SECTION 5: THREATS TO SAGE-GROUSE AND RESPONSIVE CONSERVATION MEASURES (EXISTING AND NEW)

To assist with conservation planning efforts, the ALAT Plan identifies conservation objectives and measures for each of the threats to sage-grouse and their habitats as identified in the 2010 warranted by precluded finding (75 FR 13910) as well as the COT Report (2013). For the purposes of this ALAT Plan, a Conservation Measure (CM) is defined as any activity or action which, when implemented or continued to be implemented, will reduce or remove threats to sage-grouse and will improve or maintain sagebrush-steppe habitat. In addition, this section described the metrics to be measured and reported to the USFWS. These conservation measures have been developed based upon professional experience and the best available science and biological judgment. Successful implementation of these conservation measures will ameliorate the threats to sage-grouse in Oregon and will allow for the long-term conservation of the species.

The ALAT Plan provides a unified all lands approach to sage-grouse conservation to ensure species protection for sage-grouse in eastern Oregon and is meant to supplement, and not replace the *Greater Sage-Grouse Conservation Assessment and Strategy for Oregon* (Hagen 2011), the LITs, or the locally driven process that created them. Since 2010, each LIT has further refined conservation opportunities and knowledge gaps for sage-grouse in their respective Action Areas (Appendix X). Accomplishments and conservation actions which have been implemented since 2010 are identified and summarized below for each PAC to assess the overall effectiveness at the state level. Some participating stakeholders reported conservation projects by county, not PAC or Action Area boundary, therefore those statistics will not be directly comparable, but generally follow similar geographic distributions.

5.1. PRIMARY THREATS TO SAGE-GROUSE: Conifer Encroachment, Exotic Annual Grasses, and Wildfire

5.1.1. Conifer Encroachment

Sage-grouse are negatively impacted by the expansion of juniper in sagebrush-steppe habitats, even if the underlying sagebrush habitat remains (Freese et al. 2009). Sage-grouse avoid these areas of expansion (Casazza et al. 2010) because of increased predation risk, and as juniper increases in abundance and size, the underlying habitat quality for sage-grouse

diminishes. Sage-grouse appear to abandon breeding areas around leks when as little as 4% tree cover exists on the landscape (Baruch-Mordo et al. 2013), so early action is essential to prevent population level impacts.

Understanding the nuances of the conifer encroachment process is essential to implementing a targeted approach to tackling this problem. Miller et al. (2005) characterized three stages of juniper woodland succession:

- Phase I (early) – trees are present, but shrubs and herbs are the dominant vegetation that influence ecological processes (hydrologic, nutrient, and energy cycles) on the site;
- Phase II (mid) – trees are co-dominant with shrubs and herbs and all three vegetation layers influence ecological processes on the site;
- Phase III (late) – trees are the dominant vegetation and the primary plant layer influencing local ecological processes.

Scope of the Problem: Current estimates suggest that approximately 2.4 million acres of sage-grouse habitat is affected by juniper encroachment in eastern Oregon (Hagen 2011). A recent analysis found early phase conifer encroachment (Phase I and II; <10% canopy cover) occurs across 1,239,017 acres within Action Areas (Figure 5.6, Table 5.2). An additional 846,704 acres in Action Areas is Phase III (>10% canopy cover). The majority (848,343 acres) of juniper encroachment (Phase I and II) occurs on federal lands, followed by private (346,760 acres) and state or local lands (41,857 acres; Table 5.2). However, these estimates are based on 2012 imagery and do not account for juniper removal that has occurred since 2012. Although the need for additional work exists, significant conifer reduction has already occurred across Oregon's sagebrush country. Efforts made to address the juniper encroachment threat in Oregon since 2010 are summarized in Table 5.2 below.

Future treatment of juniper encroachment will be prioritized in those areas where sage-grouse are most likely to benefit. Sites in Phase I or II successional stages often retain a significant understory of sagebrush, grasses, and forbs compared to Phase III sites where understory plant layers are reduced or absent. Removal of juniper on sites in Phase I or II can prevent loss of key plants and produce immediate habitat benefits for sage-grouse. Treatment of Phase III sites, although beneficial, is generally not strategic given that it requires significantly more resources on a per-acre basis and significantly more time to recover the understory vegetation required to support sage-grouse.

In Oregon, most encroached sites are still in a state of transition. It is estimated that 80% of juniper encroachment is still in Phase I or II, but the amount of Phase III woodland is expected

to increase to 75% of the total encroachment over the next 30-50 years (Miller et al. 2008), which emphasizes the urgency of action now.

Insert map of INR Conifer Canopy Cover

Figure 5.6. Conifer canopy cover across the extent of the SageCon planning area. Areas with 0-10% and >10% canopy cover are considered Phase I and II (combined), and Phase III, respectively.

Table 5.2. The current extent of juniper (reported as acres) by land ownership and total SGI-funded juniper (2010-2014) removal by Action Area. Canopy cover is ≤ 10% and > 10% for Phase I and II (combined) and Phase III, respectively. Other ownership is Tribal or undefined.

Action Area	Federal		Private		State		Other		Total Phase I & II	Total Phase III	SGI-funded
	Phase I & II	Phase III	Phase I & II	Phase III	Phase I & II	Phase III	Phase I & II	Phase III			
12 Mile	20,594	12,024	32,654	14,249	2,169	877	-	-	55,417	27,150	38,371
Baker	10,421	8,446	26,406	16,926	-	-	-	-	36,827	25,372	7,864
Beaty	40,968	22,386	2,658	2,119	783	395	-	-	44,409	24,900	933
Bowden Hills	89	7	78	56	-	-	-	-	167	63	-
Brothers	51,320	50,174	24,683	25,313	1,633	1,207	-	-	77,636	76,694	4,752
Bully Creek	70,813	51,979	36,355	27,444	1,108	829	-	-	108,276	80,251	19,066
Burns	37,118	26,348	16,841	12,286	686	978	16	-	54,661	39,612	5,126
Cabin Lake	5,909	5,619	831	189	-	-	-	-	6,740	5,808	861
Coglan Buttes	762	5	80	118	-	-	-	-	842	123	-
Cow Lakes	27,897	4,174	6,669	5,662	313	99	65	92	34,943	10,028	6,415
Cow Valley	7,076	4,799	23,465	2,458	231	51	-	-	30,772	17,308	12,854
Crowley	49,865	17,988	11,417	5,783	2,500	1,277	-	-	63,782	25,048	2,308
Drewsey	86,341	84,190	36,504	27,957	1,846	1,148	-	-	124,691	113,295	19,180
Dry Valley/Jack Mt.	11,489	4,385	2,130	1,084	46	-	-	-	13,666	5,469	-
Folly Farm	21,326	14,613	5,806	5,383	15,665	16,806	-	-	42,796	36,802	-
Glass Buttes	30,865	20,178	3,052	1,012	267	227	-	-	34,184	21,417	-
Louse Canyon	12,634	4,843	601	455	1,208	715	1,972	637	16,414	6,650	505
Misery Flat	5,952	2,182	1,525	1,581	1,200	739	-	-	8,677	4,502	-
North Steens	26,469	22,044	8,874	10,052	11	1	-	-	35,354	32,097	1,054
North Wagontire	108,575	53,187	4,857	1,624	629	508	-	-	114,061	55,320	-
Paulina	14,697	23,229	27,766	21,001	27	4	-	-	42,491	44,234	28,554
Picture Rock	22,204	11,002	2,321	1,001	58	2	3	-	24,586	12,005	-
Post	1,235	3,558	9,291	12,617	8	101	-	-	10,534	16,276	100
Pueblos	13,698	2,250	1,226	169	-	-	-	-	14,923	2,419	-
Saddle Butte	654	67	11	8	52	9	-	-	717	85	-
Soldier Creek	24,061	5,191	4,620	2,197	11,037	5,264	-	-	39,718	12,652	4,361
South Steens	58,513	55,461	15,145	11,146	60	87	-	-	73,718	66,695	-
Tackman	5,956	10,348	5,346	6,082	-	-	-	-	11,302	16,429	3,675
Trout Creeks	39,153	12,739	2,996	1,385	2	0	-	-	42,150	14,124	-
Tucker Hill	3,003	1,869	4,603	4,269	-	-	-	-	7,606	6,138	7,523
Unity	4,431	4,706	15,537	14,846	-	-	-	-	19,967	19,552	17,848
Warners	34,257	20,978	12,415	7,043	317	165	-	-	46,989	28,187	9,640
Grand Total	848,343	560,971	346,760	253,515	41,857	31,489	2,056	729	1,239,017	846,704	190,989

Conservation Objective: Remove juniper from areas of sagebrush that are most likely to support sage-grouse in and around priority habitats (Action Areas, core, or areas with 75% breeding bird density), with particular emphasis on early phase encroachment to prevent further habitat loss and promote re-colonization of former habitats. Complete conifer removal within lek buffers on private and state lands within 10 years; complete conifer removal within lek buffers on public lands within 20 years.

Conservation Actions: Juniper treatment will be prioritized in areas of known sage-grouse use, particularly lekking areas that are at high risk of being abandoned in the near future due to increased conifer cover. Phase I and II juniper invasions within priority sage-grouse habitat will have highest priority for treatment. However, additional prioritization will be applied first to areas within 4 miles of known leks (active or pending), particularly in those areas where the canopy cover will likely result in local extirpation in the near future.

Action 1: Remove all Phase I and II conifer encroachment (<10% canopy cover) in sage-grouse priority habitats (Action Areas, core, or areas with 75% breeding bird density) and important areas of connectivity in Oregon in 10-20 years.

[Add text re Governor's Recommended Budget, NRCS coordination]

Implementation of this action should be based on the following approach to prioritization and practices.

- Prioritize juniper removal within 1 mile of known leks (with an active or pending status) and then expand juniper removal to within 4 miles of known leks. Complete conifer removal within lek buffers on private and state lands within 10 years; complete conifer removal within lek buffers on public lands within 20 years.
- Within 1 mile of known leks, completely remove juniper. Beyond the 1 mile buffer and within 4 miles of leks, completely remove juniper; where complete conifer removal is not feasible, reduce juniper canopy cover to less than 4%.
- After treatments within lek buffers are complete, prioritize Phase I and II conifer removal in additional priority habitats (Action Areas, core, or areas with 75% breeding bird density) that provide adequate sage-grouse habitat (e.g., sagebrush landcover > 25%), particularly in areas with medium-to-high resistance and resilience.

- Utilize mechanical techniques for juniper removal and techniques for slash removal that have the greatest likelihood of retaining an intact sagebrush component within treatment areas, such as "lop and scatter" or "jackpot burning". Complete jackpot burning during the spring when environmental conditions are favorable, however, avoid disturbance to sage-grouse during critical biological timeframes (e.g., lekking and spring movements). Eliminate all limbs from felled trees in excess of 4 feet in height to reduce perching opportunities for avian predators.
- In order to reduce per-acre costs and promote sustainable rural economic development, seek to integrate juniper removal projects and by-products with efforts to develop and engage juniper markets and utilization as wood products or woody biomass. Feasibility of such integration will depend on a variety of factors such as project location, transportation costs, tree size, and market maturity.
- Retain old-growth or culturally significant juniper (pre-settlement trees established prior to 1850).
- Consider seeding conifer removal areas prior to treatment if the perennial grass community is in poor condition or if exotic annual grasses are present. Broadcast seeding prior to soil disturbance or under slash may increase the chances of establishment.
- Rest treated areas from grazing by livestock and free roaming equids until understory perennial grasses are re-established and can sustain disturbance.

Action 2: Strategically treat Phase III conifer encroachment (>10% canopy cover) as needed in sage-grouse priority habitats (Action Areas, core, or areas with 75% breeding bird density) where the greatest opportunities exist to restore connectivity, reduce risk of catastrophic wildfire, and create future sage-grouse habitat opportunities. Implementation of this action should be based on the following approach to prioritization and practices:

- Prioritize Phase III juniper removal after Phases I and II have been addressed. Prioritize Phase III areas in or adjacent to priority areas (Action Areas, core, or areas with 75% breeding bird density) that provide adequate sage-grouse habitat (e.g., sagebrush landcover > 25%), particularly in areas with medium-to-high resistance and resilience.
- Retain old-growth or culturally significant juniper (pre-settlement trees established prior to 1850).

- Because Phase III stands generally lack a desirable understory shrub and grass component, recognize that conifer removal areas will likely require seeding and planting of native shrubs and perennial grasses.
- Rest treated areas from grazing until understory perennial grasses are re-established and can sustain disturbance.
- Utilize prescribed fire as a tool to remove Phase III juniper judiciously and follow best management practices for prescribed fire:
    - Limit prescribed fire to higher elevations where there is little risk of invasive plant establishment post-treatment (e.g. high resistance and resilience);
    - Conduct prescribed fire treatments in a mosaic such that only 1/3 of treatment areas are burned (not to exceed 160 acres);
    - Use caution with prescribed fire in mountain big sage sites to prevent fire from escaping and any subsequent establishment of invasive annual grasses or other weeds;
    - Ensure timing of prescribed burns does not interfere with sage-grouse behaviors such as lekking and seasonal movements;
    - Avoid prescribed fire in low elevation, xeric sagebrush communities (e.g. low resistance and resilience).

Responsible Parties: BLM, USFS, NRCS, SWCDs, OWEB, ODFW, Private Landowners

Conservation Measures & Decision Support Tools: Additional Conservation Measures and guidelines for conducting juniper removal to benefit sage-grouse are detailed in Appendix 5.1. A spatial decision support tool is currently under development and will help to identify and prioritize areas for conifer removal. At the site-specific scale, state and transition models for mid- and high elevation zones can assist in identifying the current vegetation state of a site and associated management actions required for restoration (see Figures 5.4 and 5.5). Prescriptions for conifer removal on any given site should also be based on a field investigation that utilizes Ecological Site information and guidance provided in USGS Circular 1321 (Miller et al. 2007).

Conservation Measures Completed Since 2010:

A diverse partnership in Oregon has been aggressively implementing the actions needed to reduce the threat of conifer encroachment. Since the 2010, partners have been dedicating significant technical and financial resources to strategically scale-up conifer removal efforts to benefit sage-grouse.

From 2010 to 2013, NRCS and its partners through the Sage Grouse Initiative (SGI) invested over $13 million to help ranchers mechanically remove early phase conifer encroachment in priority sage-grouse habitat, resulting in 146,348 acres (229 square miles) of treatment. These actions occurred across 20 Action Areas (Table 5.2).

Importantly, since 2010 and the inception of SGI, the annual rate of NRCS-funded conifer removal has accelerated ten-fold while continuing to hone treatments in priority landscapes to maximize benefits for sage-grouse (Figure 5.7). Another $3 million was made available in 2014 and rancher demand for assistance has exceeded supply.

Furthermore, similar efforts to address conifer encroachment have occurred and remain underway at large-scales on public lands in the Lakeview, Burns, and Prineville BLM Districts, ensuring treatments are contiguous across land ownership boundaries and achieve landscape-level benefits.

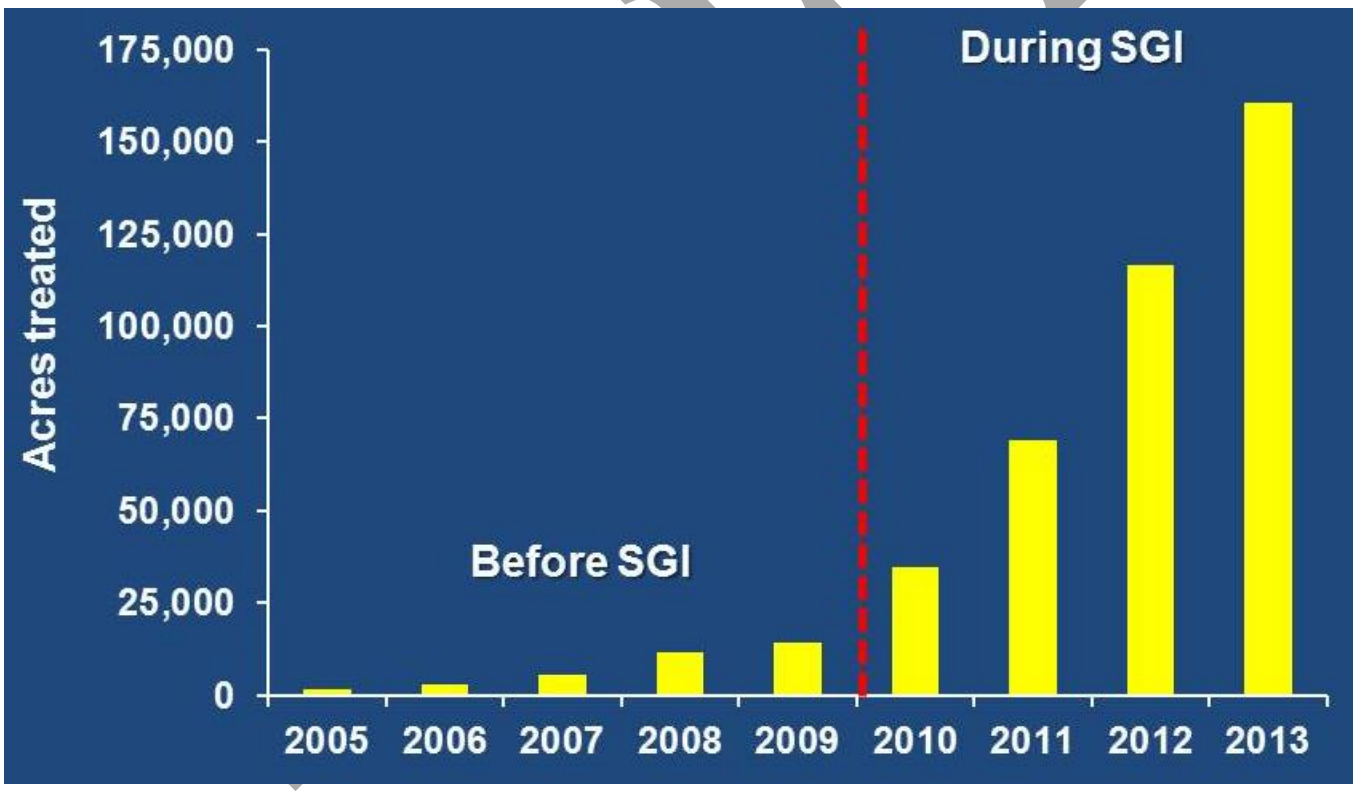


Figure 5.7. Cumulative amount of NRCS-funded conifer removal in sage-grouse range on private lands in Oregon prior to and during the Sage Grouse Initiative (2005-2013).

5.1.2 Exotic Annual Grasses

Exotic annual grasses (primarily cheatgrass and medusahead) alter habitat suitability for sage-grouse by reducing or eliminating native forbs and grasses essential for food and cover. Invasive annual grasses also increase fire frequency, which directly threatens sage-grouse habitat and further promotes the establishment of invasive annual grasses (Balch et al. 2013). This annual grass and fire feedback loop can result in conversion from sagebrush-steppe communities to annual grasslands (Davies et al. 2011, Miller et al. 2011).

Establishment of plant communities that do not provide suitable habitat (e.g., introductions and monocultures of non-native, invasive plants) has greatly reduced and is continuing to reduce sage-grouse habitat quality and quantity in Oregon. Long prior to 2010, many sagebrush-steppe communities have crossed a threshold after which they are no longer recoverable using currently available control methods. Invasive weeds continue to expand from borders of large infestations. In addition to treatment of existing sites in priority locations, prevention and early detection is needed to contain and ultimately reduce this threat. Management direction to address this threat is two-fold: (1) control, or stop the spread of invasive annual grasses so as to reduce existing or eliminate further establishment, and (2) reduce existing established areas of invasive annual grasses in priority locations that provide the best opportunity to restore suitable sage grouse habitat.

Scope of the Problem: While a precise method to measure the extent of at-risk lands does not currently exist, models from the Integrated Landscape Assessment Project (ILAP) provide a coarse estimate of the extent of annual grass dominance (Halofsky et al. 2013). In 2013, annual grasses were estimated to be the dominant or subdominant herbaceous vegetation across nearly 2 million acres (18%) of sage-grouse Action Areas in Oregon (Table 5.3; Figure 5.8). While the actual extent of annual grasses is likely much larger, this estimate illustrates the vast scale and relative distribution of the problem. Site inventories are required to assess the actual extent of annuals, adequacy of desired vegetation, and identify opportunities to implement conservation measures.

Table 5.3. Estimated extent of lands where invasive annual grasses are predicted to be the dominant herbaceous vegetation (Source: 2013 INR Exotic Annual Grasses derived from 2013 ILAP Current Vegetation data).

Action Area	Federal	Private	State	Other	Grand Total	% of Action Area
12 Mile	4,200	7,290	500	-	11,990	5%
Baker	38,080	73,570	-	-	111,650	24%
Beaty	116,150	9,080	12,510	-	137,740	15%
Bowden Hills	69,520	18,150	-	-	87,670	73%
Brothers	12,440	7,430	270	-	20,140	4%
Bully Creek	71,690	30,000	2,220	-	103,910	18%
Burns	8,100	3,620	20	10	11,750	6%
Cabin Lake	670	60	-	-	730	1%
Coglan Buttes	42,360	1,080	-	-	43,440	67%
Cow Lakes	108,540	13,960	2,220	230	124,950	27%
Cow Valley	30,070	65,010	2,780	-	97,860	25%
Crowley	175,060	41,270	11,810	-	228,140	24%
Drewsey	65,350	33,090	3,010	-	101,450	18%
Dry Valley/Jack Mountain	84,380	14,370	3,630	-	102,380	14%
Folly Farm	34,700	5,610	11,600	-	51,910	16%
Glass Buttes	13,520	3,200	320	-	17,040	9%
Louse Canyon	179,860	7,440	1,430	4,140	192,870	21%
Misery Flat	11,330	2,340	1,390	-	15,060	14%
North Steens	21,020	4,980	180	-	26,180	16%
North Wagontire	7,620	2,280	20	-	9,920	2%
Paulina	5,580	19,690	20	-	25,290	13%
Picture Rock	11,440	2,530	100	70	14,140	10%
Post	640	6,580	10	-	7,230	21%
Pueblos	51,220	4,100	-	-	55,320	18%
Saddle Butte	60,860	380	3,520	-	64,760	40%
Soldier Creek	92,340	13,920	14,090	-	120,350	25%
South Steens	14,500	15,870	240	-	30,610	9%
Tackman	1,830	4,690	-	-	6,520	20%
Trout Creeks	86,210	14,440	100	-	100,750	23%
Tucker Hill	2,270	3,610	-	-	5,880	14%
Unity	3,230	9,050	-	-	12,280	12%
Warners	17,680	2,160	3,210	-	23,050	6%
Grand Total	1,442,460	440,850	75,200	4,450	1,962,960	18%

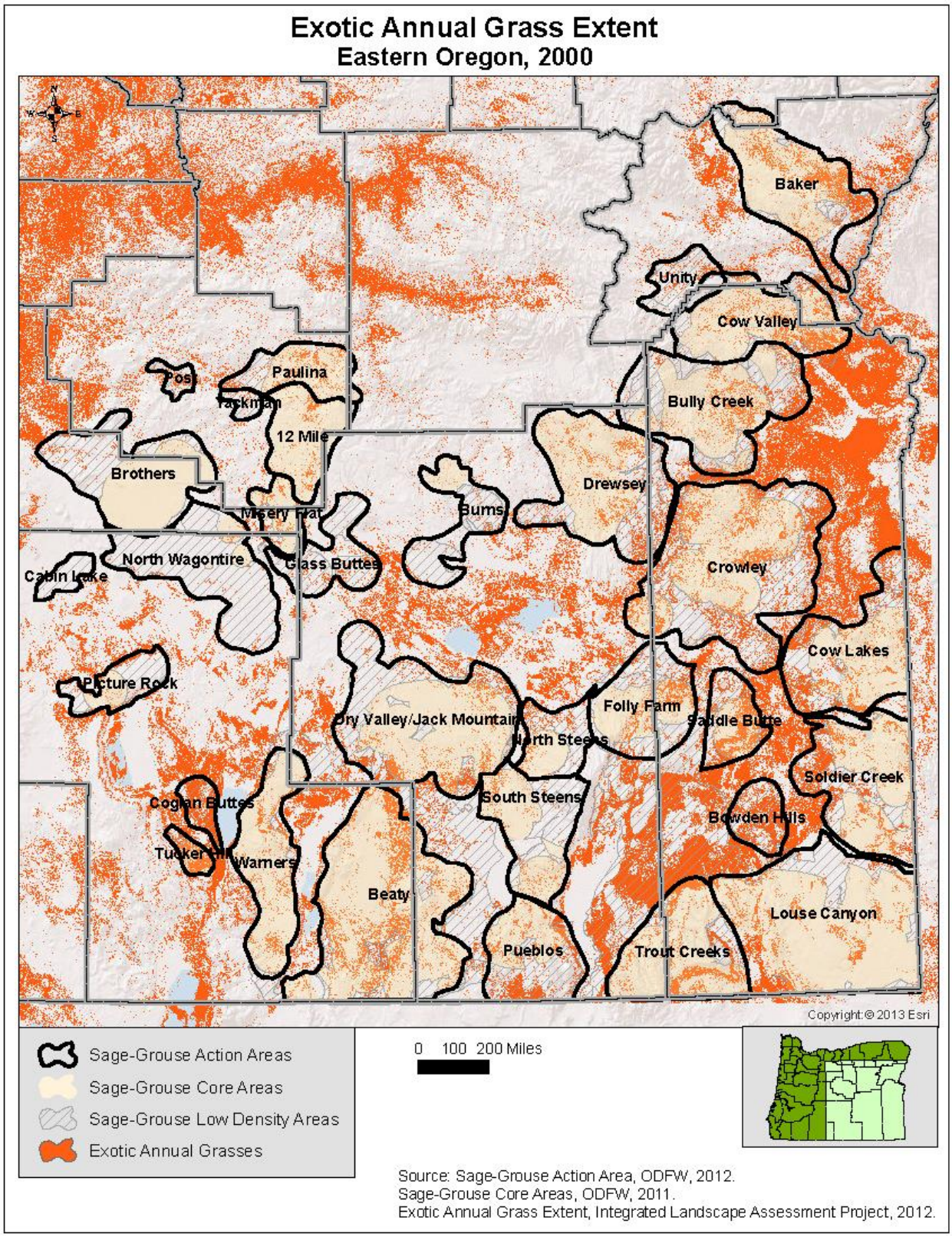

Exotic Annual Grass Extent
Eastern Oregon, 2000
Baker
Unity
Cow Valley
Paulina
Bully Creek
12 Mile
Brothers
Drewsey
Burns
Crowley
North Wagontire
Glass Buttes
Cabin Lake
Cow Lakes
Picture Rock
Folly Farm
Saddle Butte
Dry Valley/Jack Mountain
North Steens
Soldier Creek
South Steens
Bowden Hills
Coglan Buttes
Tucker Hill
Warners
Beaty
Louse Canyon
Pueblos
Trout Creeks
Copyright © 2013 Esri
Sage-Grouse Action Areas
Sage-Grouse Core Areas
Sage-Grouse Low Density Areas
Exotic Annual Grasses
0 100 200 Miles
Source: Sage-Grouse Action Area, ODFW, 2012.
Sage-Grouse Core Areas, ODFW, 2011.
Exotic Annual Grass Extent, Integrated Landscape Assessment Project, 2012.

Figure 5.8. Estimated area where exotic annual grasses are the dominant or subdominant herbaceous vegetation, 2013 (Source 2013 INR Exotic Annual Grass layer derived from 2013 ILAP Current Vegetation data).

Conservation Objective: Develop and implement invasive plant management plans that emphasize: 1) preventing the spread of annual grasses in areas at high risk for invasion; 2) containing existing infestations; and 3) restoring healthy native plant communities in areas with the greatest probability of success in conserving sagebrush ecosystems.

Conservation Actions: Invasive plant management activities occur along a continuum from prevention activities to restoration activities. Given the scale of the problem and limitations on available approaches and funding, managers need a framework within which to prioritize prevention and restoration activities for annual grass management. Three important considerations are:

- Annual Grass Occupancy – Do annual grasses occupy the site, and if so, to what extent?
- Resistance and Resilience – How resistant is the site to annual grass invasion? How likely is the site to support a healthy native plant community following disturbance (resilience)?
- Proximity to Key Sage Grouse Habitat – Is the site within or adjacent to areas of known sage-grouse use with an adequate to optimal sagebrush component (landcover >25% and >65%, respectively).

Prevention: Areas should be prioritized for prevention activities (see below Action 1 for further activity detail) based on the risk of invasion. Priority should be given first to sites with low annual grass occupancy and low resistance and resilience because annual grasses are highly competitive in these ecological sites once established (Figure 5.9a). These sites will generally be low elevation areas in the most desirable vegetation states (States A and B in the low elevation state and transition model).

Restoration: Areas should be prioritized for restoration activities (see below Action 2 for further activity detail) based on the probability of success and the likelihood that areas will naturally resist infestation or have the resilience to restore without intervention. Priority should be given first to sites with mid-high resistance and resilience and moderate annual grass occupancy, particularly if native species are seeded or planted (Figure 5.9b). Areas with high annual grass infestation and low resistance and resilience have a relatively low aptitude

for successful restoration and/or will require multiple interventions at higher costs. Restoration with native species in these zones is less likely to be successful, and in some situations, use of non-native perennial species that are competitive with annual grasses may be appropriate. Areas with low annual grass occupancy and high resistance and resilience are likely to not require restoration because they have a relatively greater potential to resist further infestation and/or restore naturally. Once annual grass occupancy and resistance and resilience properties have been analyzed for a given area, potential prevention and restoration sites can then be prioritized on the basis the proximity of sites to key sage grouse habitat.

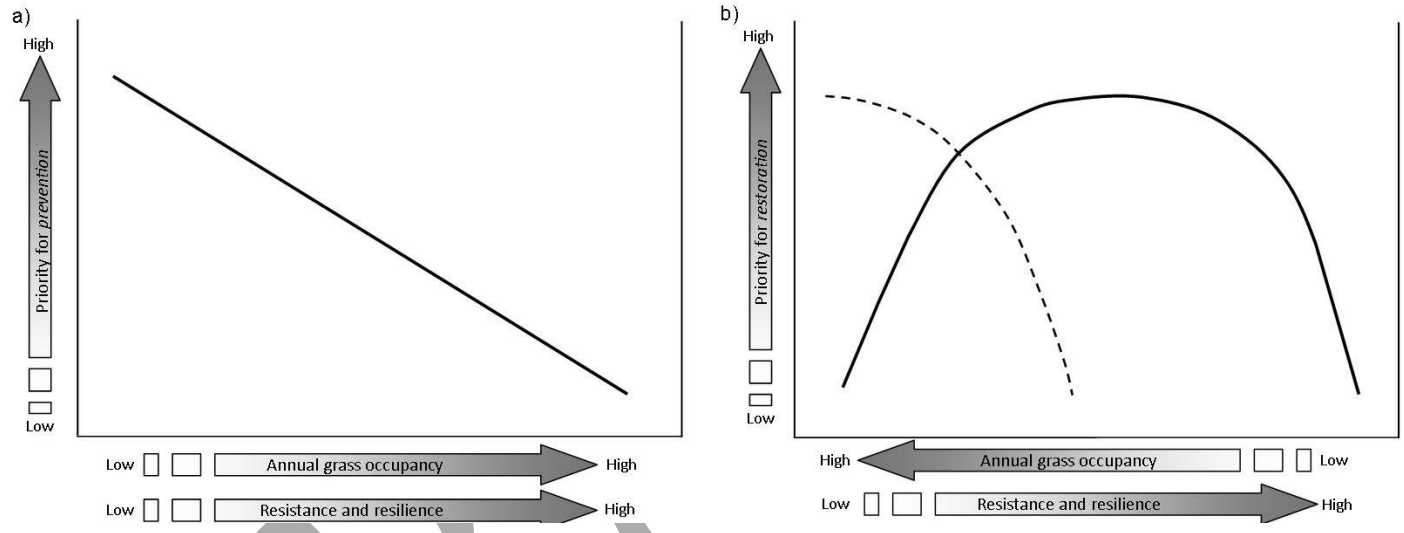


Figure 5.9. Using annual grass occupancy and site resistance and resilience to prioritize areas for preventing the spread of annual grasses and for restoration. a) In prioritizing prevention activities, annual grass occupancy should be considered first, followed by resistance/resilience; b) In prioritizing restoration activities, site resistance and resilience should be considered first, followed by annual grass occupancy. The dotted and solid lines represent how the use of non-native perennials and native species, respectively, may be considered and prioritized in restoration work.

The prioritization process described above will be used to determine where invasive plant management plans should be developed and implemented first. Once a planning area has been selected, the flow chart shown in Figure 5.10 will be used to guide planning, implementation, and adaptive management.

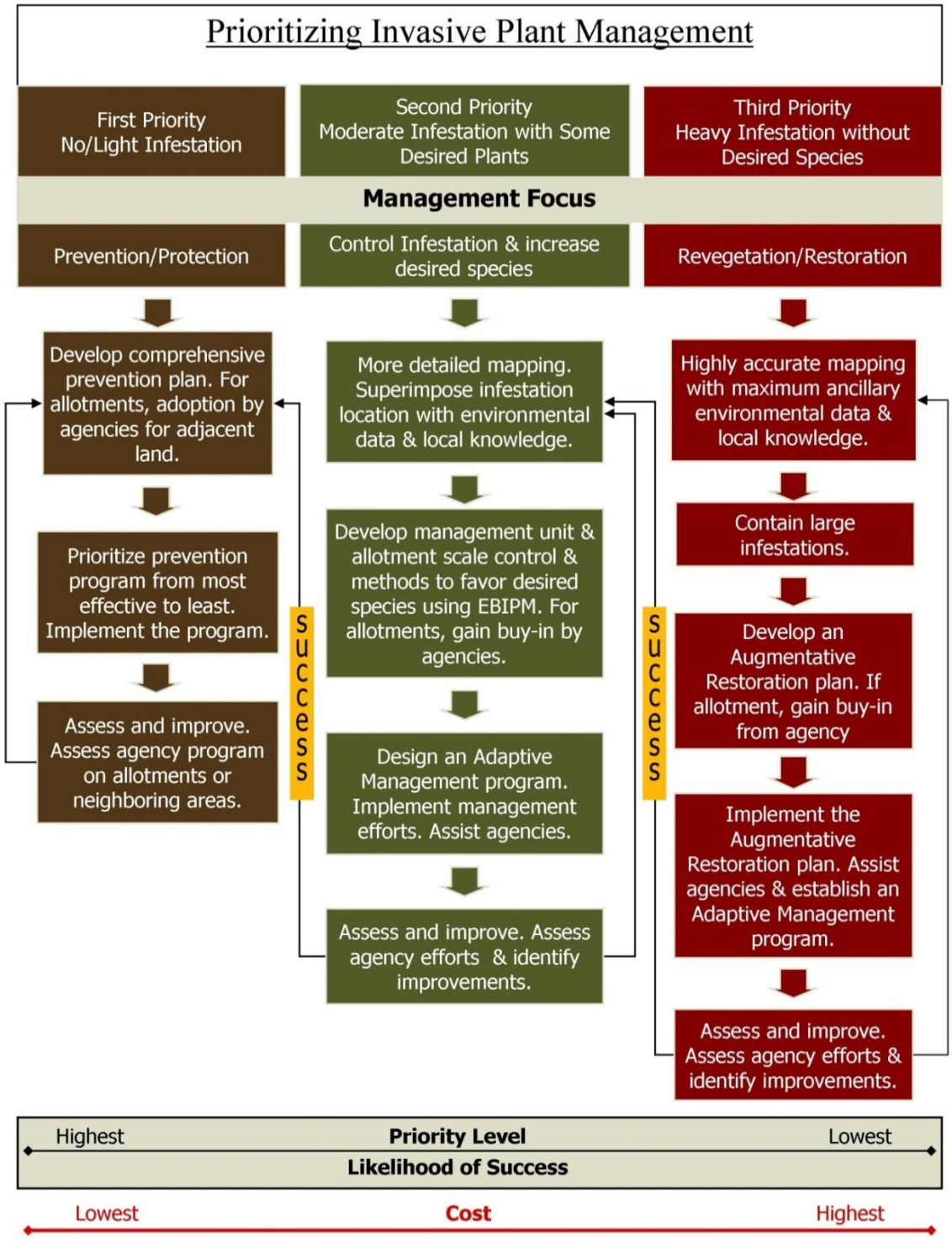

Prioritizing Invasive Plant Management
First Priority
No/Light Infestation
Second Priority
Moderate Infestation with Some Desired Plants
Third Priority
Heavy Infestation without Desired Species
Management Focus
Prevention/Protection
Control Infestation & increase desired species
Revegetation/Restoration
Develop comprehensive prevention plan. For allotments, adoption by agencies for adjacent land.
Prioritize prevention program from most effective to least. Implement the program.
Assess and improve. Assess agency program on allotments or neighboring areas.
More detailed mapping. Superimpose infestation location with environmental data & local knowledge.
Develop management unit & allotment scale control & methods to favor desired species using EBIPM. For allotments, gain buy-in by agencies.
Design an Adaptive Management program. Implement management efforts. Assist agencies.
Assess and improve. Assess agency efforts & identify improvements.
Highly accurate mapping with maximum ancillary environmental data & local knowledge.
Contain large infestations.
Develop an Augmentative Restoration plan. If allotment, gain buy-in from agency
Implement the Augmentative Restoration plan. Assist agencies & establish an Adaptive Management program.
Assess and improve. Assess agency efforts & identify improvements.
Success
Success
Highest
Priority Level
Lowest
Likelihood of Success
Lowest
Cost
Highest

Figure 5.10. Flow chart for prioritizing and implementing invasive plant management within a planning area. Ecologically-based invasive plant management (EBIPM) is a decision-making tool designed to assist land managers to assess rangeland health, identify causes for degradation, identify and select strategies to repair causes of infestations, and adaptively manage (ebipm.org).

Action 1: Develop and implement invasive annual grass management plans for each Action Area that identify priority areas for *prevention* based on sites with low annual grass occupancy and low resilience and resistance, or other factors that merit prioritization. Implementation of this action should be based on the following approach to prioritization and practices:

- Prioritize proactive herbicide treatments as a prevention strategy in recently burned areas, particularly areas with low resistance and resilience that are proximal to valuable sage-grouse habitat. Prioritize sites within 4 miles of leks (active or pending) and sites < 2 miles from "key habitat" defined as areas with 75% breeding bird density and where sagebrush landcover is > 65%.
- Conduct systematic and strategic surveys within areas identified as priorities for prevention to better inventory the nature and scope of existing invaded sites as well as detect areas of expanding invasive annual grasses. Use this information to inform treatment approaches and expedite reporting and treatment of new infestations.
- Avoid and minimize disturbance within and around all remaining large, intact sagebrush patches-- particularly in low elevation sites with low resistance and resilience--because these sites are highly vulnerable to annual grass invasion once desirable species are removed or disturbed.
- Monitor areas impacted by ground-disturbing activities for a minimum of 3 years and, where monitoring detects new invasions, apply herbicide to the newly establishing annual grasses expeditiously.
- Suppress fire in areas within or proximal to valuable sage-grouse habitat that are particularly vulnerable annual grass invasion.
- Avoid using fire as a habitat management tool in zones with < 12 inches precipitation or lower elevations (e.g., with low resistance and resilience); use prescribed fire in a manner that limits mortality of desired plants and the risk of invasive annual grass establishment.

Action 2: Develop and implement invasive plant management plans for each Action Area that identify priority areas for *restoration* based on sites with high resilience and resistance and low annual grass occupancy or other factors that merit prioritization. Implementation of this action should be based on the following approach to prioritization and practices:

- Prioritize restoration in sites invaded by invasive annual grasses with the greatest potential to succeed (e.g., moderate infestations or areas with inadequate perennial species in medium-to-high resistance and resilience) that are proximal to valuable sage-grouse habitat. . Prioritize sites within 4 miles of leks (active or pending) and sites < 2 miles from "key habitat" defined as areas with 75% breeding bird density and where sagebrush landcover is > 65%. Over time, expand restoration activities outward from key habitat patches.
- Considerable interventions will be required to transition low elevation sites from degraded sagebrush and exotic annual grass states (state and transition model states C and D, respectively) to more desirable states (State A: sagebrush perennial herbaceous state and State B: perennial herbaceous state), as these sites do not have the potential to restore naturally.
- Prioritize restoration efforts in recently burned areas, particularly areas that are proximal to valuable sage-grouse habitat. Prioritize sites within 4 miles of leks (active or pending) and sites < 2 miles from "key habitat" defined as areas with 75% breeding bird density and where sagebrush landcover is > 65%.
- Tailor restoration strategies (e.g., aerial or broadcast versus drill seeding versus plantings, use of drought-tolerant species, use of experimental techniques like coated seeds) according to site-specific resistance and resilience to ensure greatest likelihood of plant establishment.
- Aggressively treat invasive plants where they threaten the quality of sage-grouse habitat, particularly in prioritized restoration sites described above.
- Use appropriate certified weed-free seed mixes in habitat restoration with goal to establish perennial grasses, forbs, and shrubs.
- When seed supply is limited, use native seed in sites within core Action Areas that have ecological characteristics that are most favorable for plant establishment.
- Utilize locally-sourced native plant species when available and consider seed mixes that contain aggressive, fire-resistant, non-native perennial species that are competitive with invasive weeds to initially stabilize plant communities to allow for long-term recovery of sagebrush and other native species.
- Monitor restoration projects for effectiveness and repeat rehabilitation activities as required.
- Rest treated areas from grazing by livestock and free-roaming equids until understory perennial grasses are re-established and can sustain disturbance.

Action 3: Develop and implement invasive plant management plans for each Action Area that identify priority areas to *contain* existing patches of invasive weeds. Implementation of this action should be based on the following approach to prioritization and practices:

- Prioritize containment where large infestations of invasive annual grasses threaten highly valuable sage-grouse habitat. Prioritize sites within 4 miles of leks (active or pending) and sites < 2 miles from "key habitat" defined as areas with 75% breeding bird density and where sagebrush landcover is > 65%.
- Conduct inventories in the areas identified above as priorities for containment to better understand the nature and scope of existing invaded sites. Use this information to expedite reporting and tailor treatment approaches for these sites.
- Implement and maintain containment programs for large infestations that may include the following techniques: 1) border spraying; 2) establishing a barrier to expansion with aggressive perennial species that are competitive with invasive weeds; 3) biological control agents; and/or 4) targeted grazing.
- Utilize approved herbicides according to best management practices.

Action 4: Employ general techniques to prevent human-caused spread of annual invasive grasses.

- Power wash vehicles involved in development projects, as well as fuels management or fire suppression activities prior to and after use.
- Require best management practices for construction projects in and adjacent to sagebrush to prevent invasion.
- Manage OHV use to minimize the spread of invasive species.

Action 5: Employ grazing management techniques that maintain the perennial native grass and shrub community and prevent spread of annual invasive grasses during BLM allotment reviews as well as CCA and CCAA implementation.

- Assess allotments and other lands dominated by Wyoming big sagebrush for grazing impacts to native perennial grass and forbs, and soil biotic crusts.
- Identify allotments with invasive annual grasses and implement control measures to prevent the transfer of invasive species via livestock.
- Evaluate and treat heavily used areas (e.g., water sources or transfer areas) for non-native grass invasions.
- Require the use of certified weed-free hay in priority habitat.
- Where appropriate, utilize targeted grazing in heavily infested allotments in conjunction with seeding as a control and/or restoration technique.

Action 6: Support infrastructure, resources, and research that will enhance annual grass prevention and habitat restoration.

- Support on-going research evaluating annual grass prevention and control techniques and precision restoration technologies seeking to improve the likelihood of planting and seeding success when actively restoring sagebrush sites.
- Actively pilot and implement new techniques and research findings (e.g. ACK-55) in order to determine effectiveness in treatment and restoration outcomes when applied in the field in Oregon. Expand application of such techniques or methods with urgency when results are positive.
- Create incentives and dedicated funding sources for local, native seed sources and storage in order to increase the availability of native seed.
- Advance efforts to develop local seed sources, banks / storage facilities, and/or seed and plant nurseries. Work with federal and state agencies, local counties, business development interests, and local growers in pursuit of this action.

Action 7: Remove administrative or procedural barriers to annual grass management.

- Encourage State and County Weed Boards to elevate these species on noxious weed lists.
- Support policy changes to remove the court-ordered injunction prohibiting the use of herbicides on all federally-administered lands in Oregon.
- Support policy changes aimed at better deterring human-caused invasive weed spread and incenting treatment of existing invasions.
- Support restructuring of post-fire emergency stabilization and restoration (ESR) funding scheme to ensure adequate funds are available for long-term post-fire habitat management.
- Coordinate with state and federal agencies to develop consistent procedures and policies for the treatment of noxious and invasive plants, chemical usage, and timing.

Responsible Parties: BLM, NRCS, ARS, DSL, OSWB, OWEB, OSU, CWMAs, County Weed Departments, SWCDs, Watershed Councils, Private Landowners

Conservation Measures & Decision Support Tools: Conservation measures and guidelines for minimizing the impact of invasive noxious weeds on sage-grouse habitats are detailed in Appendix 5.1. A spatial decision support tool is currently under development and will help to identify and prioritize areas for prevention and control of invasive annual grasses, as well as restoration. At the site-specific scale, state and transition models can assist in identifying the current vegetation state of a site and associated management actions required for prevention and restoration (see Figure 5.3-5.5). Best management practices and decision guides developed through the Agricultural Research Service's Ecologically Based Invasive Plant

Management (EBIPM) program should be utilized when developing and implementing invasive species management plans (ebipm.org).

Conservation Measures Completed Since 2010:

Strategic efforts to reduce annual grasses are underway in key landscapes for sage-grouse in Oregon. For example, in 2010, NRCS partnered with the Keating Valley Soil and Water Conservation District, Baker County Weed District, Tri-County Cooperative Weed Management Area, USFWS, OWEB, ODFW, BLM and local landowners to inventory and attack medusahead rye across 26,000 acres in the heart of core habitat in the Baker Action Area. Specifically, the Keating Valley area was prioritized based on sage-grouse telemetry data gathered by USFWS which indicated that grouse concentrated in that area, but tended to avoid the annual grassland patches within otherwise suitable habitat. An intensive weed inventory across the project area revealed roughly 7,500 acres in need of active treatment. Strategies implemented include herbicide application and seeding to contain annual grasslands and spot treatment of annuals in surrounding, intact sagebrush areas to maintain resilient and resistant plant communities. Improved grazing management is a key strategy being employed in and around the project area to promote perennial bunchgrass health that is essential to resist annual grass invasion and to promote adequate nesting cover for grouse. Within the Keating Valley, experimental plots were established to test the effectiveness of a naturally-occurring bacterium that restores soil attributes that are key to inhibit the establishment of annual grasses. Test plots across the West have shown promising results: a 50% reduction in annual grass growth was documented after three years. Finally, partners are evaluating outcomes of investments by monitoring vegetation response in order to inform adaptive management.

5.1.3 Wildfire

Wildfire, particularly in low elevation Wyoming big sagebrush communities, is one of the primary risks to sage-grouse, especially as it functions within the positive feedback loop between exotic invasive annual grasses and fire frequency (Miller et al. 2011). Wildfires can remove long-lived species, such as sagebrush, reducing sage-grouse habitat quality and quantity. Further, areas impacted by wildfire are more susceptible to invasion by exotic annual grasses. Replacement of native perennial bunchgrass communities by invasive annuals is a primary contributing factor to increased fire frequencies in the sagebrush ecosystem. Thus, every effort must be made to retain and restore native plant communities within and outside core areas.

Historically fire was a key ecological attribute in Oregon's sagebrush-steppe, with a vital role in maintaining sagebrush habitats. Today, fire remains a driving force, but its ecological role is compromised by the invasive non-native species (primarily cheatgrass and medusahead rye), habitat reduction, and fragmentation. The beneficial role of fire can be retained in some circumstances through the judicial use of prescribed fire and appropriate wildfire management tactics. However, great caution and care need to be applied before fire is used for fuel reduction, restoration, and wildfire management purposes, especially if the goal is to improve sage-grouse habitat.

Scope of the Problem: Wildfires are a major threat to sagebrush-steppe ecosystems in Oregon and much of the Great Basin. Fire suppression and management practices performed in the last century have resulted in fuel buildup, encroachment of trees into shrublands, and the increasing dominance of invasive annual grasses. These factors have contributed to changes in fire regimes throughout the western US (Miller et al. 2013). Eastern Oregon is no exception. Wildfires are part of these ecosystems. Properly functioning ecosystems should have adequate resilience to recover after fires and resistance to invasive species. However, the degree of resilience and resistance is not the same for all ecosystems and tends to be higher on more productive lands with cooler and moister soils that are often found in higher elevations, on northern slopes, and in more northeastern latitudes (Chambers et al. 2013). At lower elevations, on south-facing slopes, and in areas with warmer and dryer soils, vegetation communities are less productive and therefore less resilient after fire.

In some cases, up to 70% of core areas have burned (Figure 5.11). Within core Action Areas, an estimated XX acres are at high risk of fire (Figure 5.12). Within this area, XX acres are in areas with low to moderate resistance and reliance – areas that if impacted by fire would be difficult to recover. Further refining the scope of the problem, approximately 36, 952 acres are within valuable sage-grouse habitat (e.g, areas comprising 75% of the breeding bird density where there is adequate [25-65%] to optimal sagebrush [>65%] landcover.

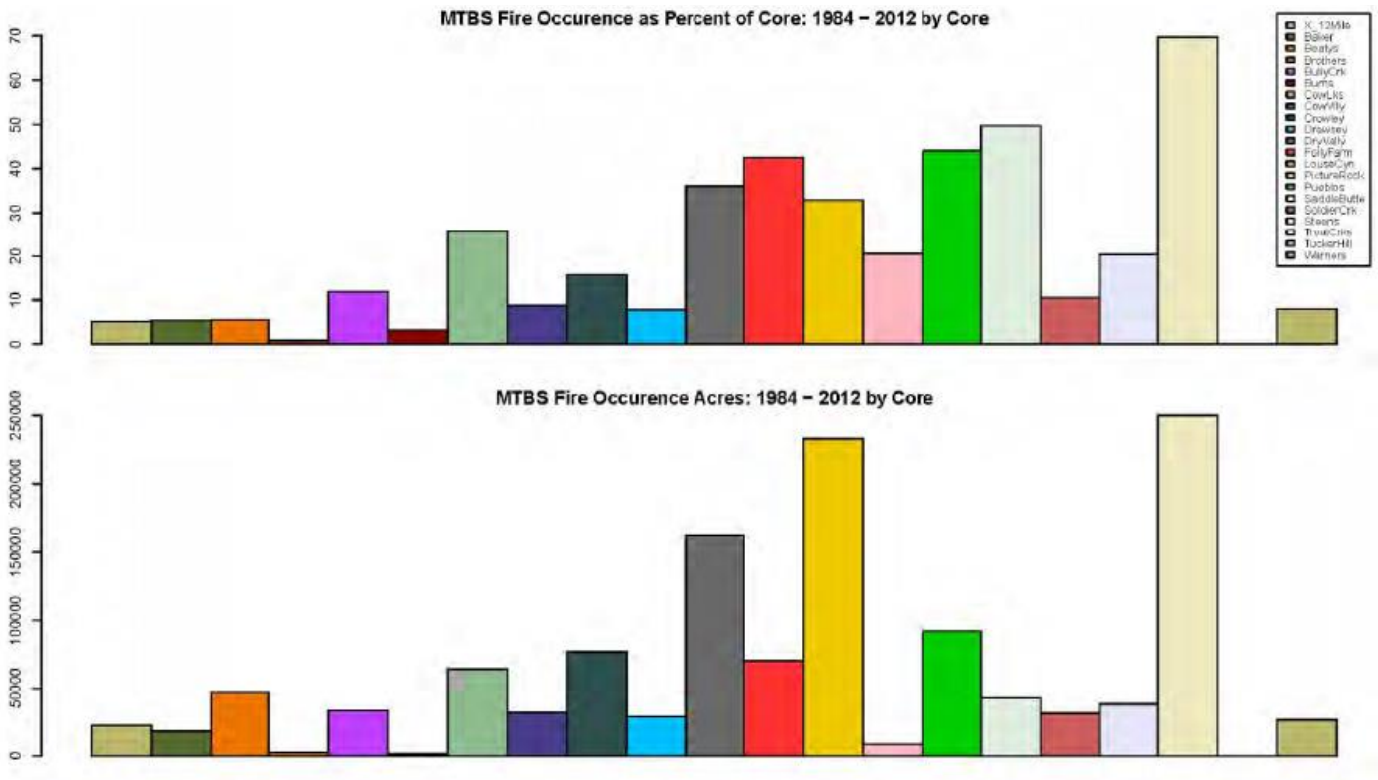


Figure 5.11. Fire occurrence in core areas as a percent of total core area and total burned acres. Source: Monitoring Trends in Burn Severity (MTBS, www.mtbs.gov)

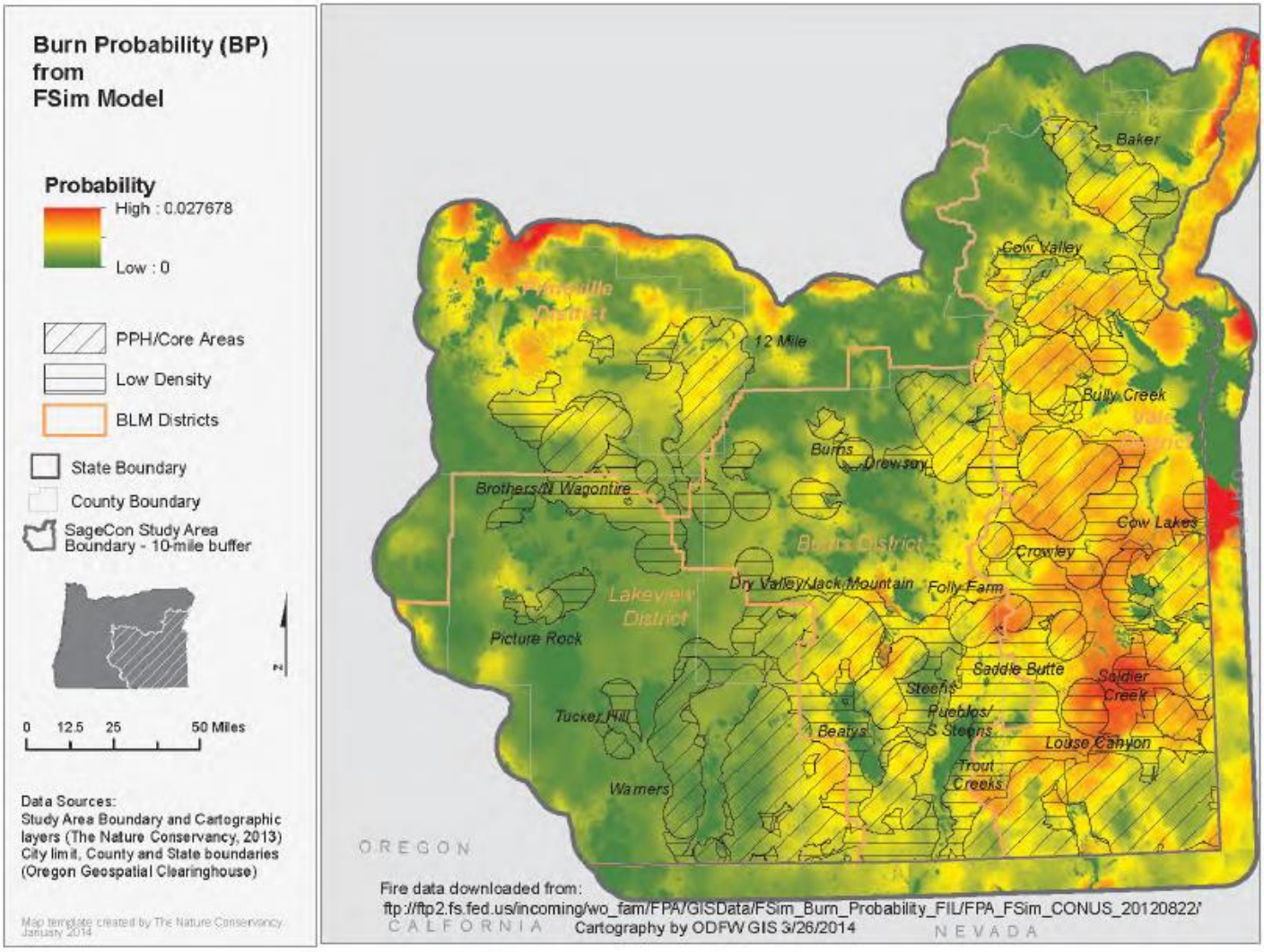


Figure 5.12. Burn probability across the sage-grouse habitat.

Further compounding the problem is the remote, rural nature of areas most essential to sage-grouse that are threatened by fire. Fire suppression in these areas is the responsibility of federal land managers and Rangeland Fire Protection Associations (RFPAs). However, an estimated 20,0000 acres of core and 75,000 acres of low density sage-grouse habitat, is located on rangelands that are not under the jurisdictional responsibility of any formal fire protection organization (Figure 5.13). On these unprotected lands, private landowners provide their own fire protection through independent efforts, each with a varying level of suppression capacity. The most effective way to increase wildfire protection of sage brush habitat is to support the formation, maintenance and enhancement of new or existing RFPAs.

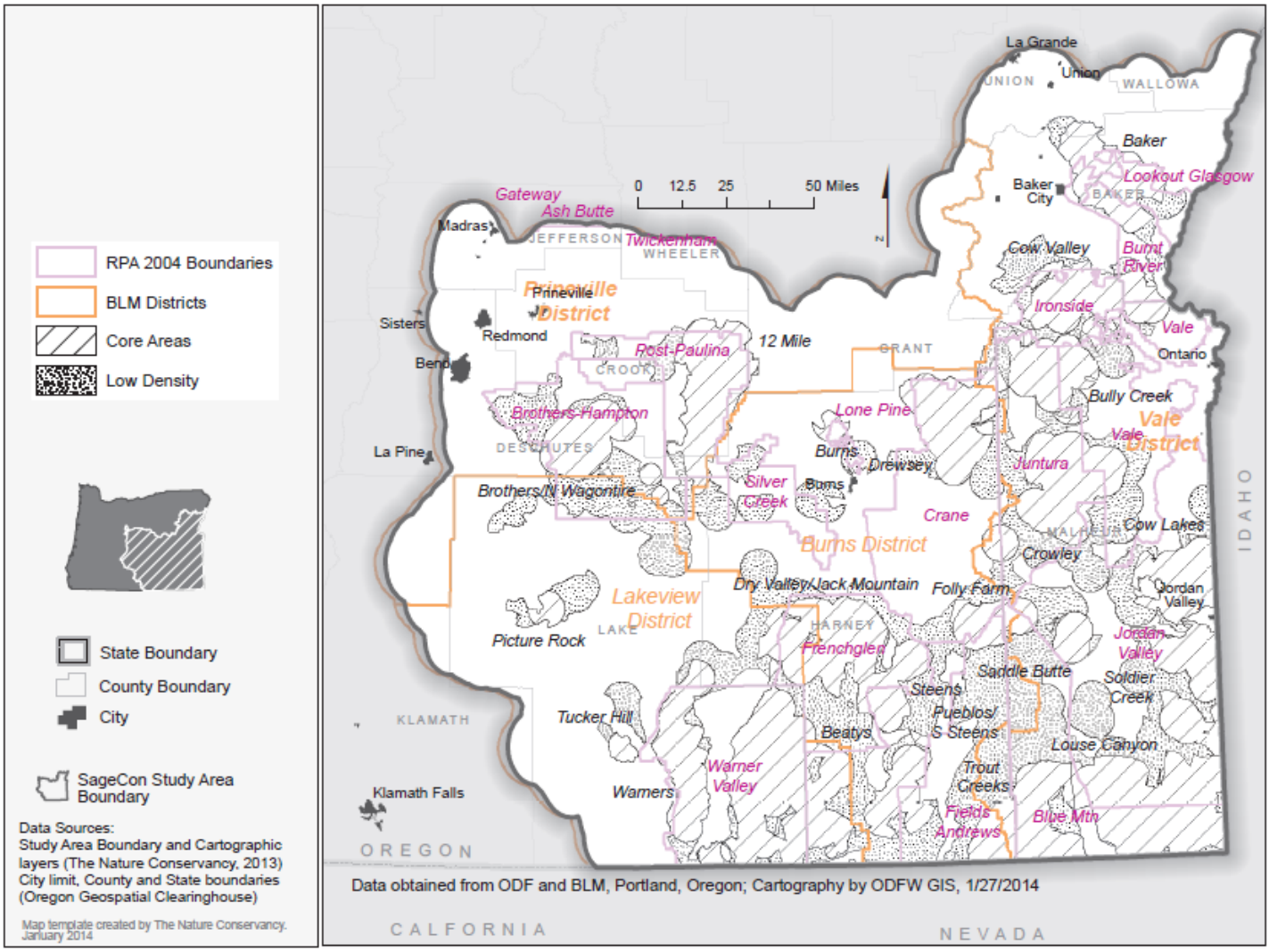


Figure 5.13. Rangeland Fire Protection Association and BLM district boundaries within sage-grouse habitat.

Conservation Objective: Retain and restore healthy native sagebrush plant communities within the range of sage-grouse and reduce the negative impacts of wildfire on sage-grouse habitat.

Conservation Measures: Conservation actions fall into four primary categories: fire prevention, fire operations (suppression), fire operations (policy, planning, and capacity building), and post-fire rehabilitation. Activities to reduce fuel loads or provide fire breaks should be prioritized to prevent fire spread into key sage-grouse habitat. Fire breaks should be situated along existing linear features (roads, transmission lines) in areas with high wildland fire potential with the lowest potential for post-fire recovery (e.g., areas with low-to-moderate

resistance and resilience). Prescribed fire to reduce fuel loads (e.g., Phase 1 and 2 juniper stands) should be used cautiously and only in areas with the highest resistance and resilience value. Fire suppression should prioritize sagebrush habitats, particularly those with in core areas and connectivity corridors between core areas.

Action 1: Implement best practice *prevention* strategies to reduce the risk of wildfire to core sage-grouse habitat and important areas of connectivity.

- Identify priority habitat areas (e.g., sagebrush communities with low resilience to disturbance and resistance to invasive annual grasses associated with warm and dry soil temperature and moisture regimes) and implement preventative management strategies to reduce the threats to sage-grouse resulting from impacts of wildfires and invasive annual grasses. Additional emphasis should be placed on areas with high wildfire potential, areas dominated by invasive annual grasses that are proximal intact habitat with low resistance and resilience, and that are within or proximal to areas that area highly valuable to sage-grouse.
- Pre-position resources near PACs when conditions are commensurate for large fire growth (e.g., high fire severity conditions, forecasted lightning) to ensure rapid response to ignitions. Coordinate among fire agencies to ensure adequate equipment and funds are available for pre-positioning efforts.
- Restrict motorized travel and ban campfires in sage-grouse habitat during high fire severity conditions to reduce the risk of accidental ignitions.
- Reduce the risk of vehicle or human-caused wildfires and the spread of exotic species by planting perennial vegetation (e.g., green-strips) paralleling road rights-of-way
- Take steps to prevent future degradation and address currently degraded sagebrush systems (as described in the conifer encroachment and invasive annual grasses sections above) to reduce the impacts of wildfire in sage-grouse habitat.
- Conduct fuel management treatments designed to protect existing sagebrush, modify fire behavior, restore native plants, and create landscape patterns that benefit sage-grouse.
- Reduce juniper fuel loads in areas adjacent to valuable sage-grouse habitat. Prioritize Phase I and II juniper stands within 1 mile of known leks and then expand juniper removal to within 4 mi of known leks. Prioritize Phase III juniper stands after Phases I and II have been addressed. Prioritize Phase III areas in or adjacent to priority areas (Action Areas, core, or areas with 75% breeding bird density) that

provide adequate sage-grouse habitat (e.g., sagebrush landcover > 25%), particularly in areas with medium-to-high resistance and resilience.

- Use prescribed fire to reduce fuel loads in a prudent manner. Avoid using fire as a habitat management tool in zones with < 12 inches precipitation or lower elevations (e.g., with low resistance and resilience); use prescribed fire in a manner that limits mortality of desired plants and the risk of invasive annual grass establishment.
- Strategically use livestock grazing to reduce fuel loads in years with high accumulation of fuels. Balance grazing used to reduce fuel loads with the objective to maintain suitable habitat for sage-grouse and minimize impacts to native grasses.
- Establish fuel breaks and/or green-strips in strategic locations to compartmentalize future fires thereby reducing the potential acres burned and fire risk to sage-grouse habitat. Strategically place fuel breaks where high fire risk coincides with sage-grouse habitat with the lowest potential for post-fire recovery (e.g., areas with low-to-moderate resistance and resilience). When designing fuel breaks, consider the following: 1) existing roads or utility corridors that could be widened with mowing, green-stripping, or black-stripping; 2) natural fuel breaks; 3) prevailing winds that may influence the placement of fuel breaks (e.g., prioritize east-to-west roads or place on south side of road if only one side is mowed); 3) use of fire-resistant perennial species (e.g., crested wheatgrass or forage kochia) as an effective means to slow the spread of fire while preventing the establishment of non-native grasses. Monitor and maintain fuel breaks to prevent annual grass invasion in these disturbed areas.
- Restrict motorized travel and ban campfires in sage-grouse habitat during high fire severity conditions to reduce the risk of accidental ignitions.
- Reduce the risk of vehicle or human-caused wildfires and the spread of exotic species by planting perennial vegetation (e.g., green-strips) paralleling road rights-of-way
- Take steps to address degraded sagebrush systems (as described in the conifer encroachment and invasive annual grasses sections above) to reduce the impacts of wildfire in sage-grouse habitat.

Action 2: Focus fire *suppression* activities in prioritized sage-grouse habitat within the framework of the federal and state wildland fire policies.

- Utilize trained Resource Advisors with sage-grouse expertise to assist in prioritizing fire suppression activities so that valuable sage-grouse habitat is protected.

- Utilize mobile technology to ensure Incident Management Teams can access dynamically updated spatial data required to prioritize suppression to protect sage-grouse habitat.
- Ensure coordination among the BLM, RFPAs and Rural Fire Protection Districts (RFPDs) to increase initial attack and extended attack capability and effectiveness.
- After protection of life and property, suppression should prioritize sagebrush habitats within 4 miles of a lek.
- Further prioritize suppression to prevent fire from entering valuable habitat (core and low density) that is most vulnerable to invasion by annual grasses (e.g., Wyoming big sagebrush communities, areas with low resistance and resilience)
- Agencies should focus appropriate combination of resources to quickly arrive at new ignitions combined with effective suppression strategies supported by appropriate tactical resources, also known as Speed and Focus, a principle of fire suppression actions.
- Re-allocate fire response resources (crews, equipment, etc.) to important sage-grouse habitats. Identify where resources are lacking and provide those resources to decrease response time to fires in sage-grouse habitats.
- Retain unburned areas (including interior islands and patches between roads and the fire perimeter) of sage-grouse habitat unless there is a compelling safety, resource protection, or control objectives at risk. Consider the use of aircraft and mechanized equipment to protect these islands. This may require additional suppression (e.g., aircraft and mechanized equipment) and resources for holding and mop-up. Fire managers and Resource Advisors should proactively plan for and anticipate these needs early in the incident.
- During fire suppression, judiciously use heavy equipment and limit brush removal to the level necessary to expeditiously extinguish the fire. Use existing fuel breaks, such as roads, utility corridors, or areas with fire-resistant vegetation to minimize fire spread. Establish additional defensible fire lines in areas where: 1) effectiveness is high; 2) fire risk is likely; and 3) negative impacts (fragmentation) are minimal.
- Use direct attack tactics when it is safe and effective to reduce the amount of burned habitat. Direct attack supported by any available mechanized equipment (e.g., bulldozer, tractor with blade, aerial drops) is the most efficient at reducing the overall size of rangeland fires thereby keeping habitat intact.
- To the extent possible, locate wildfire suppression facilities (e.g., base camps, spike camps, drop points, staging areas, heli-bases) in areas where physical disturbance to sage-grouse habitat can be minimized. Preferred areas for suppression facilities

may include previously disturbed areas, grasslands, near roads/trails or in other areas where there is existing disturbance or minimal sagebrush cover.

Action 3: *Build capacity* and *support planning and policies* so that local associations and state and federal agencies are equipped to prevent and suppress fires in sage-grouse habitat.

- Support pre-fire planning activities that will ensure readiness and swift decision-making during the fire season.
- Compile greater sage-grouse information into state-wide tool boxes. Tool boxes will contain maps, listing of resource advisors, contact information, local guidance, and other relevant information for each District.
- Preload maps of sage-grouse core and low density habitat into all dispatch plans (e.g., Wild CAD, run-cards).
- Orient fire Duty Officers sage-grouse management objectives and core and low density habitat to prioritize in the event of a fire.
- Provide education to fire suppression personnel about the need and value of protecting sagebrush landscapes.
- Annually review District Fire Management Plans (Phase I) to incorporate new sage-grouse information (e.g., lek and habitat viability maps) and fire suppression resources (including location of fuel breaks, water sources, etc.) to ensure up-to-date information is available and distributed to fire suppression personnel for setting wildfire suppression priorities and initial attack planning.
- Train Resource Advisors to assist in prioritizing fire suppression activities and work with Incident Commanders and Incident Management Teams as appropriate.
- Ensure advance coordination among BLM, RFPA and RFPDs so that minimum personnel training and equipment standards are met.
- Conduct interagency training exercises with local, state, and federal agencies to ensure safety, coordination, communication, and effectiveness during fire management operations.
- Support policies that promote integration across agencies and jurisdictions to provide seamless fire suppression during fires
- Implement policy changes that integrate and coordinate more fire suppression resources, such as Air National Guard Mobile Airborne Firefighting Units and Rangeland Fire Protection Associations (RFPA).

- Ensure advance coordination among BLM, RFPA and RFPDs so that minimum personnel training and equipment standards are met.
- Build capacity so that agencies responsible for fire suppression have adequate resources to take appropriate actions.
- Identify funds to upgrade or construct additional airports that meet the requirements of single engine air tankers to shorten response and turn-around times for suppression aircraft.
- Identify funding to acquire additional required fire fighting resources; consider establishing new Incident Attack Centers in or adjacent to PACs.
- Identify existing water sources and strategically develop additional water sources in priority sage-grouse habitat with high wildfire risk that are > 7 miles from an existing source. Pursue development of water sources that will not increase mosquito breeding areas.
- Identify existing travel routes and primitive roads that if upgraded would minimally increase disturbance to sage-grouse habitat while affording decreased fire response time and reducing the need for cross-country travel during fire suppression.

Action 4: Prioritize *post-fire rehabilitation* and ensure adequate resources are available for emergency stabilization and ongoing restoration activities to protect, enhance, or maintain sage-grouse habitat within core and to restore connectivity between core areas.

- Prioritize proactive herbicide treatments as a prevention strategy in recently burned areas, particularly areas with low resistance and resilience that are proximal to valuable sage-grouse habitat. Prioritize sites within 4 miles of leks (active or pending) and sites < 2 miles from "key habitat" defined as areas with 75% breeding bird density and where sagebrush landcover is > 65%.
- Prioritize post-fire rehabilitation restoration efforts in areas that are proximal to valuable sage-grouse habitat. Prioritize sites within 4 miles of leks (active or pending) and sites < 2 miles from "key habitat" defined as areas with 75% breeding bird density and where sagebrush landcover is > 65%.
- Utilize best practice management techniques to prevent invasive annual grasses and restore burned areas as described in invasive annual grasses section above

Responsible Parties: BLM, USFS, DSL, ODF, RFPAs, Private Landowners

Conservation Measures & Decision Support Tools

Conservation measures and guidelines for minimizing the impact fire on sage-grouse habitat are detailed in Appendix 5.1. A spatial decision support tool is currently under development and will help to identify and prioritize areas for fire prevention and suppression, as well as post-fire stabilization and rehabilitation. At the site-specific scale, state and transition models can assist in identifying the current vegetation state of a site and associated management actions required for prevention and restoration (see Figures 5.3-5.5). BLM Instruction Memorandum 2013-128 provides direction on sage-grouse conservation during fire operations and fuels management activities. The Greater Sage-Grouse Wildland Fire and Invasives Assessment Team (FIAT) is currently undertaking a process to identify priority habitat areas and management strategies to reduce the threats to sage-grouse resulting from invasive annual grasses, wildfires, and conifer expansion. This information will quantify future fire prevention, suppression, and capacity building activities planned actions by the BLM.

Conservation Measures Completed Since 2010:

Approximately 4.1 million acres of private and state owned rangelands are protected by 17 independent RFPAs in eastern Oregon. These associations are comprised of 493 all-volunteer firefighters, and they use 174 pieces of fire suppression equipment (Table 5.4).

The BLM successfully suppresses about 98% of all wildfire ignitions. As an integral part of its collaborative efforts with Oregon and other federal agencies to conserve sage-grouse habitat, the BLM has committed to making sage-grouse habitat protection a high natural resource priority, focusing its hazardous fuels program on areas where fire management for sage-grouse habitat protection is most critical. As part of this process, the BLM will also take a number of preventative actions, including creating fuel breaks to limit the spread of fires; coordinating locally to reduce fuel loads and wildfire starts along travel corridors; pre-positioning firefighting resources to quickly respond to one or multiple fires; and expanding the training and use of RFPAs, Rural Fire Departments and other local, non-federal agency individuals as liaisons in wildland fire detection and suppression operations. Funding will support the planning and implementation of fuels treatments in order to reduce the start and spread of wildfires in sage-grouse habitat.

Table 5.4. Characteristics of Rangeland Fire Protection Associations in eastern Oregon.

Rangeland Protection Association	Established	Private & State acres	Membership Properties	Volunteers	Suppression Equipment
Ash Butte	2009	138,326	25	15	14
Blue Mountain	2013	137,213	15	30	3
Brothers / Hampton	2006	240,612	65	15	11
Burnt River	2000	171,884	10	15	4
Crane	1998	767,461	150	128	29
Fields / Andrews	1998	156,893	50	15	11
Frenchglen	2013	276,189	10	25	5
Gateway	2010	10,676	36	25	3
Ironside	1964	340,105	49	60	31
Jordan Valley	2008	470,777	50	60	24
Juntura	2007	264,684	5	15	6
Lone Pine	2013	28,106	4	10	4
Post / Paulina	2006	377,188	40	25	10
Silver Creek	2001	83,925	30	10	4
Twickenham	2001	98,263	20	10	5
Vale	2008	315,445	25	20	5
Warner Valley	2011	250,906	20	15	8
Total		4,128,654	604	493	174

The BLM's goal is to limit acres burned and damaged within and adjacent to sage-grouse habitat. The BLM will meet this goal through the management actions, including those involving renewable resource authorization, fuels management, fire operations, and emergency stabilization prioritization. Rapid restoration of sage-grouse habitat has proven difficult (e.g., Arkle et al. 2014), requiring the BLM to focus on its pre-fire, fire suppression and post-fire efforts. The BLM will place a high priority on treatments that will aid fire suppression and reduce fire threats within and adjacent to sage-grouse habitat.

BLM Districts within Oregon have also engaged in partnership with the RFPA, ODFW biologists, and other stakeholders to complete fire and invasives assessments (FIAT) that are expected to be completed in January 2015. FIAT was developed and designed to produce a product of potential projects on the landscape to help protect sage-grouse populations and habitat using two steps:

Step 1: Identify priority areas (PACs) based on breeding bird density, sagebrush landscape cover, conifer expansion, and soil temperature and moisture regimes.

Step 2: Develop management unit applications for invasive annual grasses and conifer expansion by 1) reviewing the data used in Step 1, assessing its quality, and incorporating local information; and 2)

developing focal habitat activity/implementation plans (fire operations, rehabilitations, prioritized management tactics) for use across jurisdictional boundaries.

5.2 SECONDARY THREATS

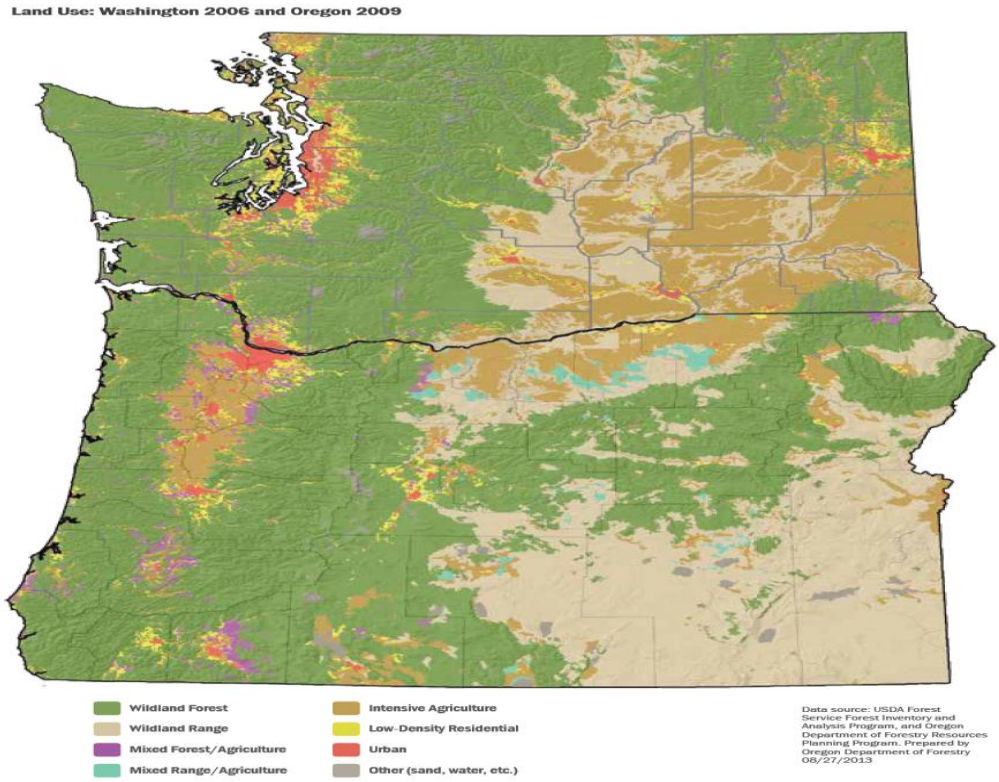
Secondary threats to sage-grouse in Oregon are those factors that are associated with habitat loss and fragmentation resulting from anthropogenic disturbance, and include loss or potential loss of sagebrush habitats as a result of urban and ex-urban development, energy and infrastructure, mining, conversion to cultivated agriculture, disease, vegetation treatments resulting in the alteration and/or removal of sagebrush to enhance livestock grazing, and impacts from free-roaming equids. The secondary threats are described in the 2010 USFWS Warranted But Precluded Determination, the 2011 *Greater Sage-Grouse Conservation Assessment and Strategy for Oregon (Hagen 2011)*, and the 2013 Final COT Report. Section 2 of this report also summarizes these sources of information.

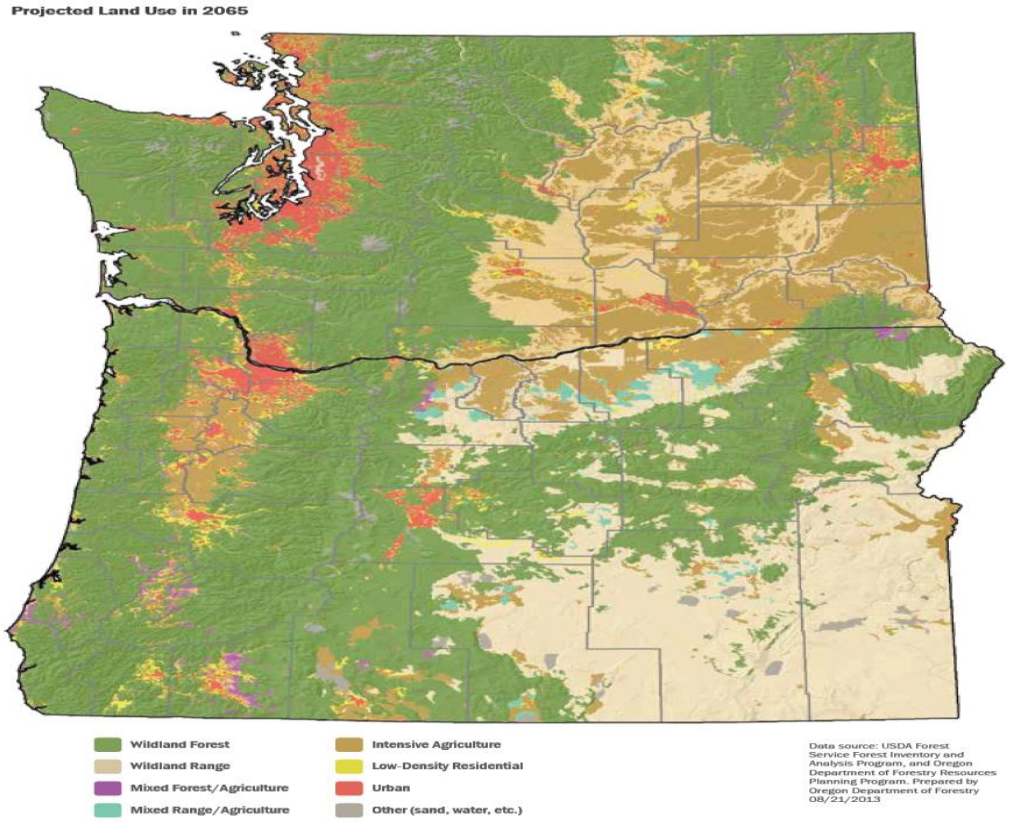
Existing anthropogenic disturbance (i.e., the direct footprint of human-caused disturbances that result in the conversion of sagebrush habitat to land that is unsuitable for sage-grouse) is limited within the SageCon planning area and exceedance of biological minimum thresholds (i.e., 3%, including existing baseline levels of disturbance) is unlikely. Although habitat fragmentation from infrastructure and energy development have been identified as primary threats to sage-grouse in the COT Report (USFWS 2013), they have not had a significant impact within Oregon. Due to mineral potential, natural topographic fragmentation, and relative remoteness of the landscapes the expected infrastructure growth is minimal. An assessment of mid- to broad-scale baseline habitats conditions also suggests changes in agriculture and human development have been slight within the SageCon planning are. Nevertheless, the distributions of agriculture, development, and sagebrush for occupied leks strongly resembled the patterns identified in other studies (e.g., Baruch-Mordo et al. 2013, Knick et al. 2013), supporting assertions that sage-grouse are highly sensitive to human impacts.

5.2.1 Urban Development

Urbanization was identified a secondary threat by the USFWS in 2010. However, the USFWS noted that the Northern Great Basin was the area least affected by urbanization, and the rate of urbanization in Oregon is much lower than any other state – with virtually no urban expansion in eastern Oregon and very little ex-urban development. ODF, Farms, Forests, and People, 2011; Central and Eastern Oregon Land Use Planning Assessment – Sage Grouse Habitat, Harney County et al., 2013. Oregon's land use system, administered by its county governments, effectively precludes urban development outside of existing communities. Since 1973, Oregon has had a state-wide land use program that requires each city in the state

to establish and maintain an urban growth boundary (UGB). Urban uses of land must locate within UGBs, and UGBs are expanded only when there is a documented need to do so. As a





result of this system, the extent of urban expansion in Oregon has been very slow. That rate also is significantly lower than surrounding states. Recent analysis by the Oregon Department of Forestry and the Pacific Northwest Research Station shows that between 1976 and 2009 the urban land area in Eastern Oregon expanded by 33,000 acres, while urban areas in Eastern Washington expanded by 70,000 acres. ODF 2013, at 11. In addition, almost all of that expansion in Oregon occurred prior to 1984, when Oregon's land use regulations were fully implemented. ODF 2013, at 12. The analysis includes a projection of future lands uses in 2065 in Oregon and Washington. As shown in the Figure above, that analysis predicts almost no significant urbanization in Eastern Oregon over this period. In contrast, Washington is predicted to experience substantial expansion of its urban areas.

Existing Conservation Measures: The expansion of urban areas in Oregon is regulated by state statute and rule. ORS 197.295 to 197.298, Statewide Land Use Planning Goal 14, and OAR 660-024 are the primary state laws implementing the urban growth boundaries. At the local government level, as noted above, each city has an urban growth boundary, which is a part of the city's and the county's comprehensive plan, and which is a controlling standard for

land use decisions, requiring urban uses to located within UGBs. GIS information for each city's UGB may be accessed at [ODOT City Maps].

Conclusions: There has been no new urbanization in Oregon's identified sage-grouse habitat since 1974, and future urban expansions in sage-grouse habitat are unlikely due to the combination of relatively low population change in this area of the state and Oregon's existing land use regulations. Urbanization is not a threat to sage-grouse in Oregon, and existing regulatory mechanisms are adequate to assure that it does not become a threat.

5.2.2 Ex-Urban Development

Oregon's land use system, administered by its county governments, effectively precludes urban development outside of existing communities. In addition, it severely limits ex-urban development. In the 11.5 million acres of sage-grouse habitat in Oregon there are approximately 900 homes. Harney County, at 104. This translates into an estimated population density of one person per eight square miles (or one person per 5,100 acres). Harney County, at 4. The very low level of settlement in eastern Oregon translates directly into both a lack of ex-urban development, *and* a relative lack of infrastructure (roads, power lines, cell towers and other public and private systems that support rural development).

Under both state and local laws, almost all of the lands (98%) identified as Sage-grouse habitat are designated as resource lands and zoned for exclusive farm, ranch or forest uses. These lands are subject to very large minimum parcel size requirements (320 acres or more for most rangelands), limited land division opportunities, and limited provisions for uses not related to farm, ranch or forest management.

Residential development on resource lands is generally allowed only for a farm dwelling or a forest dwelling, again with substantial minimum parcel size requirements. ORS Chapter 215, and ORS 215.283 in particular, establish standards for non-farm uses on resource lands. ORS 215.278 to 215.293 contain many of the applicable standards for dwellings. Reflecting these standards, very few new dwellings have been developed in Core Areas over the past ten years.

County	Dwellings in Core Areas in the Last 10 Years	Core Area Acreage (Non-federal)
Baker	9	385,140
Crook	1	270,891
Deschutes	3	66,723
Harney	25 (some are replacement dwellings)	353,931
Lake	13	138,788

Malheur	8	580,488

Harney County 2013 (number derived from text for each county).

Existing Conservation Measures: Ex-urban development in Oregon is regulated by state statute and rule as well as county implementing ordinances. ORS 215.283 is the primary statute governing non-farm uses. Dwellings are regulated under 215.278 to 215.293, with state implementing rules as well as local ordinances. The local ordinances are described in detail in Appendix __, Central and Eastern Oregon Land Use Planning Assessment, Sage-grouse Habitat, Harney County (2013).

Conclusions: There has been very little ex-urban development in Oregon's identified sage-grouse habitat over the past ten years, and future development is tightly controlled by existing state and local regulatory mechanisms. Ex-urban development is not a threat to sage-grouse in Oregon, and existing regulatory mechanisms are adequate to assure that it does not become a threat.

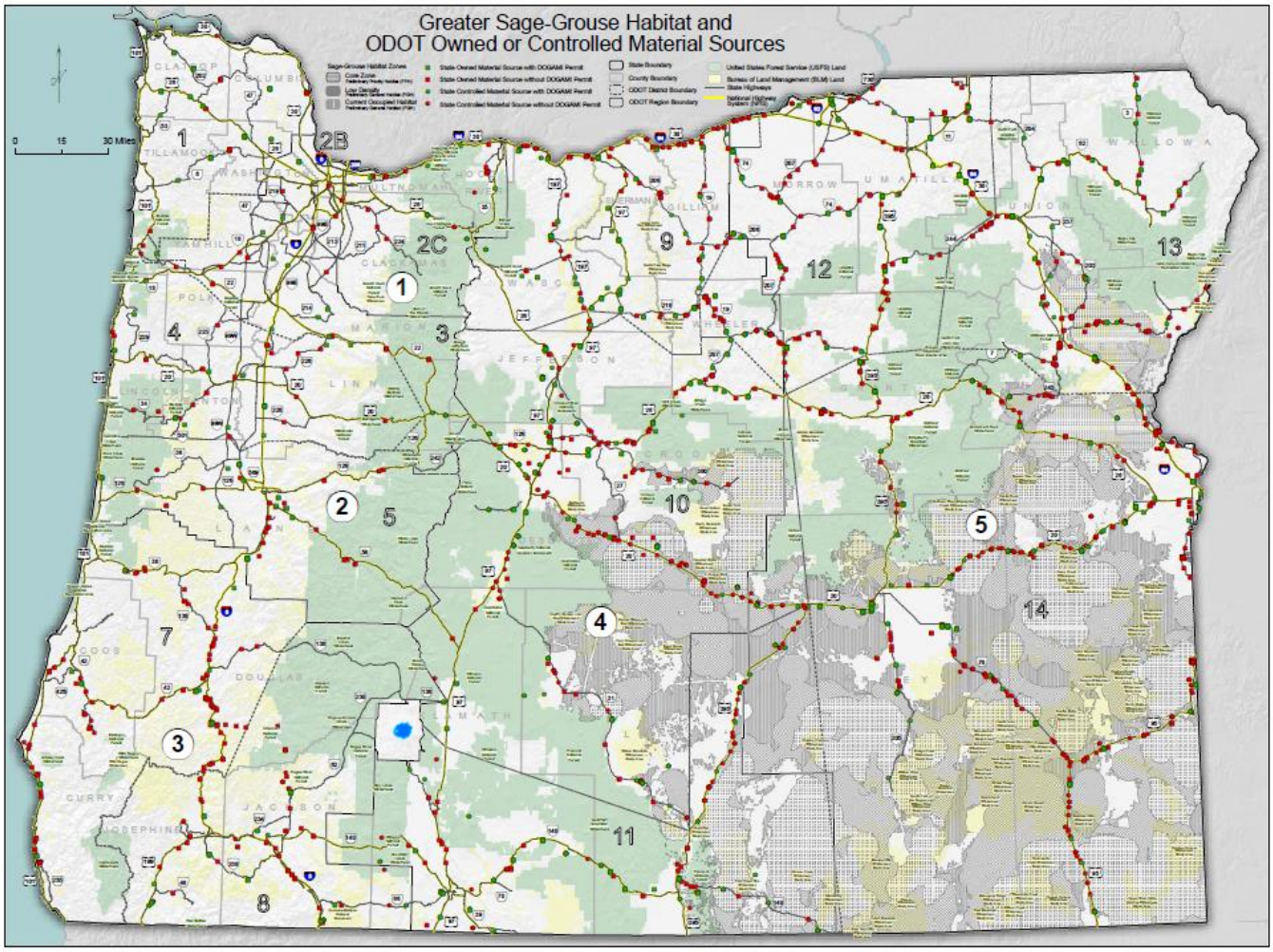
5.2.3 Oil & Gas Development

There is no active oil or gas development in Oregon sage-grouse habitat. There has been some exploratory activity in the Snake River Plain, including exploration leasing. Oil and gas exploration and development is regulated in Oregon through the Department of Geology and Mineral Industries (DOGAMI). ORS chapter 520 and associated implementing rules provide the agency with relatively broad authority to regulate oil and gas development to prevent adverse impacts to resources or neighboring property.

5.2.4 Aggregate Operations

DOGAMI regulates aggregate operations under ORS chapter 517. The primary focus of DOGAMI's program is reclamation and the protection of water quality. Land use approval for aggregate operations is also required, and is typically where any potential conflicts with other uses or resources are considered. Land use approvals are governed by both state law and local ordinance. On rangelands, the primary focus of most land use regulations is to minimize conflicts with ranching operations, but many counties also have regulations addressing wildlife conflicts. The following figure shows state owned and state-controlled aggregate sites. As

indicated, aggregate sites typically are located in close proximity to existing roads, and are used primarily for road maintenance. A site may go for long periods without use, depending on maintenance needs and the number of sites in the vicinity.



5.2.5 Other Mining

There are two pending larger-scale mining proposals within sage-grouse habitat: Oregon Energy's proposed uranium mine near Ft. McDermitt, and Calico Resources' proposed Grassy Mountain gold mine, near Vale. These proposed mines are being reviewed under DOGAMI's chemical process mining standards, and are both in the study phase. DOGAMI's chemical process mining standards provide substantive consideration of wildlife impacts.

DOGAMI's administrative rules provide (with regard to wildlife impacts):

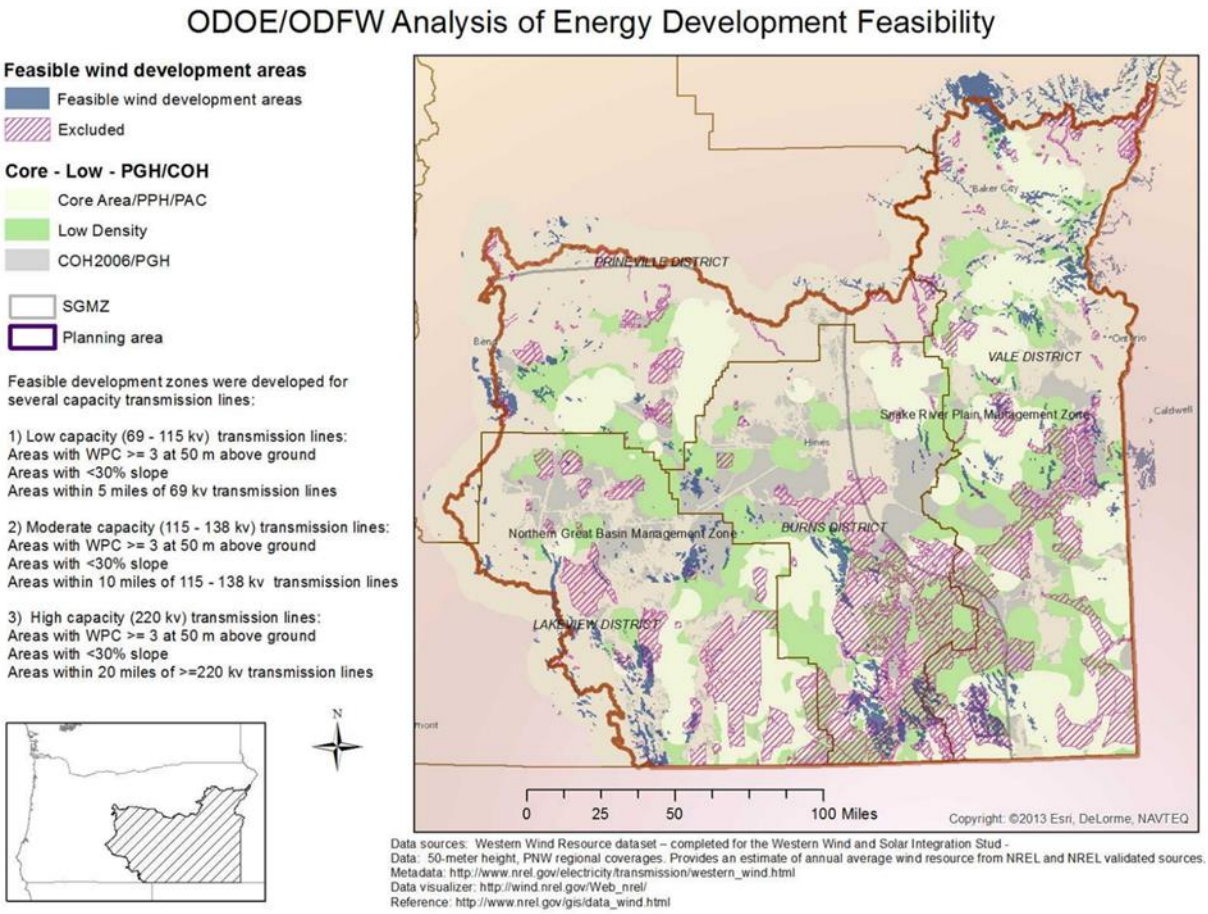
> "The Department shall require a mining operation to comply with protection standards for fish and wildlife consistent with policies of the Department of Fish and Wildlife, including:
>
> (1) Protective measures to maintain an objective of zero wildlife mortality.
>
> (2) All chemical processing solutions and associated wastewater must be covered or contained to preclude access by wildlife, or maintained in a condition that is not harmful to wildlife.
>
> (3) Onsite and offsite mitigation ensuring there is no overall net loss of habitat value.
>
> (4) No loss of existing critical habitat of any state or federally listed threatened or endangered fish or wildlife species."

These standards appear adequate to assure that any mining development will be consistent with ODFW policies. As described in more detail below, ODFW's sage-grouse mitigation policy is being updated to follow an avoidance, minimization and mitigation hierarchy, and to include a maximum threshold for disturbance by large-scale development within PACs (Core Areas). This existing regulatory mechanism will protect against adverse impacts to sage-grouse and Core Areas. Under the avoidance text, a mining operation would need to demonstrate that it cannot avoid locating within a Core Area through an analysis of alternatives.

5.2.6 Wind Energy Development

The Oregon Department of Energy has completed an analysis of the potential for wind and solar development in sage-grouse habitat in Oregon. Relatively recent changes in energy markets in the western U.S. and in California in particular have altered the likelihood of this form of development in eastern Oregon since the completion of the USFWS warranted but precluded determination in 2010. Appendix __ contains a summary of this analysis. That analysis includes a map illustrating areas of potential wind development considering both Core

Areas and distance from transmission, which is replicated below.



Large-scale wind development (over 104 megawatts) is regulated at the state level through the Energy Facility Siting Council (EFSC), a division of the Oregon Department of Energy (ODOE). EFSC's wildlife standard requires proposed projects to be consistent with ODFW mitigation policy. In the same manner as with mining proposals, described above, this means that a proposed wind development going through the EFSC process must avoid Core Areas unless it can demonstrate through an alternatives analysis that it must locate within a Core Area. Even if such a showing is made, the project also must minimize its footprint within Core Areas, and mitigation for its full adverse effects consistent with the Mitigation Framework.

Smaller wind projects, below the 104 megawatt level (nameplate), are reviewed through the county land use process, under the statewide planning system. These projects are considered within the non-farm category of a utility facility. Under ORS 215.275, utility facilities must

demonstrate that they have to locate on lands zoned for farm use on the basis of an alternatives analysis. In addition, such proposals may be conditioned to avoid conflicts with existing farming and ranching practices, as well as with wildlife resources that have been protected under a county's comprehensive plan.

Oregon is proposing new conservation measures directed to a defined set of larger-scale uses with the potential for future development in sage-grouse habitat. These conservation measures are described below, in subsection 5.2.13.

5.2.7 Solar Energy Development

Oregon's renewable portfolio standard includes specific provisions relating to solar generation. The state solar requirements have largely already been met by utilities and, as a result, significant additional development is not expected in the next ten years. Beyond that timeframe there is the potential for additional utility-scale solar development in eastern Oregon. As with wind, these projects will locate as close as possible to existing transmission lines with capacity in order to minimize their costs.

The ODOE analysis of renewable energy potential indicates that there are a large number of potential suitable sites for solar development, including many outside of Core Areas and many outside of sage-grouse habitat altogether. As a result, the state expects that solar development will not be significantly affected by the avoidance policy described above for wind development. With many possible locations, solar developers should be able to located projects to avoid Core Areas and minimize any mitigation obligations.

5.2.8 Geothermal Development

[In process]

5.2.9 Electric Transmission

[In process]

5.2.10 Natural Gas Transmission

[In process]

5.2.11 Roads

[In process]

5.2.12 Other Infrastructure

[In process]

5.2.13 New Conservation Measures for Energy, Mining and Infrastructure Uses

Consistent with the approach being developed by the Bureau of Land Management, Oregon is working with local governments to develop a set of conservation measures to steer wind, solar, geothermal, mining and infrastructure uses to avoid Core Areas. This system also is the basis for the All Lands All Threats mitigation program, described in more details in section 6 of this Plan.

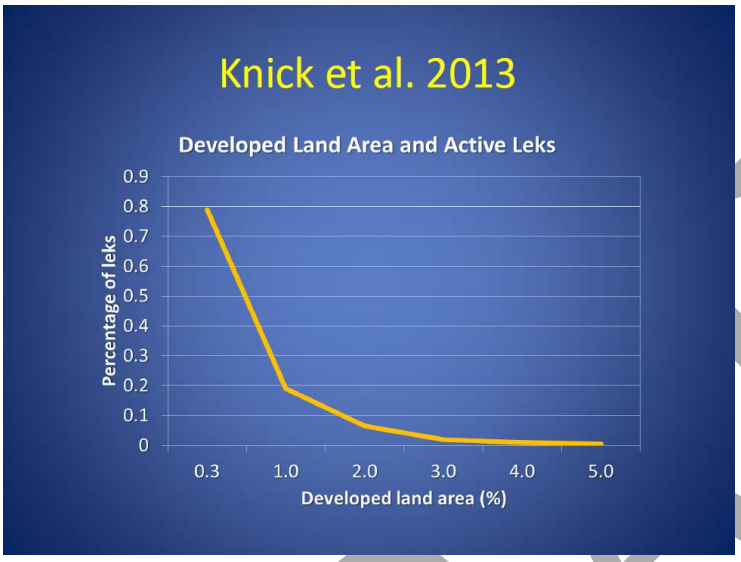
These conservation measures include the following elements.

- A state rule implementing statewide land use planning Goal 5 in counties with PACs. This rule will serve as a "safe harbor" for counties, and as a backstop for USFWS. It will apply in counties that have not adopted their own ordinance amendments through the process described below.
- The rule will apply to a defined set of uses that tend to have a larger footprint in terms of their impacts on sage-grouse: wind, solar and geothermal energy, electric transmission lines, other energy development, mining, roads and communications facilities.
- The rule will set up the "avoid, minimize, and mitigate" hierarchy, applied to PACs (as they may be modified over time), including appropriate tests for what a project proponent must show to meet each level of that hierarchy. That test will include an alternatives analysis. Cost and locational dependence will be considered in that evaluation, but may not be used as determinative factors.
- Using wind generation as an example, a proposed project with its turbines in a Core Area must analyze other locations with access to transmission in the same region to show that there are not locations outside of Core Areas. The fact that other sites may be more expensive can be considered, but can't be determinative. The rule is expected to create a high bar for locating a wind project entirely within a Core Area.
- Similarly, the minimization element of the hierarchy will require an analysis of alternative locations or project configurations to demonstrate a minimum footprint within Core. Again using wind as an example, a wind project with turbines outside of a

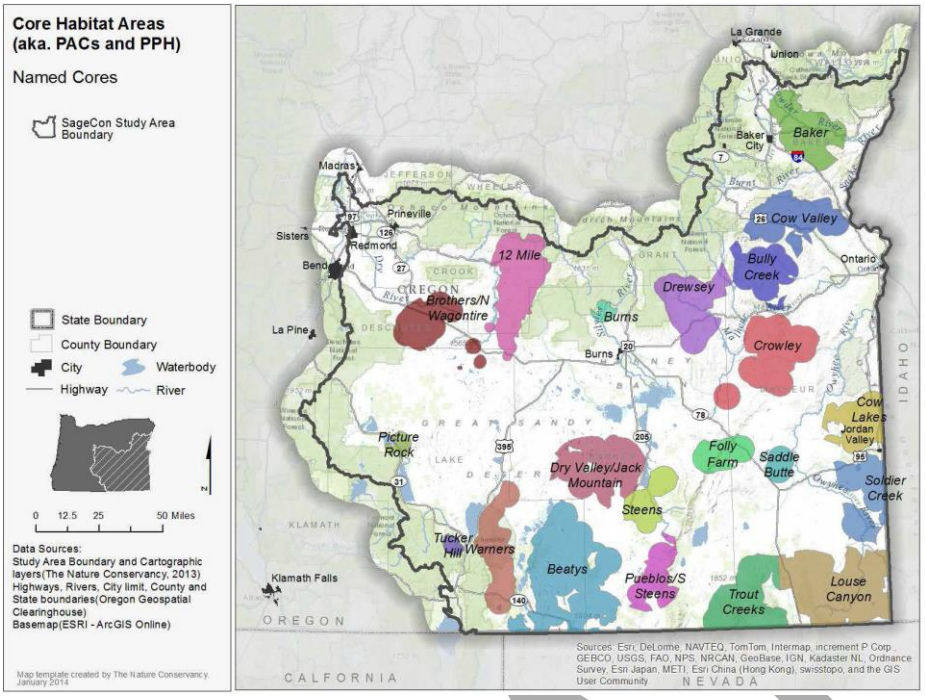
Core Area may require a transmission interconnect that runs through a Core Area to connect to the power grid. In this type of circumstance, the project would be require to look at alternative routing for the transmission interconnect that would minimize fragmentation of Core Area.

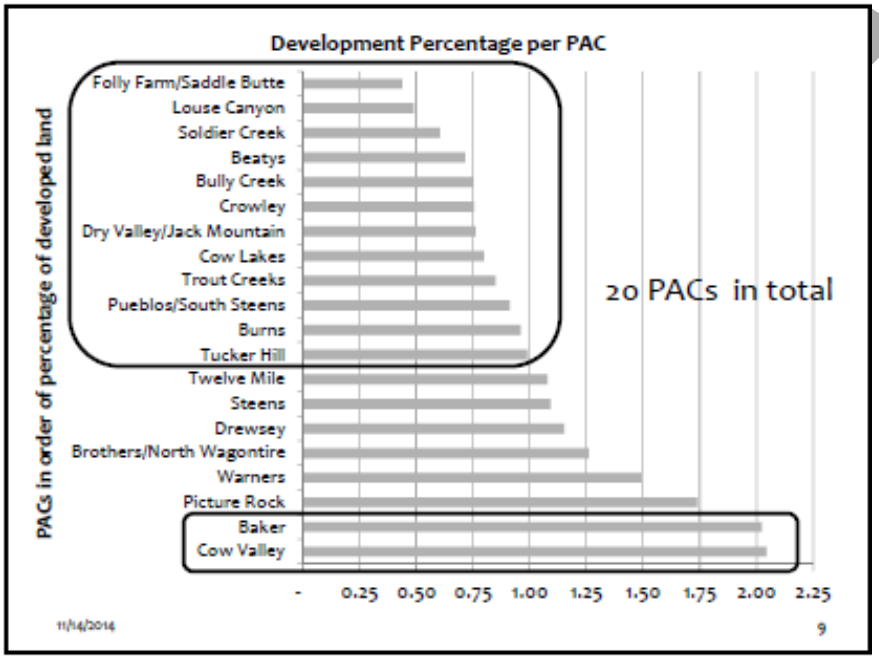
- Finally, the rule will also provide an upper threshold on disturbance within a PAC. The baseline footprint of existing wind development, along with other energy development, mining, and roads has been documented (see figure __, below), and the rule will provide for reporting of future disturbance to a single data repository. The upper threshold of disturbance from the footprint of these uses will be three percent. In addition, within each PAC, the rule will contain intermediate trigger points below the threshold. These triggers will be designed to assure that the system can be managed adaptively if there are unexpected, large-scale developments that threaten to utilize the entire remaining opportunity for development. In addition, as PACs are affected positively by restoration efforts, or negatively by fire, weeds or conifers, these intermediate triggers can be adjusted – providing strong incentives for conservation efforts while also responding to other threats.
- The rule will apply to the programs of other state agencies including both regulatory programs (DOGAMI, DSL and DEQ (solid waste)) and proprietary programs including state highways. For state rangelands, the Department of State Lands (DSL) is developing its own CCAA.
- Counties are being encouraged to develop their own ordinances, either through a similar "safe harbor" approach or through a full Goal 5 process. County ordinances will need to meet certain performance requirements including the same type of mitigation hierarchy described above – steering these forms of development to avoid Core Areas. Until county ordinances are in place, and have been determined to be consistent with the safe harbor rule, the rule will continue to apply to land use applications for the uses identified above.
- The state will work with counties and the BLM to coordinate reviews of these uses, including administration of the mitigation system described in section 6 of the ALAT Plan. The rule also will provide for reporting of land use actions and development permits to a central repository. Reporting will identify the amount of disturbance from each new use, and the state will monitor the total change in each PAC over time. This system will be coordinated with the BLM, as well as coordinated across county lines where PACs overlap into more than one county.

This system will "level the playing field" between large-scale uses, while also providing additional flexibility relative to current ODFW mitigation policy. Overall, the state believes the system will provide both a net conservation benefit to sage grouse, and more opportunity for rural economic development. The basis for the development threshold is research by Knick et al. showing, using methods consistent with those used by Oregon, that most leks occur on lands where the level of disturbance is below three percent.



The following figures show the location of PACs (as now mapped). These areas are the basis for the application of the disturbance threshold applied to the defined set of larger-scale uses. The current (baseline) level of disturbance within each PAC is shown in figure __.





At the same time that the state land use agency (the Land Conservation and Development Commission) is developing the rule described above, the Oregon Fish and Wildlife Commission will be asked to develop a corresponding supplement to its existing Sage Grouse Conservation Strategy (which is also adopted by rule). That supplement will mirror the LCDC rule in the

application of the mitigation hierarchy, and will create the geospatial definition of Core Areas and Low Density Areas that will be used in the LCDC safe harbor, county ordinances, and the ALAT mitigation policy.

5.2.14 Other Disturbance Threats

Direct Sagebrush Elimination

The intentional removal or treatment of sagebrush (using prescribed fire, or mechanical and chemical tools, to remove or alter the successional status of sagebrush ecosystems) contributes to habitat loss and fragmentation, a primary factor in the decline of sage-grouse populations. Removal and manipulation of sagebrush may also increase the opportunities for the incursion of exotic annual grasses (Beck et al. 2012). However, sagebrush removal to create fire breaks may be critical to reducing the size of burns.

Conservation Objective: Avoid sagebrush removal or manipulation in sage-grouse habitats.

Exceptions to the intentional removal of sagebrush may be considered when minor habitat losses are sustained while implementing other conservation measures. For example,

Implementation and Actions Completed to Address Sagebrush Elimination:

Where vegetation treatments are warranted:

- Ensure technical expertise through ODFW, NRCS, SWCD, and/or the OSU extension is available to landowners prior to implementing vegetation treatments.
- If brush beating is used, it should be in mosaic patterns as a tool to increase production of understory species and to increase diversity to benefit sage-grouse habitat. Current recommendations suggest brush beating (or other appropriate treatment) in strips (or a mosaic pattern) 12 to 50 ft wide (with untreated interspaces 3 times the width of the treated strips). Treatment should occur in areas with relatively high shrub cover (>25%) and without an understory of annual grasses to improve the herbaceous understory for brood-rearing, particularly where such habitats may be limiting. Such treatments should not be conducted in known winter habitat (Dahlgren et al. 2006).
- Any vegetation treatments conducted in plant communities dominated by exotic annual species should be accompanied by rehabilitation (and if necessary, reseeding) to achieve re-establishment of perennial vegetation and allow for long-term recovery of sagebrush and other native species.

- When implementing vegetative control measures that use herbicides, all best management practices and only approved herbicides should be used. Responsible agencies will determine how sagebrush treatments are part of a larger landscape plan. These treatments should utilize a mosaic pattern of treatment (or scattered pattern of treatment such as with tebuthiuron pellets) rather than a large uniform block.
- Evaluate the effectiveness of vegetation treatments on sage-grouse.

Where prescribed burning is warranted:

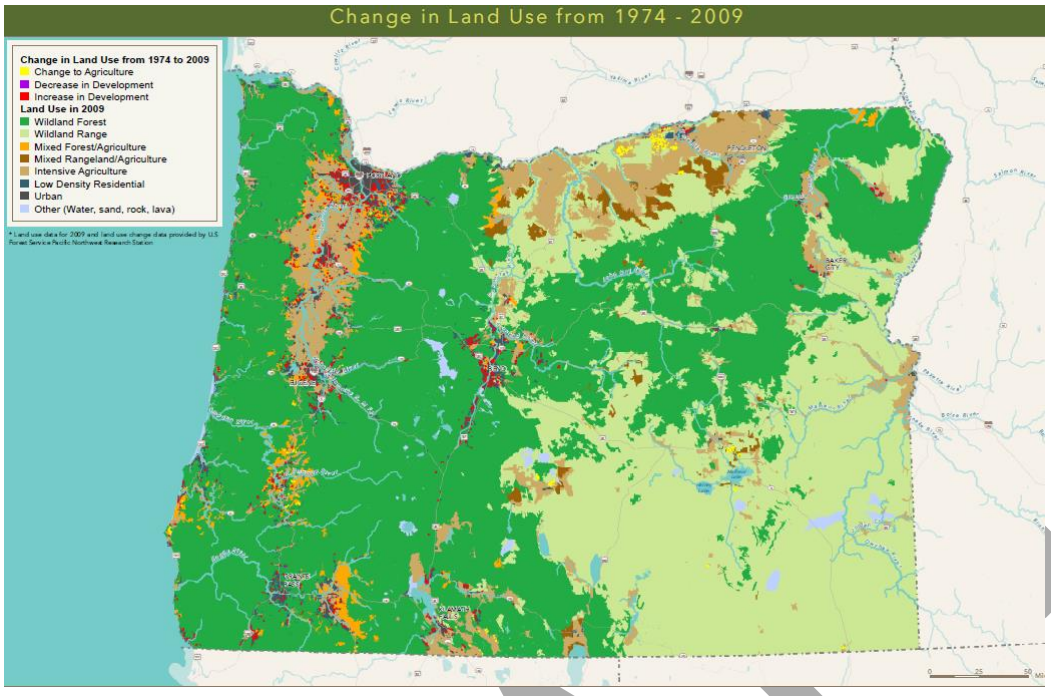
- All prescribed burns or mechanical fuel treatments within sagebrush habitats should have identified sage-grouse habitat objectives, and should consider existing sagebrush communities, site conditions, and site potential in treatment designs (see Monsen 2005);
- Avoid using fire to treat sagebrush habitat in <12" precipitation zones/lower elevations and/or wintering habitats;
- Reduce the use of prescriptive fire in sagebrush ecosystems that have decreased/declined in resiliency due to annual grass invasion. Conduct broadcast burns of juniper-invaded sagebrush, judiciously taking into consideration the spatial and habitat needs of sage-grouse relative to the size of the burn. Only one-third of the treatment areas should be burned (e.g., not to exceed 160 ac). Once sagebrush has begun to recruit, a broadcast burn can be conducted for another one-third of the treatment area;
- Use prescribed burning and mechanical fuels treatments at appropriate scales (i.e., small, irregular in shape, and that encourage natural re-establishment of the native plant community) to maintain or improve the quality and quantity of sage-grouse habitats. Consider fire scale, seasonality, and moisture regime from a sage-grouse habitat management perspective in planning prescribed burns (see Monsen 2005);
- Conduct broadcast burns of juniper-invaded sagebrush, judiciously taking into consideration the spatial and habitat needs of sage-grouse relative to the size of the burn. Only one-third of the treatment areas should be burned (i.e., not to exceed 160 ac). Once sagebrush has begun to recruit a broadcast burn can be conducted for another one-third of the treatment area;
- Use caution when planning use of prescribed fire in high elevation mountain big sage sites to prevent fire escape and any subsequent establishment of invasive annual grasses or other weeds;
- Ensure timing of prescribed burns does not interfere with lekking or other known seasonal movements of sage-grouse;

- Consider recent drought events and their effects on sage-grouse habitat (e.g., understory vigor) when planning/implementing prescribed fire or fuel reduction treatment projects;
- Avoid prescribed fire in low elevation, xeric sagebrush communities.

Agricultural Conversion

Agricultural conversion is typically defined as the conversion of sagebrush habitats to tilled agricultural crops or re-seeded to domestic grass pastures, resulting in habitat loss and fragmentation. In the northern half of eastern Oregon, large areas of sagebrush-steppe habitat have been converted to agricultural lands (Wisdom et al. 2002). Sage-grouse are known to forage in alfalfa fields in some parts of the species' range (see review by Knick et al. 2011) and irrigated alfalfa fields could be an important element of brood-rearing in some habitats, especially in areas where native forbs and moist meadows have been depleted or degraded. Although sage-grouse will occasionally use agricultural lands w) as late summer and late brood-rearing habitat, row crops and dryland cereal grains are generally not beneficial habitat (Swensen et al. 1987, Blus et al. 1989). In southeastern Oregon, most conversion occurred in the late 1800s to early 1900s, reached a threshold in the mid-1950s and has remained relatively unchanged since. However, the number of irrigated acres has increased slightly in some areas since the 1950s.

The following figure shows areas of expansion and contraction in development, as well as areas of expansion in agriculture from 1974 to 2009.



Conservation Objective: Minimize further loss of sagebrush habitat and prioritize restoration.

Implementation and Actions Completed to Address Agricultural Conversion:

Given the relative absence of significant expansion in cultivated areas in sagebrush habitat, the state does not consider this to be a significant current threat to sage-grouse habitat. The state is creating a system to monitor development of new cultivated fields in sagebrush habitat through periodic aerial photography, and through monitoring of new applications for irrigation. If the state determines that cultivated areas within a PAC has increased by more than __ over a __-year period that will trigger an adaptive process to develop additional measures addressing this threat. The state will avoid providing financial support to additional irrigation development in PACs, and will work with NRCS and the FSA to explore incentives for agricultural operations to avoid Core Areas.

Recreational Uses

Recreational activities in sagebrush habitats range from hiking, camping and hunting, to lek viewing and OHV use. The impacts of recreation activities on sage-grouse habitat have been poorly documented, however, excessive use within sage-grouse habitat can result in habitat loss and fragmentation (e.g., creation of off-road trails) and both direct and indirect

disturbance to the birds (e.g., repeated disturbance to leks for viewing). Repeated disturbance and harassment of sage-grouse could negatively impact sage-grouse by disrupting breeding activities (Call 1979). In addition, off-trail recreation by OHV users can fragment habitat and create corridors for spread of exotic plant species (Knick et al. 2011).

Although improper OHV use is identified as a potential threat to sage-grouse habitats in Oregon (Hagen 2011), there have been no specific published studies to date of OHV effects on sage-grouse (USFWS 2010, Hagen 2011, Knick et al. 2011).

Conservation Objective: In areas with substantial recreation activities, maintain healthy native sagebrush communities based on local ecological conditions and with consideration of drought conditions, and manage direct and indirect human disturbance (including noise) to avoid interruption of normal sage-grouse behavior.

Implementation and Actions Completed to Address Recreation: Ongoing concern related to the need to better regulate OHV use resulted in issuance of Executive Order 11644 (1972, 37 FR 2877). This Executive Order required public land management agencies to develop regulations and designate areas where OHV use was permitted and not permitted. Executive Order 11644 was amended to exclude some emergency and national defense uses from regulation by Executive Order 11989, issued in 1977. The BLM (2012) issued Instruction Memorandum (IM) 2012-043 designed to provide additional, interim protections of sage-grouse. This IM specifically addresses many types of development, including ongoing and proposed travel management authorizations and activities. For ongoing travel activities, the IM requires evaluation of existing use and effects on sage-grouse; and where needed, implementation of seasonal travel restrictions, closure and reclamation of unauthorized travel routes, and limitation and enforcement of trail use to existing trails/roads and seasons. For proposed authorizations and activities, the IM limits construction to existing routes unless rerouting reduces impacts to sage-grouse, restricts new construction to minimum standards, and prohibits construction on existing routes that would change the route category or enhance capacity.

Fences

Fences can be deleterious to sage-grouse populations and habitats, with threats including habitat fragmentation and direct mortality through collisions (Stevens et al. 2012).

Conservation Objective: Minimize the impact of fences on sage-grouse populations.

Implementation and Actions Completed to Address Fences: Fence removal and modification actions completed within the SageCon planning reduce the risk of direct mortality of sage-grouse from fence strikes. From 2010-2012, no new fences were installed through NRCS-SGI in Oregon. Approximately 10.6 miles of fences have been marked with diverters to improve visibility of fences by sage-grouse during flight (Stevens et al. 2011) through NRCS-SGI. A new Fence Collision Risk Tool is also available that maps relative risk collision risk near leks to assist efforts to reduce this threat (Stevens et al., In press, NRCS 2012).

5.3 Biological Threats

Potential threats to sage-grouse related to anthropogenic disturbance and biological threats (e.g., small, isolated populations, grazing, free-roaming equids) are presented as separate entities within the ALAT Plan but emphasize the cumulative effects of these stressors on ecological processes affecting sage-grouse habitats and their combined influenced on sagebrush-stepped ecosystem diversity. Accordingly, all threats affecting sage-grouse populations in Oregon will be addressed in the ALAT Plan to assist the SageCon effort in developing an approach to avoiding, minimizing, and compensating for impacts to sage-grouse habitat that result in a net benefit to the species.

Isolated/Small Size

Continued habitat loss and fragmentation may increase the risk of loss of genetic variation in small, isolated sage-grouse populations. Genetic diversity is necessary for a population to respond to environmental change, thus a loss of genetic variation may jeopardize the persistence of fragmented populations (Shaffer 1981).

Conservation Objective: Avoid creation or further loss of small, isolated populations.

Implementation and Actions Completed to Address Isolated/Small Size:

In the *Greater Sage-Grouse Conservation Assessment and Strategy for Oregon (Hagen 2011)*, the lack of information about sage-grouse populations, movements, and habitat was identified as a risk factor for six Action Areas (Cow Valley, Unity, Burns, Post, Picture Rock, Cow Lake). The prelude to sage-grouse management to sustain small populations is site-specific research and monitoring to gain knowledge of population vital rates, population risks, habitat selection factors, and the interaction of these factors. Because much of the sage-grouse research in Oregon has focused on Hart Mountain National Antelope Refuge, there is a lack of basic ecology from regions such as Baker County, Trout Creek

Mountains, most of Malheur County, and areas north of Burns. Several research projects have been initiated to address the information gaps identified by the *Greater Sage-Grouse Conservation Assessment and Strategy for Oregon* and LITs. Notably, three studies have specifically addressed winter habitat use and seasonal movements that describe sagebrush communities used by sage-grouse and some limited migratory information for populations in portions of the Prineville and Vale BLM Districts and Baker Resource Area. Telemetry studies conducted from 2006-2008 in the Prineville District focused on mapping seasonal habitats with an emphasis on winter habitat use. In 2009, the USFWS initiated a project to address the lack of data on the distribution and movements of a sage-grouse occupying the Baker Resource Area. From 2009-2012, the USFWS collected over 1,300 bird locations from a sample of 63 radio-marked sage-grouse. These data will be used to inform land management agencies responsible for actions that may impact this sage-grouse population. In addition, results from this study will be used to identify areas where habitat restoration projects will have the greatest likelihood of enhancing the Baker Resource Area sage-grouse population. Currently, a baseline telemetry study is underway to better understand winter habitat use in the Warner Mountains. These data will also serve as a baseline for demography and spatial use relative to large-scale juniper removal and potentially wind energy development within the Lakeview BLM District. In addition, ODFW in collaboration with Oregon State University, is evaluating the effects of wildfire on sage-grouse population dynamics in the Trout Creek Mountains. These studies all add to the breadth of knowledge on the basic biology of these populations that was previously unknown.

Free-Roaming Equids

Concentrated or overabundant feral horse and burro populations can reduce habitat quality and quantity. Equid grazing results in a reduction of shrub cover and more fragmented shrub canopies (Beever and Aldridge 2011). Additionally, sites grazed by free-roaming equids have a greater abundance of annual invasive greases, reduced plant diversity, and reduced grass density (Beever and Aldridge 2011). Effects of feral horses on sagebrush habitats may be especially pronounced during periods of drought. Feral horses have different grazing patterns than domestic livestock, thus increasing the magnitude of grazing across the landscape (Beever and Aldridge 2011). Given the high mobility of free-roaming equids, the conservation measures below should be applied across all sage-grouse habitats

Conservation Objective: Reduce the negative impacts of grazing by free-roaming equids on sage-grouse habitat and maintain populations at or below Appropriate Management Level (AML)

Implementation and Actions Completed to Address Free-Roaming Equids:

5.4 OTHER UNFORESEEN CIRCUMSTANCES NOT PROVIDED FOR IN THE COT REPORT

Unforeseen circumstances are those threats that were not addressed in the COT Report (e.g., drought, West Nile virus, predation) that may have local, short-term negative impacts on sage-grouse populations and/or sagebrush-steppe habitat is Oregon. The impacts of these threats on local sage-grouse population varies across the landscape in presence and intensity and is likely based on the resilience of that population and its associated habitats. Additional conservation measures and guidelines for minimizing the impact of these threats on sage-grouse habitats are detailed in Appendix X.

Climate Change

The effect of climate change on the amount and distribution of future sage-grouse habitat is largely unknown (USFWS 2013). However, global climate change models project more variable and severe weather events, higher temperatures, drier summer soil conditions, and rainier winter season across much of the sage-grouse range (Miller et al. 2011). Projected changes in climate regimes for the sagebrush biome may influence sage-grouse conservation both directly and indirectly (Neilson et al. 2005, Schrag et al. 2010).

Global climate change poses a significant threat to sage-grouse through a variety of mechanisms. Increasing temperatures will likely result in a shift in climatic conditions most suitable to the species, possibly resulting in portions of the current sage-grouse range becoming unsuitable. Such range shifts are already occurring in many species (Root et al. 2003). Climate change may also bring with it changes in seasonality that could impact reproduction. Decreased synchrony between photostimulated events (e.g., mating and nesting) and temperature stimulated events (e.g., habitat greenup, insect availability) could negatively impact reproductive success. Weather extremes typically carry negative implications for reproduction and survival. Increased frequency and intensity of drought may pose the greatest threat to sage-grouse relative to climate change. Habitat quality may play an even greater role in sage-grouse reproduction and survival in the future. For example, habitats that were adequate for the species under normal conditions could become unsuitable if weather fluctuations become more extreme, with only the highest-quality habitats remaining suitable.

Conservation Objective:

Implementation and Actions Completed to Address Climate Change:

Drought

When rangeland plants are deprived of precipitation, it affects the plant's growth cycle, volume of growth, and fruition. Drought is site-specific and is typically considered to occur when two growing seasons of precipitation are below the long-term average, affecting plant life cycles as described above. Prolonged drought is when the conditions described above persist for three or more growing seasons. Prolonged drought can harm plants important to sage-grouse reducing sage-grouse habitat quality and quantity

Conservation Objective: Preserve and maintain the ecological integrity of sagebrush-steppe ecosystems and conserve the essential habitat components for sage-grouse.

- ***Implementation and Actions Completed to Address Drought.***

West Nile Virus

The emergence of West Nile Virus (WNv) in the western U.S. and the lack of resistance in the sage-grouse immune system is a serious management concern (Naugle et al. 2004, Clark et al. 2006). Surface water developments may increase habitat for mosquitoes, increasing the potential for WNv exposure.

Conservation Objective: Reduce potential for direct mortality and/or disease transmission.

Implementation and Actions Completed to Address West Nile Virus

The Oregon Department of Agriculture, in coordination with mosquito control agencies and local county health departments, has implemented a surveillance program to monitor the reemergence and spread of WNv in the state to assist state and local agencies in reducing the impact of this disease. As part of the on-going surveillance efforts throughout the state, Oregon Health Authority is testing adult mosquitoes and birds for mosquito-borne encephalitis.

ODFW also increased its monitoring efforts for WNv across the occupied range of sage-grouse in Oregon. In 2006, a die-off of at least 60 sage-grouse was documented near Burns Junction, and two other sage-grouse mortalities were confirmed from WNv from Crane and Jordan Valley. Of the birds found dead, three provided suitable tissue samples and all were confirmed

to be infected with WNv. No other significant mortalities have been documented in Oregon since 2006. From 2004-2011, ODFW collaborated with the National Wildlife Health Center to monitor sage-grouse for the presence of the disease or its antibodies. Over 1,000 blood samples (using Nobuto strips) from hunter harvested birds were collected. Only one bird (a juvenile male harvested in the Beulah Unit in northern Malheur County) tested positive for anti-bodies in the Nobuto strip samples.

Catastrophic Flooding

Excessive runoff resulting from catastrophic hydrological events (e.g., rain on snow event) is associated with mass-wasting of hill slopes, damage to river banks, and downstream flooding. These events have the capability to drastically change stream hydrology and vegetative composition of riparian corridors.

Conservation Objective: Maintain or enhance the existing plant community to ensure suitable sage-grouse habitat.

Implementation and Actions Completed to Address Catastrophic Flooding

Predation

Although predation was not identified by the USFWS as a significant range-wide threat in the 2010 warranted finding (75 FR 13910), predation may be significant at localized levels. In particular, the impacts of predation on sage-grouse can increase where habitat quantity and quality has been compromised by anthropogenic activities (Coates 2007, Bui 2009, Hagen 2012). Predator management has been effective at local scales for short periods, but its efficacy over broad ranges or over long time spans has not been demonstrated (Hagen 2011a). In areas of compromised habitats, predator control may be effective to ensure sage-grouse persistence until habitat conditions improve.

Conservation Objective: Minimize the effects of predation on isolated, translocated, or declining populations.

Implementation and Actions Completed to Address Predation

Predation on sage-grouse has not been quantified in Oregon but ravens have been found to contribute to nest destruction (Coates and Delehanty 2010). Juniper and transmission line removal in sage-grouse habitat reduces predation risks by removing avian predator perches in sagebrush habitat.

Insecticides

Grasshoppers and Mormon crickets periodically have infestations which cause significant long-term damage to sagebrush. The use of insecticides is not known to pose range-wide threats to sage-grouse. However, organophosphorous insecticides have been documented as causing mortality to sage-grouse. Some insecticides could have detrimental effects to individual sage-grouse through direct contact, either by consumption of insects exposed to certain insecticides or by reduction of insect populations during times when insects are a crucial part of the birds' diets.

Conservation Objective: Maintain important sage-grouse forage base and avoid or minimize direct mortality to sage-grouse.

Implementation and Actions Completed to Address Insecticides

Sagebrush Defoliator Moth

Periodic outbreaks of the sagebrush defoliator moth (*Aroga websteri*) can cause widespread damage to rangeland ecosystems in eastern Oregon. Sagebrush is the exclusive larval host of the Aroga moth and in high numbers, larvae can kill host plants and reduce the production of foliage and flowering by surviving plants.
Although the Aroga moth is widespread throughout its native range, its impact on sagebrush ecosystems can vary considerably. Aroga moth outbreaks are a natural phenomenon and any impacts to sage-grouse habitat are temporary.

Conservation Objective: Identify sites impacted by Aroga moth outbreaks and assess the ecological and economic effects of Aroga moth outbreaks in eastern Oregon.

Implementation and Actions Completed to Address the Aroga Moth

Noxious Weeds [other than cheatgrass and Medusa head]

Non-native weeds can permanently degrade sage-grouse habitat. It is critical for land managers in sage- grouse habitat to conduct early detection and rapid response (EDRR) surveys for invasive noxious weeds, such as spotted knapweed, yellow starthistle, diffuse knapweed, and white top. If found early, these weeds can be controlled and detrimental

impacts to sage-grouse habitat avoided. Prevention is key; once an area is overrun with weeds, restoration is difficult and expensive.

After any ground disturbing activity, such as juniper removal, management plans should include reseeding of desirable plants as necessary, treatment of any invasive plants, and ongoing monitoring to ensure that sagebrush and other native plant species come back instead of noxious weeds/invasive plants.

Conservation Objective:

Implementation and Actions Completed to Address Noxious Weeds

APPENDIX X. CONSERVATION MEASURES TO ADDRESS THREATS AND REGULATORY MECHANISMS

Conservation Measures

To assist with conservation planning efforts, the ALAT Plan identifies conservation measures for each of the threats to sage-grouse and their habitats as identified in the 2010 warranted by precluded finding (75 FR 13910). For the purposes of this ALAT Plan, a conservation measure is defined as any activity or action which, when implemented or continued to be implemented, will reduce or remove threats to sage-grouse and will improve or maintain sagebrush-steppe habitat.

The ALAT Plan provides a unified all lands approach to sage-grouse conservation to ensure species protection for sage-grouse in eastern Oregon and is meant to supplement, and not replace the *Greater Sage-Grouse Conservation Assessment and Strategy for Oregon* (Hagen 2011), Local Implementation Teams (LITs), or the locally driven process that created them. Below is a comprehensive list of conservation measures that are consistent with the COT report (2013) and that will adequately address the identified threats to sage-grouse and their habitats in Oregon.

Appendix X consists of a matrix of conservation measures for each threat and has the following organization:

Primary Threats	Conifer Encroachment Annual Grasses Wildfire
Secondary Threats	Isolated/Small Size Agricultural Conversion Energy Mining Infrastructure Free-Roaming Equids Recreation Urbanization
Other Threats	Drought West Nile Virus Catastrophic Flooding Predation Insects Fences Climate Change Sagebrush Defoliator (Aroga Moth) Noxious Weeds
Cross-Cutting Issues	Sagebrush Elimination Grazing Resilience and Restoration

A strategy level(s) are indentified for each conservation measure and refers to the three hierarchical levels outlined in the ecological framework for managing threats (Level I - Large-scale Planning, Level II - Prioritization within Priority Habitats, and Level III – Site-specific Management) previously described in Section X.

Metrics

In addition, listed with each threat are the metrics to be measured and reported to the USFWS. Each metric listed is not necessarily applicable to each PAC as the threats impacting sage-grouse vary across the landscape in presence and intensity. Only biologically significant data is captured in these metrics and the quantitative metrics provided below are those that highlight on-the-ground efforts. This data is intended to be geospatial so the State of Oregon can illustrate the efforts that have taken place on the landscape. For Strategy Level III, the metric will be a change in acres in a particular vegetation state. This approach is outlined in Figures X – XX. For example, removal of early phase juniper at mid and upper elevations will move a site from non-habitat (state C) to potential year-round habitat (state A). Thus, juniper treatments will be reported as change from states C, D, or E to states A or B depending on the specific situation. This approach is consistent with the Harney County CCAA and will provide a uniform approach to reporting impacts of conservation efforts. Strategy Level I analysis allows reporting of acres within core areas. Some CMs will require different reporting metrics which are listed in the metric column.

The conservation measures and associated metrics have been developed based upon professional experience and the best available science and biological judgment. Successful implementation of these conservation measures will ameliorate the threats to sage-grouse in Oregon and will allow for the long-term conservation of the species.

Appendix 5.1

Primary Threats	Conservation Measures	Strategy Level
Conifer Encroachment	Promote education and outreach through Soil Water Conservation Districts (SWCDs) and Local Implementation Teams (LITs) to encourage participation in the NRCS Sage-Grouse Initiative (SGI).	I (Large-scale Planning)
	Enlist LITs to apply local expert knowledge in conjunction with the spatial decision support tool (currently under development) to identify priority areas to address conifer encroachment.	II (Prioritization within Priority Habitats)
	Remove all Phase I and II conifer encroachment (<10% canopy cover) in sage-grouse priority habitats (Action Areas, core, or areas with 75% breeding bird density) and important areas of connectivity in Oregon in 10-20 years. • Prioritize juniper removal within 1 mile of known leks (with an active or pending status) and then expand juniper removal to within 4 miles of known leks. Complete conifer removal within lek buffers on private and state lands within 10 years; complete conifer removal within lek buffers on public lands within 20 years. • Within 1 mile of known leks, completely remove juniper. Beyond the 1 mile buffer and within 4 miles of leks, completely remove juniper; where complete conifer removal is not feasible, reduce juniper canopy cover to less than 4%. After treatments within lek buffers are complete, prioritize Phase I and II conifer removal in additional priority habitats (Action Areas, core, or areas with 75% breeding bird density) that provide adequate sage-grouse habitat (e.g., sagebrush landcover > 25%), particularly in areas with medium-to-high resistance and resilience.	II (Prioritization within Priority Habitats)
	Give preference to the use of mechanical techniques for juniper removal and slash removal, such as "lop and scatter" or "jackpot burning" with the aim to retain an intact sagebrush component within treatment areas. • Complete jackpot burning during the spring (March-April) when environmental conditions are favorable (when soils are frozen and the moisture content of felled trees is low), however, avoid disturbance to sage-grouse during critical biological timeframes (e.g., lekking and seasonal movements). • Eliminate all limbs from felled trees in excess of 4 feet in height to reduce perching opportunities for avian predators.	III (Site-specific Management)
	Consider seeding Phase I & II conifer removal areas prior to treatment if the perennial grass community is in poor condition (<2 plants /10ft^2, <1 plant/10ft^2 on dry and wet sites, respectively) or if exotic annual grasses are present. Broadcast seeding prior to soil disturbance or under slash may increase the chances of establishment.	III (Site-specific Management)
	Rest treated areas from grazing until understory perennial grasses are re-established and can sustain disturbance.	III (Site-specific Management)

	Strategically treat Phase III conifer encroachment (>10% canopy cover) as needed in sage-grouse Action Areas where the greatest opportunities exist to restore connectivity, reduce risk of catastrophic wildfire, and place create future sage-grouse habitat opportunities. • Prioritize Phase III juniper removal after Phases I and II have been addressed. Prioritize Phase III areas in or adjacent to areas within core and low density habitat that provide adequate sage-grouse habitat (e.g., sagebrush landcover > 25%), particularly in areas with medium-to-high resistance and resilience.	II (Prioritization within Priority Habitats)
	Because Phase III stands generally lack a desirable understory shrub and grass component, recognize that conifer removal areas will likely require seedings and plantings of shrubs and perennial grasses.	III (Site-specific Management)
	Utilize prescribed fire as a tool to remove Phase III juniper judiciously and follow best management practices for prescribed fire: • Limit prescribed fire to higher elevations where there is little risk of invasive plant establishment post-treatment (e.g. high resistance and resilience); • Conduct prescribed fire treatments in a mosaic such that only 1/3 of treatment areas are burned (not to exceed 160 acres). This will ensure there is are proximal seed sources for sagebrush, native grass, and forb regeneration. A mosaic approach should consider the spatial and habitat needs of sage-grouse in order to allow for continual use of the treatment area by sage-grouse; • Use caution with prescribed fire in mountain big sage sites to prevent fire from escaping and any subsequent establishment of invasive annual grasses or other weeds; • Ensure timing of prescribed burns does not interfere with sage-grouse behaviors such as lekking and seasonal movements; • Avoid prescribed fire in low elevation, xeric sagebrush communities (e.g. low resistance and resilience).	III (Site-specific Management)
	Consider removing encroaching juniper within existing riparian and transitional zones.	II (Prioritization within Priority Habitats)
	For all juniper treatment areas (regardless of juniper phase), retain old-growth or culturally significant juniper (pre-settlement trees established prior to 1850).	III (Site-specific Management)
	For all juniper treatment areas (regardless of juniper phase) rest treated areas from grazing until understory perennial grasses are re-established and can sustain disturbance. • Length of rest will depend on understory composition at the time of treatment and the response of desirable vegetation following treatment. • Set quantifiable objectives for post-treatment vegetation recovery based on pre-treatment monitoring data, return livestock grazing only once objectives have been met.	III (Site-specific Management)
	Conduct long-term (>30 years) monitoring and evaluation of vegetation responses to treatments. Use an adaptive management approach to maintain the benefit of juniper removal within sage-grouse habitats.	III (Site-specific Management)

Annual Grasses	Enlist LITs to apply local expert knowledge in conjunction with the spatial decision support tool (currently under development) to identify priority areas to address annual grasses.	II (Prioritization within Priority Habitats)
	Develop and implement invasive annual grass management plans for each Action Area that identifies priority areas for *prevention*. • Prioritize prevention in sites with low annual grass occupancy and low resilience and resistance. These sites will generally be low elevation areas in the most desirable vegetation states (States A and B in the low elevation state and transition model). • Prioritize proactive herbicide treatments as a prevention strategy in recently burned areas, particularly areas with low resistance and resilience that are proximal to valuable sage-grouse habitat. Prioritize sites within 4 miles of leks (active or pending) and sites < 2 miles from "key habitat" defined as areas with 75% breeding bird density and where sagebrush landcover is > 65%. • Maximize the likelihood of finding areas of expanding invasive annual grasses by developing and conducting systematic and strategic surveys • Rapidly report and treat new infestations. Eradicate when practical and economically feasible. • Retain and limit disturbance within and around all remaining large, intact sagebrush patches, particularly in low elevation sites with low resistance and resilience, because these sites are highly vulnerable to annual grass invasion once desirable species are removed or disturbed. • Monitor areas impacted by ground-disturbing activities for a minimum of 3 years and apply herbicide to new invasions of annual grasses expeditiously. • Suppress fire in areas within or proximal to valuable sage-grouse habitat that are particularly vulnerable annual grass invasion. • Avoid using fire as a habitat management tool in zones with < 12 inches precipitation or lower elevations (e.g., with low resistance and resilience); use prescribed fire in a manner that limits mortality of desired plants and the risk of invasive annual grass establishment.	II (Prioritization within Priority Habitats) and III (Site-specific Management)
	Develop and implement invasive plant management plans for each Action Area that identifies priority areas for *restoration*. • Prioritize restoration in sites with high resilience and resistance and low annual grass occupancy. Considerable interventions will be required to transition low elevation sites from degraded sagebrush and exotic annual grass states (state and transition model states C and D, respectively) to more desirable states (State A: sagebrush perennial herbaceous state and State B: perennial herbaceous state), as these sites do not have the potential to restore naturally. • Prioritize restoration in sites invaded by invasive annual grasses with the greatest potential to succeed (e.g., moderate infestations or areas with inadequate perennial species in medium-to-high resistance and resilience) that are proximal to valuable sage-grouse habitat. Prioritize sites within 4 miles of leks (active or pending) and sites < 2 miles from "key habitat" defined as areas with 75% breeding bird density and where sagebrush	II (Prioritization within Priority Habitats) and III (Site-specific Management)

	landcover is > 65%. Over time, expand restoration activities outward from key habitat patches. • Prioritize restoration efforts in recently burned areas, particularly areas that are proximal to valuable sage-grouse habitat. Prioritize sites within 4 miles of leks (active or pending) and sites < 2 miles from "key habitat" defined as areas with 75% breeding bird density and where sagebrush landcover is > 65%. • Tailor restoration strategies (e.g., aerial or broadcast versus drill seeding versus plantings, use of drought-tolerant species, use of experimental techniques like coated seeds) according to site-specific resistance and resilience to ensure greatest likelihood of plant establishment. • Aggressively treat invasive plants where they threaten the quality of sage-grouse habitat, particularly in prioritized restoration sites described above. • Use appropriate certified weed-free seed mixes in habitat restoration with goal to establish perennial grasses, forbs, and shrubs. • When supply is limited, use native seed in sites within core Action Areas that have ecological characteristics that are most favorable for plant establishment. • Utilize locally-sourced native plant species when available and consider seed mixes that contain aggressive, fire-resistant, non-native perennial species that are competitive with invasive weeds to initially stabilize plant communities to allow for long-term recovery of sagebrush and other native species. • Monitor restoration projects for effectiveness and repeat rehabilitation activities as required. • Rest treated areas from grazing from livestock and free-roaming equids until understory perennial grasses are re-established and can sustain disturbance.	
	Develop and implement invasive plant management plans for each Action Area that identifies priority areas to *contain* existing patches of invasive weeds. • Implement and maintain containment programs for large infestations that may include the following techniques: 1) border spraying; 2) establishing a barrier to expansion with aggressive perennial species that are competitive with invasive weeds; 3) biological control agents; and/or 4) targeted grazing. • Prioritize containment where large infestations of invasive annual grasses threaten highly valuable sage-grouse habitat. Prioritize sites within 4 miles of leks (active or pending) and sites < 2 miles from "key habitat" defined as areas with 75% breeding bird density and where sagebrush landcover is > 65%. • Utilize approved herbicides according to best management practices.	II (Prioritization within Priority Habitats) and III (Site-specific Management)

	Employ general techniques to prevent human-caused spread of annual invasive grasses. • Power wash vehicles involved in development projects, as well as fuels management or fire suppression activities prior to and after use. • Require best management practices for construction projects in and adjacent to sagebrush to prevent invasion.	III (Site-specific Management)
	Employ grazing management techniques that maintain the perennial native grass and shrub community and prevent spread of annual invasive grasses. • Assess allotments dominated by Wyoming big sagebrush for grazing impacts to native perennial grass and forbs, and soil biotic crusts. • Identify allotments with invasive annual grasses and implement control measures to prevent the transfer of invasive species via livestock. • Evaluate and treat heavily used areas (e.g., water sources or transfer areas) for non-native grass invasions. • Require the use of certified weed-free hay in priority habitat. • Where appropriate, utilize targeted grazing in heavily infested allotments in conjunction with seeding as a control and/or restoration technique.	III (Site-specific Management)
	Support infrastructure, resources, and research that will enhance annual grass prevention and habitat restoration. • Support on-going research evaluating annual grass prevention and control techniques and precision restoration technologies seeking to improve the likelihood of seeding success when actively restoring sagebrush sites. • Create incentives and dedicated funding sources for local, native seed sources and storage in order to increase the availability of native seed.	I (Large-scale Planning)
	Remove administrative or procedural barriers to annual grass management. • Encourage State and County Weed Boards to elevate these species on noxious weed lists. • Support policy changes to remove the court-ordered injunction prohibiting the use of herbicides on all federally-administered lands in Oregon. • Support restructuring of post-fire emergency stabilization and restoration (ESR) funding scheme to ensure adequate funds are available for long-term post-fire habitat management. • Coordinate with state and federal agencies to develop consistent procedures and policies for the treatment of noxious and invasive plants, chemical usage, and timing.	I (Large-scale Planning)
Wildfire	Implement best practice *prevention* strategies to reduce the risk of wildfire to core sage-grouse habitat and important areas of connectivity. • Identify priority habitat areas (e.g., sagebrush communities with low resilience to disturbance and resistance to invasive annual grasses associated with warm and dry soil temperature and moisture regimes) and implement preventative management strategies to reduce the threats to sage-grouse resulting from impacts of wildfires and invasive annual	I (Large-scale Planning) and II

	grasses. Additional emphasis should be placed on areas with high wildfire potential, areas dominated by invasive annual grasses that are proximal intact habitat with low resistance and resilience, and that are within or proximal to areas that area highly valuable to sage-grouse. • Pre-position resources near PACs when conditions are commensurate for large fire growth (e.g., high fire severity conditions, forecasted lightning) to ensure rapid response to ignitions. Coordinate among fire agencies to ensure adequate equipment and funds are available for pre-positioning efforts. • Restrict motorized travel and ban campfires in sage-grouse habitat during high fire severity conditions to reduce the risk of accidental ignitions. • Reduce the risk of vehicle or human-caused wildfires and the spread of exotic species by planting perennial vegetation (e.g., green-strips) paralleling road rights-of-way • Take steps to prevent future degradation and address currently degraded sagebrush systems (as described in the conifer encroachment and invasive annual grasses sections above) to reduce the impacts of wildfire in sage-grouse habitat. • Conduct fuel management treatments designed to protect existing sagebrush, modify fire behavior, restore native plants, and create landscape patterns that benefit sage-grouse. ▪ Reduce juniper fuel loads in areas adjacent to valuable sage-grouse habitat. Prioritize Phase I and II juniper stands within 1 mile of known leks and then expand juniper removal to within 4 mi of known leks. Prioritize Phase III juniper stands after Phases I and II have been addressed. Prioritize Phase III areas in or adjacent to priority areas (Action Areas, core, or areas with 75% breeding bird density) that provide adequate sage-grouse habitat (e.g., sagebrush landcover > 25%), particularly in areas with medium-to-high resistance and resilience. ▪ Use prescribed fire to reduce fuel loads in a prudent manner. Avoid using fire as a habitat management tool in zones with < 12 inches precipitation or lower elevations (e.g., with low resistance and resilience); use prescribed fire in a manner that limits mortality of desired plants and the risk of invasive annual grass establishment. ▪ Strategically use livestock grazing to reduce fuel loads in years with high accumulation of fuels. Balance grazing used to reduce fuel loads with the objective to maintain suitable habitat for sage-grouse and minimize impacts to native grasses. ▪ Establish fuel breaks and/or green-strips in strategic locations to compartmentalize future fires thereby reducing the potential acres burned and fire risk to sage-grouse habitat. Strategically place fuel breaks where high fire risk coincides with sage-grouse habitat with the lowest potential for post-fire recovery (e.g., areas with low-to-moderate resistance and resilience). When designing fuel breaks, consider the following: 1) existing roads or utility corridors that could be widened with mowing, green-stripping, or black-stripping; 2) natural fuel breaks; 3) prevailing winds that may influence the placement of fuel breaks (e.g., prioritize east-to-west	(Prioritization within Priority Habitats) and III (Site-specific Management)

	roads or place on south side of road if only one side is mowed); 3) use of fire-resistant perennial species (e.g., crested wheatgrass or forage kochia) as an effective means to slow the spread of fire while preventing the establishment of non-native grasses. Monitor and maintain fuel breaks to prevent annual grass invasion in these disturbed areas. • Restrict motorized travel and ban campfires in sage-grouse habitat during high fire severity conditions to reduce the risk of accidental ignitions. • Reduce the risk of vehicle or human-caused wildfires and the spread of exotic species by planting perennial vegetation (e.g., green-strips) paralleling road rights-of-way • Take steps to address degraded sagebrush systems (as described in the conifer encroachment and invasive annual grasses sections above) to reduce the impacts of wildfire in sage-grouse habitat.	
	Focus fire *suppression* activities in prioritized sage-grouse habitat within the framework of the federal and state wildland fire policies. • Utilize trained Resource Advisors with sage-grouse expertise to assist in prioritizing fire suppression activities so that valuable sage-grouse habitat is protected. • Utilize mobile technology to ensure Incident Management Teams can access dynamically updated spatial data required to prioritize suppression to protect sage-grouse habitat. • Ensure coordination among the BLM, RFPAs and Rural Fire Protection Districts (RFPDs) to increase initial attack and extended attack capability and effectiveness. • After protection of life and property, suppression should prioritize sagebrush habitats within 4 miles of a lek. • Further prioritize suppression to prevent fire from entering valuable habitat (core and low density) that is most vulnerable to invasion by annual grasses (e.g., Wyoming big sagebrush communities, areas with low resistance and resilience) • Agencies should focus appropriate combination of resources to quickly arrive at new ignitions combined with effective suppression strategies supported by appropriate tactical resources, also known as Speed and Focus, a principle of fire suppression actions. • Re-allocate fire response resources (crews, equipment, etc.) to important sage-grouse habitats. Identify where resources are lacking and provide those resources to decrease response time to fires in sage-grouse habitats. • Retain unburned areas (including interior islands and patches between roads and the fire perimeter) of sage-grouse habitat unless there is a compelling safety, resource protection, or control objectives at risk. Consider the use of aircraft and mechanized equipment to protect these islands. This may require additional suppression (e.g., aircraft and mechanized equipment) and resources for holding and mop-up. Fire managers and Resource Advisors should proactively plan for and anticipate these needs early in the incident. • During fire suppression, judiciously use heavy equipment and limit brush removal to the level necessary to expeditiously extinguish the fire. Use	I (Large-scale Planning) and II (Prioritization within Priority Habitats) and III (Site-specific Management)

	existing fuel breaks, such as roads, utility corridors, or areas with fire-resistant vegetation to minimize fire spread. Establish additional defensible fire lines in areas where: 1) effectiveness is high; 2) fire risk is likely; and 3) negative impacts (fragmentation) are minimal. • Use direct attack tactics when it is safe and effective to reduce the amount of burned habitat. Direct attack supported by any available mechanized equipment (e.g., bulldozer, tractor with blade, aerial drops) is the most efficient at reducing the overall size of rangeland fires thereby keeping habitat intact. • To the extent possible, locate wildfire suppression facilities (e.g., base camps, spike camps, drop points, staging areas, heli-bases) in areas where physical disturbance to sage-grouse habitat can be minimized. Preferred areas for suppression facilities may include previously disturbed areas, grasslands, near roads/trails or in other areas where there is existing disturbance or minimal sagebrush cover.	
	Build capacity and *support planning and policies* so that state and federal agencies are best-equipped to prevent and suppress fires in sage-grouse habitat. • Support pre-fire planning activities that will ensure readiness and swift decision-making during the fire season. ▪ Compile greater sage-grouse information into state-wide tool boxes. Tool boxes will contain maps, listing of resource advisors, contact information, local guidance, and other relevant information for each District. ▪ Preload maps of sage-grouse core and low density habitat into all dispatch plans (e.g., Wild CAD, run-cards). ▪ Orient fire Duty Officers sage-grouse management objectives and core and low density habitat to prioritize in the event of a fire. ▪ Provide education to fire suppression personnel about the need and value of protecting sagebrush landscapes. ▪ Annually review District Fire Management Plans (Phase I) to incorporate new sage-grouse information (e.g., lek and habitat viability maps) and fire suppression resources (including location of fuel breaks, water sources, etc.) to ensure up-to-date information is available and distributed to fire suppression personnel for setting wildfire suppression priorities and initial attack planning. ▪ Train Resource Advisors to assist in prioritizing fire suppression activities and work with Incident Commanders and Incident Management Teams as appropriate. ▪ Ensure advance coordination among BLM, RFPA and RFPDs so that minimum personnel training and equipment standards are met. ▪ Conduct interagency training exercises with local, state, and federal agencies to ensure safety, coordination, communication, and effectiveness during fire management operations. • Support policies that promote integration across agencies and jurisdictions to provide seamless fire suppression during fires ▪ Implement policy changes that integrate and coordinate more fire suppression resources, such as Air National Guard Mobile Airborne	I (Large-scale Planning)

	Firefighting Units and Rangeland Fire Protection Associations (RFPA). ▪ Ensure advance coordination among BLM, RFPA and RFPDs so that minimum personnel training and equipment standards are met. • Build capacity so that agencies responsible for fire suppression have adequate resources to take appropriate actions. ▪ Identify funds to upgrade or construct additional airports that meet the requirements of single engine air tankers to shorten response and turn-around times for suppression aircraft. ▪ Identify funding to acquire additional required fire fighting resources; consider establishing new Incident Attack Centers in or adjacent to PACs. ▪ Identify existing water sources and strategically develop additional water sources in priority sage-grouse habitat with high wildfire risk that are > 7 miles from an existing source. Pursue development of water sources that will not increase mosquito breeding areas. ▪ Identify existing travel routes and primitive roads that if upgraded would minimally increase disturbance to sage-grouse habitat while affording decreased fire response time and reducing the need for cross-country travel during fire suppression.	
	Prioritize *post-fire rehabilitation* and ensure adequate resources are available for emergency stabilization and ongoing restoration activities to protect, enhance, or maintain sage-grouse habitat within core and to restore connectivity between core areas. • Prioritize proactive herbicide treatments as a prevention strategy in recently burned areas, particularly areas with low resistance and resilience that are proximal to valuable sage-grouse habitat. Prioritize sites within 4 miles of leks (active or pending) and sites < 2 miles from "key habitat" defined as areas with 75% breeding bird density and where sagebrush landcover is > 65%. • Prioritize post-fire rehabilitation restoration efforts in areas that are proximal to valuable sage-grouse habitat. Prioritize sites within 4 miles of leks (active or pending) and sites < 2 miles from "key habitat" defined as areas with 75% breeding bird density and where sagebrush landcover is > 65%. • Utilize best practice management techniques to prevent invasive annual grasses and restore burned areas as described in invasive annual grasses section above	II (Prioritization within Priority Habitats) and III (Site-specific Management)

Secondary Threats	Conservation Measures	Strategy Level	

Isolated/Small Size	Restore or enhance habitat by managing for appropriate vegetation composition and structure to benefit sage-grouse.		
	Identify seasonal habitats/ranges: ○ Identify limiting habitats (if any exist) for isolated or small populations, and for subpopulations (as described in Stiver et al. 2006); ○ Identify movement patterns between seasonal ranges; ○ Identify migratory status (1-stage, 2-stage, non-migratory)		
	Actively pursue opportunities to increase occupancy and connectivity between PACs. ○ Establish protocols for project proponents to aid in pre-construction planning and siting of development (infrastructure, etc.) to avoid PACs and key seasonal habitats; or site properly (when avoidance is not feasible) to minimize impact and reduce fragmentation in PACs and seasonal habitats.	I	
	Translocate sage-grouse from larger, more stable populations. ○ Avoid translocations without understanding the underlying genetic implications; ○ Use translocation only as a last resort to bolster small populations; ○ If translocations are implemented, identify best season (time of year) and appropriate gender and age class; ○ Implement monitoring of translocated sage-grouse to analyze efficacy of translocation efforts		
	Minimize risk of direct loss through collisions with vertical infrastructure on the landscape: ○ Conduct fence marking to reduce collision in area identified as high-risk (Stevens et al. 2012).		
	Apply strategic predator control to protect and maintain isolated small populations. ○ Develop predator control plans to identify predators and type of impact (direct mortality and/or nest predation) and prescribe manageable plan(s) or method(s) of control.		
Agricultural Conversion	Avoid sagebrush removal or manipulation in sage-grouse breeding or wintering habitats.	I, III	
	Avoid conversion of native rangeland to monotypic perennial grass seedings, cropland, and/or irrigated pasture.	III	

	Add shrubs, forbs, and native grasses to monotypic perennial grass stands through active or passive management.	III	
	Limit use of insecticides that reduce prey base or directly affect sage-grouse, especially in existing habitat and during lekking season.		
	Alter hay-cutting patterns to reduce incidental mortality.		
	Discourage the use Farm Bill policies and commodity programs that facilitate ongoing conversion of native habitats to marginal cropland.	III	
	Continue and expand incentive programs that support conservation of remaining sagebrush-steppe habitats. o Protect existing habitats on private lands through conservation agreements. o Provide incentives to avoid (or minimize) conversion of sage-grouse habitats to agriculture. o Enroll private lands in CCAAs	III	
	Develop criteria for set-aside programs which stop negative habitat impacts and promote the quality and quantity of sage-grouse habitat.	III	
	Develop and/or enforce state restrictions on agriculture conversion on state lands.		
	Work with counties and states to restrict and/or reduce agriculture conversion in planning and zoning efforts.		
	Evaluate whether past vegetation restoration applications in CRP, cropland, and large monocultural non-native grass plantings serve as suitable habitat.	III	
Energy	Avoid energy and other large-scale industrial development in PACs. Identify areas where leasing is not acceptable, or not acceptable without stipulations for surface occupancy that maintains sage-grouse habitats.	I	
	If development must occur in sage-grouse habitats due to existing rights and lack of reasonable alternative avoidance measures, the development should occur in the least suitable habitat for sage-grouse and be designed to ensure at a minimum that there are no detectable declines in sage-grouse population trends by implementing the following: o Reduce and maintain the density of energy structures below which there are not impacts to the function of sage-grouse habitats (as measured by no declines in sage-grouse use), or do not result in declines in sage-grouse populations within PACs; o Design development outside PACs to maintain populations within adjacent PACS and allow for connectivity among PACs;	I, II, III	

	○ Consolidate structures and infrastructure associated with energy development; ○ where feasible; ○ Reclamation of disturbance resulting from a proposed project should only be considered as mitigation for those impacts, not portrayed as minimization; ○ Design development to minimize tall structures (turbines, power lines), or other features associated with the development (e.g., noise for drilling or ongoing operations; Blickley et al. 2012; and predator subsidies: Howe et al. 2014, Lockyer, et al. 2013.); ○ Apply measures to deter predator perching and nesting on elevated structures. ○ Evaluate the need for permanent or seasonal road or area closures		
	Place seasonal and timing restrictions within 3 miles of occupied (or occupied pending) leks on surface-disturbing activities during breeding, nesting, and early brood-rearing season.	I	
	Reduce the density of the habitat disturbance across the landscape and at the PAC level: ○ Reduce cumulative disturbance in PACs – use of disturbance caps; ○ Utilize state tools to minimize disturbance; ○ Maintain disturbance activities within established limits of cumulative impacts.	I	
	Develop conservation agreements with energy companies to provide USFWS assurance in regards to how companies will be operating and protections that will be exercised.		
	Withdraw underperforming, under-developed leases.		
	Limit extensions of undeveloped leases.		
	Mitigate impacts to habitat from development of these features: ○ Create consistency in mitigation efforts for impacted populations and habitat(s). Establish consistent compensatory mitigation framework, as well as a conservation credit systems to mitigate for impacts from energy development in order to provide for no net loss of sage-grouse habitat in or near PACs; ○ Create mitigation plans for all development and habitat loss. ○ Engage in weed control efforts during pre- and post- project construction.	I, II, III	

	Evaluate the need for restoration of previously reclaimed infrastructure sites. Prioritize areas in need of additional restoration efforts and identify potential funding sources.	II, III	
Mining	Avoid mining activities and/or any associated facilities within occupied habitats, including seasonal habitats.	I	
	Avoid leasing in sage-grouse habitats until other suitable habitats can be restored to habitats used by sage-grouse, resulting in no net loss of habitat.	I	
	Prevent development of subsurface mineral rights through acquisition or conservation agreement.		
	Follow best management practices to limit impacts of mining on sage-grouse (e.g., road location and use, reclamation requirements, clustering disturbances, etc.), including operations and maintenance. o Establish a project footprint; o Establish the amount of habitat that needs to be mitigated for prior to further development; o Attempt to synchronize timelines for sage-grouse and mining development; o Employ time of day, seasonal restrictions near leks, nesting habitat; especially in PACs; o Restrict duration of construction for all mine development.		
	Follow ROW avoidance in priority sage-grouse habitat in or near PACs.		
	Reclamation plans (including reclamation of abandoned mines) should focus on restoring areas disturbed by mining and associated facilities to healthy sagebrush ecosystems, including evidence of use by sage-grouse. o Reclamation plans must have a realistic timeline, plan for potential need to multiple years of treatment, as well as monitoring until habitat is returned to functional status geared specifically for sage-grouse; o Plans must reduce the density of the habitat disturbance across the landscape and at the PAC level.	II, III	
	Implement on-site planning to avoid habitat disturbance o Reduction of cumulative disturbance in PACs – use of disturbance caps; o Use of state tools to minimize disturbance; o Maintain disturbance within established limits of cumulative impacts	I	

	Establish adequate state regulations, OSM oversight, and federal minimums.		
	Mitigate impacts to habitat from development of these features: o Create consistency in mitigation efforts for impacted populations and habitat(s); o Establish consistent compensatory mitigation framework, and well as a conservation credit systems to mitigate for impacts development in order to provide for no net loss of sage-grouse habitat in or near PACs' o Create mitigation plans for all development and habitat loss.	I, III	
	Support changes in state regulation to change standards for reclamation.		
	Evaluate the need for restoration of previously reclaimed infrastructure sites. Prioritize areas in need of additional restoration efforts and identify potential funding sources.		
Infrastructure	Avoid construction of these features in sage-grouse habitat, both within and outside of PACs.	I	
	If avoidance is not possible, consolidate new structures with existing features and/or preclude development of new structures within locally important sage-grouse habitats.		
	Limit or re-locate right-of-way permits in PACs.	I	
	MET towers should be constructed without guy wires; if guy wires are necessary then the wires should be marked with anti-strike devices.		
	Convert generator or windmill powered pumps (noise) to solar, when economically feasible.		
	Avoid installation of compressor stations in PACs or other sage-grouse habitat where sage-grouse would be affected by noise and operation activities.	I	
	All commercial pipelines should be buried and habitat that is disturbed needs to be reclaimed with current and future emphasis placed on suppression of non-native invasive plant species.	II, III	
	Evaluate and take advantage of opportunities to remove, bury, or modify new and existing power lines in PACs. Where possible cooperate with local utilities to retrofit power lines to reduce or eliminate nesting (e.g., ravens) and perching by avian predators.	I	

	Remove transmission lines and roads that are duplicative or are not functional.	
	Place infrastructure in already disturbed locations where habitat has not been restored, especially in existing utility or transportation corridors.	
	Infrastructure corridors should be designed and maintained to preclude introduction of invasive plant species.	
	Remove or decommission non-designated roads within sagebrush habitats.	
	Limit motorized travel to designated roads.	
	Establish speed limits to reduce vehicle/wildlife collisions or design roads to be driven at slower speeds.	
	Evaluate the need for permanent or seasonal road or area closures.	
	Limit route construction to realignments of existing designated routes, particularly if that realignment has a minimal impact on sage-grouse habitat, eliminates the need to construct a new road, or is necessary for motorist safety.	
	Use existing roads or realignments to access valid existing rights that are not yet developed. If valid existing rights cannot be accessed via existing roads, then build any new road constructed to the absolute minimum standard necessary, and add the surface disturbance to the total disturbance in the PAC.	
	When re-seeding roads use appropriate seed mixes and consider the use of transplanted sagebrush.	III
	Habitat function lost from placement of infrastructure should be replaced.	
	Restore habitat that may improve connectivity to disturbed and/or fragmented habitat as a result of surface disturbing activities. o Where feasible, modify or remove structures that are currently contributing to negative impacts to either sage-grouse or their habitats (e.g., fencing, abandoned and/or inactive power lines, roads, in-active wells, etc.).	III
	Mitigate impacts to habitat from development of these features.	

	Evaluate the need for restoration of previously reclaimed infrastructure sites. Prioritize areas in need of additional restoration efforts and identify potential funding sources.	II, III	
Free-Roaming Equids	Develop, implement, and enforce adequate regulatory mechanisms to protect sage-grouse habitat from negative influences of grazing by free-roaming equids.		• •
	Establish consistent methodology for surveys o Conduct counts and surveys using a statistically based methodology; o Obtain updated population estimates		
	Document and report habitat damage on private lands from free-roaming equids.	III	
	Manage free-roaming equids at levels that allow native sagebrush vegetative communities to achieve proper functioning condition for riparian areas (PFC) and rangeland health standards for uplands (RHS). Similar measures should be implemented on non-federal lands.	III	
	Determine if the current appropriate management levels (AMLs) maintain suitable sage-grouse habitat parameters. Manage for population levels within established AMLs within horse management areas (HMAs) on federal lands. Current AMLs should be adjusted for drought conditions.	III	
	Prioritize funding for wild horse gathers in PACs that are over AML.	I	
	Prioritize wild horse and burro gathers in PACs, unless removals are necessary in other areas to prevent catastrophic environmental issues, including herd health impacts.	I	
	Within PACs, develop or amend herd management area plans (HMAPs) to incorporate sage-grouse habitat objectives and management considerations for all HMAs.	I	
	Consider the use of permanent sterilization as a method to manage herd sizes.		
Recreation	Avoid development of recreational facilities (e.g., new roads and trails, campgrounds) in sage-grouse habitats unless such developments would create a benefit to sage-grouse conservation. o Avoid creating new trails in sagebrush habitat (PACs) and/or near leks (minimally 0.6 miles from existing leks); o When feasible, re-route trails outside of PACs and reclaim old trails;	I	Repo seas

	○ Establish 3 mile disturbance buffer in nesting habitat in PACs	
	Protect existing leks and provide secure sage-grouse breeding habitat with minimal disturbance and harassment through seasonal closures of roads and areas.	I
	Assist with developing public viewing areas of sage-grouse leks with oversight from ODFW and land management agencies to minimize disturbance. Encourage local communities to develop and implement managed lek viewing opportunities.	
	Develop and implement lek-viewing protocol for guidance in managing lek viewing activities to minimize the impacts to sage-grouse (e.g., monitoring visitors to leks and providing an opportunity for the public to view leks without disturbing the birds by providing viewing blinds, defining parking areas, etc.) ○ Encourage managed lek viewing on private lands as a revenue source for private landowners; ○ Educate the public about ethical viewing and photography of sage-grouse; ○ Educate commercial bird watching tour guides and photographers about ethical viewing and photography of sage-grouse ○ As appropriate, encourage local volunteers (e.g., Adopt-a-Lek Program) to assist with lek counts to increase educational opportunities. Ensure that all volunteers are trained about the sensitivity of lek location information.	I
	OHV use should be restricted to areas 2 miles from leks during the breeding season except within designated OHV recreation areas.	I
	OHVs should be restricted to on-trail or on–road use during the nesting season (1 March – 30 June) in areas known to be occupied by sage-grouse.	I
	Designate OHV areas outside of PACs.	I
	Educate OHV users on how to responsibly use OHVs while minimizing adverse effects on public land resources, including sage-grouse habitat in or near PACs.	I
	Facilities (e.g., kiosks, toilets, signs, etc.) should be constructed at least 2 miles from leks to minimize disturbance during the breeding season.	I
	Close rangelands that are highly susceptible to fire to OHV use during the fire season.	II

	Support enforcement of regulations		
Urbanization	Retain all remaining large intact sagebrush patches, particularly at low elevations.	I, III	
	Avoid and minimize habitat loss and fragmentation of sage-grouse habitat, especially in contiguous tracts of sagebrush. o Use of strategic placement of development and site new development outside of PACs; o Work with counties to adjust zoning regulations; specifically a reduction of construction, lot size, subdivision size, and general amount of subdivisions in occupied sage-grouse habitat, and PACs; o Require site planning to account for consolidation of infrastructure; o Attempt to create easements in lieu of development with land owners to decrease the amount of housing and anthropogenic infrastructure development on the landscape.	I, III	
	Do not relinquish public lands for the purpose of urban development in priority sage-grouse habitat.		
	Complete land exchanges for additional or more contiguous public ownership of PACs. o Acquire habitat through land swaps, conservation leases, and/or incentive-based programs.	I	
	Consolidate infrastructure that supports urban development.		
	Do not allow landfills in sage-grouse habitats or within 5 km of sage-grouse habitats.	I	
	Provide incentives to maintain large tracts of private lands that provide habitat for sage-grouse including but not limited to: o Pursue and support policies that keep large, intact, working ranches in business; o Developing habitat conservation plans; o Developing conservation easements or leases; o Land swaps		
	Mitigate for unavoidable impacts.		

Other Threats	Conservation Measures	Strategy Level	
Drought	Utilize adaptive management to adjust levels and season of livestock grazing during drought conditions to maintain suitable sage-grouse habitat. These adaptive management measures may include: ○ Implementing management changes, such as grazing rest, deferment, rotation, or other changes designed to maintain long-term vegetation health for sage-grouse; ○ Developing grass banks for use during drought conditions; ○ Developing additional water sources for livestock and sage-grouse; ○ Employing other vegetation management to ensure long-term plant community health.		
	Conduct additional monitoring and evaluation during drought.		
	Focus post-drought management on vegetation recover (perennial grasses, forbs, shrubs).		
	Develop springs, wells, and other water sources, in appropriate sage-grouse habitats, to provide reliable water and forb/insect production during drought conditions. Consider appropriate water development design to reduce WNv risk to sage-grouse. Where appropriate, consider fencing to protect areas for sage-grouse use.		
	Develop grass banks for livestock producers to grazing during extreme drought conditions.		
West Nile Virus	Monitor sage-grouse and other species for presence of WNv; coordinate this effort with other research and management activities.		
	Report observations of dead or sick sage-grouse or other bird deaths that could be attributed to disease or parasites to responsible agencies within 48 hours.		
	When developing or modifying water developments, use best management practices to mitigate potential impacts from WNv (Clark et al. 2006, Doherty 2007, Walker et al. 2007b, Walker and Naugle 2011) and encourage the design of water development structures to minimize WNv risk to sage-grouse		
	Mitigate water sources that provide breeding habitat for mosquitoes: ○ Change irrigation techniques from flood to sprinkler systems; ○ Control water overflow		

	Cooperate with responsible agencies to implement feasible mosquito control, which may include: o Minimizing unnecessary standing water that could be used as mosquito breeding grounds within sage-grouse habitat; o Use appropriate EPA-regulated larvicides and/or adulticide in areas that mosquito habitat cannot be reduced; o Evaluate the effectiveness of spraying for adult mosquitoes, and consider using mosquito specific control measures.		
Catastrophic Flooding	Utilize adaptive management based on evaluation of degree of flood impact. Adjust levels and season of livestock grazing after a catastrophic flood event to maintain and/or rehabilitate suitable sage-grouse habitat.		
	Re-evaluate stream segments to identify critical areas and changes in ecological state and identify measures that could enhance stream function.		
Predation	Minimize attractants for corvids, raptors, and coyotes (i.e., dump sites, bone piles, etc.) during the breeding season in the vicinity of a lek.		
	Discourage raven nesting, roosting, perching in or near PACs.		
	Limit construction of tall structures, including fences and commercial wind or cell towers, in PACs.		
	Remove encroaching trees within at least 100 m of occupied sage-grouse leks and other habitats (e.g., nesting, brood-rearing, and wintering).		
	Convert electrically (AC) powered pumps or wind mills on agricultural lands to solar.		
	Fit transmission towers with anti-perch devices.		
	Utilize predator management programs when documented as a limiting factor on sage-grouse populations. If poor habitat conditions are causing a predator problem, habitat conditions should be addressed first if possible, jointly, or shortly after predator control. Predator management includes lethal and non-lethal methods (see Hagen 2011). Lethal control should not be implemented alone but in conjunction with non-lethal methods where implicated.		
	When needed, pursue take permits for corvids from USFWS under the Migratory Bird Treaty Act.		
	When downward population trends and nesting success are detected in sage-grouse habitat in or near PACs, initiate predator surveys and identify responsible predator species to target and implement an effective predator control effort.		

	Monitor effects of predator control to determine causal relations with sage-grouse survival and adapt control strategies accordingly.		
	Initiate local or regional predator control programs based on biological assessments appropriate to local conditions.		
	When ravens have been identified as negatively affecting a population, implement a predator control program to reduce transient raven populations for increased sage-grouse nest and chick survival. Lethal control should not be implemented alone but in conjunction with non-lethal methods where implicated.		
Insecticides	Work with responsible agencies to plan and design control efforts to avoid harming sage-grouse and non-target species. If possible, contract with Animal and Plant Health Inspection Service (APHIS) and/or Oregon Department of Agriculture (ODA) for all insecticide treatments.		
	Avoid spraying treatment areas in May and June (or as appropriate to local circumstances) to provide insect availability for early development of sage-grouse chicks.		
	Use approved chemicals with the lowest toxicity to sage-grouse that still provide effective control. Avoid carboryl/malathion; use dimilin if at all possible.		
	When feasible and as outlined by APHIS or ODA, use Reduced Area/Agent Treatments (RAAT) to control grasshoppers, which focuses control efforts along strips to avoid spraying entire fields.		
Fences	In consultation with permittees and/or private landowners, identify and remove unnecessary fences in PACs. Facilitate the removal of abandoned fences within sage-grouse habitat.		
	Mark or remove fences that are in high risk areas for collision (Stevens et al. 2012) with permanent flagging or other suitable devise to reduce sage-grouse collisions on flat to gently rolling terrain in areas of moderate to high fence densities (i.e., more than 1 km of fence per km^2) located within 2 km of occupied leks.		
	Placement of new fences and livestock management facilities (including corrals, loading facilities, water tanks, and windmills) should consider their impacts on sage-grouse and, to the extent practicable, be placed at least 1 km from occupied leks (Stevens et al. 2012).		

Climate Change	For post-fire and restoration seeding, consider using seed collections from warmer component within a native species current range (Kramer and Havens 2009) to account for potential changes in climate (Miller et al. 2011).		
Sagebrush Defoliator Moth			
Noxious Weeds			

Cross-Cutting Issues	Conservation Measures	Strategy Level	
Sagebrush Elimination	Review and, where warranted, revise government programs that could incentivize or cost share sagebrush elimination.		•
	Identify Winter Concentration Areas (WCA) as well as 'Winter Refuge' areas and/or habitat for harsh winters prior to any sagebrush treatments; o Ensure geospatial information is available, including delineated WCAs.	III	•
	Avoid mechanical or chemical removal of sagebrush or manipulation in sage-grouse breeding or wintering habitats, with special attention given to large expanses of sagebrush, especially in PACs.	I, III	•
	Avoid using fire to treat sagebrush habitat in <12" precipitation zones/lower elevations and/or wintering habitats. o Reduce the use of prescriptive fire in sagebrush ecosystems that have decreased/declined in resiliency due to annual grass invasion.	II	•
	Sagebrush conversion on public lands (e.g., crested wheatgrass seedings) should be avoided if the sole purpose is to increase livestock forage.	III	
	Restore or enhance habitat for sage-grouse by managing for appropriate vegetation composition and structure. o Maintain a balance between nesting, brood-rearing, and winter habitat.	III	
	Incorporate incentive-based programs (Farm Bill, CRP, NRCS-SGI) for maintaining habitat in PACs.	I	

	Enroll landowners in conservation easements to protect existing sage-grouse habitat, with a focus in PACs	I	
	Mitigate for unavoidable impacts.		
Grazing	Develop and/or use a written grazing management plan to maintain or enhance the existing plant community to ensure a community suitable as sage-grouse habitat. If available, use approved ecological site descriptions and indicators of suitable seasonal habitat to set realistic goals for the plant community.	III	
	Reduce disruptive activities one hour after sunset to two hours after sunrise from March 1 through June 30 within 0.6 miles of the perimeter of occupied leks, unless brief occupancy is essential for routine ranch activities (e.g., herding or trailing livestock into or out of an area at the beginning or end of the grazing season). Examples of disruptive activities may include noise, human foot or vehicle traffic, or other human presence.	I	
	Reduce OHV travel in nesting habitat from March 1 through June 30 unless travel is essential for routine ranch activities (including but not limited to: repairing fence, "doctoring" livestock, finding lost livestock, and irrigation activities).	I	
	The timing and location of livestock turnout and trailing should not contribute to livestock concentrations on leks during the sage-grouse breeding season.	I	
	Avoid supplemental winter feeding of livestock in occupied habitat unless it is part of a plan to improve ecological health or to create mosaics in dense sagebrush stands that are needed for optimum sage-grouse habitat, or is needed for emergency care of livestock.	III	
	Range management structures should be designed and placed to be neutral or beneficial to sage-grouse. Structures that are currently contributing to negative impacts to either sage-grouse or their habitats should be removed or modified to remove the threat.	I	
	In consultation with permittees and/or private landowners, change salting and watering locations to improve livestock distribution and maintain or enhance sage-grouse habitat quality.		
	Reduce physical disturbance to sage-grouse leks from livestock by placing salt, water, or mineral supplements >0.6 miles from an occupied lek.	I	
	New construction of livestock facilities (livestock troughs, fences, corrals,	I	

	handling facilities, "dusting bags," etc.) should be at least 0.6 miles from leks to avoid concentration of livestock, collision hazards to flying birds, or avian predator perches.		
	Identify areas that may contain fences that pose the highest threat to sage-grouse, remove or mark these fences with anti-strike markers or other agreed upon visual markers (Stevens 2011). ○ Fences within 1 mile of an occupied lek or known season use area should be marked with anti-strike markers.	I	
	Manage grazing in riparian areas to ensure bank stability, survival of deep-rooted riparian vegetation, floodplain connectivity, and stream functionality.	III	
	Develop additional water sources where needed for wildlife and livestock, to reduce impacts to riparian, wetland, playas, and wet meadow areas important to sage-grouse.		
	Spring developments, both old and new, should be constructed and/or modified to maintain their free-flowing natural and wet meadow characteristics.		
	Ensure wildlife accessibility to water and install escape ramps in all new and existing water troughs.		
	Coordinate grazing management strategies across public and private lands so operations with deeded/BLM allotments can be planned as single units.		Worl
	Inform and educate affected grazing permittees regarding sage-grouse habitat needs and conservation measures.		
	Manage for the maintenance and, where necessary, restoration of healthy perennial grass (Blank and Morgan 2012) and sagebrush vegetative communities.	III	
	Ensure that allotments meet ecological potential and wildlife habitat requirements; and, ensure that the health and diversity of the native perennial grass community is consistent with the ecological site.	III	
	Incorporate sage-grouse habitat needs or habitat characteristics into relevant resources and allotment management plans, including the desired conditions (e.g., consistent with the HAF or with values adjusted for regional conditions) with the understanding that these desired conditions may not be fully achievable: (i) due to the existing ecological condition, ecological		

	potential or the existing vegetation; or (ii) due to causal events unrelated to existing livestock grazing.	
	Conduct habitat assessments and, where necessary, determine factors causing any failure to achieve the habitat characteristics. Make adjustments as appropriate. o Given limited agency resources, prioritize completion of land health assessments and processing grazing permits within PACs. Focus on allotments that have the best opportunities for conserving, enhancing, or restoring habitat for sage-grouse and then sage-grouse habitats adjacent to PACs.	I, III
	Follow best management practices for grazing. Implement management actions to modify grazing management to meet seasonal sage-grouse habitat requirements, including: o Season or timing of use; o Numbers of livestock (includes temporary non-use or livestock removal); o Distribution of livestock use; o Intensity of use; o Type of livestock	I, III
	Assessment of grazing impacts on sage-grouse should be based on that portion of the pasture which is known to be sage-grouse habitat and will not be based on "average use" throughout the entire pasture.	
	Where livestock grazing management results in forage use level detrimental to habitat quality, it is recommended changes in grazing management be made as soon as possible to recover habitat quality. Adjustments to grazing management should be conducted in accordance with regulations of responsible land management agency. Adaptive management that should be considered includes: o Changes in salting and/or watering locations; o Change in the season, fencing, duration, or intensity of use; o Reducing grazing use levels; o Extended livestock non-use until specific local objectives are met as identified by the LIT or authorizing officer on BLM-administered lands.	III
	Limit grazing in PACs after fire, drought, or other impacts.	I
	During drought periods, prioritize evaluating effects of the drought in PACs relative to their needs for food and cover. Since there is typically a lag in vegetation recovery following drought (Thurow and Taylor 1999, Cagney et	I, II, III

	al. 2010), ensure that post-drought management allows for vegetation recovery that meets sage-grouse needs in PACs		
	Create grass banks established for drought conditions to provide rest for over-utilized rangelands and allotments to assure sufficient residual cover that may improve nesting conditions.		
	Create new and incorporate existing incentive-based programs to create and/or improve important seasonal habitat (lek, nesting, brood-rearing, wintering). o Provide land-owners with opportunities to enroll in CCAAs.	III	
	Assist LITs in developing a process to evaluate management options and set priorities for funding habitat improvement projects.	II, III	
	Identify opportunities to compensate landowners for the cost of implementation of conservation measures and facilitating practices to benefit sage-grouse and their habitats on private lands (e.g., grazing banks, conservation easements, and other options).		
Resilience & Restoration	Identify and secure funding to support post-fire restoration efforts in sage-grouse habitat.		
	Evaluate the need for rehabilitation based on pre-fire plant community health, fire intensity, and proximity to invasive annual species (e.g., cheatgrass, medusahead).	II, III	
	Allow for natural post-fire vegetation recovery where healthy pre-fire plant communities exist and observed fire intensity indicates natural recovery and invasion of non-natives unlikely. Timing of livestock grazing following wildfire will depend on response of desirable vegetation.	II, III	
	Following wildfire, rehabilitate where natural recovery is unlikely, due to fire intensity and/or proximity to invasive annual species, and where feasible, practicable, and if adequate funding is available. Where annual grasses are prevalent, plant aggressive fire-resistant perennial species to stabilize the site and allow for long-term recovery of sagebrush and other native species.	II, III	
	If seeding is necessary, use appropriate mixtures of sagebrush, native grasses and forbs, and appropriate non-native perennials that will increase the probability of recovering ecological processes and habitat features of the site.	II, III	
	Sagebrush should be included in fire rehabilitation seeding mixtures or as seedlings as often as possible.	III	

	When re-seeding an area in sage-grouse habitat, use certified "weed-free" seeds.		
	When dealing with harsh sites or if the supply of native plant and sagebrush seed is limited, crested wheatgrass can be planted in lieu of native species or as a mixture with native species, because it is readily available, can successfully compete with cheatgrass, and establishes itself more readily than natives. o If crested wheatgrass is planted initially or in lieu of native species, specific efforts or plans are needed to interseed native grasses, forbs, and shrubs in the rehabilitation area. Interseeding would not be necessary unless the initial seed mix contains >2 lbs/ac of crested wheatgrass.		
	Apply available seed where it is most likely to be effective and to areas of highest need.		
	Ensure sage-grouse habitat needs are considered in restoration efforts including managing for the range of variation, as appropriate for the local area.		
	In the case of limited resources, prioritize PACs over habitats outside of PACs for restoration efforts.	I	
	Following wildfire, rehabilitate firelines and/or trails caused by equipment use during fire suppression activities in sage-grouse habitat.		
	Consider re-allocation of funding from other habitat work to restoration of sage-grouse habitats affected by fire.		
	Address shortage of locally-adapted seed and storage capabilities and encourage development of native seed banks for use in restoration efforts.		
	Develop grass banks to provide rest for over-utilized rangelands and allotments to assure sufficient residual cover that may improve nesting conditions.		
	Replace fence (or temporarily fence) where needed to protect recovering habitat post-fire and, where appropriate, mark these fences with anti-strike markers or other agreed upon visual markers.		
	Power-wash all vehicles and equipment involved in fuels management activities, including engines, water tenders, personal vehicles, and ATVS, prior to entering the area to minimize the introduction of undesirable and/or invasive plant species.		

	Conduct post-treatment monitoring to assess if rehabilitation techniques have been successful and to determine if rehabilitation efforts need to be repeated if initial attempts fail.	III	
	Monitor and control invasive vegetation post-wildfire for at least three years.	III	
	Evaluate whether past vegetation restoration applications in wildfire sites serve as suitable sage-grouse habitat.	III	