation Condition

Ecological Site Inventory (ESI) is the BLM's standard vegetation inventory technique. This method involves the use of soil information to map ecological sites and plant communities. During the process, natural resource and vegetation attributes are collected for the area being assessed, and then compared to a reference ecological site (Habich, 2001). ESI completed from 2009-2016 on approximately 150,000 acres of the Brothers PAC using protocols established in BLM's Ecological Site Inventory and Monitoring Technical Reference 1734-7 (Habich, 2001). The ARMPA documented acres and percent of existing and potential sage-grouse habitat in Oregon PACs in Appendix J (Table 5). In total, 93% of the PAC has either existing or potential habitat available. The following sections summarize the sagebrush canopy class, juniper class, and dominant condition rating.

Table 5: ARMPA Table J-1 summary for PAC: Acres and Percent of Existing and Potential Sage-grouse Habitat in Oregon PACs as of 2014.

PAC	Existing Habitat Acres			Potential Habitat Acres			Total Habitat Acres	Total PAC Acres
	BLM	Other	Percent	BLM	Other	Percent		
Brothers/N. Wagontire	164,003	71,370	86.5%	18,463	18,382	13.5%	272,218	293,462

Sagebrush

The Brothers PAC is largely comprised of mountain sagebrush (*Artemisia tridentata spp. vaseyana*) with components of Wyoming sagebrush (*Artemisia tridentata spp. wyomingensis*), basin big sagebrush (*Artemisia tridentata spp. tridentata*), low sagebrush (*Artemisia arbuscula*), early sagebrush (*Artemisia longiloba*), and silver sagebrush (*Artemisia cana*) observed across the PAC. The FIAT assessment estimated about 51% percent of the evaluated portion of the PAC is comprised of sagebrush. Of the ESI evaluated acres, approximately 38% had sagebrush canopy cover of 15-25% and 95% had sagebrush cover of 5-25% (Table 6). These sagebrush communities are critical to sage-grouse, providing cover,

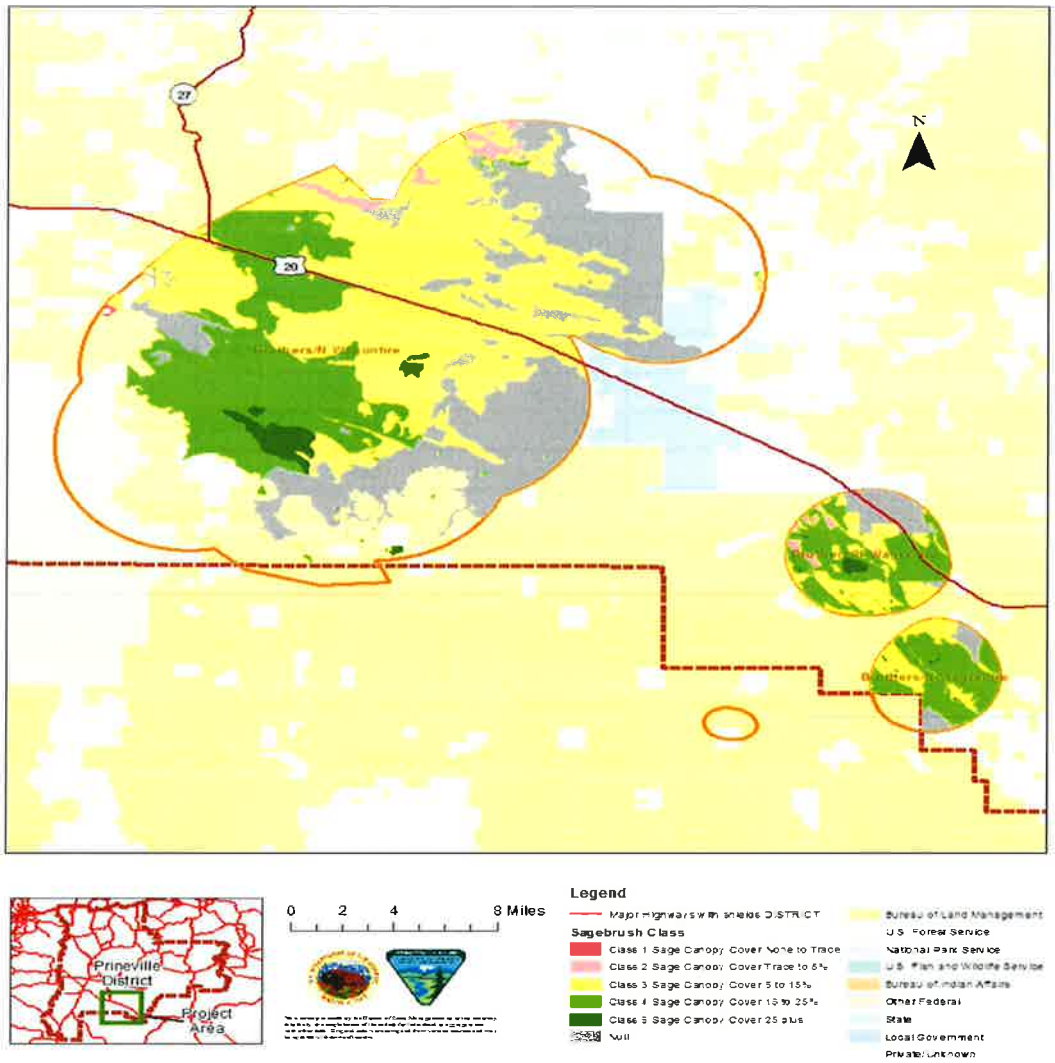
winter food, and habitat for native herbaceous species consumed by hens prior to egg-laying and by chicks during the brood rearing period (Dumroese et al 2015).

Other sagebrush cover class maps were analyzed (i.e. USGS maps produced for Wisdom et. al 2003). But they were completed at a large scale and were not accurate at the fine scale. This was noted by professional observations and on the ground experience.

Table 6: ESI Sagebrush Canopy Class Summary

ESI Sagebrush Canopy Class	Acres	Percentage
Class 1. None to Trace	225	0.1%
Class 2. Trace to 5%	3,386	2.2%
Class 3. 5% to 15%	87,081	57.5%
Class 4. 15% to 25%	56,938	37.6%
Class 5. >25%	3,922	2.6%
Total	151,552	100%

Figure 4: ESI Sagebrush Canopy Class



Trees

The main tree species within the PAC is western juniper (*Juniperus occidentalis*). Its range varies across the PAC and the old growth juniper woodlands are predominantly found in the northern portion of the PAC with patches in the southeastern portion. BLM has conducted juniper reduction treatments on approximately 18,418 acres primarily in juniper woodland areas within the PAC boundary. Additional treatments are planned in future years. The Natural Resource Conservation Service (NRCS) and private landowners have been treating juniper on private lands within the PAC. The extent and acres are not known; privacy requirements in the federal legislation authorizing funds for this type of work protect this information from disclosure. The following juniper classes were determined for the acres evaluated by ESI within the PAC in Table 7. For clarification the following define the classes listed in the table. Not

invading is <5 non-old growth trees per acre, Invading is 5+ non-old growth trees/acre, Not old growth is <5 old growth trees per acre, and Old growth is 5+ Old growth trees/acre.

Table 7: Juniper classes

ESI Juniper Class	Acres	Percentage
Not Old Growth/Invading	8,588	5.7%
Not Old Growth/Not Invading	137,827	90.9%
Old Growth/ Invading	5,138	3.4%

Dominant Condition Class

The ESI process captures information regarding plant species, dominant vegetation, percent foliar cover, pounds per acre, percent of climax, as well as juniper and sagebrush canopy estimates, microbiotic crusts and basal cover of vegetation. The assessments are tied ecological sites and include information regarding potential departure from the associated reference ecological sites. Final condition class for ESI is determined based on the total percent Climax Vegetation similarity index on the ESI data form. Of the acres evaluated through ESI the following dominant vegetation condition classes were determined (see Table 8). See Technical Reference 1734-7 (Habich, 2001) for more information on the ESI process.

Table 8: Dominant Condition Class

ESI Dominant Condition Class	Acres	Percentage
Excellent	112	0.1%
Good	82,970	55.2%
Fair	62,086	41.3%
Poor	5,158	3.4%
Total	150,326	100%

Native Herbaceous Plants

Lakeview District

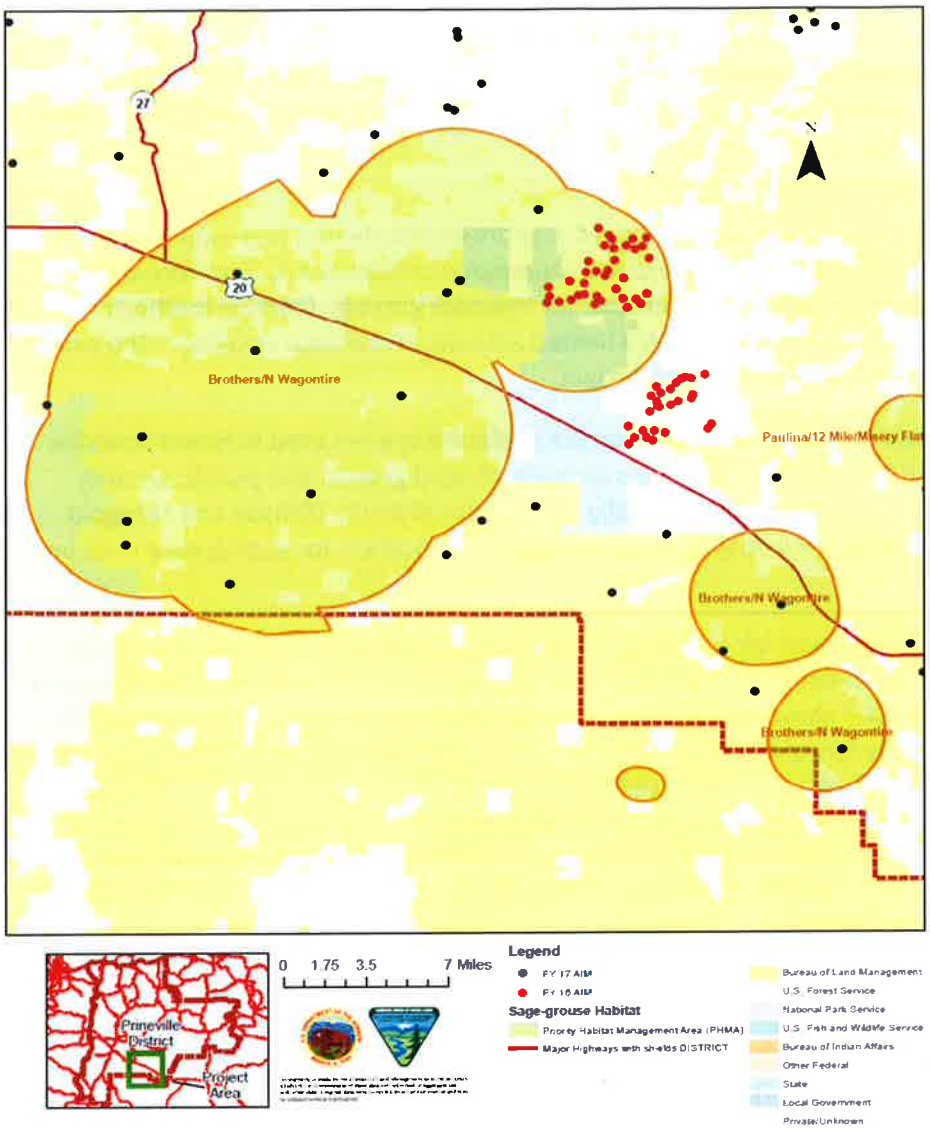
The current condition of native herbaceous plants is not well documented within the PAC on BLM-managed land, and no information is available on non-federal lands. In 2016, BLM-Lakeview District Office began installing long term Assessment, Inventory and Monitoring plots (AIM Plots) on the BLM-managed lands near the southern edge

of the Brothers/Wagontire PAC; however, only preliminary data is available (BLM 2016, unpublished data). Data collected from six (6) AIM plots, identified 60 plant species; 6 shrubs, 44 herbaceous species, 9 grasses, and one tree species. Of the 44 herbaceous species documented, 34 are species thought to be beneficial to sage-grouse (sage-grouse forbs). Average species diversity was 28 species, which is lower than expected for productive sagebrush communities. All but three herbaceous and one grass species were native. The non-native species included desert madwort (Alyssum desertorum), curveseed butterwort (Ceratocephala testiculata), spring draba (Draba verna), and cheatgrass (Bromus tectorum). Cheatgrass was present at all but one of the plots.

Prineville District

The current condition of native herbaceous plants varies across the PAC. Vegetation communities range from sagebrush/bitterbrush dominated with perennial bunchgrass and forb understory to invading juniper, rabbitbrush on some more historically disturbed sites. In 2016, BLM began installing long term Assessment, Inventory and Monitoring plots (AIM Plots) on the BLM-managed lands predominantly in the sage grouse habitat areas. This process will help inform the landscape scale assessment of the Prineville district within both the PACs. Currently, AIM data is only available for the Bright allotment of the PAC and this data has not yet been analyzed or summarized. AIM data will continue to be collected for the rest of the PAC over the next 5 years.

Figure 5. AIM plot locations within the Brothers/N. Wagontire PAC for 2016 & 2017.



Hagen et. al (Hagen et. al 2008) documented habitat objectives for sage grouse in portions of the PAC (Sage-grouse habitat objectives for the Brothers planning areas of Central Oregon's High Desert, 2008). The assessment documented forb canopy to be marginal and should be increased throughout the region, grass cover was adequate in most areas, and sagebrush canopy cover was found to be adequate throughout the region. For their assessment area they provided proportions of habitat rankings for the assessed lands: 23% optimal, 52% suitable, and 25% unsuitable with the majority of these assessment occurring within three dominant ecological sites that accounted for 140, 953 acres.

Hagen et. al stated that approximately 34,000 acres of private land are within the same three dominant ecological sites. They were rapidly assessed to provide a starting point for the planning effort in 2008. Hagen et. al suggested that a more extensive habitat assessment would be vital to obtain a complete picture of the habitat conditions in the area.

State lands within the Todd and Marion pastures were assessed in the same manner in 2007. The data suggested that these areas had an adequate sagebrush (>15%) and grass canopy cover (>20%), but were relatively poor in forb canopy cover (<5%). However, 2007 was a poor forb production year and might not be a representative of the average conditions. The pastures were overall suitable for sage-grouse year-round use.

Crested Wheatgrass Seedings

In the 1950s through 1970 and early 1980s, BLM removed sagebrush and planted non-native crested wheatgrass or crested wheatgrass hybrids (e.g., "Hycrest' (*Agropyron cristatum X A. desertorum*)) in several areas considered degraded to improve conditions for livestock grazing. Planting methods included drill seeding and plowing and seeding; with a limited amount of chemical spraying. The extent of crested wheatgrass seedings on private lands not known.

Crested wheatgrass and hybrids like 'Hycrest' have been the preferred species used in recent post-fire rehabilitation to compete with invasive annual grasses because of rapid growth and prolific seeding vigor (NRCS 2006). Crested wheatgrass seedings typically lack species diversity (Fansler and Mangold 2010, Marlette and Anderson 1986), including forb species that are important for sage-grouse hens and chicks.

Analysis within the PAC has shown lower lek counts at Canary Lake. This area had the highest amount of seeded areas. Seedings varied from native grasses to crested wheatgrass to unknown species. However, telemetry data from 1995 and 2007 shows some use, predominantly winter with some spring use. The majority of the observations were located in the Canary-tower seeding (native grasses). Given that these seedings are now 35 or more years old, aside from the Canary-tower seeding, it is uncertain whether or not these areas are being under-utilized by sage-grouse simply due to the fact that they are crested wheatgrass/unknown seedings.

Based on the currently available information, the team concluded that the evidence was inconclusive about how much of a role the crested wheatgrass seedings may be playing in the population decline of sage-grouse in the PAC.

Figure 5 and Table 9 below depict areas where seeding for grazing rehabilitation and fire restoration is known to have occurred within the PAC. The last recorded seeding was in 1981.

Figure 6: Crested Wheatgrass Seedings

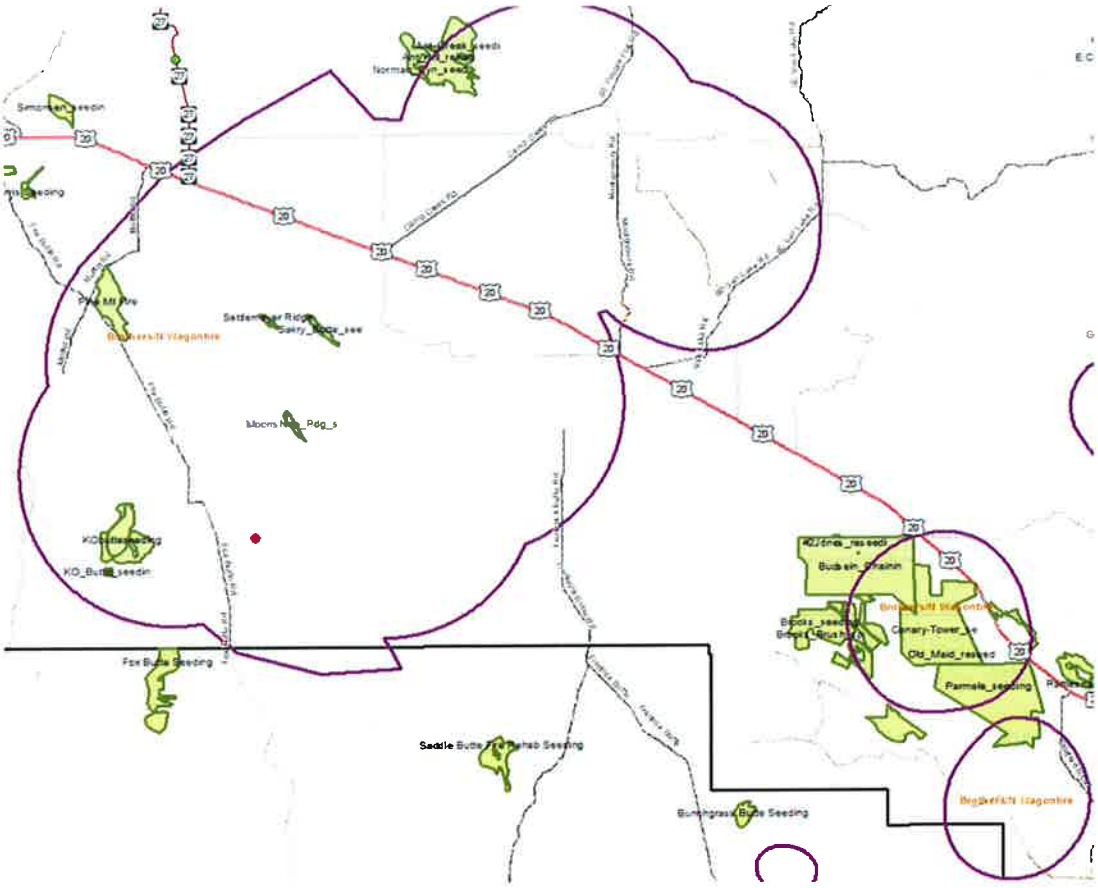


Table 9: Crested Wheatgrass Summary

TRTMNT NAME	REVEG TYPE	TRTMNT DATE	TRTMNT TARGET	ACRES
Old_Maid_reseed	Seeding	1955	unknown	79
Old_Maid_reseed	Seeding	1955	unknown	209
Old_Maid_reseed	Seeding	1955	unknown	270
KObutteseeding	Seeding	1960	Crested Wheatgrass	1247
Ant_Creek_seedi	Seeding	1975	unknown	569
Moonshine_Rdg_s	Seeding	1973	Grass/Shrub	115
Ant_Hill_rehab	Seeding	1981	unknown	67
Ant_Hill_rehab	Seeding	1981	unknown	447
Norman_Cyn_seed	Seeding	1977	Crested Wheatgrass	884
Sakry_Butte_see	Seeding	1973	Crested Wheatgrass	148
KO_Butte_seedin	Shrub Planting	1962	Bitterbrush	39

Ant_Hill_rehab	Seeding	1981	unknown	498
Ant_Hill_rehab	Seeding	1981	unknown	1886
Parmele_seeding	Seeding	1966	Crested Wheatgrass	4436
Brooks_Brush_sp	Seeding	1964	Native Grass	428
Brooks_seeding	Seeding	1963	Native Grass	70
KObutteseeding	Seeding	1962	Native Grass	604
Canary-Tower_se	Seeding	1962	Native Grass	4406
Pine Mt Fire	Seeding	1977	unknown	897
Settlemeyer Ridge	Seeding	1973	unknown	61
Brooks_seeding	Seeding	1963	Native Grass	691
Brooks_seeding	Seeding	1963	Native Grass	1310
Brooks_seeding	Seeding	1963	Native Grass	428
Budsein_Chainin	Seeding	1983	unknown	5065
Brooks_Brush_sp	Seeding	1964	Native Grass	70
Brooks_Brush_sp	Seeding	1964	Native Grass	691
Brooks_Brush_sp	Seeding	1964	Native Grass	1317

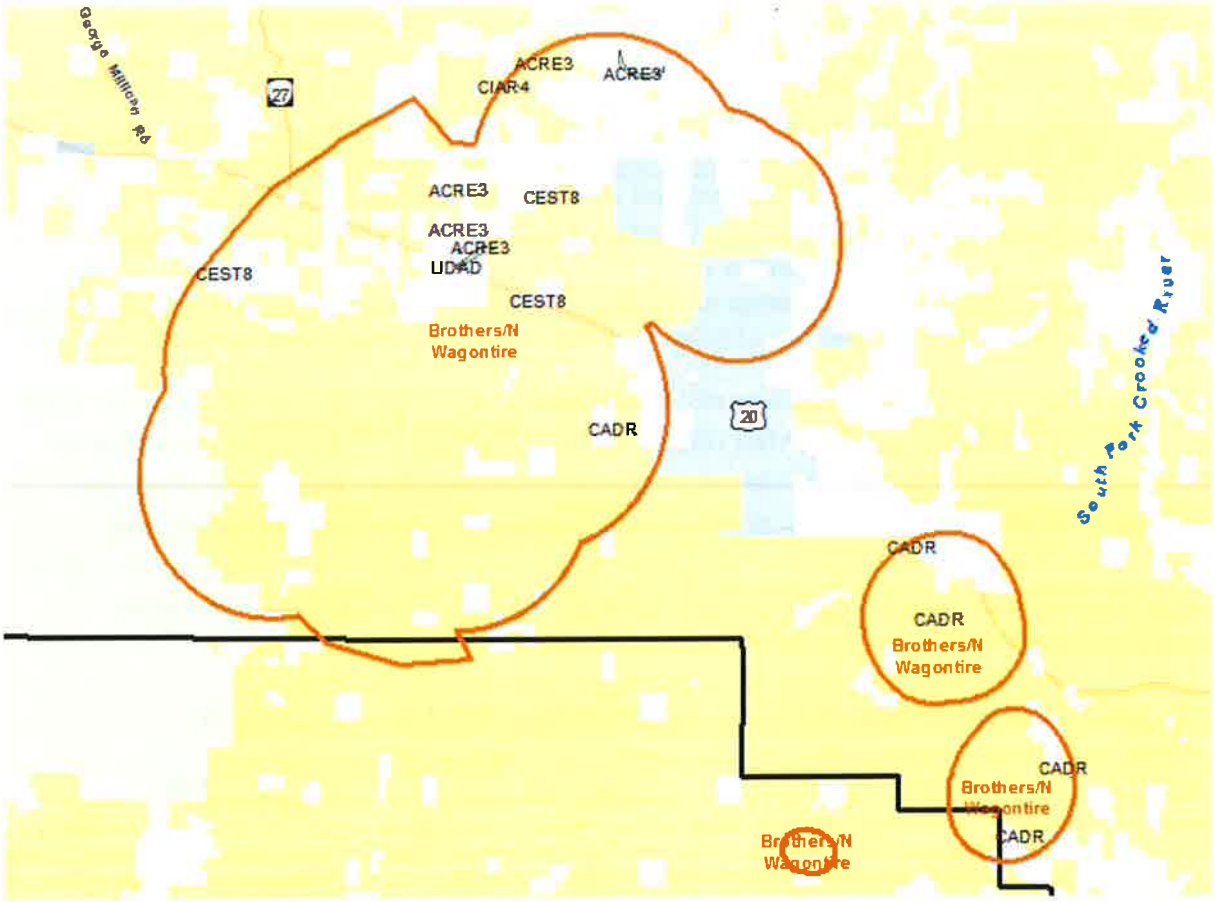
It is anticipated that once AIM data is collected and analyzed we will have better data to describe forb presence and diversity, and presence and extent of annual grasses.

Fire and Invasives Assessment Tool (FIAT) address two categories of invasive species: invasive annual grasses and conifer species expanding into sagebrush habitats. For invasive treatment acres for the PPA a total of 217,454.79 acres were identified. The proposed treatments in the FIAT are covered by the High Desert Shrub Steppe Environmental Assessment.

Invasive Plants

Noxious weed species with mapped infestations in the PAC include dalmation toadflax (LIDAD), Russian knapweed (ACRE3), spotted knapweed (CEST8), Canada thistle (CIAR4) and whitetop (CADR) (Figure 6). Whitetop most commonly occurs in areas surrounding playas and water tanks. Russian knapweed, dalmation toadflax and spotted knapweed infestations primarily occur along roads (Camp Creek Road, Coffey Road, Moffitt Road, and Highway 20). There is one patch of Canada thistle and several patches of Russian knapweed near the northern border of the largest PAC polygon that appear to be more associated with drainages than transportation corridors.

Figure 7: Mapped infestations in the PAC



Invasive annual grasses, primarily cheatgrass, are present in patches throughout the PAC based from field observations. Spatial data representing extent and abundance of invasive annual grasses in the PAC are lacking.

The scientific literature (e,g, Knick et al. 2011, Coates et al. 2016) and the COT report (FWS 2013b) identified invasive plants, invasive annual grasses in particular, as a significant factor in sage-grouse population declines across the intermountain West. Invasive species displace native species and often reduce herbaceous diversity, limiting both insect production and forb availability for hens and chicks. In addition, invasive annual grasses facilitate the spread of wildfires and subsequent loss of sagebrush and native grass and forb species important for both sage-grouse food and cover (Knick and Hanser 2011, Manier et al. 2013, Chambers et al. 2014b, Dunroese et al. 2015).

Hunting/Wingbee Data

The 2005-2016 sage-grouse hunting seasons were 9 days, versus 5 days from 1995-2004, and 2 days in 1993 and 1994. Daily bag and season limits have been the same from 1993-2016. Both daily and season limits are 2 sage-grouse. The 2016 hunting season in OR was by permit for 9 days (September 10-18).

Portions of the PAC are located in three different Wildlife Management Units (WMU). They are WMUs Paulina (35), Maury (36), and Wagontire (73). WMU 73 is split into two sub-units, North Wagontire and South Wagontire. In 2016, hunting for sage-grouse was not allowed in WMUs 35 and 36. WMU 73, as a whole, incorporates portions of the Picture Rock and 12 Mile/Paulina/Misery Flat PHMAs. WMU 73 spans portions of Deschutes, Lake, and Harney Counties. WMU 73 is 1,992,959.7 acres. Only 53.17% (156,028.3 acres) of the PAC is located within WMU 73 (See Figure 6). The PAC makes up 7.8% of the entire WMU. In 2016, WMU 73 had 24 wings turned in. Table 10: below provides a summary of sex composition by age, and age composition of wings from harvested sage-grouse in WMU 73.

The 2017 sage-grouse hunting season will be restricted to the North Wagontire sub-unit (Hunt No. J73A) and not South Wagontire sub-unit (Hunt No. J73B). WMUs 35 and 36 will still be closed to hunting for the 2017 season. The North Wagontire sub-unit incorporates portions of the Brothers/ N. Wagontire and 12 Mile/Paulina/Misery Flat PHMAs. WMU 73 spans portions of Deschutes, Lake, and Harney Counties. The North Wagontire sub-unit is 1,002,790.5 acres. Only 15.6% (156,028.3 acres) of the PAC is located within the North Wagontire sub-unit (See Figure 6). The PAC makes up 7.8% of the North Wagontire sub-unit.

Table 10: Summary of sex composition by age, and age composition of wings for WMU #73

Sample Size	Juveniles			Yearlings			Adults		
	M	F	Total	M	F	Total	M	F	Total
	N/%	N/%	N/%	N/%	N/%	N/%	N/%	N/%	N/%
24	5/45	6/55	11/46	0/0	2/100	2/8	4/36	7/64	11/46

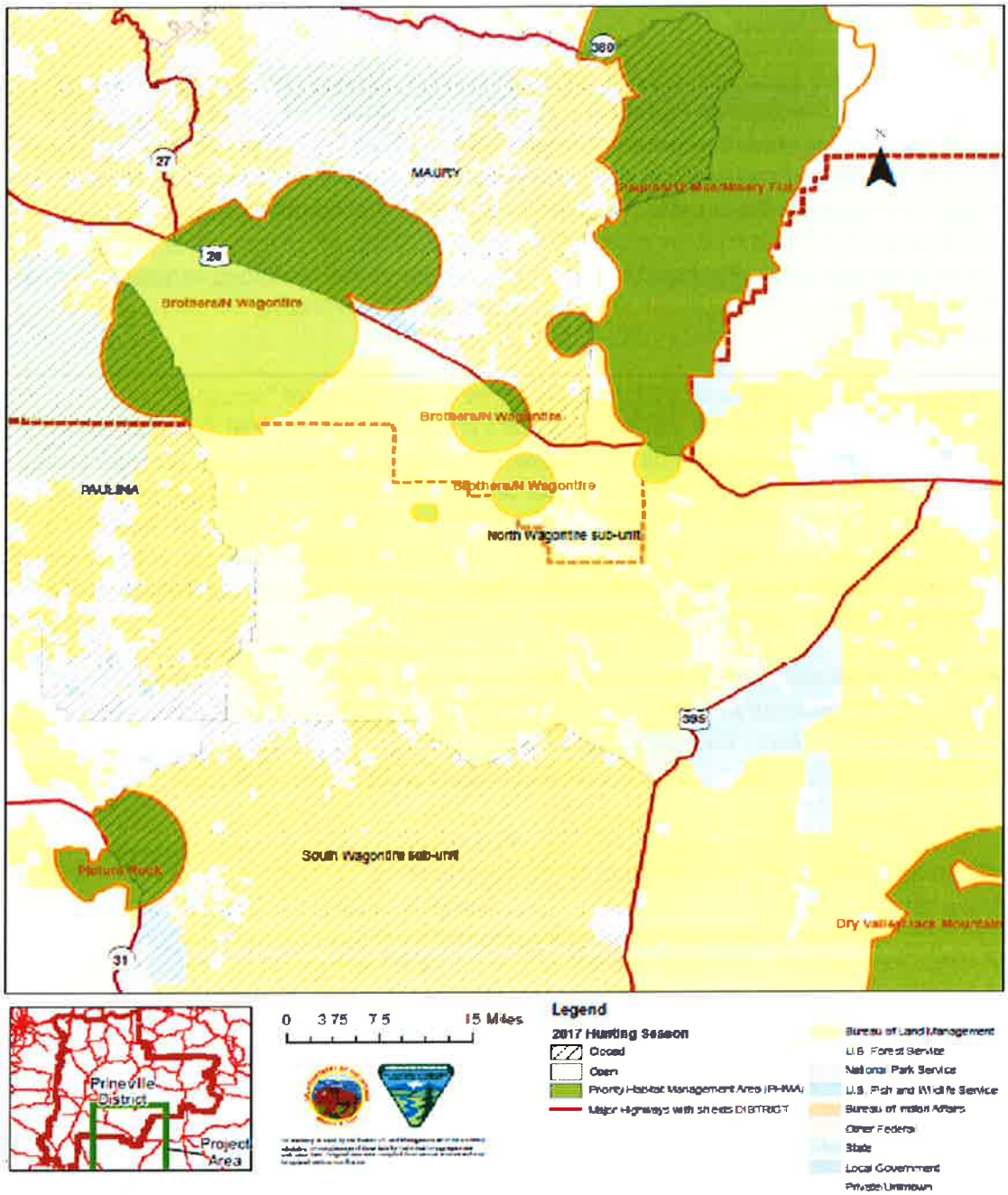
The Wagontire Unit has a 2016 estimated fall population of 1,028. 55 permits were allowed in 2016 with a harvest limit of 51 (5% of the 2016 estimated fall population). There was a 54% hunter participation rate for 2010-2015. 28 birds were officially harvested in 2015.

Oregon's sage-grouse season is limited-entry for each WMU. Meaning, not all who apply for tags draw them. Sage-grouse are not hunted range-wide in Oregon. Hunting is permitted in only 10 of 21 WMUs where sage-grouse occur. Permit numbers are allocated to take no more than 5% of the fall population. Each permit holder is allowed only 2 sage-grouse per season. In 2016, estimated harvest of sage-grouse was 537 birds, 2.7% of the estimates 19,951 sage-grouse in potential hunt areas.

Sage-grouse nesting success (as indicated by retention of at least primary feather P9) for all WMUs with sage-grouse harvest was 30% in 2016. There was an estimate of 1.22 juveniles per female in the

Wagontire Unit compared to 1.48 juveniles per female in all WMUs with sage-grouse harvest. The long term average juvenile per female ratio is 1.5. Connelly et al. (2000) suggested that a chick per hen ratio ≥ 2.25 indicates a healthy, stable or increasing, population. But this ratio may be higher than required to maintain some populations and requires further study (Braun 2012).

Figure 8: Map of Hunting Unit within PAC Boundary



Fence/Wire Collision Risk

Fences can cause direct mortality to sage-grouse as a result of collisions that occur during flight (Stevens et al. 2012a). Few studies have examined sage-grouse fence collision mortalities and biologists do not know if particular age and sex classes of sage-grouse are disproportionately susceptible to fence collision mortalities. Evidence of fence collision mortalities consists of carcasses, feather piles, and feather tufts on barbed wire; this evidence does not generally allow for determining the sex and age of the bird killed (Stevens et al. 2012a). However, the logical assumption is that only young flightless chicks are not susceptible to fence collisions.

In December 2015, the USFWS updated the fence collision risk raster dataset originally developed by The Nature Conservancy for the SageCon Partnership. This is a spatially explicit model for sage-grouse fence collision risk near lekking areas in southeast Oregon. Each 30-m pixel has a predicted collision risk, where the maximum estimate of collisions per lekking season was predicted as a function of distance to the closest lek and a terrain ruggedness index (TRI; Riley et al. 1999). The modeling approach used a stochastic-linear-immigration-death collision model (SLID; Stevens 2012), which accounted for removal bias of collision evidence over time. Predicted collision risk is the maximum-likelihood estimator of total collisions for the pixel's value of TRI and distance to lek, assuming a 78-day lekking season (March 15-May 30) (Stevens et al. 2013).

We updated risk layer using only leks with a 2016 ODFW Conservation Status of "occupied" and "occupied-pending" and the most current version of ODFW's lek spatial data. Spatial data indicate approximately 388.8 miles of BLM fence within the Brothers/N. Wagontire PAC (609.5). We intersected the fence collision risk layer with the spatial data in order to determine how many miles of BLM fence pose a considerable risk to sage-grouse within the Brothers/N. Wagontire PAC. The model produced a layer that had 31.37 miles of fence that need marking, of which, only 19.35 miles were on BLM managed land. Generally, only areas identified with an estimated maximum of >1.0 collisions per lekking period are recommended for marking with anti-strike markers.

Table 11: Miles of BLM fence estimated to pose a collision risk to sage-grouse. Only fence segments occurring in areas with >1 maximum estimated bird collision per lekking season are recommended for retrofitting with anti-strike markers. Sources: BLM, USFWS.

Maximum estimated collisions per lekking season	Miles of BLM fence	Percent of Total BLM Fence
> 1 bird	19.35	3.17
Total	19.35	3.17

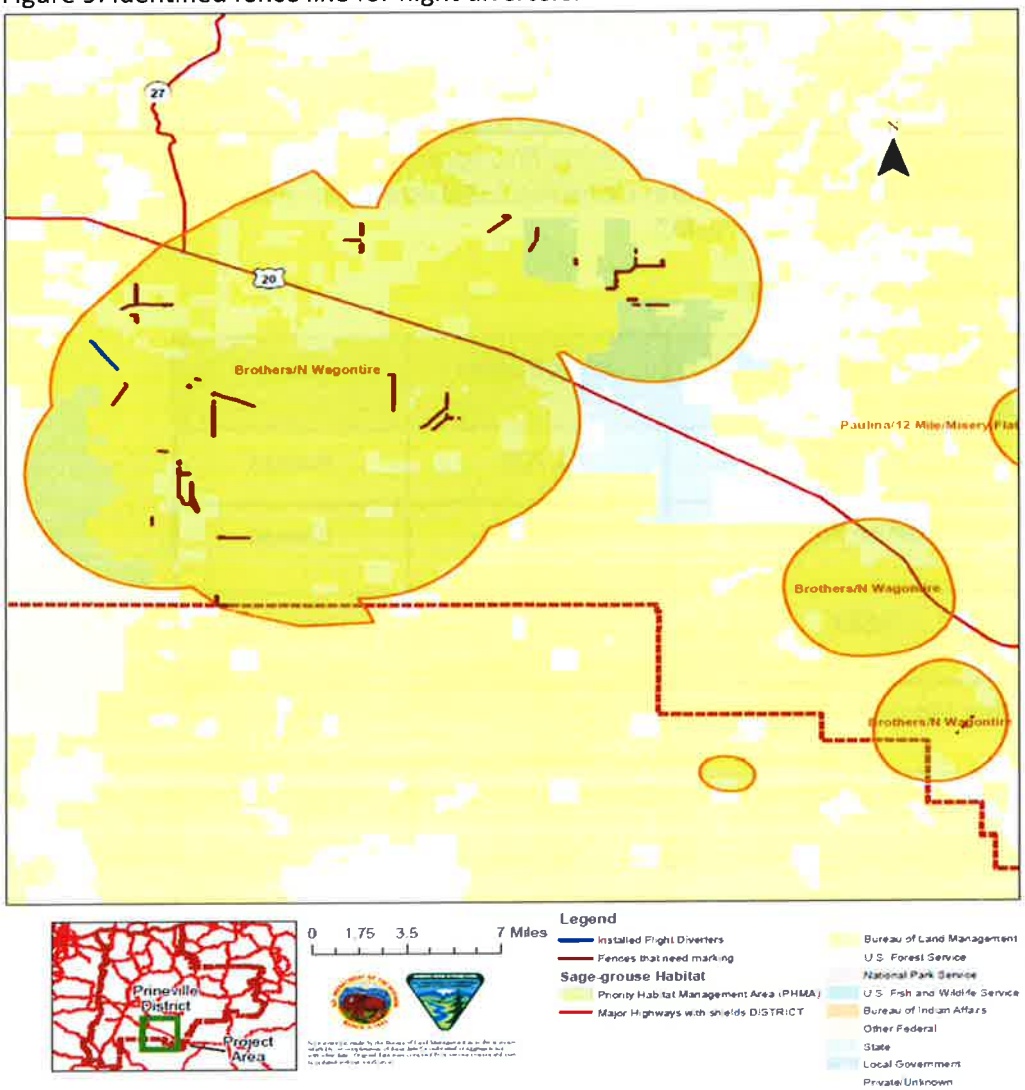
This analysis is limited to BLM-managed lands and the BLM fence dataset is known to contain some errors and may not include all fences. Thus, the results reported here may not include all fences that pose a risk to sage-grouse on BLM-managed land. Further, this assessment does not include all fences that occur on private land and thus collision risk on private lands remains unquantified. Private land

enrolled in the CCAA with the Crook County Soil and Water Conservation District is assessed for fence collision risk and conservation measures to reduce this threat are indicated in Site Specific Plans for each property.

Given that less than 19.35 miles (3.17%) of known BLM fences pose a considerable risk to sage-grouse, the team concluded that mortality caused by collision with fences on BLM-managed lands may be a contributing factor but probably has not contributed significantly to the population decline experienced in the Brothers/N.Wagontire PAC. However, since geospatial data is not available for fences on private lands, we cannot estimate the degree of this threat across the entire PAC. 1.65 miles of fence is already marked within the Brothers/N. Wagontire PAC.

Wires associated with communication or meteorological towers may also pose a potential threat to sage-grouse, however geospatial data for these types of towers were not obtained and are thus beyond the scope of this analysis.

Figure 9. Identified fence line for flight diverters.



Predation

The Prineville BLM initiated meetings with permittees within the PAC in fall of 2016. A common concern from private landowners was the amount and types of predators. Most notably ravens and coyotes were said to be widespread and abundant.

There are golden eagle territories (Four) documented within the PAC (FWS 2014), ferruginous hawks, ravens and red tailed hawks. Raptors have direct impacts by mortality on adults and chicks, and by flushing sage grouse on leks during the breeding season. The extent of this impact is unknown at this time but is present throughout the PAC.

Fire

Fire History

From 1980 to 2016 five wildfires have burned within the PAC boundary, burning approximately 4,544 acres (less than 2%) of the Brothers/N. Wagontire PAC. Of these fires two were naturally ignited by lightning, two were human caused, and one is unknown cause. The proportion of acres burned from lightning versus human caused is very similar at 44% and 48% respectively and the remaining 8% of total acres burned from a fire of unknown cause. Four of the five fires occurred between 1980 and 2006 and burned more than 100 acres, with two of these fires exceeding 1,000 acres. The most recent fire occurred in 2013 burning 30.5 acres (Source: BLM).

Table 12. Recent fires within PAC 1980-2016

Fire Year	Fire Name	Acres Burned	Cause
1980	Ant Hill	1,705	Human
1981	Pumice Point	509	Human
2006	I-883	1,930	Lightning
2008	Pine Mountain Southeast	370	Unknown
2013	Fox Butte	30	Lightning
Total Acres Burned		**4,544**	

The Deschutes National Forest provided additional fire history for their portion of the PAC. The most recent fire to occur was a 1977 fire. The FS had a total 6 fires ranging from 1914-1977 with a total of

9,947 acres burned.

Fire Regime

A natural fire regime is a general classification of the role fire would play across a landscape in the absence of modern human mechanical intervention, but including the influence of aboriginal burning (Agee 1993, Brown 1995). The five natural (historical) fire regimes are classified based on average number of years between fires (fire frequency) combined with the severity (amount of replacement) of the fire on the dominant overstory vegetation.

These fire regimes include:

I – 0-35 year frequency and low (surface fires most common) to mixed severity (less than 75% of the dominant overstory vegetation replaced);

II – 0-35 year frequency and high (stand replacement) severity (greater than 75% of the dominant overstory vegetation replaced);

III – 35-100+ year frequency and mixed severity (less than 75% of the dominant overstory vegetation replaced);

IV – 35-100+ year frequency and high (stand replacement) severity (greater than 75% of the dominant overstory vegetation replaced);

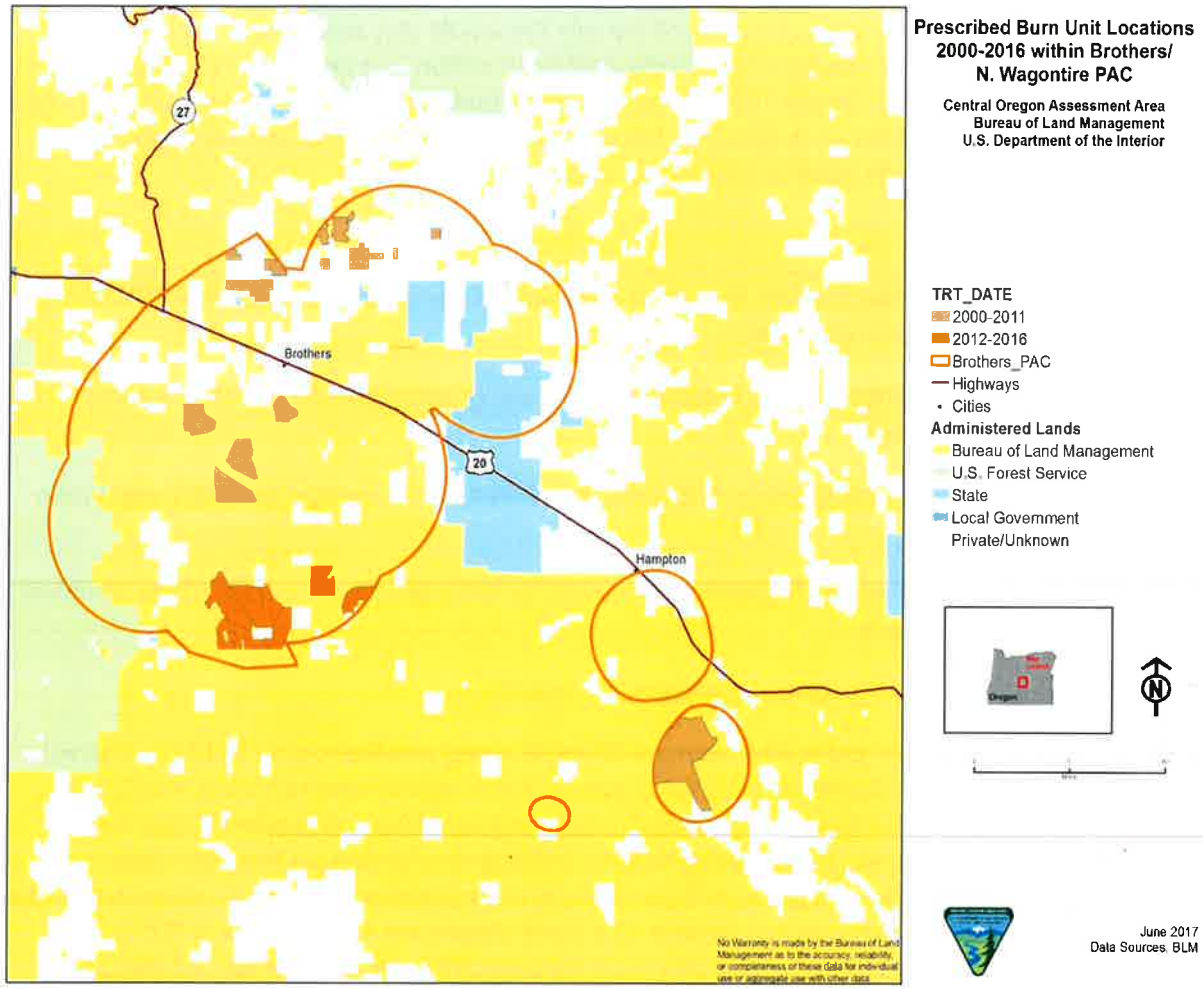
V – 200+ year frequency and high (stand replacement) severity.

The PAC is primarily characterized by fire regime 2 (154,935 acres) and fire regime 3 (101,746 acres) with a smaller component of fire regime 5 (29,042 acres). A fire regime condition class (FRCC) is a classification of the amount of departure from the natural regime (Hann and Bunnell 2001). The classification is based on a relative measure describing the degree of departure from the historical natural fire regime resulting in changes to one (or more) ecological components such as vegetation, fuel composition, fire frequency, severity and pattern. The three classes are based on low (FRCC 1), moderate (FRCC 2), and high (FRCC 3) departure from the central tendency of the natural (historical) regime (Hann and Bunnell 2001, Hardy et al. 2001, Schmidt et al. 2002). Low departure is considered to be within the natural (historical) range of variability, while moderate and high departures are outside. The FRCC within the PAC is a mix of the three classification with 64% of the PAC classified as FRCC 1 (low departure), 20% FRCC 2 (moderate departure), and 15% FRCC 3 (high departure).

Prescribed Fire

Within the PAC prescribed fire has been implemented on approximately 33,984 acres (11.5% of PAC area) between 2000 and 2016. More recent prescribed burns (2012-2016) were jackpot burns completed following juniper reduction treatments for sage grouse habitat improvements. Current BLM data is unclear as to the type of burns (broadcast or jackpot) on earlier burns completed prior to 2012 but local knowledge indicates they were a combination of broadcast and jackpot burns completed for rangeland improvements and fuels reduction.

Figure 10: Prescribed burn unit locations within Brothers/N. Wagontire PAC 2000-2016.



Energy Development

Renewable Energy (Wind and Solar)

Historic

BLM Prineville District direction as provided on page 29 of the Brothers/La Pine RMP, public lands will continue to be available for rights-of-way, including multiple use and single use utility/transportation corridors following existing routes, communication sites and roads. According to BLM corporate information available in Legacy Rehost 2000 System (LR 2000), no wind energy Rights-of-Ways (ROWs) were granted 10 years after the Brothers/La Pine RMP was implemented. There is currently one authorized wind energy ROW granted on the BLM Prineville District, but it is located outside the PAC boundary. With regards to
solar energy ROWs, there were no such ROWs granted on the BLM Prineville District after the Brothers/La Pine RMP was implemented.

Current

Based on a BLM LR 2000 Wind Energy Pending Applications And Granted Rows report and a Current Solar Energy Cases report ran on June 22, 2017, there are no authorized wind or solar energy ROWs within the Brothers/North Wagontire PAC.

Renewable Energy Conclusion

Given the absence of historic and current wind and solar energy ROWs activities within the Brothers/North Wagontire PAC, such activities are not probable causes for tripping the population soft trigger for the PAC. It is recommended that BLM follow the applicable management decisions under Renewable Energy (Wind and Solar) of the ARMPA when processing proposals for wind and solar ROWs on BLM-administered lands within PHMA and/or GHMA.

Mineral Resources (Mineral Materials, Locatable, and Leasable Minerals)

Historic

Mineral Materials-

The extraction and processing of mineral materials is an historic and ongoing activity within and surrounding the PAC. The majority of the activities have been associated with the development and use of mineral materials (such as cinders, stone, sand and gravel) as road base for major roadways in the area and for other construction related projects. There is a continued demand for mineral material in areas near population centers and along major roadways within and in close proximity to the PAC boundary.

As provided on page 120 of the 1989 Brothers/La Pine Resource Management Plan (RMP), salable minerals will continue to be made available for sale to the public and under free use permits to State and local governments, and allow development of new mineral material sites as needed if their development was consistent with the long term protection and management. Mineral material activities conducted on BLM managed lands within the PAC boundary have been limited to developed community pits and appropriated Federal Highway material sources. The most recent pit expansion on BLM managed lands in the PAC occurred in 1997 at the Hampton Butte/Van Lake community pit. Prior to the ARMPA, BLM would issue over-the-counter contracts for the sale of mineral materials from the Hampton Butte Pit/Van Lake.

In addition to activities on BLM managed lands, mineral material activities have occurred within those portions of the PAC that overlap National Forest System lands managed by Forest Service.

Locatable Minerals

There are no records of locatable mineral development within the PAC.

Leasable Minerals (Oil, Gas and Geothermal)

Master Title Plat and Historic Index records show that there was an interest in Oil and Gas (O&G) developments in Central Oregon during the 1950's, 60's, and 80's. During these periods of increased interest, O&G leases were issued across BLM managed lands within what is now the Brothers/North

Wagontire PAC. All of the O&G leases issued were terminated. O&G actions, such as drilling wells, did not occur on the leases.

From 1970 through present, there has been an increased interest in geothermal energy development and exploration near Glass Buttes. These volcanic features overlap the most eastern segment of the Brothers/North Wagontire PAC. In response to the increased interest, BLM issued geothermal leases and received proposals for geothermal exploration at Glass Buttes, Oregon.

During the late 1970's and early 1980's, BLM issued geothermal leases to multiple companies including Alaska Geothermal, Phillips Petroleum Company, and Francana Resources. According to Oregon Department of Geology and Mineral Industries' (DOGAMI) Geothermal Information Layer for Oregon (GTILO-2), five geothermal exploration wells were drilled/abandoned within the PAC boundary. These wells were drilled by DOGAMI and Phillips Petroleum Company.

In 2009, BLM issued multiple geothermal leases to Ormat Nevada Inc. These leases encompassed 37,500 acres of BLM managed lands in south central Oregon, including the most eastern segment of the PAC. By 2010, BLM received a geothermal drilling permit application from Ormat Nevada Inc. to conduct a geothermal exploration project along the west and east flanks of Glass Buttes. This project was called Midnight Point and Mahogany Geothermal Exploration Projects. Under the Mahogany Project, three exploratory wells would be drilled on the BLM Prineville District and three on Private lands. Five of the Mahogany Project wells were proposed to be drilling within the PAC boundary. Sometime between 2013 and 2015, Ormat Nevada Inc. decided not to pursue the Mahogany Exploration project. In 2015, Ormat Nevada Inc.'s leases were closed without action.

Current

Mineral Materials

According to DOGAMI's Mineral Information Layer for Oregon (MILO-2) and U.S. Geological Survey Mineral Resource Data System, there are approximately 15 known mineral material sites within the PAC. Of the 15, there are three open, active pits on federally managed lands. The three pits include: Hampton Butte/Van Lake Community Pit managed by the BLM Prineville District, Grassy Butte Federal Highway-Aid appropriated material source, and a cinder pit managed by the Forest Service (FS) Deschutes National Forest (DNF). A map of the mineral material sites on federally managed lands is provided below (Figure X). Of the remaining 12 pits, 11 are located on private lands and one is an inactive mineral prospect located on BLM Prineville District. There does not appear to be any ongoing or new mining activities occurring in those portions of the PAC that overlap BLM Lakeview District.

The Hampton Butte/Van Lake community pit, is the only open pit managed by the BLM that falls within the PAC boundary. The pit is located at the peak of Lumpkin Hill at T. 20 S., R. 20 E., Sec. 22, approximately 15 miles, as a crow flies, to the Northeast of Brothers, Oregon. Crook County and Deschutes County currently maintain Free Use Permits to removal mineral materials from the pit. Neither Crook County nor Deschutes County have removed material from the pit under their current permits or in the last 20 years. Per the Oregon Greater Sage Grouse ARMPA, no new sales contacts will be issued for the disposal of mineral materials from the pit, as it is located in Greater Sage Grouse Priority Habitat Management Area.

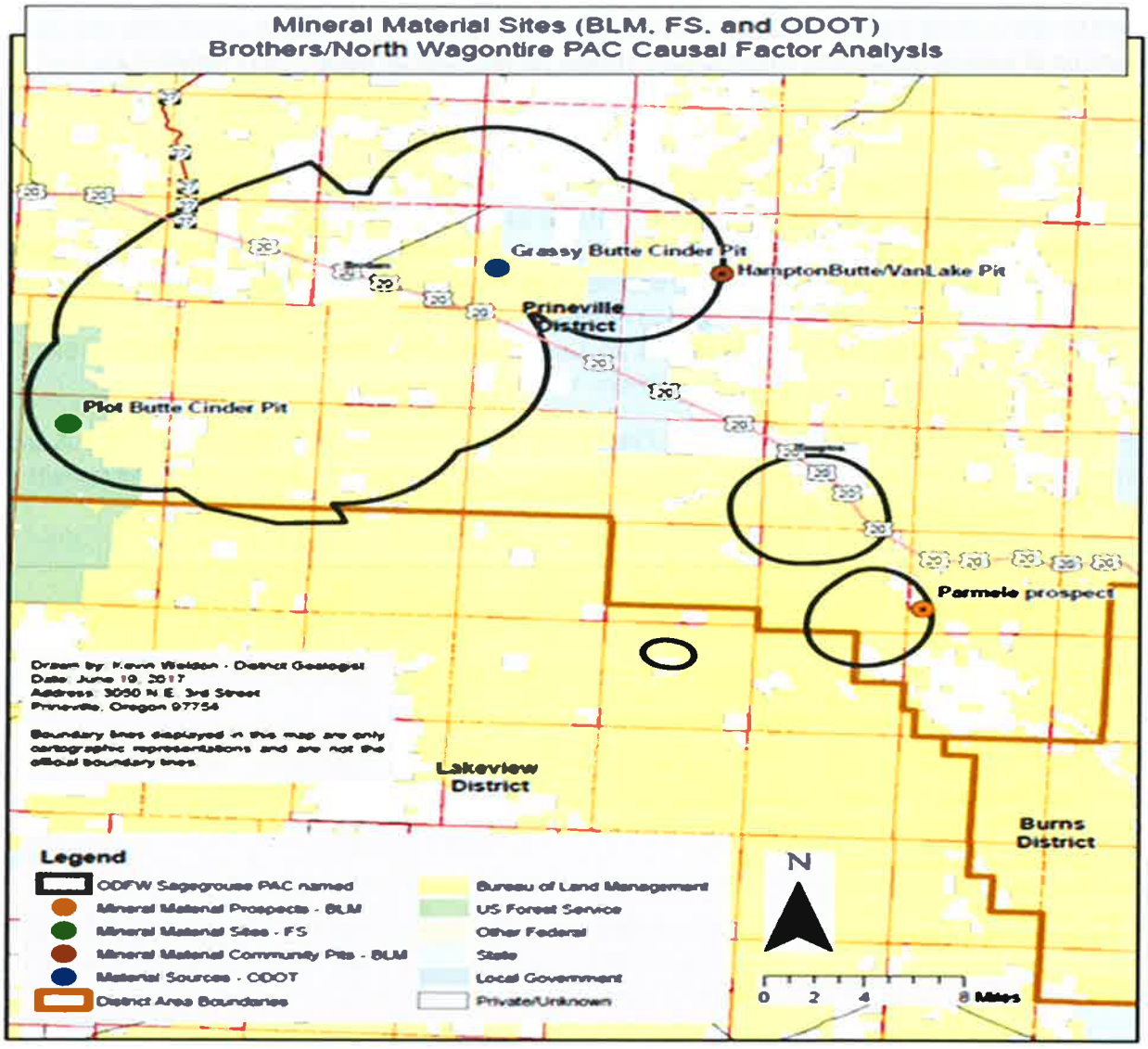
The ARMPA modified the 1989 Brothers/La Pine RMP management direction, through the

implementation of Management Decisions (MD) specific to mineral material activities within PHMA and GHMA. Those MDs include: MD Mineral Resources (MR) 14 and MD MR 15. In MD MR 14, PHMA are closed to new mineral material sales; however, these areas remain "open" to free use permits and the expansion of existing active pits, only if specific criteria (as provided on page 2-25 of ARMPA) are met. Under MD MR 15, GHMA remains open subject to stipulations that will protect Greater Sage-grouse and its habitat.

Oregon Department of Transportation (ODOT) conducts mining and processing operations from the appropriated Grassy Butte material source. The material source is located at T. 20 S., R. 19 E., Sec. 19, approximately six miles, as a crow flies, to the Northeast of Brothers, Oregon. Grassy Butte is located on BLM managed lands; however, the lands are appropriated, through the authorities of Title 23 U.S.C. Section 107(d) and 317, to the Federal Highway Administration (FHWA) from BLM for highway material for the Federal-aid System. Such appropriations are considered Right-of-Ways. FHWA transferred the appropriations to ODOT and administers conditions of the appropriation.

The FS cinder pit is located on the east flank of Plot Butte, which is located at T. 22 S., R. 16 E., Sec. 8 and 9, approximately 10 miles, as a crow flies, to the Southeast of Pine Mountain Observatory. The current status of the pit is unknown at this time.

Figure 11: Mineral Material Sites



Locatable Minerals

There are no metallic/locatable mineral activities occurring within the PAC boundary. Based on LR 2000 Public Mining Claim Geo Index reports ran on June 16, 2017, there are no active mining claims within the PAC.

Leasable Minerals (Oil and Gas, and Geothermal)

There are no active geothermal leases or O&G leases within the Brothers/North Wagontire PAC. There are no known inactive or ongoing geothermal or O&G developments within the PAC.

Potential Issues

Mineral Materials

Expansion and/or development of existing mineral material sites, improper disposal of food refuse at sites, dust and fly rock generated from operations, noise generated from blasting and heavy equipment use, perching opportunities provided on heavy equipment, spread of invasive/noxious weeds, incomplete reclamation of closed sites. An action would be to update site stipulations to include applicable Required Design Features (RDF) as provided in the ARMPA. Potentially applicable RDFs include: RDF Common to All #1, RDF Common to All # 9, RDF Common to All #11, RDF Common to All #19, RDF Noise #1, RDF Roads #7. Another action for GRSG is to require reclamation plans for all Free Use Permits for disposal of mineral materials located within the PAC boundary.

Locatable Minerals and Leasable Minerals (Oil and Gas, and Geothermal)

Given that there are no metallic/locatable or energy activities occurring within the PAC, potential issues related to these resources are not addressed.

Mineral Resources Conclusion

Mineral resource development within the Brothers/N Wagon Tire PAC appears to have played a minimal, localized role in GRSG populations. This role may have contributed to tripping the population soft trigger. Mineral material development activities are anticipated to continue within the PAC under free use permits. Activities associated with mineral materials includes, but is not limited to expanding existing pits and creating new pits. To maintain or minimize the role that mineral resource development plays on GRSG populations it is recommended that all new mineral resource authorizations are made subject to the management decisions provided under Mineral Resources of the ARMPA and applicable RDFs provided in the ARMPA.

Infrastructure

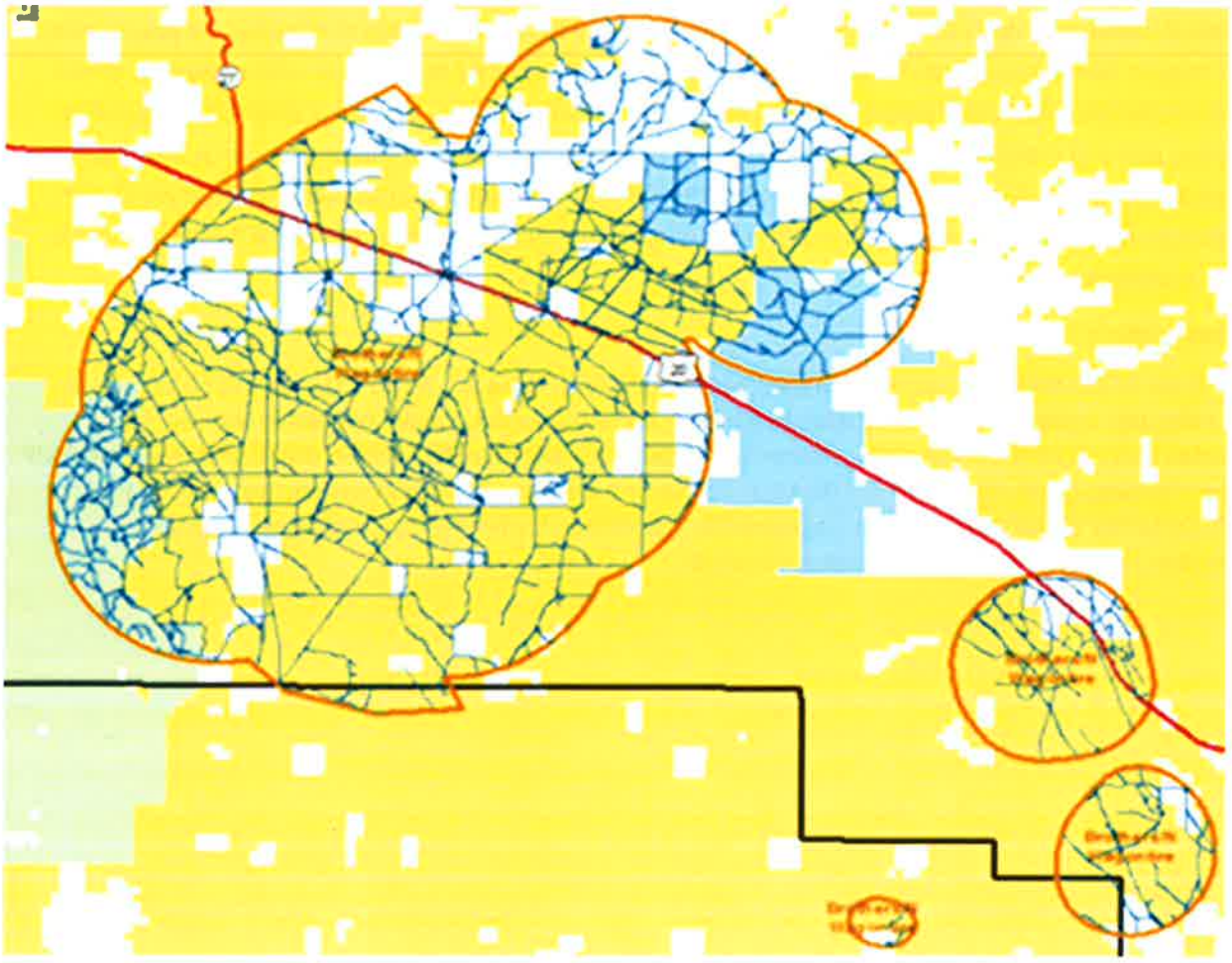
There are 679.8 miles of road on BLM land within the PAC (Figure 12, Table 13) with a road density of 2.4 miles per square mile. This equates to 5230.41 acres of habitat converted, within the PAC this equates to 1.7% of the PACS acres. There isn't a route density objective within the Brothers/LaPine RMP to be meeting. Currently, there are no associated attributes for road classifications for roads within the PAC. To better understand habitat fragmentation, potential for recreation, and types of potential disturbance road classification needs completed.

Table 13: Road and Route Density Summary

Ownership by District	Road/Route Miles
BLM	679.8
Lakeview District	14.4
Prineville District	665.4
PV	270.2
Lakeview District	1.2
Prineville District	269.0
ST	52.6
Prineville District	52.6
USFS	83.4
Prineville District	83.4
(blank)	0.0
Lakeview District	0.0
Prineville District	0.0
Grand Total	**1086.0**

Density (mi/mi2)	**2.4**
PAC Acres	293458.0
PAC mi2	458.5

Figure 12: Roads and Routes

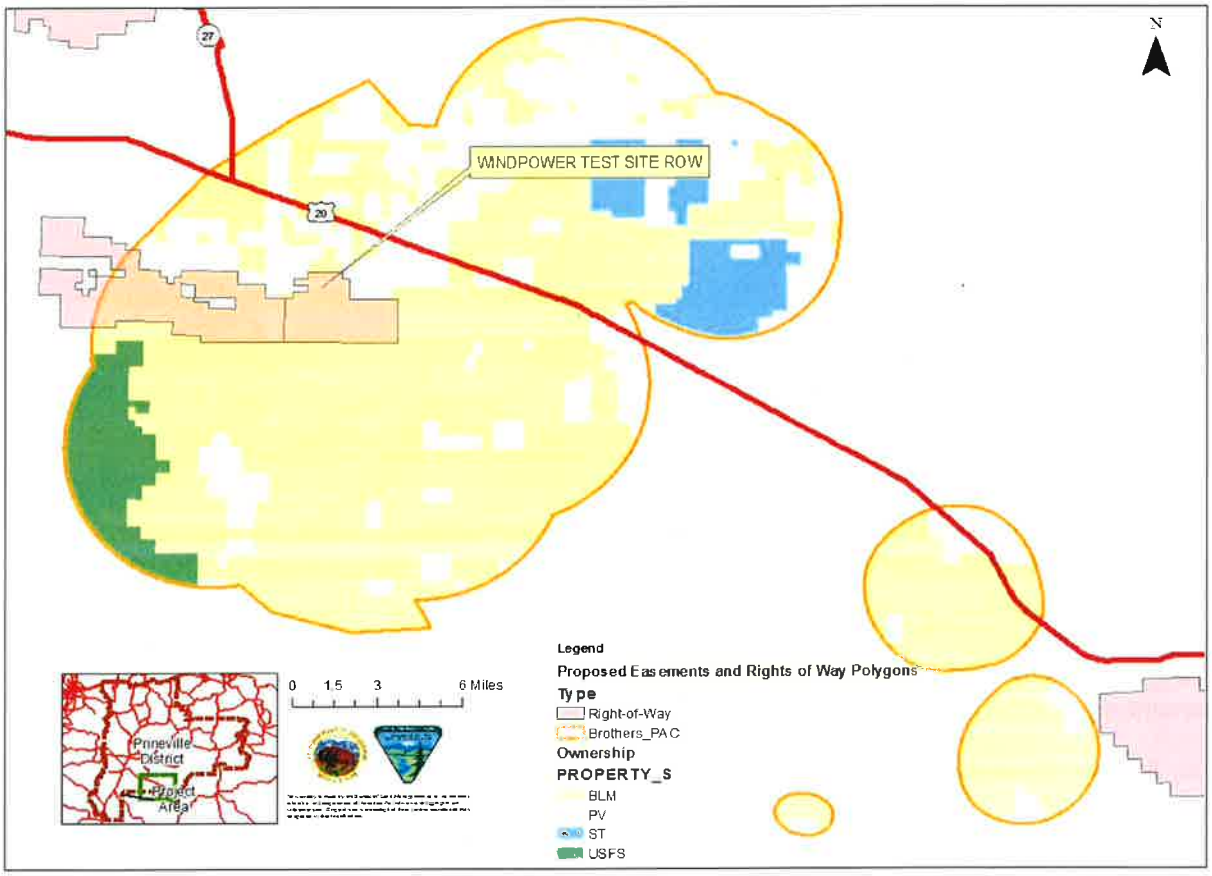


The ARMPA Management Decision for Renewable Energy one (MD RE: 1) states: Designate PHMA as an exclusion are for new utility/commercial scale development of wind or solar ROWs. Table 14 summarizes ROW cases in the PAC. The wind project test site shows a closed case, and it's presumed that infrastructure was taken down at that time. Follow up will need to occur to fully document that this is true for the 38,127 acres (Figure 13).

Table 14: Current Right of Way Cases

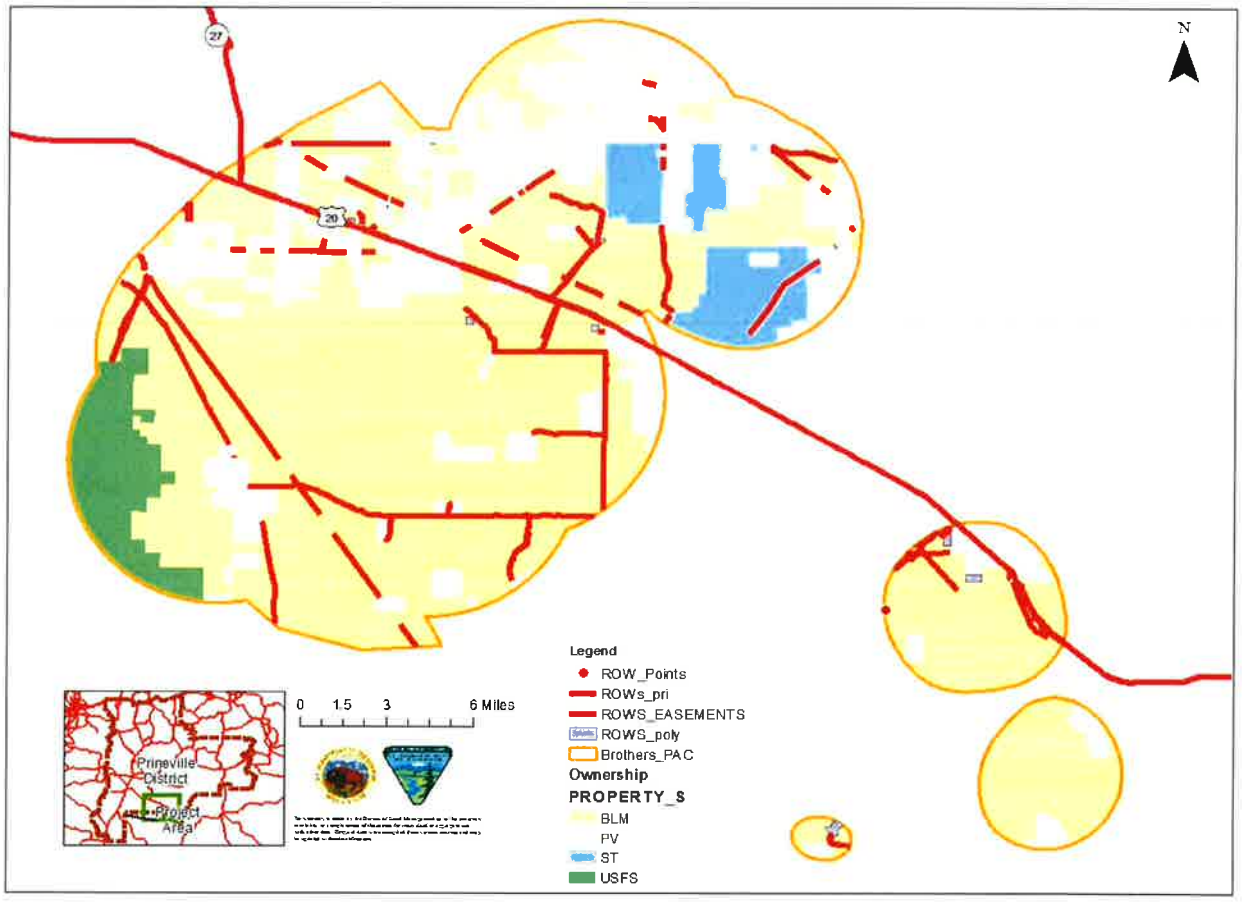
ROW CASE TYPE	AUTHORIZED CASE - ACRES	CLOSED CASES - ACRES
Roads	5230.407	219.156
Unauthorized Activities	5.9	5.45
Power Line	291.736	72.934
Wind Project Test Site	38127.34	38127.34
Power Facility	6.8	1
Communication Site	16.034	5.631
Telephone Line	277.25	6.33

Figure 13: Windpower test site



ARMPA provides guidance on documenting surface disturbing activities where habitat has been converted to other uses. It calculates habitat that has already been converted at the PAC scale, and then incorporates new disturbances to help ensure we aren't removing habitat in a detrimental way. Of the other documented ROW cases in Figure 14, a minimal amount of approximately 598 acres or 0.2 percent of habitat have been converted. Follow up on whether these ROWs have all been tracked in the Surface Disturbance and Tracking Tool (SDARTT) will need to occur. Currently the PAC is at 1.53% (BLM National Operations Center (NOC) estimate) and 0.57% (Institute for Natural Resources (INR) estimate).

Figure 14: Right of Ways and Easements



The ARMPA amends the existing RMP direction related to cross-country travel in the Travel and Transportation Section 2.2.10: "MD TTM 1: Unless already designated limited or closed all PHMA and GHMA shall be designated as limited to existing roads, primitive roads, and trails, including existing SRMAs. Where areas are currently designated "closed" under existing applicable RMPs the closed designations shall be maintained. Travel management planning will be deferred to future implementation/activity level planning or concurrent with future RMP planning."

Overall, infrastructure that's converted habitat is minimal within the PAC. Main roads may be acting as a deterrent and limiting connectivity within the PAC. A more detailed analysis will need to be completed to look at specific impacts to leks or lek complexes, for example location of tall structures. As the road

density is low when compared to other BLM lands, the extent of the road network is widespread and relatively abundant throughout the entire PAC fragmenting the habitat.

Grazing

Management direction for livestock grazing in the Brothers/LaPine RMP states grazing management in the Brothers portion will continue so as to maintain or improve ecological condition on all grazing allotments. All grazing allotments in the planning area have been assigned to a management category: I (Improve), M (Maintain), and C (Custodial). The categorization process is designed to establish allotment priorities for management actions. The I allotments are usually areas with a potential for resource improvement and where BLM controls enough land to implement changes. The M allotments are usually where satisfactory management exists and major resource conflicts have been resolved. Most of the C allotments are small, unfenced tracts intermingled with larger acreages of non-BLM lands, thus limiting BLM management opportunities. (Brothers/ LaPine RMP 1989). There are seven I, two M, and one C allotments within the PAC (Table 15, Figure 14.)

Figure 15: Allotment map

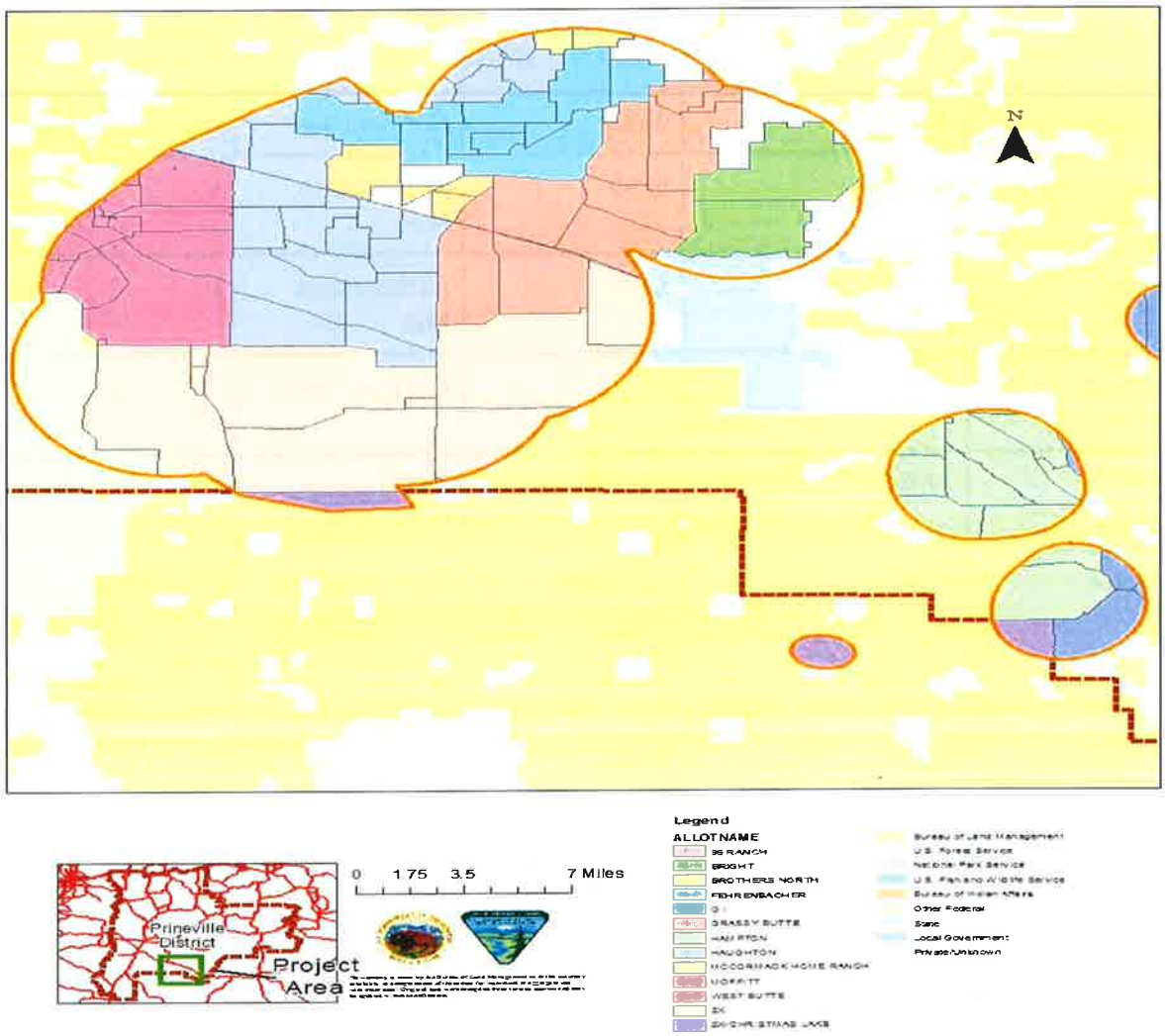


Table 15: Allotments in PAC

Allotment	BLM Acres within PAC	AUMs	Rangeland Health	Management Category
96 Ranch	2	476 (allotment total)	Not Evaluated	I
Bright	15,188	643	Not Evaluated	M
Brothers North	5,351	1109	*Not meeting Standard 5 Livestock Casual.	I
Fehrenbacher	23,274	492	Not Evaluated	M
G.I.	5,357	11,166 (allotment total)	All Standards Met	I
Grassy Butte	38,476	3010	Not Evaluated	M
Hampton	26,585	6895	All Standards Met	I
Haughton	46,998	5355	All Standards Met	I
McCormack Home Ranch	1,764	60	Not Evaluated	C
Moffitt	27,940	2334	All Standards Met	I
West Butte	140	1948 (allotment total)	*Not Meeting Standards 1,2,3,5 Not due to Livestock	I
ZX- Prineville	70,963	7100	All Standards Met	I
ZX Lakeview	5680	30593(partial allotment total/PAC)	All Standards Met	I

- Brothers North Standard 5 did not meet due to vegetative conditions for sage grouse. One

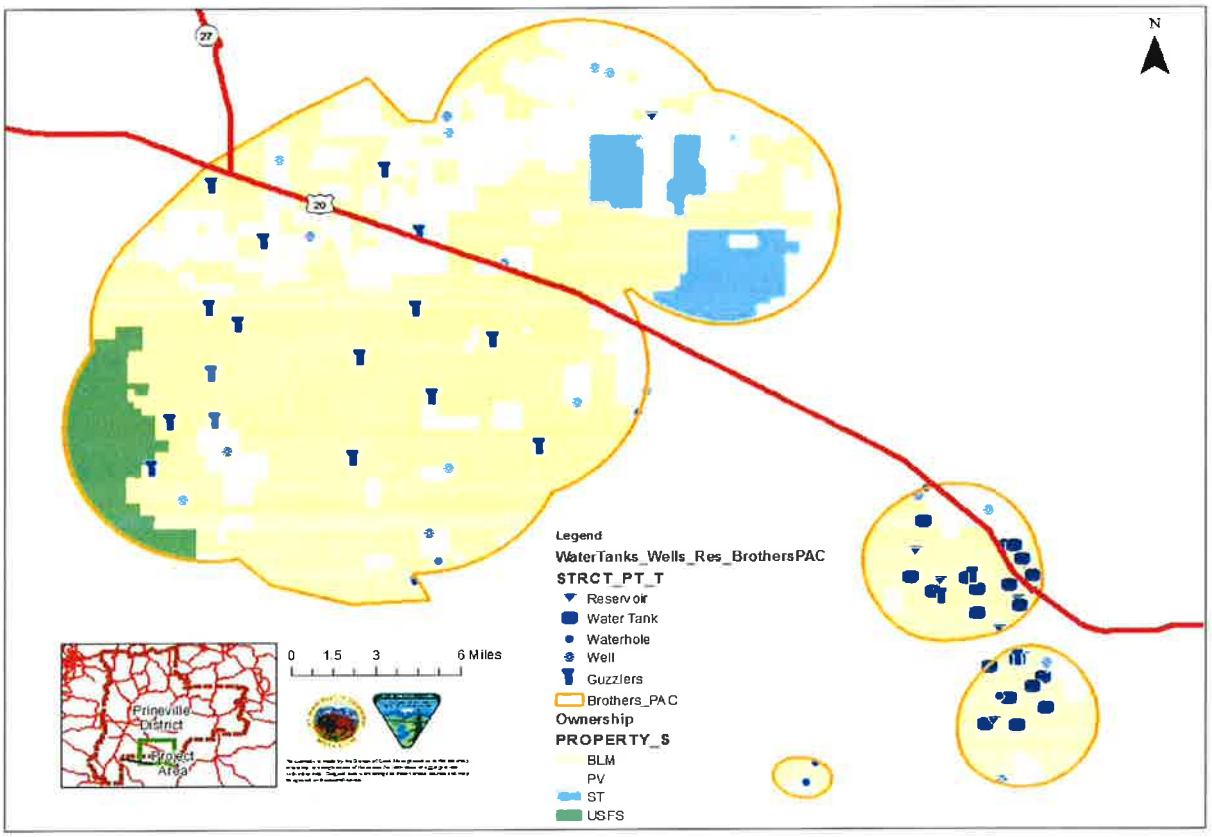
Pasture did not meet the height and density requirement of sagebrush. Another pasture lacked forb cover and grass height required for hiding cover. Changes in the grazing management have been implemented following the rangeland health assessment.

- West Butte Standard 1 and 3 were not meeting due to historic livestock grazing, lack of water sets, juniper encroachment, historic drought conditions, Aroga moth, and fire suppression.
- West Butte Standard 2 failed to extreme encroachment of Juniper trees into the riparian system and subsequent lack of riparian species present in the site.
- West Butte Standard 5 failed due to historic grazing practices, historic drought conditions, Aroga moth, and the suppression of fire.

Rangeland Health Assessments and Evaluations are the BLM's mechanism for determining if grazing is a causal factor for non-attainment of the Standards for Rangeland Health (BLM 1997). Rangeland Health Assessments have been completed on 7 of the allotments. All standards were meeting on 6 of the 7 allotments assessed within the Prineville District. Livestock grazing rotations across the PAC include rest rotations and deferred and include authorized grazing throughout the seasons.

The Figure 16 indicates rangeland improvements throughout the PAC. Watering locations for livestock include water troughs, wells, and dugouts associated with Playa features. Other types of range improvements that exist within the PAC are pipelines, cattle guards, and fences.

Figure 16: Rangeland improvements



Recreation

There are zero miles of developed trails within the PAC boundary. Recreation within the PAC primarily consists of activities such as general rural road driving for pleasure, off-road/trail OHV driving, and hunting. There are no designated trails within the PAC. A current inventory of off-road/trail routes does not exist. There are no Special Recreation Permits currently approved within the PAC.

The Brothers-La Pine RMP (1989) provides specific guidance on OHV use and rock hounding. The Brothers-La Pine RMP States that: "The use of off-road vehicles on public lands will be regulated in accordance with the authority and requirements of Executive Orders 11644 and 11989 and regulations contained in 43 CFR 3809. They require that off-road vehicle use on public land not create significant adverse impacts to resource values that conflicts between visitors to the public lands be minimized, that public hazards are identified and public safety occurs (pg. 45)." The RMP defines all areas within the PAC as having no cross-country travel restrictions.

The Greater Sage-Grouse Conservation Assessment and Strategy for Oregon (2011 pg. 45) amends the Brothers- La Pine RMP and states that: "the impacts of recreational activity on sage-grouse habitat have been poorly documented in the literature. However, displaying males or visiting female sage grouse have been known to abandon lek sites frequented by birdwatchers and photographers who observe and photograph at distances not tolerated by the birds (Call 1979). Off highway vehicle (OHV) use also may be detrimental to sage grouse breeding or nesting activities if the timing and intensity of the activity conflicts with sage grouse use of those areas. Intensive off-trail OHV use may cause nest abandonment, if laying or incubating females are flushed from nesting locations."

Monitoring current recreation use within the PAC would better determine whether significant impacts are occurring as a result of these activities. Efforts across GHMA and PHMA to educate public users about the ARMPA would help with compliance for the updated cross-country travel restriction.

Drought

ODFW's Sage-Grouse Conservation Assessment and Strategy for Oregon (2011) states:

> Sage grouse adults and chicks depend on high quality forage (e.g., forbs) in these riparian/wetland areas during the late growing season when upland communities have desiccated. Chick survival has been identified as one of the greatest limiting factors for sage grouse populations. Research suggests that when sage grouse are forced to transition to a fall/winter diet of sagebrush earlier in the season during drought years, sage grouse chicks have lower survival. In effect, riparian/wetland areas help fill the needs of a protein rich diet of forbs and insects before they change to a diet of sagebrush leaves during winter (pg. 45).

To assess how precipitation levels may affect sage grouse within the Brothers PAC, we analyzed average annual and monthly precipitation values. Within the Brothers PAC, the data downloaded from PRISM's 4 kilometer grid cells and averaged 250mm per year from 1971 to 2000 and 229 mm per year from 2001 to 2016. Average annual sage grouse population seems to track the preceding years' annual precipitation (Figure 16). In addition, the cumulative value of all four preceding April and May precipitation appears track the trend in the annual Sage Grouse Population (Figure 17). When the preceding four years of April and May precipitation are high, annual Sage Grouse Population appears to be higher. Likewise, when the preceding four years of April and May precipitation are low, the annual

Sage Grouse Population appears to be lower.

PRISM data assumes that for a localized region, elevation is the most important factor in the distribution of climate variables and calculates a local climate-elevation relationship for each grid cell on the landscape and uses nearby station data to populate the regression function. PRISM weights the station data points to control for the effects of a wide variety of physiographic variables such as the proximity to coastlines, the location of temperature inversions and cold air pools, and several measures of terrain complexity.

As expected, sage-grouse populations follow annual precipitation levels with the exception of the steady population decline in recent years. This is one indication that sage-grouse populations in the PAC follow the annual precipitation levels. But, other factors may be influencing the continued decline in recent years.

Figure 17: Average Precipitation in the preceding four Aprils and Mays

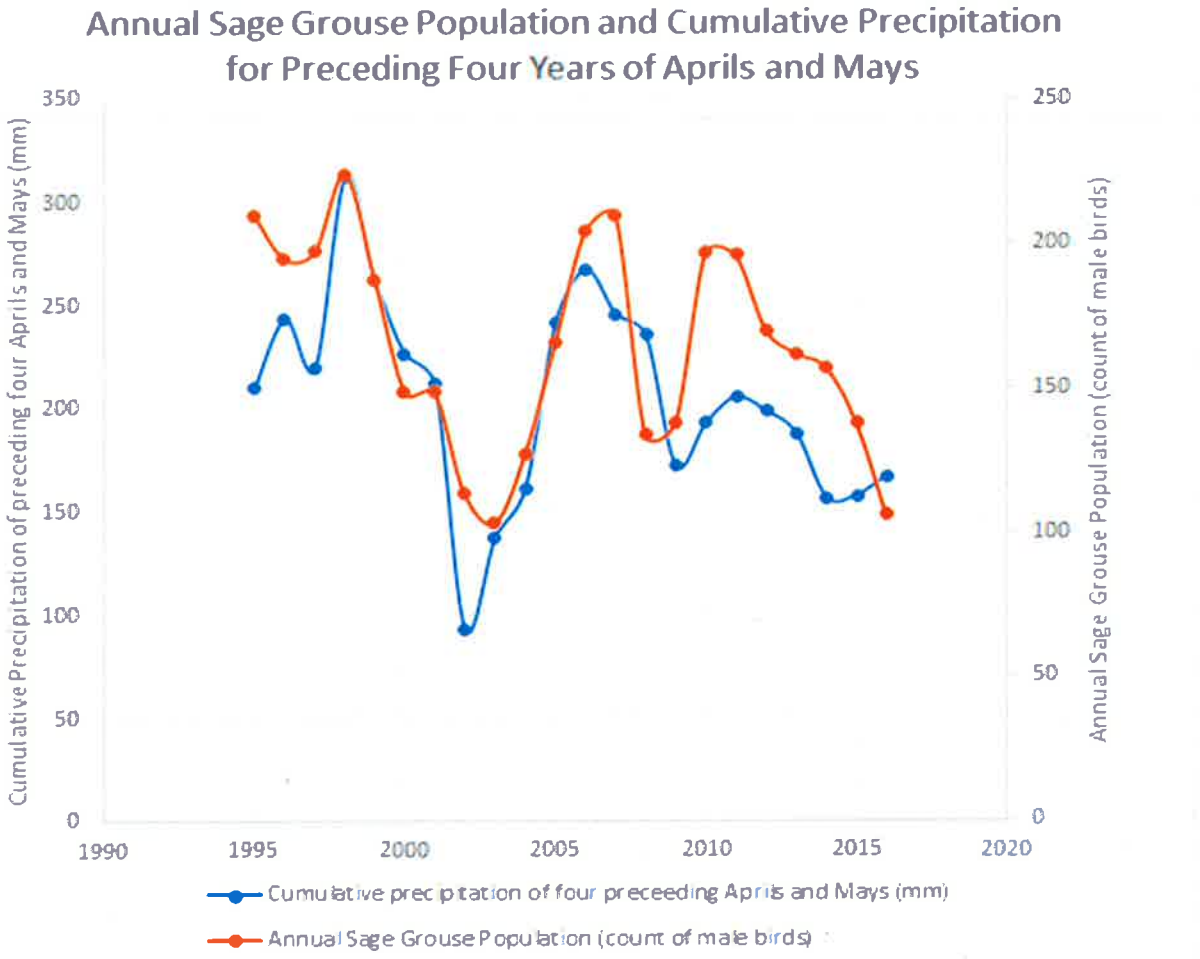
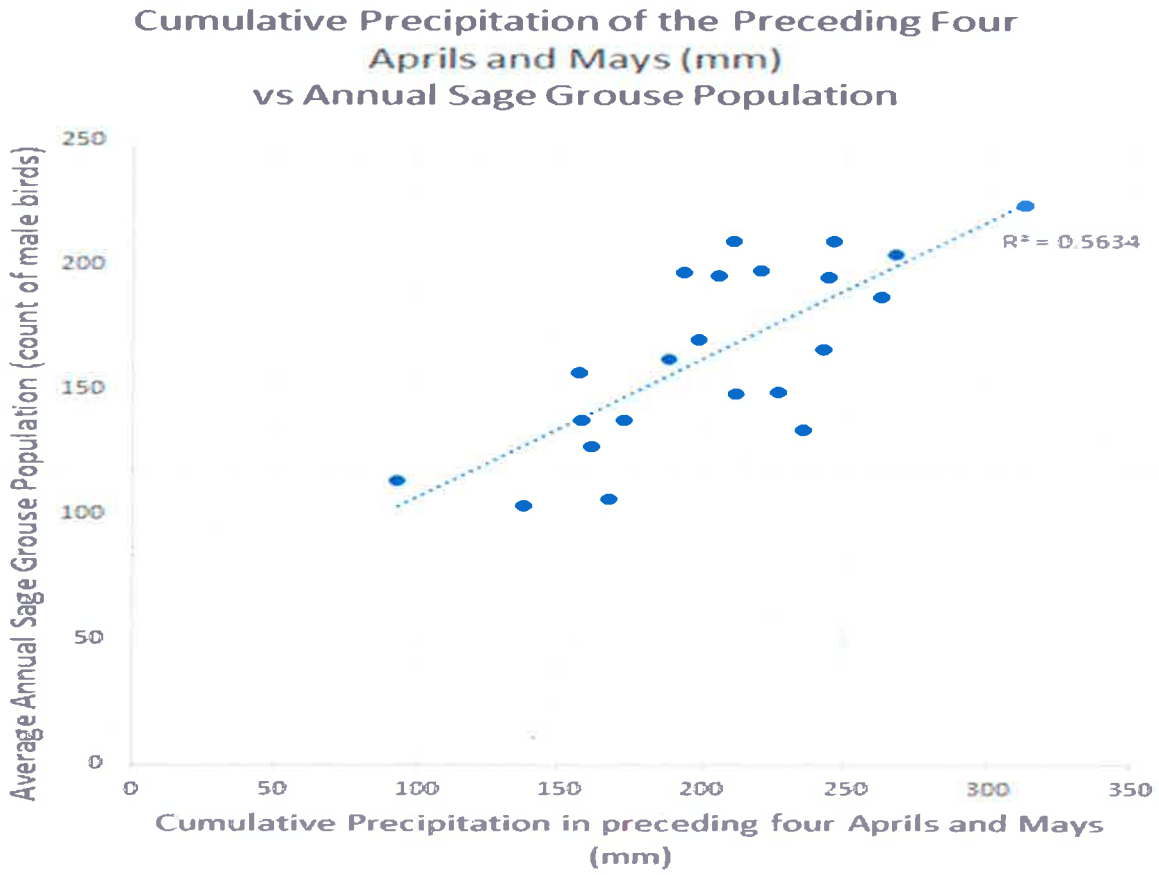


Figure 18: Cumulative Precipitation



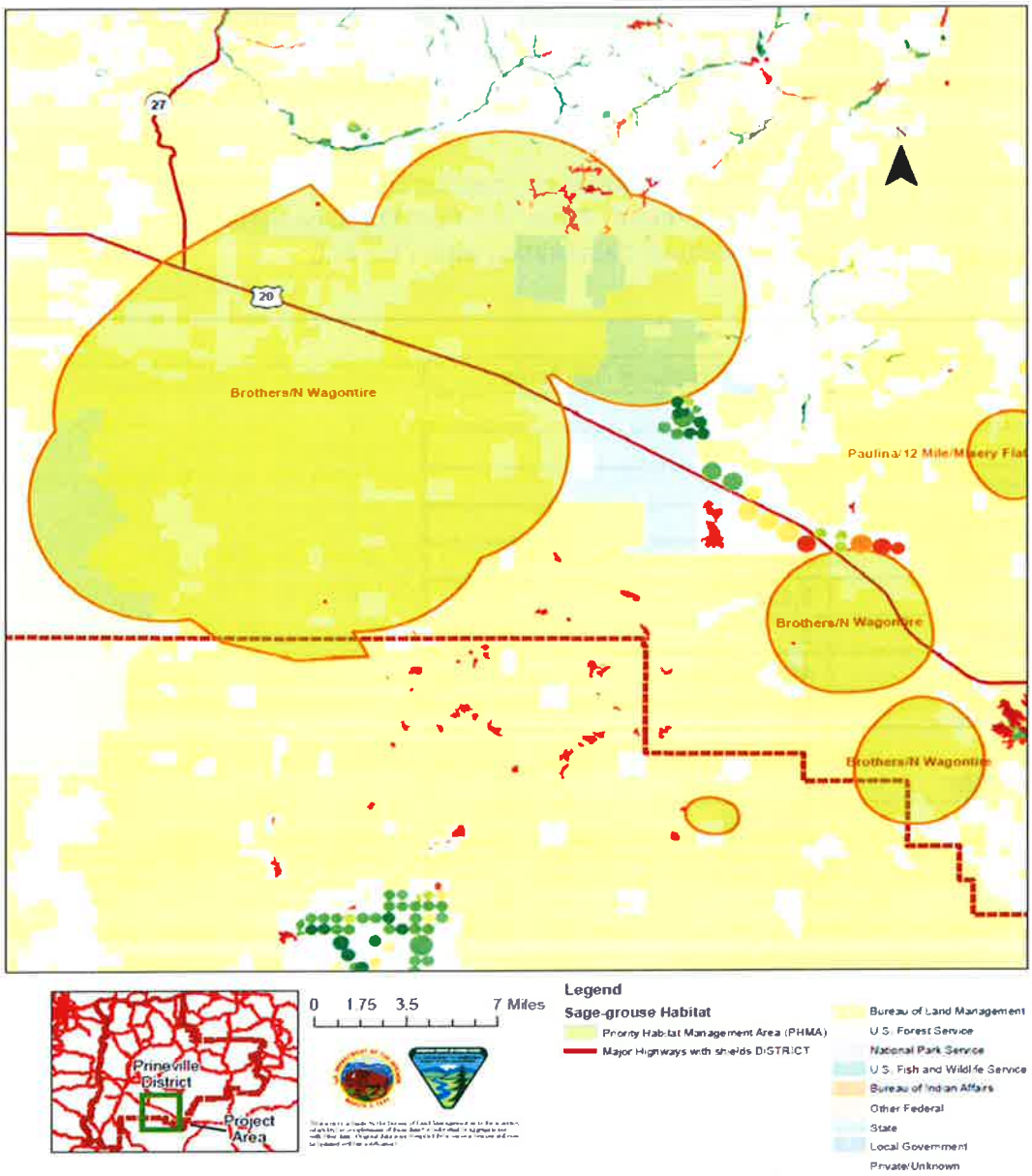
Mesic Resources

Mesic resources are generally defined as sites with higher vegetative productivity during the late growing season (July 15 to September 30). Mapping efforts for mesic habitat were completed by The Sage-grouse Initiative (SGI). SGI used normalized difference vegetation indices (NDVI) to quantify photosynthetic activity and correlate closely to fluctuations in net primary productivity from 1984 to 2016. These values were calculated from data gathered each year from July 15 through September 30.

Sage-grouse utilize mesic habitat during the late growing season. These areas are some of the only places with lush vegetation, water, and insects. Hens bring their broods to these areas to forage when the early season water and forbs begin to dry up. As shown in Figure 18, mesic habitat in the Brothers/N. Wagontire PAC is very limited.

One current project that addresses this issue is the Playa Project. In 2007 playas were inventoried on the Prineville District, including many within the PAC, to gather the following information; plant species inventory, wildlife species inventory, assess water resources availability for human and livestock use, and the ecological condition of each playa feature through Ecological Site Inventory, ESI. The Sage-Grouse Playa Management EA was completed in 2014 which helps facilitate further restoration of these sensitive areas.

Figure 19. Mesic Resources data from NRCS Sage-grouse Initiative. Red indicates 0 years of productivity, green indicates years of 100% productivity.



Agricultural Conversion

Agriculture can influence the ability of sagebrush-dominated landscapes to support sage-grouse through habitat loss and fragmentation. Agricultural development can also influence sage-grouse by providing access to sagebrush habitats for predators such as domestic cats, red fox, and corvids. In addition to predators, irrigated agriculture adjacent to sagebrush habitats may expose sage-grouse to mosquitoes carrying West Nile virus (WNv). In June and July, as sagebrush habitats become dry and herbaceous plants mature, females usually move their broods to moister sites where succulent vegetation is available. Manier et al. (2013 and references therein) suggest (1) sage-grouse populations may become extirpated when the proportion of a landscape permanently converted from sagebrush to agriculture exceeds 25 to 27%, (2) substantial declines in lek counts may occur when this proportion exceeds 16%, and (3) lek-count declines may occur when the proportion is as low as 1.5% of the landscape. Johnson et al (2011) reported trends in lek counts stabilize as the percent of agricultural land increases beyond 2.5%.

Examining the proportion of agriculture in the PAC based on Cropland USDA data, the amount of agricultural lands is minimal with only 0.29% present. Table 16 is from Cropland USDA 2007, 2015. Shrubland is the dominant vegetation/agricultural classification within the PAC.

Table 16: Cropland Data Summary

Class Name	Sum of Cropland GIS Acres
Alfalfa	420
Barren	422
Developed/Low Intensity	190
Developed/Med Intensity	2
Developed/Open Space	435
Evergreen Forest	3,181
Fallow/ Idle Cropland	2
Grass/ Pasture	449
Herbaceous Wetlands	17
Open Water	2
Other Hay/ Non Alfalfa	4
Shrubland	288,334
Triticale	1
Winter Wheat	1
Woody Wetlands	1
Grand Total	293,460

West Nile virus

West Nile virus (WNv) is an arthropod-borne viruses (arbovirus) transmitted to humans through the bites of infected mosquitoes. Arboviral surveillance data are reported to CDC through ArboNET; in addition to tracking human disease, ArboNET maintains data on arboviral infections among presumptive viremic blood donors, veterinary disease cases, mosquitoes, dead birds, and sentinel animals. According

to annual surveillance data for Baker, Union, Wallowa, and Malheur Counties, WNv has been detected in one or more of these counties every year since 2004 (http://diseasemaps.usgs.gov/index.html). WNv has been detected in Deschutes County with 1-10 documented human cases, and through veterinary cases. Currently ODFW, East Cascade Audubon Society, US Fish and Wildlife Service, BLM, and USFS are initiating a survey within the PAC. Greater sage-grouse are highly susceptible to infection with WNv, with substantial mortality reported in wild populations and in experimentally infected birds (Clark et al. 2006). Laboratory testing will occur as samples are collected throughout the summer of 2017.

Conclusions

Potential causes may include, but are not limited to, the following: Drought, lack of mesic habitat, juniper encroachment, and route density/infrastructure/travel management (causing habitat fragmentation). These topics should be further discussed with the team.

- Drought: The sage-grouse population in the PAC follows closely to the moisture regime. But, the population has expressed a steady decline and has yet to respond. This suggests other issues might be affecting sage-grouse.
- Lack of mesic habitat: The PAC has a limited amount of mesic habitat (Figure 17). These mesic resources are also not reliable during late brood-rearing.
- Travel Management: Over 5,200 acres (1.7%) of the PAC has been converted from habitat to roads. Additional roads may further fragment the habitat even further, therefore decreasing the quality of the habitat.

Note – these will come forward to the Situation Analysis

On-going Actions

- The High Desert Shrub Steppe EA covers the PAC and surrounding areas for juniper thinning and jackpot burning.
- The Playa EA was completed in 2014 and covers juniper thinning in lands with wilderness characteristics, filling of playas, road reroutes, and vegetation restoration treatments. In addition the ZX allotment grazing permit was renewed in 2014 and considered GRSG when scheduling rotations, and water developments.
- Candidate Conservation Agreements with Assurances (CCAA) and Candidate Conservation Agreements are being initiated and completed within the PAC.
- Rangeland Health Assessments are an ongoing District priority and will be focused within our PACs with considerations for important resource concerns such as Threatened & Endangered species habitat, degraded resource conditions, or other legal obligations as stated in Instructional Memorandum 2016-141.
- West Nile virus surveillance on guzzlers, water troughs, and playas is occurring within in the PAC during the 2017 summer season.
- Installing flight diverters
- Building adaptive management criteria into grazing permit renewals (see also IM-WO-2016-142)

Potential Actions

The following actions are general short and long term suggestions for action that could potentially improve sage-grouse habitat and populations. There might be additional actions that come forward in the near future when new data is available. The following actions are not ranked in any priority.

Complete travel management

- Map and inventory all routes within the PAC.

Juniper Treatments

- Prioritize treatment areas within the PAC.

S & Gs, AIM, ESI

- Identify and prioritize these data needs within the PAC.
- Continue habitat assessment work
- Complete Rangeland Health Assessments on the remaining 5 allotments as well as update existing determinations to reflect current conditions.

Predator Control

- Work with private landowners, APHIS, and ODFW about known areas with higher populations of predators for predator control and documentation.
- Identify locations to install perch deterrents

Map fencelines throughout PAC

- Inventory and assess condition of fences on all lands. As noted earlier in the document, there are some discrepancies in the BLM fence geospatial layer (i.e. not inventoried, mismapped, etc.). There is also a limited amount of spatial information for fences on private lands.

Mark more fences

- Once all fences are inventoried, prioritize marking fences around leks, then in other habitats.

Fly for leks

- Flight surveys for leks would verify that leks/complexes have not moved and if new leks have formed.

Adjust PAC boundary to include Kotzman Basin and Exclude Canary Lake

- If the PAC boundary is adjusted, one suggestion would be to exclude the Canary Lake peripheral location and include Kotzman Basin into the PAC. Adjusting the PAC boundary this way would not increase the acreage of the PAC boundary, management acres would stay roughly the same. Collar data previously collected by Jan Hanf indicates grouse use in the Kotzman Basin. There is a high probability that grouse are moving habitat in both areas. Canary Lake has not had an active lek since 2003. The Kotzman Basin complex has had attendance since 2004.

Reduce/remove hunting tags

- Although hunting in WMU 73 is well within the 5% limit and there is no information as to where grouse were harvested, there is still a possibility that hunting occurred in the PAC. With such a

sharp decline in the population in a short period, further analysis should be conducted to see if hunting is impacting the PAC. Potential modifications could include not hunting in the PAC for a short period, shorten the hunting season in the PAC, or require harvest information (location, date, etc.) for areas within the PAC.

Reduce noxious weeds and invasive annual grasses

- Continue to prioritize the treatment of noxious weeds within PAC boundaries,
- obtain and ground truth more accurate spatial data characterizing the extent and abundance of invasive annual grass infestations within the PAC boundary, and
- expand treatments to include invasive annual grass treatments along roadways, in isolated infestations and within juniper thinning project areas. Incorporation of increased invasive annual grass treatments into the current weed management program will require that additional funding be sought out and obtained by the Weeds, Wildlife, Range, and Fuels departments.

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