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# OREGON WOLF CONSERVATION AND MANAGEMENT PLAN



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**OREGON DEPARTMENT OF  
FISH AND WILDLIFE**

**DRAFT, APRIL 2019**

**EXECUTIVE SUMMARY**  
**(April 2019)**

The *Oregon Wolf Conservation and Management Plan* (Plan) was first adopted in 2005 and updated in 2010. This update, which began in March 2016, is the result of a thorough, multi-year evaluation of the Plan and included a facilitated stakeholder process. Some of the changes contained within this Plan are general updates and reorganization of content. Other changes are more substantive in nature, and include management improvements based on information gained over years of wolf management in Oregon. In general, changes made in this Plan include: 1) updates to base information (i.e., status, population, distribution, etc.), 2) new science related to the biology and management of wolves, and 3) management improvements based on information gained through years of wolf management in Oregon. Chapter II (Wolf Conservation and Monitoring) includes detailed information on the three phases of wolf management and discusses the state’s two wolf management zones. Chapter III (Wolf as Special Status Game Mammal) is a new chapter comprised of content from the previous plan and addresses the Special Status Game Mammal definition and conditions of that definition. Chapter IV (Wolf-Livestock Conflicts) includes information on the use of non-lethal deterrents, the use of controlled take in certain situations, and expands livestock producer options for investigating potential wolf depredations of livestock. Chapter V (Wolf-Ungulate Interactions, and Interactions With Other Carnivores) addresses interactions between and impacts of wolves and other wildlife species. Chapter VI (Wolf-Human Interactions) addresses the types of wolf-human interactions and strategies for reducing negative situations. The final chapters address strategies for plan implementation and future direction and include Chapter VII: Information and Education, Chapter VIII: Reporting and Evaluation, IX: Research and Information Management, and Chapter X: Budget for Implementation.

Readers should note that while some sections of earlier Oregon Fish and Wildlife Commission (Commission) adopted Plans are condensed or combined in this 2019 Plan, earlier adopted Plans will continue to be made available on the ODFW wolf website at <http://www.dfw.state.or.us/Wolves/index.asp>.

The Plan’s goal remains the same:

**To ensure the conservation of gray wolves as required by Oregon law while protecting the social and economic interests of all Oregonians.**

The 2005 Plan was originally crafted using an adaptive approach that requires periodic and formal evaluation using information gained through the actual management of wolves. The Oregon Department of Fish and Wildlife (ODFW) considered the following principles while reviewing and updating the Plan.

- Adhere to the factors included in the 2015 delisting analysis when considering any proposed changes.
- Maintain conservation focus for wolves in all population phases.
- Maintain flexible management options of the 2005 Plan when addressing conflict as the wolf population increases.

- 1 • Address ODFW personnel and budget limitations when evaluating future commitments.
- 2 • Develop an effective workload sharing program with the U.S. Fish and Wildlife Service
- 3 (USFWS) to monitor expanding wolf populations and address wolf-livestock conflicts in the
- 4 federally listed portion of Oregon.

5  
6 Gray Wolves (*Canis lupus*) were listed as endangered under the federal Endangered Species Act  
7 (ESA) and the state ESA when the Plan was updated in 2010. Gray wolves were establishing in  
8 northeastern Oregon at that time; today, the status of wolves in the state is more complex. In 2011,  
9 the USFWS delisted the gray wolf from the federal ESA east of Oregon Highways 395, 78, and 95 as  
10 part of the larger Northern Rocky Mountain Distinct Population Segment; wolves west of this  
11 boundary remained federally listed. In January 2015, the Oregon conservation population objective  
12 was reached in the East Wolf Management Zone. The Commission initiated a biological status  
13 review to determine if the species required continued listing under the Oregon ESA. That review  
14 led to the delisting of wolves in Oregon in November 2015. While these changes represent  
15 landmarks in the modern history of the gray wolf, this Plan strives to provide continued  
16 conservation and effective management of wolves into the future.

17 The objectives and strategies contained within this Plan are intended to serve multiple functions into  
18 the future – they provide management guidance to address wolf-livestock conflicts, monitor wolf  
19 population and health factors, evaluate wolf interactions with native ungulate and other carnivore  
20 populations, conduct wolf-related research, and address wolf-human interactions. The Plan also  
21 identifies potential conservation threats for managers to consider when considering a number of  
22 management activities. While Oregon’s wolf population is predicted to continue to grow and  
23 expand its distribution, it is unclear at this time what the future population and specific distribution  
24 will be. This Plan contains strategies which direct ODFW to develop detailed and predictive  
25 population models which will improve understanding of potential occurrence, habitat suitability,  
26 potential wolf range, and will inform the development of future population and distribution goals.

27 Wolves have reached Phase III population levels in eastern Oregon, but the state’s wolf population  
28 is still relatively small at this time. Wolves occur in both eastern Oregon forested areas, and the  
29 forests of the Cascade Mountains. However, the extent they will successfully expand into the  
30 Oregon coast range is undetermined. This Plan strives to provide a framework by which the  
31 management of this species may, at some point in the future, transition to a management approach  
32 similar to other wildlife in Oregon, while continuing to recognize the unique history of the species.

**OREGON WOLF CONSERVATION AND MANAGEMENT PLAN**

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17

## I. INTRODUCTION

### A. Background

In 1999, Wolf B-45, a radio-collared female from Idaho, was the first wolf from the reintroduced Idaho population known to have travelled to Oregon. One of Oregon’s most famous wolves, it was later captured by the U.S. Fish and Wildlife Service near the Middle Fork of the John Day River and returned to Idaho. Shortly after, two other wolves which originated from the Idaho reintroduced population were found dead – in May 2000 a radio-collared male wolf was struck by a vehicle south of Baker City, and in October 2000 an uncollared male wolf was found shot between Ukiah and Pendleton.

The news that wolves were back in Oregon sparked intense interest and heated debates across the state, and prompted Oregon Fish and Wildlife Commission (Commission) to initiate development of a state Wolf Conservation and Management Plan (Plan). They appointed a 14-member committee to oversee the work and, over a three-year period, the Plan was drafted with input from a wide variety of stakeholders and the public.

When the Plan was first adopted in 2005, there were no known wolves in the state. In 2008, the first modern-day reproduction by wolves was documented in Oregon when pups were discovered in the Wenaha Wildlife Management Unit (WMU) in northeastern Oregon. By the end of 2011, the wolf population had grown to 29 known wolves, including four packs and one breeding pair. A pack is defined as a group of four or more wolves traveling together in winter and a breeding pair is an adult male and an adult female wolf with at least two pups that survived to December 31 of the year of their birth. The population continued to increase and in 2013 a minimum wolf population of 64 wolves in 8 packs was documented, including 4 breeding pairs. The most recent completed surveys (2018) documented a statewide minimum population of 137 wolves, including 16 packs and 15 breeding pairs. Much has changed since the Plan was originally written. In 2011, the gray wolf was delisted from the Federal Endangered Species Act in the eastern-most portion of the state and in 2015, wolves were delisted from the Oregon ESA statewide. This Plan, however, continues to provide for conservation and management of wolves into the future.

This Plan was crafted using an adaptive management approach and requires regular reporting to the Commission and a formal evaluation every five years. In 2010, the Plan was reviewed and updated. In 2013, the Plan and associated Rule were modified as a result of litigation arbitration and new legislation. The 2015 evaluation was delayed as the Commission deliberated whether to remove the gray wolf from the Oregon List of Endangered Species. The current Plan evaluation and review began in March of 2016 and this document is a result of that review.

### B. History of Wolves in Oregon

Gray wolves are native to Oregon and their existence in the state is documented through archeological records; Native American accounts; journals and diaries of early explorers and pioneers; museum specimens; wolf bounty records; and various other books and reports. Historical accounts point to a relatively wide distribution of wolves, although their abundance varied from

1 place to place. The following written accounts (Young and Goldman 1944, Young and Goldman  
2 1946) offer interesting observations of wolves at the time of westward expansion:

- 3 • “...(wolves) are exceedingly numerous in Oregon and Washington Territories, from the  
4 Cascades to the Rocky Mountain Divide.” George Suckley, expedition Naturalist, 1853-55.
- 5 • “...the wolves are very numerous in this country and exceedingly troublesome.” Mr.  
6 Drayton, Wilkes Expedition, vicinity of Fort Walla Walla, 1841.
- 7 • Lewis and Clark noted that seven elk killed by expedition hunters were “...untouched by the  
8 wolves, of which indeed there are but a few in this country.” Lewis and Clark, winter of  
9 1805-06, Fort Clatsop area, near the mouth of the Columbia River.

10  
11 Additional wolf location information was reported by biologist Vernon Bailey (1936):

- 12 • “...in 1834 Wyeth reported several (wolves) killed along the Deschutes River.”
- 13 • “...in 1835 Townsend secured the type of this subspecies near Fort Vancouver just north of  
14 the Columbia River.”
- 15 • “...in 1854 Suckley collected (wolf) specimens near The Dalles.”
- 16 • “...in 1897 Captain Applegate reported them (wolves) formerly common, but at that time  
17 extremely rare in the southern Cascade region.”
- 18 • “...Jewett reports one large male wolf taken...August 20, 1930, near Balm Mountain on the  
19 Umpqua National Forest.”
- 20 • “...another old male wolf taken (1930)...on the shore of Crescent Lake in Klamath County.”
- 21 • “...two other wolves were killed in Douglas County and one in Lane County during 1930,  
22 and one near McKenzie Bridge in Lane County in 1931.”

23  
24 As more people moved west and wild prey populations became depleted, stockowners found it  
25 necessary to protect their livestock from carnivores, and ultimately, wolves were extirpated.  
26 Governments and bounties played a role, and the first wolf bounty in the Oregon Territory was  
27 established in 1843 at an Oregon Wolf Association meeting in the Willamette Valley. The bounty for  
28 a large wolf was \$3 and was paid from “subscriptions” to the association. In 1913, the Oregon State  
29 Game Commission offered a \$20 wolf bounty in addition to the regular \$5 paid by the state at the  
30 time. From October 1, 1913 through May 10, 1914, payments were made on wolves in Oregon: 10  
31 in Douglas County; 6 in Crook County; 6 in Clackamas County; 6 in Linn County; and 1 in Lane  
32 County.<sup>1</sup> From 1913-1946, 393 wolves were presented for payment in Oregon (Olterman and Verts  
33 1972). Many of these wolves were taken prior to the mid-1930s—no more than two wolves per year  
34 were bountied after 1937. The last records of wolves submitted for bounty in Oregon were in 1946  
35 for an animal killed in the Umpqua National Forest in southwest Oregon<sup>2</sup>, and in 1947 from a  
36 person in Florence Oregon (collection location unknown).<sup>3</sup>

37  
38 The first major work on the state’s mammals, *The Mammals and Life Zones of Oregon*, described wolves  
39 as present in most timbered areas of Oregon (Bailey 1936). The author considered wolves to be  
40 most common in western Oregon, from the western foothills of the Cascade Range to the Coast.  
41 This observation may have been influenced by the distribution of the human population rather than

---

<sup>1</sup> From the Oregon Sportsman 2 (6):19, 1914, as quoted in Bailey 1936.

<sup>2</sup> OSGC Annual Game Report 1947.

<sup>3</sup> Oregon bounty ledger book 1946-1947, as referenced in Robinson, M. J. 2005. *Predatory Bureaucracy: The Extermination of Wolves and the Transformation of the West*. University Press of Colorado.

1 directly related to the abundance of wolves. Information regarding wolves from other locations in  
2 Oregon where habitat existed may not have been available.

3  
4 In a special report on endangered mammals of Oregon, 80 wolf specimens were located in various  
5 museums and private collections (Olterman and Verts 1972). The authors stated "...most specimens  
6 were collected from the western slope of the Cascade Mountains ... This distribution is not  
7 representative of the range originally occupied by the wolf in the state because the species probably  
8 was eliminated from some areas before 1913 when specimens were first preserved." At the time of  
9 their report, they believed the wolf to be extirpated from the state and the absence of populations in  
10 neighboring states to preclude natural immigration or re-establishment.

11  
12 A report compiled in 1996 stated that no authentic gray wolf records were known between 1946 and  
13 1974 (Marshall et al. 1996). During the period 1974-1980, four records of wolves were noted,  
14 although the author considered at least two of these records to be tame wolves or wolf-dog hybrids.

15  
16 During the second half of the 20<sup>th</sup> century, however, attitudes toward wolves in North American  
17 changed significantly and strong support for wolf conservation was seen throughout the United  
18 States (Mech and Boitani 2003). Socio-cultural influences, including the voice of conservationists  
19 such as Aldo Leopold, provided ecological perspectives and support for wolves.

20  
21 These changing wildlife values were embodied in the federal ESA of 1973 and the Oregon ESA of  
22 1987. Twelve years after the Oregon ESA was enacted, the first wild gray wolf was documented in  
23 the state. It came as a result of the USFWS's Northern Rocky Mountain Wolf Recovery Plan – the  
24 implementation of that plan resulted in the relocation of 66 gray wolves from Canada into central  
25 Idaho and Yellowstone National Park in 1995 and 1996.

## 26 27 **C. Biology and Ecology**

28  
29 A discussion on the biology and ecology of wolves includes physical characteristics, pack size,  
30 reproduction, food habits, movements and territories, dispersal, mortality, genetics, and population  
31 growth. Significant numbers of books and papers have been written on these subjects. Efforts to  
32 condense these for the western United States have been undertaken during development of other  
33 state management plans. Appendix B, Wolf Biology and Ecology, includes a description of this topic  
34 that was adapted from the Montana Gray Wolf Conservation and Management Plan (2002) and also  
35 provides a summary of wolf diseases. Information in Appendix B was not revised in this Plan  
36 update.

## 37 38 **D. Role of Wolves in Ecosystems**

39  
40 Large carnivores, including wolves, can contribute to the structure and function of ecosystems. For  
41 example, wolves can reduce abundance or pack size of a common mesopredator, coyotes (Smith et  
42 al. 2003, Berger and Gese 2007a, Merkle et al. 2009), which may in turn influence populations of  
43 smaller carnivores (e.g., foxes; Levi and Wilmers 2012, Newsome and Ripple 2014), reduce  
44 predation on some ungulates (e.g., pronghorn; Berger and Conner 2008, Berger et al. 2008), and  
45 influence small mammal populations (Miller et al. 2012). In systems where apex predators such as  
46 wolves returned after being absent for long periods, some mesopredator suppression occurred,

1 benefitting small mammal and avian communities and biodiversity (Crooks and Soule 1999, Ritchie  
2 and Johnson 2009b, Letnic and Dworjany 2011).

3  
4 The removal or restoration of apex predators, such as wolves, can also influence behavior,  
5 abundance and population dynamics of prey species (*see* Section A: Potential Effects of Wolf  
6 Predation on Oregon's Ungulates in Chapter V). This can result in changes to vegetative  
7 communities (Schmitz 2006), which then influence other wildlife or ecosystem processes (Ripple et  
8 al. 2010) – often referred to as a trophic cascade (Hairston et al. 1960, Beschta and Ripple 2009).  
9 Predators can also alter behavior, movements, and distribution of prey and can influence their  
10 browsing patterns. These situations are generally referred to as behaviorally mediated trophic  
11 cascades (Schmitz et al. 1997) – predators increasing the risk of predation for prey, which can alter  
12 prey behavior (Laundré et al. 2001). In response to predation risk, some prey will alter their  
13 behavior, movements, diet, and habitat use to reduce predation risk (Hernández and Laundré 2005,  
14 Laundré et al. 2010) and this could lead to changes in vegetative communities and subsequent  
15 trophic cascades (Ripple and Beschta 2004a, Fortin et al. 2005a).

16  
17 Wolf recolonization can produce direct and indirect influences on other carnivores (*see* Section D:  
18 Wolf Interactions with Other Carnivores-Multiple Predator systems in Chapter V), prey, and  
19 vegetative communities. For example, in Yellowstone and Banff National Parks, wolf predation  
20 reduced elk density and changed elk behavior, which was correlated with increased abundance and  
21 growth of woody plant species such as willow, cottonwood, and aspen (Ripple and Beschta 2003,  
22 Smith et al. 2003, Ripple and Beschta 2004b, Hebblewhite et al. 2005, Ripple and Beschta 2012,  
23 Ripple et al. 2015, Beschta et al. 2016). Increased willow abundance in Yellowstone National Park  
24 led to increased number of beavers and habitat for birds and other wildlife (Hebblewhite and Smith  
25 2010). The increased vegetative cover in riparian areas likely also decreased stream temperatures and  
26 reduced erosion, benefiting a wide variety of aquatic species (Hebblewhite and Smith 2010). Grizzly  
27 bear diets had a higher percentage of fruit in their diets following wolf recolonization of  
28 Yellowstone, which was correlated with decreased ungulate browsing of serviceberry (Ripple et al.  
29 2014a); however, these conclusions have been challenged (Barber-Meyer 2015). Berger et al. (2001)  
30 suggested the historical loss of grizzly bears and wolves led to changes in riparian vegetation that  
31 also coincided with decreased abundance and diversity of bird species. Combined, these examples  
32 highlight the importance of large carnivores, including wolves, in influencing ecosystem structure  
33 and biodiversity (Beschta and Ripple 2009, Estes et al. 2011, Ripple et al. 2014b).

34  
35 While the role of wolves shaping trophic cascades have been widely reported and popularized, many  
36 of the conclusions that have been reached on the topic are equivocal. For example, (Hebblewhite  
37 and Smith 2010) indicated that willow in Yellowstone appeared to have benefited from reduced  
38 browsing pressure from elk, but other woody browse species were not showing signs of recovery  
39 following wolf reintroduction. Further, Kauffman et al. (2010) found that recovery of aspen in  
40 Yellowstone was not occurring even in sites where elk were more vulnerable to predation,  
41 suggesting behavioral changes in elk alone were not sufficient to benefit aspen recovery. Middleton  
42 et al. (2013b) found further support that elk behavior is not heavily influenced by wolf predation.  
43 When wolves were in close proximity to elk (< 1 km), elk increased movement rates, shifted  
44 distributions, and increased vigilance; however, elk were only this close to wolves once every 9 days  
45 leading to minimal changes in elk behavior overall, which would likely influence the strength of any  
46 trophic cascades observed. Additionally, abiotic factors (e.g., snow depth, soil moisture) were  
47 equally important in determining willow and aspen recruitment as browsing by elk (Tercek et al.  
48 2010, Kauffman et al. 2010). In a decade long study in Yellowstone, it was found that the reduction

1 in herbivore browsing attributable to reduced elk populations did not recover riparian vegetation.  
 2 Rather, to restore riparian vegetation and structure, ungulate browsing must be completely removed  
 3 and restoration of hydrological conditions (e.g., reconnect historic floodplain and stream channels)  
 4 must occur (Marshall et al. 2013). The authors concluded, the effects of predation from a top-  
 5 carnivore alone on ungulate behavior and population size is unlikely to reverse the decades long  
 6 changes that have occurred in riparian systems.

7  
 8 It is also important to consider that while there is evidence that trophic cascades and other  
 9 ecosystem-level responses have occurred following the recolonization of wolves, they have largely  
 10 been observed in national parks or other protected areas where elk densities are high and not  
 11 managed with recreational hunting. Outside of protected areas (such as much of Oregon), other  
 12 factors may play a large role in shaping vegetative communities; ungulate density, behavior and  
 13 habitat use; and ultimately ecosystem structure and composition. Land management activities such  
 14 as fire suppression and timber harvest influence vegetation structure and composition (Parsons and  
 15 DeBenedetti 1979, Lindenmayer and Franklin 2002). Cattle grazing also influences vegetation  
 16 structure and composition (Moser and Witmer 2000, Averett et al. 2017) and may? alters elk  
 17 behavior and movements (Stewart et al. 2002). Hunting (Conner et al. 2001, Vieira et al. 2003,  
 18 Proffitt et al. 2010, Cleveland et al. 2012) and disturbance from motorized vehicles (Johnson et al.  
 19 2000, Rowland et al. 2000, Naylor et al. 2009, Coe et al. 2011) also have a large effect on behavior,  
 20 movements, habitat use, densities, and distribution of elk. Further, while elk showed changes in  
 21 movements and behavior in response to both human hunting and wolves in the Greater  
 22 Yellowstone Area, the observed responses to human hunting were greater than to wolves (Proffitt et  
 23 al. 2009), suggesting that elk may already have behaviorally induced changes in behavior and habitat  
 24 use outside of protected areas. Finally, additional factors, including climate and habitat productivity  
 25 may directly affect ecosystems (Oksanen et al. 1981, Crête 1999) and the degree to which wolves  
 26 influence ecosystem structure and function (Rooney and Anderson 2009). Consequently, it is  
 27 unknown if ecosystem changes as observed in some protected areas will occur in the more managed  
 28 landscapes of Oregon, where livestock grazing occurs on most forested lands, and where ungulate  
 29 populations are carefully managed through hunting.

## 31 **E. Legal Status**

### 33 **Federal**

34  
 35 When this Plan was first developed in 2005, wolves across Oregon were listed as endangered under  
 36 the federal ESA. That changed on May 5, 2011, when the USFWS ultimately delisted the Northern  
 37 Rocky Mountain Distinct Population Segment of wolves from the list of endangered species,  
 38 following initial delisting in 2009 and relisting in 2010. The delisting included the easternmost  
 39 portion of Oregon bounded by Oregon Highways 395/78/95. At this date, wolves in the remainder  
 40 of Oregon (west of those same highways) continue to be federally protected as endangered and the  
 41 Federal ESA sets the minimum protection levels for wolf management. In the listed area, ODFW  
 42 implements this Plan in conjunction with the *2019 Federal/State Coordination Strategy for Oregon Wolf*  
 43 *Plan Implementation* (Appendix C).

1 **State**

2  
3 Wolves were listed as endangered under Oregon ESA when the Plan was first adopted by the  
4 Commission in 2005. In 2009, the Oregon Legislature changed the status of wolves from protected  
5 non-game wildlife to a special status game mammal under ORS 496.004(9). This change was called  
6 for in the 2005 Plan and allows ODFW to use existing, stable state and federal funding sources and  
7 existing field staff to include wolf management as part of their daily duties. ORS 496.004(9) also  
8 directed the Commission to define the substantive standards governing this special status game  
9 mammal classification. Those standards are included in Chapter III (Wolves As Special Status Game  
10 Mammals) of this Plan.

11  
12 In January 2015, the conservation objective of four breeding wolf pairs for three consecutive years  
13 in the East Wolf Management Zone (*see* Chapter II for descriptions of wolf management zones and  
14 objectives) was reached. As directed by the Plan, this moved wolf management into Phase II of a  
15 three-phase management approach in eastern Oregon and triggered a biological review of the gray  
16 wolf's status to determine if it should be removed from the Oregon List of Endangered Species.  
17 Delisting a species from Oregon ESA (ORS 496.176) is a public process that requires a rulemaking  
18 decision by the Commission based on the following five determinations:

- 19  
20 1. The species is not now (and is not likely in the foreseeable future to be) in danger of  
21 extinction in any significant portion of its range in Oregon or in danger of becoming  
22 endangered; and  
23 2. The species natural reproductive potential is not in danger of failure due to limited  
24 population numbers, disease, predation, or other natural or human-related factors affecting  
25 its continued existence; and  
26 3. Most populations are not undergoing imminent or active deterioration of range or primary  
27 habitat; and  
28 4. Over-utilization of the species or its habitat for commercial, recreational, scientific, or  
29 educational purposes is not occurring or likely to occur; and  
30 5. Existing state or federal programs or regulations are adequate to protect the species and its  
31 habitat.

32  
33 On November 9, 2015, the Oregon Fish and Wildlife Commission removed wolves from the  
34 Oregon List of Endangered Species. This decision was the result of public Commission meetings on  
35 April 24, October 9, and November 9, 2015. The biological status review and scientific analysis used  
36 in the delisting decision is available on the ODFW website,  
37 [www.odfw.com/Wolves/management\\_plan.asp](http://www.odfw.com/Wolves/management_plan.asp).

38  
39 Although delisted statewide, wolves remain protected by the Wolf Plan and its associated rules. It is  
40 this Plan and Oregon's wildlife policy that guides long-term management of the species into the  
41 future. The wildlife policy states "that wildlife shall be managed to prevent the serious depletion of  
42 any indigenous species" and includes seven coequal management goals (ORS 496.012). It follows  
43 that continued use of many of this Plan's conservation and management measures that led to  
44 achieving early conservation objectives should ensure that future relisting is unnecessary.

1 **F. Wolf Plan Development and Update**  
2

3 For a detailed history on the development of the Wolf Plan, see the 2005 Wolf Conservation and  
4 Management Plan, [www.odfw.com/Wolves/management\\_plan.asp](http://www.odfw.com/Wolves/management_plan.asp).

5  
6 Beginning in June 2003, a 14-member Wolf Advisory Committee appointed by the Oregon Fish and  
7 Wildlife Commission developed a draft Wolf Conservation and Management Plan with input from  
8 numerous individuals and groups. At that time, the Commission directed the following guiding  
9 principles for the planning process:

- 10 1. Commission provides direction to write a wolf management plan based on “conservation”  
11 of wolves, as required by state law.
- 12 2. Commission will select a “Wolf Advisory Committee” to advise the Commission on wolf  
13 issues and draft a wolf management plan.
- 14 3. Ideas from wolf management plans produced by other states will be considered.
- 15 4. The themes and concerns expressed by the public through town hall meetings and written  
16 comments must be considered and incorporated in the final Plan.
- 17 5. Active re-introduction of wolves will not be considered. Natural dispersal of wolves from  
18 the Idaho population will be accepted.
- 19 6. The final Plan will be consistent with the Oregon ESA (ORS 496.171-496.192) and the  
20 Oregon Wildlife Policy (ORS 496.012).
- 21 7. A final Plan will strive for flexibility in managing wolf populations while providing needed  
22 protections for wolves.
- 23 8. A final Plan will seek relief for livestock producers from expected wolf depredation.
- 24 9. The Committee and the final Wolf Conservation and Management Plan will maintain its  
25 focus on wolves and will not address public land grazing or other public land management  
26 issues.
- 27 10. A final Plan will address impacts to prey populations, including deer and elk.

28  
29 The first draft was released in October 2004 for public review, and the final Plan and associated  
30 administrative rules were adopted by the Commission on December 1, 2005 after an extensive  
31 public review process.

32  
33 In 2010, the Plan was evaluated and updated. Most of the changes were related to the issue of wolf-  
34 livestock conflict. Input was received from numerous stakeholder groups, tribes, and partner  
35 agencies, and public input was taken throughout the review process. The 2010 Plan update was  
36 adopted in October 2010. See the 2010 Wolf Conservation and Management Plan,  
37 [www.odfw.com/Wolves/management\\_plan.asp](http://www.odfw.com/Wolves/management_plan.asp).

## II. WOLF CONSERVATION AND MONITORING

On November 9, 2015, the Commission approved the delisting of wolves from the list of Oregon Endangered Species. The decision to delist is consistent with the Commission’s long-term goal for listed species, which requires that sufficient actions be taken to ensure that future protections under the Oregon ESA will not be needed. As statewide conservation of wolves continues to be a Commission priority, this chapter focuses on methods and procedures for continued conservation and management of wolves in Oregon.

Continued conservation of the gray wolf will be achieved through the following objectives:

- Continue to promote a naturally reproducing wolf population in suitable habitat within Oregon, which is connected to a larger source population of wolves, allowing for continued expansion into other areas of the state.
- Maintain a conservation population objective for both East and West Wolf Management Zones (WMZs) of four breeding pairs of wolves present for three consecutive years. Maintain a management population objective for each zone of a minimum of seven breeding pairs of wolves present for three consecutive years.
- Maintain a management regime in the West WMZ that simulates Oregon ESA protections until the conservation population objective is met.
- Identify and monitor potential conservation threats to Oregon wolves and, if feasible, implement measures to reduce threats that can negatively affect Oregon’s wolf population.
- Effectively and responsibly address conflict with competing human values while using management measures which are consistent with long-term wolf conservation in all phases of wolf management status under this Plan.
- Maintain accurate information on the population status and distribution of wolves in Oregon through a comprehensive monitoring program.
- Continue to coordinate with other agencies and organizations to achieve wolf conservation and management objectives.

### A. Wolf Distribution

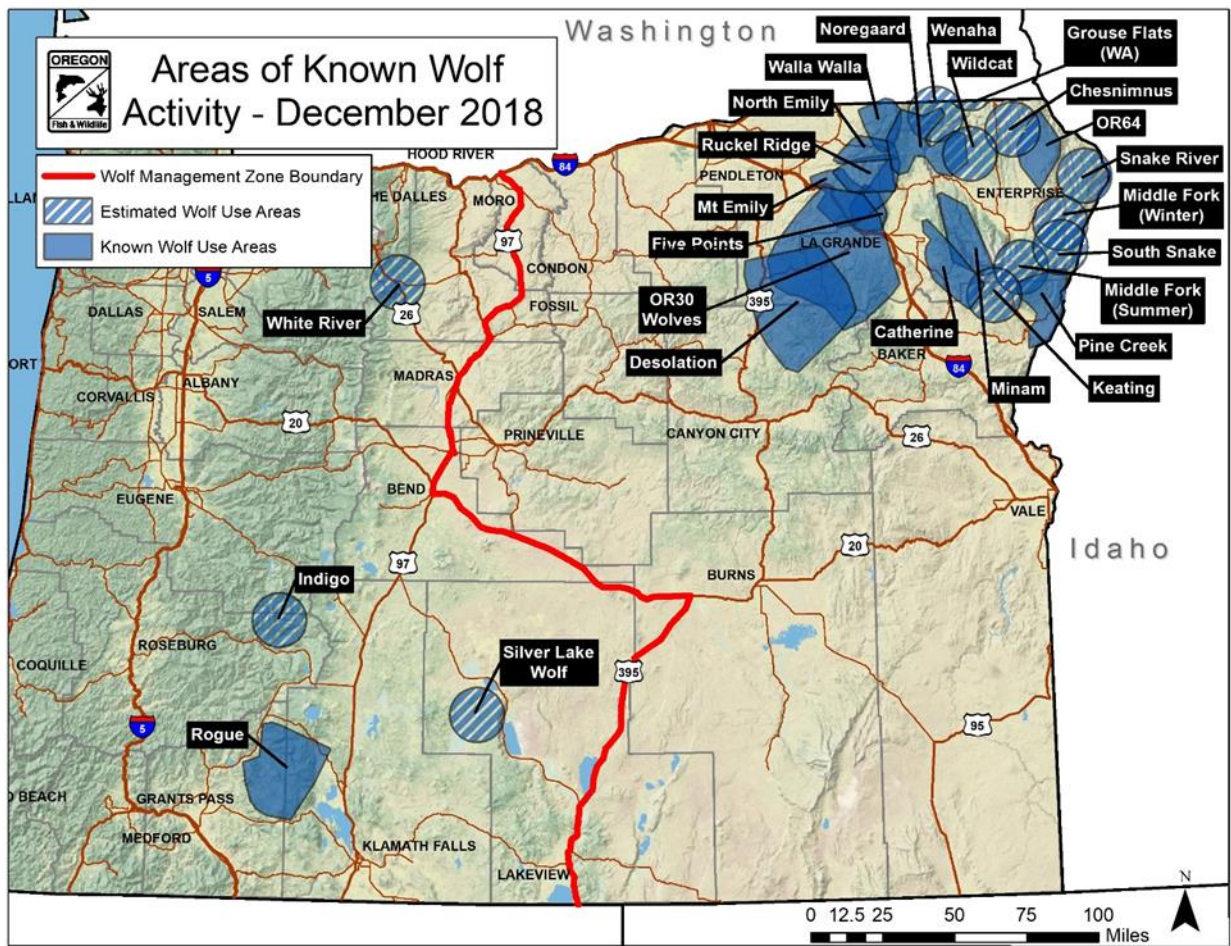
#### Objectives

- Continue to promote a naturally reproducing wolf population in suitable habitat within Oregon which is connected to a larger source population of wolves, allowing for expansion into other areas of the state.

#### Strategies

- Allow continued establishment of packs in Oregon through dispersal from adjacent states and within the state and not through reintroductions from outside the state.

- 1 • Maintain two wolf management zones in Oregon to provide flexibility in achieving wolf conservation and management goals for the state.
- 2
- 3 • Do not restrict wolf distribution by management zones, property ownership boundaries, or other administrative designations, unless adaptive processes deem them necessary.
- 4
- 5 • Employ management actions that support wolf packs occupying large, contiguous blocks of public land with minimal human activity and adequate prey base.
- 6
- 7 • Translocate wolves within the state only where needed to achieve conservation objectives in specific circumstances.
- 8
- 9 • Develop spatial population models to improve understanding of potential occurrence, habitat suitability, potential wolf range, and to assist with development of future population and distribution goals.
- 10
- 11
- 12



13 **Figure 1.** Distribution of known wolves in Oregon as of December 2018.

14 The habitat requirements of any wildlife species determine the species’ potential or likely distribution  
 15 on the landscape. Some species have very specific habitat requirements whereas others, like the gray  
 16 wolf, are considered habitat generalists. Since establishment was documented in 2008, Oregon’s  
 17 wolves expanded rapidly and in 2018 resident wolves occur within approximately 18,903 km<sup>2</sup> of the  
 18 state. Most wolves occur in northeastern Oregon, and four areas of known wolf activity now occur  
 19 within the West WMZ (Figure 1). ODFW wolf collar data indicate that wolves in Oregon primarily  
 20  
 21

1 use forested habitat with seasonal shifts to more open habitats that reflect seasonal distributions of  
 2 prey (e.g., lower elevation elk wintering areas). In addition, data from all documented resident wolf  
 3 locations in Oregon through 2018 showed that 59% of all locations occur on public, 38% on  
 4 private, and 3% on Tribal lands (ODFW, unpublished data). Denning occurs on both public and  
 5 private land in Oregon and all known den sites occurred within forested habitat.

## 6 7 **Dispersal and Connectivity**

8  
 9 The ability for wolves to effectively disperse from their natal territory and establish new populations  
 10 is key to the success of this Plan. Between 2011 and 2016, ODFW dispersal data of wolves from  
 11 Oregon packs from Global Positioning System (GPS) or very high frequency (VHF) collars (n=21)  
 12 or DNA analysis (n=12) showed that 23 dispersers (70%) remained in Oregon, and 10 wolves (30%)  
 13 dispersed to other states (California, 2; Idaho, 5; Montana, 1; Washington, 2). Mean straight-line  
 14 distance traveled was 189.3 km with a range of 22-580 km. Mean dispersal distance traveled for  
 15 males was 209.6 km and for females was 153.8 km. Seven mortalities during dispersal were  
 16 documented (Idaho, 4; Oregon, 1; Montana, 1; Washington, 1). Six of these were actively dispersing  
 17 and one appeared resident in an area, but had not joined or formed a pack. All seven known  
 18 dispersal mortalities were human-caused (shot).

19  
 20 These data support the natural dispersal method as effective to provide continued expansion and  
 21 ongoing genetic connectivity between wolf populations in other states and within the state.  
 22 Continued wolf movement into Oregon from Idaho is likely given the current population of wolves  
 23 in the state of Idaho—an estimated 786 wolves in 108 packs at the end of 2015 (Idaho Wolf  
 24 Monitoring Progress Report, 2015). Although this Plan does not specifically designate where wolves  
 25 should occur in Oregon, it sets an expectation that the wolf population in the state will continue to  
 26 distribute and expand into suitable range in both the east and west side of the state.

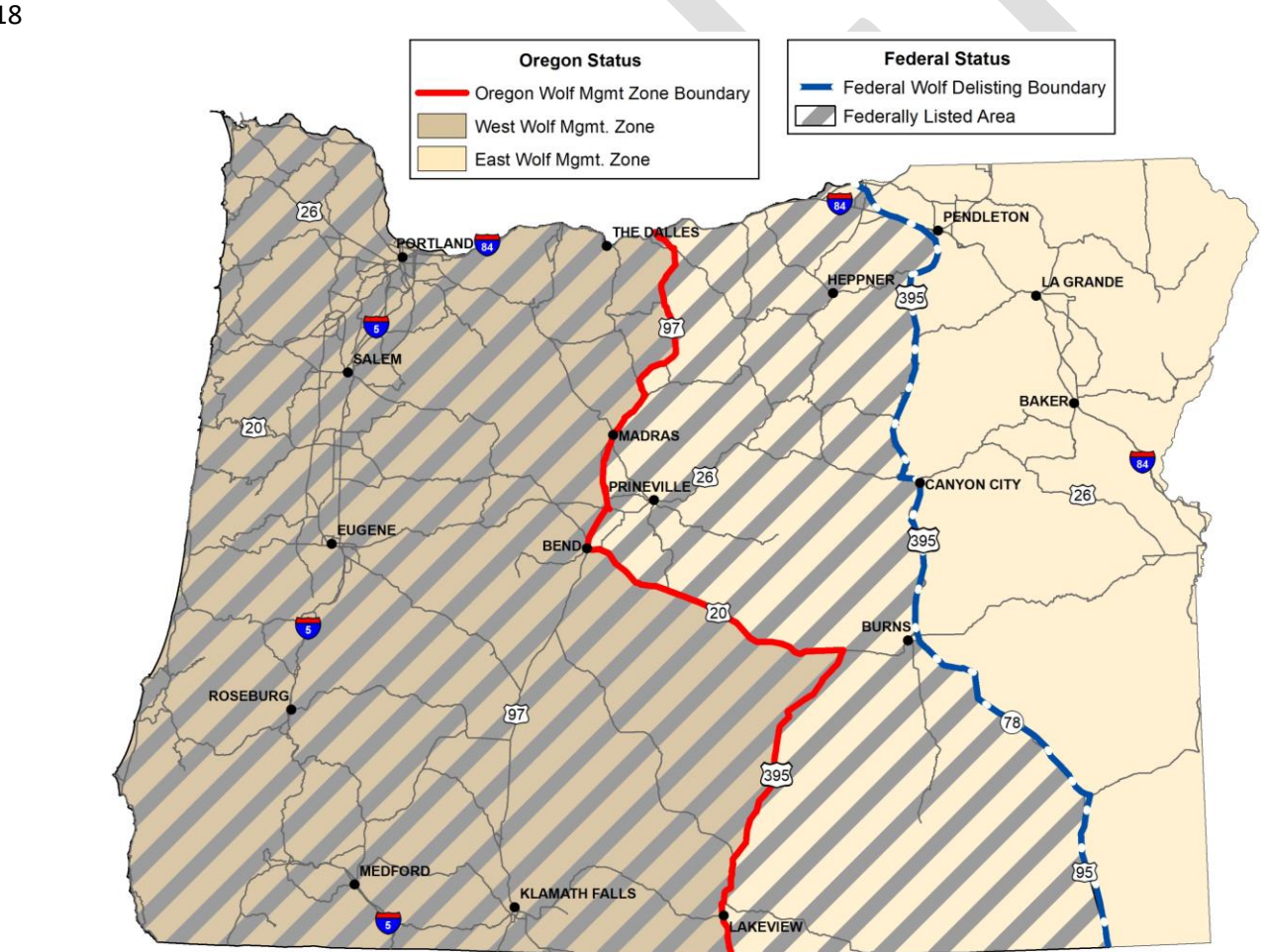
27  
 28 In a growing wolf population, expansion across landscapes is directly related to effective dispersal  
 29 (i.e., the ability of wolves to disperse and successfully reproduce) and issues of genetic interchange as  
 30 discussed above. At the time the Plan was first adopted in 2005, the ability of wolves to effectively  
 31 disperse to areas of habitat outside of northeast Oregon was assumed but undocumented. However,  
 32 habitat connectivity between the East and West WMZs has since been confirmed by observing the  
 33 GPS locations of multiple radio-collared wolves as they traveled to southern Oregon Cascade  
 34 Mountains, as well as dispersal of radio-collared wolves from northeastern Oregon to northern  
 35 California (California Department of Fish and Wildlife News Release June 2016).

36  
 37 An examination of data from GPS-collared dispersers shows that dispersal in Oregon occurred  
 38 largely through forested habitats. However, dispersers that travelled larger distances (e.g. more than  
 39 85 km) generally crossed a variety of land cover types and landscape features (i.e., open prairie or  
 40 shrub habitats, roads, rivers, etc.). Data from multiple GPS-collared dispersers indicated attempted,  
 41 but unsuccessful, crossings of Interstate 84 between La Grande and Pendleton. Multiple collared  
 42 wolves have successfully crossed interstate highway I-84 in the same area; some crossed just once,  
 43 others crossed many times. One collared wolf crossed I-5 twice in southern Oregon. Two wolves  
 44 have been struck by vehicles in Oregon: May 2000 when a wolf dispersing from Idaho was struck by  
 45 a vehicle on Interstate 84 south of Baker City and January 2019 when a collared wolf from a resident  
 46 group was struck on Interstate 84 between Pendleton and La Grande. Combined, these data of  
 47 dispersing wolves suggest interstate highways are at least partially permeable to dispersing wolves  
 48 with some increased risk of mortality.

1  
2 The ability of wolves to cross large rivers is also important for maintaining connectivity between  
3 Oregon wolves and the larger Northern Rocky Mountain (NRM) population, which includes Idaho.  
4 Though no wolf crossings of the Columbia River have been recorded, GPS-collared wolves (both  
5 dispersers and non-dispersing resident wolves) have successfully crossed the Snake River on multiple  
6 occasions (ODFW, unpublished data), indicating the river itself does not impede connectivity  
7 between subpopulations in Idaho and Oregon.

8  
9 **Wolf Management Zones**

10  
11 The Wolf Plan’s two zones provide management flexibility in eastern Oregon and ensure continued  
12 protections for wolves in western Oregon until the conservation objective is reached. In 2018,  
13 wolves were in Phase III in the East WMZ and in Phase I in the West WMZ. Maintaining two  
14 management zones allows for different levels of active management (including lethal control in  
15 certain situations, see Chapters III, IV, V) of wolves depending on the circumstances and Phase of  
16 the zone. The zones provide emphasis to the importance of continued population connectivity with  
17 a larger population in eastern Oregon and Idaho. See Figure 2 for zone boundaries.



19  
20 **Figure 2.** The boundary between East and West Wolf Management Zones (red line), and the  
21 current federal ESA status boundary in Oregon (blue line).

1 When this Plan was first adopted in 2005 there was little contemporary data or experience with  
 2 wolves on the Oregon landscape, and an understanding of suitable habitat or how wolves would  
 3 eventually distribute themselves was incomplete. Since that time, the establishment and expansion of  
 4 wolves has provided managers with increasing information regarding habitat use, travel areas, and  
 5 territory selection. A significant amount of potential wolf habitat in Oregon is occupied seasonally  
 6 by livestock, and it is expected that depredation on livestock will continue to occur in places where  
 7 wolves and livestock are closely associated. As such, management of depredating wolves will  
 8 continue to be a recurring theme in managing the species. Variation in local conditions will likely  
 9 cause some areas to be more prone to livestock depredations than others, and chronic conflict may  
 10 preclude establishment of some wolf packs in certain circumstances. The Plan emphasizes use of  
 11 non-lethal techniques to prevent livestock depredation, but allows implementation of lethal control  
 12 to address chronic depredation (*see* Chapter IV). Thus, the overlap of wolves and livestock on the  
 13 landscape will continue to influence both distribution and levels of wolf-human conflict.

14  
 15 Management decisions related to wolf distribution and population in the future will require a  
 16 thorough evaluation of suitable habitat in Oregon. This will be achieved by specific habitat and  
 17 population analyses conducted by ODFW (*see* Chapter IX) to determine habitat availability, capacity,  
 18 probability of occurrence, and to assess impacts of various potential management actions. The  
 19 analysis will use Oregon-derived empirical data and data from other pertinent areas (e.g., other NRM  
 20 wolf research) and will assist with development of future management options including population  
 21 and distribution objectives through additional zones and phases.

22  
 23 While wolves will likely not be distributed throughout all of their historic range in Oregon, wolf  
 24 distribution will not be restricted by management actions to only the most remote habitats. Suitable  
 25 habitat may well exist outside of these areas and provide opportunity for colonization. Continuing to  
 26 promote wolf occupancy of available habitat throughout the state is intended to facilitate the long-  
 27 term survival of wolves in the modern Oregon landscape.

## 28 **Translocation and Relocation**

29  
 30  
 31 Natural dispersal is the intended means for wolf dispersal across the state. In some situations,  
 32 however, translocation may be considered to help meet conservation objectives in both zones of the  
 33 state. Translocation to facilitate wolf movement and establishment may be used only in areas where  
 34 dispersing wolves are determined to be essential to achieve conservation objectives. Translocation  
 35 may be used only after a public process, involving public meetings, public testimony, and approval  
 36 by the Commission. Wolves known or suspected of having depredated livestock will not be  
 37 translocated. State wildlife biologists will coordinate and implement any translocation action.

38  
 39 Relocation differs from translocation (in this Plan) in that relocation does not require a public  
 40 process and is not used to facilitate dispersal. Movement or transport of wolves within their pack  
 41 area (e.g., during capture operations) is not considered relocation under this section. Though  
 42 relocation is available to wolf managers on a day-to-day basis to immediately solve a localized  
 43 situation or problem, it is not expected to be used on a regular basis. In the NRM area, relocated  
 44 wolves showed lower survival, lower pack establishment, and a strong homing tendency (Bradley et  
 45 al. 2005) —all important considerations when planning any type of relocation. In addition,  
 46 depredation of livestock is not always solved by relocation of wolves alone. In the NRM area, more  
 47 than a quarter of wolves relocated in response to depredation continued to prey on livestock  
 48 (Bradley et al. 2005). For this reason, relocation will not be considered in Oregon for wolves known

1 or suspected of having depredated livestock or pets. For purposes of relocation only, wolves would  
2 be transported and released into suitable habitat. ODFW is authorized to capture and hold wolves in  
3 Oregon for the purpose of relocation, translocation, or to aid in recovery of an injured wolf.  
4

5 Prior to conducting any active relocation of wolves within the state by ODFW, the governing body  
6 of each county may choose to hold a public hearing regarding such action. The existence of such a  
7 hearing shall not be a precondition to ODFW acting to relocate wolves as needed, nor does it in any  
8 way limit ODFW's legal authority over wildlife management. The purpose of the hearing is to assist  
9 in identification of suitable habitat located within a county for purposes of wolf relocation. If the  
10 governing body holds such hearings, ODFW shall assist in preparation of the record of the hearing  
11 by giving and receiving information relating to identifying suitable habitat located within the county  
12 for the purpose of wolf relocation. The record of the hearing shall itself be a part of the criteria for  
13 identifying suitable habitat in that county for the purpose of wolf relocation.  
14

## 15 **B. Population Objectives and Management Phases**

### 16 **Objectives**

- 17 • Maintain a conservation population objective for both East and West Wolf Management  
18 Zones (WMZs) of four breeding pairs of wolves present for three consecutive years.  
19 Maintain a management population objective for each zone of a minimum of seven breeding  
20 pairs of wolves present for three consecutive years.
- 21 • Maintain a management regime in the West WMZ that simulates Oregon ESA protections  
22 until the conservation population objective is met.

### 23 **Strategies**

- 24 • Maintain three wolf management phases to facilitate both conservation and management  
25 needs as the population grows.
- 26 • Express the wolf population status in either region as the number of breeding pairs (Phase I  
27 and II) until the management population objective is achieved.
- 28 • Transition wolf population monitoring to the number of wolf packs present in a region  
29 when the management population objective is achieved in that region (Phase III). (A pack is  
30 defined as four or more wolves traveling together in winter.)

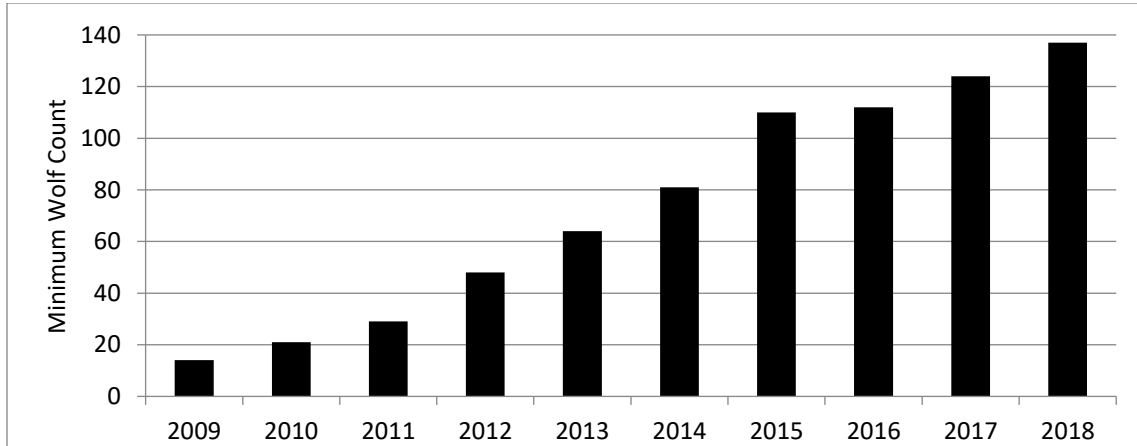
31 Annual winter counts of wolves were initiated by ODFW in 2009, and from 2009 through 2018  
32 Oregon's wolf count increased in all years with a mean increase of 1.30 ( $\pm$  0.21 SD)(ODFW,  
33 unpublished data; Figure 3). ODFW does not routinely conduct den or rendezvous surveys and  
34 relies on winter pup recruitment data to assess reproductive success. The minimum number of  
35 breeding pairs in Oregon since 2009 has varied annually but an increasing trend has been observed.  
36 The number of wolves associated with a breeding pair can vary from 4-15 wolves (ODFW,  
37 unpublished data). In Oregon, the number of wolf packs represented by a breeding pair is 1.2 packs  
38 per breeding pair for the period 2009 through 2018. The average pack size by year was 5.8 to 10.5  
39 (average 7.6).  
40  
41  
42  
43  
44

## 1 Management Phases

2

3 Management phases are applied to each zone independently and are only based on the population  
4 levels in each zone. Also, management activities associated with each phase may still be subject to  
5 federal ESA law, depending on the federal listing status of wolves (Figure 2).

6



7

8 **Figure 3.** Oregon minimum year end wolf count from 2009 through 2018.

9

10 **Phase I: Conservation Phase.** Phase I occurs anytime a zone's minimum conservation population  
11 objective of four breeding pairs of wolves for three consecutive years is not met. Based on Oregon  
12 data, these wolf population objectives suggest the following: four breeding pairs equates to 4.8  
13 packs. This number of packs would be equivalent to 28-51 wolves in packs. These data do not  
14 include other (non-breeding) pairs and individual wolves which may add an additional 10-15% to  
15 population estimates (Fuller et al. 2003b).

16

17 Though wolves were delisted from the Oregon ESA in 2015, the Phase I provisions for the West  
18 WMZ will remain in effect until the conservation population objective is reached for that zone or  
19 until this Plan is amended through a public rulemaking process. This will ensure a management  
20 regime that replicates Oregon ESA protections for individual wolves within the zone. The  
21 management regime for western Oregon is based upon the Commission's statutory authority to  
22 regulate the take of wildlife. Although wolves were reclassified as a special status game mammal in  
23 2009 (*see* Chapter III), the Commission retains the authority to regulate take of wolves as necessary  
24 to ensure a healthy population.

25

26 **Phase II: Transition Phase.** Phase II occurs when the wolf population has achieved the  
27 conservation objective for a zone but is not in Phase III. Management activities will be directed  
28 toward achieving the Phase III management population objective of a minimum of seven breeding  
29 pairs of wolves present in a zone for three consecutive years. Seven breeding pairs equates to 8.4  
30 packs. This number of packs would be equivalent to 49-89 wolves in packs. These data do not  
31 include other (non-breeding) pairs and individual wolves which may add an additional 10-15% to  
32 population estimates (Fuller et al. 2003b).

33

34 This phase entails continued intensive monitoring and tracking of population health factors (similar  
35 to Phase I), with an emphasis on detecting population declines and conservation threats, while  
36 continuing to address damage and safety situations. Though the intent of this phase is to prevent

1 population declines and the potential for relisting, the phase is not in itself a “buffer” against  
2 relisting. This is because, in certain situations, wolves could be relisted under state ESA based on  
3 several population health factors (see strategies for addressing population decline below), which  
4 could potentially be met before the population declines to Phase I levels.

5  
6 **Phase III: Management Phase.** Phase III occurs when a zone wolf population has at least seven  
7 breeding pairs for three consecutive years. Management activities will be directed toward ensuring  
8 the wolf population in each zone does not decline to Phase II levels and to address unmanageable  
9 levels of conflict.

## 10 11 **Conservation Population Objective**

12  
13 When this Plan was first adopted in 2005, the conservation population objective of at least four  
14 breeding pairs for three consecutive years *in eastern Oregon* was based on the prediction that, a  
15 naturally self-sustaining population of wolves would continue to exist in Oregon if delisted from the  
16 Oregon list of Endangered Species. It recognized the importance of genetic connection between  
17 Oregon’s new population and the much larger population in Idaho, and the need for a sufficient  
18 number of wolves to ensure the natural reproductive potential of the wolf population would not be  
19 in danger of failure. ODFW used the federal definition of a wolf breeding pair because it provided a  
20 higher level of certainty in assessing the population status and documenting successful reproduction.  
21 The original conservation population objective was achieved in 2015, and wolves statewide were  
22 subsequently delisted by the Commission. The population analysis at the time of delisting indicated a  
23 very low probability of conservation failure under the circumstances at that time (ODFW 2015),  
24 supporting that the conservation objective was sufficient for its intended purpose.

25  
26 The achievement of the conservation population objective in the East WMZ in 2015, and the  
27 continued growth of the wolf population in that zone, did not reduce the need for continued  
28 conservation in the West WMZ where the population has not yet reached this level. Because of the  
29 need for continued protection in this zone, wolves there will remain in Phase I until a population of  
30 four breeding pairs for three consecutive years is reached.

## 31 32 **Management Population Objective**

33  
34 The management population objective for both the East and West WMZs is at least seven breeding  
35 pairs for three consecutive years. This population level provides for maintenance of wolf numbers  
36 and is not intended as a population cap. Achieving this objective provides a high level of assurance  
37 that the wolf population will not decline below conservation population objectives. Once the  
38 management population objective has been achieved, any further population goals (higher or lower)  
39 would be considered and defined through ODFW’s normal rulemaking or planning process based  
40 on available data and public input. To facilitate future population planning, wolf managers will use  
41 data (including Oregon-specific data) on wolf movements, pack home ranges, and other population  
42 parameters to develop a population model or models. Models assist Oregon wolf managers in better  
43 understanding effective management zones, viability thresholds, population objectives, and the  
44 effects of different management options (including population caps) on the future wolf population.  
45 Depending on circumstances at the time, a new or amended planning effort based on Oregon-  
46 specific wolf data could be undertaken.

1 The status of wolves in Oregon will be expressed as the number of breeding pairs until the  
2 management population objective is met. After the management population objective is met,  
3 monitoring methods will transition to enumerating wolf packs rather than breeding pairs to reduce  
4 monitoring costs.

## 6 **General Discussion of Wolf Population Objectives**

8 When the 2005 Plan was developed, one of the main challenges for wolf planners was estimating the  
9 number and distribution of wolves sufficient to achieve conservation of wolves in Oregon and  
10 satisfy state delisting criteria, while protecting the social and economic interests of all Oregonians.  
11 Initial concerns ranged from setting population goals too high (thereby fostering unrealistic  
12 expectations), social and biological conflict, and uncertainty regarding the capacity of Oregon to  
13 support wolves. Drafters of the 2005 Plan relied on information from other state plans and the  
14 scientific literature to develop wolf population objectives.

16 Today, the Oregon landscape is different. Wolves are increasing in both distribution and abundance,  
17 and have established in both East and West WMZs. As originally predicted, most wolves occur in  
18 eastern Oregon with much of northeastern Oregon having contiguous wolf territories. The decision  
19 to divide the state into two zones with separate but equal population objectives continues to provide  
20 the flexibility needed to manage increasing wolf numbers in eastern Oregon while encouraging  
21 conservation in western Oregon. This approach also ensures connectivity to other populations of  
22 wolves in Idaho and Washington, an important factor in achieving conservation of wolves in all of  
23 Oregon.

25 The conservation population objective does not represent a desired population level nor is it  
26 necessarily a minimum viable population in itself. For this reason, few management changes will  
27 occur when the West WMZ achieves the objective and moves to Phase II. Conservation will remain  
28 the focus, with a goal of achieving the management objective level and Phase III.

30 Ultimately, the adequacy of the current conservation population objective (four breeding pairs for  
31 three consecutive years for each zone) is best determined by its ability to meet the intended purpose  
32 — to ensure conservation of the species via a naturally self-sustaining population. The objective was  
33 initially developed before wolves were established in the state, and this necessarily meant that a  
34 population that achieved the conservation objective would likely have healthy population factors  
35 (related to increasing population growth). When the objective was achieved in eastern Oregon in  
36 2015, analysis showed the Oregon population was at very low risk of conservation failure (ODFW  
37 2015). In that situation, the population was increasing at a mean annual rate of 43% and there were  
38 nine breeding pairs in the final year of Phase I. Clearly, the chosen conservation population  
39 objective was adequate to meet its intended purpose in eastern Oregon.

41 However, a zone may have population health factors, or a population that is stable or declining and  
42 around the four breeding pair level, that upon similar analysis may be at a higher risk of conservation  
43 failure. In this situation, ODFW may conduct a zone-specific population analysis, with conservation  
44 threats in this chapter in mind, when moving from Phase I to Phase II in the western zone to  
45 determine if additional conservation measures are necessary to improve population performance and  
46 move toward the management objective. Such an analysis could result in Commission action to  
47 adopt additional measures to conserve wolves if necessary.

1 The intent of the management population objective of seven breeding pairs in each zone is to  
2 maintain wolf numbers and direct Phase III management activities to prevent the population from  
3 longterm declines while allowing flexibilities in management options when addressing wolf-human  
4 conflicts. To assess the effect of population size on the risk of the population declining to Phase II  
5 levels, ODFW used a population model developed in 2015 (ODFW 2015). Simulations showed the  
6 probability of having fewer than seven breeding pairs within the next 20 years drops below 5% when  
7 the starting population is at least 300 wolves—a population level that could be achieved in the East  
8 WMZ in coming years. However, under this Plan, seven breeding pairs is not a sufficient population  
9 “cap” or threshold.

10  
11 Once the management population objective is achieved in a WMZ, activities still continue to focus  
12 on conservation and reducing population declines. The question of how many wolves Oregon  
13 should ultimately manage for is not answered by science alone (Bruskotter 2013), and was not  
14 considered in the first 2005 Plan. Oregon’s wolf population is still expanding, and there are many  
15 portions of Oregon where wolves are not yet established. While additional population planning may  
16 be premature at this time, it is expected that the Commission will be tasked with addressing the  
17 question of how many wolves to manage for in the future, based largely on available data and public  
18 input. Development of spatial population models using Oregon data will aide this process by  
19 providing a scientific basis for addressing the question of population objectives and management  
20 options into the future. ODFW has begun examining potential population models, including those  
21 used in other western states.

### 22 **Strategies for Addressing Wolf Population Decline/Potential for Future State Relisting**

23  
24  
25 Oregon’s wolf population will be monitored throughout the three-phase adaptive management  
26 strategy. At the time of writing, wolves in the East WMZ are managed according to Phase III  
27 management strategies and continued conservation efforts allow for continued wolf population  
28 growth while addressing wolf-human conflict. The West WMZ is in Phase I and conservation  
29 strategies will continue to be prioritized until Phase II and III objectives have been met.

30  
31 When the conservation population objective of four breeding pairs for three consecutive years in  
32 each zone was first adopted in 2005, Oregon had no known resident wolves. Inherently, developers  
33 of the 2005 Plan expected: 1) a population that went from none to the four breeding pair mark  
34 would have healthy population attributes causing the increase, and 2) a likelihood (with an increasing  
35 population) that more than four breeding pairs would be present in eastern Oregon at the end of the  
36 third consecutive year. Both of these expectations were realized and played an important role in the  
37 2015 decision to delist wolves from the state list of endangered species. However, a species’ status  
38 under Oregon ESA is determined by five criteria as defined in Chapter I, and if wolf population  
39 attributes deteriorate, causing a population decline or fewer packs in Oregon, this may warrant  
40 consideration for relisting at a population well above the conservation population objective. In the  
41 event of a rapid population decline, the Commission may relist the species under ESA using an  
42 emergency listing process per ORS 496.176(7).

43  
44 Wolves in Oregon will continue to be affected by natural and human-caused factors; the population  
45 may continue to increase, stabilize, or decline. Though short-term downward fluctuations are rarely  
46 indicators of a serious population problem, it is possible that breeding pair success, and the wolf  
47 population, could decline on a long-term basis. While in Phase I or II, in the event of an observed

1 population decline, or an observed decline of other factors related to population fitness or  
2 reproductive potential, ODFW will initiate an assessment which will include causal factors, (i.e.  
3 determination of short or long-term nature of the decline) and recommendations of methods to  
4 improve the situation. The assessment will consider natural fluctuations in wolf populations and may  
5 include a one-year increased monitoring effort. Depending on the severity of the situation, an  
6 additional year of intensive monitoring may be needed and will be determined based on the  
7 assessment. Furthermore, the assessment will guide ODFW's decision to conduct a biological status  
8 review per ORS 496.176(3) to consider if relisting is needed.  
9

10 In Phase III, a population decline in either zone may warrant additional monitoring measures similar  
11 to Phase I and II declines, and the level of investigation will vary depending on the circumstances of  
12 the decline. Results of any additional monitoring would be included in the normal reporting (e.g.,  
13 annual report) to the Commission. Though relisting is not likely to be immediately considered,  
14 ODFW will use information gained in the assessment to employ methods to reverse the decline. If,  
15 however, the population drops to Phase II or lower levels, ODFW will immediately conduct an  
16 assessment as outlined for Phase I/II above. ODFW will reinstitute the monitoring of breeding pair  
17 status (see the Monitoring Wolf Population section in this chapter) in situations where the Phase III  
18 population declines to Phase II levels.  
19

20 The Commission's authority to relist a species derives from its authority to initially list any species.  
21 This authority lies in the listing/delisting provisions of ORS 496.172 and ORS 496.176. Pertinent  
22 sections are as follows:  
23

- 24 a. ORS 496.172(1) requires the Commission to conduct investigations of wildlife species  
25 native to this state and to determine whether any such species is a threatened or  
26 endangered species.
- 27 b. ORS 496.176(2) gives the Commission authority to, by rule, add or remove any wildlife  
28 species from either list or change the status of any species on the lists.
- 29 c. ORS 496.176(3) provides the criteria the Commission must use in making its decision.
- 30 d. ORS 496.176(5) allows for any person to petition the Commission to add, remove, or  
31 change a species' status.
- 32 e. ORS 496.176(7) provides for emergency listing by the Commission when there is a  
33 significant threat to the continued existence of the species within the state.  
34

35 The decision to relist the wolf will be based upon scientific assessments of biological data. However,  
36 decisions to list or delist any species are often contentious, and some researchers have demonstrated  
37 that swings in the listing status of wolves can lead to inconsistent management authority and  
38 declining public support for wolves (Olson et al. 2014). It is in the best interest of this species and  
39 the citizens of Oregon that the state takes whatever management steps necessary to safeguard  
40 wolves from a population decline or other factors that would necessitate a relisting decision.

1 **C. Potential Conservation Threats**

2

3 **Objective**

4

- 5 • Identify and monitor potential conservation threats to Oregon wolves and, if feasible, implement measures to reduce threats that can negatively affect Oregon’s wolf population.
- 6 • Effectively and responsibly address conflict with competing human values while using management measures which are consistent with long-term wolf conservation in all phases of wolf management status under this Plan.

7

8 **Strategies**

9

- 10 • Track human-caused mortality rates to the extent feasible and assess the effects of human-caused mortality on overall population performance.
- 11 • Initiate additional education and training to improve public identification of both wolves and coyotes to lessen the chance of misidentification and accidental hunter take.
- 12 • Collect and analyze genetic samples from Oregon wolves to determine ancestry, wolf-dog hybridization, and genetic connectivity.
- 13 • Monitor habitat use by wolves and connectivity of habitats using collared wolf location information.
- 14 • Determine the health status of Oregon wolves through continued monitoring and use an adaptive/responsive approach to identify emerging or endemic diseases, which may depress wolf populations or affect humans, wildlife, or domestic animals.
- 15 • Continue to assess human attitudes toward wolves in Oregon and any effects they may have on wolf conservation and management efforts.

16

17 Continued successful conservation of wolves is highly dependent on the identification of potential threats that may affect Oregon’s growing wolf population. Conservation threats are factors which may continually depress or eliminate a wolf population (Boitani 2003). These factors are different from actions that may cause short-term population fluctuations and are discussed in other sections of this Plan.

18

19 **Human-caused Mortality**

20

21 Human-caused mortality occurs in all areas where wolves occur with people (Fritts et al. 2003), and it remains a primary influence on the dynamics of most wolf populations (Creel and Rotella 2010). In a landscape-scale project to develop an ecosystem-based strategy for the management of eastside forests in the Pacific Northwest, it was predicted that wolf mortality related to humans would be one of the primary challenges to wolf conservation within the Interior Columbia Basin (Wisdom et al. 2000). Consequently, effectively accounting for human-caused mortality will be important for conservation and management of wolves in Oregon (*see* Chapter VI: Wolf-Human Interactions).

22

23 In 2015, ODFW evaluated the effects of increased human-caused mortality on the state’s wolf population at that time using an individual-based population model (ODFW 2015) . Results indicated that a total human-caused mortality rate (including authorized and unauthorized take) of 15% would still result in an increasing population on average, but a total human-caused mortality

24

1 rate of 20% would cause the wolf population to decline on average. These rates were in addition to  
2 natural mortality rates (12% for adults), which would translate to a 27 to 32% total mortality rate, for  
3 a slightly increasing and slightly declining population, respectively. These findings were compatible  
4 with other studies which demonstrated wolf populations were sustainable with total mortality rates  
5 up to 25-30% (Adams et al. 2008, Creel and Rotella 2010, Sparkman et al. 2011). From 2009-2018,  
6 known human-caused mortality rates (authorized and unauthorized) did not exceed 10% annually of  
7 minimum counts in Oregon, suggesting the wolf population should continue to increase so long as  
8 total human-caused mortality continues to stay below 15% and natural mortality rates remain the  
9 same. Continued monitoring of human-caused mortality and refinements to population modeling  
10 efforts to account for this mortality and other mortality sources will be important for wolf  
11 conservation in the future.

12  
13 At the pack level, responses to wolf mortality varies and is often related to the breeding status of the  
14 wolves that die—losses of one or both breeders can have a disproportionately negative impact on  
15 pack persistence and structure (Brainerd et al. 2008). In a study that included data from the NRM  
16 wolf population, the loss of one breeder resulted in pack dissolution in approximately 26% of the  
17 cases, and the loss of both breeders increased the rate of pack dissolution to 85%. Most breeding  
18 wolves in the study that died were human-caused mortalities and the authors recommended that  
19 lethal control in recolonizing populations should be limited to solitary individuals or territorial pairs  
20 where possible (Brainerd et al. 2008). In another study (Borg et al. 2015), pack persistence following  
21 the loss of one or both breeders was also affected by pack size (larger packs persisted at a higher  
22 rate) and seasonality of breeder loss. In this case, summer loss of breeders may have less of a  
23 negative impact because females are not pregnant and pups are older. Human-caused mortality in  
24 reproductive packs will have a lesser effect when pups are greater than six months old and when  
25 packs contain more than six members (including three or more adults) (Brainerd et al. 2008). Given  
26 these conclusions, it is important to consider the composition of human-caused mortality when  
27 assessing potential effects on wolf populations.

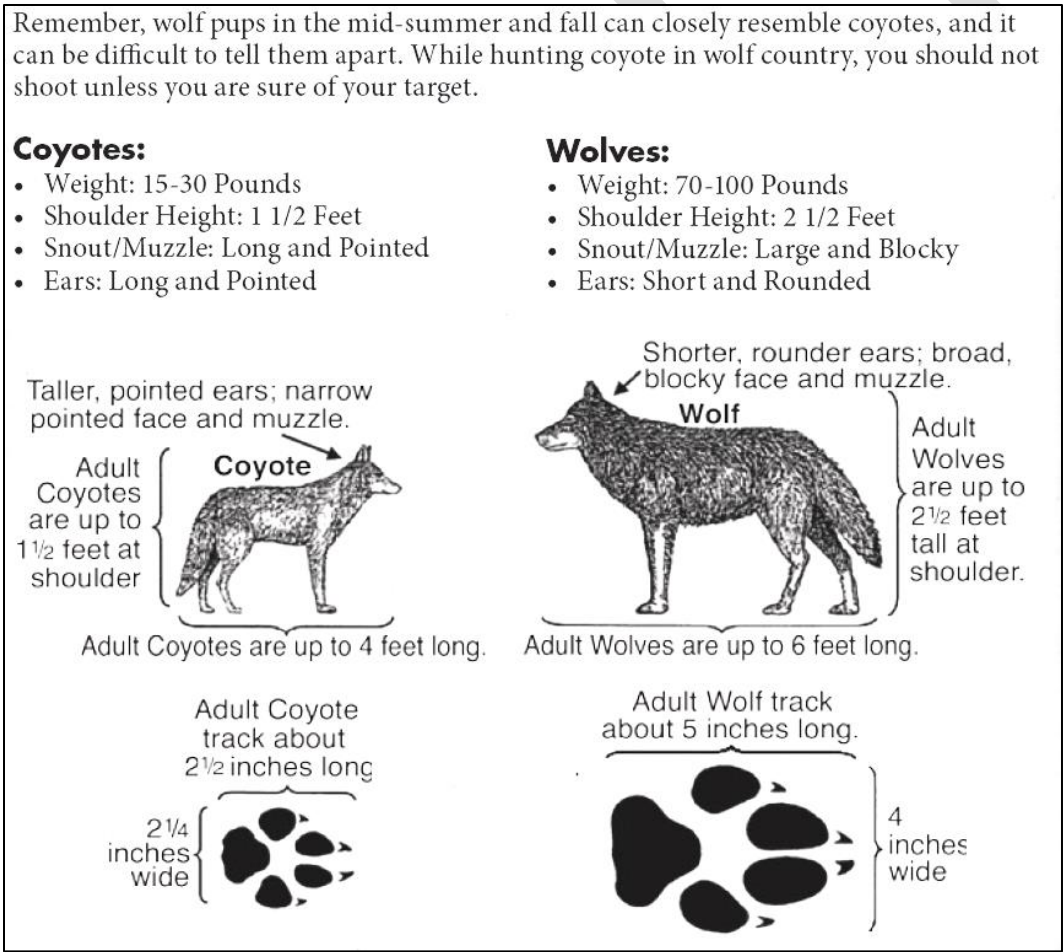
28  
29 In Oregon, human-caused mortality includes both authorized and unauthorized take (Table 1).  
30 Authorized take includes lethal removals permitted by statute or administrative rule and have  
31 included take to address livestock conflict (e.g. administrative removals, landowner permits, wolves  
32 caught in the act) or human safety. Unauthorized take consists of accidental (e.g. vehicle collisions,  
33 guard dogs) and illegal (e.g., poaching) take. Authorized take of wolves is the mortality parameter  
34 over which ODFW has the most control. Other sections of this Plan (and associated rules) outline  
35 when human-caused mortality may be authorized. When wolf numbers are low, sustained high levels  
36 of human-caused mortality under variable environmental conditions increases the risk of population  
37 failure. Larger populations are able to sustain higher levels of human-caused mortality without  
38 threatening overall conservation of populations (ODFW 2015). Given the relatively small population  
39 size of Oregon's wolves, ODFW will closely regulate authorized take. Consequently, this Plan does  
40 not establish hunting seasons, or take quotas for wolves. The use of those management tools in the  
41 future would require larger wolf populations to reduce any risk of conservation failure and would  
42 require Commission approval through a separate public rulemaking process (Chapter III). Further,  
43 administrative removals are allowed in specific circumstances under this Plan, and these are precisely  
44 tracked and regulated. If monitoring indicates declines in survival, reproduction, population growth  
45 rates, or population size that may influence wolf population viability, ODFW has the authority to  
46 reduce or eliminate most authorized take to ensure the long-term conservation of wolves in Oregon.

1 Table 1. Documented wolf mortalities in Oregon from 2000-2018 (years without documented  
 2 mortalities are not included). Major mortality categories include human-caused, natural, and  
 3 unknown. Human-caused consist of authorized lethal removal (e.g. mortalities associated with  
 4 livestock depredation and human safety) and unauthorized lethal removal (e.g. accidental and  
 5 unlawful mortalities). Pending mortalities are those where the investigation of unauthorized take has  
 6 not been completed. Examples of natural mortalities include death due to disease or injury.  
 7 Unknown mortalities are those without sufficient evidence to determine cause of death.

Year	Human-Caused					Natural	Unknown	Annual Total
	Authorized		Unauthorized					
	Depredation Related	Human Safety	Accidental	Unlawful	Pending			
2000			1	1				2
2007				1				1
2009	2							2
2010				1				1
2011	2		1					3
2012				1				1
2013				1		2		3
2014								0
2015			1	2	1		3	7
2016	5			1	1			7
2017	5	1	2	3	1	1		13
2018	3		1	2		1		7
Total	17	1	6	13	3	4	3	47

8  
 9 Of perhaps greater concern for long-term conservation, is the potential effects of unauthorized take  
 10 on wolf populations, as ODFW has less control over unauthorized take. Further complicating the  
 11 issue is that unauthorized take, specifically unlawful take, is often difficult to measure and document.  
 12 Recently, it has been suggested that unauthorized take may be underestimated in some wolf  
 13 populations, contributing to reduced population growth rates (Sweden: Liberg et al. 2011,  
 14 Wisconsin: Treves et al. 2017). While the potential for increased and undocumented unauthorized  
 15 take may have occurred and reduced population growth rates in those study areas, both wolf  
 16 populations increased during the period of analysis. It has also been suggested that changes in  
 17 policy for wolf management (i.e., allowing of authorized take) may cause an increase of unauthorized  
 18 take of wolves and reduce population growth rates (Chapron and Treves 2016). This suggestion has  
 19 been repeatedly challenged (see Olson et al. 2017, Pepin et al. 2017, Stien et al. 2017) and it is  
 20 unclear if the potential increase had a measurable effect on the size of the wolf population (Olson et  
 21 al. 2017). Due to the potential that some instances of unauthorized take (i.e., poaching) may be  
 22 concealed (referred to as ‘cryptic poaching’), estimates of unauthorized take and associated mortality  
 23 risk may be underestimated (Treves et al. 2017). However, the degree to which this may occur in  
 24 Oregon is unknown. Regardless, the potential effects of unauthorized take should be considered an  
 25 important factor influencing wolf conservation, especially in cases of small population sizes. Given  
 26 the potential for higher levels of unauthorized take than anticipated and that this may reduce  
 27 potential population growth rates of wolves (Liberg et al. 2011, Treves et al. 2017), assessing levels  
 28 of unauthorized take will be important when evaluating the impacts of human-caused mortality to  
 29 wolf conservation and management in Oregon.

1  
 2 In most cases, unauthorized killing of Oregon wolves has been a result of illegal shooting, and one  
 3 case reported as mistaken identity resulted in the killing of a radio-collared wolf in Grant County in  
 4 2015. Wolves can be difficult to distinguish from coyotes, and the coloration of individual wolves  
 5 likely contributes to misidentification. Smaller red wolves and Mexican wolves are further at risk  
 6 because they are smaller and more similar in size to coyotes. It has been proposed that unauthorized  
 7 losses of wolves as a result of mistaken identity (e.g., confusing wolves with coyotes while hunting)  
 8 may negatively affect the overall conservation of red wolves and Mexican wolves (Newsome et al.  
 9 2015). Although NRM gray wolves are much larger than red and Mexican wolves, evaluating  
 10 misidentification as a potential threat for gray wolves should be considered. Coyotes are classified as  
 11 predatory animals in Oregon (ORS 610.002) and per ORS 496.162 this Plan does not prescribe  
 12 limitations on the taking of coyotes. However, to lessen the chance of misidentification and  
 13 accidental hunter take, ODFW will implement additional education and training through existing  
 14 program avenues – hunter education, website information, and media contacts. For example,  
 15 variations of Figure 4 (below) occur in the Big Game Hunting Regulations and Furbearer Hunting  
 16 and Trapping Regulations and a coyote and wolf identification quiz was created and posted to the  
 17 ODFW wolf website.

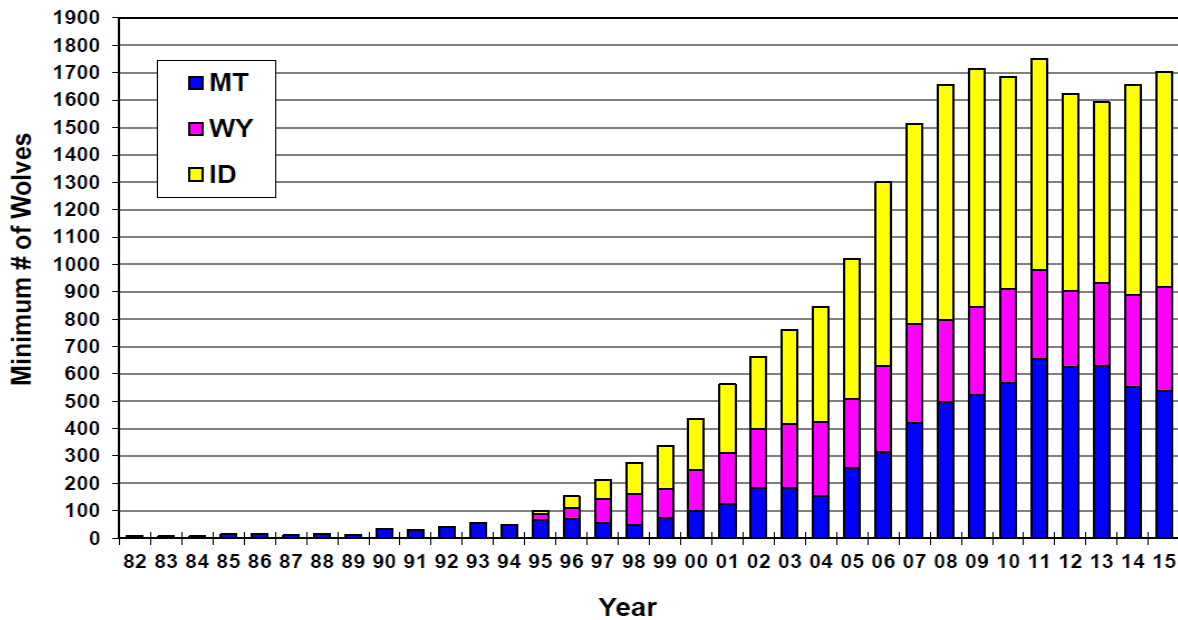


18  
 19 **Figure 4.** Identification guide for wolves and coyotes from the Oregon Big Game Hunting  
 20 Regulations. A similar guide is found in the Furbearer Hunting and Trapping Regulations.

1 **Genetic Diversity and Connectivity**

2  
 3 Genetic diversity of Oregon’s wolves is important and the loss of genetic variability among wolves  
 4 within the population over time can negatively affect a number of population performance  
 5 parameters (e.g., reproductive rates, survival, and resistance to disease). While there are examples of  
 6 small and isolated wolf populations that have persisted for decades (Fritts and Carbyn 1995, Boitani  
 7 2003, Liberg 2005), inbreeding is a threat to the long-term viability of small, isolated populations  
 8 (Liberg 2005, Fredrickson et al. 2007), and this may be exacerbated by wolves’ smaller effective  
 9 population sizes as few adults breed relative to the overall population. Although no data suggests  
 10 Oregon wolf populations are small and isolated, maintaining adequate numbers of breeding adults  
 11 over time is important to maintaining genetic variability.  
 12

13 To understand this subject, it is important to understand the origin of Oregon’s wolves, which came  
 14 from dispersers from the growing NRM population in Idaho, Montana and Wyoming (Figure 5).  
 15 Wolves from southern Canada had naturally recolonized and were successfully reproducing in  
 16 northwestern Montana in the late 1980’s. Wolves reintroduced into central Idaho in 1995 and 1996  
 17 originated from two distinct wolf populations in Canada: 15 wolves from 7 packs came from  
 18 Hinton, Alberta in 1995, and 20 wolves from 9 packs came from Fort St. John, British Columbia in  
 19 1996 (M. Jimenez, USFWS, personal communication). At the same time 31 wolves were  
 20 reintroduced into Yellowstone National Park in Wyoming. Additionally 10 wolves were relocated  
 21 from the recolonizing northwestern Montana subpopulation to Yellowstone National Park in 1997  
 22 (Vonholdt et al. 2008). Genetic analysis concluded that the reintroduced wolves were as diverse as  
 23 their general source population (Forbes and Boyd 1996;1997) and that genetic variation within the  
 24 NRM population is high (Forbes and Boyd 1996;1997, Vonholdt et al. 2008).  
 25



26  
 27 Figure 5. Estimated number of wolves in documented packs, other documented groups, and lone  
 28 wolves in Montana, Wyoming, and Idaho 1982-2015. Note that various regulations and  
 29 management actions occurred across states and years so some trends were influenced by policy  
 30 changes. Figure from [www.fws.gov/mountain-prairie/es/wolf-2016.php](http://www.fws.gov/mountain-prairie/es/wolf-2016.php).

1  
2 Genetic diversity is typically maintained via genetic interchange between subpopulations—as few as  
3 one to two immigrants per generation (approximately five years for wolves) can minimize the effects  
4 of inbreeding (Vila et al. 2003, Liberg 2005). This can be achieved by the demonstrated ability of  
5 wolves to rapidly disperse long distances and avoid inbreeding by selecting unrelated mates  
6 (Vonholdt et al. 2008). Idaho, Montana, Washington, and Wyoming wolf populations are genetically  
7 connected to each other and to Canada through natural dispersal (U. S. Department of the Interior  
8 2009). It follows that natural dispersal should allow a sufficient number of immigrants to arrive in  
9 Oregon as long as sufficient connectivity is maintained between populations in adjacent states  
10 (Hebblewhite et al. 2010).

11  
12 In Oregon, effective genetic interchange with a larger Idaho subpopulation has been demonstrated  
13 by Oregon’s westernmost wolf pack (Rogue) in the southern Oregon Cascade Mountains which is  
14 one generation removed from the central Idaho population—the breeding male of the Rogue pack  
15 (wolf OR7) is an offspring of an Idaho-born female (wolf B300). Radio-collar data shows that  
16 dispersing wolves immigrate to and emigrate from Oregon, indicating that Oregon is part of a  
17 metapopulation with Idaho and Washington. Genetic sampling of captured Oregon wolves (ODFW,  
18 unpublished data) confirms genetic relatedness to the Idaho subpopulation of wolves, further  
19 indicating a biological connection between the two subpopulations.

20  
21 While genetic diversity is currently considered high, monitoring will continue to assess levels of  
22 genetic interchange and population structure of Oregon wolves. Concerns of reduced genetic  
23 variability or isolation among Oregon wolves may be mitigated by management actions such as  
24 increased protection (especially individual breeder wolves) or translocation to augment depressed  
25 subpopulations. However, this is likely unnecessary based on data presented in this section.

## 26 27 **Habitat**

28  
29 Wolves are highly adaptive and are habitat generalists that can thrive in a variety of habitat types and  
30 structures. Further, adequate prey is considered of paramount importance and thought to regulate  
31 wolf populations in many areas. Even with these relatively simple requirements, wolf establishment  
32 and persistence may be limited or affected by a number of habitat-related variables. A review of  
33 predictors of important wolf habitat from previous research includes: 1) forested areas (Mladenoff et  
34 al. 1995, Larsen and Ripple 2004, Oakleaf et al. 2006a, Benson et al. 2015); 2) public ownership of  
35 land (Mladenoff et al. 1995, Carroll 2003, Larsen and Ripple 2004); 3) prey availability (Mech and  
36 Boitani 2003, Peterson and Ciucci 2003, Larsen and Ripple 2004, Oakleaf et al. 2006a); 4) low  
37 human presence (Belongie 2008); and 5) low road density (Mech et al. 1988, Kohn et al. 2001, Carroll  
38 2003, Larsen and Ripple 2006, Belongie 2008, Zimmermann et al. 2014, Benson et al. 2015).

39  
40 While Oregon’s wolf population has expanded geographically since its establishment in 2008,  
41 breeding wolves are still absent from much of Oregon. In an attempt to identify potential habitat  
42 and range of wolves in the state, based on the above predictors (excepting private land), ODFW  
43 developed a coarse map in 2015 using spatial data related to land cover type, elk ranges, human  
44 population density, road density, and cultivated or other land types altered by humans. The results of  
45 this project are contained in Appendix D. The resulting map of potential wolf range corresponded  
46 well with known wolf distribution in Oregon, and suggests that habitat availability is not currently  
47 limiting the continued expansion of wolves in Oregon.

1 The map, however, also illustrates that not all of Oregon’s historical wolf habitat is currently  
2 available to wolves because of high human densities, extensive road systems, and cultivated habitats.  
3 Current areas of unsuitable habitat and range include the Willamette Valley, Columbia Basin, and  
4 highly developed portions of central, southern, and eastern Oregon. Some portions of Oregon’s  
5 Coast Range may also be unsuitable for wolf establishment and persistence, though this is untested  
6 as wolves are not known to occur in that portion of the state at this time. Oregon’s human  
7 population is estimated at 4.1 million people and has increased 7% since 2010. It is projected to  
8 reach 4.8 million people by 2030 (2017 World Population Review). The extent to which this will  
9 impact available wolf habitat is unknown, though most of the projected population growth will  
10 occur in the already developed Willamette Valley and Portland metropolitan area.

### 11 **Human Attitudes Toward Wolves**

12  
13  
14 As shown previously, the initial extirpation of wolves from the state and other areas was a direct  
15 result of negative human attitudes that resulted in high levels of persecution of wolves. Human  
16 attitudes toward wolves are important to the overall conservation of wolves because they can affect  
17 behavior and actions toward wolves (Browne-Nuñez et al. 2012, Treves et al. 2013). They can also  
18 influence management and policy decisions that influence population sustainability. Intolerance of  
19 wolves caused by negative human attitudes or perceptions may dispose people to illegal behavior  
20 (Treves et al. 2013). Therefore, the well-established relationship between human-caused mortality  
21 and conservation of wolves warrants that ODFW consider public attitudes toward wolves when  
22 developing management policies.

23  
24 A worldwide review of public attitudes towards wolves from 1972-2000 showed a general public  
25 support for wolves and wolf restoration efforts (Williams et al. 2002). However, the research  
26 suggested that people with the most positive attitudes about wolves have been those with the least  
27 experience with them. People who live in areas with wolves have more negative attitudes toward  
28 wolves than the general public, and negative attitudes are further amplified by wolf predation of  
29 livestock (Ericsson and Heberlein 2003). Residents within Wisconsin’s wolf range showed an  
30 overall decline in tolerance of wolves between 2001 and 2009 (Treves et al. 2013). This time period  
31 was associated with changes in policies towards wolves that allowed increased authorized take and  
32 during which the wolf population and the number of depredations more than doubled. In Utah, an  
33 area without wolves, researchers showed no significant changes in attitudes toward wolves during a  
34 similar (1994-2003) timeframe (Bruskotter et al. 2007).

35  
36 Some research has suggested that negative attitudes which result in illegal killing of wolves may be  
37 moderated with the use of effective and responsible management programs (Olson et al. 2014).  
38 Because public acceptance of some management actions (e.g., population management, lethal  
39 removal of depredating wolves) is often tied to overall attitudes toward wolves (Musiani and Paquet  
40 2004), it will be important for managers in Oregon to monitor changes in human attitudes toward  
41 wolves and management actions of wolves. This could be accomplished through Oregon-specific  
42 monitoring of attitudes and perceptions of Oregon’s diverse public through universities or other  
43 scientific research organizations.

### 44 **Hybridization**

45  
46  
47 Wolves are capable of hybridizing with other canid species and documented hybridization has  
48 occurred with coyotes, domestic dogs, and feral dogs. While some researchers believe that

1 hybridization may cause the loss of pure gene pools (Hess et al. 2013), others suggest that  
2 hybridization may not be an important conservation concern in some populations of wolves (Vila  
3 and Wayne 1999). In some instances, the hybridization may be limited to a single event or result in  
4 the evolution of a group of wolves suggested to be a distinct species (Wilson et al. 2000). Generally,  
5 behavioral and physiological differences between wolves and wolf hybrids, coyotes, and dogs keep  
6 the populations distinct (Vila and Wayne 1999).

7  
8 Because wolf hybrids can be difficult to distinguish from wild wolves, negative encounters between  
9 humans and domesticated wolf-dog hybrids often are incorrectly attributed to wild wolves. The  
10 potential does exist for the genetic pollution of some wolf populations, but the risk is low  
11 considering offspring from wolves and dogs will often have a low survival rate (Vila and Wayne  
12 1999). Though domestic wolf-dog hybrids are widely reported to exist in Oregon, there are no  
13 known wild-living populations of wolf-dog hybrids. In addition, wolf-dog hybrids have not been  
14 identified in genetic samples collected and analyzed to date (ODFW, unpublished data). Combined,  
15 these data substantiate that hybridization between wolves and dogs is not currently threatening the  
16 overall conservation of wild wolves in Oregon. Continued monitoring of Oregon's wolves by  
17 collection and analysis of genetic samples from all handled wolves will inform managers of the  
18 presence and prevalence of wolf-dog hybrids.

19  
20 Wolf-dog hybrids are regulated as domestic dogs in Oregon, and the Wolf Plan has no jurisdiction  
21 over wolf-dog hybrids. Authority to regulate the breeding, raising, and holding of wolf-dog hybrids  
22 lies with individual Oregon counties. Some Oregon counties have adopted ordinances that regulate  
23 the possession of captive wolves and wolf hybrids. For example, Union County prohibits breeding  
24 of captive wolves, keeping wolves within the county, and releasing of a predatory animal. The  
25 possession of wolves or hybrids as pets is discouraged because of the potential threat to human  
26 safety. "Hybrids and tame wolves have little fear of humans, are less predictable and manageable  
27 than dogs, and are considerably more dangerous to people" (Fritts et al. 2003).

28  
29 To help protect wild wolf genetic health in Oregon, the Commission adopted rule OAR 635-0440-  
30 0460 in January 2017 regarding the holding of wolves. The new rule tightly regulates the holding of  
31 pure wolves and not the holding of hybrid wolf-dogs. However, it does require proof of hybridity,  
32 and lack of this proof may result in a required holding permit (which cannot be issued after January  
33 20, 2017). Components of the wolf holding rule include:

- 34
- 35 • Wolves held in captivity require a wildlife holding or wildlife exhibitor/animal entertainment
  - 36 industry or wildlife sanctuary permit.
  - 37 • After January 20, 2017, wolves held under a valid permit may only be transferred to an AZA
  - 38 accredited facility as approved by ODFW.
  - 39 • Wolves cannot be imported, exported, purchased, sold, or exchanged except by permit from
  - 40 ODFW.
  - 41 • Specifically prohibits wolves from being removed from the wild.
  - 42 • Captive wolves cannot be bred, reproduced, or propagated.
- 43

#### 44 **Diseases and Wolf Health**

45  
46 Diseases in carnivores generally have minimal impact on humans or domestic species such as  
47 livestock. Though rare, nearly all occurrences of important diseases in carnivores are associated with

1 carnivore-specific pathogens including viruses like rabies, canine parvovirus, and canine distemper.  
2 These often involve public health concerns and may result in carnivore population effects. Very little  
3 disease-caused mortality has been documented in Oregon wolves, and there are currently no known  
4 disease issues affecting Oregon wolf populations or threatening Oregon's public, other wildlife, or  
5 domestic species. A summary of diseases potentially affecting wolves in Oregon is contained in  
6 Appendix B of this Plan.  
7

8 To test for diseases in Oregon, ODFW routinely collects blood serum samples during wolf capture  
9 events. Serum samples are banked and can be used to test for common wolf pathogens which may  
10 influence local wolf populations. As of the writing of this Plan serologic screening has been  
11 performed on 38 wolf samples and positive titers and prevalence rates for the following diseases  
12 have been documented: Leptospirosis (5%), canine distemper virus (8%), canine adenovirus (66%),  
13 and canine parvovirus (89%) (ODFW, unpublished data). It is important to note that a positive  
14 serologic test does not necessarily indicate an active infection, but instead indicates an exposure to  
15 the pathogen.  
16

17 It will be important to continue identifying emerging and re-emerging diseases or endemic diseases  
18 already occurring on the landscape. Disease testing and monitoring is part of most sound wildlife  
19 management programs and will be included in Oregon's wolf management efforts. At a base level,  
20 routine collection and banking of blood serum of captured wolves will allow continued testing for  
21 many specific pathogens. Other collection of samples (e.g., endoparasites and ectoparasites, body  
22 tissues) will be performed on an as observed and available basis. Furthermore, in situations of new  
23 or re-emerging disease detection, new management or research needs, increased observed or  
24 suspected disease-caused wolf mortality, or other indicators that diseases may be affecting or  
25 depressing local wolf populations, ODFW will implement a responsive testing protocol to monitor  
26 and remedy the problem if possible. This response protocol will include the following:  
27

- 28 • Identify specific pathogens and the risk factors that pose a health threat to people, wolf  
29 populations, or domestic animals.
- 30 • Determine rationale for specific disease testing (surveillance, management and control, research)  
31 and whether testing meets criteria for costs versus benefits and the probability of providing  
32 meaningful results.
- 33 • Use the best technology available or gold standard testing protocols for each disease.
- 34 • Assess management implications of any detected disease to humans, domestic animals, and other  
35 wildlife (i.e., is it socially or biologically important?).
- 36 • Determine the prevalence of an identified disease tested (e.g., how many animals in the  
37 population are affected?).
- 38 • Determine other species that may play a role in transmission, reservoir maintenance, or serve as  
39 an intermediate host in the case of parasites. If a disease is known to occur in domestic or other  
40 wild animals, consider testing those potentially affected species.
- 41 • Determine if testing should be compulsory (test all live-captured or killed wolves for specific,  
42 identified diseases) or opportunistic based on management questions or research requests.
- 43 • Evaluate the costs associated with testing. Costs would be expected to increase with increasing  
44 wolf population numbers.
- 45 • Identify a threshold for when testing may prove unnecessary.

1 **D. Monitoring Wolf Populations**

2  
3 **Objective**

- 4  
5 • Maintain accurate information on the population status and distribution of wolves in Oregon  
6 through a comprehensive monitoring program.

7  
8 **Strategies**

- 9  
10 • Use radio-telemetry as the primary monitoring technique to assess the number of wolf  
11 breeding pairs and designation of wolf pack home ranges during Phases I and II. Once  
12 Phase III is reached, use radio-telemetry in select situations and for annual counts of wolf  
13 packs.  
14 • Use field observations and reported sightings by the public that are verified to assist  
15 managers in determining the distribution of wolves in Oregon, and the extent of wolf range  
16 expansion.  
17 • In addition to annual counts of wolves, use data derived from multiple sources to assess  
18 overall population health.  
19 • Evaluate new methods for monitoring wolf populations, including the use of citizen-  
20 collected data, and methods developed and tested in other states.  
21 • Continue to maintain the ODFW database on wolf population parameters and incorporate  
22 research findings.

23  
24 Overall, data from multiple sources will be used to assess overall population health; including annual  
25 counts, telemetry data, survival rates, disease testing, and a variety of monitoring techniques. Radio-  
26 telemetry will continue to be an important technique for producing necessary data for guiding  
27 management decisions and providing information regarding important population parameters such  
28 as pack distribution, mortality, dispersal, population trends, wolf den locations, rendezvous sites,  
29 winter use areas, and wolf territory boundaries. GPS collars will continue to be used in select  
30 collaring situations where additional or more precise data is required. However, in some cases VHF  
31 radio-telemetry collars will be employed to monitor wolves due to their increased reliability and  
32 battery longevity. Regardless the type of collar, telemetry will continue to be useful for monitoring  
33 wolf breeding pairs during Phase I and Phase II. Collaring data is also a critical component during  
34 development of population models to build decision management tools.

35  
36 As the statewide wolf population increases, the use of monitoring methods which do not require  
37 capture of wolves will become increasingly important. Non-capture methods currently employed  
38 include howling, track, aerial, and scat surveys; and trail camera surveillance. New pack counts and  
39 survey techniques are being developed and tested in other states with wolves, and Oregon will  
40 continue to evaluate and use these methods as they become available. In addition, biologists will  
41 continue to collect genetic samples (in any phase) from captured wolves and other sources (e.g.,  
42 scat) as available and within budgetary resources. These samples can be used to monitor breeder  
43 success, dispersal, genetic connectivity, and other population attributes. Data collected by the public  
44 through broad-scale citizen science projects (i.e., data collected by a network of volunteers) may be  
45 useful in monitoring wolves in Oregon. Examples of large-scale citizen science projects include the  
46 long-standing Christmas Bird Count; the data-rich eBird (Sullivan et al. 2009); or the Wisconsin  
47 Volunteer Carnivore Tracking Program initiated in 1995 (Wisconsin DNR 2017). Biological data

1 collected by volunteers generally requires training, specific proficiency standards, and in some cases a  
2 firm commitment by volunteers to complete surveys. In addition, rigorous filtering of volunteer-  
3 collected data is required to ensure its usefulness to managers. In Oregon, citizen-based surveys or  
4 monitoring may be helpful with assessing wolf presence, distribution, breeding status, and  
5 abundance. Potential types of volunteer monitoring include tracking, scat detection/collection, trail  
6 camera, and howl surveys. ODFW will continue to evaluate the potential for citizen science  
7 volunteer projects to provide useful wolf monitoring information at an optimal cost-benefit basis on  
8 a case-by-case basis.

9  
10 ODFW will have primary responsibility to monitor the wolf population under this Plan.  
11 Collaboration with tribes, other state and federal agencies, jurisdictions, universities, landowners,  
12 local government, and the public is essential to the success of the monitoring program. This  
13 coordination will be especially important when monitoring packs near state borders or when packs  
14 are located on or near tribal lands.

15  
16 During Phase I and Phase II, wolves will be collared within reasonable and practical limits with  
17 respect to budgetary constraints and human/wolf safety. For known packs, effort will be made to  
18 collar at least one member of the pack with emphasis on at least one breeding adult. Other pack  
19 members may be collared to the extent feasible and depending on circumstances or pack-specific  
20 monitoring needs.

21  
22 During Phase III, the wolf population will generally be monitored through counts of wolf packs as  
23 an indirect estimator of breeding pairs. However, in years where initial survey data or other  
24 information indicate the possibility of dropping below Phase III population levels, breeding pairs  
25 will continue to be enumerated for that year. Biologists will begin the transition from breeding pairs  
26 to packs by concurrently surveying packs during winter and determining the number of breeding  
27 pairs during Phase II. For the purpose of population monitoring and research to guide decision-  
28 making, collaring will be used in select situations, such as with wolves that appear in new locations.  
29 However, radio-telemetry will also be employed in situations not specifically related to population  
30 monitoring such as select situations of livestock depredation or other wolf-human conflict. While  
31 not all packs will be expected to have collared wolves, managers will consider the proximity to  
32 livestock and history of wolf-livestock conflict when prioritizing collaring levels.

## 34 **E. Coordination with Other Governments, Agencies, and Organizations**

### 36 **Objective**

- 37  
38 • Continue to coordinate with other agencies and organizations to achieve wolf conservation  
39 and management objectives.

### 41 **Strategies**

- 42  
43 • Continue to use the expertise of the U.S. Fish and Wildlife Service (USFWS), the U.S.  
44 Department of Agriculture's Wildlife Services Program (Wildlife Services), U.S. Forest  
45 Service (USFS), Bureau of Land Management (BLM), Oregon Department of Agriculture  
46 (ODA), tribal governments and private sector professionals, and other state agencies.

- 1 • Use the *2019 Federal/ State Coordination Strategy for Oregon Wolf Plan Implementation* in portions  
2 of Oregon where wolves are listed under the federal ESA. See Appendix C. Urge the  
3 USFWS to update this strategy on a schedule compatible with this Plan.
- 4 • Work with the Oregon State Police Fish and Game Enforcement Division, the lead  
5 enforcement agency, and other law enforcement entities including the USFWS, U.S. Forest  
6 Service, and county sheriff departments.
- 7 • Coordinate with other state land management agencies such as the Department of State  
8 Lands, Department of Forestry, and Parks and Recreation Department as needed.
- 9 • Engage non-governmental wolf stakeholder organizations for input regarding wolf  
10 management in Oregon.
- 11 • Inform public and private land managers of general wolf activities on their respective lands  
12 as needed.
- 13 • Inform county boards of government of wolf-related activities as needed.

14  
15 Successful implementation of the Wolf Plan requires continued close coordination with adjacent  
16 states, other government agencies, tribes, county governments, nongovernmental organizations, and  
17 willing landowners to share resources, reduce costs and avoid potential duplication of effort with  
18 these entities. Similar coordination efforts are a regular part of many current wildlife management  
19 activities.

20  
21 Although many conservation and management hurdles were overcome during the first 10 years of  
22 this Plan's implementation, the management of wolves in Oregon in the future will require continual  
23 improvement of methods to resolve conflicts between wolf stakeholders. Deep-rooted social  
24 identity strongly influences thoughts about wolves and their management (e.g., tolerance)  
25 (Naughton-Treves et al. 2003) and despite agency efforts to address issues related to management  
26 and livestock depredation, the antagonism and conflict between pro-wolf and anti-wolf groups can  
27 be significant (Bangs et al. 2005, Madden and McQuinn 2014). In Oregon, it is expected that an  
28 increasing and expanding population of wolves may result in more, not less, conflict in the future.  
29 Additionally, as wolves expand into new areas of Oregon new and different levels of public  
30 engagement with ODFW may appear.

### III. WOLVES AS SPECIAL STATUS GAME MAMMALS

In 2009, the Oregon Legislature changed the status of wolves from protected non-game wildlife to a special status game mammal under ORS 496.004 (9). This change was called for in the 2005 Plan and allows ODFW to use existing, state and federal funding sources and existing field staff to include wolf management as part of their duties. These funding sources include both federal Wildlife Restoration grants (also known as Pittman-Robertson: PR) and fees from the sale of hunting licenses.

The special status game mammal classification recognizes the wolf's distinct history of extirpation and conflict with certain significant human activities as well as its unique place in human social attitudes based on experiences and myths that span centuries. This classification is based on Oregon's management successes with respect to other large carnivore game mammals (e.g., black bear, cougar) but also recognizes the factors that make the wolf somewhat distinct from other large carnivores. The classification provides the most options for long-term management by retaining, in addition to protective measures, tools such as responsive hunting and trapping for management purposes, although these management tools would not be applied in the same manner as under a traditional game mammal or furbearer classification.

ORS 496.004(9) lists all Oregon game mammals but specifically directs the Commission to define in rule the substantive standards governing wolves as a special status game mammal. Therefore, the Commission adoption of the framework of this Plan and the provisions within satisfy this requirement, but particularly the standards specific to this classification include, but are not limited to, those below.

1. When in Phase I and II, wolves are protected consistent with the conservation direction outlined in the Plan and lethal removal is only authorized in the Plan for specific depredation circumstances (i.e. chronic depredation, caught in the act). Lethal removal for human safety is authorized by statute in all Phases.
2. When in Phase III, the Plan also directs wolf protection and authorizes lethal removal, but includes the use of controlled take with the following stipulations:
  - (a.) Controlled take would be by ODFW special permit authorization only, and focused on a specific area or situation experiencing conditions that warrant a management response.
  - (b.) General season hunts (e.g., seasons open to holder of appropriate license and tag without restriction to the number of participants) are not permitted. Controlled hunts (e.g., planned hunts with a specific timeframe, area boundaries and where the number of hunters is limited through a public drawing or other means) require Commission approval through the planning and hunt development public process.
  - (c.) In the circumstances where controlled take is being implemented, trapping may be used for lethal management control. Before receiving special permit authorization from ODFW, trappers must be approved by ODFW. This ensures that both equipment and methods are best suited to the desired management outcome.
  - (d.) Controlled take by the public through hunting and trapping may be used in two circumstances as a management response tool to assist ODFW wildlife conservation and management efforts:
    - i. Long term, recurring depredation of livestock

1. The take will only address conflict situations in a specified area, and
  2. The take will not impair wolf population viability or reduce overall population health factors within the region.
- ii. Wild ungulate populations not meeting established management objectives or herd management goals
1. ODFW has determined that wolves are a major cause of the population not meeting established ungulate objectives or herd management goals (e.g., movements, use of key feeding areas, survival rates, nutrition, or other biological factors) and that the controlled take is expected to improve the situation.
  2. The take will not impair wolf population viability or reduce overall population health factors within the region.
- (e.) In addressing appropriate management response to wild ungulate impacts per paragraph d(ii) criteria above, ODFW will consider the following factors: 1) data or other information indicating that wolves are a major cause of ungulates not meeting objectives; 2) ability to address the situation through non-lethal means; 3) the level and duration of wolf removal necessary to remedy the situation; 4) ability to measure ungulate response to management actions; and, 5) identification of other potential major causes of an ungulate population not meeting objectives and attempts made to address them.
- (f.) In an effort to inform future actions and wolf management related to controlled take, ODFW will monitor the results and evaluate the impacts of any wolf removal under this section. As part of the annual wolf report to the Commission, information on wolf take and any documented effects on ungulate populations will be reported.

## Other Considerations

Other provisions related to the special status game mammal classification are:

- The maximum enforcement of applicable statutes imposing penalties for harming or killing a wolf illegally has been sought by the State. In 2016, the Oregon Legislature amended ORS 496.705 to increase the penalty for unlawful taking of gray wolves from \$1,000 to \$7,500. The Oregon State Police administers a TIP (Turn in Poachers) reward program through the Oregon Hunters Association specifically for citizens who turn in or provide information leading to the issuance of citation of someone who has illegally killed a wolf or other wildlife. Previously, only cash rewards were provided but in 2017, the Oregon Legislature amended ORS 497.112 to allow cash or hunter preference points as a reward.
- Where consistent with the above, Oregon's wildlife laws, wildlife damage statutes, and other related statutes remain applicable to this classification.
- Nothing in this classification would otherwise change legal options available to livestock producers and other citizens under this Plan or other current law aimed at addressing wildlife damage, livestock protection, and protection of human life.

## IV. WOLF-LIVESTOCK CONFLICTS

The ranching and farming industries are important components of the Oregon economy, and addressing conflicts between wolves and livestock is an essential part of this Plan. The Wildlife Policy (ORS496.012) directs ODFW to manage wildlife populations at optimum levels and in a manner consistent with the primary uses of the lands and waters of the state. ORS 496.004 defines “optimum level” as “...wildlife population levels that provide self-sustaining species as well as taking, nonconsumptive, and recreational opportunities”. In addition, ORS 610.055 directs that appropriate measures must be taken to assist farmers, ranchers and others in resolving wildlife damage, and that federal, state, county and local government should cooperate in efforts to control wildlife damage. In the case of damage, wildlife is defined to mean fish, wild birds, amphibians, reptiles, feral swine (as defined by the Oregon Department of Agriculture) and other wild mammals (ORS 496.004). Combined, these policies mandate that this Plan effectively address wolf-livestock conflict at a variety of scales, from industry-wide to individual producers. This chapter focuses on information, methods and management actions to reduce or minimize wolf-livestock conflicts in Oregon.

### A. Livestock Depredation and Other Effects

#### Livestock Status and Losses in Oregon

Oregon has approximately 1,297,945 cattle, and 214,613 sheep within its borders.<sup>3</sup>

Land ownership in the state is split evenly between private and public lands. The federal government owns nearly half the land in Oregon and much of that land is utilized by the cattle industry. In 2016, the U.S. Forest Service permitted 91,341 cattle<sup>4</sup> and the BLM approximately 151,877 cattle to graze on federal lands within Oregon. In eastern Oregon, it was estimated in 1997 that two-thirds of beef cattle spend some of the year on federal lands (Tanaka et al. 1997).

Current losses of livestock in Oregon to depredation from coyotes, cougars and bears vary by county depending upon the dominant vegetation, the number of carnivores and the number of livestock. Coyotes, the most abundant of the three, caused 63% of cattle losses by a predator in 2010 (USDA National Agricultural Statistics Service, 2011). In 1997, a statewide Wildlife Damage Survey was conducted by the Oregon Agricultural Statistics Service for the Oregon Department of Agriculture. Total livestock losses for that year from cougar, black bear, coyote, bobcat, eagles, ravens and dogs for all types of livestock amounted to \$1.6 million. Losses for cattle/calves and sheep/lambs was \$824,000 and \$767,000 respectively. An additional cost to producers for livestock injured by predators was \$214,000. The survey also recorded \$1.3 million spent by producers on non-lethal predator damage prevention. Prevention expenses included fencing, hazing devices, and guardian animals (Oregon Agricultural Statistics Service 1997).

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<sup>3</sup> USDA Census of Agriculture 2012.

<sup>4</sup> USDA Grazing Statistical Summary 2016.

## 1 Wolf-livestock Conflicts

2

3 Wolves prey on domestic animals in all parts of the world where the two coexist (Mech and Boitani  
4 2003, Karlsson and Johansson 2010). However, Mech and Boitani stated, “we know of no place in  
5 North America where livestock compose a major portion of wolf prey, or where wolves rely mainly  
6 on livestock to survive.” Further, wolves do not automatically hunt livestock (Chavez and Gese  
7 2006), but may learn to and begin killing livestock at some point. Additionally, wolves encountering  
8 livestock on a regular basis are likely to depredate sporadically (Bangs and Shivik 2001, Wydeven et  
9 al. 2004). This observation differs from the situation in Europe and Asia where livestock are  
10 common components of wolf diets.

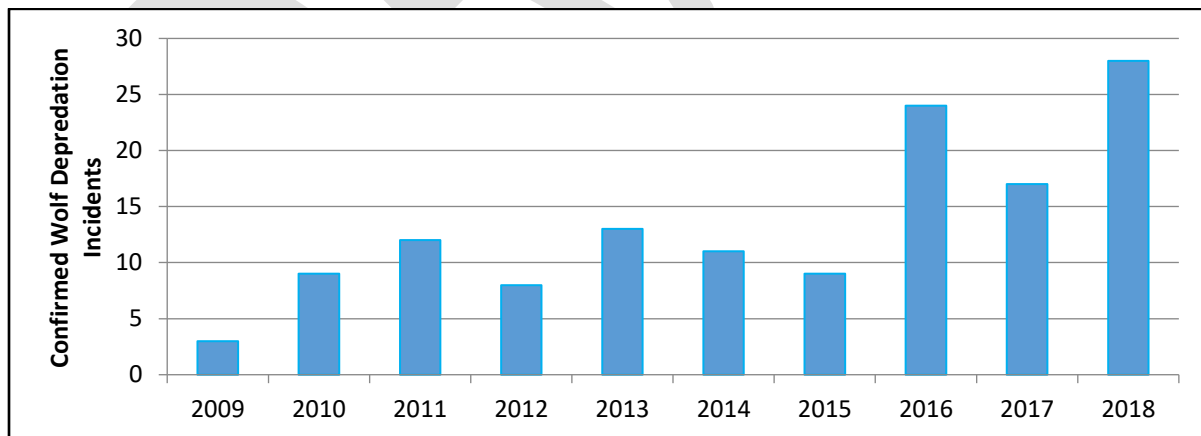
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12 Confirmed wolf depredations result in a comparatively small proportion of all livestock losses,  
13 though wolf damage can be significant to individual livestock producers (Collinge 2008, U.S. Fish  
14 and Wildlife Service 2015). In the NRM area overall, losses of livestock to wolves have been small  
15 relative to the overall numbers of livestock (U. S. Department of the Interior 2008). From 2008  
16 through 2013, an average of 189 cattle depredations (range=143-214) and 410 sheep depredations  
17 (range=162-749) occurred each year. Sixty-two of 355 (~17%) known wolf packs that existed in  
18 2014 were involved in at least one confirmed livestock depredation (U.S. Fish and Wildlife Service  
19 2015). In Oregon, between 2000 and 2018, 23 of 34 (68%) known wolves/packs were involved in at  
20 least one confirmed livestock depredation and 17 wolves/packs have depredated two or more times  
21 (50%). Of those 17, 13 depredated a third time and 11 depredated a fourth time (ODFW,  
22 unpublished data).

23

24 In Oregon, data collected from 2009-2018 shows a total of 134 incidents of confirmed depredation  
25 which resulted in 193 confirmed losses—71 cattle, 89 sheep, 3 goats, 3 llamas, 1 alpaca, 3 livestock  
26 protection dogs, 16 chickens, and 7 geese. As the Oregon wolf population increased from 2009-  
27 2018, incidents of wolf depredation trended upward (Figure 6), though not at the same rate as the  
28 minimum wolf count (Figure 3).

29



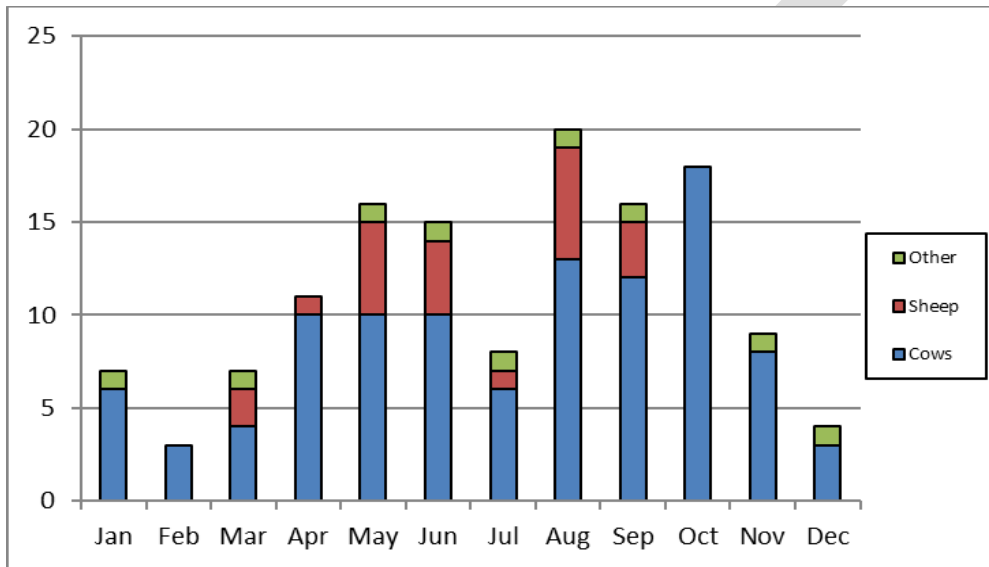
30

31 **Figure 6.** Confirmed wolf depredations incidents by year in Oregon (2009-2018)

32

33 Factors that can affect wolf depredation of livestock include pack size (Wydeven et al. 2004, Bradley  
34 et al. 2015), livestock density (Hebblewhite 2011), pasture size and remoteness (Bradley and  
35 Pletscher 2005), livestock husbandry methods (Fritts et al. 2003, Sime et al. 2007, Dondina et al.  
36 2014), and abundance of native prey (Fritts et al. 2003, Bradley 2004, Treves et al. 2004, Bradley and

1 Pletscher 2005). Consideration of these factors, and others, may make it possible to predict the risk  
 2 of wolf depredation, thereby increasing the potential for successful preventative measures. Wolf  
 3 depredation often reflects the seasonality of livestock calving (Fritts 1982), grazing practices, and  
 4 seasonal variation in energetic requirements of wolf packs (Fritts et al. 2003, Musiani et al. 2005,  
 5 Morehouse and Boyce 2011). In Montana, cattle depredations increased in the spring (March-May)  
 6 when calves were small, then showed a peak in the fall when pups were bigger, and pack cohesion  
 7 and energetic demands of the pack were higher. Sheep were more vulnerable year-round, with  
 8 depredation increases in summer and fall months when sheep are dispersed on the landscape (Sime  
 9 et al. 2007). In Oregon, confirmed depredations to date have followed a similar spring/fall pattern  
 10 (Figure 7).  
 11



12  
 13 **Figure 7.** Total confirmed depredation incidents by month in Oregon (2009-2018).  
 14

15 Most cattle losses as a result of wolf depredation in the northern United States are calves (Fritts et al.  
 16 2003, Oakleaf et al. 2003, Sime et al. 2007). Calves depredated by wolves tend to be smaller (Oakleaf  
 17 et al. 2003), and may be in poorer physical condition (Bradley and Pletscher 2005). In western  
 18 Wyoming, calf loss in an area with both wolves and grizzly bears increased with increasing livestock  
 19 density, and the overall effect of wolves and grizzly bears increased calf loss by 2% (Hebblewhite  
 20 2011). Selection of calves by depredating wolves has also been observed in Oregon. From 2009-  
 21 2018, 94 of 110 (85%) of cattle that have been killed or injured by wolves have been calves, and 16  
 22 of 110 (15%) have been adult cattle (ODFW, unpublished data). Depredation incidents involving  
 23 multiple-cattle are uncommon as only four incidents have been documented in Oregon over that  
 24 span (ODFW, unpublished data).  
 25

26 Sheep are vulnerable to wolf predation year-round due to their size and, unlike cattle, adult sheep are  
 27 commonly killed by wolves (Fritts et al. 2003, Sime et al. 2007). This pattern has been observed in  
 28 Oregon where 43 of 104 (41%) of sheep killed or injured (2009-2018) involved adult sheep while  
 29 61 of 104 (59%) involved lambs. In addition, more than half of Oregon’s sheep depredation  
 30 incidents involved multiple animals (ODFW, unpublished data), ranging from 2 to 24 injured or  
 31 dead sheep.

1 Wolves readily scavenge on livestock carcasses and removal of carcasses or other attractants can  
2 reduce wolf presence near livestock (Fritts et al. 2003, Bangs et al. 2006). In Alberta, 85% of  
3 livestock scavenging events occurred at livestock carcass disposal sites, which are often in close  
4 proximity to livestock (Morehouse and Boyce 2011). While some research did not demonstrate a  
5 clear link between depredation and carcass disposal (Bradley 2004, Bradley and Pletscher 2005),  
6 limited Oregon data has shown reduced wolf use of private land wintering livestock and calving  
7 areas following carcass removal (ODFW, unpublished data). Use of this practice will continue to be  
8 emphasized in Oregon to help reduce interactions between wolves and livestock.

9  
10 Detection and documentation of wolf depredation losses can sometimes be difficult, which is why  
11 confirmed wolf depredation data in Oregon are considered minimum figures. Several studies have  
12 shown that cattle depredations are less likely to be detected in open range situations (Oakleaf et al.  
13 2003, Sommers et al. 2010, Morehouse and Boyce 2011). In one study (Oakleaf et al. 2003),  
14 researchers detected only 1 of 8 predator-caused calf mortalities in remote forested and  
15 mountainous terrain. The authors also suggested that higher detection rates were expected in less  
16 timbered or less rugged country. Sommers et al. (2010) found that in some habitats 6.3 calves were  
17 killed by wolves for each confirmed depredation. These studies suggest that the rate of undetected  
18 depredations will depend partially on the characteristics of the rangeland (i.e., remoteness and  
19 accessibility) and the corresponding likelihood of finding dead livestock. Identification of wolf-  
20 caused depredation can also be affected by livestock density, frequency of human presence, summer  
21 precipitation, reporting bias, and the presence of other predators (Hebblewhite 2011). Even when  
22 livestock carcasses are located, accurate determinations of wolf depredation can affect overall data  
23 on wolf depredations, as experienced investigators cannot always identify wolf depredation (Fritts et  
24 al. 2003). Many factors can affect the accurate determinations of wolf depredation on livestock  
25 including weather, time since death of the animal, amount of consumption, decomposition, evidence  
26 of other predators, and experience of the investigator

27  
28 Aside from depredation kills, wolves also wound, chase, and test cattle. There is little published  
29 information that quantifies indirect effects of carnivores on domestic ungulates, though several  
30 researchers suggest that indirect effects of wolves on cow-calf production can be significant  
31 (Laporte et al. 2010, Steele et al. 2013). Indirect effects of carnivores on livestock foraging behavior  
32 can include reduced forage efficiency, greater time spent on vigilance, and possibly selection of  
33 poorer habitat and diet to avoid predators (Howery and DeLiberto 2004). Furthermore, harassment  
34 by predators can increase physiological stress responses (Cooke et al. 2013) or modify travel and  
35 bunching response (Laporte et al. 2010). Reduced animal health, decreased reproduction, lower  
36 weaning weights, and weight lost due to reduced forage efficiency may all affect the revenues of  
37 livestock producers, although there is little research of how these wolf-specific effects relate to  
38 additional production costs. In one Wyoming study, cattle prices and not wolf effects drove the  
39 gross margin of ranches (Steele et al. 2013); this is consistent with other research indicating non-  
40 predation factors, such as market fluctuations and extreme weather, may be greater threats to  
41 livestock production than wolves (Chavez et al. 2005).

## 42 43 **B. Working Dog and Pet Depredation**

44  
45 At the time this Plan was updated, no pets or sporting dogs have been confirmed lost by wolf  
46 predation or attack in Oregon. However, as wolves expand their range, dog owners will need to be  
47 aware of the potential risks to their animals. Areas or situations where wolves and domestic dogs

1 encounter each other can result in dog or wolf mortality. Wolves are territorial and may alter their  
2 regular movements or activities to seek out and confront domestic dogs. In Wisconsin, wolf-caused  
3 losses of hounds used for black bear hunting resulted in more total compensation paid, in some  
4 years, than for livestock losses (Treves et al. 2002). In some regions of the world, dogs are an  
5 important food source for wolves, to the extent that wolves reportedly have reduced the number of  
6 stray dogs in some areas (Mech and Boitani 2003).

7  
8 Working dogs used to herd or protect livestock are considered livestock for the implementation of  
9 this Plan and the Oregon Department of Agriculture's Wolf Depredation Compensation and  
10 Financial Assistance Grant Program (ORS 610.150), and they are vulnerable to wolf depredation.  
11 Prior to December 31, 2008, four events of depredation of livestock protection dogs while guarding  
12 sheep or cattle have been documented in Oregon, resulting in the death of three dogs and injury of  
13 two others (ODFW, unpublished data). The killing of guard dogs by wolves has also been well  
14 documented in the NRM Recovery Area (Bangs and Shivik 2001, Mech and Boitani 2003, Bangs et  
15 al. 2006). Guard dogs appear to be more effective and less at risk when an adequate number of  
16 experienced dogs per herd are present coupled with the presence of trained herders (Stone et al.  
17 2008). However, livestock producers using working dogs in conjunction with trained herders face  
18 added costs to protect their livestock from predator depredation. Additionally, working dogs and  
19 trained herders may be more effective for protecting sheep flocks than protecting cattle.

20  
21 In Oregon, some wolves are likely to use areas near human habitation or areas used for recreation  
22 which could put pets or working dogs at risk. Dogs running at large or dogs working cattle or sheep  
23 may be vulnerable in these situations. Bird hunting dogs or hounds used in areas occupied by wolves  
24 also could be at risk. Continued public education will be important in preventing wolf/domestic dog  
25 interactions.  
26

### 27 **C. Tools for Minimizing Livestock Depredation**

28  
29 An integrated approach is required to minimize depredation of livestock, including the use of both  
30 proactive and corrective measures in situations of active depredation. In the relatively short  
31 timeframe that wolves have re-established in Oregon, wolf managers and livestock producers have  
32 implemented a number of non-lethal and lethal techniques to minimize depredation. The  
33 effectiveness of non-lethal and lethal techniques to minimize depredation can vary. Treves et al.  
34 (2016) provided a summary of 12 published papers assessing effectiveness of non-lethal and lethal  
35 techniques to reduce livestock depredation by canids, felids, and ursids. Of the five non-lethal  
36 examples, the researchers found that four were effective at reducing depredation and one showed no  
37 effect. Of the seven assessments of lethal control techniques, two were found to be effective at  
38 reducing depredation, two showed counterintuitive results, and three showed no effect. Determining  
39 effectiveness of lethal control methods is difficult however, because effective study designs (i.e.,  
40 random assignment of treatments) may not always be logistically possible, studies are often  
41 observational in nature, and confounding variables may be present or analyses techniques may be  
42 inappropriate. For example, Wielgus and Peebles (2014) concluded lethal control increased the risk  
43 of wolf depredation the following year, but using the same data set and a different analysis  
44 technique, Poudyal et al. (2016) found the opposite pattern. Bradley et al. (2015) examined  
45 effectiveness of lethal control on recurrent depredations at a pack level over 5 years and observed  
46 that entire pack removal (79% reduction in recurrent depredation) was more effective at reducing  
47 depredation than partial pack removal (29% reduction in recurrent depredation). This suggests

1 lethal control may be effective at reducing livestock depredation at a local scale in some scenarios.  
2 Given these findings, ODFW will continue to emphasize use of non-lethal techniques whenever  
3 possible, but lethal control of wolves may be required in some situations of chronic livestock  
4 depredation.

## 6 **Non-lethal Deterrents**

8 Techniques to discourage depredation are continually being developed, and many have been specific  
9 to wolves in the NRM states (Bangs and Shivik 2001, Bangs et al. 2006, Stone et al. 2008). Further,  
10 Treves et al. (2016) found that in several experimental studies, various non-lethal techniques were  
11 effective at reducing livestock depredation across a variety of predator species. In addition, the role  
12 of certain husbandry practices such as increasing supervision, pasture choice based on habitat  
13 features, stocking rates of different ages have been shown to reduce livestock depredation risk  
14 (Muhly et al. 2010). Though non-lethal measures and husbandry practices may not have universal  
15 effectiveness and may not be feasible in some situations, they can be effective in reducing conflict in  
16 some situations (Sime et al. 2007). Not all non-lethal measures are useful in all situations, and it is  
17 important that managers and producers identify which measures are appropriate. The following is a  
18 list of non-lethal or preventative measures to help livestock producers minimize the risk of wolf  
19 predation on livestock and most have been implemented in Oregon. This list is provided to help  
20 identify measures which are appropriate for different wolf-livestock conflict situations.

22 Additional information about these measures can be viewed at:  
23 [www.odfw.com/Wolves/non-lethal\\_methods.asp](http://www.odfw.com/Wolves/non-lethal_methods.asp)

### 25 Reducing Attractants

26 The physical removal or treatment of livestock carcasses (or portions of) which may attract  
27 wolves. Removal may occur by hauling carcasses to disposal in a landfill or other appropriate  
28 location, or by burying, composting, or incinerating in some situations. In situations where carcasses  
29 cannot be practically removed, temporary fencing or fladry (see below) may be useful to prevent  
30 wolf use of the carcasses.

### 32 Fencing

33 Fencing used specifically to deter wolves from livestock, may be permanent or temporary, and  
34 constructed of a variety of fencing materials and electrified, depending on the situation. In general,  
35 fencing is considered when attempting to protect livestock in a small pasture, enclosure, or when  
36 stock is gathered in a reasonably protectable area (e.g., sheep nighttime bedding area). It is generally  
37 not applied to larger or dispersed grazing operations.

### 39 Fladry

40 A rope or electric wire (turbo fladry) with evenly spaced red flags that hang down (Musiani et al.  
41 2003), creating an apparent psychological barrier that wolves avoid crossing. Highly portable and  
42 quickly installed, fladry can be used for a variety of livestock operations including sheep night  
43 penning and some calving areas, but can be challenging to install and maintain at large scales. It is  
44 best used as mobile protection on a short-term basis in a small area. Fladry requires regular  
45 maintenance for effective use. In general, fladry is not intended for use over long periods of time in  
46 the same location (usually less than 90 days) because wolves may become habituated, and thereby  
47 reduce its effectiveness.

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Livestock Management Practices

These livestock management practices are actions taken specifically to help avoid wolf-livestock conflicts and can include practices such as changing pastures use to avoid areas of wolf activity, evening feeding, calving season changes, changing herd structure, low-stress livestock handling, and others.

- Changing Location: If possible, changing pastures or grazing sites to avoid wolf use areas may be an option when wolf use data or recent depredation indicates area-specific problems.
- Changes to Herd Structure: Producers may choose to put cows with small calves and weaned calves in more protectable situations or areas that have less wolf use. For areas with known wolf use, producers may choose to put dry cows, cows with larger calves, and ewe-only bands in those areas as they consist of larger or older animals that are less vulnerable to depredation.
- Delayed Turn Out: In some situations, producers choose to wait to put calves in forested pastures and allotments until after the elk and deer have produced their young for the year, greatly increasing natural food sources.
- Evening Feeding: Feeding in the evening can have the effect of bunching cows and calves into a common area where they would be less vulnerable to night predation. Evening feeding may also affect birthing times of livestock (some animals do not generally give birth while their stomach is full).
- Changes to Calving and Lambing: Livestock are at increased risk during the calving and lambing seasons and several management actions may reduce risk to younglivestock. Calving and lambing in more protectable situations can reduce loss from wolves and other causes versus calving in large forested pastures or open range allotments. Birthing earlier to have larger calves on allotments and reducing the length of the calving period have also appeared to be effective for some producers.
- Low-Stress Livestock Handling: A technique was developed for working with cattle to efficiently move cattle while minimizing animal stress. Traditional livestock handling can be stressful to cattle, which may lead to poor animal health, less efficient movement, and creates noise when calves are separated from their cows. Wolves in the area can be attracted to the noise and vulnerable calves. One of the main features of low-stress livestock handling is creating herd movement through the least amount of energy and pressure as necessary. With respect to predation risk, low-stress livestock handling offers several benefits. First, cattle moved in this manner are more likely to remain in a herd and cows are less likely to be separated from their calves. Calves that remain with their mothers and cattle standing their ground in a herd are less vulnerable to predation. Secondly, cattle placed through low-stress livestock handling are less likely to scatter after being moved, allowing the producer to place the cattle in an appropriate area and be more confident that the herd will remain there even in the producer’s absence.

Livestock Protection Dogs

Use of specific breeds of guarding dogs or other animals that are used with intent to protect livestock from wolf depredation and alert the producer to wolf presence. Breeds such as Pyrenees, Anatolian, Akbash, or other established guarding breeds are commonly used. Livestock protection dogs are most effective when a person is nearby to respond if dogs engage wolves and are normally used in conjunction with herded livestock such as sheep, but may be used in some situations for

1 cattle or other livestock species. Multiple trained adult dogs are usually recommended, but the  
2 number may depend on the level of wolf activity in the area, size of grazing area, and behavior  
3 characteristics of the dogs. Wolves may be more aggressive near dens or rendezvous sites and dogs  
4 are not recommended in these areas.

#### 5 6 Human Presence as a Non-lethal Measure

7 The underlying concept of increasing human presence as a deterrent to wolf depredation is that  
8 wolves tend to avoid humans. Human presence actions are often conducted with the primary intent  
9 of reducing or deterring wolf depredation, though in some situations it may be passive or secondary  
10 to other ranching operations (e.g., all-night presence for the purpose of calving while wolves are in  
11 the area would be expected to minimize wolf-livestock conflict). Two approaches to using human  
12 presence as a deterrent are: 1) regular or planned presence using range riders, hazers, herders, or  
13 other planned human guarding of livestock, and 2) presence in response to wolf information (e.g.,  
14 tracks, observations of wolf activity, abnormal livestock behavior, notification by ODFW), or during  
15 susceptible depredation times such as nighttime, when wolves are known to be present in areas of  
16 livestock. Monitoring for signs of wolf activity, though not considered a non-lethal measure by itself,  
17 is important to help prioritize effective wolf-deterring human presence. Types of human presence  
18 associated with ranching operations include:

- 19 • Hazers and Range Riders: Generally considered to be regular or sometimes continuous  
20 presence for the specific purpose of protecting livestock, range riders patrol areas with  
21 wolves and livestock at hours when wolves are most active (dawn, dusk, night). The rider  
22 uses information available to patrol in livestock areas with current wolf activity and is  
23 equipped to actively haze wolves away from livestock when found. In areas of active  
24 depredation and in large areas with dispersed livestock, more than one range rider may be  
25 necessary to provide adequate protection.
- 26 • Herders or other Guarding: This is directly applicable to sheep operations where herding is a  
27 normal part of sheep ranching. During the daytime herders often keep the sheep bunched  
28 making the sheep more protectable and preventing sheep from becoming separated from the  
29 band. Herders may be most important at night when sheep are gathered in bedding areas.  
30 Effectiveness is increased if a herder is working with livestock protection animals, fladry, or  
31 other barriers to protect sheep. Additional herders may be needed in areas of high wolf  
32 activity to specifically work at night when depredation is most likely to occur.
- 33 • Individual Response: This is human presence which may be additional to regular ranch  
34 operation and with the intent of deterring wolf-livestock conflict if wolves are present. It is  
35 often tailored to situations when wolves are in proximity to livestock (i.e., may not be  
36 practical or expected when wolves are known to be in another area). Presence may be  
37 conducted by patrolling during active wolf periods such as dawn and dusk, and in situations  
38 such as calving or lambing periods, and may be best conducted at night to further reduce  
39 depredation. It also includes monitoring and responding to information of wolf activity in  
40 areas of livestock. This response may be increased when gathering or moving livestock as  
41 these activities can create distress and noise in livestock when there is a temporary separation  
42 of cows from their calves.

1 Alarm or Scare Devices

2 This includes any combination of alarm system with lights and/or loud sounds which are used for  
3 the purpose of scaring wolves from areas of livestock. Primarily used for protection of  
4 defined/enclosed areas or small pastures, but in certain situations can be used to deter wolves from  
5 using a more general area, especially calving pastures.

- 6 • Radio-activated-guard (RAG) devices: These are scare devices which are triggered by the  
7 signal from an approaching radio-collared wolf. When activated they emit strobe light  
8 flashes and varying loud sounds designed to deter the wolf. RAG devices can also be used  
9 as an alarm device to alert a producer that radio-collared wolves are in the area. RAG  
10 devices may be available through ODFW or other organizations. These devices can only be  
11 used in areas where one or more wolves are radio-collared.
- 12 • Other light and sound making devices: These may be warranted in situations similar to  
13 above but where wolves are uncollared and could include a variety of lighting devices (e.g.,  
14 Fox Lights), motion-activated alarm devices (e.g., Critter Gitter), radios, music players,  
15 etc. Varying the sounds and frequently changing positions of the device will increase  
16 effectiveness and reduce the chance that wolves become habituated.

17 Hazing or Physically Scaring Wolves

18 This is direct harassment of wolves with the intent to use human actions to actively scare wolves  
19 away from livestock and may include loud noises (e.g., yelling, air horns, firing shots in a safe  
20 direction), spotlights or other confrontation with wolves. There are two types of harassment  
21 recognized by Oregon Administrative Rule: non-injurious and non-lethal injurious. **Please Note:**  
22 **Harassment of wolves is regulated, and is discussed later in this chapter.**

23 Experimental Practices

24 There are a number of non-lethal and preventative practices (i.e., bio-fencing, bellling cattle,  
25 inflatable tube men, using wolf-savvy cattle, shock collars, and possibly others) which may reduce  
26 depredation risk, but are not yet known to be effective. Experimental practices are encouraged but  
27 may require additional use to determine if they are practical, useful, and the conditions in which they  
28 would be most effective. Producers are encouraged to coordinate experimental practices with  
29 ODFW before implementing them.

30  
31 There may be other non-lethal deterrents not included on this list that may be reasonably expected  
32 to minimize wolf-livestock conflict in some situations. ODFW periodically updates the ODFW  
33 wolf webpage based on new research, information, and experience in working with wolves,  
34 landowners, and situations of wolf-livestock conflict. This page can be accessed at  
35 [www.odfw.com/Wolves/non-lethal\\_methods.asp](http://www.odfw.com/Wolves/non-lethal_methods.asp).

36 **Lethal Removal**

37  
38 Lethal removal of wolves to resolve wolf-livestock conflict is controversial and heavily scrutinized  
39 by the public (Musiani et al. 2005, Bangs et al. 2006, Bradley et al. 2015). In Montana, despite the  
40 lethal removal of 254 wolves prior to 2006, the population continued to grow and expand its  
41 distribution (Sime et al. 2007). The combination of non-lethal and lethal methods (which included  
42 the ability to take wolves caught in the act of attacking livestock) was thought to have kept  
43 depredations at a lower level than was originally predicted (Sime et al. 2007). The general

1 understanding is that the effectiveness of lethal removal is only short term, often lasting only the  
2 grazing season (Bradley 2004, Musiani et al. 2005). When employed in Oregon, lethal removal of  
3 wolves in response to depredation is considered to be a corrective action—its purpose is to stop  
4 presently occurring damage by wolves in a localized area, and not necessarily to address the potential  
5 of future depredations at a regional or statewide scale.

6  
7 The effectiveness of using lethal removal to stop or minimize depredation, while continuing to  
8 provide overall conservation for the species, is key in determining its usefulness in solving  
9 depredation. However, research into the effects of lethal removal are ambiguous, likely because  
10 studies are observational in nature and often related to the scale of analysis (e.g., pack level versus  
11 range-wide). One study found a positive relationship between lethal control at a statewide scale and  
12 future-year depredations, supporting the concept that lethal control had the opposite of its intended  
13 effect (Wielgus and Peebles 2014), though this finding was refuted by other studies (Poudyal et al.  
14 2016, Kompaniyets and Evans 2017). Analysis of long-term statewide data in Minnesota showed  
15 that killing a high number of wolves did not result in fewer depredations the following year (Harper  
16 et al. 2008), but on a shorter term basis lethal control was effective in reducing further losses in  
17 sheep, and in cattle in some situations (e.g., if at least one adult male wolf was removed). In the  
18 NRM at the pack scale, lethal removal was effective at reducing further depredations, though the  
19 effectiveness was strongly related to the number of wolves removed, where entire pack removal was  
20 more effective than partial pack removal (Bradley et al. 2015).

21  
22 In situations of lethal removal of breeder wolves, the probability of pack dissolution is increased  
23 (Brainerd et al. 2008, Borg et al. 2015), though the dissolution does not appear to have significant  
24 effects on overall population dynamics due to strong compensatory mechanisms (Borg et al. 2015).  
25 Even so, lethal removal of solitary individuals or territorial pairs in situations of chronic wolf-  
26 livestock conflict would be expected to have fewer effects on overall wolf conservation (Brainerd et  
27 al. 2008). This study also recommended that impacts to overall wolf populations is reduced when  
28 lethal removal is conducted on reproductive packs when pups are  $\geq 6$  months old and packs contain  
29  $\geq 6$  members (including  $\geq 3$  adult-sized wolves) (Brainerd et al. 2008). Depredations in Oregon often  
30 occur during the spring and fall months, overlapping these considerations in many cases.

31  
32 While lethal removal has been observed to reduce subsequent depredation at the pack level over a  
33 shorter time period, there is less evidence to support long-term reduction. A cycle can develop  
34 where new wolves re-colonize, cause new depredations, which leads to additional removals (Musiani  
35 et al. 2005). This situation is often unacceptable to advocates, livestock producers, and wolf  
36 managers (Bangs et al. 2006). In Montana, partial pack removal reduced subsequent depredations by  
37 29%, while full pack removal reduced subsequent depredations by 79% over a span of five years  
38 (Bradley et al. 2015). In this study, pack size of remaining wolves following lethal removal was the  
39 best predictor of recurring depredations with larger remaining packs having a higher probability of  
40 recurring depredation than smaller packs.

41  
42 In Oregon, authorized lethal removal for chronic depredation has occurred on five different  
43 situations involving wolves (Keating, Imnaha in 2011 and 2016, Harl Butte, Meacham, Pine Creek).  
44 In two of those situations, subsequent depredations by the same wolves occurred during or  
45 following efforts to removal of some but not all individuals (Imnaha 2011, Harl Butte). In spring  
46 2018, depredations continued after the removal of one individual of the Pine Creek pack but ceased  
47 for the year following removal of a third individual. In 2016, the entire Imnaha pack (4 members)  
48 were lethally removed. Depredations began again less than 4 months later in the same area, by

1 unrelated wolves that had occupied the Imnaha pack's former territory. Depredations were  
2 effectively stopped following the removal of both Keating wolves in 2009 and following the breakup  
3 of the Meacham Pack after the breeding female was removed (ODFW, unpublished data). For these  
4 reasons, lethal control of wolves is best used in an adaptive, integrated management program, which  
5 includes non-lethal and preventative measures as a starting point to reduce risk of depredation.

6  
7 Protection of livestock by allowing the taking of wolves caught in the act of attacking livestock is an  
8 additional tool to resolve wolf-livestock conflict (Bangs et al. 2006). This type of take is thought to  
9 empower producers to protect livestock (Sime et al. 2007) and immediately targets only the  
10 offending animal(s) while eliminating further control by agencies (Bangs et al. 2006). In Oregon, the  
11 single wolf taken under this Plan's caught-in-the-act provisions (May 2016) embodied both of these  
12 principles; depredation has not recurred since the taking, and the remaining pack was a successful  
13 breeding pair in 2016. Specific regulations concerning this type of take are detailed later in this  
14 chapter.

15  
16 Human tolerance toward wolves is long recognized as an important factor in recovery (Chapter II)  
17 and persistence of wolf populations (Fritts and Carbyn 1995, Fritts et al. 2003, Bangs et al. 2006).  
18 While lethal removal is only conducted in Oregon as a corrective measure, the concept of removing  
19 depredating wolves is believed to improve tolerance and reduce illegal take of wolves by the public  
20 (Bangs et al. 1995). However, the ability of lethal removal in situations of livestock depredation to  
21 improve tolerance by humans toward wolves is unclear. Research in Wisconsin suggested that lethal  
22 control measures in the short-term were ineffective for increasing tolerance (Browne-Nuñez et al.  
23 2012) and may even increase illegal take (Chapron and Treves 2016). Additional research in  
24 Wisconsin, however, showed that illegal behavior toward wolves can be moderated with effective  
25 state management programs which included lethal control of depredating wolves (Olson et al. 2014).  
26 Continued outreach, education, and effective management will be critical to increasing tolerance of  
27 wolves and ensuring long-term conservation of wolves in Oregon.

## 28 29 **Compensation**

30  
31 Though not a direct tool for minimizing wolf-livestock conflict, compensation for wolf-caused  
32 losses is common in most states with wolves. In Oregon, compensation is part of the state's  
33 integrated approach to addressing damage by wolves. Some researchers have reported the  
34 ineffectiveness of compensation as a means to increase tolerance toward wolves by livestock  
35 producers (Naughton-Treves et al. 2003, Stone 2009, Boitani et al. 2010); however, one study in the  
36 NRM showed that compensation was successful in maintaining more acceptance of wolves than  
37 would have existed without it (Stone 2009). Furthermore, in states where tolerance was not  
38 increased by compensation programs, there was still strong approval of compensation programs by  
39 intended recipients (Naughton-Treves et al. 2003, Stone 2009), and that if compensation was  
40 available, most livestock producers with losses did seek to be compensated (Stone 2009). As part of  
41 the development of the 2005 Oregon Wolf Plan, public support for a compensation fund was clearly  
42 stated in comments generated during town hall meetings held by ODFW throughout the state  
43 during 2002 and 2003. Additionally, a poll of Oregonians in 1999 demonstrated public support for  
44 the return of wolves to the state and for compensation to livestock producers for wolf-caused losses  
45 (Davis and Hibbitts 1999).

46  
47 The 2005 Plan called for the implementation of a compensation program and in 2011 the Oregon  
48 Legislature created a compensation program (ORS 610.150) and a funding mechanism for the

1 program (ORS 610.155). The program is administered by the ODA and uses a combined  
2 approach—compensation for direct losses, missing livestock, and reimbursement for non-lethal  
3 costs. See the Livestock Producer Assistance section in this chapter.  
4

## 5 **D. Strategies to Address Livestock Conflict**

### 6 **Objective**

- 7 • Continue to implement a three-phased approach based on population objectives that  
8 minimizes conflicts with livestock while ensuring conservation of wolves.  
9

### 10 **Strategies**

- 11 • Implement an adaptive management approach to wolf conflicts for both East and West  
12 WMZs that emphasizes non-lethal control techniques while the wolf population is in Phase  
13 I and transitions to a more flexible approach to depredation control in Phase II and Phase  
14 III.
- 15 • Promote, educate, and equip landowners, livestock producers, and the public with tools and  
16 knowledge to implement non-lethal and lethal wolf management techniques.
- 17 • Allow the use of multiple approaches that will give individuals flexibility to customize wolf  
18 management to their situation.
- 19 • Continue to pursue the establishment of wolf management specialist positions within  
20 ODFW to minimize conflicts and work directly with individuals who experience conflicts.
- 21 • Keep landowners, livestock producers, and the public informed of general wolf distribution  
22 information as needed.
- 23 • Inform land management agencies, landowners, livestock producers, and the public of  
24 planned or completed wolf management activities as needed.
- 25 • Use lethal controls on packs and/or individual wolves that depredate on livestock under  
26 specified circumstances as described in this Plan.  
27

28 The intent of these strategies is to prevent any losses from occurring or resolve wolf-livestock  
29 conflicts before they result in additional losses while ensuring conservation of wolves. Non-lethal  
30 techniques will be the first choice of managers in situations of wolf-livestock conflict in all phases.  
31 While multiple non-lethal techniques employed in other states should be used here, adaptations to  
32 these techniques and development of new non-lethal techniques will be encouraged as needed to  
33 address factors unique to Oregon. In situations where chronic losses are occurring, lethal control  
34 actions may be employed to minimize livestock losses regardless of the wolf population status.  
35 While there are differences in how livestock conflicts are addressed in the three phases, the  
36 differences are not substantial. The Plan endeavors to provide as much flexibility to address conflicts  
37 as possible while wolves exist in low numbers, while still remaining focused on achieving wolf  
38 population objectives for each zone.  
39

40 This three phased-approach that is based on the current population status of wolves will continue to  
41 provide options to wolf managers, livestock producers, and the public while promoting the goal of  
42 conservation for wolves. When wolf numbers are low, more emphasis is placed on non-lethal  
43 deterrents and modifications to livestock production practices. Wolf managers and livestock  
44  
45  
46

1 producers are not required to exhaust all non-lethal techniques, but instead, a good faith effort to  
2 achieve a non-lethal solution is expected. In order to use the widest array of management tools  
3 available in any given management phase, livestock producers will be encouraged to employ  
4 management techniques to discourage wolf depredation, and agencies will advise and assist in  
5 implementing such techniques. In order to meet these growing demands and ultimately minimize  
6 conflict, establishing additional ODFW wolf-specific positions and continuing with ODA Wolf  
7 Depredation Compensation and Financial Assistance Grant Program for non-lethals will be  
8 essential.

9  
10 Wolf managers working with livestock producers are encouraged to employ management techniques  
11 that have the highest likelihood of success in resolving the conflicts and are reasonable for the  
12 individual situation. This includes the identification of circumstances that may attract wolf-livestock  
13 conflict. For implementing actions to resolve conflict, ODFW considers that a condition on the  
14 landscape is not inherently unreasonable if the condition is a common practice, regardless of the  
15 presence of wolves. For example, a livestock carcass pile or disposal area was a common practice of  
16 many livestock operations before the presence of wolves. However, even if not considered  
17 inherently unreasonable, a carcass may be identified to be an attractant to wolves and ODFW may  
18 recommend removal of the attractant before control actions are considered. Conversely, a carcass  
19 that is intentionally placed in a location for the purpose of attracting wolves or other scavengers may  
20 be considered unreasonable, and under this Plan options for addressing the conflict are reduced.  
21 Carcasses of natural prey species (e.g., deer and elk) do not generally attract wolf-livestock conflict  
22 and it is not expected that individual wildlife carcasses, which commonly occur on the landscape  
23 (e.g., road kills or wildlife killed by natural causes), will be removed. However, in some cases wildlife  
24 carcass disposal sites may be identified as an attractant which may lead to wolf-livestock conflict. In  
25 these cases, the carcasses should also be removed and use of the disposal site discontinued.

26  
27 Non-lethal conflict deterrence plans are recommended (but not required) for livestock producers  
28 ranching and farming in Oregon to reduce conflict and aid in agency response to chronic  
29 depredation. Livestock producers know their operations and understand their livestock's  
30 vulnerabilities best and have local knowledge of the history of depredations in their areas.  
31 Therefore, ODFW will continue to help operators develop site-specific strategies to reduce conflict  
32 that are best suited for specific situations. In the event of wolf activity or a suspected depredation, a  
33 non-lethal conflict deterrence plan would guide decision making on what steps to take to eliminate  
34 further conflict. Should chronic depredation occur, the plan would be used to ensure that non-  
35 lethals have been deployed in a manner consistent with legal requirements before lethal control may  
36 be considered. This expedites ODFW's evaluation of the situation and responses to queries from the  
37 public.

38  
39 In all Phases, non-lethal techniques will continue to remain the first choice of managers dealing with  
40 conflicts. However, in Phase III, more emphasis may be put on lethal control to ensure protection  
41 of livestock in situations where livestock are at substantial risk despite the continued use of non-  
42 lethal measures.

43  
44 When chronic depredation occurs, ODFW evaluates each situation on a case-by-case basis to  
45 determine the appropriate response action. Merely meeting the criteria (see criteria below for  
46 minimum requirements of chronic depredation in each phase), will not automatically result in lethal  
47 removal actions. ODFW considers a number of factors when considering if lethal control actions  
48 are warranted or how they will be applied. Wolf-specific considerations may include the number and

1 identification (where information is available) of depredating wolves, pack area and status (number  
2 of adults, pups, and ages), proximity to dens/rendezvous areas, health (old age, injuries),  
3 frequency, severity and distance between depredation incidents, past depredation history of the pack,  
4 wolf behavior and travel patterns, terrain and remoteness, and the potential of lethal control to  
5 change pack behavior and minimize depredation. Livestock specific considerations may include the  
6 type of livestock and level of vulnerability (e.g., calves/lambs, or adults), time of year, grazing  
7 season, potential changes in husbandry practices, continued presence of livestock, pasture size and  
8 remoteness, non-lethal measures used, ability to implement effective non-lethal measures, and  
9 stocking density of livestock.

10  
11 Upon adoption by the ODFW Commission and filing with the Secretary of State, this Plan and its  
12 associated technical rules automatically amends current administrative rules concerning harassment  
13 and take. The text below summarizes the types of harassment and take allowed by this Plan. Consult  
14 the associated technical rules (OAR 635-110-0010 through-0030) for precise wolf regulations. In the  
15 event of a conflict between this Plan and the technical rules, the technical rules govern.

### 16 17 **Phase I (Conservation Phase)**

18  
19 In Phase I, the use of non-lethal measures to prevent or resolve depredation is emphasized and, with  
20 few exceptions, an extensive process is generally required by producers and ODFW before lethal  
21 control measures can be considered. OAR 635-110-0010 describes the specific regulations regarding  
22 harassment and take of wolves in response to wolf-livestock conflict.

23  
24 For the purpose of addressing wolf-livestock conflict, ODFW will implement the following general  
25 process in Phase I areas:

- 26 1. When resident wolf use of an area is determined, ODFW will designate “Areas of Known  
27 Wolf Activity” and coordinate with potentially affected producers about wolves, wolf  
28 management, conservation, and non-lethal measures and procedures.
- 29 2. If depredation is confirmed, ODFW will designate an “Area of Depredating Wolves” and  
30 will prepare and make publically available an area-specific conflict deterrence plan for the  
31 situation. Producers are encouraged, but not required to implement measures within this  
32 plan. However, options for future lethal removal will be based largely on implementation of  
33 non-lethal measures within the deterrence plan.
- 34 3. Chronic depredation in Phase I is defined as at least four qualifying incidents of depredation  
35 within the previous six months by the same wolf or wolves. Qualifying incidents of  
36 depredation will be based on the level of non-lethal measures used for each situation after an  
37 “Area of Known Wolf Activity” is designated.
- 38 4. In situations of chronic depredation where lethal control actions are being considered,  
39 ODFW will document the wolf depredation and non-lethal measures used, and make the  
40 information publically available

1 The following explains options available to livestock producers in situations of wolf-livestock  
2 conflict.

3  
4 **Important Note:** At the time of this Plan’s adoption, wolves in the West Zone, and a portion of  
5 the East Zone (west of Hwy’s 395-78-95) are listed as endangered under the Federal Endangered  
6 Species Act. All management related to harassment and take of wolves is regulated by the U.S. Fish  
7 and Wildlife Service, not ODFW. The information below only reflects ODFW rules regarding  
8 harassment and take of wolves once they are delisted from the Federal ESA. Until that time, federal  
9 laws preempt these rules.

10  
11 Non-injurious harassment of wolves includes scaring off an animal(s) by making loud noises (e.g.  
12 safely firing shots into the air,)or otherwise confronting the animal(s) without doing bodily harm. It  
13 is allowed without a permit by livestock producers (or their agents) on land they own or land they  
14 lawfully occupy, or by permittees (or their agents) who are legally using public land under valid  
15 livestock grazing allotments. For non-injurious harassment to occur, the following criteria apply:

- 16 • It is allowed only for wolves in close proximity of livestock or in the act of testing, chasing,  
17 or otherwise disrupting livestock.
- 18 • It must not result in injury to the wolf.
- 19 • It must be reported to ODFW within 48 hours.

20  
21 Any non-injurious harassment that does not meet each requirement of this rule requires a permit in  
22 advance from ODFW.

23  
24 Non-lethal injurious harassment means scaring off a wolf (or wolves) older than 6 months without  
25 killing but with some injury to the wolf and includes rubber bullets, bean bag projectiles, and vehicle  
26 or other pursuit-oriented hazing. It is conducted for the purpose of minimizing wolf-livestock  
27 conflict when livestock are present. It is allowed by permit issued by ODFW to livestock producers  
28 (or their agents) on private lands they lawfully occupy or by permittees (or their agents) who are  
29 using public land under valid livestock grazing permits. Non-lethal injurious harassment permits  
30 shall remain valid for the livestock grazing season in which it is issued provided the livestock  
31 operator (on private and public land) is compliant with all applicable laws, including permit  
32 conditions. The agency shall inform permit holders (on public and private land) of non-lethal  
33 methods for minimizing wolf-livestock conflict, provide guidance upon request, and inform permit  
34 holders that receiving future lethal control permits will be contingent upon documentation of efforts  
35 to use non-lethal methods. For a non-lethal injurious harassment permit to be issued, the following  
36 criteria must apply:

- 37 • ODFW confirms wolf depredation on livestock or other wolf-livestock conflict (i.e. testing,  
38 chasing, or otherwise disrupting livestock).
- 39 • The applicant will work with ODFW to determine appropriate course of action.
- 40 • ODFW will consider locations of known wolf dens and the presence of livestock before a  
41 permit is issued.
- 42 • The harassment does not result in the death of a wolf.
- 43 • No identified circumstances exist that are attracting wolf-livestock conflict.
- 44 • The harassment must be reported to ODFW within 48 hours.

1 Relocation may occur when a wolf or wolves become inadvertently involved in a situation or are  
2 present in an area that could result in conflict with humans or harm to the wolf. Examples include a  
3 wolf caught in a trap set for another animal or a wolf found living within or near communities and  
4 causing human safety concerns. This action differs from translocation in that the need is more  
5 immediate to solve a particular situation. For such action to occur, four criteria must be met:

- 6 • The action must be directed by ODFW.
- 7 • The wolf is not known or suspected by ODFW to have depredated livestock or pets.
- 8 • The action must be taken to prevent conflict with humans or reduce the possibility of harm  
9 to the wolf.
- 10 • Wolves will be relocated to suitable habitat at the direction of ODFW.

11  
12 In Phase I, lethal take of wolves may be authorized in three situations regarding conflict with  
13 livestock as described below. Threat to human safety is a third situation in which the use of lethal  
14 force is allowed under statute and as discussed in Chapter VI of this Plan. As addressed in Chapter  
15 III, controlled take is not allowed.

- 16  
17 1. A person or the agent of a landowner or lawful occupant may use lethal force to stop a wolf  
18 on land the person owns or lawfully occupies without a permit under the following  
19 conditions:
  - 20 • The wolf is in the act of:
    - 21 i. biting, wounding, or killing livestock or working dogs, or
    - 22 ii. chasing livestock or working dogs, if non-lethal actions were used per OAR 635-  
23 110-0010 8(b)(C) and 8(c) and occurs during a situation of chronic depredation  
24 of livestock (determined by ODFW).
  - 25 • No bait or other intentional actions to attract wolves have been used.
  - 26 • The wolf carcass must not be removed or disturbed, and the scene preserved.
  - 27 • The incident must be reported to ODFW within 24 hours.
- 28  
29 2. ODFW may authorize its personnel or authorized agents to use lethal control in certain  
30 situations of chronic depredation of livestock by wolves. For such action to occur, a number  
31 of criteria must apply:
  - 32 • Chronic depredation is defined as at least four qualifying incidents of depredation,  
33 confirmed by ODFW, of livestock within the previous six months by the same wolf or  
34 wolves. A first confirmed depredation in an area outside an “Area of Known Wolf  
35 Activity” qualifies toward a situation becoming chronic. Subsequent depredations may  
36 only qualify based on the level of non-lethal measures implemented for the situation. See  
37 OAR 635-110-0010 (8) for specific rules.
  - 38 • Livestock producers in the “Area of Depredating Wolves” have worked to  
39 reduce wolf-livestock conflict and are in compliance with wolf protection laws  
40 and the conditions of any harassment or take permits.
  - 41 • ODFW determines that the situation of wolf depredation upon livestock in the  
42 “Area of Depredating Wolves” is likely to remain chronic despite the use of  
43 additional non-lethal conflict deterrence measures.
  - 44 • The wolf or wolves identified for removal are those ODFW believes to be  
45 associated with the qualifying depredations, the removal of which ODFW  
46 believes will decrease the risk of chronic depredation in the “Area of

1 Depredating Wolves”.

- 2 • ODFW documents and makes publically available its determinations, relevant  
3 information and findings related to the depredation situation and any decisions  
4 to use lethal control to remedy the situation.
- 5 • ODFW lethal control authorization expires when the wolf or wolves targeted for  
6 removal are removed, have left the area, or in 45 days after issuance. Under very  
7 specific circumstances, additional depredations may result in extension or  
8 reinstatement of lethal control actions. See OAR 635-110-0010(10) for specific  
9 rules.

10 3. Under extreme circumstances, ODFW may also authorize the use of lethal force. This  
11 decision would be made by the ODFW Director or designee, must be made public and  
12 include relevant findings and determinations, and must be exercised within 14 days of the  
13 determination or of the last confirmed depredation, whichever comes later. Extreme  
14 circumstances means:

- 15 • Four or more confirmed livestock depredations by the same wolf or wolves  
16 within a seven day period.
- 17 • No bait or other intentional actions to attract wolves have been used and non-  
18 lethal measures are and will likely remain ineffective.
- 19 • Depredation has escalated beyond reasonable, available means of ODFW and  
20 affected livestock owners to stop additional depredations from occurring.

## 21 **Phase II (Transition Phase)**

22 Non-injurious harassment of wolves is allowed under the same conditions as in Phase I.

23  
24 Non-lethal injurious harassment is conducted for the purpose of minimizing wolf-livestock conflict  
25 when livestock are present. It does not require a permit on private land, and therefore is allowed for  
26 livestock producers or their designated agents on their own or lawfully occupied land without permit  
27 or preauthorization. However, non-injurious techniques should be attempted initially. A permit is  
28 required on public land, and may be issued to permittees or their agents who are legally using public  
29 land under valid livestock grazing allotments. The injurious harassment permit shall remain valid for  
30 the duration of the grazing season in which it has been issued provided the grazing permittee is in  
31 compliance with applicable laws including permit conditions.  
32  
33

34 Regarding non-injurious harassment on private or public land, the following criteria apply:

- 35 • Wolves may be pursued, for the purpose of minimizing wolf-livestock conflict.
- 36 • Any harassment must be reported to ODFW within 48 hours.
- 37 • No identified circumstances exist that are attracting wolf-livestock conflict.

38 Permit criteria for use on public land include:

- 39 • ODFW confirms wolf depredation on livestock or other wolf-livestock conflict in the area.
- 40 • The permittee will work with the agency to determine the appropriate course of action.
- 41 • Locations of known wolf dens will be considered before issuing a permit.

42 Relocation of wolves will be considered under the same circumstances as in Phase I.  
43  
44

1 In Phase II, lethal take of wolves may be authorized in situations of conflict with livestock as  
2 described below. Threats to human safety is an additional situation in which the use of lethal force is  
3 allowed by statute, as discussed in Chapter VI of this Plan. As addressed in Chapter III, controlled  
4 take of wolves is not allowed.

5  
6 1. Landowners, livestock producers, grazing permittees, or their designated agents may use  
7 lethal force to stop a wolf that is in the act of biting, wounding, killing, or chasing livestock  
8 or working dogs under the following conditions:

- 9 • No bait or other intentional actions to attract wolves have been used.
- 10 • The wolf carcass must not be removed or disturbed, and the scene preserved.
- 11 • The incident must be reported to ODFW within 24 hours.

12  
13 2. Livestock producers, on land they own or lawfully occupy, or their designated agents, or  
14 permittees (or their designated agents) who are legally using public land may be issued a  
15 permit that provides authorization to take a gray wolf under the following conditions:

- 16 • The area has had at least two confirmed livestock depredations within a consecutive 9-  
17 month period.
- 18 • ODFW designates a lethal control permit area that is within the area of the depredating  
19 wolves, and determines that wolves present a significant risk to livestock present in the  
20 area.
- 21 • Efforts to use non-lethal methods which are appropriate for the situation are  
22 documented.
- 23 • No identified circumstances exist that are attracting wolf-livestock conflict.
- 24 • The recipient of the permit is in compliance with applicable laws, including permit  
25 conditions.
- 26 • Wolves taken under these permits are the property of the state and must be reported to  
27 ODFW within 24 hours.

28  
29 3. To stop chronic depredation on private and public land, state personnel or agents are  
30 authorized to use lethal force on wolves as follows:

- 31 • The area has had at least two confirmed livestock depredations within a consecutive 9-  
32 month period.
- 33 • Efforts to use non-lethal methods which are appropriate for the situation are  
34 documented.
- 35 • No identified circumstances exist that are attracting wolf-livestock conflict.
- 36 • Evidence does not exist of non-compliance with applicable laws, including permit  
37 conditions.

### 38 39 **Phase III (Management Phase)**

40  
41 Non-injurious harassment of wolves is allowed under the same conditions as in Phase I except that  
42 the harassment does not have to be reported to ODFW.

43  
44 Non-lethal injurious harassment is allowed under the same conditions as in Phase II,  
45 except that wolf depredation on livestock or other wolf-livestock conflict in the area may  
46 be confirmed by either ODFW or USDA Wildlife Services.

1  
2 Relocation of wolves will be considered under the same circumstances as in Phase I.

3  
4 In Phase III, lethal take of wolves may be authorized in situations of conflict with livestock as  
5 described below. Threats to human safety is an additional yet separate situation in which the use of  
6 lethal force is allowed, as discussed in Chapter VI of this Plan.

- 7  
8 1. Landowners, livestock producers, grazing permittees, or their designated agents may use  
9 lethal force to stop a wolf that is in the act of biting, wounding, killing, or chasing livestock  
10 or working dogs under the following conditions:
- 11 • No bait or other intentional actions to attract wolves have been used.
  - 12 • The wolf carcass must not be removed or disturbed, and the scene preserved.
  - 13 • The incident must be reported to ODFW within 24 hours.
- 14
- 15 2. Livestock producers, on land they own or lawfully occupy, or their designated agents, or  
16 permittees (or their designated agents) who are legally using public land may be issued a  
17 permit that provides authorization to take a gray wolf under the following conditions
- 18 • The area has had at least two confirmed livestock depredations within a consecutive 9-  
19 month period. Wolf depredation on livestock may be confirmed by either ODFW or  
20 Wildlife Services.
  - 21 • ODFW designates a lethal control permit area that is within the area of the depredating  
22 wolves, and determines that wolves present a significant risk to livestock present in the  
23 area.
  - 24 • Efforts to use non-lethal methods which are appropriate for the situation are  
25 documented.
  - 26 • No identified circumstances exist that are attracting wolf-livestock conflict.
  - 27 • The recipient of the permit is in compliance with applicable laws, including permit  
28 conditions.
  - 29 • Wolves taken under these permits are the property of the state and must be reported to  
30 ODFW within 24 hours.
- 31
- 32 3. To stop chronic depredation on private and public land, state personnel or agents are  
33 authorized to use lethal force on wolves as follows:
- 34 • The area has had at least two confirmed livestock depredations within a 9-month period.  
35 Wolf depredation on livestock or other wolf-livestock conflict may be confirmed by  
36 either ODFW or Wildlife Services.
  - 37 • Efforts to use non-lethal methods which are appropriate for the situation are  
38 documented.
  - 39 • No identified circumstances exist that are attracting wolf-livestock conflict.
  - 40 • Evidence does not exist of non-compliance with applicable laws, including permit  
41 conditions.
- 42
- 43 4. Controlled take would be by ODFW special permit authorization for the public, and focused  
44 on a specific area of situation experiencing conditions that warrant a management response.  
45 Regarding livestock conflict, controlled take may be authorized in Phase III in areas to  
46 address situations of long term, recurring wolf-livestock conflict. The take will only address

1 conflict situations in a specified area, and the take would not impair population viability or  
2 reduce overall wolf population health factors within the region.  
3  
4

## 5 **E. Agency Response to Wolf Depredation**

### 6 **Objective**

- 7 • Develop and implement an effective and transparent wolf depredation response program  
8 that responds to the needs of Oregon livestock producers and minimizes the risk of wolf-  
9 livestock conflict.  
10  
11

### 12 **Strategies**

- 13 • Respond to reports of wolf-livestock complaints in a timely manner (similar to response  
14 protocols for cougars and black bears) to investigate the situation, and if appropriate  
15 recommend actions to minimize depredation.  
16
- 17 • Continue to include wolf responsibilities in the ODFW-Wildlife Services contract in  
18 Oregon.  
19
- 20 • Ensure that investigations and determinations of wolf depredation are objectively  
21 conducted using a consistently applied standard of physical evidence—regardless of the  
22 agency performing the investigation.
- 23 • Coordinate with USFWS in federally listed areas to reduce wolf-livestock conflict while  
24 conserving wolves.  
25

26 Wildlife Services agents respond to coyote, cougar, and black bear depredation complaints in 26  
27 counties in Oregon. ODFW has historically provided State General and Wildlife License funds to  
28 Wildlife Services to address damage from statutorily defined predatory animals, cougar, black bear,  
29 furbearers, and wolves. However, future funding for Wildlife Services is contingent on legislative  
30 appropriation. Counties, private entities, Oregon Department of Agriculture and others also fund  
31 Wildlife Services activities at varying levels.  
32

### 33 **Federally Listed (ESA) Portion of Oregon**

34  
35 Where wolves are listed under federal ESA in Oregon, ODFW and Wildlife Services implement this  
36 Plan within the *2019 Federal/State Coordination Strategy for Oregon Wolf Plan Implementation* (Appendix  
37 C). The Strategy outlines roles and responsibilities of each agency and how the agencies will  
38 collaborate to implement wolf management in Oregon. The Strategy is under review and will be  
39 updated to reflect the current situation in Oregon.  
40

41 When a livestock owner suspects wolf-livestock depredation and requests an investigation, Wildlife  
42 Services, ODFW, and USFWS (or any combination of these agencies) will investigate. The agency  
43 receiving a request for an investigation will coordinate with the other two agencies. Initial  
44 investigations will be completed on-site, but prior to making a final agency determination or  
45 providing public notification on whether a wolf or wolves were responsible (unless it is clear that

1 wolves were not involved), the investigating agency(s) will confer to review and discuss the evidence  
2 found.

- 3 • The USFWS is the lead agency for decisions on the use of lethal control and/or injurious  
4 harassment in response to depredation. USFWS will coordinate closely with ODFW on the  
5 implementation of non-lethal control efforts and on monitoring of wolf activity.
- 6 • ODFW, as authorized under its Section 6 permit, is the lead agency for coordinating with  
7 affected landowners on non-lethal control actions and for monitoring wolf activity in  
8 response to depredation on livestock. ODFW is required to investigate and confirm wolf  
9 depredation in situations where the affected livestock producer wishes to pursue  
10 compensation payment through the ODA Wolf Depredation Compensation and Financial  
11 Assistance Grant Program.
- 12 • Wildlife Services are experienced at investigating dead livestock and addressing predation,  
13 and will frequently be involved in depredation investigations. They will work with ODFW  
14 and USFWS in the federally listed area to investigate livestock depredations and implement  
15 and maintain non-lethal tools.

### 16 **Federally Delisted Portion of Oregon**

17  
18 In federally delisted portions of Oregon, ODFW will continue to respond to wolf complaints and  
19 do so in a manner similar to the way the agency handles cougar and black bear damage complaints.  
20 Livestock owners with a suspected wolf depredation or other wolf-livestock conflict contact ODFW  
21 or Wildlife Services to initiate the investigation process. ODFW would advise Wildlife Services (or  
22 the reverse) of the situation and one or both would proceed to the location. The scene would be  
23 secured and ODFW and/or Wildlife Services personnel would cooperatively conduct the  
24 investigation.  
25

26  
27 While in Phase I and II, ODFW will make the final determination on investigations of suspected  
28 wolf depredation. ODFW, Wildlife Services agents, and the livestock producer will work  
29 cooperatively to determine the appropriate response, including non-lethal or lethal techniques (if  
30 warranted), to prevent further loss of livestock. The specific response to depredation will depend on  
31 wolves' legal status and population levels.  
32

33 When in Phase III, either ODFW or Wildlife Services may conduct investigations of suspected wolf  
34 depredation. Close coordination between the two agencies will be paramount to successful  
35 implementation of this Plan. Both agencies will review and implement consistently applied training  
36 protocols and standards used when investigating suspected wolf depredation and making  
37 determinations. Furthermore, ODFW will continue to rely on objectively conducted and evidence-  
38 based investigations, regardless of which agency conducts the investigation. This means that ODFW  
39 will not only consider if a depredation is "confirmed," but also the physical evidence associated with  
40 the confirmation of depredation when implementing response measures outlined in this chapter.

41 When evaluating an investigation of wolf depredation, ODFW will consider:

- 42 • The protocol used when conducting the investigation and its ability to lead to an objective  
43 determination.
- 44 • The amount of physical evidence or information collected and its ability to inform an  
45 accurate determination.
- 46 • The level of consistency between the physical evidence documented and the determination  
47 of depredation.

- The level of consistency of interpretation of physical evidence with other investigations and determinations.
- Investigations and resulting documentation should be completed at a high professional level.

ODFW's current contract with Wildlife Services includes responding to wolf depredations in addition to cougar and black bear. Continued and perhaps increased funding will be necessary to provide coverage in all counties with wolves in Oregon.

**Note:** April 1, 2019, USDA Wildlife Services will not assist in the lethal removal of wolves or expand its role in depredation investigations (including confirming wolf depredations) until it has evaluated its obligations under the National Environmental Policy Act.

## **F. Livestock Producer Assistance**

### **Objective**

- Maintain and enhance a cooperative livestock producer assistance program that proactively minimizes wolf-livestock conflict and assists livestock producers experiencing wolf-related livestock losses.

### **Strategies**

- Provide education, outreach, and technical assistance to landowners and livestock producers to reduce wolf-livestock conflicts.
- Work with livestock producer organizations, county extension services, ODA, conservation organizations, and other appropriate groups and agencies to make outreach and educational materials available regarding depredation prevention (e.g., media materials, workshops, website resources, site reviews and evaluations).
- Provide resources necessary to implement non-lethal wolf deterrent techniques as needed and available.
- Provide training to state and county personnel, volunteers, and cooperators as needed. Training will focus on non-lethal methods to reduce depredation, procedures for securing a depredation scene, preserving evidence, and identification of wolf depredation.
- Continue to support ODA's Wolf Depredation Compensation and Financial Assistance County Block Grant Program.
- Provide landowners and local livestock producers information on areas where wolves are known to be active.

ODFW has a long history of providing assistance to landowners and citizens affected by the actions of various wildlife species. ODFW has specific authority by the Oregon Legislature to manage wildlife populations in the state, guided by the agency's Wildlife Damage Policy. Field biologists respond to and provide assistance for a variety of wildlife damage complaints in both rural and urban settings. The type of assistance provided can take many forms including, but not limited to; technical advice, protective barriers, repellants, lethal or non-lethal removal, emergency hunts, hazing permits, kill permits, and forage enhancement programs.

1  
2 Working proactively with livestock producers to minimize wolf-livestock conflicts will continue to  
3 be an important component of a livestock producer's assistance program. Sharing new information  
4 and techniques related to reducing potential wolf-livestock conflicts and making available the  
5 necessary tools and equipment will be essential for a successful program. ODFW will continue to  
6 work with other states, organizations, tribes, and academic institutions to develop and refine  
7 preventive measures which reduce overall wolf-livestock conflicts.

8 In 2012, the ODA established and implemented a Wolf Depredation Compensation and Financial  
9 Assistance grant program (ORS 610.150) to assist livestock producers with costs associated with  
10 wolf depredation and non-lethal control measures. Funds from this grant program are awarded to  
11 counties to help create and implement county wolf depredation compensation programs under  
12 which:

- 13 • Compensation is paid to persons who suffer loss or injury to livestock or working dogs due  
14 to wolf depredation.
- 15 • Financial assistance is provided to persons who implement livestock management techniques  
16 or non-lethal wolf deterrence techniques designed to discourage wolf depredation of  
17 livestock.
- 18 • Awards are only available to producers through counties with a wolf depredation  
19 compensation program to help with implementation and administrative costs.

20 The program is currently funded through a combination of federal grant funds, and funds in the  
21 Wolf Management Compensation and Proactive Trust Fund established by the Oregon Legislature  
22 in 2011 (ORS 610.155). Funds are made available to producers through Oregon counties  
23 participating in the program. In 2017, a total of 10 participating counties were awarded \$252,570 in  
24 grant funds. ODFW assists with the implementation of this program through two primary roles:  
25 determining when wolf depredation occurs and delineating areas of known wolf activity. In addition,  
26 ODFW will continue to provide input to counties on appropriate non-lethal and preventative  
27 measures. For additional information regarding the program, see  
28 <http://staging.apps.oregon.gov/oda/programs/ISCP/Pages/WolfDepredation.aspx>.

29 Attaching radio-collars and monitoring members of established wolf packs can provide important  
30 information regarding wolf movements in relation to areas used by livestock. Continued  
31 coordination between ODFW biologists and livestock producers regarding current wolf movements  
32 and historical activity areas will allow livestock producers to anticipate potential conflict areas and  
33 respond appropriately. Livestock producers would have the option of making informed decisions  
34 regarding their animal husbandry practices in response to knowledge of wolf activity in livestock  
35 areas.

1 **V. WOLF-UNGULATE INTERACTIONS AND INTERACTIONS WITH**  
2 **OTHER CARNIVORES**

3  
4 Oregon has native populations of elk, mule deer, white-tailed deer, black-tailed deer, bighorn sheep,  
5 mountain goats, and moose. These ungulates have high social, biological, economic, and recreational  
6 value in Oregon, and are also an important food source for native carnivores. Revenue generated  
7 from hunting is important to rural communities (Martin and Gum 1978, Fried et al. 1995, Sarker and  
8 Surry 1998), and license and tag sales provide funding for wildlife and conservation activities  
9 implemented by ODFW (Geist et al. 2001). Consequently, managers are presented the challenge of  
10 maintaining ungulate populations which are capable of sustaining carnivore populations and  
11 recreational hunting opportunities for the public, while minimizing agricultural damage.

12  
13 In addition to their recreational and economic importance, ungulates also play an important role in  
14 shaping and structuring ecological communities. Large herbivores consume large amounts of plant  
15 biomass that can influence vegetation and ecosystem structure (Hobbs 1996, Augustine and  
16 McNaughton 1998, Weisberg and Bugmann 2003, Wisdom et al. 2006). Furthermore, large  
17 herbivores are important for conservation of sustainable carnivore populations (Wolf and Ripple  
18 2016). In some situations, large carnivores can influence herbivore population abundance and  
19 behavior, which may affect lower trophic levels and ecosystem structure (Ripple and Beschta 2004b,  
20 Berger et al. 2008, Ripple et al. 2010, Estes et al. 2011, Newsome and Ripple 2014, Ripple et al.  
21 2015, Wilmers and Schmitz 2016, Winnie Jr and Creel 2016).

22  
23 For years, Oregon has sustained populations of several medium and large carnivores that are known  
24 to prey upon ungulates including black bear, cougar, coyote, and bobcat. The recent recolonization  
25 by wolves has undoubtedly added complexity to ungulate population dynamics within the state.  
26 However, the effects of wolves on native ungulate populations are difficult to determine because of  
27 the complex multiple-prey, multiple-predator system and unique climate observed in Oregon. There  
28 is a large body of literature to suggest a complex suite of abiotic, bottom-up, and top-down forces  
29 including hunter harvest, predation, primary productivity, and climatic conditions that may be  
30 limiting or regulating factors of ungulate population dynamics (Crête 1999, Melis et al. 2009, Griffin  
31 et al. 2011, Brodie et al. 2013, Johnson et al. 2013). In some instances, non-predation related  
32 mechanisms, such as high levels of harvest by humans, extreme summer or winter weather, or  
33 habitat changes may be the ultimate driver of ungulate declines (Vucetich et al. 2005, White and  
34 Garrott 2005, Wright et al. 2006, Middleton 2012, Brodie et al. 2013, Middleton et al. 2013a). These  
35 factors may work independently or synergistically to affect ungulate populations and the relative  
36 magnitude of each effect may differ depending on local conditions. Consequently, the relative  
37 effects of wolf predation in Oregon are likely to be situation dependent and influenced by additional  
38 localized or regional factors. Despite Oregon's unique climate and assemblage of predators and  
39 prey, there is a large body of literature upon which the potential effects of wolves on native ungulate  
40 populations may be assessed. This chapter will provide a summary of potential effects of wolves on  
41 ungulate populations and provide preliminary information about wolf predation in Oregon.

42  
43 **A. Potential Effects of Wolf Predation on Oregon's Ungulates**

44  
45 The concepts of compensatory and additive mortality represent two ends of the spectrum of  
46 predation-caused mortality and are key in understanding the effects of predators on ungulate

1 populations. In general, predation can be considered compensatory mortality when it compensates  
 2 for some other source of mortality – that is, an animal that was killed by a predator would have  
 3 otherwise died from some other source (e.g., overwinter starvation). In contrast, predation is  
 4 considered to be additive to other sources of mortality in situations where individuals removed by  
 5 predation likely would have otherwise survived. In some situations, wolf predation may be  
 6 compensatory because wolves are known to kill vulnerable or weak animals and remove less fit  
 7 individuals from the population (Boyd et al. 1994, Peterson and Ciucci 2003, Smith et al. 2004,  
 8 White and Garrott 2005). However, wolves are also known to kill relatively healthy animals,  
 9 particularly during advantageous hunting conditions (e.g., deep snow) (Nelson and Mech 1986,  
 10 Mech et al. 2001), and in these situations the mortality may be additive. Determining the degree to  
 11 which predation is additive or compensatory is difficult and often relies on controlled experiments  
 12 with results often confounded by climatic conditions or other factors interacting with predation  
 13 (Mech et al. 2001, Hebblewhite 2005, Vucetich et al. 2005). While predicting the effect of wolves on  
 14 Oregon's ungulate populations is difficult, a review of research conducted elsewhere can provide a  
 15 better understanding of the potential effects.

## 16 17 **Elk**

18  
19 Wolves are effective predators of elk and in areas where they co-occur, elk are typically the primary  
 20 prey of wolves, with predation focused on calves and older adults (Mech and Peterson 2003).  
 21 Preliminary examination of wolf diets in the Wenaha and Mt. Emily WMUs in northeast Oregon  
 22 supports this conclusion (ODFW, unpublished data).

23  
24 In a meta-analysis of 12 elk populations, calf survival through summer was investigated in systems  
 25 with three (cougars, black bear, coyotes), four (addition of wolves) and five (addition of grizzly bear)  
 26 predators. The addition of wolves to the system resulted in similar calf survival, with wolf predation  
 27 nearly compensatory for mortality caused by other existing predators (Griffin et al. 2011). Other  
 28 studies highlighted that wolves, owing to their coursing hunting style, typically selected physically  
 29 disadvantaged and older, or younger-aged prey that might otherwise succumb to severe winter or  
 30 summer drought conditions (Vucetich et al. 2005, Atwood et al. 2007, Barber-Meyer et al. 2008,  
 31 Metz et al. 2012), further illustrating the generally compensatory nature of wolf predation on elk  
 32 calves.

33  
34 When preying on adult elk, wolves typically kill older animals (Boyd et al. 1994, White and Garrott  
 35 2005, Evans et al. 2006, Wright et al. 2006, MacNulty et al. 2016). Older cow elk can be  
 36 reproductively senescent (Stewart et al. 2005) and contribute little to population growth  
 37 rates (Gaillard et al. 1998, Raithel et al. 2007). Furthermore, older elk typically have lower survival  
 38 rates than younger elk (Evans et al. 2006, McCorquodale et al. 2011, Clark 2014) and are more likely  
 39 to die during severe winters or other adverse environmental conditions (Garrott et al. 2003, Garrott  
 40 et al. 2009, Brodie et al. 2013). This suggests that wolf predation on these individuals is largely  
 41 compensatory (Garrott et al. 2009) and will have minimal effects on elk population growth rates.

42  
43 While wolf predation on adult elk, particularly older animals, appears to be largely compensatory,  
 44 wolf predation combined with predation from all other native carnivores in western North America  
 45 reduced survival of cow elk by <2% (Brodie et al. 2013). While reductions in cow elk survival can  
 46 reduce population growth rates of elk (Gaillard et al. 1998, Raithel et al. 2007) this small decline in  
 47 cow survival is unlikely to reduce sustainability of elk populations, but may affect antlerless elk  
 48 hunting opportunity. Wolves will also prey upon bull elk (Mech and Peterson 2003). The number of

1 bull elk in the population has little influence on population growth rates, so long as sufficient  
2 numbers of prime-aged males are in the population to breed females during their first estrous cycle  
3 (Noyes et al. 1996). Wolves are unlikely to kill enough bull elk to cause this situation to occur, but  
4 removal of bull elk from the population through wolf predation could ultimately reduce availability  
5 of bull elk to hunters.

6  
7 In multiple prey systems, predators may either utilize prey opportunistically (e.g., kill prey as  
8 encountered) or they may selectively prey upon a particular species or age class of prey (e.g., actively  
9 seek out juvenile ungulates). In Oregon, selective predation on juvenile age classes of elk can have  
10 strong effects on recruitment (Johnson et al. 2013, Clark 2014, Proffitt et al. 2014), which explains a  
11 large amount of variation in population growth rates of elk (Harris et al. 2008). Given the large  
12 effect that variation in calf elk survival can have on elk population dynamics (Raithel et al. 2007),  
13 wolf predation on calves may have a large effect on elk populations in areas with high predation  
14 rates on calf elk by cougars (Clark 2014).

15  
16 In addition to the direct effects of wolf predation on elk, wolves may also have a number of indirect  
17 effects. Wolves tend to be inefficient hunters and are rarely successful at more than 20% of  
18 attempted hunts (Smith et al. 2000, Mech et al. 2001) and success is less than 10% when only adult  
19 elk are the prey being hunted (MacNulty et al. 2011). As a result, wolves continually test prey to  
20 identify weak individuals (Peterson and Ciucci 2003) and this near constant hunting pressure and  
21 risk of predation from wolves could lead to changes in behavior that influence elk habitat use,  
22 vigilance, movement rates, and migration patterns. If predation risk causes elk to utilize areas of  
23 lesser forage quality for long durations, increase movement rates, or spend less time feeding, elk  
24 fitness and reproductive potential would be expected to decline (Creel et al. 2009). Additionally, in  
25 situations where elk must allocate more time to scan for predators, they may become nutritionally  
26 challenged, which could reduce pregnancy rates (Cook et al. 2004, Cook et al. 2013, Cook et al.  
27 2016) or survival (Cook et al. 2004, Bender et al. 2008). However, little research has linked the anti-  
28 predator behaviors discussed above to reduced fitness and/or reproductive output of ungulates  
29 (Lind and Cresswell 2005).

30  
31 In some situations, elk have utilized habitat differently following wolf colonization (Creel et al. 2005,  
32 Mao et al. 2005, Atwood et al. 2009). These studies found that elk avoided open areas, used areas  
33 with less snow, and used steeper terrain to reduce predation risk. Within winter ranges, the mosaic  
34 of open, risky sites and safer areas with denser vegetation allowed elk to reduce predation risk  
35 (Kauffman et al. 2007). Elk moved from open grasslands to forested areas (which may be avoided  
36 by wolves, Kunkel and Pletscher 1999) in areas of higher wolf density (Creel et al. 2005, Fortin et al.  
37 2005b). In some areas, elk utilized more structurally complex landscapes following wolf  
38 colonization which may have reduced their vulnerability to wolf predation, but increased their  
39 susceptibility to cougars (Atwood et al. 2009). This was supported by the proportion of elk in  
40 cougar diets having increased significantly over the duration of the study (Atwood et al. 2007). This  
41 is a possibility that could occur in Oregon, where cougars selectively prey upon calves (Clark 2014),  
42 though it has not been observed to date (ODFW, unpublished data).

43  
44 In some landscapes, elk can mitigate the risk of predation by movement and habitat selection  
45 (Kauffman et al. 2007). In areas of Montana, elk abandoned traditional calving grounds near wolf  
46 dens (Hamlin and Cunningham 2009), though this has not been documented in Oregon. In other  
47 areas, elk showed decreased fidelity to winter ranges (Barber-Meyer et al. 2008), abandoned winter  
48 ranges altogether, and formerly non-migratory herds began to display migratory behavior (Eisenberg

1 2012). Large portions of two major elk herds in and near Banff National Park have become non-  
2 migratory, using areas near human development where human activity reduced wolf presence and  
3 therefore, predation risk (Hebblewhite et al. 2002, Idaho Department of Fish and Game 2010). This  
4 was despite the fact that migration afforded higher quality forage to elk (Middleton 2012, Middleton  
5 et al. 2013a). This suggests elk may actively reduce risk of predation by changing habitat use despite  
6 the negative consequences of utilizing lower quality habitat.

7  
8 Several studies have shown increased vigilance rates by elk in areas wolves occur and as wolf density  
9 increases (Laundré et al. 2001, Wolff and Van Horn 2003, Eisenberg 2012). However, Middleton  
10 (2012) and Gower et al. (2009) noted that predation risk did not translate to generalized alertness in  
11 elk. For example, elk did not reduce foraging time even when wolves were in close proximity  
12 (Middleton et al. 2013b). Several researchers suggest that elk are able to scan for predators while  
13 chewing (Fortin et al. 2004a, Gower et al. 2009, Middleton 2012, Middleton et al. 2013b), and Fortin  
14 et al. (2004b) demonstrated that elk only slightly reduce their bite rate when engaged in vigilant  
15 behaviors and fitness may not be affected. This was supported by Middleton et al. (2013b) where  
16 predation risk did not impact spring body fat levels of elk. Further, others have not detected  
17 changes in nutritional indices for elk before and after wolf reintroduction (White et al. 2009) and  
18 body fat levels were adequate to prevent fitness-induced pregnancy loss (White et al. 2011).

19  
20 In many areas, direct predation by wolves cannot fully explain decreased calf recruitment which  
21 prompted inquiry into the potential consequences of wolf-induced fear and stress on elk pregnancy  
22 rates (Creel et al. 2007, Creel et al. 2009, Hamlin et al. 2009, Creel et al. 2011, White et al. 2011).  
23 Creel et al. (2007) documented decreased progesterone in fecal samples of elk exposed to chronic  
24 predation risk, which could reduce pregnancy rates, and progesterone concentrations were predictive  
25 of calf recruitment. Garrott et al. (2009) also detected decreased pregnancy rates for elk subjected to  
26 wolf predation risk and proposed this occurred because of either elk anti-predatory behaviors in  
27 response to wolf presence or nutritional deficiencies in elk due to prolonged drought. However,  
28 others have observed no decrease in pregnancy rates since wolf reintroduction (Hamlin and  
29 Cunningham 2009, White et al. 2011). Furthermore, the link between pregnancy rates and calf  
30 recruitment ignored predation costs on calf survival (White et al. 2011) and new information  
31 showing that calves comprised the majority of summer wolf diets was not considered (Metz et al.  
32 2012). Given the equivocal patterns observed in changes in body condition and pregnancy rates of  
33 elk exposed to wolf predation risk, it is difficult to determine the degree to which wolves will effect  
34 body condition and pregnancy rates of elk in Oregon, if at all. For example, Middleton et al. (2013b)  
35 concluded that effects of wolf predation are more likely to occur through direct consumption of  
36 prey, rather than indirect, non-consumptive effects on prey behavior.

#### 37 38 Northern Yellowstone Elk Herd

39  
40 The documentation of long-term decline of the northern Yellowstone elk herd highlights the  
41 difficulties in determining the effects of predation on ungulate populations. While it is clear that the  
42 northern Yellowstone elk herd declined since the reintroduction of wolves, the role and magnitude  
43 of wolf predation in this decline is not clear (MacNulty et al. 2016). When preying upon adult elk,  
44 wolves in Yellowstone consistently preyed upon older individuals (>10 years; MacNulty et al. 2016)  
45 and this will translate to minimal effects on elk population size (Wright et al. 2006, Eberhardt et al.  
46 2007).

1 Approximately half of the elk killed by wolves in the northern Yellowstone elk herd were calves  
2 (Smith et al. 2004, Wright et al. 2006, Metz et al. 2012). The effect of wolves on calf recruitment is  
3 likely having the greatest effect on the northern Yellowstone elk herd, but the exact role that  
4 predation on calves plays on elk population dynamics is not well understood given predation is often  
5 compensatory (Proffitt et al. 2014). While calf elk represent a large proportion of wolf-killed prey in  
6 the northern Yellowstone system (Metz et al. 2012), wolves do not necessarily contribute to reduced  
7 survival rates of calves. Overwinter calf survival prior to wolf reintroduction (Singer et al. 1997) was  
8 similar to following wolf reintroduction (Barber-Meyer et al. 2008) even though wolf densities were  
9 at the highest observed since reintroduction (Cubaynes et al. 2014). In contrast, survival during the  
10 summer prior to wolf reintroduction (Singer et al. 1997) was over twice as high as observed  
11 following reintroduction (Barber-Meyer et al. 2008). Since wolf reintroduction, predation on calves  
12 from black and grizzly bears more than doubled, which corresponded with increased grizzly bear  
13 numbers (Kamath et al. 2015). Cougar numbers also increased 76% from 1987-1993 and 1998-2004  
14 (Ruth et al. 2017), but despite this increase, cougars were responsible for similar amounts of  
15 predation before (1.5%) and after (2.6%) wolf reintroduction (Singer et al. 1997, Barber-Meyer et al.  
16 2008). Further, it appears wolf predation in the absence of grizzly bears is largely compensatory for  
17 cougar predation (Griffin et al. 2011). Given the observed changes in several carnivore populations,  
18 it is difficult to determine the relative role of wolves in decreased summer calf survival.

19  
20 Hunter harvest likely also contributed to some of the declines by removing a larger proportion of  
21 prime-aged cow elk compared to wolves (Lemke et al. 1998, Vucetich et al. 2005). The combined  
22 effect of human harvest (focused on prime-aged cows) and predation from multiple carnivores  
23 (focused on calves) on two critical age classes for elk population growth (Gaillard et al. 1998, Raithel  
24 et al. 2007) likely contributed to population declines in elk observed from the late 1990s to mid-  
25 2000s. Under high levels of predation on calves, even minimal hunting pressure on cow elk can  
26 result in reduced survival (Brodie et al. 2013) and population declines (Vucetich et al. 2005, Clark  
27 2014). Consequently, managers may need to consider reducing antlerless elk harvest in some  
28 situations following wolf colonization, as was eventually done for the Northern Yellowstone elk  
29 herd (Loveless 2015).

### 30 31 Effects of Wolves in Other Areas

32  
33 Hebblewhite et al. (2002) compared population dynamics of elk herds in the absence and presence  
34 of wolf predation in Banff National Park. They found that in areas without wolves, elk populations  
35 were regulated by density-dependent mechanisms and limited by human-caused mortality. Elk  
36 populations subjected to wolf predation were primarily limited by the combined effects of snow  
37 depth and wolf predation; however, snow depth was not a significant predictor of population  
38 dynamics of elk prior to wolf recolonization, suggesting an interacting effect of climate and  
39 predation. This finding that ungulate populations are largely regulated by habitat and climate in the  
40 absence of wolf predation is similar to research conducted on other ungulate populations in North  
41 America (Messier 1991, Gasaway et al. 1992, Sæther 1997, Singer et al. 1997, Gaillard et al. 1998,  
42 Taper and Gogan 2002). Ungulate abundance may be restricted as a result of the interplay between  
43 predation and low vegetative productivity and/or harsh climate conditions (Hebblewhite 2005, Melis  
44 et al. 2009, Brodie et al. 2013). These results may be an artifact of the increased vulnerability of  
45 ungulates to predation when escape is hindered by deep snow and/or animals experience decreased  
46 fitness due to climate-related energy loss and food stress (Hebblewhite et al. 2002, Hebblewhite  
47 2005). These findings also highlight the interactive effects of the habitat and climate with wolf  
48 predation that make it difficult to generalize the effects of wolves on prey.

1 Wolf predation has likely contributed to declines in some Idaho elk populations, but wolf predation  
2 alone does not explain the magnitude of these declines. For example, elk population declines in  
3 central Idaho were primarily caused by decreased habitat quality as a consequence of decades of fire  
4 suppression and reductions in timber harvest, as well as extreme winter conditions in the mid-1990s  
5 (Idaho Department of Fish and Game 2006, White et al. 2010). Bear and wolf predation  
6 exacerbated these declines and elk populations have yet to recover (Idaho Department of Fish and  
7 Game 2006, White et al. 2010). A similar situation appears to have occurred in the Bitterroot Valley,  
8 Montana, where prior to wolf re-establishment in 2002, elk population declines appear to have been  
9 initiated by a combination of high antlerless harvests, habitat factors resulting in poor elk body  
10 condition and low pregnancy rates (<70%), and a growing cougar population (Hamlin and  
11 Cunningham 2009, K. Proffitt, Montana Fish, Wildlife, and Parks [MFWP], personal  
12 communication). Research is ongoing in the Bitterroot Valley to understand the mechanisms  
13 driving this population trend.

14

## 15 **Deer**

16

17 Predation effects on deer appear to be largely influenced by the relation of deer to ecological  
18 carrying capacity (Ballard et al. 2001). Populations near carrying capacity, while heavily preyed upon,  
19 do not respond well to predator control (Ballard et al. 2001), and predation mortality is largely  
20 compensatory. When deer populations are below carrying capacity, predation has the potential to be  
21 additive and predators will have a larger effect on deer populations. In general, it is thought that  
22 deer populations tend to be directly regulated by factors other than predation (Ballard et al. 2001,  
23 Bergman et al. 2015).

24

### 25 **Mule Deer**

26

27 In much of Oregon, mule deer ranges overlap with elk. Consequently, in these areas of overlap,  
28 deer are likely to be secondary prey for wolves because elk typically dominate wolf diets in these  
29 systems (Mech and Peterson 2003). Preliminary data from Oregon supports this assertion where  
30 wolf diets were >70% elk (ODFW, unpublished data). While deer can make up >20% of wolf diets  
31 in some areas (Mech and Peterson 2003), the low rate of predation on deer in areas where elk occur  
32 suggests it is unlikely wolves will have a large direct effect on mule deer populations. In areas where  
33 deer occur in the absence of elk in Oregon (i.e., southeastern Oregon) it is likely that the available  
34 prey base will only support a low density wolf population (Fuller et al. 2003a, Mech and Peterson  
35 2003, Peterson and Ciucci 2003). Information on effects of wolves in systems where mule deer are  
36 the primary prey is limited and it is difficult to assess the effect wolves will have in these single prey  
37 systems. Wolves can reduce coyote densities, at least temporarily (Crabtree and Sheldon 1999,  
38 Hebblewhite and Smith 2009), which could reduce any potential effects of coyotes on deer as seen  
39 in pronghorn (Berger and Conner 2008, Berger et al. 2008) and any predation from wolves may  
40 substitute for reduced coyote predation.

41

42 Given their low prevalence in wolf diets, wolves are unlikely to have large direct effects on mule  
43 deer populations. However, wolves may indirectly contribute to increased predation by cougars.  
44 Cougars are the primary predator of deer in western North America (Iriarte et al. 1990) including  
45 Oregon (Clark 2014). Wolves may cause cougars to utilize steeper terrain (Buotte et al. 2005), which  
46 is more likely to be used by mule deer (Johnson et al. 2000, Ager et al. 2003), increasing their use of  
47 mule deer (Elbroch et al. 2015a). In Oregon, cougars occupying the Mt. Emily WMU had similar  
48 amounts of mule deer in their diets before (Clark 2014) and after (ODFW, unpublished data) wolves

1 colonized the area. Wolves may also influence changes in behavior and population reductions of  
2 cougars (Buotte et al. 2005, Bartnick et al. 2013, Ruth et al. 2017) and coyotes (Arjo and Pletscher  
3 1999, Switalski 2003a, Berger and Conner 2008, Merkle et al. 2009, Newsome and Ripple 2014) and  
4 predation pressure on deer may be reduced. This relationship has been suggested for pronghorn,  
5 where fawn survival increased following the reintroduction of wolves and reduction in coyote  
6 densities (Berger et al. 2008), but it is not known if this will occur with cougars and mule deer.

#### 7 8 Black-tailed Deer

9  
10 Evidence exists that wolves may reduce black-tailed deer populations. For example, wolves  
11 introduced to a small island where they previously did not exist caused deer populations to approach  
12 extinction (Klein 1995). Cougars and wolves were significant predators of doe deer on Vancouver  
13 Island (McNay and Voller 1995) and experimental reductions of wolf populations led to increased  
14 fawn survival (Atkinson and Janz 1994) and population growth (Hatter and Janz 1994).  
15 Additionally, in southeast Alaska, deer density is higher on islands without wolves compared to  
16 those occupied by wolves (Smith et al. 1987). These studies are restricted to islands and in areas  
17 with single-prey systems, and the results may not translate well to Oregon. Black-tailed deer in  
18 Oregon have extensive range overlap with Roosevelt elk, which are likely to be the primary prey of  
19 wolves (Mech and Peterson 2003). Consequently, the magnitude of wolf predation on black-tailed  
20 deer in Oregon is likely to be less than observed in single prey systems. However, the effect of  
21 wolves on black-tailed deer in multiple prey systems is not well understood at this time.

#### 22 23 White-tailed Deer

24  
25 Wolf predation on white-tailed deer can be substantial (Messier 1991, Mech and Peterson 2003), but  
26 effects of wolf predation is largely dependent on winter severity, habitat, and presence of alternative  
27 prey (Nelson and Mech 1986, Fuller 1990, Nelson and Mech 1991, Mech and Peterson 2003,  
28 Peterson and Ciucci 2003). White-tailed deer population declines have been observed in areas with a  
29 combination of severe winters (Post and Stenseth 1998, DelGiudice et al. 2002), high human  
30 exploitation (Fuller 1990, DelGiudice et al. 2002), and wolf predation (Messier et al. 1991, Post and  
31 Stenseth 1998). However, there is little evidence available to suggest that wolf predation alone will  
32 negatively affect white-tailed deer populations (Mech and Peterson 2003).

33  
34 Columbian white-tailed deer occur at lower densities in western Oregon and have a more limited  
35 distribution than white-tailed deer in eastern Oregon. Columbian white-tailed deer are unlikely to  
36 serve as the primary prey of wolves given their relatively low population size. In situations where  
37 wolf numbers are determined by their primary prey, which is likely to be elk, and they selectively  
38 prey upon small populations of Columbian white-tailed deer, wolves could negatively affect this prey  
39 population. This type of scenario has been observed with endangered woodland caribou (Wittmer  
40 et al. 2005, Bergerud et al. 2007) and opens the possibility of selective predation on a rare secondary  
41 prey also being observed in Oregon. The probability of this scenario occurring in Oregon is  
42 unknown at this time.

#### 43 44 **Moose**

45  
46 Moose occur at low densities in northeast Oregon, with known populations less than 100 individuals  
47 (ODFW, unpublished data). While moose can be an important component of wolf diets (Mech and  
48 Peterson 2003), the low density of moose in Oregon will reduce wolf hunting efficiency. Successful

1 hunting opportunity for wolves is a combination of encounter rates (i.e., how frequently wolves  
2 locate moose) and ability to kill (i.e., locating a vulnerable individual) (Peterson and Ciucci 2003).  
3 Given the current low moose abundance, wolves will infrequently encounter moose and will likely  
4 kill few individuals. However, given the small population size of moose, even limited predation may  
5 negatively affect their populations, especially if reproductively valuable cow moose are killed.  
6 Oregon's moose population occurs at the edge of the species range and moose at the boundaries of  
7 their southern range have inherently low population growth rates (Ruprecht 2016). This will cause  
8 moose to have a low potential growth increment, and wolf predation may occur at a high enough  
9 level to affect the moose population.

10  
11 While monitoring has been limited, wolves did not kill any radio-collared adult moose in northeast  
12 Oregon and no moose were documented in wolf diets during winter monitoring of predation of the  
13 Wenaha wolf pack (ODFW, unpublished data) where a large proportion of Oregon's moose  
14 population occurs. However, wolf predation on moose may be most common during summer when  
15 wolf predation is focused on calves (Mech and Peterson 2003) and we currently do not have data to  
16 determine the degree to which wolves in Oregon prey upon calf moose.

### 17 18 **Bighorn Sheep and Mountain Goats**

19  
20 Wolves are a coursing predator that typically relies on open and flat habitats to successfully capture  
21 prey (Peterson and Ciucci 2003). Bighorn sheep and mountain goats typically occupy steep and  
22 extremely rugged terrain which limits the effectiveness of wolves to successfully kill these species  
23 and is the primary attribute these species use to escape wolf predation (Mech and Peterson 2003).  
24 While wolves are known to kill bighorn sheep and mountain goats, success rates are low, and wolves  
25 typically have a lower percentage of these species in their diet than is available on the landscape  
26 (Peterson et al. 1984, Huggard 1993, Dale et al. 1995, Mech and Peterson 2003), likely because they  
27 have low habitat overlap with wolves. Consequently, wolves are unlikely to have a large direct effect  
28 on bighorn sheep and mountain goat populations in Oregon.

29  
30 In contrast to wolves, cougars can be effective predators of bighorn sheep and mountain goats,  
31 although predation may be sporadic and is often the result of specialized predation by a few  
32 individuals (Ross et al. 1997, Logan and Sweanor 2001). Wolves may indirectly affect bighorn sheep  
33 and mountain goat populations if they cause shifts in cougar distributions and habitat use. Evidence  
34 exists that cougars may spatially avoid wolves by using more rugged habitats (Akenson et al. 2005,  
35 Buotte et al. 2005, Ruth et al. 2017). This may cause cougars to spend more time in areas occupied  
36 by bighorn sheep and mountain goats and could lead to increased predation from cougars as  
37 encounter rates between cougars and prey increase. This relationship has not been documented in  
38 Oregon where cougars have more abundant prey species (e.g., deer) available in most areas.

### 39 40 **B. Elk and Mule Deer Populations since Wolf Re-establishment**

41  
42 Ungulate and wolf populations are now interacting in at least nine WMUs in northeast Oregon. At  
43 the WMU level, these interactions have occurred from between four to ten years based on  
44 documented wolf establishment. In six of the nine WMUs, elk populations increased to varying  
45 degrees after a wolf group or pack was established in the WMU (Table 2). Declines were observed  
46 in the Chesnimnus, Imnaha, and Sled Springs WMUs. However, interpretation of the impact on  
47 wolf predation on elk populations in these WMUs are confounded by management efforts to reduce

1 the elk population through antlerless harvest to minimize conflicts with elk on private land.  
 2 Additionally, the highest observed change in population size (Wenaha WMU) is confounded by  
 3 management efforts to reduce cougar numbers in that unit, which corresponded with increased calf  
 4 survival and population growth rates of elk (Clark 2014). Calf recruitment measured by late winter  
 5 calf ratios varied across the area and through time with a generally increasing trend in two WMUs,  
 6 declining trend in two WMUs, and a generally static trend in five WMUs.

7  
 8 Table 2. Trend in Rocky Mountain elk populations for Wildlife Management Units with at least one  
 9 established wolf pack in northeastern Oregon. Population estimates within a WMU column become  
 10 bold and shaded the year a wolf pack was documented in the WMU.

Year	Catherine Creek	Chesnimnus	Imnaha	Minam	Mt Emily	Sled Springs	Snake River	Walla Walla	Wenaha	Total Elk Estimate
2003	450	2,900	950	1,800	4,800	2,100	3,000	1,500	1,150	18,650
2004	450	2,900	1,000	2,000	4,600	2,150	3,350	1,500	1,400	19,350
2005	650	3,000	1,100	2,000	4,300	2,100	3,400	1,450	1,350	19,350
2006	800	3,100	1,100	2,100	3,900	2,600	3,500	1,400	1,450	19,950
2007	800	3,400	1,100	2,100	2,500	2,600	3,700	1,500	1,600	19,300
2008	1,000	3,400	1,200	2,100	4,600	2,600	3,700	1,500	1,600	21,700
2009	1,250	3,500	<b>2,200</b>	2,100	3,000	2,500	4,000	1,500	<b>1,600</b>	<b>21,650</b>
2010	1,100	3,700	<b>2,200</b>	2,100	3,000	2,500	4,000	1,500	<b>1,500</b>	<b>21,600</b>
2011	1,050	3,700	<b>2,200</b>	2,100	<b>2,800</b>	2,500	<b>4,000</b>	<b>1,500</b>	<b>1,600</b>	<b>21,450</b>
2012	1,150	5,300	<b>2,250</b>	<b>2,300</b>	<b>2,900</b>	2,700	<b>4,000</b>	<b>1,500</b>	<b>1,800</b>	<b>23,900</b>
2013	1,500	5,200	<b>2,300</b>	<b>2,400</b>	<b>3,000</b>	3,000	<b>4,350</b>	<b>1,600</b>	<b>2,350</b>	<b>25,700</b>
2014	1,350	<b>5,000</b>	<b>2,200</b>	<b>2,450</b>	<b>3,100</b>	3,100	<b>4,300</b>	<b>1,600</b>	<b>2,450</b>	<b>25,550</b>
2015	<b>1,050</b>	<b>5,100</b>	<b>2,000</b>	<b>2,500</b>	<b>3,100</b>	<b>3,100</b>	<b>4,300</b>	<b>1,600</b>	<b>2,550</b>	<b>25,300</b>
2016	<b>900</b>	<b>4,500</b>	<b>2,000</b>	<b>2,500</b>	<b>3,200</b>	<b>3,100</b>	<b>4,300</b>	<b>1,700</b>	<b>2,600</b>	<b>24,800</b>
2017	<b>1,750</b>	<b>4,400</b>	<b>2,000</b>	<b>2,500</b>	<b>3,200</b>	<b>2,900</b>	<b>4,400</b>	<b>1,750</b>	<b>2,700</b>	<b>25,600</b>
2018	<b>1,450</b>	<b>4,400</b>	<b>2,000</b>	<b>2,600</b>	<b>3,300</b>	<b>2,800</b>	<b>4,600</b>	<b>1,700</b>	<b>2,700</b>	<b>25,550</b>

11  
 12 In contrast to elk, mule deer populations in all nine WMUs with established wolves in northeast  
 13 Oregon have fewer mule deer in 2018 than when a wolf pack became established in the WMU  
 14 (Table 3). However, the observed decline in mule deer numbers generally began prior to  
 15 establishment of wolves (Table 3). Similar population declines have also been observed throughout  
 16 most of Oregon’s mule deer range. Fawn recruitment measured by late winter fawn also varied  
 17 across the area and through time and tended to stay within the long term range of variability. In  
 18 general, it is broadly thought that deer populations tend to be regulated by factors other than  
 19 predation (Ballard et al. 2001, Bergman et al. 2015). Consequently, the degree to which wolves have  
 20 contributed to population changes in northeast Oregon is unknown.

1 Table 3. Trend in mule deer populations for Wildlife Management Units with at least one established  
 2 wolf pack in northeastern Oregon. Population estimates within a WMU column become bold and  
 3 shaded the year of wolf pack establishment.

Year	Catherine Creek	Chesnimnus	Imnaha	Minam	Mt Emily	Sled Springs	Snake River	Walla Walla	Wenaha	Total Deer Estimate
2003	1,750	3,600	4,800	3,500	4,600	4,800	2,600	1,800	1,200	28,650
2004	1,700	3,500	4,800	3,500	4,100	4,800	2,600	1,850	1,300	28,150
2005	1,500	3,600	4,500	3,700	4,200	4,900	2,800	1,850	1,400	28,450
2006	2,000	4,100	4,300	4,300	4,750	9,100	2,400	2,000	3,000	35,950
2007	1,700	3,400	4,200	4,000	5,000	8,300	2,350	1,995	2,950	33,895
2008	1,950	2,850	4,150	3,650	5,000	7,650	2,400	1,950	2,600	32,200
2009	1,850	2,600	<b>4,000</b>	3,150	4,900	7,450	2,300	1,850	<b>2,900</b>	<b>31,000</b>
2010	1,250	3,050	<b>4,400</b>	3,350	4,750	8,000	2,400	1,750	<b>2,900</b>	<b>31,850</b>
2011	1,700	3,300	<b>4,350</b>	3,200	<b>4,750</b>	8,000	<b>2,550</b>	<b>1,800</b>	<b>2,600</b>	<b>32,250</b>
2012	1,300	3,200	<b>3,600</b>	<b>3,300</b>	<b>4,550</b>	7,200	<b>2,400</b>	<b>1,700</b>	<b>2,650</b>	<b>29,900</b>
2013	1,300	3,350	<b>3,700</b>	<b>3,300</b>	<b>3,500</b>	7,200	<b>2,500</b>	<b>1,730</b>	<b>2,700</b>	<b>29,280</b>
2014	1,700	<b>3,300</b>	<b>2,700</b>	<b>2,300</b>	<b>3,650</b>	5,800	<b>2,700</b>	<b>1,770</b>	<b>2,750</b>	<b>26,670</b>
2015	<b>1,650</b>	<b>3,400</b>	<b>3,000</b>	<b>2,600</b>	<b>3,800</b>	<b>6,400</b>	<b>2,900</b>	<b>1,800</b>	<b>2,600</b>	<b>28,150</b>
2016	<b>1,500</b>	<b>3,400</b>	<b>3,000</b>	<b>2,600</b>	<b>3,800</b>	<b>6,400</b>	<b>2,900</b>	<b>1,800</b>	<b>2,600</b>	<b>28,000</b>
2017	<b>1,100</b>	<b>3,400</b>	<b>3,000</b>	<b>2,600</b>	<b>3,700</b>	<b>6,000</b>	<b>2,900</b>	<b>1,750</b>	<b>2,400</b>	<b>26,850</b>
2018	<b>1,550</b>	<b>2,700</b>	<b>2,500</b>	<b>2,000</b>	<b>3,650</b>	<b>6,000</b>	<b>2,200</b>	<b>1,700</b>	<b>2,250</b>	<b>24,550</b>

4  
 5  
 6 **C. Big Game Wildlife Management Units and Management Objectives**  
 7

8 ODFW established WMUs and management objectives (MOs) to manage deer and elk populations  
 9 and hunter numbers. WMUs were established to allocate harvest and distribute hunters rather than  
 10 delineate big game species herd ranges. WMUs are long standing geographic areas with boundary  
 11 descriptions and maps printed in the annual Oregon Big Game Regulations pamphlet. MOs are the  
 12 number of deer and elk that ODFW strives to maintain in each WMU in the state (*see* Figures 8 and  
 13 9 for maps of WMUs).  
 14

15 There are two types of MOs for each WMU. MOs for deer and elk are set for both the population  
 16 size and the desired ratio of bucks per 100 does (buck ratio) and bulls per 100 cows (bull ratio).  
 17 Annual herd composition information, including buck, bull, and spring fawn and calf to adult ratios,  
 18 are used to monitor the adult male population segment and the recruitment of young animals into  
 19 the population. Management strategies are designed to maintain population characteristics near  
 20 MOs.  
 21

22 When ODFW determines MOs for deer and elk in a WMU, a variety of factors are considered.  
 23 These include landowner tolerance, habitat, land ownership, winter range, carrying capacity and  
 24 public access. How each factor influences the final MO varies by species and the unique  
 25 circumstances of each management unit. The primary consideration for each MO is the  
 26 department’s statutory obligation to prevent the serious depletion of indigenous wildlife, provide  
 27 optimum recreational and aesthetic benefits, and maintain populations at levels compatible with the

1 primary uses of the land. In areas where deer and elk winter primarily on private lands, damage to  
2 private property is a critical factor influencing MOs.

3  
4 **Elk Population Information**

5  
6 Currently, nearly two thirds of the Rocky Mountain elk populations (63%) are at or above desired  
7 population MO for the WMU (Figure 8). Conversely for Roosevelt elk only 19% of the WMUs are  
8 at or above population MO (Figure 9). Generally, where populations are below MO, particularly in  
9 western Oregon, poor habitat conditions, human-caused factors, and possibly predation are  
10 contributing to low calf ratios that may be depressing populations. In 2018, the statewide elk  
11 population was estimated to be about 132,000 of which about 72,000 were Rocky Mountain and  
12 60,000 were Roosevelt elk.

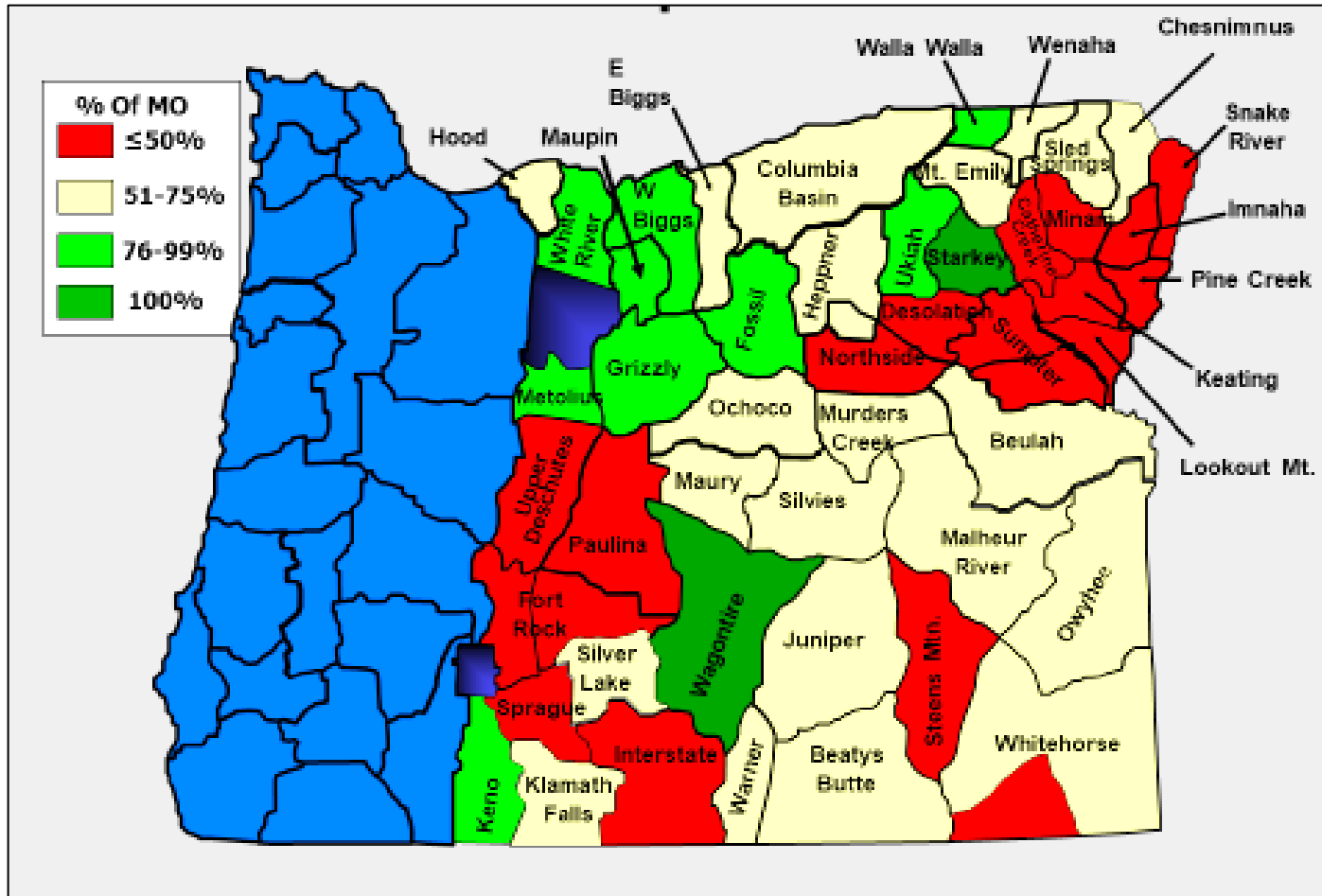
13  
14 **Mule Deer Population Information**

15  
16 John Fremont reported few deer or other big-game species in southeastern Oregon during the  
17 1840s. However, by the late 1850s, gold miners traveling from California to the Boise Basin found  
18 deer abundant in eastern Oregon. Vernon Bailey (1936) estimated Oregon's mule deer population to  
19 be 39,000 to 75,000 animals from 1926 to 1933. Mule deer populations increased through the 1930s  
20 and 1940s, peaking during the mid-1950s, mid-1960s, and mid-1970s. The estimated spring  
21 population in 1990 was 256,000 animals, 26 percent below the established statewide management  
22 objective of 344,900 as listed in the Oregon Mule Deer Plan (ODFW 1990). The estimated 2018  
23 population was 190,500 and continues to remain below established MOs in 47 of 49 WMUs (Figure  
24 10).

25  
26 **Black-tailed Deer Population Information**

27  
28 Black-tailed deer populations are declining in many areas of western Oregon. Habitat changes  
29 (resulting from changes in timber management practices including dramatic reductions in timber  
30 harvest on federal property), diseases (particularly deer hair loss syndrome), and predation (bobcats,  
31 coyotes and cougars) are factors contributing to recent declines. There are no MOs for black-tailed  
32 deer. In 1998, the black-tailed deer population was estimated at approximately 387,000. Current  
33 black-tailed deer population trend information is not available for all areas; but available information  
34 indicates the population has declined since that time. The current black-tailed deer population for  
35 Oregon is estimated at approximately 320,000 animals.





1  
2  
3

**Figure 9.** Status of mule deer populations by management unit. Black-tail deer estimates are not available for Westside units (ODFW).

1 **White-tailed Deer Population Information**

2  
3 The Northwest white-tailed deer inhabits portions of northeastern Oregon and populations have  
4 been expanding geographically as well as numerically during the past 25 years. Preferred habitats  
5 include low elevation riparian areas, low elevation forested areas, and agricultural areas. The most  
6 abundant populations are located along the western edge of the Blue Mountains in Umatilla County  
7 as well as in portions of Union, Wallowa, and Baker counties. No population estimates are available  
8 at this time.  
9

10 Two populations of Columbian white-tailed deer exist in Oregon, one in southwestern Oregon near  
11 Roseburg and the other on a series of islands and the mainland in the lower Columbia River. There  
12 have been no formal MOs adopted for this sub-species of white-tailed deer. Columbian white-tailed  
13 deer were listed as endangered by the federal government in 1973 and were included on the original  
14 state endangered list in 1987. Populations have been increasing to the degree that the Roseburg  
15 population was removed from the state endangered species list in 1995 and federally delisted in  
16 2003. The lower Columbia River population remains listed under the federal ESA but populations  
17 are increasing to the point where a downlisting to threatened or delisting is being considered.  
18 Population estimates for the two populations are approximately 6,000 animals in the Roseburg  
19 population and 400-600 animals in the Columbia population, which includes animals found in  
20 Washington. Major threats to the population include disease (adenovirus and deer hair loss  
21 syndrome), predation, habitat loss, and major flooding in the Columbia River area. Trapping and  
22 transplanting is a major activity to repopulate historic range and to secure the populations' survival  
23 in case of a catastrophic event.  
24

25 **Pronghorn Population Information**

26  
27 Oregon's pronghorn population has increased during the last 25 years, with the majority of the  
28 animals occupying the arid sagebrush/grasslands of southeastern Oregon. Short-term fluctuations in  
29 population levels and recruitment have occurred during this time period. These fluctuations were  
30 primarily attributed to changes in coyote abundance and winter weather severity. The long-term  
31 population increase has been aided by development of irrigated alfalfa on private land, which has  
32 expanded and improved pronghorn habitat in many areas. The estimated pronghorn population for  
33 Oregon is 24,000 animals.  
34

35 **California Bighorn Sheep Population Information**

36  
37 California bighorn sheep were extirpated in Oregon by 1912. All 32 current herds were reestablished  
38 through transplants since 1954. Most herds in the state are stable to increasing. Factors affecting the  
39 four herds experiencing recent declines are thought to be predation (cougar and eagle), habitat issues  
40 (juniper encroachment and noxious weeds), and disease. California bighorn are susceptible to  
41 pasteurella pneumonia outbreaks, but most of the range does not have domestic sheep allotments,  
42 therefore the potential for infection is lower than in Rocky Mountain bighorn sheep populations.  
43 The current California bighorn sheep population in Oregon is estimated to be 4,200 animals.  
44

45 **Rocky Mountain Bighorn Sheep Population Information**

46  
47 Rocky Mountain bighorn sheep were reintroduced in 1971 after being extirpated from the state in  
48 the 1940s. A tri-state, multi-agency and private conservation group effort to reestablish bighorn

1 sheep in Hells Canyon was started in 1997 (Hells Canyon Bighorn Restoration Initiative). Ongoing  
2 research indicates disease (pneumonia) from domestic sheep and goats is the primary cause of  
3 mortality followed by cougar predation on adults. The population estimate in 2018 was 700 animals  
4 in 11 herds or subpopulations in Oregon  
5

### 6 **Rocky Mountain Goat Population Information**

7

8 Rocky Mountain goats indigenous to the north central Cascades and northeast Oregon likely  
9 disappeared prior to European settlement. Restoration efforts began in 1950 with a release of five  
10 goats in the Wallowa Mountains. More recently, successful reintroductions have occurred in the  
11 Elkhorn Mountains, Wenaha, Cascade Mountains and Hells Canyon. Populations have exhibited  
12 good production and recruitment. Pioneering of vacant habitats has occurred in the Vinegar Hill,  
13 Mount Ireland and Strawberry Mountains areas. Future management will be focused on restoration  
14 efforts in suitable habitats. Oregon currently has an estimated 1,000 mountain goats for 2018.  
15

## 16 **D. Wolf Interactions with other Carnivores – Multiple Predator Systems**

17

18 Several carnivores are known to prey upon deer and elk and interactions among these carnivores  
19 may affect the response of ungulates to predation. Wolves are generally dominant over other  
20 carnivores currently occupying Oregon at both kill sites and during direct interactions (Ballard et al.  
21 2003, Ruth and Murphy 2010). Dominant carnivores may exclude or reduce the abundance of other  
22 carnivores through interference competition, such as direct killing, aggressive interactions, territorial  
23 marking, as well as exploitive competition in which carnivores compete for prey or other resources  
24 (Crabtree and Sheldon 1999, Crooks and Soule 1999, O'Neill 2002, Glen and Dickman 2005, Berger  
25 and Gese 2007b, Ritchie and Johnson 2009a). Competition between carnivores is likely to increase  
26 as dietary overlap increases (Donadio and Buskirk 2006, Ruth and Murphy 2010). These  
27 interactions are heightened as shared prey become scarce (Begon et al. 1996, Donadio and Buskirk  
28 2006, Glen et al. 2007). In Oregon, wolves are likely to have a high degree of dietary overlap with  
29 cougars and likely to a lesser degree with coyotes. While black bears are known to kill ungulates,  
30 they are largely omnivorous and dietary overlap with wolves, which are obligate carnivores, is likely  
31 minimal.  
32

### 33 **Black Bear-Wolf Interactions**

34 Black bears were observed to be subordinate to wolves at carcasses in Yellowstone National Park  
35 (YNP; Ballard et al. 2003). Wolves are also known to kill black bears and, in some cases, wolves  
36 have dug into winter dens to kill bears (Horejsi et al. 1984, Paquet and Carbyn 1986), but this is  
37 likely a rare occurrence and should have minimal population level effects. Bears have initiated  
38 interactions with wolves (Hayes and Mossop 1987) and wolves are occasionally killed by bears, but  
39 this has had minimal effects on wolf populations (Jimenez et al. 2008). Dietary overlap between  
40 wolves and black bears is probably less significant given that ungulates are typically only important  
41 in spring bear diets as neonates; bears' nutritional requirements are met through invertebrates and  
42 plant matter during the remainder of the non-hibernation period (Bull et al. 2001). Scavenging of  
43 wolf-killed carcasses may become an added source of protein for bears (bears scavenge a high degree  
44 of cougar-killed prey in NE Oregon; ODFW, unpublished data) and this could lead to direct  
45 competitive interactions between wolves and bears at kill sites. However, direct competition  
46 between wolves and black bears is limited, likely due to minimal dietary overlap (Ballard et al. 2003).

1 **Coyote-Wolf Interactions**

2 It has been shown that wolves can have demonstrable population effects on coyotes in areas of  
3 sympatry. For instance, within eight years of wolf recolonization of Isle Royale National Park,  
4 coyotes were completely eliminated from the island due to competitive interactions (Krefting 1969).  
5 Studies in the Greater Yellowstone Ecosystem (GYE) show that coyote densities were significantly  
6 lower in the presence of reintroduced wolves and transient coyotes dispersed out of sites where  
7 wolves were abundant (Berger and Gese 2007b). Within two years of reintroduction, wolves killed  
8 23-33% of coyotes located in core wolf use areas and the number of coyote packs and pack size  
9 were also reduced (Crabtree and Sheldon 1999). In the years since wolf reintroduction, coyotes  
10 appear to have learned behaviors to reduce aggressive encounters with wolves (Merkle et al. 2009).  
11 The original decrease in the number of coyote packs returned to the pre-wolf average, but pack size  
12 remained smaller, indicating that the overall coyote population is less than during the pre-wolf  
13 period (Hebblewhite and Smith 2009). While coyotes in the GYE now have access to increased  
14 wolf-killed carrion (Wilmers et al. 2003), interference and exploitation competition between the two  
15 canids reduces the full effect of the subsidy provided by wolves (Arjo and Pletscher 1999, Switalski  
16 2003b, Merkle et al. 2009).

17  
18 Coyotes can be significant predators of deer, particularly fawns (Ballard et al. 2001). Consequently,  
19 reduced coyote densities in response to wolf presence may ultimately benefit deer populations.  
20 However, whether reduced coyote populations ultimately relieve the predatory pressure experienced  
21 by prey has only begun to be examined. For example, in the GYE, pronghorn antelope fawn  
22 survival rates were four times higher at sites with greater wolf densities and lower coyote densities  
23 (Berger et al. 2008). Mule deer appeared to respond positively to reductions in coyote density, but  
24 effects were influenced by abundance of alternative prey (e.g., small mammals), where survival was  
25 higher during years of high small mammal abundance, and climate, where survival was lower during  
26 severe winters (Hurley et al. 2011). Furthermore, experimental reductions of coyotes have had  
27 minimal effects on deer populations and deer are ultimately regulated by factors other than  
28 predation (Ballard et al. 2001, Bergman et al. 2015).

29  
30 **Cougar-Wolf Interactions**

31 Wolves and cougars are both obligate carnivores that focus their predation on large ungulates, which  
32 suggests a high degree of competition is likely to occur between the species. Wolves are dominant  
33 to cougars in areas of sympatry, consequently, the recolonization of Oregon by wolves may  
34 influence cougar population size and distribution, habitat use, kill rates, and prey use, which are  
35 likely to have cascading effects on ungulate populations that will be difficult to predict. Kortello et  
36 al. (2007) found cougars avoided areas recently visited by wolves, but a gross-scale home range  
37 analysis showed a high degree of spatial overlap between the two predators. Akenson et al. (2005)  
38 also observed that radio-marked cougars moved to the perimeter of their home ranges when radio-  
39 marked wolves were present in their territories. In a comparison of pre- and post-wolf conditions, it  
40 was observed that cougars shifted to more rugged areas associated with the bottoms of steep river  
41 canyons (Buotte et al. 2005, Ruth et al. 2017). Cougars in YNP also condensed the size of their  
42 home ranges after wolves were restored, presumably to avoid interactions (Buotte et al. 2005).  
43 During winter, cougars and wolves were able to maintain distinct use of habitat, despite the fact that  
44 their home ranges converge as they seek prey that migrate to lower elevations or areas with milder  
45 conditions (Alexander et al. 2006). In Banff National Park (BNP) and other areas of the Canadian  
46 Rocky Mountains, wolves consistently used gentle-sloped valley bottoms associated with high elk  
47 densities, while cougars descended from higher elevations as winter progressed and rarely accessed  
48 the valley floor, opting instead to remain on the adjacent hillsides (Alexander et al. 2006).

1 Evaluation of wolf and cougar kill sites also provides evidence for spatial partitioning between the  
2 two carnivores. In the northern range of YNP, Kauffman et al. (2007) observed that in the winter,  
3 wolf hunting grounds were snow-covered, grassy areas of level terrain compared to cougars.  
4 Similarly, in the Madison Range, Montana, wolf kill sites occurred in open and gentle-sloped riparian  
5 habitat which is more suitable for long pursuits (Atwood et al. 2007) . By contrast, sites of cougar  
6 kills were located on steeper terrain (>15% slope) and were more structurally complex, which would  
7 provide advantages for an ambush predator (Atwood et al. 2007). Similar topographical differences  
8 between the predators' kill sites were noted in the Salmon River Mountains, Idaho (Husseman et al.  
9 2003). This spatial partitioning of habitat by wolves and cougars may change diets and prey use of  
10 cougars (Elbroch et al. 2015a), which could change predator-prey dynamics in Oregon, potentially in  
11 unanticipated ways.

12  
13 As the dominant predator, wolves are effective in usurping cougar-killed prey. Wolves consistently  
14 scavenge cougar-killed prey, but cougars rarely visit or scavenge wolf-killed prey (Kunkel et al. 1999,  
15 Kortello et al. 2007). Although data are limited, similar results were observed in Oregon (ODFW,  
16 unpublished data). Usurping of cougar kills has the potential to increase kill rates of cougars as they  
17 must make additional kills in an attempt to meet their basic energetic requirements. Increased kill  
18 rates by cougars could have important implications for prey populations, especially if cougar  
19 predation is selective on a particularly important age class of ungulate or if cougars selectively prey  
20 upon a low density ungulate population. However, cougar kill rates appear to be relatively constant  
21 across a range of prey systems (see summary in Knopff et al. 2010) and were nearly identical in areas  
22 with (Knopff et al. 2010) and without wolves (Clark 2014). This likely occurs because kill rates are  
23 driven by energetic requirements of cougars (Knopff et al. 2010) and kleptoparasitism of cougar kills  
24 by wolves are relatively rare, at least in Oregon to date (ODFW, unpublished data). This suggests  
25 that cougars are likely to have similar kill rates following wolf colonization in Oregon.

26  
27 Ruth (2004a) compared cougar diets before and after YNP's wolf reintroduction and revealed few  
28 differences, however this research concluded at the onset of dramatic elk declines (Yellowstone  
29 Center for Resources 2011). At the time of their study, Kunkel et al. (1999) did not note any  
30 changes in cougar prey selection after wolves recolonized and prey availability was declining in  
31 Glacier National Park (GNP); they speculated this was because there was still adequate prey biomass  
32 available for both carnivores. In contrast, interference and exploitation competition with wolves  
33 apparently altered cougars' diets in BNP (Kortello et al. 2007) and the GYE (Elbroch et al. 2015a).  
34 As elk populations declined, cougars increasingly preyed on mule deer and bighorn sheep, while  
35 wolves continued to specialize in elk (Kortello et al. 2007). In central Idaho, both wolves and  
36 cougars selected for juvenile elk, but cougars used adult elk and all age classes of deer in proportion  
37 to availability (Akenson et al. 2005). In Oregon, cougars in the Mt. Emily Wildlife Management Unit  
38 had similar diets before (Clark 2014) and after (ODFW, unpublished data) wolves colonized the  
39 area. Cougars in northeast Oregon have a strong limiting effect on elk populations in the absence of  
40 wolves (Clark 2014) and the addition of wolves could lead to increased predation pressure on elk  
41 from two predators if cougar population size is not influenced by wolf recolonization.

42  
43 Wolf-killed cougars have been documented in a number of locations. In YNP, Ruth (2004a)  
44 discovered that 23% of cougar mortalities were attributed to wolves. Cougars killed by wolves have  
45 also been documented in GNP (Boyd and Neale 1992, Kunkel et al. 1999, Ruth 2004b) and BNP  
46 (Kortello et al. 2007). Wolves also demonstrated non-lethal aggressive behavior towards cougars.  
47 For instance, cougars have been chased and treed by wolves (Ruth 2004b, Akenson et al. 2005;  
48 ODFW, unpublished data). Observations of cougars killing wolves are rare (Ruth 2004a, Jimenez et

1 al. 2008) and cougars only prevailed in interactions involving solitary wolves (Ruth and Murphy  
 2 2010). In Oregon, wolves have killed young (<3 month) cougar kittens, but have not yet been  
 3 observed to kill adult cougars (ODFW, unpublished data). Although significant competition  
 4 between wolves and cougars was noted in the northern range of YNP, cougar survival rates 10 years  
 5 after wolf reintroduction remained unchanged from the pre-wolf time period (Ruth et al. 2011).  
 6 Conversely, Kortello et al. (2007) noted depressed cougar survival rates (0.51) in BNP, and Akenson  
 7 et al. (2005) observed decreased cougar populations after the return of wolves in north central  
 8 Idaho, but other factors such as large-scale fire may have influenced this finding. (Ruth 2004b)  
 9 speculated that the pre-wolf cougar population size would not be supported in the GNP region as  
 10 prey declines continued. In all study areas where wolves co-existed with cougars, necropsies of dead  
 11 cougars revealed severe malnourishment (Ruth 2004b, Akenson et al. 2005, Kortello et al. 2007).  
 12 Orphaning, malnutrition, and wolf-caused mortality of cougar kittens occurred more frequently  
 13 following recolonization of the northern range of YNP by wolves (Ruth et al. 2011). Without  
 14 emigration from nearby source areas, cougar populations may decline as a result of direct wolf-  
 15 induced mortality, starvation resulting from prey competition, and slowed reproduction and  
 16 recruitment (Kunkel et al. 1999, Ruth 2004a, Kortello et al. 2007). However, the degree to which  
 17 this is directly related to wolf recolonization is not well understood and further research is needed.  
 18

## 19 **E. Strategies to Address Wolf-Ungulate Interactions**

### 20 **Objective**

- 21 • Ensure that conservation and management of wolves is conducted using an adaptive  
 22 management approach which recognizes the importance of Oregon's ungulate populations  
 23 to both wolves and humans and strives to meet management objectives for both wolves and  
 24 ungulate species.  
 25  
 26  
 27

### 28 **Strategies**

- 29 • Monitor and evaluate population-level influence of wolves on ungulate species by applying  
 30 Oregon-specific wolf and ungulate monitoring information – identify trends, and areas of  
 31 further investigation or closer monitoring.
- 32 • In Phase I and II, if ODFW determines that wolves are a major cause of the population not  
 33 meeting established ungulate objectives or herd management goals in a WMU, non-lethal  
 34 management actions including transrelocating wolves to other suitable habitat may be used  
 35 on a case-by-case basis.
- 36 • In Phase III, if ODFW determines that wolves are a major cause of the population not  
 37 meeting established ungulate objectives or herd management goals in a WMU, active  
 38 management (e.g., non-lethal methods or lethal removal) of wolves may be used. Actions  
 39 involving lethal removal will be considered on a case-by-case basis (*see* Chapter III) only as  
 40 follows:  
 41
  - 42 ○ Any take will not impair wolf population viability or reduce overall wolf population  
 43 health factors within the region.
  - 44 ○ ODFW has determined that the controlled take action is expected to allow the  
 45 affected ungulate population to meet established objectives or herd management  
 46 goals.

- 1           ○ Controlled take would be administered with special permit authorization by the  
2           public and targeted at wolves in a specific location involved with the above-  
3           mentioned conditions that warrant a management response (*see* Chapter III).
- 4           ● Active management (e.g., non-lethal or lethal removal) of wolves may be initiated in areas  
5           where ungulate species have been transplanted to supplement or expand their historic range,  
6           if wolves are determined to be affecting the success of the transplant goals and the  
7           Commission determines that such take of wolves would remedy the situation, while not  
8           affecting the wolf population viability or health factors within the region. In this situation,  
9           lethal removal of wolves will be an option only when in Phase III.
- 10          ● Active management (e.g., non-lethal or lethal removal) of wolves may be initiated in  
11          important ungulate winter ranges or winter feeding sites that congregate elk in specific areas  
12          or that serve to draw ungulates away from agricultural lands, and may attract wolves.. Lethal  
13          options under this strategy are only available when in Phase III, and if ODFW determines  
14          that wolves are a major cause of ungulate populations not meeting established range or area  
15          objectives.
- 16          ● Implement situation-specific monitoring to assess the effectiveness of management actions  
17          conducted as part of this chapter, and use monitoring results to inform future actions.

DRAFT

## VI. WOLF-HUMAN INTERACTIONS

Addressing public safety concerns and providing information on wolf behavior are important to wolf conservation. Human-wolf interactions occur in a number of ways. This chapter covers: background on human safety; general public and wolves; hunters and trappers and wolves; dogs and wolves; illegal, incidental and accidental take of wolves; and strategies to address wolf-human interactions.

### A. Human Safety<sup>4</sup>

Compared to other wildlife-human interactions, attacks by wolves on humans are rare. A review worldwide of wolf attacks from 1950 up to early 2000 identified only eight records of non-rabid wolves in Europe and Russia combined involved in human fatalities (Linnell et al. 2002), while the wolf population in Europe and Russia is estimated at 50,000 animals (The Wildlife Society 2012). While rare, injurious and fatal attacks by wolves have occurred and include rabid wolves (Linnell et al. 2002, McNay 2002b); as well as attacks by wolves on humans resulting from starvation, health-related conditions, human guarding of livestock where conditions have deprived wolves of wild prey (notably India), wolf habituation to humans and defense behavior associated with food source, and when cornered or trapped (Linnell et al. 2002, McNay 2002a, Fritts et al. 2003, Krithivasan et al. 2009, Butler et al. 2011).

In comparison, an estimated 25 attacks by black bears on humans occur each year in North America, with one being fatal every third year (Conover 2001). From 1890 to 2001 in North America, there have been 17 fatal and 72 non-fatal verified attacks by cougars (Beier 1991, Fitzhugh unpublished, Linnell et al. 2002). Domestic dogs in America are responsible for 4.7 million bites and 15-20 fatalities per year<sup>5</sup> (Sacks et al. 1996). Domestic dogs also are the single most important vector for transmission of rabies to humans (Moore et al. 2000). See Conover, 2001, for an overview of other species attacks, bites or stings on humans.

Fatal wolf attacks on humans in North America have been rare despite the presence of 70,000 wolves in Canada and Alaska and over 6,200 wolves in the contiguous United States (Linnell et al. 2002, McNay 2002a;b, The Wildlife Society 2012). McNay (2002b) compiled 80 documented wolf-human encounters, none fatal, in Alaska and Canada from 1900 to 1996 with one unprovoked instance of wolf aggression from 1900 to 1969, but 18 instances of unprovoked wolf-human encounters during 1969 to 2000. The author identified increases in wolf protection; along with increases in wolf numbers and increases in human activity in wolf habitat to coincide with the rise in unprovoked attacks. An overview and review of 80 specific instances in Alaska and Canada is provided in McNay (2002a, 2002b).

Habituation of wolves to human presence may be a factor that can increase the occurrence of wolf attacks. For example, five wolf attacks, by healthy but likely habituated wolves, on humans occurred in Algonquin Provincial Park, Ontario, Canada between 1987 and 2000, a location that previously had never reported such attacks (Schmidt and Timm 2007). Since 2000, the Algonquin Provincial

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<sup>4</sup> Information in this section was used with permission from California Department of Fish and Wildlife's December 2015 Draft Conservation Plan for Gray Wolves in California.

<sup>5</sup> [www.dogbitelaw.com](http://www.dogbitelaw.com) 2004.

1 Park has had procedures to deal with fearless wolves including monitoring, posting warnings,  
2 aggressive aversive conditioning, and, if necessary, dispatching habituated wolves (Stronks 2015).  
3 Techniques such as these should be considered to minimize habituation of wolves and reducing risk  
4 of wolf attacks on humans.

5  
6 Attacks on humans are more likely to occur when wolves are injured or diseased. For example, in  
7 August 2013, a teenager camping in Minnesota was bitten in the head by a wolf, requiring stitches.  
8 The injuries were not life threatening. After wildlife officials killed the wolf, which had been  
9 reported hanging around the campground in the weeks preceding the encounter, a necropsy was  
10 performed. The one-and-a-half year-old wolf had only fish spines and scales in its stomach and had  
11 severe facial deformities and dental abnormalities (likely caused by traumatic injury as a pup), and  
12 brain damage caused by infection, prompting wildlife officials to speculate that these malformations  
13 predisposed it to be less wary of people and human activities than what is normally observed in  
14 healthy wild wolves and also affected its ability to effectively capture wild prey (Minnesota  
15 Department of Natural Resources 2013).

16  
17 Attacks by healthy wild wolves on humans are a rare event, and fatal attacks are even more  
18 uncommon. After no documented human fatalities between 1900 and 2000, two such cases have  
19 occurred since the early 2000's in North America. In 2005, a 22-year-old man in northern  
20 Saskatchewan was killed by gray wolves (Alaska Department of Fish & Wildlife 2008), which were  
21 known to be feeding/scavenging at an unregulated garbage dump (Patterson 2007). In 2010, a 32-  
22 year-old woman in Chignik Lake, Alaska was attacked and killed while jogging along a road. An  
23 exhaustive investigation by the Alaska Department of Fish and Game (Butler et al. 2011) concluded  
24 that four to six wolves, which were likely healthy, were responsible for this fatality.

25  
26 Despite the rare occurrence of human mortalities or injuries caused by wolves, as large carnivores,  
27 wolves are fully capable of inflicting serious harm to humans. As such, wolves should be respected  
28 for their capabilities and humans should avoid close contact at all times. In the rare occurrence that  
29 defense of human life from a wolf is required, the federal ESA provides that a person is not liable  
30 for take of a listed species if the person takes the animal based on a good faith belief that the person  
31 is acting to protect someone from bodily harm. Similarly, Oregon's criminal code provides a defense  
32 that may justify an otherwise illegal take if the act was necessary to avoid imminent, grave injury to a  
33 person (ORS 161.200).

## 34 35 **B. Interactions with the Public**

36  
37 It is important that people who are most likely to encounter wild wolves—hunters, trappers,  
38 livestock managers, rural residents, anglers, recreationalists, guides, packers, and forest workers—  
39 have a basic understanding of wolf behavior and how to help keep wolves wild and what to do in  
40 the unlikely event that a wolf threatens a person. Like any large carnivore, wolves can cause serious  
41 injury and humans should avoid close contact at all times.

42  
43 Wolves generally avoid human interactions and a wolf will usually respond to most human  
44 encounters by running or trotting away. However, in some situations a wolf (especially a young  
45 wolf) will not flee but will stand and appear curious. This behavior is normal and does not indicate  
46 aggression. Additionally, it is common for wolves to bark or howl in response to detection of or  
47 disturbance by humans. This behavior is often a fear response to an unfamiliar or startling encounter

1 and rarely indicates aggressive or threatening behavior. Barking is also common near den or pup  
2 rearing sites. Wolves which are simply passing near, watching, or otherwise behaving in a non-  
3 threatening manner should not necessarily be considered dangerous. In some situations hunters in  
4 camouflage have reported interactions with wolves, especially while using a big game or predator  
5 call. In all reports, the wolves left once the source of the sounds or smell was identified as human.  
6 At time of writing, only one wolf has been taken due to human safety in Oregon when in 2017 a  
7 hunter encountered wolves and shot one in self-defense believing his life was in danger.  
8

9 Like all wildlife, wolves can lose fear of humans as a result of frequent interaction by direct contact  
10 (e.g., visual) or by indirect contact (e.g., food or garbage left behind). This is called habituation and  
11 the following are some guidelines to help keep wolves from becoming habituated to humans.

- 12 • Resist the temptation to approach wolves. Fewer contacts with humans help keep them  
13 wild.
- 14 • Do not approach fresh wolf kills, dens, or rendezvous areas.
- 15 • Don't feed wolves, including leaving food or garbage where wolves can find it after you've  
16 left the area. Wolves are naturally wary of people, but they can easily lose their fear of  
17 humans by associating them with food.
- 18 • Don't feed any wildlife. Attracting deer and other mammals can attract all large carnivores.
- 19 • Feed pets indoors. Don't leave pet food outside.
- 20 • When camping, secure all food from wildlife and sleep away from cooking areas.
- 21 • Keep dogs leashed or in close proximity when outdoors (*see* Section D, Dogs and Wolves).
- 22 • Avoid wolf pups and any young wildlife when encountered.
- 23 • Report odd wolf behavior to authorities – including wolves that appear tame or comfortable  
24 around humans.

25 During a close encounter, or if a wolf threatens a person:

- 26 • Stay calm, and do not turn or run away.
- 27 • If necessary, make noise, raise your voice and speak firmly, throw objects, or wave clothing  
28 while keeping eye contact.
- 29 • Back away slowly while facing the animal.
- 30 • Leave the wolf a way to escape.
- 31 • Pick up small children without bending down.
- 32 • Continue to move away from the area while keeping eye contact if possible.
- 33 • Report odd wolf behavior to authorities – including wolves that appear tame, comfortable  
34 around humans, or threatening.

35  
36 Additional information regarding living with wolves can be found in the Wolf-Human Interactions  
37 section of the ODFW wolf website, [www.odfw.com/Wolves/human\\_interactions.asp](http://www.odfw.com/Wolves/human_interactions.asp).  
38

### 39 **C. Hunters, Trappers and Wolves**

40  
41 Hunters and trappers may come in contact with wolves and should know the status of wolves in the  
42 state and the laws that protect them. Information on wolf identification is available in the Oregon  
43 Big Game and the Oregon Furbearer Trapping and Hunting Regulations and on the ODFW wolf  
44 website. Wolf status information is available on the website and by contacting a local ODFW office.  
45 Hunters have a responsibility to identify their target. Killing a wolf as a result of mistaking it for  
46 another species may be considered intentional, knowing, reckless or criminally negligent take, subject  
47 to criminal penalties.

1 As wolves can be attracted to traps set for other species, especially those set for coyotes, trappers  
2 have a responsibility to know the difference between wolves and coyotes and how to identify wolf  
3 sign. To reduce the chance of incidental wolf catch, trappers are asked to avoid trapping in areas  
4 with fresh wolf sign and learn how to improve trap sets (e.g., trap size, design) to avoid capturing  
5 wolves. This information is available in the Oregon Furbearer Trapping and Hunting regulations.  
6 Additionally, trappers should immediately notify ODFW, OSP or USFWS if a wolf is caught in a  
7 trap. Since the Wolf Plan was first enacted in 2005, licensed or authorized trappers have incidentally  
8 caught seven wolves in legal foothold traps or snares. In these cases, the trapper immediately  
9 reported the incident, the wolf was safely released, and each one was fitted with a radio collar.

10  
11 Hunters and trappers are ideally suited to help monitor wolf populations due to their abilities to  
12 recognize wildlife sign, recreating (often undetected) through all Oregon habitats, and regularly using  
13 tools such as trail cameras. They are always encouraged to continue to submit wolf observations via  
14 the ODFW website: [https://www.dfw.state.or.us/Wolves/wolf\\_reporting\\_form.asp](https://www.dfw.state.or.us/Wolves/wolf_reporting_form.asp).

## 16 **D. Dogs and Wolves**

17  
18 Wolves are territorial by nature and guard their territory from other canids, including coyotes and  
19 domestic dogs. They are especially protective around active dens and rendezvous sites. Although  
20 most wolf-dog altercations in the western states have occurred in remote locations, wolves have  
21 occasionally fought with dogs near homes, even when people were nearby (Wiles et al. 2011).

22  
23 Hunting dogs and dogs used to protect livestock are at increased risk of wolf-dog conflicts, but  
24 anyone with a dog in wolf country should take steps to limit potential conflicts. Fortunately, this  
25 advice is good for reducing dog conflicts with most wildlife and in general:

- 26  
27 • If possible, know if you are in an area of known wolf activity (AKWA). These areas are  
28 shown on the ODFW wolf website and are based on actual wolf data and information that  
29 has been verified by ODFW. Additionally, the public may contact their local ODFW office  
30 to get information regarding wolf activity in the area.
- 31 • Keep dogs in close proximity and in view.
- 32 • Place a bell or a beeping collar on wider ranging dogs to indicate they are not wild canids.
- 33 • Talk loudly to the dog or use whistles to show the dog is associated with a human.
- 34 • Control the dog so that it stays close to you. Dogs which range away from their owner in  
35 wolf country are at increased risk of wolf confrontation.
- 36 • Place the dog on a leash if wolves or fresh sign are seen.
- 37 • Train companion dogs not to chase or approach wildlife, and to return on command.
- 38 • Remember, it is illegal to shoot at, attempt to injure or kill a wolf even if it is attacking your  
39 dog, except under certain circumstances with livestock working dogs.
- 40 • See Chapter IV for information on working dogs used to protect livestock.

1 **E. Illegal, Incidental, and Accidental Take**  
2

3 All unexpected take is investigated by Oregon State Police and where applicable, USFWS Law  
4 Enforcement.

5 House Bill 4046, which was enacted in the 2016 Oregon Legislative Assembly Regular Session,  
6 increased penalties for the unlawful taking or killing of wildlife. The Fish and Wildlife Commission  
7 requested this increase at the time the wolf was delisted from the state ESA. The bill added gray  
8 wolf to the list of game mammals for which the Commission may institute suit for recovery of  
9 damages and increased the penalty for unlawful killing of a gray wolf to \$7,500 from \$1,000 (ORS  
10 496.705).

11  
12 **Illegal Take**  
13

14 The gray wolf is protected from illegal take under federal and state laws. As of this writing, wolves  
15 are federally listed as endangered in the western three quarters of the state and are protected from  
16 illegal take statewide by state law. Under state law, illegally killing a wolf, is a Class A misdemeanor  
17 crime and someone convicted of illegally killing a wolf may be imprisoned for up to one year and  
18 fined \$7,500 (ORS 496.992, 498.002). Persons convicted of violating the wildlife laws also may lose  
19 hunting privileges for a period of 36-60 months, or permanently, and may be subject to forfeiture of  
20 property used in the commission of violating the wildlife laws.

21  
22 **Incidental Take**  
23

24 Federal law defines incidental take as take that results from, but is not the purpose of, an otherwise  
25 lawful activity. Federal and state laws do not distinguish between incidental and illegal take for  
26 purposes of determining criminal or civil sanctions. If an incidental take permit has been issued  
27 under federal or state law, and a person violates the terms of that permit, that violation could be an  
28 additional basis for civil or criminal sanction. At the time of writing, no wolves have been taken in  
29 Oregon under coverage of a federal or state incidental take permit (ITP).

30  
31 **Accidental Take**  
32

33 Neither federal nor state law define “accidental” take, but presumably it would include situations  
34 where the take is not reasonably foreseeable by a person carrying out an otherwise lawful activity—  
35 for example, an individual, who lawfully driving a car, strikes and kills wildlife.

36  
37 If a person did not intend to kill an animal (or act recklessly or with criminal negligence) then, under  
38 the Oregon wildlife laws, misdemeanor and felony penalties generally would not apply. Civil  
39 sanctions, including damages, could be sought. However, as a practical matter, civil sanctions are  
40 rarely if ever sought in accidental situations. The law does provide reporting requirements, even for  
41 accidental take.

1 **F. Strategies to Address Wolf-Human Interactions**  
2

3 As wolf populations expand, increases in wolf-human contact can be expected. The Plan’s objective  
4 is to minimize the potential for negative wolf-human interactions through development and  
5 implementation of a comprehensive public education program. The following strategies support this  
6 objective.  
7

- 8 • Implement a comprehensive education program that supports co-existence with wolves and  
9 wolf conservation within the parameters of the Plan.
- 10 • Wolves found living within or near communities and could result in conflict with humans or  
11 harm to the wolf shall be considered candidates for relocation. However, wolves that are  
12 known or suspected to have depredated livestock or pets will not be relocated.
- 13 • Inform the public about ways to avoid wolf interactions and appropriate responses to  
14 encounters with wolves.
- 15 • Share information regarding areas of known wolf activity with the public as appropriate.
- 16 • Ensure agencies respond to reported wolf-human interactions in a timely manner and  
17 develop response protocols for reported wolf-human conflicts similar to those used for  
18 human interactions with cougars and black bears.
- 19 • Discourage activities that lead to habituation of wolves to humans.
- 20 • Inform and educate the public about staying away from sick or debilitated animals and  
21 reporting them to ODFW.
- 22 • Reports of wolf-human interactions will continue to receive high attention for investigation  
23 by ODFW and animal control authorities.

## VII. INFORMATION AND EDUCATION

### Objective

- To inform and educate the public through a comprehensive information and education program that fosters two-way communication between wildlife managers and others with an interest in wolves.

### Strategies

- Implement a communications plan which emphasizes easy access to information and transparency in regard to wolf management activities, and includes the following:
  - A comprehensive wolf website as part of the ODFW site containing information on the biology and behavior of wolves, wolf use areas, pertinent wolf related documents and updates of recent events.
  - An annual report on management activities that is distributed through the website, at Commission meetings, group meetings, and by request.
  - Productive media relations, including news releases, timely response to queries, and use of social media.
  - Information on the importance of public wolf reports and how to report wolf sightings.
  - Participation in meetings about wolves hosted by interested organizations as staff time allows.
  - Wolf identification and protection information in Oregon Big Game Regulations and Oregon Furbearer Trapping and Hunting Regulations.
  - Information for livestock producers about non-lethal and legal lethal wolf management techniques and areas of known wolf use.
  - Information about wolf conservation and co-existing with wolves.
  - Inform citizens about wolf encounters and human safety in wolf country.
  - Inform hunters and trappers how to avoid taking wolves while hunting or trapping other species of wildlife.
  - Coordinate information and education efforts with other agencies and non-governmental organizations to ensure that accurate information is disseminated to interested parties and that costs are kept to a minimum.

A coordinated communications effort has supported the Wolf Plan since it was first adopted in 2005. A variety of strategies and channels are used to engage a wide range of audiences, including private landowners, public land managers, hunters, trappers, ranchers, conservationists, recreationists, and other groups and organizations. Legislators and local governments are provided with information proactively and as requested. ODFW staff and partners—USFWS, Oregon State Police, the Department of Agriculture, Wildlife Services, Native American tribes, other state fish and wildlife agencies, and others—are in regular communication regarding wolf management. Media contacts are proactive and media requests receive timely response. Oregonians can access information about wolves in the state and subscribe to receive wolf and wolf-livestock updates through the ODFW website at: <http://odfw.com/wolves>.

## VIII. REPORTING AND EVALUATION

### Objective

- Document and report the annual activities related to wolf conservation and management, and evaluate program effectiveness toward meeting the Plan’s goals and strategies and maintaining consistency with state and federal laws.

### Strategies

- Develop and distribute an annual report that describes the activities related to implementation of this Plan.
- Continue to maintain a comprehensive wolf website as part of the ODFW site, which offers open and transparent information and updates regarding the implementation of this Plan for the public, partner agencies, organizations, tribes, and the Commission.
- Continue to implement a periodic evaluation of the effectiveness of this Plan on a 5-year basis.
- Continue to develop and refine measures to track progress toward meeting the objectives of this Plan.
- Incorporate feedback received from the public and stakeholder groups into the periodic evaluation of this Plan.

Because of the intense interest in wolves and the implementation of this Plan, an annual report will continue to be written that summarizes management activities and results of wolf conservation and management in Oregon. The annual report will be made available to the Commission, elected officials and any others who request it to keep them informed about Oregon’s results. Upon request, the Oregon Fish and Wildlife Commission and Oregon Legislature shall be briefed and updated regarding the Plan’s implementation. The public demand for current information continues to increase. To meet this demand, ODFW’s wolf website will continue to be relied on as a means of providing up-to-date reporting about wolf management in the state.

Much is left to be learned about wolf conservation and management in Oregon. This is why an adaptive management approach will be used and why measurable objectives must be part of the feedback mechanism. While benchmarks measure results, not effort, monitoring those results can help determine whether to modify program objectives or management practices. Evaluation will include assessing how each portion of the Plan has been implemented, and its effectiveness. Evaluation and public and stakeholder engagement may be most appropriate following release of the annual report.

ODFW will continue to evaluate the effectiveness of implementation every five years and recommend any changes to the Commission, similar to other wildlife species Plans. Two events could trigger an evaluation before the five year review: a change of the wolf’s legal status at the state or federal level or statutory changes to the Oregon ESA. The completion of any formal evaluation could result in a decision by the Commission to enter into rulemaking and amend the Plan. Measures that track progress toward meeting the Plan’s objectives will aid in evaluating where the Plan is succeeding and where improvement is needed as implementation progresses. The Commission may consider forming a committee to evaluate the effectiveness of wolf conservation and management in Oregon.

## IX. RESEARCH AND INFORMATION MANAGEMENT

### Objective

- Improve the conservation and management of wolves and the other species, ecosystem processes, and resources they affect in Oregon using science-based information derived from research.

### Strategies

- Implement research projects, as financial and logistical resources allow, which are responsive and adaptive to management and conservation needs of wolves and other wildlife and resources they affect.
- Assess and develop science based monitoring programs to ensure effective conservation and management of wolves.
- Develop effective collaborations and partnerships with other state and federal agencies, universities, and other cooperators to identify potential research projects and improve rigor and scientific approach when conducting wolf-related research in Oregon.
- Publish research conducted by ODFW and other collaborators in peer-reviewed scientific journals.
- Where applicable, apply research conducted in other areas to Oregon to improve management.
- Disseminate research findings developed in Oregon to ensure stakeholders and other interested parties are educated on wolf research conducted in Oregon.

Research and information management will continue to be an essential component of this Plan, and will be strategically focused on questions that will affect short and long-term management decisions. In addition, this program should synthesize and utilize existing information generated from other areas, and this will best be achieved through continued collaborations and partnerships with other state and federal agencies, universities, and other entities.

While a multitude of wolf-related research projects are possible, financial and logistical constraints will ultimately limit the ability to conduct potentially relevant research. Consequently, research activities will be focused on areas that will provide managers with science-based findings that will improve conservation and management of wolves and the resources they interact with. Broadly, research conducted in Oregon may focus on: 1) wolf ecology, monitoring, population estimation, and population dynamics, 2) effects of wolves on native ungulates, 3) effects of wolves on other carnivores, and 4) methods to identify areas of wolf conflict and approaches to reduce potential conflicts.

As wolf populations increase and expand their range in Oregon, it will become logistically and financially prohibitive for ODFW to continue current wolf monitoring efforts. Additionally, models used to predict the number of breeding pairs (Mitchell et al. 2008) rely on knowing pack sizes, which are difficult to obtain as wolf populations increase. Consequently, development and refinement of additional monitoring techniques will be important to address over the next five years of this Plan's

1 implementation. Recently developed approaches such as surveying predicted rendezvous sites  
2 (Ausband et al. 2010, Stansbury et al. 2014) or patch occupancy modeling (Miller et al. 2013, Rich et  
3 al. 2013) may prove to be useful alternatives for monitoring Oregon's wolf populations in the future.  
4 Alternatively, recent advances in genetic and modeling techniques may allow application of non-  
5 invasive genetic monitoring (Morin et al. 2016) or camera trap surveys (Chandler and Royle 2011,  
6 Sollmann et al. 2013) to effectively monitor wolf populations in the future. ODFW will continue to  
7 assess alternative monitoring approaches and develop new approaches to meet monitoring needs in  
8 the future.

9  
10 While using GPS-collars and aerial surveys to census wolf populations in the future may not be  
11 logistically feasible in all situations (*see* Chapter II), ODFW will continue to capture and radio-collar  
12 wolves to obtain important biological information as part of future research projects. Information  
13 gathered from GPS-collars is critical for estimating survival (Pollock et al. 1989, Smith et al. 2010),  
14 dispersal routes and corridors (Horne et al. 2007, Chetkiewicz and Boyce 2009), home range or  
15 territory size, and habitat use (Johnson et al. 2004, Oakleaf et al. 2006b), all of which are critical for  
16 effective management and conservation of wolves. In addition, both GPS- and VHF-collars can  
17 provide researchers and managers the ability to quickly detect when mortalities occur from a variety  
18 of causes.

19  
20 During the next five years of Plan implementation, ODFW will continue to study wolves and  
21 conduct analyses to determine territory sizes, habitat use, movement rates, and survival rates of  
22 wolves in Oregon. Over time, this information will be updated and revised as additional data across  
23 Oregon is collected and available for use. Additionally, information gained from GPS-collars will be  
24 useful in development of spatially explicit population models (Maletzke et al. 2016), developing  
25 models that incorporate habitat use and mortality to estimate population size (Robinson et al. 2015),  
26 or models that document the probability of persistence of wolves on the landscape (Oakleaf et al.  
27 2006b).

28  
29 The complex interactions of habitat, climate, and predation on ungulate population dynamics (Crête  
30 1999, Melis et al. 2009, Griffin et al. 2011, Brodie et al. 2013, Johnson et al. 2013), makes it difficult  
31 to predict any effects that re-established wolves may have on Oregon's ungulates. Consequently,  
32 identifying and prioritizing research for wolf effects on ungulates will be ongoing and will be  
33 responsive to potential issues that arise. There is a large body of literature to draw upon (*see* Chapter  
34 V) in guiding wolf and ungulate management and identifying knowledge gaps that could be  
35 supplemented by research in Oregon. Additionally, ongoing research in other areas will help guide  
36 Oregon wolf and ungulate management. For example, research is currently being conducted in  
37 Washington to determine the effects of recolonizing wolves on mule deer and white-tailed deer and  
38 to assess the effects wolves have on coyote populations and subsequent effects on mule deer fawns  
39 (<http://www.predatorecology.com/current-lab-members.html>, accessed January 11, 2019). In  
40 Montana, research is being conducted to understand the role of nutrition and predation from  
41 wolves, cougars, and black bears on elk populations  
42 (<http://fwp.mt.gov/fishAndWildlife/management/elk/bitterroot/>, accessed January 11, 2019).

43  
44 ODFW in cooperation with Oregon State University is currently conducting research to document  
45 wolf diets in northeast Oregon and preliminary results suggest wolf diets are largely comprised of elk  
46 (ODFW, unpublished data), as seen in other areas wolves and elk co-occur (Mech and Peterson  
47 2003). Specific research projects regarding effects of wolves on elk and other ungulates may be

1 necessary if wolves are thought to be contributing to ungulate population declines or where clear  
2 knowledge gaps exist that would be informative to management.

3  
4 Identifying the effects of wolves on other carnivores is not only important for management of  
5 carnivores, but also for the prey they consume. Cougars are an important predator of ungulates in  
6 Oregon (Clark 2014), and cougar home ranges, habitat use (Buotte et al. 2005, Ruth et al. 2017), prey  
7 use (Kortello et al. 2007, Elbroch et al. 2015b), and populations may ultimately be affected by  
8 wolves, which may influence ungulate population dynamics (*see* Chapter V). However, little is known  
9 about wolf-cougar interactions at this time. To investigate these interactions, ODFW in  
10 collaboration with Oregon State University implemented a research project to determine potential  
11 effects of wolves on cougars in 2013. This follows research which investigated cougar ecology in the  
12 Mt. Emily WMU before the re-establishment of wolves (Clark 2014, Clark et al. 2014, Clark et al.  
13 2015). The current project aims to compare cougar prey use, habitat use, survival rates, densities, and  
14 population dynamics before and after wolves colonized the landscape and link these changes to  
15 ungulate population dynamics where applicable. Additional research is being initiated in Washington  
16 to investigate wolf-cougar interactions ([http://www.predatorecology.com/current-lab-](http://www.predatorecology.com/current-lab-members.html)  
17 [members.html](http://www.predatorecology.com/current-lab-members.html), accessed January 11, 2019) and will provide additional information on this topic to  
18 inform management of wolves, other carnivores and their prey.

19  
20 As wolves continue to increase in population and distribution in Oregon, they will have increased  
21 encounters with livestock, which could lead to increases in depredation. Identifying and developing  
22 approaches that will minimize livestock depredation will be critical for the long-term conservation of  
23 wolves in Oregon. ODFW will play an important role in determining effective approaches for  
24 coexistence of wolves in areas with livestock, but can also draw from research being conducted in  
25 other areas. A multi-state effort is underway, which includes data collection in Oregon, to determine  
26 the effectiveness of various breeds of livestock guard dog breeds to deter wolf depredations (J.  
27 Young, USDA, APHIS, Wildlife Service, personal communication). Several additional wolf-  
28 livestock projects are being conducted in Washington including: 1) assessing livestock mortality rates  
29 in wolf occupied areas, calculating livestock kill rates by wolves, determining effectiveness of non-  
30 lethal techniques to reduce wolf depredations, and 2) a retrospective analysis to determine effects of  
31 environmental factors on wolf depredation. In Montana, ongoing research is being conducted to  
32 evaluate the effects of wolf removals and public harvest in areas of recurrent depredation, and  
33 evaluate the effectiveness of range riding to reduce livestock depredations (J. Gude, Montana Fish,  
34 Wildlife, and Parks, personal communication).

35  
36 Engaging in partnerships and cooperative research projects ensures a rigorous and sound scientific  
37 approach when conducting wildlife research. ODFW has a demonstrated history collaborating with  
38 universities (Oregon State University, University of Idaho, and University of Nevada, Reno), U.S.  
39 Forest Service Pacific Northwest Research Station, National Council for Air and Stream  
40 Improvement, and statistical consultants. Additionally, ODFW has participated in the Western Elk  
41 Research Collaborative, which is a collaboration of state agencies and universities, to conduct meta-  
42 analyses of range-wide elk data (Griffin et al. 2011, Brodie et al. 2013). Future collaborations that  
43 utilize range-wide wolf data should be investigated and initiated to better inform wolf conservation  
44 and management. Currently, as part of ongoing research investigating wolf-cougar interactions,  
45 ODFW has partnered with Oregon State University. ODFW will continue to partner with external  
46 collaborators on future wolf research to ensure effective management and conservation of wolves  
47 occurs.

## X. BUDGET FOR IMPLEMENTATION

1  
2  
3 A secure funding source is necessary to fully implement the goal, objectives, and strategies contained  
4 within this Plan. This chapter focuses on the cost of wolf conservation and management in Oregon  
5 and identifies current funding sources. As the wolf population has increased, the costs associated  
6 with management have also increased. Though this was predicted in earlier versions of this Plan,  
7 managers in the future will face continual challenges to streamline management costs and to  
8 find/maintain funding sources to implement this Plan.  
9

10 Federal funding for implementation of this Plan of wolf management in Oregon has shifted from  
11 federal State Wildlife Grant (SWG) to federal funds from the Pittman-Robertson Federal Aid  
12 Program (PR)— a change made possible when wolves were made a special status game mammal in  
13 2009 by the Oregon Legislature. The change in status was called for in the 2005 Plan and allows  
14 ODFW to use more stable PR funds to support wolf management within the state. The PR funds  
15 are derived from a tax on ammunition and firearms used for sport hunting.  
16

17 Since 2005, the federal government has shared in the fiscal responsibility of wolf management in  
18 Oregon, in part because the state has contributed to the success of the federal ESA. Since 2012,  
19 ODFW received approximately \$300,000 in federal support funds to support management,  
20 monitoring and research of wolves. These funds were expended in June 2017 and is consistent with  
21 the 2005 Plan’s expectation that with federal delisting in part of the state, the USFWS would likely  
22 decrease its federal support. To offset the loss of these federal support funds while maintaining the  
23 management level anticipated in this Plan, ODFW increased PR funding approximately  
24 \$50,000/year for the 2017-2019 biennium.  
25

26 Currently, ODFW’s implementation of the Plan is primarily conducted by two wolf-specific  
27 biologists, district wildlife biologists, a carnivore-furbearer coordinator, and the ODFW Wildlife  
28 Research Program. Funding for the wolf program, which includes the two wolf-specific biologists,  
29 for the 2017-2019 biennium consists of federal funds from PR. This federal source provides 75% of  
30 the wolf program funding. This federal grant requires state match which comes from a combination  
31 of Oregon Department of Fish and Wildlife license dollars (9.5%) and wildlife lottery funds  
32 (15.5%). The total budget allocation for the 2017-2019 biennium is \$678,223 and funds the two full-  
33 time wolf program positions, program supplies (e.g., vehicles, cameras, collars), two seasonal student  
34 interns, and various contract services (e.g., aircraft, DNA and serology analysis) to implement wolf  
35 management in Oregon. From the 2009-2011 to 2017-2019 biennium, on average the cost of the  
36 wolf program increased by approximately 7% per biennium.  
37

38 The wolf population and the associated management requirements have grown beyond the capacity  
39 of the two wolf-specific biologists in the wolf program and the additional workload has been placed  
40 on ODFW’s district wildlife biologists. These positions are funded by license dollars (75%) and state  
41 general fund (25%). In some months, as much as 50% of a district’s field staff time is spent on the  
42 urgent requirements of wolf livestock depredation investigations and mitigation. As Oregon’s wolf  
43 population continues to increase, a more comprehensive, statewide effort will be needed for ODFW  
44 to continue to monitor wolves on a larger landscape, collect population data, capture/radio-collar  
45 wolves, and address wolf-livestock conflicts. This effort must also be expanded to meet the public  
46 demands for wolf information including satisfying non-ODFW needs dependent on wolf information  
47 (i.e. Wolf Depredation Compensation and Financial Assistance Grant Program mentioned below).

1 ODFW will continue to seek solutions for meeting these growing needs including adding more biologists  
2 to adequately implement all aspects of the Wolf Plan.

3 The annual budget of the ODFW Wildlife Research Program is approximately \$3,000,000 and about  
4 75% of program funding comes from PR funding, with remaining portions from in-kind  
5 contributions, grants, and sales of hunting licenses and tags. Funding for wolf research identified in  
6 this Plan will occur within the current research program and budgets while balancing research needs  
7 for other species of management or conservation concern.

8  
9 The Oregon Department of Agriculture's Wolf Depredation Compensation and Financial Assistance  
10 Grant Program is another source of funding for wolf conservation and management in Oregon. The  
11 compensation program was created in 2012 and provides four types of financial assistance options;  
12 1) direct depredation payment for loss, and 2) missing livestock payment, and 3) preventative  
13 measures, and 4) program implementation costs. Livestock producers receive funds through  
14 participating county governments, and a total of 10 counties were awarded \$252,570 in grant funds  
15 in 2017 and \$160,890 in 2018. The total budget for the 2015-17 biennium was approximately  
16 \$376,000 and the estimated 2017-19 biennium is \$274,000-350,000, pending federal grant proposals.  
17 Because of the large portion of general fund that supports this program, continued state general  
18 fund allocation will be key to the future of the compensation program in Oregon.

DRAFT

**XI. LITERATURE CITED**

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DRAFT

## APPENDIX A: GLOSSARY OF TERMS

- 1
- 2 **Breeding pair:** an adult male and an adult female wolf with at least two pups that survived to December 31
- 3 of the year of their birth.
- 4
- 5 **Confirmed loss:** a depredation loss where there is physical evidence that an animal was actually killed by a
- 6 wolf.
- 7
- 8 **Controlled take:** Commission approved action for wolf population management that allows members of the
- 9 public or tribes to kill a wolf by special permit (on public or private lands) to address long term, recurring
- 10 wolf-livestock conflicts, ungulate population objectives, or winter range or feeding area objectives.
- 11
- 12 **Delist:** to remove a species from the list of endangered or threatened species.
- 13
- 14 **Depredation:** an incident or event that results in the confirmed injury or death of lawfully present livestock
- 15 or working dogs on federal, state, tribal, or other public lands, or private lands by one or more wolves.
- 16
- 17 **Dispersal:** generally refers to the natural movement of an animal from one area to another.
- 18
- 19 **Fladry:** a method of non-lethal wolf control that involves attaching numerous strips of flagging material
- 20 along a fence or other device for the purpose of keeping wolves out of an area occupied by livestock.
- 21
- 22 **Fur-bearing mammal:** as defined by Oregon law, beaver, bobcat, fisher, marten, mink, muskrat, otter,
- 23 raccoon, red fox, and gray fox [ORS 496.004(8)].
- 24
- 25 **Game mammal:** as defined by Oregon law, antelope, black bear, cougar, deer, elk, moose, mountain goat,
- 26 mountain sheep, silver gray squirrel, and gray wolf as a special status mammal defined by commission rule
- 27 [ORS 496.004(9)].
- 28
- 29 **Guard dog:** any dog actively used to defend livestock from depredation.
- 30
- 31 **Lethal take:** management actions resulting in the death of a wolf or wolves. Lethal take may be initiated
- 32 under the following circumstances: threat to human safety, to stop a wolf in the act of attacking livestock or
- 33 to stop chronic wolf depredations on private or public lands.
- 34
- 35 **Management Objective:** a specific minimum population level of animals for management purposes; for this
- 36 Plan, wolf population objectives are defined by the number of breeding pairs of wolves present in the
- 37 population.
- 38
- 39 **Northern Rocky Mountain Wolf Recovery Plan:** a document prepared by a team of individuals with
- 40 expertise regarding the biological and habitat requirements of the wolf, outlining the tasks and actions
- 41 necessary to recover the species within parts of its former range in the Rocky Mountain Region. The original
- 42 Plan was completed in 1980. The revised Recovery Plan was approved August 3, 1987.
- 43
- 44 **Oregon Endangered Species Act:** law passed by the Oregon Legislature in 1987 that provides for listing
- 45 and protection of threatened and endangered fish and wildlife species [ORS 496.171-192].
- 46
- 47 **Other wolf-livestock conflict:** for purposes of this Plan, other wolf-livestock conflict means testing,
- 48 chasing, or otherwise disrupting livestock.

- 1 **Pack:** a group of wolves, usually consisting of a male, female and their offspring from one or more years. For  
2 purposes of monitoring, a pack may be defined as a group of four or more wolves traveling together in  
3 winter. Ongoing and future wolf research may refine this definition for monitoring purposes.  
4
- 5 **Pursuit:** for purposes of this Plan, pursuit of wolves is limited to pursuing adult wolves (greater than six  
6 months old) by foot, horseback, non-motorized or motorized vehicle for non-lethal injurious harassment.  
7
- 8 **Species:** as defined by Oregon law, any species or subspecies of wildlife [ORS 496.004(15)].  
9
- 10 **Sporting dog:** any dog used to aid a hunter in the legal pursuit of wildlife during an authorized hunting  
11 season.  
12
- 13 **State endangered species:** any native wildlife species determined by the Commission to be in danger of  
14 extinction throughout any significant portion of its range within this state; and any native wildlife species  
15 listed as an endangered species pursuant to the federal Endangered Species Act of 1973 (P.L. 93-205, 16  
16 U.S.C. 1531), as amended [ORS 496.004(6)].  
17
- 18 **State threatened species:** any native species the Commission determines is likely to become an endangered  
19 species within the foreseeable future throughout any significant portion of its range within this state; and any  
20 native wildlife species listed as a threatened species pursuant to the federal Endangered Species Act of 1973  
21 (P.L. 93-205, 16 U.S.C. 1531), as amended [ORS 496.004(17)].  
22
- 23 **Suitable habitat:** (e.g., high, medium, low suitability) for purposes of this Plan, is defined by factors  
24 including availability of natural prey, level of human occupation, level of livestock activity and density of open  
25 roads.  
26
- 27 **Take:** as defined by Oregon law, to kill or obtain possession or control of any wildlife [ORS 496.004(16)].  
28
- 29 **Ungulate:** any of the species deer, elk, bighorn sheep, pronghorn, moose, and mountain goat.  
30
- 31 **Wildlife:** as defined by Oregon law, fish, shellfish, wild birds, amphibians and reptiles, feral swine as defined  
32 by Oregon Department of Agriculture rule, and other wild mammals [ORS 496.004(19)].  
33
- 34 **Wildlife Management Unit (WMU):** a geographic unit used in managing Oregon's big game animals. The  
35 state has been divided into 77 different units each with a name and a number for reference purposes.  
36
- 37 **Wolf Management Zone (WMZ):** for purposes of wolf conservation and management in Oregon, two  
38 regions, one east and one west of a line defined by U.S. Highway 97, U.S. Highway 20 and U.S. Highway 395  
39 were created. Each region has separate population goals for wolves.  
40
- 41 **Working dog:** guarding and herding dogs used to actively aid in the herding or protection of livestock.

## APPENDIX B: WOLF BIOLOGY, ECOLOGY, AND DISEASES

Appendix B was present in the 2010 Oregon Wolf Conservation and Management Plan and includes a description of wolf biology and ecology that was adapted from the Montana Gray Wolf Conservation and Management Plan (2002) and a summary of wolf disease. Only disease information in this Appendix was revised in this Plan update, therefore other resources should be considered for more up-to-date information on biology and ecology.

### WOLF ECOLOGY IN THE NORTHERN ROCKIES

NOTE: This section was adapted from the Montana Gray Wolf Conservation and Management Plan August 2002 with permission.

#### Physical Characteristics

Male gray wolves in Montana weigh 90-110 pounds, and females weigh 80-90 pounds. Wolves in the Greater Yellowstone Area (GYA) are slightly heavier. Smith et al. (2000) reported that in 1999 winter-captured adult females averaged 108 pounds, while female pups averaged 96 pounds. Male pups averaged 107 pounds. About half of the wolves in Montana are black and the remainder gray. Both color phases may be found in a pack or in one litter of pups. White wolves, usually old animals, are occasionally seen. Tracks are normally 4.5 to 5.5 inches long (Harris and Ream 1983).

Wolves may resemble coyotes, particularly when wolves are young. Wolves also may be confused with some large domestic dog breeds. Wolves are distinguished from dogs by their longer legs, larger feet, wider head and snout, narrow body, and straight tail. Other distinguishing characteristics require closer examination than is possible in field settings with live animals. In many instances, behavior distinguishes between wild wolves, wolf-dog hybrids and domestic dogs (Boyd et al. 2001, Duman 2001).

#### Pack Size

The gray wolf is a highly social species that lives in packs. Packs are formed when male and female wolves develop a pair bond, breed and produce pups. The pack typically consists of a socially dominant breeding pair (alphas), their offspring from the previous year and new pups. Other breeding-aged adults may be present, but they may or may not be related to the others. Cooperatively, the pack hunts, feeds, travels and rests together. The pack also shares pup-rearing responsibilities, including hunting and tending pups at the den or at a series of rendezvous sites. Pack size is highly variable (USFWS et al. 2001). In northwest Montana, it ranges from two to 11, and averages five to seven. In the GYA, pack sizes range from five to 27 and average 9.3. Average pack size is larger inside Yellowstone National Park (YNP) (14.6 individuals) than outside (5.8 individuals) (Smith et al. 2000).

#### Reproduction

Wolves normally do not breed until at least 22 months of age (Mech 1970). Breeding usually occurs only between the dominant male and female in a pack. In the northern Rockies, the breeding season peaks in mid- to late February (Boyd et al. 1993). Wolves localize their movements around a den site and whelp in late April, following a 63-day gestation period. Wolves may be sensitive to human disturbance during the denning season. After the pups are about eight weeks old, they are moved to a series of rendezvous sites. In northwest Montana, maximum litter size averaged 5.3 (range 1-9) from 1982 to the mid 1990s. By December, average

1 litter size declined to 4.5 (Pletscher et al.1997). In central Idaho, average litter size was 5.1 from 1996-1998  
2 (Mack and Laudon 1998).

3 Pup survival is highly variable and is influenced by several factors, including disease, predation and nutrition  
4 (Mech and Goyal 1993, Johnson et al. 1994). In northwestern Montana from 1982-1995, 85 percent of pups  
5 survived until December, though survival varied year to year (Pletscher et al. 1997). Pup mortality in the first  
6 eight months of life was attributed to human causes (8 of 20 mortalities, 40 percent), unknown causes (2 of  
7 20, 15 percent), and disappearance (9 of 20, 45 percent). In YNP, during the first four years, 133 pups were  
8 born in 29 litters and 71 percent were believed to still be alive in 1998 (Bangs et al. 1998). Pup survival varied  
9 between 73 and 81 percent from 1996-1998. However, canine parvovirus was strongly suspected as a  
10 contributing factor in the low pup survival (45%) in 1999. In 2000, pup survival rebounded to 77% (Smith et  
11 al. 2000). In central Idaho, 92-99 pups were produced between 1995 and 1998 (Mack and Laudon 1998).

12 Occasionally, more than one female in a pack may breed, resulting in more than one litter per pack (Ballard et  
13 al. 1987). This phenomenon has been documented in YNP (Smith et al. 2000, USFWS et al. 2000, USFWS et  
14 al. 2001). In 1999, one pack had two litters. In 2000, 13 wolf packs produced 16 litters. Occasionally this  
15 phenomenon leads to the formation of a new pack (Boyd et al. 1995).

## 16 **Food Habits**

17 The gray wolf is an opportunistic carnivore and is keenly adapted to hunt large prey species such as deer, elk  
18 and moose. Wolves may scavenge carrion or even eat vegetation. In Montana white-tailed deer, mule deer, elk  
19 and moose make up the majority of wolf diets. In northwestern Montana white-tailed deer comprised 83  
20 percent of wolf kills, whereas elk and moose comprised 14 percent and 3 percent, respectively (Kunkel et al.  
21 1999). However, 87 percent of wolf kills in YNP during 1999 were elk (Smith et al. 2000). In central Idaho elk  
22 (53 percent) and deer (42 percent) were the most frequently detected species in scat samples collected in  
23 summer 1997 (Mack and Laudon 1998). Ungulate species compose different proportions of wolf diets,  
24 depending on the relative abundance and distribution of available prey within the territory.

25 Wolves also prey on smaller species such as rabbits or beaver. Wolf scat collected in YNP in 1998 contained  
26 voles, ground squirrels, snowshoe hares, coyotes, bears, insects and vegetation (Smith 1998). Earlier work in  
27 northwestern Montana also documented non-ungulate prey species such as ruffed grouse, ravens, striped  
28 skunks, beavers, coyotes, porcupines and golden eagles (Boyd et al. 1994).

29 Wolves also scavenge opportunistically on vehicle- or train-killed ungulates, winterkill and on kills made by  
30 other carnivores, particularly mountain lions. Wolves in northwestern Montana scavenge the butchered  
31 remains of domestic livestock or big game animals at rural bone yards or carcass disposal sites. Wolves also  
32 may kill and feed upon domestic livestock such as cattle, sheep, llamas, horses, or goats. They also may kill  
33 domestic dogs but usually do not feed on the carcass.

## 34 **Movements and Territories**

35 A pack establishes an annual home range or territory and defends it from trespassing wolves. From late April  
36 until September pack activity is centered at or near the den or rendezvous sites, as adults hunt and bring food  
37 back to the pups. One or more rendezvous sites are used after pups emerge from the den. These sites are in  
38 meadows or forest openings near the den, but sometimes are several miles away. Adults will carry small pups  
39 to a rendezvous site. Pups travel and hunt with the pack by September. The pack hunts throughout its  
40 territory until the following spring.

41 Pack boundaries and territory sizes may vary from year to year. Similarly, a wolf pack may travel in its  
42 territory differently from one year to the next because of changes in prey availability or distribution,  
43 intraspecific conflict with nearest neighbors, or the establishment of a new neighboring pack. Because the

1 attributes of each pack's territory are so unique (elevations, land use, land ownership patterns, prey species  
2 present and relative abundance), it is difficult to generalize about wolf territories and movements.

3 After recolonizing the Glacier National Park (GNP) area in the 1980s, individual wolves dispersed and  
4 established new packs and territories elsewhere in western Montana. Wolves demonstrated a greater tolerance  
5 of human presence and disturbance than previously thought characteristic of the species. It previously was  
6 believed that higher elevation public lands would comprise the primary occupied habitats (Fritts et al. 1994).  
7 While some packs have established territories in backcountry areas, most prefer lower elevations and gentle  
8 terrain where prey is more abundant, particularly in winter (Boyd-Heger 1997). In some settings, geography  
9 dictates that wolf packs use or travel through private lands and co-exist in close proximity with people and  
10 livestock. Since the first pack established a territory outside the GNP area in the early 1990s, packs in  
11 northwestern Montana negotiated a wide spectrum of property owners and land uses. These colonizers also  
12 settled across an array of rural development.

13 With the exception of GNP packs, wolves in northwest Montana move through a complex matrix of public,  
14 private and corporate-owned lands. Landowner acceptance of wolf presence and the use of private lands is  
15 highly variable in space and time. Given the mobility of the species and the extent to which these lands are  
16 intermingled, it would not be unusual for a wolf to traverse each of these ownerships in a single day. Land  
17 uses range from dispersed outdoor recreation, timber production or livestock grazing to home sites within the  
18 rural-wildland interface, hobby farming/livestock, or full-scale resort developments with golf courses.

19 Private land may offer habitat features that are especially attractive to wolves so the pack may use those lands  
20 disproportionately more often than other parts of their territory. Land uses may predispose a pack to conflict  
21 with people or livestock, although the presence of livestock does not make it a forgone conclusion that a pack  
22 will routinely depredate. Domestic livestock are present year round within the territories of many Montana  
23 packs. For example, since the late 1980s, the Ninemile and Murphy Lake packs encountered livestock  
24 regularly, but caused conflict only sporadically.

25 The earliest colonizing wolves had large territories. Ream et al. (1991) reported an average of 460 square  
26 miles. In recent years average territory size decreased, probably as new territories filled in suitable, unoccupied  
27 habitat. In the Northwest Montana Recovery Area during 1999 the average territory size was 185 square miles  
28 for eight packs. Individual territories were highly variable in size, with a range of 24-614 square miles  
29 (USFWS et al. 2000).

30 Territories in the GYA were larger, averaging 344 square miles with 11 packs. Individual pack territories  
31 ranged from 33 to 934 square miles. Central Idaho wolf packs had the largest average territory size of 360  
32 square miles with 13 packs, with individual pack territories ranging from 141 to 703 square miles (USFWS et  
33 al. 2000).

### 34 **Dispersal**

35 When wolves reach sexual maturity, some remain with their natal pack while others leave, looking for a mate  
36 to start a new pack of their own. These individual wolves are called dispersers. Dispersal may be to nearby  
37 unoccupied habitat near their natal pack's territory or it may entail traveling several hundred miles before  
38 locating vacant habitat, a mate, or joining another pack. Animals may disperse preferentially to areas occupied  
39 by conspecifics (Ray et al. 1991). This appears true for the gray wolf, a species that uses scent marking and  
40 howling to locate other wolves (Ray et al. 1991). Boyd and Pletscher (1999) indicated that the dispersers in  
41 their study moved toward areas with higher wolf densities than found in their natal areas, in this case  
42 northward towards Canada. This has important implications for wolves in Montana, which now have  
43 conspecifics to the south and west in central Idaho and YNP. Dispersal already has resulted in the formation  
44 of several new packs in Montana (Fig. 2) (Boyd et al. 1995, USFWS et al. 2001). Wolves probably will

1 continue dispersing from the core areas and slowly occupy landscapes between the Canadian border, central  
2 Idaho and northwestern Wyoming (USFWS et al. 2000).

3 Ultimately this will yield a meta-population capable of genetic exchange across the northern Rocky Mountains  
4 (Forbes and Boyd 1996, 1997).

5 Boyd and Pletscher (1999) studied wolf recovery in northwestern Montana from 1979 to 1997. Male wolves  
6 dispersed at an average age of 28.7 months and traveled an average of 60 miles from their natal territory  
7 before establishing a new territory or joining an existing pack. Females averaged 38.4 months old at dispersal  
8 and traveled an average of 48 miles. Males and females, combined, traveled an average of 60 miles (range 10 -  
9 158 miles). A captured sample of males and females dispersed at rates proportional to their occurrence. There  
10 were two peaks of dispersal: January-February (courtship and breeding season) and May-June.

11 The Yellowstone Wolf Project documented 36 dispersal events (18 females and 18 males) from 1995 to 1999  
12 (Smith et al. 2000). Males dispersed an average of 54 miles and females dispersed an average of 40 miles. The  
13 longest recorded dispersal of a Yellowstone wolf to date was 221 miles. This Yellowstone-born male  
14 ultimately settled in central Idaho.

15 Increasingly, dispersal is being documented among and between all three recovery areas in the northern  
16 Rockies (Bangs et al. 1998, Mack and Laudon 1998, Smith et al. 2000). Combined, there were 21 known  
17 dispersal events in 2000 and 19 in 1999 (USFWS et al. 2000). Dispersal paths crossed international  
18 boundaries, state boundaries, public and private land boundaries, different land uses, and agency jurisdictions.

## 19 **Mortality**

20 Wolves die from a variety of causes, usually classified as either natural or human-caused. Naturally caused  
21 mortalities result from territorial conflicts between packs, injuries while hunting prey, old age, disease,  
22 starvation or accidents. In an established Alaskan wolf population largely protected from human-caused  
23 mortality, most wolves were killed by other wolves, usually from neighboring packs (Mech et al. 1998).  
24 However, in the northern Rockies, natural mortality probably does not regulate populations (USFWS 2000).  
25 Humans are the largest cause of wolf mortality and the only cause that can significantly affect populations at  
26 recovery levels (USFWS 2000). Human caused mortality includes control actions to resolve conflicts, legal  
27 and illegal killings, and car/train collisions.

28 Pletscher et al. (1997) studied survival and mortality patterns of wolves in the GNP area. Total annual survival  
29 for this semi-protected population was a relatively high 80 percent. The survival rate for resident wolves was  
30 even higher (84 percent), but dispersers had a 64 percent chance for survival. Despite the high survival rates,  
31 humans accounted for the vast majority of wolf deaths. Of the 43 deaths investigated from 1982 to 1995, 88  
32 percent were human-caused (56 percent legal, 32 percent illegal). Three wolves died of natural causes and two  
33 died of unknown causes.

34 More recent mortality data are available from the USFWS et al. (2001). In the Northwest Montana Recovery  
35 Area, there were at least 18 mortalities in 2000. Cause of death was known for 15. At least seven wolves were  
36 illegally killed, four died in agency control actions, and four died from vehicle /train collisions. In the GYA,  
37 at least 20 wolves died in 2000, and the cause of death is known for 15. Nine wolves died due to human  
38 causes (six control actions, two vehicle collisions, one illegal) and six died from natural causes. Five additional  
39 mortalities were documented, but the causes were not readily apparent. These either were classified as  
40 unknown or unresolved pending further investigation. In the Central Idaho Recovery Area, 17 human-caused  
41 mortalities were documented in 2000. Control actions removed 10. One wolf died of natural causes and five  
42 more died from unknown causes.

## 43 **Genetics**

1 In recent years the application of genetic techniques to the study of wildlife populations has permitted  
2 managers to address issues of genetic diversity and population viability with increased confidence. These  
3 techniques have yielded information relevant to wolf conservation and management in the northern Rockies.  
4 Wolf recovery in the northern Rockies advanced from the combination of recolonization of northwestern  
5 Montana by relatively few wolves from Canada and the reintroduction of wolves into YNP and central Idaho.  
6 In northwestern Montana the founding population was small enough that inbreeding among closely related  
7 individuals was possible. Fortunately, the genetic variation among the first colonizers was high (Forbes and  
8 Boyd 1996). The combination of high genetic variation among colonizers and ongoing natural dispersal to  
9 and from Canadian populations was adequate to ensure long-term population viability, provided that genetic  
10 exchange continued.

11 Similar concerns existed for the relatively small founding population reintroduced to YNP and central Idaho.  
12 But wolves were trapped from two distinct source populations in Canada. The genetic variation among  
13 reintroduced wolves (and the source populations from which they came) also was high (Forbes and Boyd  
14 1997). Overall, heterozygosity was similar among samples of natural recolonizers, reintroduced individuals,  
15 and the Canadian source populations. Field studies of wolf dispersal and migration distances supported the  
16 genetic results (Ream et al. 1991, Boyd et al. 1995, Boyd and Pletscher 1999). Wolf populations in the  
17 northern Rockies should not suffer from inbreeding depression.

18 An underlying tenant of the wolf recovery and restoration program is that each state's wolf population is  
19 functionally connected so that genetic material can be exchanged among all three. In isolation, none of the  
20 three populations could maintain its genetic viability (USFWS 1994a, Fritts and Carbyn 1995).

## 21 **Population Growth**

22 Wolf populations increase or decrease through the combination and interaction of wolf densities and prey  
23 densities (Keith 1983, Fuller 1989). Actual rates of change depend on whether the wolf population is  
24 pioneering vacant habitat (as in YNP and central Idaho) or whether the population is well established (as in  
25 northwestern Montana). The degree and type of legal protection, agency control actions, and regulated  
26 harvest also influence population trends. Once established, wolf populations can withstand as much as 45  
27 percent mortality from all sources (National Academy of Sciences 19XX), with some studies indicating that  
28 established populations may withstand as much as 28-35 percent mortality from humans exclusive of natural  
29 mortality factors (Keith 1983, Fuller 1989).

30 If protected, low density wolf populations can increase rapidly if prey is abundant. Keith (1983) speculated  
31 that a 30 percent annual increase could be the maximum rate of increase for any wild wolf population. Once  
32 densities were high enough, social interactions probably intensify. Intraspecific conflict and increased  
33 competition for food eventually cause the population to level off or decline (Keith 1983, Fuller 1989).

34 Wolf populations in the GNP area (northwestern Montana and southeastern Alberta) increased an average of  
35 23 percent annually from 1986 to 1993 (Fritts et al. 1995). After 1993 the population leveled off (Pletscher et  
36 al.1997). Those packs produced dispersers that eventually colonized vacant habitats in western Montana  
37 (USFWS unpubl. data). Some packs which formed in the Northwestern Montana Recovery Area since the  
38 early 1990s persisted, but others did not. Packs have been lost due to illegal mortality, control actions where  
39 livestock depredation was chronic, and for unknown reasons.

40 The average annual rate of increase from 1992 to 2000 in northwestern Montana was 4.7 percent (USFWS et  
41 al. 2001). In 1992 the minimum mid-winter count (including pups) was 41 wolves. Sixty-two wolves were  
42 counted in 2000. The highest count was 70 wolves at the end of 1996. The population grew in some years,  
43 but declined in others. Some of the variation probably reflects true changes wolf numbers, but some variation  
44 may be due to monitoring inaccuracy or decreased monitoring effort.

1 Prey populations influenced recent wolf population dynamics in northwestern Montana. White-tailed deer  
2 populations expanded from the late 1970s through the mid 1990s, in part precipitating and sustaining  
3 increases in wolf numbers and distribution. However, the winter of 1996-1997 was exceptionally severe, and  
4 white-tailed deer populations declined significantly (Sime, unpubl. data).

5 Other prey populations also declined, with poor recruitment attributed to winterkill. The USFWS believes the  
6 significant decline in natural prey availability led to the record high number of livestock depredations and  
7 subsequent lethal control. Wolf depredations on livestock in 1997 alone accounted for 50 percent of all  
8 depredations in northwestern Montana between 1987 and 1999. Smaller prey populations likely translated to  
9 decreased wolf pup survival in 1997 and 1998, compared to 1996. Ungulate populations rebounded in recent  
10 years and the wolf population also is nearing its 1996 level.

11 Wolf populations in the GYA and central Idaho areas exceeded all expectations for reproduction and survival  
12 (Bangs et al. 1998). Populations became established in both areas within two years, rather than the predicted  
13 three to five years. Pup production and survival in the GYA has been high. The average annual growth rate  
14 for the GYA from 1996 to 2000 is 35 percent, based on the minimum count as of December 31 and  
15 including pups (USFWS et al. 2001). However, population growth in the GYA slowed in 1999 after the rapid  
16 increase in the first three years post-reintroduction (Smith et al. 2000). The average annual growth rate for  
17 this population is 36 percent, based on minimum counts on December 31 and including pups (USFWS et al.  
18 2001).

19 It is likely that population growth rates will slow for both the core Yellowstone and central Idaho populations  
20 because of declining availability of suitable, vacant habitat. However, these populations will be a source of  
21 founders for new packs outside YNP, central Idaho, Wyoming and Montana. While population growth slows  
22 or levels off in core areas, wolf numbers and distribution outside core areas are expected to increase rapidly in  
23 the next few years as wolves born in the initial pulse sexually mature and disperse to colonize vacant habitats  
24 elsewhere.

25 Pack membership typifies the predominant manner in which a wolf exists in the wild. The pack is the  
26 mechanism by which wolves reproduce and populations grow. However, in most wolf populations, some  
27 lone, nomadic individuals exist as dispersers -- looking for vacant habitat, waiting to be found by a member of  
28 the opposite sex within a new home range, or searching for an existing pack to join. Up to 10-15 percent of a  
29 wolf population may be comprised of lone animals.

30 This is a temporary transition. Wolves in northwestern Montana usually found other wolves in an average of  
31 66 days (range 2-202 days) (Boyd and Pletscher 1999). Occasionally, lone wolves get into conflict with people  
32 and/or livestock, ultimately being lost to the population through legal or illegal means. For a wolf to make a  
33 contribution to the population, it must affiliate with other wolves. Until they affiliate with a pack, lone wolves  
34 generally are counted separately or omitted from population counts altogether because they do not contribute  
35 to population growth.

36

## 37 **DISEASES AND WOLVES IN OREGON**

38 The arrival of wolves into northeastern Oregon was from populations in western Idaho and the arrival of this  
39 charismatic species has raised questions among different stakeholders about their effect on not only livestock,  
40 but also management of other wildlife species, and pathogens they may carry or are infected with from prey  
41 they consume in Oregon. The effects of disease associated with this top carnivore and other wildlife, pets,  
42 livestock, and humans are largely unknown in Oregon. However, based on the literature and past events and  
43 current populations in other regions, the risk of negative consequences from disease is predicted to be

1 minimal if not extremely low. The founding populations in Idaho are not presently noticeably impacted by  
2 any epidemic or epizootic diseases.

3 Wolves (*Canis lupus*) are exposed to a variety of viral, bacterial, fungal and parasitic diseases throughout all  
4 areas of their range. Due to the naturally low densities of this top carnivore species, the large home range and  
5 distribution among packs within populations, and relatively secretive nature of wolves, large die-offs from  
6 disease might go undetected unless specific populations are being intensively monitored (Brand et al. 1995).  
7 From a management perspective, ODFW, through our wildlife health program, monitors and conducts  
8 surveillance for emerging or re-emerging diseases in Oregon, and we evaluate the effects endemic Oregon  
9 diseases have on a new host like the wolf. We are also vigilant in surveillance for pathogens that might prove  
10 infectious to people should they come in contact with infected wildlife.

11 Several publications provide extensive overviews of the known diseases that affect free-ranging wolves  
12 (Brand et al. 1995, Mech 1970). This summary identifies diseases carried by wolves that may be associated  
13 with Oregon populations. Portions of this summary are adapted from a recently published chapter on wolf  
14 diseases by ODFW veterinarian, C. Gillin with D. Hunter in Reading et al. 2010. The following pathogens  
15 are a list of those occurring throughout the range of the wolves in western North America, including several  
16 pathogens shared with domestic dogs and other wild canids.

### 17 **Viruses**

18 Viral diseases are most important to carnivores from an epizootic perspective. Viral diseases  
19 affecting wolves in North America include rabies, canine parvovirus, canine distemper, infectious  
20 canine hepatitis, and oral papillomatosis. Of these, epidemic and endemic rabies is predicted to be  
21 capable of causing population declines in wolves and other wild carnivores. Canine parvovirus is  
22 another virus that may affect wolf pup recruitment based on evidence in a captive wolf colony in  
23 Minnesota where 11 of 12 pups succumbed to the disease (Mech and Fritts 1987). Such poor pup  
24 survival has the potential to severely impact recruitment in wild populations.

25 Brand et al. (1995) and others (Johnson (1995), Mech (1970), Murie (1944), and Cowan (1949))  
26 identified rabies as a disease that could potentially limit population numbers. Rabies is a virus that is  
27 generally confined to one species in a geographic area, although extension to other species is not  
28 uncommon. However, the role that rabies may play in regulating wolf populations is unknown  
29 (Brand et al. 1995). Historic and recent accounts of rabies in wolves (Ballard et al. 1997) indicate that  
30 this disease will likely remain in wolf range for extended periods and several authors have shown  
31 wolf packs being reduced due to the incidence of rabies (Chapman 1978, Davis et al. 1980, Theberge  
32 et al. 1994).

33 North American wolves are not considered reservoirs of rabies virus. In published cases, wolves  
34 were suspected of contracting the disease from other canid species including red foxes (*Vulpes vulpes*)  
35 and arctic foxes (*Alopex lagopus*) (Mech 1970, Rausch 1973, Ritter 1981, Theberge et al. 1994). The  
36 spread of rabies by wolves, though generally contained within individual packs (Chapman 1978), can  
37 occur when infected animals contact members of adjacent packs at their territory boundaries or via  
38 dispersing individuals. In Oregon, as of 2010, rabies is limited to strains associated with bats and is  
39 considered a very low disease risk in wolves.

40 Canine parvovirus was first detected in domestic dogs in 1978 and had spread worldwide by 1980  
41 (Pollock 1984). Parvovirus is very stable in the environment and spread by direct contact and fecal  
42 contamination of the habitat. Once infected, canids are capable of periodically shedding the virus for  
43 many years. Based on retrospective studies of serological data, canine parvovirus likely entered wild  
44 coyote (*Canis latrans*) and wolf populations in North America sometime during 1978-79 (Barker et al.

1 1983, Thomas et al. 1982) and possibly as early 1975 (Goyal et al. 1986). Canine parvovirus occurs  
2 worldwide and in Oregon is most frequently diagnosed in domestic dogs.

3  
4 <sup>6</sup>Parvovirus may limit some wolf populations through pup mortality. A decline in the wolf  
5 population of Isle Royale National Park, Michigan in the 1980s coincided with an outbreak of CPV  
6 among dogs in the region, and the subsequent appearance of antibodies against CPV in sampled  
7 wolves indicated exposure to the virus (Peterson 1995 as cited in Kreeger 2003). However, Mech  
8 (2011) noted that the evidence for a CPV caused decline was sparse and that malnutrition and intra-  
9 specific strife offered a more cogent explanation for the decline (Mech, 2011; Peterson and Page  
10 1988). A correlation between increased antibody levels indicative of exposure and fewer pups over a  
11 30-year period suggested that CPV limited growth of a Minnesota wolf population through pup  
12 mortality (Mech et al. 2008). Re-examination of 35 years of data in this population indicated that the  
13 effect of CPV on pup survival waned after seven years, despite continued high prevalence of  
14 antibodies, suggesting that once CPV became endemic and produced its peak effect on the study  
15 population, that population developed enough immunity to withstand the disease (Mech and Goyal,  
16 2013). Exposure to CPV in young and adult wolves in YNP was 100% with no evidence of any  
17 correlation with pup mortality (Almberg et al. 2009).

18  
19 <sup>7</sup>Three wolf mortalities have been directly attributed to CPV infection: a 9-month-old female from  
20 Minnesota in 1993 (Mech et al. 1997), a yearling female and male pup from the same pack in Oregon  
21 in 2013 (ODFW 2014) and a male pup in a neighboring pack area in 2018 ( ODFW, unpublished  
22 data). These deaths demonstrate that CPV can also kill older wild wolves, not just pups.

23 Historic exposure (months to years) to CPV can be determined by the presence of immunoglobulin  
24 G (IgG). In Oregon, 32 of 38 Oregon wolf samples tested between 2010 and 2016 tested positive  
25 for IgG antibodies to CPV (86.8% prevalence). A positive test for this antibody means that the wolf  
26 was likely exposed to the virus at some point in their lives. Acute exposure to CPV is usually  
27 evaluated by testing for the presence of a rapidly produced antibody, immunoglobulin M (IgM) that  
28 persists from days to weeks. Only 4 of 38 tested were negative for both IgM and IgG antibodies to  
29 CPV, confirming the prevalent and persistent nature of the CPV virus in the environment. More  
30 recently, 13 of 14 of those wolves testing positive for IgM antibody for CPV were from serum  
31 collected between 2014 and 2016 indicating that more active infections or exposures were being  
32 documented during this time.

33 Canine distemper (CDV) is another important viral disease of wolves and other carnivores. This  
34 disease affects domestic dogs at three to nine weeks of age (Gillespie and Carmichael 1968) and  
35 morbidity and mortality can be high in exposed, unvaccinated animals. Despite the ubiquitous  
36 distribution of canine distemper, there are only two reports in the literature of mortality occurring in  
37 wild populations (Carbyn 1982 and Peterson et al. 1984). Because recruitment in North American  
38 wolf populations is generally good, canine distemper cannot be considered a significant mortality  
39 factor (Brand et al. 1995). Canine distemper virus occurs throughout the state of Oregon, most  
40 frequently identified in raccoon and skunk populations west of the Cascade Range.

41 <sup>8</sup>Exposure, as diagnosed by the presence of antibodies in the blood of an animal, to CDV in North  
42 American wolves is variable over time and among populations. Studies from Canada and Alaska

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<sup>6</sup> Paragraph from Conservation Plan for Gray Wolves in California Part II, December 2016, used with permission

<sup>7</sup> Paragraph from Conservation Plan for Gray Wolves in California Part II, December 2016, used with permission

<sup>8</sup> Paragraph from Conservation Plan for Gray Wolves in California Part II, December 2016, used with permission

1 suggested that approximately 17% of wolves were exposed to CDV (Choquette and Kuyt 1974;  
 2 Stephenson et al. 1982; Zarnke and Ballard 1987; Bailey et al. 1995; Brand et al. 1995). Exposure to  
 3 distemper has increased over time in Montana's wolf population from 2007 through 2013, becoming  
 4 quite prevalent (Sime et al. 2011; Bradley et al. 2013, 2014). Monitoring data from YNP showed that  
 5 in contrast to other viruses to which wolves were constantly and commonly exposed, the number of  
 6 sampled wolves exposed to CDV varied greatly over time and that high CDV exposure prevalence  
 7 in wolf pups was correlated with years having poor pup survival (Almberg et al. 2009). Although the  
 8 findings suggest that CDV may have contributed to pup mortality in YNP, mortalities due to CDV  
 9 were not confirmed during the study period and the number of wolf pups sampled each year was  
 10 small. It is not known if wolves maintain CDV within their population or whether the periodic  
 11 peaks in exposure are due to spillover transmission of the virus from other carnivore hosts in the  
 12 YNP ecosystem (Almberg et al. 2009).

13  
 14 Oregon wolves sampled between 2010 and 2016 show a relatively low (7.9%), but increasing  
 15 prevalence of positive antibody titers to CDV (ODFW Data). None of the 19 wolves sampled  
 16 between 2010 and 2013 tested positive for CDV antibodies, but 3 of the 19 wolf samples collected  
 17 between 2014 and 2016 tested positive for IgG antibodies to CDV (15.8% prevalence).

18 Infectious canine hepatitis (ICH) is another important viral disease in domestic dogs and has been  
 19 reported in Alaskan (Zarnke and Ballard 1987, Stephenson et al. 1982) and Canadian (Choquette and  
 20 Kuyt 1974) wolves. In Alaskan populations, annual prevalence has reached 100% with up to 42% of  
 21 the exposed animals being pups, suggesting exposure at an early age. Although, infectious canine  
 22 hepatitis appears to be enzootic in wolf populations, the percentage of wild wolves that test positive  
 23 for exposure to this disease is uncorrelated with its occurrence in domestic dogs. No mortality from  
 24 this disease has been reported in wolves. Serology of the 38 Oregon wolf samples tested between  
 25 2010 and 2016 revealed 24 wolves with detectable titer levels indicating exposure to the virus in the  
 26 past and have likely built up an immune response to the virus (ODFW, unpublished data).

27 Oral papillomatosis virus has been reported in wild populations of wolves and coyotes (Samuel et al.  
 28 1978). Although this disease causes severe oral tumors in coyotes (Trainer et al. 1968), it has not  
 29 been documented to cause mortality in wild wolves or other canids and is not considered a threat to  
 30 those populations. The occurrence, distribution, and risk to wolf populations of this virus in Oregon  
 31 are unknown.

## 32 **Bacterial and Fungal Diseases**

33 The most noted bacterial disease threats in Oregon and North American populations of wolves are  
 34 Lyme disease (*Borrelia burgdorferi*), leptospirosis (*Leptospira* spp.), tularemia (*Francisella tularensis*), and  
 35 plague (*Yersinia pestis*). Of these, Lyme disease and plague are spread through the bite of infected  
 36 fleas and ticks, whereas the other diseases are passed primarily through the exposure to, or  
 37 consumption of, mammalian prey.

38 Lyme disease has the potential to infect wolves but clinical disease has never been demonstrated  
 39 (Kazmierczak et al. 1988). The bacterium is spread through the bite of infected ticks, principally of  
 40 the genus *Ixodes dammini*. It is passed to other species through transmission via a life cycle involving  
 41 small mammals such as the white-footed deer mouse (*Peromyscus leucopus*) that host immature ticks  
 42 and then to deer, the host of the adult ticks. In one study, two of 78 wild wolves sampled in  
 43 Wisconsin and Minnesota tested positive to exposure, though disease or clinical signs were not

1 apparent (Kazmierczak et al. 1988). Recent research suggests exposure has greatly increased in  
2 Wisconsin (Jara et al. 2016). Lyme disease occurs in Oregon providing a potential for wolves to be  
3 exposed to this bacteria through an infected tick bite.

4 Leptospirosis infection, of the bacterium *Leptospira* spp., is endemic in domestic hogs, cattle, and  
5 horse herds in parts of Minnesota and in moose (*Alces alces*) populations (Khan et al. 1991). Signs of  
6 disease in domestic animal populations range from undetectable to mortalities depending on the  
7 species, type of microorganism, and host (Brand et al. 1995). Wolves in Alaska (Zarnke and Ballard  
8 1987) and in northern Minnesota (Khan et al. 1991) have tested positive for exposure to the disease.  
9 However, clinical disease has not been documented in wild canids. The disease is spread among  
10 carnivores primarily through infected urine or via consumption of infected food (Reilly et al. 1970).  
11 ODFW has documented exposure to this bacterium in multiple wildlife species throughout the state.  
12 Of the 38 wolf samples tested between 2010 and 2016, two wolves had positive serological titers at a  
13 level of 1:200 to the serovar *L. grippotyphosa* resulting in an overall prevalence of 5.3%. This titer  
14 level is not necessarily indicative of a current infection.

15 Tularemia (*Francisella tularensis*) is present in many rabbit and rodent populations. The disease has  
16 caused clinical signs in coyotes and foxes (*Vulpes* spp.) including diarrhea, loss of appetite, and  
17 difficulty in breathing (Bell and Reilly 1981). However, clinical disease has not been documented in  
18 wolves, although some Alaskan populations have shown exposure. It is thought that most wild  
19 canids are fairly resistant to the disease (Zanke and Ballard 1987).

20 In many areas where tularemia is found, the plague bacterium (*Yersinia pestis*) is also present. Similar  
21 to tularemia, canids have demonstrated an apparent resistance to infection with *Y. pestis*. Plague is  
22 maintained in wild rodent populations. Clinical disease has not been reported in wolves, although  
23 antibody titers exist in regions of wolf range where plague is found in their prey. The plague  
24 organism is spread by fleas and can be devastating in some rodent populations including prairie dogs  
25 (*Cynomys ludovicianus* and *C. gunnisoni*) in the Western United States. Both tularemia and plague occur  
26 throughout Oregon, but are unlikely to have an impact on the overall wolf population.

27 One undocumented disease threat to wolves is salmon poisoning disease (SPD), a fatal disease of  
28 dogs including wild species such as coyotes and fox that occurs on the western slopes of the  
29 Cascade Mountains from northern California to central Washington. The disease, first recognized by  
30 white settlers in the early 19<sup>th</sup> century (1814), was named salmon poisoning disease because dogs  
31 became sick after eating salmon.

32 SPD is caused by a bacterium called *Neorickettsia helminthoeca* that is carried by a parasitic fluke which  
33 has a complicated life cycle involving both snails and salmonid fish. The fluke harbors the bacteria  
34 throughout its life including immature fluke stages which are released from the snails and then infect  
35 fish. The immature flukes encyst in salmonid fish (and some non-salmonid fish and Pacific giant  
36 salamanders) and are then consumed by fish-eating mammals such as canids, bears, and raccoons.  
37 Wild and domestic canine species become severely ill when the developed and mature fluke releases  
38 the bacteria into the dog's intestine, from which the bacteria spreads to lymph nodes, spleen, liver,  
39 thymus, and brain. Although wolves do not currently occupy suitable habitat west of the Cascade  
40 Range, this disease could cause clinical signs, illness and death in wolves consuming infected salmon.

41 Fungal diseases do not appear to play an important morbidity or mortality role in wild wolf  
42 populations. The only reported fatal case occurred in a wolf in Minnesota from the fungal disease

1 blastomycosis (*Blastomyces dermatitidis*) (Thiel et al 1987). This disease is enzootic and limited to the  
2 region encompassing Minnesota and Wisconsin and is most commonly diagnosed in domestic dogs  
3 in those states (Archer 1985). In Oregon, infection with *Cryptococcus neoformans* and *C. gatti* may also  
4 pose a risk to individual wolves. This pathogen has been documented in elk in western Oregon.

## 5 **Internal Parasites**

6 Holmes and Podesta (1968), Mech (1970), and Archer et al. (1986) describe an array of parasites for  
7 which wolves serve as an important host species. These parasites include three species of spiny-  
8 headed worms (acanthocephala), nine species of flukes (trematodes), 21 species of tapeworms  
9 (cestodes), and 24 species of roundworms (nematodes). As a general observation, the majority of  
10 parasite infections cause little pathology among wolves and apparently are not a factor in regulating  
11 populations (Brand et al. 1995). Several species of note are described below.

12 Dog heartworm infection (*Dirofilaria immitis*) is caused by a nematode that inhabits the heart and  
13 pulmonary arteries of canid and several felid species, but is most prominent in domestic dogs.  
14 Several case history accounts of dog heartworm infection and fatalities have occurred in wolves held  
15 in zoo collections where the parasite occurs enzootically (Hartley 1938, Coffin 1944, Pratt et al.  
16 1981). This disease may have been partially responsible for the decline of red wolves (*Canis rufus*) in  
17 the southeastern U.S. (McCarley and Carley 1979). Mech and Fritts (1987) have expressed concern  
18 over the potential effects of *D. immitis* infection in free-ranging wolves in heartworm enzootic areas.  
19 Heartworm infection is presently not likely a population risk factor for Oregon wolves as the  
20 parasite occurs primarily in isolated areas of western Oregon.

21 Dog hookworm (*Ancylostoma caninum*) is another internal parasite of canids that causes intestinal  
22 ulcerative lesions through its blood-feeding activities. In domestic dogs, emaciation accompanied by  
23 a deficiency of red blood cells, diarrhea and occasionally death can occur. Although this parasite has  
24 not been reported in gray wolves, it has been suspected of causing infection and death in red wolves  
25 (McCarley and Carley 1979, Custer and Pence 1981) and coyotes (Mitchell and Beasom 1974).  
26 Similar morbidity and mortality may occur in areas inhabited by gray wolves where the parasite is  
27 enzootic (i.e., endemic) (Brand et al. 1995).

28 Wild canids, including wolves, harbor a wide variety of Cestodes (tapeworm) populations,  
29 particularly from the genera *Taenia* and *Echinococcus*. From an individual animal and population  
30 perspective, tapeworms do not cause known negative pathologic changes because they do not feed  
31 on the host, but rather use nutrients of passing ingested food in the intestinal tract of the host.

32 Wolves and other carnivore species serve as definitive hosts to tapeworms. *Taenia* tapeworms are  
33 fairly common in all wild canids with the eggs passed in the host's feces. The eggs are ingested by  
34 an intermediate host like a deer or elk where they hatch in the animal's small intestine. The emerging  
35 larvae migrate to muscle where it encysts. A carnivore host then ingests the infected meat and the  
36 encysted larvae matures in the predator's intestine to an adult worm and begins reproduction of  
37 eggs. Oregon deer and elk are commonly diagnosed with encysted tapeworm larvae.  
38 Similarly, the tapeworm *Echinococcus granulosus* requires two hosts to complete its life cycle. Ungulates  
39 (deer, elk, moose, domestic sheep, and domestic cattle) are intermediate hosts for larval tapeworms  
40 which form hydatid cysts in the body cavity. Canids (dogs, wolves, coyotes, foxes) are definitive  
41 hosts where larval tapeworms mature and live in the small intestine. Definitive hosts are exposed to  
42 larval tapeworms when ingesting infected ungulates. Adult tapeworms, 3-5 mm long, produce eggs

1 which are expelled in canids feces. Intermediate hosts ingest the eggs while grazing, where the eggs  
2 hatch and develop into larvae.

3  
4 <sup>9</sup>*E. granulosus* has a worldwide distribution (Gottstein 1992). There are two recognized biotypes of  
5 the parasite – the northern or sylvatic biotype that circulates between canids (wolf, dog) and cervids  
6 (moose, caribou, reindeer, deer, and elk) and is present above 45<sup>th</sup> parallel which passes through  
7 northern Oregon, bisects Montana and Wyoming, and roughly corresponds to the border with  
8 Canada across the Midwest and eastern United States. The northern biotype does not appear to  
9 cross-infect domestic livestock (Rausch 1986 as cited in Drew 2010). The southern or domestic  
10 biotype is comprised of at least nine different strains and circulates between domestic dogs and  
11 domestic ungulates, especially sheep (Jones and Pybus 2001). The southern biotype is endemic (i.e.,  
12 regularly found) in most sheep raising areas of the world including the southwestern United States,  
13 specifically Arizona, California, New Mexico, and Utah (Schwabe et al. 1971; Foreyt et al. 2009).  
14

15 In North America, *E. granulosus* in wolves had been reported previously in Alaska and Minnesota in  
16 the United States, and Alberta, British Columbia, Northwest Territories, Ontario, and Yukon  
17 Territory in Canada (Jones and Pybus 2001). From 2006-2008 adult tapeworms were detected in 39  
18 of 63 wolves (62%) collected in Idaho, and 38 of 60 wolves (63%) collected in Montana (Foreyt et  
19 al. 2009). The parasite has also been detected in the digestive tracts of wolves that have died in  
20 Oregon (ODFW, unpublished data).  
21

22 Hydatid cysts were found in domestic sheep from Idaho sent to California for slaughter in the late  
23 1960's and early 1970's. In Oregon, hydatid cysts were documented in a deer carcass from Grant  
24 County in 1977 and have also been documented in Montana and Idaho wild ungulates and wolves  
25 (Foreyt et al. 2009). In Oregon, the parasite is possibly maintained in wild coyote and fox  
26 populations.  
27

28 <sup>10</sup>Based on available information, the health risks associated with *E. granulosus* to wildlife and  
29 livestock is low. Heavy infections in wildlife may be related to poor body condition. In ungulates,  
30 the presence of large numbers of hydatid cysts in the lungs can lead to respiratory difficulty. The  
31 presence of hydatid cysts in livestock at slaughter is generally not of concern, and if present, is  
32 trimmed from the carcass. *E. granulosus* already exists in both wild and domestic species in California,  
33 thus recolonization of the state by wolves would not introduce the disease to California. Only  
34 people who have close contact with feces or fur of infected wolves without taking any prevention  
35 measures (i.e., wearing gloves, not washing hands after working) would be at risk of *E. granulosus*  
36 infection. Despite the parasite being present in wolves, no reports could be found of humans being  
37 infected by *E. granulosus* contracted from wolves in the contiguous 48 states.  
38

39 Control of parasite infections in wild animals is difficult to unfeasible. However, because most  
40 human infections are associated with infected domestic dogs, not wildlife, regular deworming  
41 treatment of domestic dogs and good hygienic practices by humans in contact with dogs are the best  
42 methods of control and prevention. Dog owners should not allow their dog to consume uncooked  
43 meat or organs from wild or domestic ungulates or to touch or disturb wolf, coyote, or fox scat.

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<sup>9</sup> Paragraph from Conservation Plan for Gray Wolves in California Part II, December 2016, used with permission

<sup>10</sup> Two paragraphs from Conservation Plan for Gray Wolves in California Part II, December 2016, used with permission

1 Hunters should wear gloves when field dressing a canid carcass, and wash any body part that may  
2 have come into contact with feces or contaminated fur.

3  
4 <sup>11</sup>*Echinococcus multilocularis*, a closely related tapeworm to *E. granulosus*, utilizes slightly different hosts  
5 for its life cycle. The most common definitive hosts (which consume cysts in the infected  
6 intermediate hosts and can shed the tapeworm eggs in feces) are small carnivores (coyotes and  
7 foxes) (Jones and Pybus 2001). Domestic dogs and cats may also serve as definitive hosts, especially  
8 in areas where the parasite is present in urban/suburban fox and coyote populations (Eckert 2004;  
9 Catalano et al. 2012). Instead of ruminants (as in *E. granulosus*), a wide variety of small mammals  
10 serve as intermediate hosts including voles, mice, lemmings, shrews, and muskrats (Jones and Pybus  
11 2001). In North America *E. multilocularis* is found primarily in the north central region from eastern  
12 Montana to central Ohio, as well as Alaska and Canada (Centers for Disease Control and Prevention  
13 2012; Catalano et al. 2012). Natural *E. multilocularis* infection was recently documented in wolves  
14 from Canada (Schurer et al. 2014), but has not been reported in wolves from the U.S. *E. multilocularis*  
15 can cause alveolar (vacuolated) cysts in the tissues of people that accidentally ingest the tapeworm  
16 eggs (Moro and Schantz 2009). Although rare, alveolar hydatid infection can be severe in people and  
17 measures to prevent human infections are similar to those for *E. granulosus* (Moro and Schantz  
18 2009). *E. multilocularis* has not been reported in the western United States (Centers for Disease  
19 Control and Prevention 2012).

20 One other parasite of note is the small, single celled parasite known as *Neospora caninum*. This  
21 parasite can cause severe clinical disease in dogs, cattle, and other animals (Dubey 2003; Dubey and  
22 Thulliez 2005). The most common clinical sign associated with cattle with neosporosis is abortion.  
23 Dogs and coyotes are important in the epidemiology of this parasite because they are the only  
24 known definitive hosts where the parasite can complete its entire lifecycle in a single host animal  
25 (Gondim et al. 2004). Wolves may also serve as definitive hosts. However, other species such as deer  
26 and raccoons can carry and shed the disease and may play an important role in the disease's spread  
27 and sylvatic cycle (Gondim 2006; Lindsay et al. 2001). Cattle frequently become infected via the  
28 ingestion of feed contaminated with oocysts or eggs shed transiently in the feces of acutely infected  
29 dogs (Barber et al. 1997). This disease has been in Oregon for a number of years and occurs in the  
30 state, generally associated with dairy operations. In a 2007 study conducted by Tufts University  
31 School of Veterinary Medicine (Lawrence and Pokras, unpublished), 40% of the coyotes and 10% of  
32 the dogs associated with selected dairies indicated previous exposure to the *Neospora* parasite. The  
33 risk of infection from wolves to cattle in Oregon is considered extremely low when compared to  
34 farm dogs and other wild canids living in proximity to cattle operations.

### 35 **External Parasites<sup>12</sup>**

36 Various ectoparasites including ticks, fleas, biting flies (Itamies, 1979, as cited in ODFW 2010), lice,  
37 and mange mites have been reported on wolves (Table 7.8 in Kreeger 2003). The two ectoparasites  
38 that can cause illness and mortality in wolves are lice and mange mites.

39  
40 Infestation with the dog louse (*Trichodectes canis*) can cause illness in wolves but there is little evidence  
41 that the parasite causes negative effects on populations (Schwartz et al. 1983; Mech et al. 1985;  
42 Jimenez et al. 2010a). The louse is transmitted by direct contact between infected and uninfected

<sup>11</sup> Modified excerpt from Conservation Plan for Gray Wolves in California Part II, December 2016, with permission

<sup>12</sup> This section is excerpted from Conservation Plan for Gray Wolves in California Part II, December 2016, with permission

1 animals. Infected animals show varying degrees of hair loss, skin infection, and inflammation that  
2 causes severe itching of the skin (pruritis). An outbreak of lice occurred in Alaskan wolves from  
3 1981-1983, with affected wolves having hair loss (alopecia) and seborrhea (crusts and oily skin  
4 resulting from excessive sebaceous gland discharge) present on up to 75% of their body surface  
5 (Schwartz et al. 1983; Taylor and Spraker 1983; Zarnke and Spraker 1985). Lice have also caused  
6 clinical disease in individual wolves in Idaho and Montana (Jimenez et al. 2010a).

7  
8 Sarcoptic mange (scabies) is a highly contagious skin disease caused by the mite *Sarcoptes scabiei*.  
9 Burrowing into the epidermis by mites and the subsequent allergic response by the host to  
10 excretions from the mites causes intense itching (pruritis), leading to progressive skin damage as the  
11 infested animal bites, scratches, and rubs the affected areas. Infested animals can suffer from  
12 alopecia, abnormal thickening of the skin (hyperkeratosis), excessive discharge of sebum from  
13 sebaceous glands in the skin (seborrhea), scabs, and ulcerations. Severe infestations can affect the  
14 animal's entire body, leading to emaciation, poor body condition, and death from secondary  
15 infections or the inability to maintain normal body temperature in winter due to hair loss (Bornstein  
16 et al. 2001). Mites are transmitted by direct contact between infested and non-infested individuals,  
17 contact with mite-contaminated denning and bedding areas, and contact with contaminated rubbing  
18 or scratching objects.

19  
20 Sarcoptic mange can result in high mortality, especially in pups and may have a role in reducing local  
21 population numbers (Todd et al. 1981 and Pence and Custer 1981 as cited in Kreeger 2003; Jimenez  
22 et al. 2010b). Between 1991 and 1996, 27% of live-trapped Wisconsin wolves exhibited symptoms of  
23 mange. During the winter of 1992-93, 58 percent showed symptoms and a concurrent decline in the  
24 Wisconsin wolf population was attributed to mange-induced mortality (Wisconsin Department of  
25 Natural Resources 1999). During that same period, mange was the third-most common cause of  
26 death in Wisconsin wolves, behind trauma (usually vehicle collisions) and illegal shooting (Wisconsin  
27 Department of Natural Resources 1999). Sarcoptic mange was confirmed in 16 wolves in Montana  
28 and six wolves in Wyoming from 2002 through 2008, and clinical signs were observed in an  
29 additional 40 wolves in Montana and 30 wolves in Wyoming (Jimenez et al. 2010b). Mange-infested  
30 wolves continue to be documented in southwest Montana and in at least one pack in Wyoming  
31 (Bradley et al. 2014; Wyoming Game and Fish Department et al. 2014). This mange mite occurs  
32 naturally throughout Oregon in many species of wildlife.  
33

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APPENDIX C: FEDERAL/STATE COORDINATION STRATEGY

**FEDERAL/STATE COORDINATION STRATEGY  
FOR OREGON WOLF PLAN IMPLEMENTATION**

WHERE WOLVES REMAIN FEDERALLY LISTED

**April 2019**

Coordinating Agencies:



# FEDERAL/STATE COORDINATION STRATEGY FOR OREGON WOLF PLAN IMPLEMENTATION

Communication and Support on Wolf Management  
Where Wolves Remain Federally Listed

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1 **Purpose and Need**

2 The purpose of this document is to describe how state and federal wildlife management  
3 agencies will collaborate on wolf management activities in central and western Oregon where  
4 the gray wolf (*Canis lupus*) remains federally listed under the U.S. Endangered Species Act  
5 (ESA). This April 2019 version replaces the March 2011 version.  
6

7 The Oregon Department of Fish and Wildlife’s (ODFW) Oregon Wolf Conservation and  
8 Management Plan (Oregon Wolf Plan) was first adopted by the Oregon Fish and Wildlife  
9 Commission in 2005 and is currently being updated with adoption of the new plan anticipated  
10 sometime in 2019. It provides comprehensive management direction for conserving and  
11 managing Oregon’s wolves, including population objectives, monitoring plans, and a framework  
12 for managing conflicts between wolves and other resource values  
13 ([www.dfw.state.or.us/Wolves/management\\_plan.asp](http://www.dfw.state.or.us/Wolves/management_plan.asp)). ODFW is the lead agency for  
14 implementing the Oregon Wolf Plan.  
15

16 The U.S. Fish and Wildlife Service (USFWS) is the lead federal agency responsible for recovery of  
17 ESA-listed wildlife. USFWS fully supports ODFW’s implementation of the Oregon Wolf Plan and  
18 on March 15, 2019 formally proposed removing the gray wolf from the ESA list across much of  
19 the country, including all of Oregon (FR 9648). Until gray wolves are federally delisted in  
20 Oregon, USFWS aims to assist ODFW in its successful implementation of the Oregon Wolf Plan  
21 in areas of the state where wolves remain federally listed. Federal ESA protections affect some  
22 aspects of wolf management and thus coordination between federal and state agencies is  
23 needed to ensure the Oregon Wolf Plan is implemented in a way that complies with all  
24 applicable laws.  
25

26 Prompt sharing of information between agencies and with affected stakeholders is a key  
27 element of successful wolf management and thus the focus of this document is on whom to  
28 notify when different wolf-related events occur. To better facilitate information exchange, this  
29 version of the coordination strategy has a much-expanded directory of “key contacts” across  
30 the state.  
31

32 This strategy pertains only to management of wild wolves. It does not pertain to domestically-  
33 raised wolves, wolf-dogs, and wolf hybrids, which are not protected under the Federal ESA.  
34 This Coordination Strategy will be reviewed and updated as needed to address changes such as  
35 the gray wolf’s ESA status, Oregon Wolf Plan management phase, and potential transfer of  
36 additional management authorities to the State of Oregon.  
37

38 **Legal Status of Wolves in Oregon – April 2019**

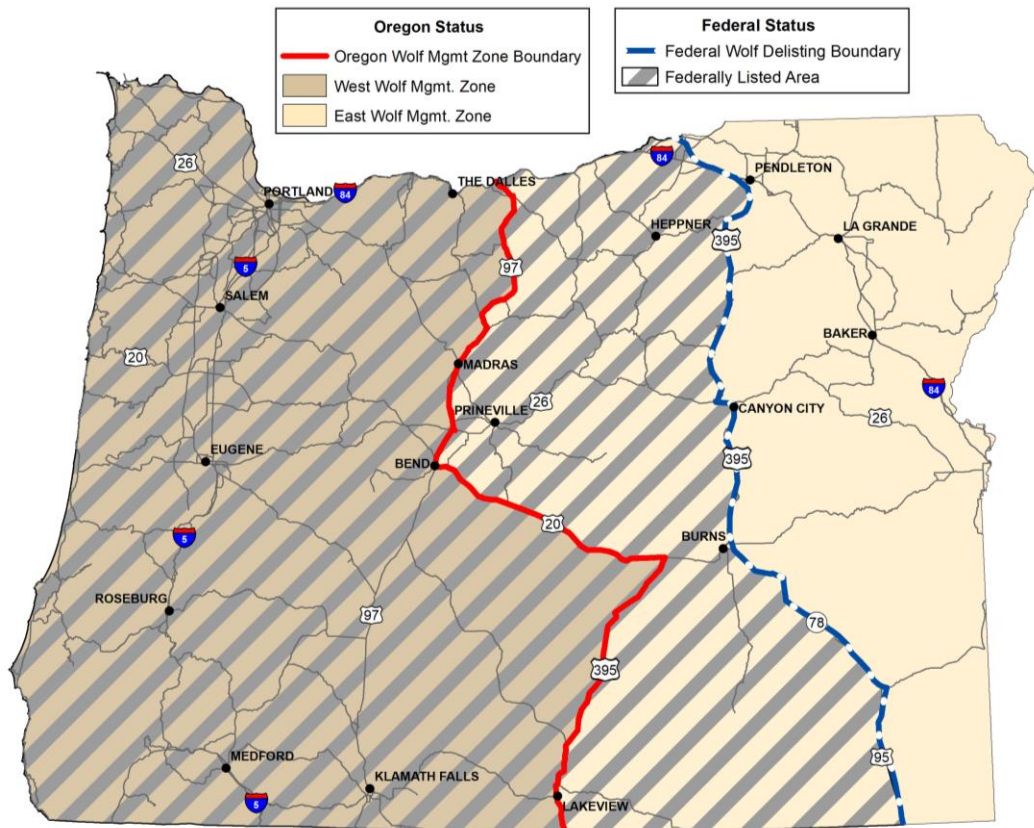
39 Currently, the gray wolf is federally listed as an endangered species in approximately the  
40 western 3/4<sup>ths</sup> of Oregon; that is, west of a boundary delineated by Highway 395 from the  
41 Washington border south to Burns, then southeast along Highway 78 to Burns Junction, and

1 finally south on Highway 95 to the Nevada border (Figure 1). On March 15, 2019, the USFWS  
2 formally proposed removing the gray wolf from the list of endangered and threatened wildlife  
3 by issuing a proposed rule in the Federal Register (FR 9648). A final rule is expected sometime  
4 in early 2020. If finalized, gray wolves would no longer be federally listed in Oregon.  
5

6 When the Oregon Wolf Plan was first adopted in 2005, the gray wolf was also State-listed as an  
7 endangered species, and the Plan established population thresholds for considering delisting.  
8 Rapid growth of the wolf population in eastern Oregon resulted in those thresholds being  
9 exceeded by 2014. This prompted ODFW to conduct a status review in 2015, and after an  
10 extensive public rulemaking process, the Oregon Fish and Wildlife Commission determined in  
11 November 2015 that the gray wolf in Oregon had met the state delisting criteria and removed  
12 them from the State Endangered Species List.  
13

14 The Oregon Wolf Plan calls for different management guidelines in the East and West Wolf  
15 Management Zones (WMZ) based on the number of breeding pairs in those areas. Currently,  
16 the West WMZ is designated to be in Phase I, the East WMZ moved into Phase III in early 2017.  
17

18 **Figure 1.** Current wolf management boundaries in Oregon. Wolves occurring east of the blue line are not federally  
19 listed and completely under ODFW's jurisdiction. This coordination strategy applies to wolves occurring west of the  
20 blue line, where they are federally listed as endangered and managed under the joint jurisdiction of ODFW and  
21 USFWS.



22

## 1 Roles and Jurisdictions

2 **This Coordination Strategy applies only in portions of the wolf's range in Oregon where they**  
3 **remain a federally-listed species under the ESA.** Implementation of Federal ESA  
4 responsibilities and the Oregon Wolf Plan will be a coordinated effort between USFWS and  
5 ODFW. An existing cooperative agreement between the USFWS and ODFW gives ODFW the  
6 authority, under Section 6 of the ESA, to implement most elements of the Oregon Wolf Plan in  
7 the listed area, including capture and handling, radio-collaring, relocating, and implementation  
8 of non-lethal measures to minimize livestock depredations.

9  
10 ODFW has primary responsibilities for implementing the Oregon Wolf Plan within the  
11 sideboards of federal ESA regulations. Agency staff in Salem and wolf specialists in La Grande  
12 are the primary contacts for overall Wolf Plan administration, with ODFW's district wildlife  
13 biologists assuming field-level wolf management duties in their areas of jurisdiction.

14  
15 USFWS is the lead agency responsible for administering the recovery of wolves under federal  
16 ESA and has primary responsibilities for ensuring management actions in the Oregon Wolf Plan  
17 comply with ESA regulations. The Oregon Fish and Wildlife Office in Portland has jurisdiction  
18 for most of the State. Part of southcentral Oregon along the California border is within the  
19 jurisdiction of the Klamath Falls Fish and Wildlife Office.

20  
21 Wildlife Services (USDA-APHIS) is the lead federal agency for managing wildlife damage  
22 problems. They have field staff based in most Oregon counties who work closely with livestock  
23 producers to reduce predator-related losses. Wildlife Services (WS) agents' expertise in  
24 investigating livestock depredations and their strong presence in rural parts of Oregon working  
25 closely with producers make them an important asset for wolf management. Wildlife Services'  
26 Oregon State Office is in Portland.

27  
28 Tribal reservation lands are self-governed by Tribal governments who have primary  
29 responsibilities for managing wildlife on those lands. Any wolf management activities within or  
30 near Tribal Reservations need to be closely coordinated with the appropriate Tribal  
31 representatives.

32  
33 The following is a description of how ODFW, USFWS, and Wildlife Services intend to coordinate  
34 and collaborate on wolf management activities in parts of Oregon where wolves are federally-  
35 listed. Agency wolf coordinators are the initial contacts and will take responsibility for most of  
36 the identified coordination tasks, however, agency personnel in local field offices will handle  
37 some coordination duties.

## 38 Wolf Monitoring

39  
40 Monitoring activities include surveys to confirm and document new wolf activity, investigating  
41 public wolf reports, capturing and radio-collaring wolves, and tracking known wolf packs and

1 individuals for annual counts or population estimation. As the wolf population increases, this  
2 aspect of wolf management is becoming a more time-consuming task.

#### 3 4 **Agency Roles and Responsibilities**

5 **USFWS:** USFWS monitors wolves in areas where wolves remain federally-listed by investigating  
6 reports of new wolf activity, monitoring known wolves, and assisting with collaring and tracking  
7 work.

8 **ODFW:** ODFW monitors wolves as they implement the Oregon Wolf Plan. ODFW personnel are  
9 authorized to capture, handle, and monitor federally-listed wolves through the agency's  
10 cooperative agreement with the USFWS, under Section 6 of the ESA. They maintain an online  
11 reporting system for the public to submit wolf sightings, investigate reported sightings, monitor  
12 disease, analyze genetics, and capture and radio-collar wolves to monitor their activity. They  
13 also maintain a database of wolf locations and depredation investigations.

14 **Wildlife Services:** Wildlife Services assists in monitoring wolf activity when requested. County  
15 personnel work closely with livestock producers and in the course of their work receive reports  
16 or find direct evidence of possible wolf activity.

#### 17 18 **Coordination on Wolf Monitoring**

19 Coordination and information sharing on wolf activity between the three agencies has been  
20 ongoing for many years and it will be important to continue and expand these coordination  
21 efforts as wolves appear in new areas.

22 ODFW's online wolf reporting site ([www.dfw.state.or.us/Wolves/wolf\\_reporting\\_form.asp](http://www.dfw.state.or.us/Wolves/wolf_reporting_form.asp)) is a  
23 valuable tool for getting information from the public on possible wolf activity. Agency  
24 personnel should encourage people to use this system when they think they've seen wolves or  
25 wolf sign. The web-based form is also appropriate for other USFWS and ODFW staff and WS  
26 field staff to use to inform USFWS and ODFW wolf personnel of information they have  
27 collected.

#### 28 29 **When Wolves Are Found In a New Area**

30 Confirmation of wolves residing in a new area is a significant development for local  
31 stakeholders (e.g., county officials, livestock producers, Tribes) and resource management  
32 agencies and thus requires prompt dissemination of information to those who could be  
33 affected. Stakeholders, officials, and agencies are notified by USFWS and ODFW staff after  
34 those agencies confirm that wolves are spending time in an area and not just rapidly moving  
35 through.

36 Because of the high mobility and frequent movement tendencies of lone wolves (i.e., active  
37 dispersers), it is important to try to distinguish active dispersers from wolves that are remaining  
38 in an area for weeks, months, or longer. Location data from radio-collared wolves show that  
39 wolves that have left their natal pack typically move rapidly across the landscape, spending at  
40 most one to three days in a given area , and making substantial movements (10-30 miles or  
41 more) each day.

1 Attempting to immediately alert stakeholders that were in the path of an actively dispersing  
2 wolf is only possible if the wolf is wearing a collar capable of transferring locations via satellite,  
3 but even then information is not instantaneous with new locations being hours to days old by  
4 the time they are received. This is extremely difficult due to the amount of area wolves pass  
5 through and rarely helpful since the wolf is usually long gone by the time the information can  
6 be disseminated. Also, wolves that are rapidly-moving rarely threaten livestock.

7  
8 Therefore, the amount and scope of information shared will be based on the amount of wolf  
9 presence known. A single documented wolf location should be shared between USFWS, ODFW,  
10 and Wildlife Services but may or may not be appropriate to share with all producers in a large  
11 area until the wolf is determined to be present in the area over a period of time.

12  
13 When new resident wolf activity is confirmed in an area, the following actions should be taken:

14  
15 • **Agency Notifications.**

16 Lead for contacting:

- |    |   |       |
|----|---|-------|
| 17 | ○ Appropriate USFWS and Wildlife Services contacts                | USFWS |
| 18 | ○ State Agencies: ODFW, Oregon Dept. of Agriculture (ODA)         | ODFW  |
| 19 | ○ Forest Service/BLM/NPS units near the location of wolf activity | USFWS |
| 20 | ○ Local Tribes if wolf activity is near Tribal lands              | USFWS |
| 21 | ○ Adjacent State Wildlife Agencies when near state borders.       | ODFW  |

- 22 • **Livestock Producer Information.** Both USFWS and ODFW will enlist help from appropriate  
23 state and federal partner agencies, and local livestock producer organizations to identify  
24 potentially affected livestock producers in the vicinity, inform them of the new wolf  
25 activity and provide information on actions they can take to protect their livestock.

- 26 • **Assess need for Tribal government consultations.** If wolf activity is within or immediately  
27 adjacent to an Indian Reservation, government-to-government discussions with the  
28 affected Tribe shall be initiated by USFWS.

- 29 • **Interested Parties Notification via ODFW updates and website.** ODFW has a distribution  
30 list, which people can subscribe to, for sharing wolf information via email updates. ODFW  
31 posts maps and information about resident wolf activity on their website.

32  
33 **Livestock Depredation Investigations and Follow-up**

34 When injured or dead livestock are found and wolf depredation is suspected, a prompt  
35 investigation following the livestock owners request is needed to determine if wolves were  
36 involved. If determined to be confirmed or probable wolf depredation, follow-up monitoring  
37 and deployment of preventative measures to deter subsequent depredations are necessary.

1 **Agency Roles and Responsibilities**

2 When depredation is suspected, Wildlife Services, ODFW, and USFWS (or any combination of  
3 these agencies) personnel will do the initial investigation of possible wolf-livestock  
4 depredations when requested. The agency which receives a request for an investigation will  
5 immediately contact the other two agencies. Initial investigations will be completed on-site, but  
6 prior to making a final agency determination or providing public notification on whether a wolf  
7 or wolves were responsible (unless it is clear that wolves were not involved), the investigating  
8 agency(s) will confer with USFWS (and ODFW if they were not involved in the on-site  
9 investigation) to review and discuss the evidence found.

10 **USFWS:** USFWS is the lead agency for decisions on control actions that have the potential to  
11 injure or kill wolves. USFWS will be proactive in assisting affected landowners and livestock  
12 producers to install and maintain preventative measures to deter future wolf attacks and on  
13 monitoring wolf activity in the area.

14 **ODFW:** ODFW will implement direction in the Oregon Wolf Plan regarding depredation  
15 investigations and advising and assisting affected landowners on deterrence and preventative  
16 measures to minimize livestock depredation. Oregon’s Wolf Depredation Compensation and  
17 Financial Assistance County Block Grant Program stipulates that affected livestock producers  
18 cannot pursue compensation payment for losses through ODA unless ODFW or a designated  
19 agent find that wolf depredation was the probable or confirmed cause for the death or injury.

20 **Wildlife Services:** As the primary Federal agency that works with livestock producers to control  
21 wildlife predation, Wildlife Services’ personnel are experienced at investigating dead livestock  
22 and are often whom livestock producers call when they suspect predation. They will frequently  
23 be involved in depredation investigations and have been expanding their capabilities to assist  
24 landowners with installing and maintaining preventative measures to deter future wolf attacks.  
25

26 **Livestock Depredation Response**

27 When a livestock depredation investigation is requested by the livestock owner a response  
28 should be taken as soon as possible to utilize time-sensitive evidence. The following actions  
29 should be undertaken:

- 30 • **Document specific location where depredation occurred and immediately notify ODFW**  
31 **or USFWS wolf contacts;**
- 32 • **Dispatch a trained investigator (from ODFW, Wildlife Services, or USFWS) to the scene to**  
33 **investigate the depredation.** Personnel from any of these agencies can lead the on-site  
34 investigation provided they have had training on investigation procedures and how to look  
35 for physical evidence of a wolf attack. The following steps should be taken to protect the  
36 site and carcass prior to the investigation:
  - 37 ○ Take several photographs of scene as it occurs before proceeding with any  
38 investigation;
  - 39 ○ Minimize human disturbance in and around the area;
  - 40 ○ Keep dogs and other animals from the area to protect evidence;



## 1 **Depredation Deterrence**

2 **The USFWS's current direction is that lethal control of wolves will not be authorized while**  
3 **they are Federally-listed as endangered.** Therefore, guidance in the Oregon Wolf Plan that  
4 pertains to determining when chronic depredation situations exist and related triggers for  
5 authorization of lethal control actions are not currently applicable in the federally-listed area.

6 In areas where wolves are present and pose a threat to livestock, personnel from the three  
7 wildlife agencies actively work with landowners and producers to deter wolf damage to  
8 livestock. Non-injurious measures are always tried first to manage depredation problems, and  
9 in many cases these are effective and the problems are resolved for the time being. However,  
10 in some cases, depredations continue despite the use of various preventative measures.

11

### 12 **Guidance on Injurious Harassment**

13

14 The USFWS supports ODFW's implementation of Oregon Wolf Plan guidance, but ESA  
15 protections do impose limitations on the use of injurious harassment. USFWS will make all  
16 decisions on the use of injurious harassment, in close coordination with ODFW. Wildlife  
17 Services may assist with implementation of injurious harassment actions, should their  
18 involvement be requested by the USFWS.

19 Non-lethal injurious harassment primarily involves the use of firearm ammunition (e.g., cracker  
20 shells, rubber bullets, bean bag projectiles) that can potentially injure but not kill a wolf. These  
21 may be used as a measure to modify wolf behavior when they are repeatedly returning to  
22 pastures and stalking livestock. These munitions can be effective at deterring wolves from  
23 returning to specific areas. Other activities that, under certain circumstances, are considered to  
24 be injurious harassment include pursuit-oriented hazing, such as chasing a wolf or wolves using  
25 a motorized vehicle.

26 USFWS has provided authorization for ODFW personnel to use injurious harassment measures  
27 when warranted. However, ODFW's issuance of permits to livestock producers or their  
28 designated agents to use injurious methods, as described in the Oregon Wolf Plan, does not  
29 apply at this time in the federally-listed area.

30

### 31 **Handling Injured, Dead, or Inadvertently Captured Wolves**

32 Wolves found injured, dead, or held in a trap need to be handled properly and all cases of  
33 possible unauthorized take should be investigated by law enforcement personnel. Injured or  
34 live-trapped wolves need to be assessed to determine if they can be released on site. If  
35 determined releasable, consideration should be given to: (1) radio-collaring the animal prior to  
36 release, and (2) if in an area where wolves had not previously been documented, coordination  
37 with potentially affected parties in area where it will be released. If determined that the injured  
38 or trapped animal is not releasable and needs treatment or euthanasia, USFWS will be  
39 consulted to determine a course of action on a case-by-case basis.

1 **Agency Roles and Responsibilities**

2 **USFWS:** USFWS will respond to these situations, if available, and is the lead authority for  
3 decision making. USFWS Law Enforcement needs to be notified when trapped, dead or injured  
4 wolves are found to investigate possible criminal wrongdoing.

5 **ODFW:** ODFW has authority under its Section 6 permit to evaluate and treat an injured or  
6 trapped wolf, release and collar it if appropriate.

7 **USFWS Law Enforcement and OSP:** USFWS Law Enforcement is the lead agency for  
8 investigating possible violations of the Federal ESA and Oregon State Police is the lead agency  
9 for investigating possible violations of State wildlife laws.

10 **Wildlife Services:** Wildlife Services personnel should notify appropriate ODFW or USFWS  
11 personnel if they find or receive a report of an injured or dead wolf. If Wildlife Services  
12 personnel are involved in the accidental capture of a wolf, they are responsible for notifying  
13 USFWS and/or ODFW immediately.

14

15 **Response Coordination**

16 When an injured, dead, or trap-held wolf is found, the following actions should be taken as  
17 soon as possible.

18 INITIAL RESPONSE:

- 19 • **Get detailed description of the incident location from the caller.** Ask about specific  
20 directions on how to reach the scene (road names, landmarks, gates, etc.).
- 21 • **Provide on-site person with the following instructions on protecting the scene:**
  - 22 ○ If animal is alive, take actions to keep self and onlookers safe;
  - 23 ○ If animal is dead, treat area as a potential crime scene, do not touch carcass, keep all  
24 people and animals from the area, and if directed to, carefully place tarp or similar  
25 covering over the wolf carcass;
- 26 • **Notify State and Federal agency primary wolf contacts.**
- 27 • **Contact USFWS Law Enforcement and Oregon State Police.** Relay information provided  
28 by the caller and request that an officer be dispatched to the scene.

29

30 **IF THE WOLF IS DEAD: Law enforcement personnel will take over the investigation and**  
31 **determine all subsequent aspects of the response.**

32

33 **IF THE SITUATION INVOLVES A LIVE WOLF (INJURED OR TRAPPED):**

- 34 • **Arrange for a rapid response by nearby ODFW or USFWS biologist, veterinarian, or**  
35 **other qualified individual to evaluate and provide initial care to the animal, while**  
36 **continuing coordination with person on-site.**

- 1 • Determine condition of animal. Arrange for immediate veterinary care and/or  
2 transportation to a veterinary facility if needed.
- 3 • If the wolf's injuries are not life-threatening, USFWS or ODFW will make decision on  
4 whether to release it on site. USFWS will also determine, with input from ODFW, where  
5 the animal should be released if it is removed from the site for treatment.
- 6 • If decision is made to release on site:
  - 7 ○ If possible, have a radio transmitter brought to scene so it can be collared before  
8 release.
  - 9 ○ Notify potentially affected parties (i.e., livestock producers in the area) if it is in a  
10 new area of wolf activity.
- 11 • **Determine need for Tribal government consultations;** if the wolf is within or immediately  
12 adjacent to an Indian Reservation, government-to-government discussions with the  
13 affected Tribe shall be initiated by USFWS and Tribal contacts will be consulted on all of  
14 the subsequent response coordination steps.

1 **Key Contacts Phone Directory**

2 **PRIMARY USFWS & ODFW WOLF PERSONNEL**

<b>John Stephenson</b>	USFWS	Wolf Specialist, Oregon Bend	(541) 786-3282 cell
<b>Roblyn Brown</b>	ODFW	Wolf Coordinator La Grande	(541) 962-1850 (541) 805-8967 cell
<b>Nate Libal</b>	ODFW	Asst. Wolf Coordinator La Grande	(541) 962-1826 (541) 736-6271 cell
<b>Jim Thraikill</b>	USFWS	Supervisory Wolf Coord., Roseburg	(541) 957-3470 (503) 703-9753 cell
<b>Mike Asch</b>	USFWS	Fish and Wildlife Biologist, Roseburg	(541) 957-3469 (503) 807-6195 cell
<b>Derek Broman</b>	ODFW	Carnivore Coordinator Salem	(503) 947-6095 (503) 991-3776 cell
<b>Jeanne Spaur</b>	USFWS, Region 8	Wolf Specialist, Klamath FWO (see map pg 15)	(541) 885-2501 (541) 891-1142 cell
<b>Elizabeth Willy</b>	USFWS, Region 8	R8 Wolf Coordinator (see map pg 15)	(541) 885-2525 (541) 891-2174 cell

3

4 **PUBLIC INFORMATION OFFICERS, ODFW & USFWS (Statewide)**

<b>Michelle Dennehy</b>	ODFW	Public Info Officer, Salem	(503) 947-6022
<b>Elizabeth Materna</b>	USFWS	Public Info Officer, Portland	(503) 807-6196

5

6 **USFWS LAW ENFORCEMENT PERSONNEL (Statewide)**

<b>Eric Marek</b>	USFWS	Resident Agent In Charge, Redmond, WA	(206) 512-9329
<b>Paul Montuori</b>	USFWS	Special Agent, Wilsonville	(503) 682-6131
<b>Kathy Spengler</b>	USFWS	Special Agent, Wilsonville	(503) 682-6131
<b>Rebecca Roca</b>	USFWS	R8 Resident Agent in Charge, Sacramento, CA	(916) 569-8444

7

1 **WILDLIFE SERVICES OREGON STATE SUPERVISORS**

<b>Dave Williams</b>	WS	Oregon State Director, Portland	(503) 326-2346 (971) 404-6717 cell
<b>Kevin Christensen</b>	WS	Asst. State Director, Portland	(503) 326-2346 (503) 329-9819 cell
<b>Paul Wolf</b>	WS	Southwest District Sup., Roseburg	(541) 679-1231 (503) 593-1719 cell
<b>Brian Thomas</b>	WS	Northwest District Sup.	(503) 399-5814 (541) 221-7582 cell
<b>Patrick Smith</b>	WS	Eastern District Sup.	(541) 963-7947 (541) 805-0128 cell

2

3 **USFWS OREGON FISH & WILDLIFE FIELD OFFICE SUPERVISORS**

<b>Paul Henson</b>	USFWS, R1	State Supervisor, Portland	(503) 231-6988
<b>Bridget Moran</b>	USFWS, R1	Bend Field Office	(541) 312-6423
<b>Marisa Meyer</b>	USFWS, R1	La Grande Field Office	(541) 962-8597
<b>Jim Thraikill</b>	USFWS, R1	Roseburg Field Office	(541) 957-3470
<b>Daniel Blake</b>	USFWS, R8	Klamath Falls Field Office	(541) 885-2512
Vacant	USFWS, R1	Newport Field Office	(541) 867-4558

4

5

6 **TRIBAL CONTACTS**

7 CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION

8 **Carl Scheeler** Wildlife Program Manager (541) 429-7242  
 9 (541) 969-3117 cell

10 CONFEDERATED TRIBES OF THE WARM SPRINGS INDIAN RESERVATION

11 **Doug Calvin** Wildlife Biologist (541) 553-2043  
 12 **Austin Smith, Jr** Wildlife Biologist (541) 553-2046

1 **U.S. FOREST SERVICE & BLM REGIONAL BIOLOGISTS (Statewide)**

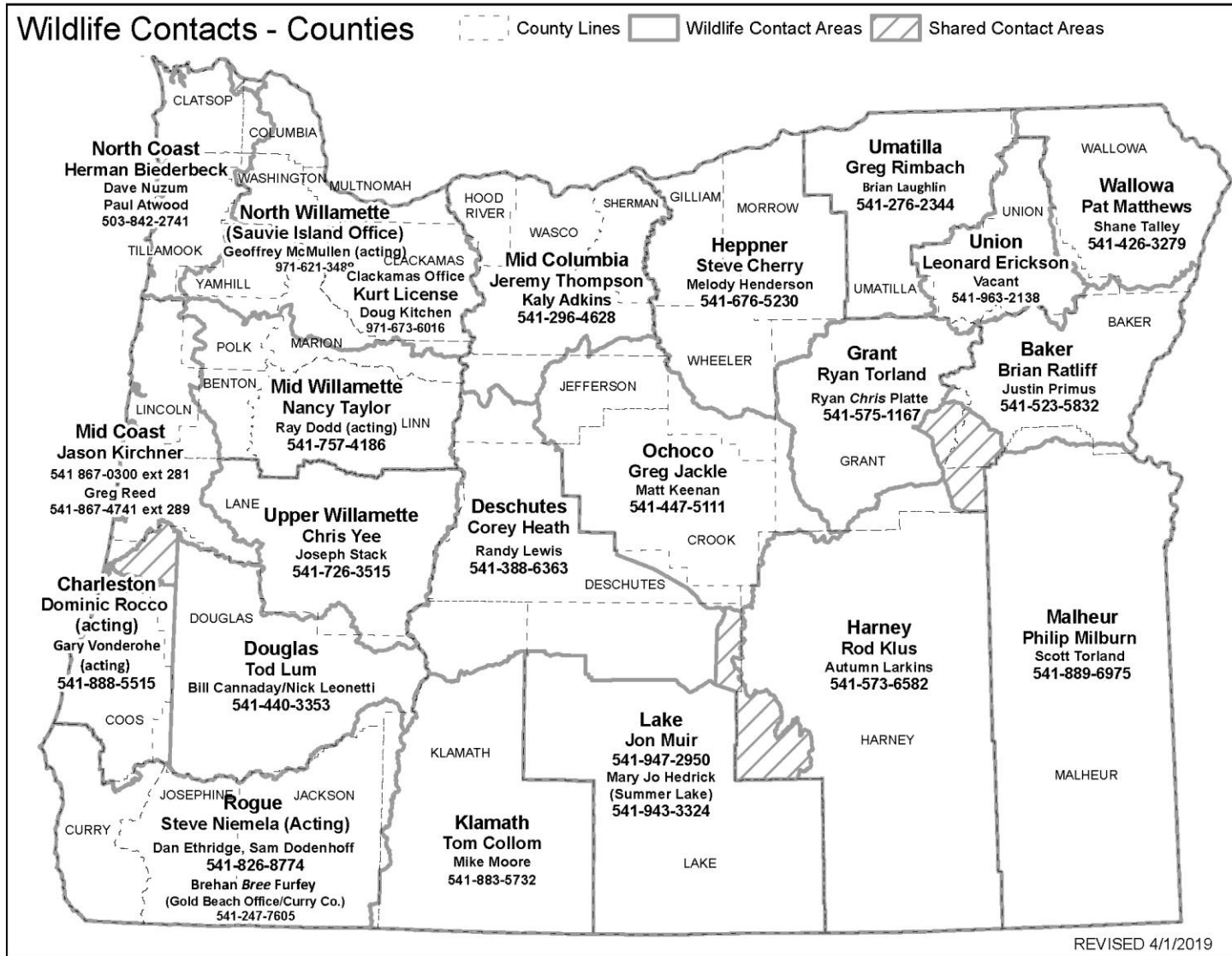
<b>John Chatel</b>	USFS	TES Species Program	(503) 808-2972 office
<b>Bruce Hollen</b>	BLM	Wildlife Biologist	(503) 808-6604 office
<b>Todd Thompson</b>	BLM	Wildlife Biologist	(503) 808-6326 office

2

3 **NATIONAL FOREST & BLM CONTACTS BY UNIT**

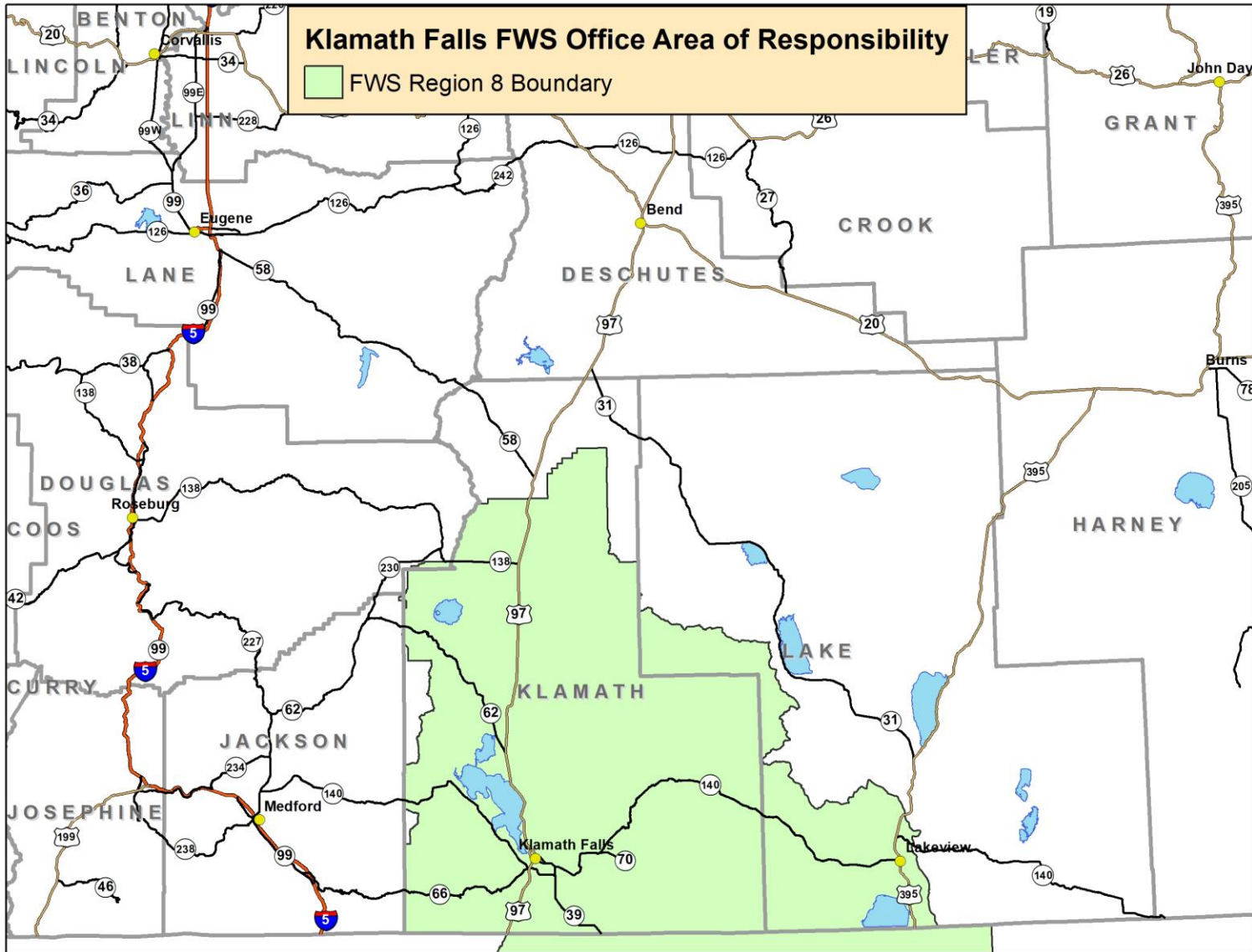
4 <b>NATIONAL FOREST</b>	<b>FOREST WILDLIFE BIOLOGIST</b>	<b>PHONE NUMBER</b>
5 Malheur	Clark Reames	541-575-3474
6 Umatilla	Lizzy Berkley	541-278-3814
7 Ochoco	Monty Gregg	541-416-6508
8 Deschutes	Lauri Turner	541-383-5640
9 Fremont-Winema	Cheran Cavanaugh (acting)	541-947-2151
10 Rogue River-Siskiyou	Dave Clayton	541-618-2054
11 Umpqua	Justin Hadwen	541-957-3260
12 Siuslaw	Deanna Williams	541-750-7013
13 Willamette	Joe Doerr	541-225-6433
14 Mt. Hood	Chuti Fiedler	503-308-1750
15 Columbia River Gorge NSA	Brett Carre	541-308-1718
16		
17 <b>BLM DISTRICT</b>	<b>DISTRICT WL BIO</b>	<b>PHONE NUMBER</b>
18 Burns	Matt O’Bradovich	541-573-4447
19 Prineville	Stephanie McKinney	541-416-6712
20	Larry Ashton	541-416-6738
21 Klamath Falls	Steve Hayner	541-885-4126
22 Lakeview	Kate Yates	541-947-6282
23 Medford	Robin Snider	541-618-2496
24 Roseburg	Rex McGraw	541-464-3273
25 Coos Bay	Carol Aron	541-751-4326
26 Northwest (Eugene/Salem)	John DeLuca	541-683-6229

1 MAP OF ODFW REGIONS AND DISTRICT WILDLIFE BIOLOGISTS



2

1 **MAP OF USFWS REGION 8 IN OREGON**



2

1 **USDA, WILDLIFE SERVICES CONTACTS BY COUNTY – CENTRAL/EASTERN OREGON**

2 Use OSP dispatch, dial\*OSP (\*677) from mobile phone or 1-800-442-2068 (southern command center) for  
 3 state enforcement contacts and after hours contacts for ODFW staff listed on wildlife contacts map.

4

5 **DESCHUTES COUNTY**

	<u>County</u>	<u>Office phone</u>	<u>Cell phone</u>	<u>Location</u>
6	Zack Perdue		541-655-0059	

7 -----

8 **GRANT COUNTY / BAKER COUNTY**

9	Nick Lulay		541-224-3210	
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10 -----

11 **HARNEY COUNTY**

12	Rod Curtis		541-589-2667	Burns
----	------------	--	--------------	-------

13 -----

14 **HEPPNER - GILLIAM, MORROW, & northern WHEELER counties**

15	Ryan Christensen	Gilliam	541-709-4082	
16	Chris Lulay	Morrow	541-303-3722	

17 -----

18 **KLAMATH COUNTY**

19	Andy Cleland		541-810-8185	Klamath Falls
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20 -----

21 **MALHEUR COUNTY**

22	Scott Phillips		541-709-7284	Ontario
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23 -----

24 **MID-COLUMBIA - HOOD RIVER, WASCO, & SHERMAN counties**

25	Jon Belozar	Wasco	541-460-2069	Maupin
----	-------------	-------	--------------	--------

26 -----

27 **OCHOCO - CROOK COUNTY & parts of WHEELER & JEFFERSON counties**

28	Zack Perdue	Crook	541-655-0059	
29	Jon Belozar	Jefferson	541-460-2069	Maupin

30 -----

31 **UMATILLA COUNTY**

32	Ken Mitchell		541-969-6759	Pendleton
----	--------------	--	--------------	-----------

33 -----

34 **UNION COUNTY, WALLOWA COUNTY**

35	Patrick Smith (District Supervisor)		541-963-7947	541-805-0128	La Grande
36	Curt Mattson			541-805-5256	

37 -----

1 **USDA, WILDLIFE SERVICES CONTACTS BY COUNTY – WESTERN OREGON**

2 Use OSP dispatch, dial\*OSP (\*677) from mobile phone or 1-800-442-2068 (southern command center) for  
 3 state enforcement contacts and after hours contacts for ODFW staff listed on wildlife contacts map.

4 **CHARLESTON - COOS COUNTY**

	<u>County</u>	<u>Office phone</u>	<u>Cell phone</u>	<u>Location</u>
5	Dan Godfrey	Coos	541-223-2947	
6	Trapper Spencer	SW	541-670-8608	

7 -----  
 8 **DOUGLAS COUNTY**

9	Paul Wolf (District Supervisor)		541-679-1231	503-593-1719	Roseburg
10	Jim Godfrey			541-670-0357	
11	Ty Nichols			541-863-9222	
12	Mark Dowdy			541-784-5026	

13 -----  
 14 **ROGUE - JACKSON, JOSEPHINE, & CURRY counties**

15	Cricket Peyton	Jackson		541-630-0050	Medford
16	Jim Dougherty	Curry		541-655-0845	

17 -----  
 18 **UPPER WILLAMETTE - LANE COUNTY**

19	John Brooks			541-520-7772	
20	Micah Bell			541-315-6048	

21 -----  
 22 **MID WILLAMETTE - BENTON, LINN, MARION, & POLK counties**

23	Brian Thomas (District Supervisor)		503-399-5814	541-221-7582	Salem
24	Landon Schacht	Benton and Polk		541-517-9513	
25	Trevor Lock	Marion		503-881-9381	
26	Jim Schacht	Linn		541-508-8783	

27 -----  
 28 **MID COAST - LINCOLN COUNTY, western LANE COUNTY**

29	Rod Perkins	Lincoln		541-961-3921	
----	-------------	---------	--	--------------	--

30 -----  
 31 **NORTH WILLAMETTE - COLUMBIA, CLACKAMAS, MULTNOMAH, WASHINGTON, YAMHILL counties**

32	Phil Weaver	Washington		503-201-5547	
33	Matt Alex	Portland		503-530-6445	
34	Mark Lytle	Clackamas		503-201-3778	

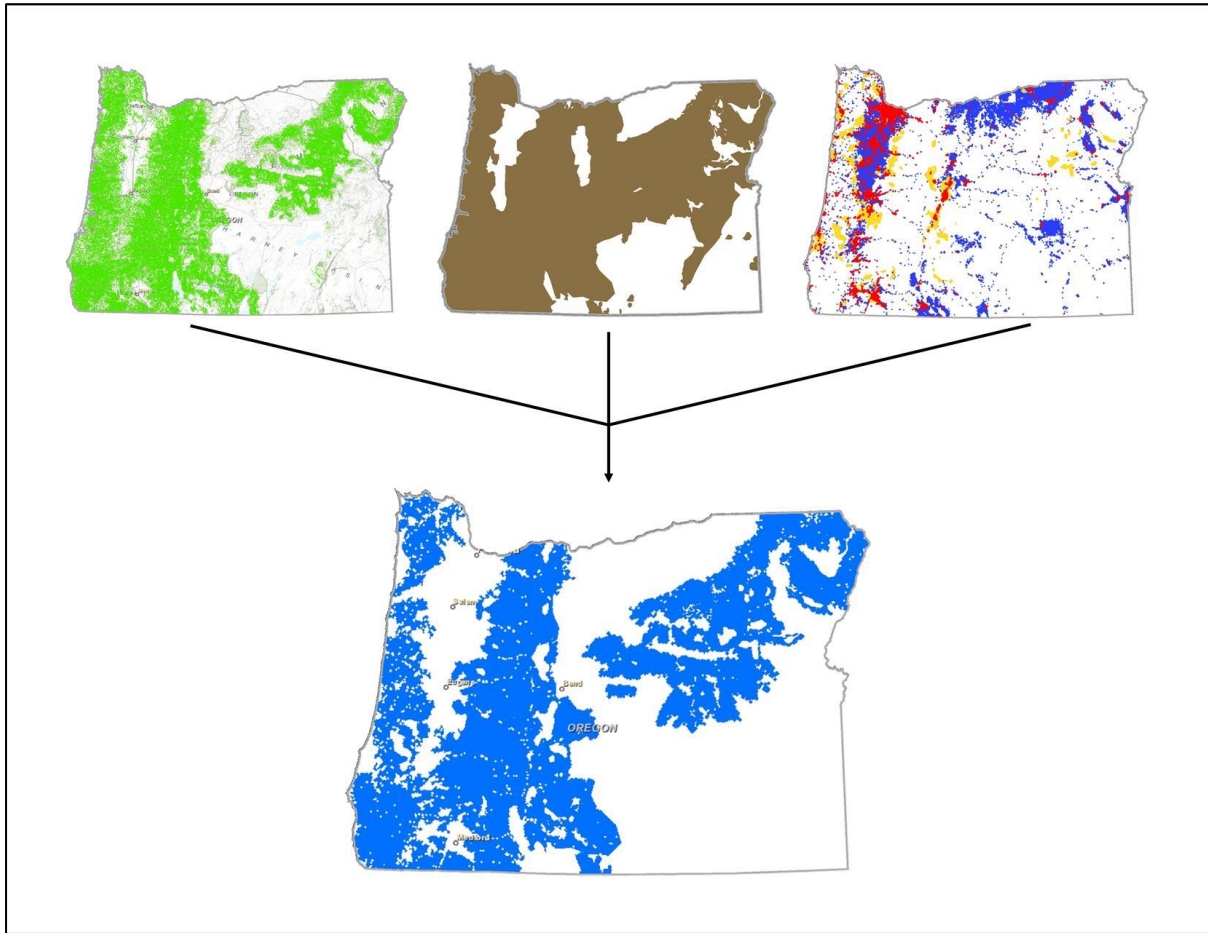
35 -----  
 36 **NORTH COAST - CLATSOP COUNTY, TILLAMOOK COUNTY**

37	Nick Searfus	Northwest		503-509-0341	
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## APPENDIX D: WOLF RANGE MAPPING

**Note:** This Report was originally presented as Appendix A to the Oregon Fish and Wildlife Commission as part of the November 2015 Biological Status Review for the gray wolf in Oregon and evaluation of criteria to remove the gray wolf from the List of Endangered Species under the Oregon Endangered Species Act.

### Mapping Potential Gray Wolf Range in Oregon



*This report is presented as Appendix A to the Oregon Fish and Wildlife Commission as part of the 2015 Biological status review for the gray wolf in Oregon and evaluation of criteria to remove the gray wolf from the List of Endangered Species under the Oregon Endangered Species Act.*



*Suggested citation:* Oregon Department of Fish and Wildlife. 2015. Mapping potential gray wolf range in Oregon. Oregon Department of Fish and Wildlife, 4034 Fairview Industrial Drive SE. Salem, OR 97302

1

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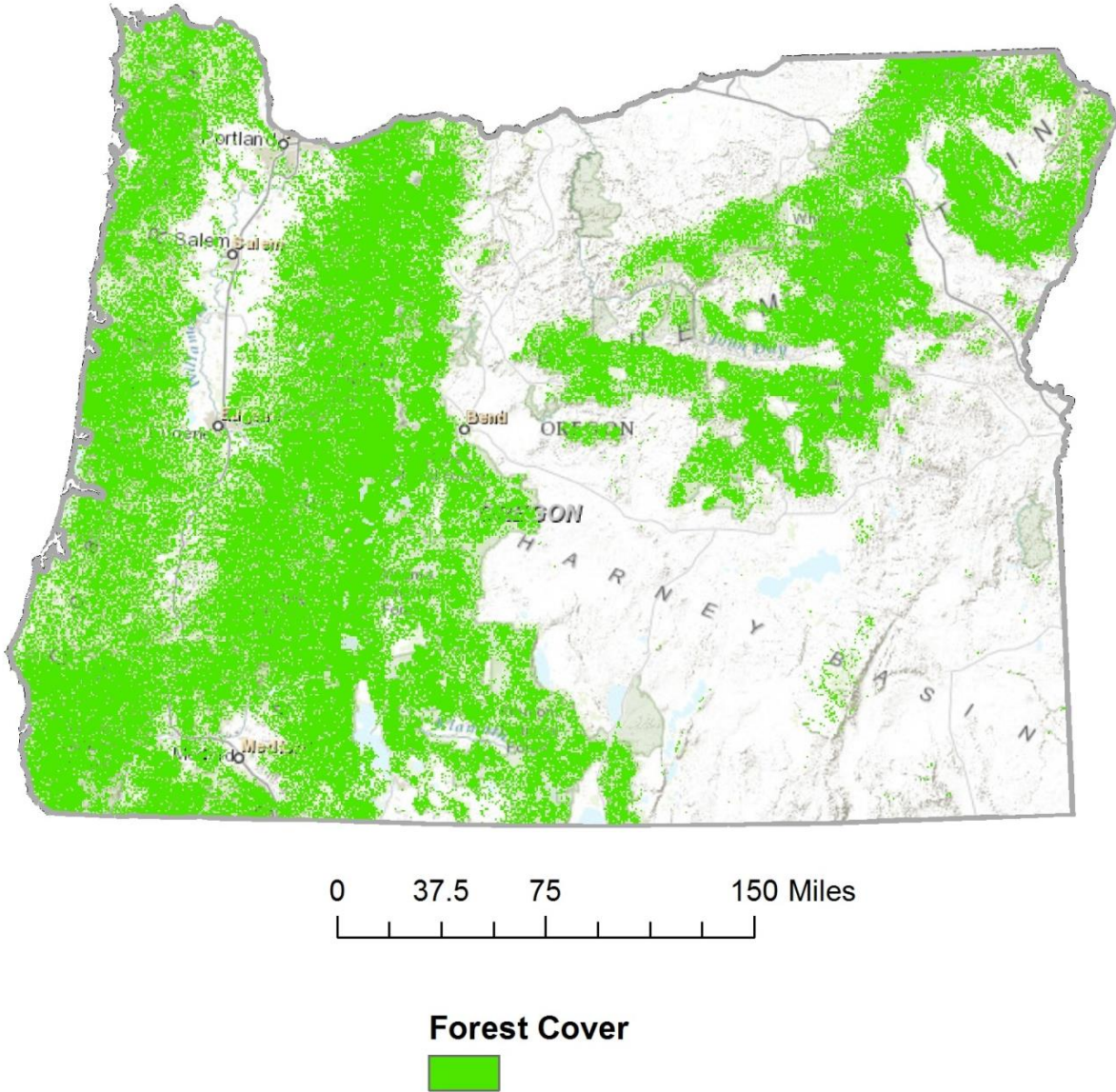
4

## 1 INTRODUCTION AND METHODS

2 As part of a biological status review of gray wolves (*Canis lupus*) in Oregon, we  
3 developed a map of potential wolf range in Oregon and calculated the amount of potential range  
4 currently occupied by wolves. To develop our map of potential wolf range, we used landscape  
5 predictor variables similar to Larsen and Ripple (2006) who predicted wolf abundance and  
6 distribution in Oregon from wolf data collected in other states. Our approach was to create a  
7 simple 1-category map at a coarse resolution (1 km<sup>2</sup>), indicating where wolves could potentially  
8 occur in Oregon. The 5 main predictors of wolf habitat from previous research are 1) forested  
9 areas (Mladenoff et al. 1995, Larsen and Ripple 2006, Oakleaf et al. 2006, Benson et al. 2015),  
10 2) public ownership (Mladenoff et al. 1995, Carroll et al. 2003, Larsen and Ripple 2006), 3)  
11 prey availability (Mech and Peterson 2003, Peterson and Ciucci 2003, Larsen and Ripple 2006,  
12 Oakleaf et al. 2006), 4) low human presence (Belongie 2008), and 5) low road density (Mech et  
13 al. 1988, Kohn et al. 2001, Carroll et al. 2003, Larsen and Ripple 2006, Belongie 2008,  
14 Zimmermann et al. 2014, Benson et al. 2015). We used all these predictors for Oregon, except  
15 public ownership, because data from Oregon indicate that wolves use both private and public  
16 lands with forested cover. Our mapping process included extracting and merging spatial data  
17 related to land cover type, elk ranges, human population density, road density, cultivated or other  
18 land types altered by humans. A short description of each data source and steps used to develop  
19 a potential wolf range map follows.

### 20 Potential Wolf Range

21 *Forested Areas* – We obtained land cover data for Oregon from the National Land Cover  
22 Database (NLCD, Jin et al. 2013). We generalized the original data set from a 0.09 km<sup>2</sup>  
23 resolution to 1.0 km<sup>2</sup> resolution (1000-m x 1000-m cell size). We then extracted land cover  
24 types identified as forested (Fig. 1). We buffered these forested areas by 2,000 meters to include  
25 forest edge habitats that we expect are used by wolves.

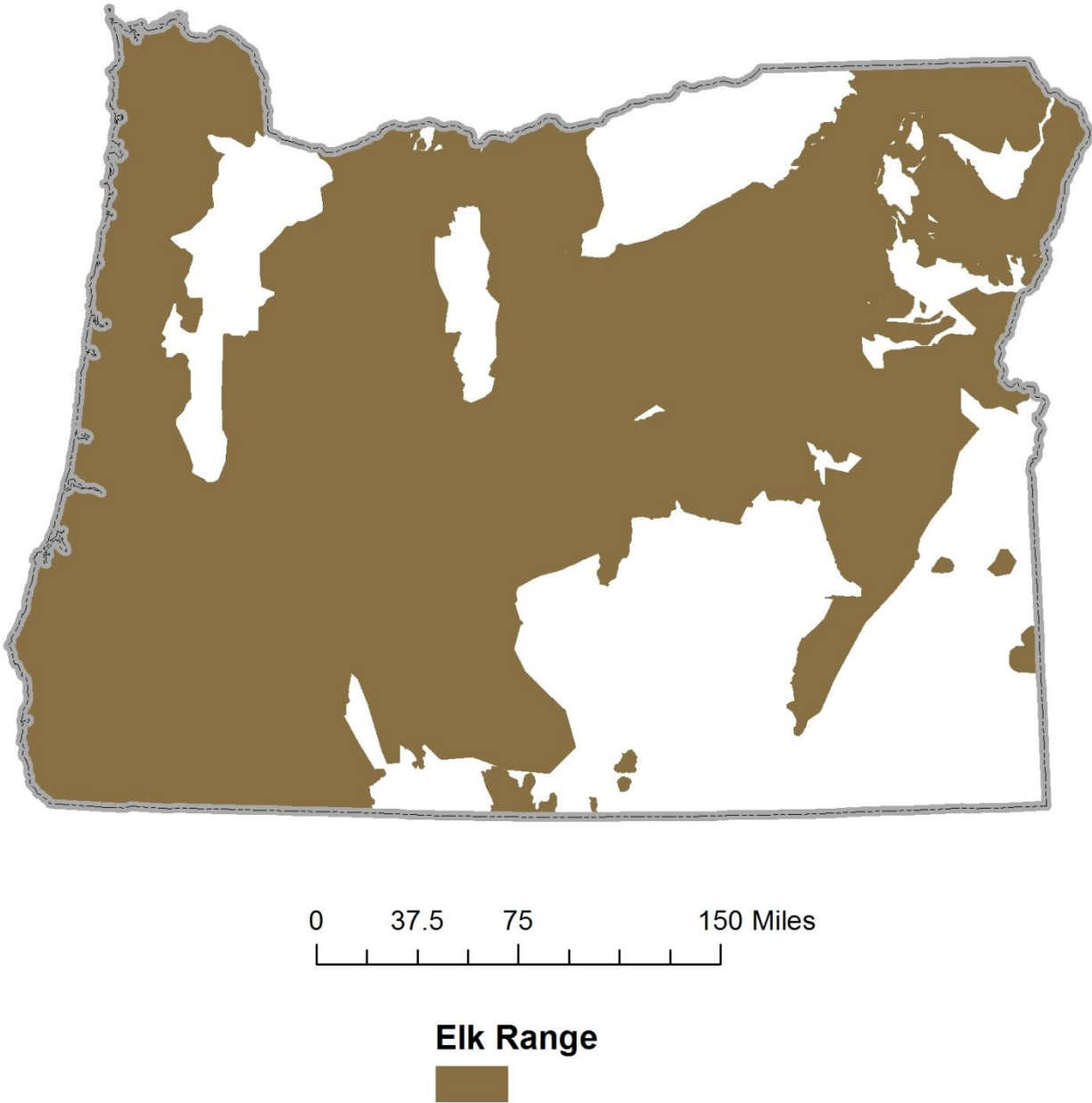


1

2 **Figure 1.** Distribution of forested land cover types, generalized to a 1 km<sup>2</sup> resolution, in Oregon. Data obtained  
3 from the National Land Cover database.

4

5 *Elk Ranges* – The second step of our analysis accounted for prey availability. Where elk and  
6 wolves coexist, elk serve as the primary prey for wolves (Mech and Peterson 2003).  
7 Consequently, we used elk range maps (Fig. 2, ODFW and Rocky Mountain Elk Foundation,  
8 unpublished data) as a surrogate for prey availability. We did not account for deer ranges in our  
9 analysis because deer are present in all elk ranges. Furthermore, we did not account for quality  
10 of deer and elk habitat or abundances of deer and elk within defined range boundaries. We  
11 overlaid elk ranges with our map of forested areas, keeping only areas where both forested areas  
12 and elk range overlapped. The subsequent map was retained for further analysis.



1

2 **Figure 2.** Boundaries of elk range in Oregon. Data were obtained from maps developed by the Oregon Department  
3 of Fish and Wildlife and Rocky Mountain Elk Foundation.

1 Contracted Range

2 Once we identified potential wolf range we then identified “contracted range”, areas no longer  
3 available to wolves because they are dominated by human habitation, roads, or agriculture.

4 *Human Population* – We obtained human population information from U. S. Census block data  
5 (Oregon Geospatial Enterprise Office 2015) and we calculated human density across Oregon.  
6 We extracted areas with human densities  $> 4$  humans / km<sup>2</sup> (Belongie 2008) and we applied a  
7 buffer of 1600-m around these areas.

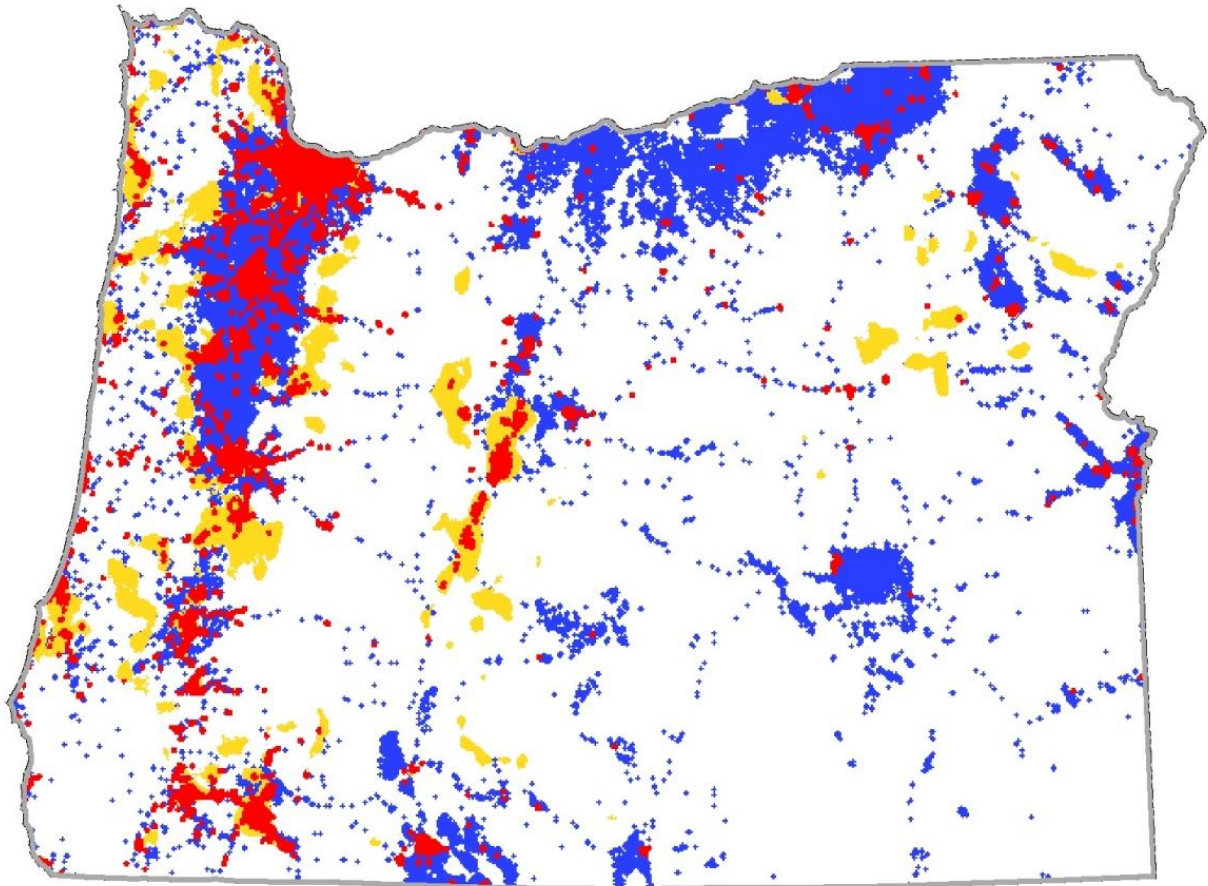
8 *Road Density* - We calculated road density from publically available data (Bureau of Land  
9 Management 2015). We used areas of known wolf activity (AKWA) in Oregon to estimate a  
10 threshold value of road density above which wolves did not currently occur. Our analysis  
11 suggested wolves did not currently occur in areas where road densities exceeded 3.5 km of road/  
12 km<sup>2</sup>.

13 *Developed, cultivated, and pasture lands* – We extracted land types from the NLCD layer  
14 identified as developed, cultivated, or hay/pasture and we applied a buffer of 1,000 meters  
15 around these areas.

16 We combined all the above described areas that were impacted by human activities to identify  
17 contracted range. In total, contracted range represented approximately 24.2% (60,746 km<sup>2</sup>) of  
18 the total land area in Oregon (Fig. 3).

19 Contiguous Potential Range

20 After removing areas of contracted range, we then removed contiguous areas of potential  
21 range  $< 500$  km<sup>2</sup>, which was the mean territory size of wolf packs in the Greater Yellowstone  
22 Ecosystem (Carroll et al. 2003). We took this approach to remove small, isolated patches of  
23 potential range that would not be capable of supporting a pack of wolves. In Oregon, mean  
24 territory size of 13 wolf packs determined from GPS locations was 1,030 km<sup>2</sup>. Consequently,  
25 our final map of potential wolf range (Fig. 4) is conservative because it includes areas of  
26 potential range smaller than the currently observed territory sizes of wolves in Oregon.



0 37.5 75 150 Miles

Population Density >4 / sq km



Road Density > 3.5 km / sq km



Cultivated or Developed Land



1

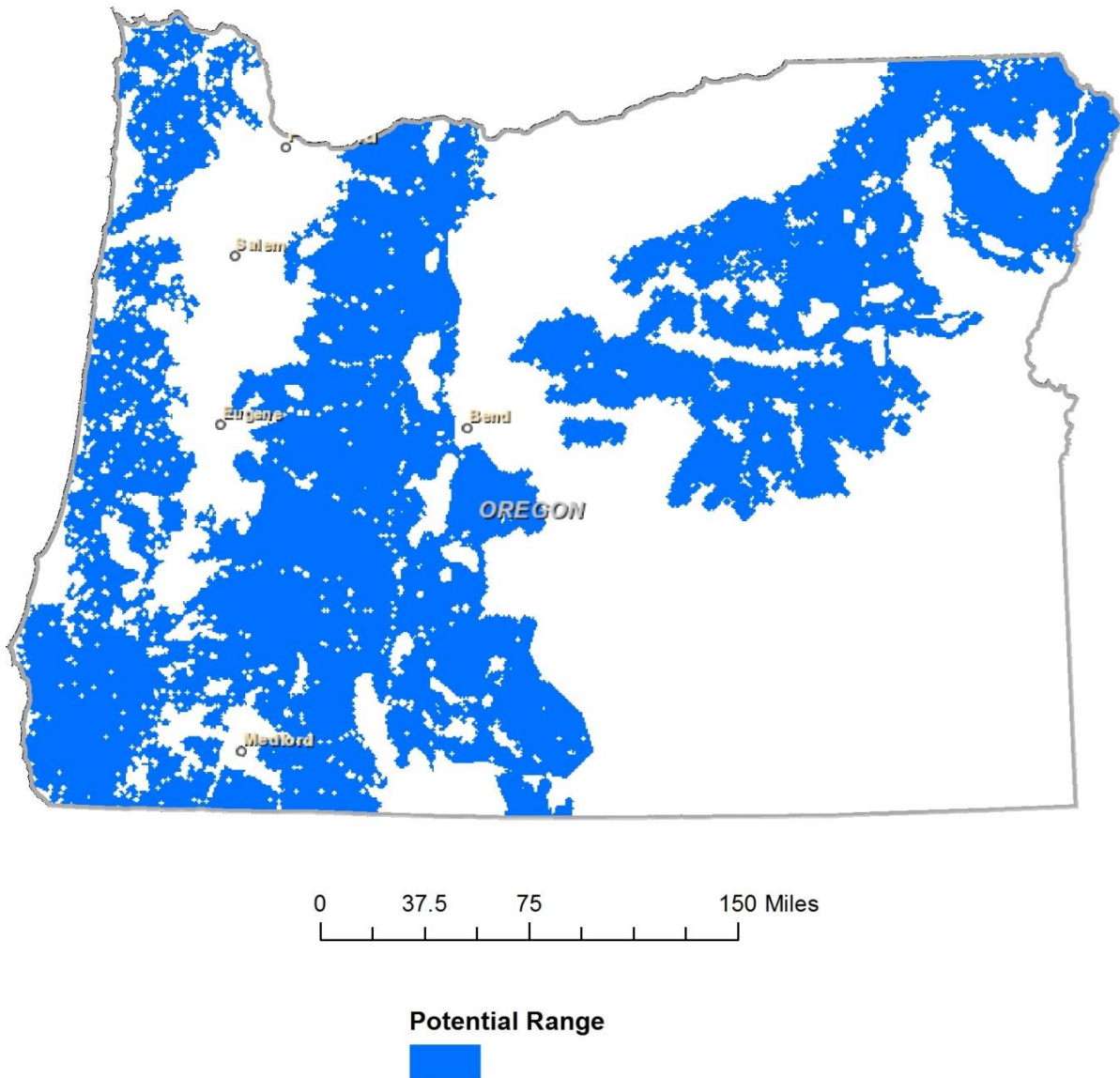
2 **Figure 3.** Distribution of contracted range, separated by human activities that prevent the area from being classified  
3 as potential wolf range.

4

5

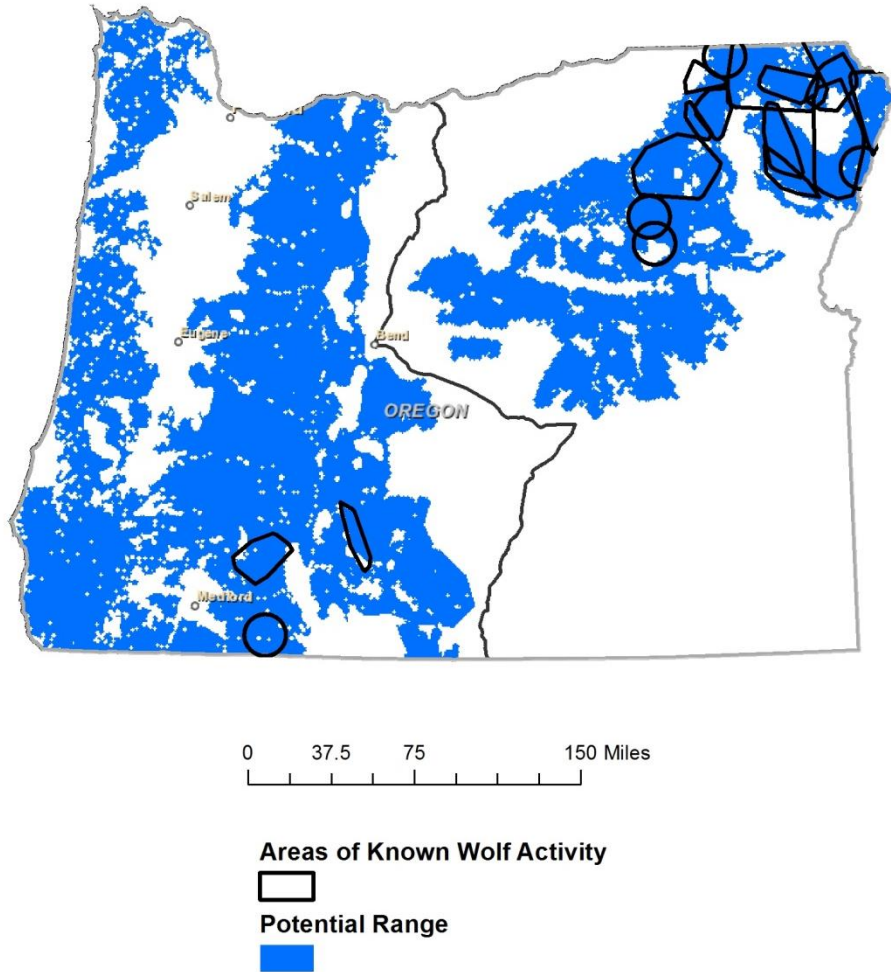
1 **RESULTS AND SUMMARY**

2 Our mapping process identified 106,853 km<sup>2</sup> of potential wolf range in Oregon (Fig. 4;  
3 Table 1). Overlaying AKWAs with our potential range map suggested our map corresponded  
4 well with known wolf distributions (Fig. 5). The exception is an area used by the Imnaha and  
5 Chesnimnus packs in northeast Oregon, whose AKWAs encompasses a large area of non-  
6 forested habitat known as the Zumwalt Prairie. This area is a remnant prairie which is  
7 productive and remote enough to support large elk herds in a non-forested environment.  
8 However, this habitat type is not present in significant amounts elsewhere in Oregon.



9  
10  
11

**Figure 4.** Distribution of potential wolf range in Oregon as determined by spatial analysis conducted by Oregon Department of Fish and Wildlife.



1

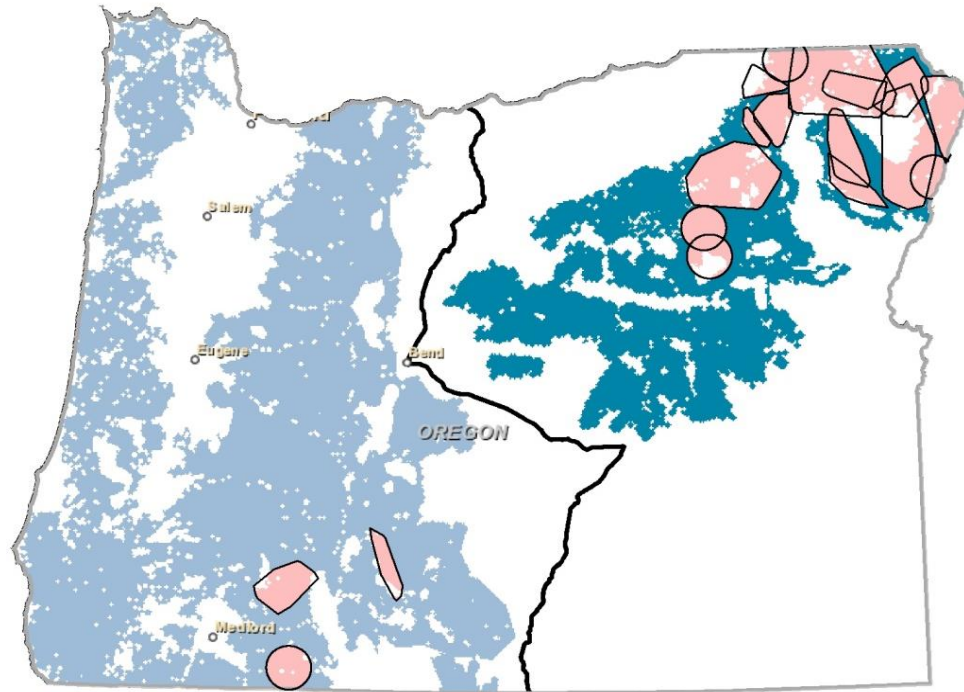
2 **Figure 5.** Current distribution of areas of known wolf activity compared to potential wolf range in Oregon.

**Table 1.** Summary of area of potential wolf range by wolf management zone in Oregon and amount of potential range currently occupied by wolves.

Management zone	Potential range (km <sup>2</sup> )	Currently occupied range (km <sup>2</sup> )
West	71,011	1,909
East	35,842	11,313
Total	106,853	13,222

3

4 Our map of potential wolf range indicates more potential range occurs in the west  
 5 management zone (71,011 km<sup>2</sup>) than the east management zone (35,842 km<sup>2</sup>). Currently, wolves  
 6 occupy 31.6% of potential wolf range in the east management zone (11,313 km<sup>2</sup> out of 35,842  
 7 km<sup>2</sup> of potential range; Fig. 6). In contrast, wolves currently occupy approximately 2.7% of  
 8 potential range in the west management zone (1,909 km<sup>2</sup> out of 71,011 km<sup>2</sup> of potential range).



0 37.5 75 150 Miles

**Wolf Management Zone Boundary**



**Areas of Known Wolf Activity**



**Potential Range**



**Overlap Areas**



1

2 **Figure 6.** Potential wolf range by wolf management zone and currently occupied potential range in Oregon.

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