

WASHINGTON GRAY WOLF CONSERVATION AND MANAGEMENT 2016 ANNUAL REPORT

A cooperative effort by the Washington Department of Fish and Wildlife, Confederated Colville Tribes, Spokane Tribe of Indians, USDA-APHIS Wildlife Services, and U.S. Fish and Wildlife Service



Photo: WDFW

This report presents information on the status, distribution, and management of wolves in the State of Washington from January 1, 2016 through December 31, 2016.

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EXECUTIVE SUMMARY

Gray wolves (*Canis lupus*) were classified as an endangered species in Washington under the provisions of the Endangered Species Act (ESA) in 1973. In 2011, wolves in the eastern third of Washington were removed from federal protections under the ESA. Wolves in the western two-thirds of Washington continue to be protected under the ESA and are classified as an endangered species under federal law.

In December 2011, the Washington Department of Fish and Wildlife (WDFW) Commission formally adopted the Wolf Conservation and Management Plan to guide recovery and management of gray wolves as they naturally recolonize the State of Washington. At present, wolves are classified as an endangered species under state law (WAC 232-12-014) throughout Washington regardless of federal status. Washington is composed of three recovery areas which include Eastern Washington, the Northern Cascades, and the Southern Cascades and Northwest Coast. The WDFW is the primary agency responsible for managing wolves in the Eastern Washington recovery area while WDFW works under a section 6 agreement with U.S. Fish and Wildlife Service (USFWS) in the federally listed portion of the state. Wolves that inhabit tribal lands in the Eastern Washington recovery area are managed by those specific tribal entities.

The minimum estimated wolf population in Washington increased by approximately 28% over 2015 estimates to at least 115 known wolves in 20 known packs including at least 10 breeding pairs. Pack size ranged from 2 to 13 and averaged 5.1 wolves per pack. During 2016 tribal, state, and university biologists captured 15 wolves (14 new wolves and 1 recapture) from 10 different packs and monitored a total of 25 unique radio collared wolves from 13 different packs, in addition to 1 lone wolf with no pack affiliation. WDFW documented 14 mortalities during the year with causes of mortality including agency removal ($n = 7$), legal harvest ($n = 3$), other human-caused ($n = 2$), and unknown/under investigation ($n = 2$).

Wolf populations were managed to ensure progress towards recovery goals while also minimizing chronic loss of livestock caused by wolves. Statewide, WDFW investigators confirmed 9 cattle were killed by wolves and an additional 6 were classified as probable wolf-kills. Six cattle were confirmed to have been injured by wolves while 1 injury to a dog was classified as probable. Four packs (20% of known packs) were involved in at least 1 confirmed livestock mortality. Seven wolves were lethally removed through agency actions during 2016. The WDFW processed 6 claims and paid a total of \$20,037.45 to compensate livestock producers who experienced direct livestock losses caused by wolves. In 2016, the Livestock Review Board recommended payments in full to two claimants and WDFW subsequently paid a total of \$65,648.19 for indirect losses possibly caused by wolves.

ACKNOWLEDGMENTS

Wolf management in Washington is a cooperative effort by the Washington Department of Fish and Wildlife (WDFW), Colville Confederated Tribes (CCT), the Spokane Tribe of Indians (STOI), USDA-APHIS Wildlife Services (WS), and the U.S. Fish and Wildlife Service (USFWS). WDFW personnel who played a primary role during 2016 include WDFW Director Jim Unsworth, former Wildlife Program Assistant Director Nate Pamplin, Wildlife Program Assistant Director Eric Gardner, former Game Division Manager and Deputy Assistant Director of Wildlife Mick Cope, former Carnivore Section Manager and Game Division Manager Anis Aoude, Conflict Section Manager Stephanie Simek, and Wolf Policy Lead Donny Martorello. Other WDFW personnel who assisted with wolf recovery and management efforts included Chris Anderson, David Anderson, Mike Atamian, Dana Base, Rich Beausoleil, Candace Bennett, Jeff Bernatowicz, Eric Boyd, Joe Bridges, James Brown, Cole Caldwell, Colleen Chandler, Treg Christopher, John Cotton, Jason Day, Paul DeBruyn, Jason Earl, Chris Erhardt, Severin Erickson, Scott Fitkin, John Gallie, Graham Grant, Morgan Grant, Ellen Heilhecker, Jeff Heinlen, Eric Holman, Ryan John, Sandra Jonker, Brian Kertson, Sarah Kindschuh, Keith Kirsch, Danyl Klump, Russell Link, Mike Livingston, Carrie Lowe, Madonna Luers, Ben Maletzke, Richard Mann, Kristin Mansfield, Joey McCanna, Troy McCormick, Scott McCorquodale, Tara Meyer, Matt Monda, William Moore, Paul Mosman, Brian Murphie, Eric Oswald, Nick Parkert, Matt Peterson, John Pierce, Steve Pozzanghera, Annemarie Prince, Dan Rahn, Scott Rasley, Kevin Robinette, Ella Rowan, Ralf Schreiner, Nicole Stephens, Pam Taylor, Michelle Tirhi, Mark Vekasy, Dave Volson, Robert Waddell, Don Weatherman, Steve Wetzel, Paul Whelan, Paul Wik, Gary Wiles, and Fenner Yarborough.

Numerous other agencies and agency personnel played a key role in wolf management efforts in Washington. In particular, we would like to thank personnel from the USFWS including Eric Rickerson, Jerry Cline, Mike Jimenez (retired), Manisa Kung, Gregg Kurz, Eric Marek, Mike Munts, and Corky Roberts (retired); WS personnel including Roger Woodruff (retired), Mike Linnell, Terry Smith, Chad Heuser, and Wade Jones; CCT personnel including Randy Friedlander and Eric Krausz; STOI personnel including Billy Joe Kieffer and Savannah Walker; the U.S. Forest Service including Elizabeth Berkley, Mike Borysewicz, John Chatel, Travis Fletcher, Chris Loggers, Monte Kuk, Ray Robertson, John Rohrer, Rodney Smoldon, and Aja Woodrow; the Washington Department of Natural Resources including Dan Boyle, Matt Fromherz, Andrew Hayes, Scott Fisher, Danielle Munzing, and Jeff Wolf; the National Park Service including Roger Christophersen; the U.S. Air Force including Todd Foster and Major J.B. Marshal; and Leo DeGroot of British Columbia Ministry of Forests, Lands, and Natural Resource Operations.

We would also like to thank the many members of the public who provided wolf observation reports and the numerous private landowners in Washington for their cooperation.

Finally, we sincerely appreciate the safe piloting and aerial telemetry skills of Dave Parker of Northern Air (Bonners Ferry, ID), Jim Pope of Leading Edge Aviation (Clarkston, WA), and Jess Hagerman of Northwest Helicopters (Olympia, WA).

Although we could not list every single person that was involved with wolf recovery and management efforts in Washington, for those not listed, we also thank you for your efforts and patience.

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INTRODUCTION

Definitions

Two terms often used when discussing gray wolves (*Canis lupus*) and wolf management are “pack” and “breeding pair”. Although similar, “pack” is primarily used to evaluate the number of wolves on the landscape while “breeding pair” is an estimate of reproductive success and recruitment. A pack is defined as two or more wolves traveling together in winter and a breeding pair is defined as at least one adult male and one adult female wolf that raised at least two pups that survived until December 31. Thus, in any given year, the number of packs will always be greater than or equal to the number of breeding pairs.

Background

Historically, gray wolves were common throughout much of Washington, but numbers began to decline as human populations increased in the latter half of the 1800s. Encouraged by high prices for hides, bounties, and government sponsored predator control programs, wolves were believed to be extirpated from Washington by the 1930s. Sporadic reports of wolves were received over the next several decades, and increased during the 1990s to early 2000s, but no resident packs were documented during this time.

Dispersing wolves from increasing populations in Idaho, Montana, and British Columbia, Canada were likely responsible for the documented reports of wolves in northern Washington during the 1990s to early 2000s. It was not until 2008 that the first resident pack in the state since the 1930s was documented in Okanogan County in north-central Washington. Since that time, wolves have continued to naturally recolonize the state via dispersal from resident Washington packs and neighboring states and provinces.

Federal Status

Gray wolves in Washington acquired federal protections under the Endangered Species Act (ESA) in 1973. When the U.S. Fish and Wildlife Service (USFWS) completed the Northern Rocky Mountain (NRM) Wolf Recovery Plan in 1987, only the states of Idaho, Montana, and Wyoming were included. In 2007, the USFWS published a final rule designating the NRM population of gray wolves as a Distinct Population Segment (DPS). The eastern third of Washington was included in the NRM DPS designation to account for dispersing wolves from populations in Idaho and Montana; however, federal recovery requirements were only applicable to those states in the original NRM Wolf Recovery Plan. To date, no federal wolf recovery requirements have been developed for Washington.

In 2008, the USFWS published a final rule to remove wolves in the NRM DPS from ESA protection. This rule was later challenged in federal court and, consequently, wolves were placed back under federal protection. The USFWS again published a final rule to remove the NRM DPS wolf population, excluding Wyoming, from the protections of the ESA in 2009, but the rule was vacated by a federal judge in 2010 which again restored federal protections to wolves in the NRM DPS. In 2011, President Obama signed the Department of Defense and Full-

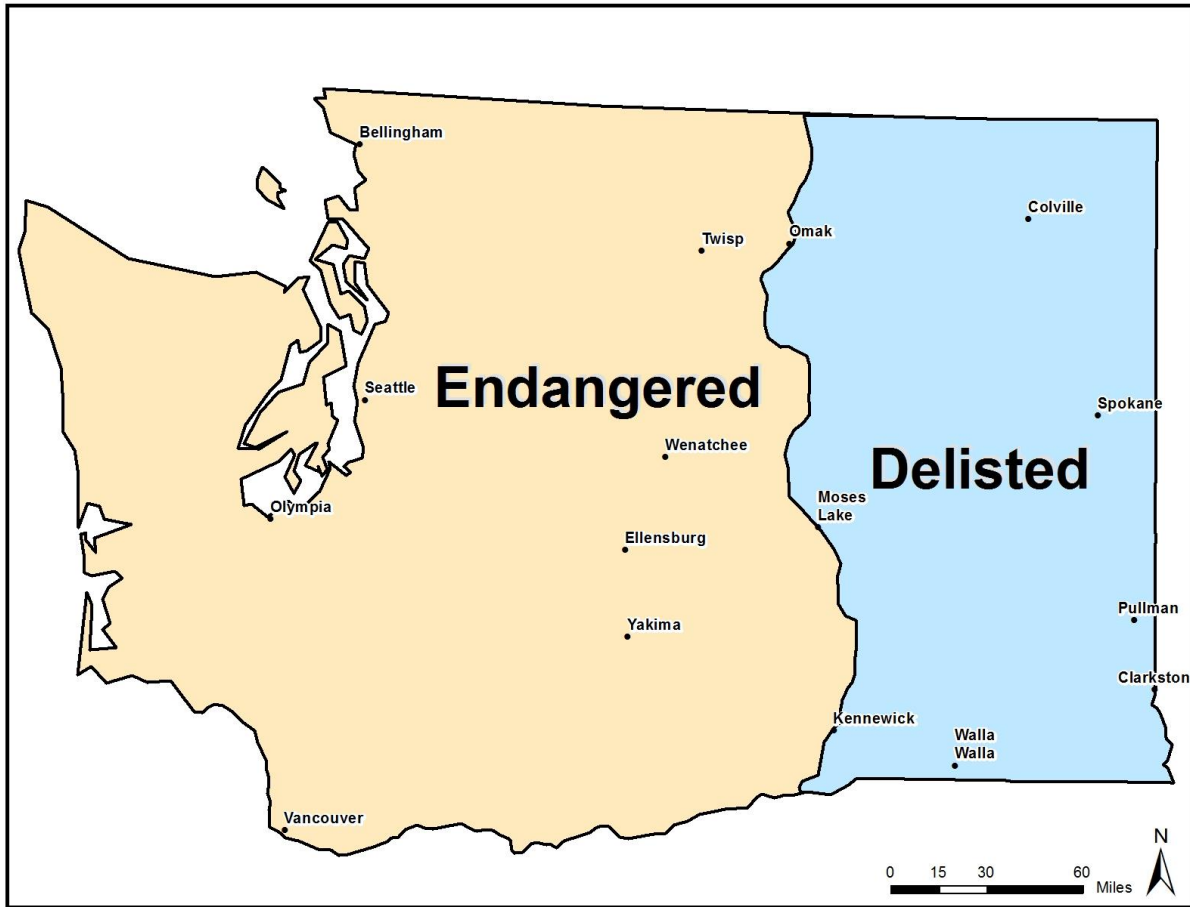


Figure 1. Federal classification of wolves in Washington State, 2016.

Year Appropriations Act, 2011; a section of which directed the Secretary of the Interior to reissue the 2009 delisting rule. As a result, wolves in the NRM DPS, including the eastern third of Washington, were once again removed from ESA protections.

Although wolves in the eastern third of Washington are no longer federally protected, wolves in the western two-thirds of the state continue to be protected under the provisions of the ESA and are presently classified as an endangered species under federal law (Figure 1). In 2013, the USFWS published a proposed rule to remove gray wolves from the list of endangered and threatened wildlife where they are currently federally protected. This rule also constituted the completion of a status review for gray wolves in the Pacific Northwest, proposed to maintain endangered status for the Mexican wolf (*Canis lupus baileyi*), and proposed to reclassify the Eastern wolf (*Canis lupus lycaon*) from a subspecies of the gray wolf to a species (*Canis lycaon*). The USFWS subjected the proposed rule to an independent expert peer review that was managed by the National Center for Ecological Analysis and Synthesis. The purpose of the peer review was to evaluate the proposed rule and determine if the best available science was used to evaluate the status of gray wolves. Results of the peer review were published in early 2014. As a result, the USFWS reopened the public comment period for the proposed rule so the public may be allowed to provide additional comment based on the results of the peer reviewed

document. To date, USFWS has not released a decision notice on the federal status of gray wolves.

State Status

In response to the expected dispersal of wolves into Washington from populations in surrounding states and provinces and the likely formation of resident packs, the Washington Department of Fish and Wildlife (WDFW) initiated the development of the Wolf Conservation and Management Plan for Washington (Plan). In 2007, the Director of WDFW appointed an 18 member working group to advise WDFW during plan development. After nearly five years of work, the WDFW Commission formally adopted the Plan in December 2011 to guide recovery and management of gray wolves as they naturally recolonize the state.

At present, wolves are classified as an endangered species under state law (WAC 232-12-014) throughout Washington regardless of federal classification. The Plan designates three recovery areas in the state that includes Eastern Washington, the Northern Cascades, and the Southern Cascades and Northwest Coast (Figure 2). The WDFW is the primary agency responsible for

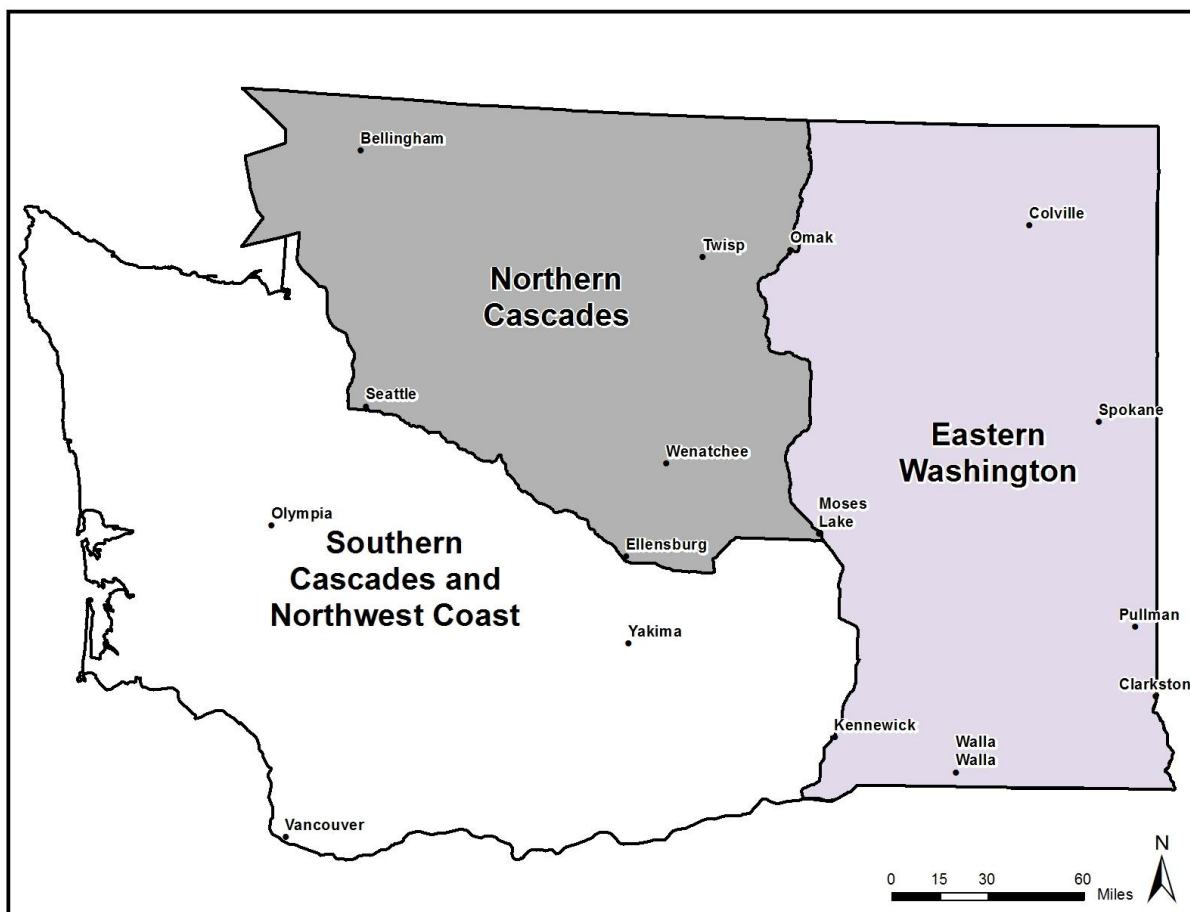


Figure 2. Washington wolf recovery areas as defined in the Wolf Conservation and Management Plan.

managing wolves in the Eastern Washington recovery area while WDFW works as a designated agent of the USFWS under a Section 6 agreement in the other two recovery areas. Wolves that inhabit tribal lands in the Eastern Washington recovery area are managed by those specific tribal entities.

The Plan allows for downlisting wolves from endangered to threatened status and threatened to sensitive status once specific criteria are met. However, the process of fully delisting wolves under state law will begin only when there are at least 4 successful breeding pairs in each recovery area plus an additional 3 breeding pairs anywhere in the state for three consecutive years; or when there are at least 4 successful breeding pairs in each recovery area plus an additional 6 breeding pairs anywhere in the state for a single year.

Funding

During calendar year 2016, WDFW spent a total of \$973,275 on wolf recovery and management activities (this does not include monies paid for Damage Prevention Cooperative Agreements, compensation, contracted range riders, or other contracts). Approximately 7% of the total budget was provided through federal grants, some of which required a state match. The remaining 93% of the budget was provided by state funds which came from a combination of additional fees for the registration of personalized and endangered species license plates and legislative funding.

POPULATION MONITORING

Monitoring Techniques

Wolf monitoring activities occur year-round and include direct observational counts either from the ground or the air, track surveys, and remote camera surveys. Biologists use a variety of monitoring techniques to evaluate pack size and reproductive success, identify pack territories, monitor movements and dispersal events, identify new areas of possible wolf activity, and mitigate conflicts with livestock. Although WDFW uses a variety of techniques to detect and document wolves across the state, it is possible that some wolves may have been present in areas that were surveyed, but simply avoided detection.

Counting the total number of wolves on the landscape can be challenging, if not impossible, so biologists use a combination of the above techniques to derive a minimum number that is known to exist at the end of each calendar year. Lone wolves were accounted for when reliable information was available. Because lone wolves are difficult to document and they account for between 10-15% of the known winter population (Mech and Boitani 2003¹, page 170), our minimum known count was multiplied by 0.125 to account for solitary and undetected wolves on the landscape. Thus, our estimates of total wolf numbers and reproductive success (e.g., breeding pair status) were likely conservative and the actual number of wolves in Washington may be slightly higher. Suspected wolf packs were those that could not be verified with confidence and they were not included in the reported minimum known estimates. If evidence collected during the most recent calendar year suggested that packs and/or breeding pairs were present on the landscape the previous year, our estimates (e.g., total number, packs, breeding pairs) will be updated to reflect this new information. This means that numbers from past reports are subject to change and may differ from numbers included in the most recent annual report.

Population Status and Distribution

As of 31 December 2016, the minimum estimate of wolves in Washington increased by approximately 28% over the 2015 minimum estimate and was composed of at least 115 wolves (Figure 3) in 20 known packs (Table 1, Figure 4). Pack size ranged from 2 to 13 and averaged 5.1 wolves per pack. Two new packs, Sherman and Touchet, were documented in 2016. Both packs are located in the Eastern Washington recovery area.

Reproduction was documented in 13 packs during 2016 and, as of 31 December 2016, 10 of those packs were considered successful breeding pairs (Table 1, Figure 5). A minimum count of 35 pups survived to the end of the calendar year.

During 2016, wolves continued to inhabit a mix of both public and private lands from eastern Washington to the east slopes of the Cascade Mountains (Figure 6). The estimated mean home range size of 14 packs with known territories was approximately 354 mi² (917 km²) and ranged from an estimated 120 mi² (312 km²) to 635 mi² (1,644 km²).

¹ Mech, L.D. and L. Boitani. 2003. *Wolves: Behavior, Ecology, and Conservation*. The University of Chicago Press. Chicago, Illinois, USA.

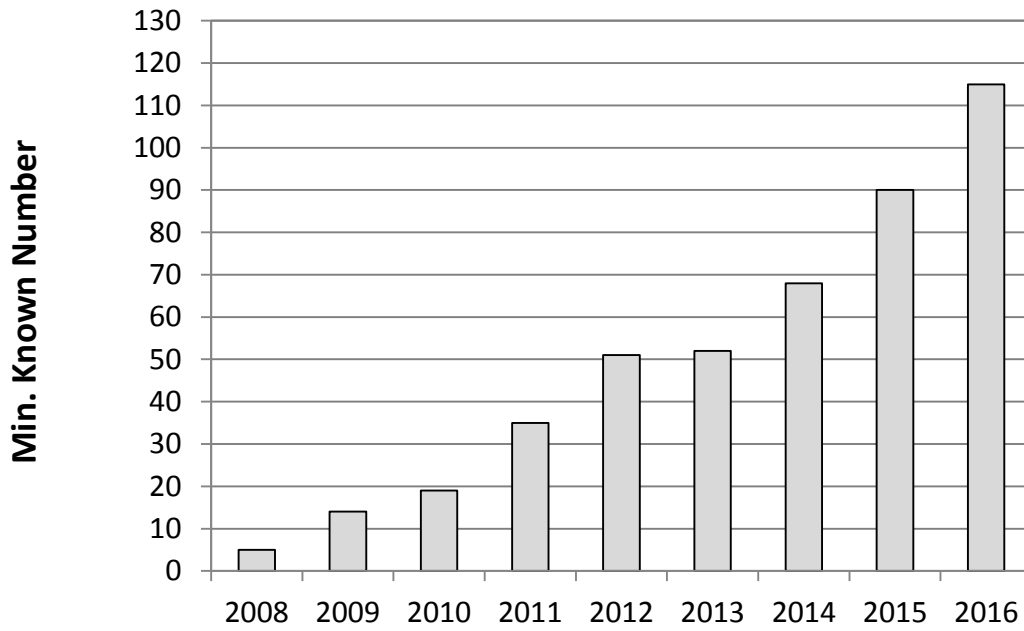


Figure 3. Minimum known number of wolves in Washington, 2008 – 2016.

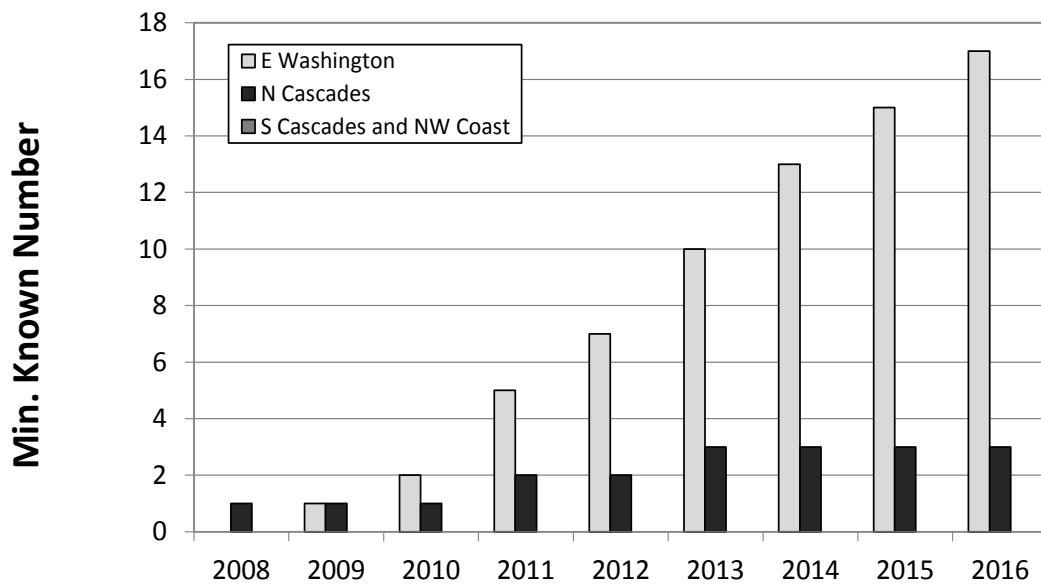


Figure 4. Minimum known number of packs by recovery area in Washington, 2008 – 2016.

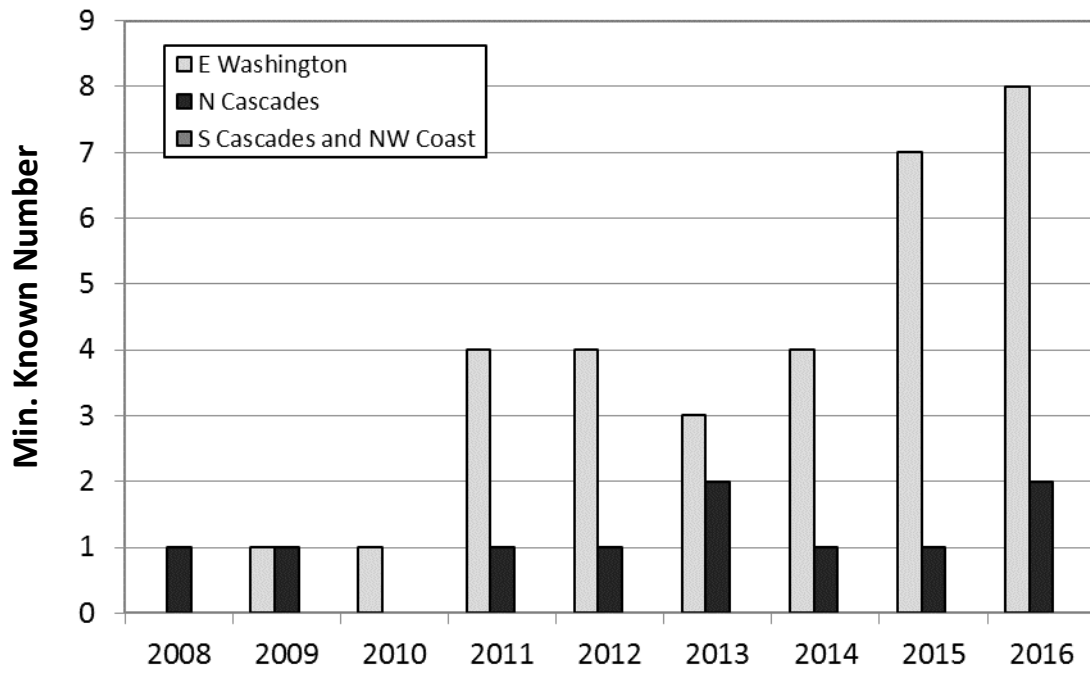


Figure 5. Minimum known number of breeding pairs by recovery area in Washington, 2008 – 2016.

Table 1. Known wolf packs in Washington by WDFW recovery area, minimum estimated size of known packs, documented mortalities, number of known wolves that dispersed, and number that went missing in 2016. Underlined packs were counted as breeding pairs. CCT = Colville Confederated Tribes.

Wolf Pack	Recovery Area	Minimum Known Pack Size Dec 2016	Documented Mortalities					Known	
			Natural	Human	Unkn	Harvest	Removal	Dispersed	Missing
Beaver Creek	E. Wash	4							
<u>Carpenter Ridge</u>	E. Wash	6							
<u>Dirty Shirt</u>	E. Wash	13			1				
<u>Goodman Meadows</u>	E. Wash	7							
Huckleberry	E. Wash	4				2		1	1
Lookout	N Cascades	3							
<u>Loup Loup</u>	N Cascades	8							
<u>Nc'icn (CCT)</u>	E. Wash	5							
Profanity Peak	E. Wash	4					7		
Salmo	E. Wash	3							
<u>Sherman</u>	E. Wash	5							
<u>Skookum</u>	E. Wash	5							
<u>Smackout</u>	E. Wash	8						1	
Stranger	E. Wash	4							
<u>Strawberry (CCT)</u>	E. Wash	7				1			
<u>Teaway</u>	N Cascades	5						1	
Touchet	E. Wash	2							
Tucannon	E. Wash	4		1					
Wedge	E. Wash	3							
Whitestone (CCT)	E. Wash	2							
Misc/Lone Wolves	Statewide	13		1	1				1
WASHINGTON TOTALS		115	0	2	2	3	7	3	2

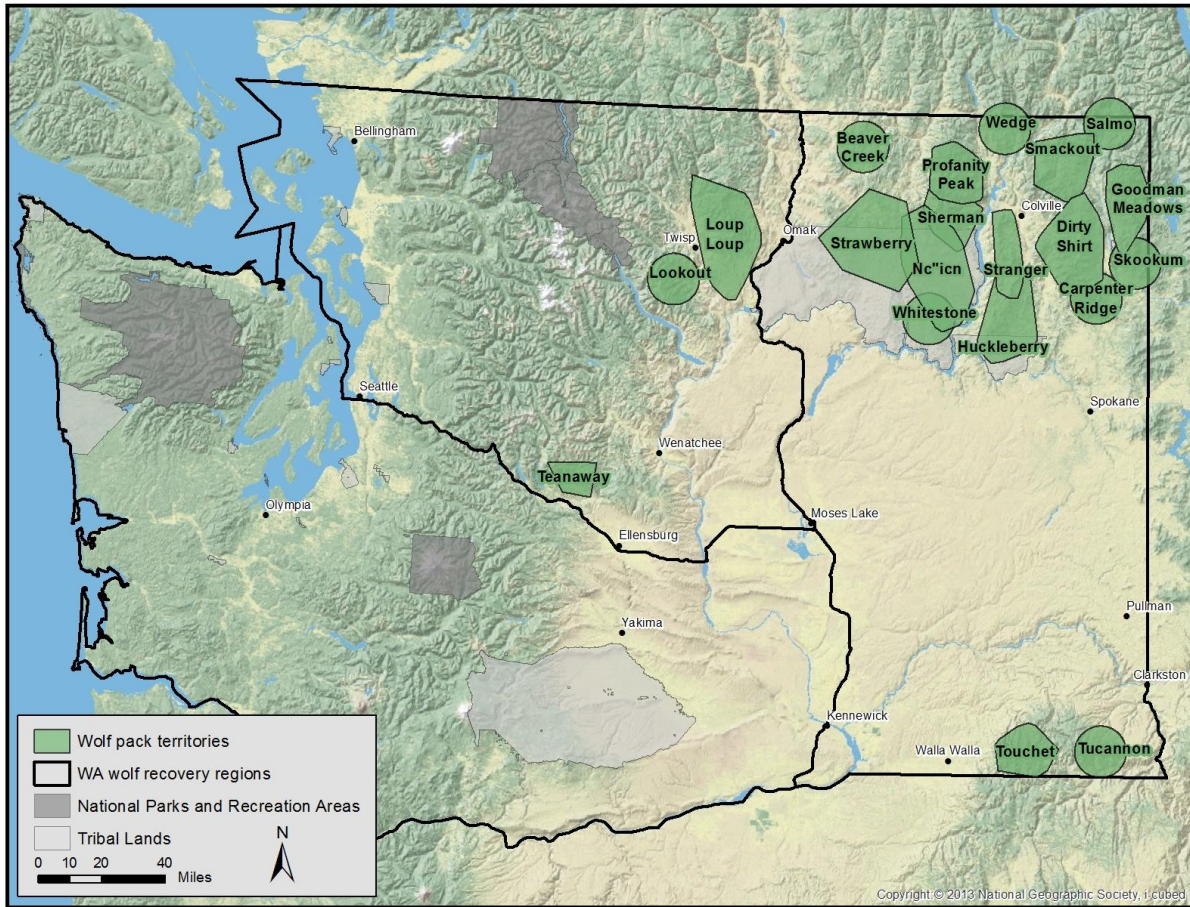


Figure 6. Known wolf packs and pack territories in Washington, 2016. Suspected packs and border packs from other states and provinces were not included.

Wolf Captures and Monitoring

In 2016, tribal, state, and university biologists captured 15 wolves (14 new wolves and 1 recapture) from 10 different packs. Eight adults, 5 yearlings, and 2 pups were captured, of which 6 were males and 9 were females. All captured wolves were fitted with either satellite or very high frequency (VHF) radio collars.

In 2016, state, federal, and tribal biologists monitored a total of 25 unique radio collared wolves (approximately 22% of the minimum known population) from 13 different packs (65% of known packs) and 1 wolf with no pack affiliation. Due to known mortalities, dispersals, planned and unplanned collar releases, and radio collar failures, biologists were actively monitoring 18 radio-collared wolves (approximately 16% of the minimum known population) from 11 different packs (55% of known packs) in Washington as of 31 December 2016.

Known Dispersals

Three known Washington wolves dispersed from their natal packs in 2016 (Table 1, Figure 7). A member of the Teanaway pack, 043f, traveled a straight-line distance of approximately 180 mi (290 km) north into southern British Columbia, Canada. A member of the Huckleberry pack, 054m, traveled a straight-line distance of approximately 396 mi (638 km) east into central Montana. A member of the Smackout pack, 065m, has traveled a straight-line distance of approximately 104 mi (168 km) southeast into the panhandle of north Idaho and his dispersal has not yet ended. One collared wolf from Oregon, OR35, dispersed a straight-line distance of approximately 18 miles (29km) into southeastern Washington and has remained within the state, forming the Touchet pack with an uncollared wolf.

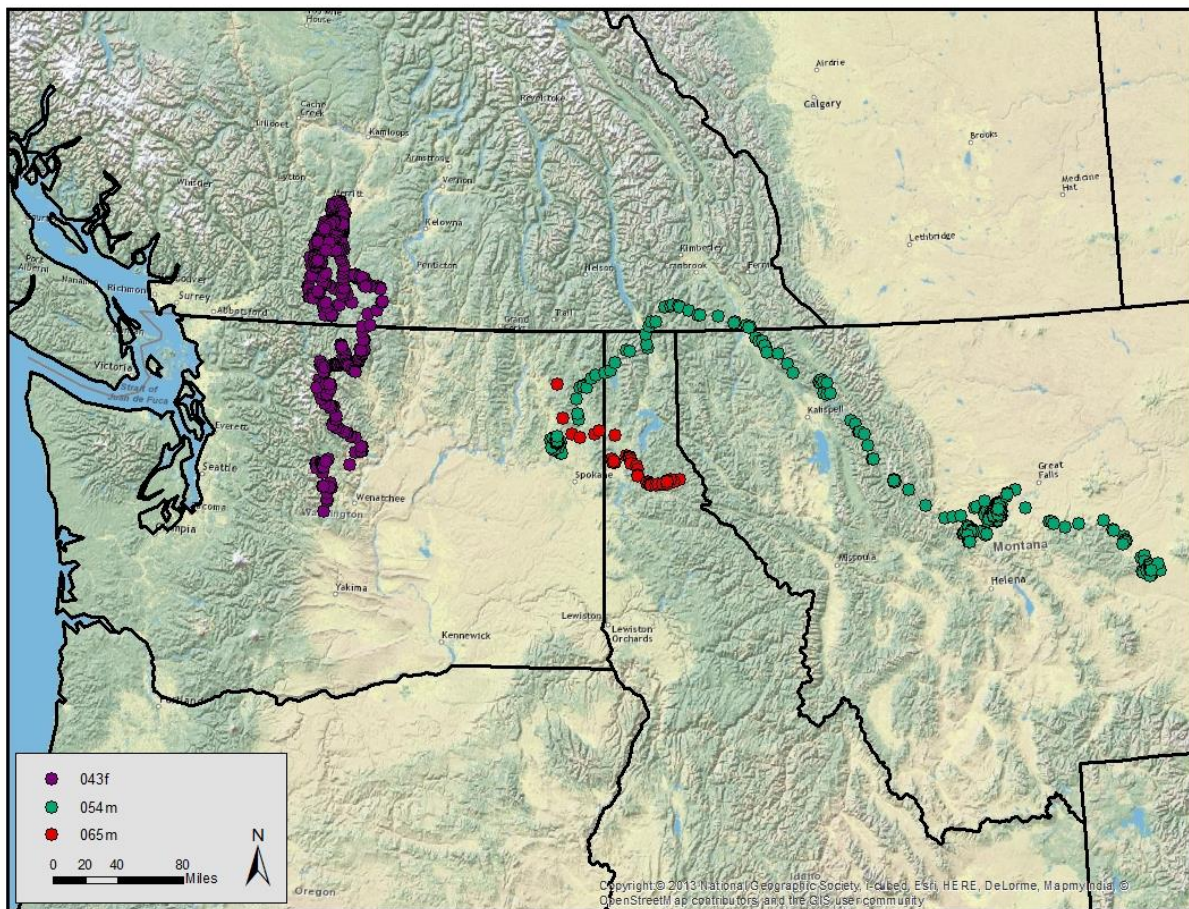


Figure 7. Known dispersers from known Washington packs, 2016.

Regulated Harvest

Regulated wolf harvest is allowed on Colville Confederated Tribal lands for tribal members only. The season runs from 1 August through 28 February and hunting is the only legal form of take. For the 2015/2016 season, a harvest limit of 3 wolves was set for 4 of 7 tribal wolf management zones (WMZ; total quota = 12 wolves). Any WMZ meeting the harvest limit will close immediately while the remaining WMZs will remain open until the end of the season or when the harvest limit is reached. No wolves were legally harvested during the 2015/2016 season. For the 2016/2017 season, the WMZs were abolished and a total quota of 3 wolves was set for the entirety of the south half of the reservation while no regulated harvest was allowed on the north half. One wolf was legally harvested during the first half of the 2016/2017 season (Table 1).

Regulated wolf harvest is allowed on the Spokane Indian Reservation for tribal members only. Wolf seasons are open year-round or until a harvest quota of 6 wolves is reached within the calendar year, at which time the season will close. Trapping and/or snaring is allowed by special permit only. Two wolves were legally harvested on the Spokane Indian Reservation in 2016 (Table 1). No regulated harvest occurred in Washington outside of the Colville and Spokane Indian Reservations in 2016.

Mortalities

A total of 14 wolves were known to have died in Washington during 2016 (Table 1). Causes of mortality included agency removal ($n = 7$), legal harvest ($n = 3$), other human-caused ($n = 2$), and unknown/under investigation ($n = 2$). In addition to known mortalities that occurred in Washington, one wolf originally captured in the state was lethally removed during agency actions in Montana and was included in their mortality totals for 2016.

MANAGEMENT

Livestock Depredations

Potential livestock depredations in Washington were investigated by personnel from WDFW and USDA-Wildlife Services with some assistance by deputies from local County Sheriff's Departments. Reported wolf-caused livestock depredations were classified as confirmed, probable, confirmed non-wild wolf, unconfirmed depredation, non-depredation, or unconfirmed cause of death based on specific criteria outlined in the Wolf Conservation and Management Plan for Washington (Plan).

The following livestock depredation statistics were based on reported livestock injuries and mortalities and do not reflect lost or missing livestock. Confirmed livestock mortalities caused by wolves in Washington included at least 9 cattle (Figure 8); investigators also confirmed 6 cattle as being injured by wolves (Table 2). Six additional cattle were classified as probable wolf-caused mortalities and 1 dog injury was classified as probable wolf. Most livestock mortalities occurred during the summer grazing season (Figure 9).

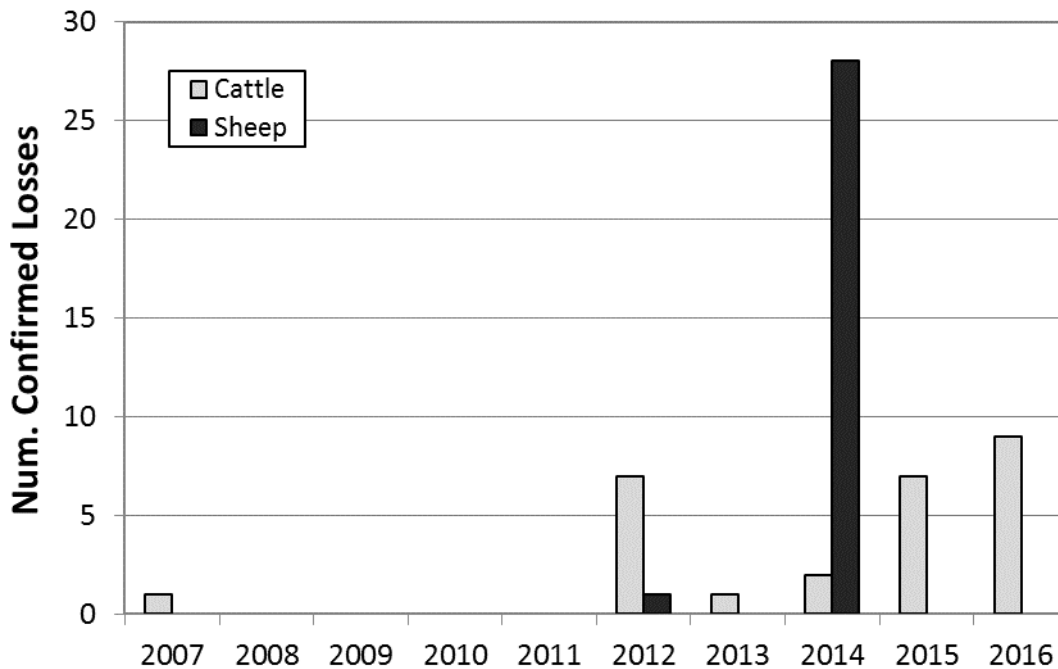


Figure 8. Total number of confirmed wolf-caused livestock losses in Washington, 2007 – 2016.

Table 2. Confirmed wolf-caused livestock and dog injuries and mortalities in Washington, 2013 – 2016.

	2013		2014		2015		2016	
	Injuries	Mortalities	Injuries	Mortalities	Injuries	Mortalities	Injuries	Mortalities
Cattle	0	1	2	2	0	7	6	9
Sheep	0	0	6	28	0	0	0	0
Other	0	0	0	0	0	0	0	0
Dogs	3	0	1	0	1	0	0	0
Total	3	1	9	30	1	7	6	9

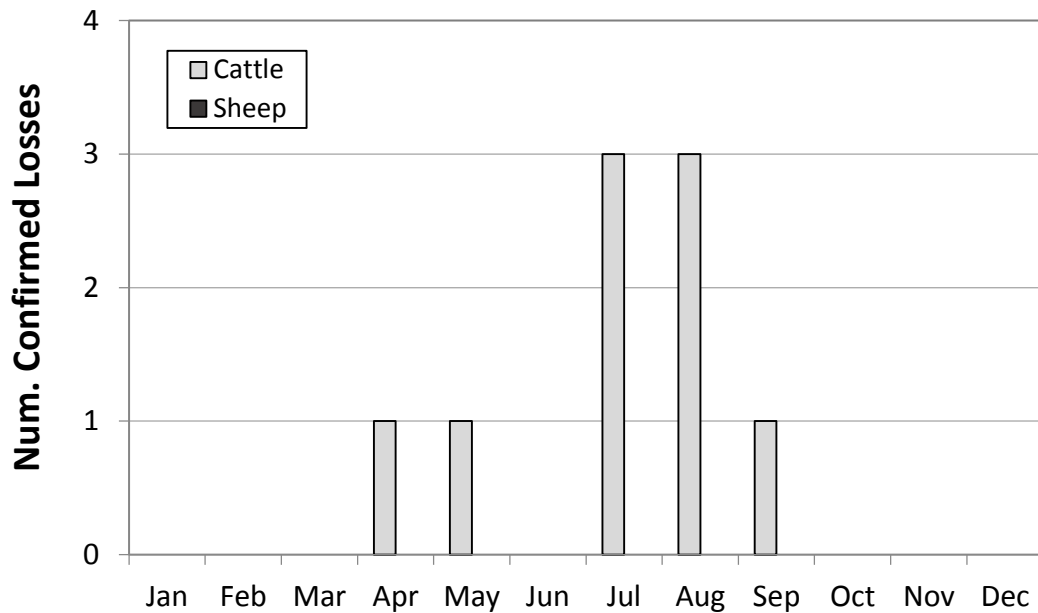


Figure 9. Number of confirmed wolf-caused livestock losses by month in Washington, 2016.

Number of Packs Involved in Livestock Depredations

Four of the 20 (20%) known packs that existed in Washington at some point during 2016 were involved in at least 1 confirmed livestock mortality (Figure 10). A known lone wolf was responsible for one additional confirmed cattle mortality investigated in 2016.

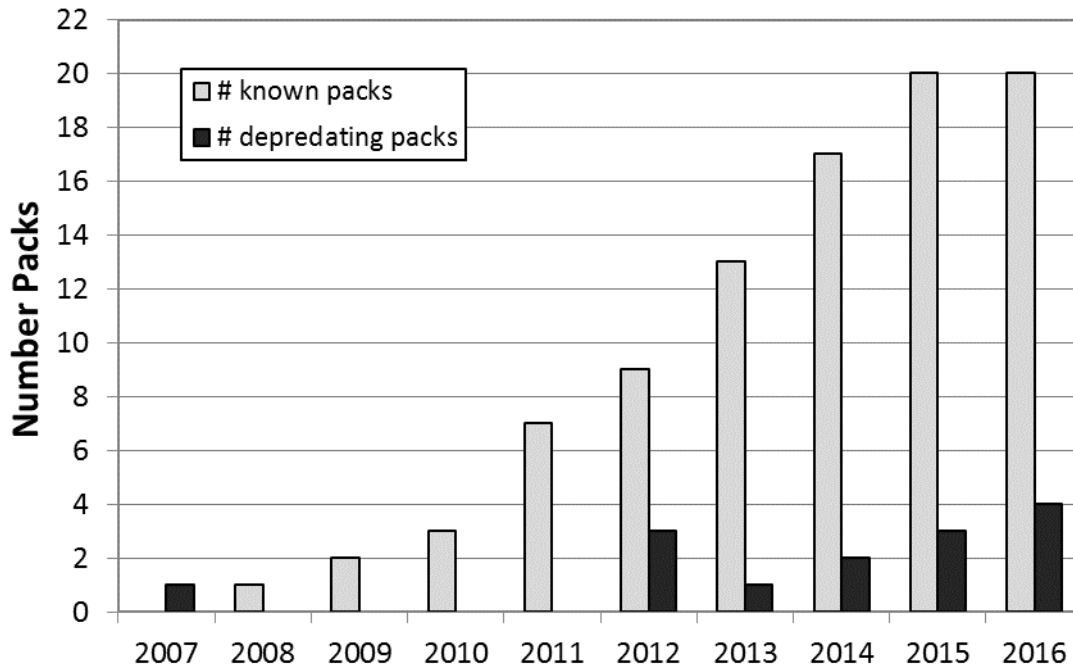


Figure 10. Minimum number of known packs that existed at some point during the calendar year and the number of confirmed depredating packs (livestock only) in Washington, 2007 – 2016.

Minimizing Wolf Conflicts with Livestock

One goal of the Wolf Conservation and Management Plan for Washington (Plan) is to manage wolf-livestock conflicts in a way that minimizes livestock losses while at the same time not significantly affecting the recovery and long-term perpetuation of a sustainable wolf population. Preventative measures used in 2016 to minimize the potential for livestock depredations caused by wolves included the use of fladry and electrified fladry, RAG boxes, fox lights, livestock guarding dogs, hazing wolves from livestock and human residences, increased human presence around range livestock, range riders, providing wolf location data to livestock producers and range riders, and removal of injured and/or dead livestock from grazing sites. Other techniques that may be used to minimize livestock depredations include both nonlethal and lethal removal of depredating wolves.

The WDFW has full management authority of wolves in the Eastern Washington recovery area (Figure 2) and, under state law RCW 77.12.240, can implement lethal measures to remove depredating wolves when it is deemed necessary to deter repeated livestock depredations. In 2016, seven wolves were removed through agency actions (Table 2).

In the western two-thirds of Washington, where wolves remain classified as an endangered species under the federal ESA, USFWS is the lead management agency (Figure 2). Lethal removal is not authorized in this part of the state, therefore, capture and relocation has been

identified as a potential management option when responding to repeated livestock depredations. No wolves were captured and relocated through any agency actions in 2016.

Under state law (WAC 232-36-051) and the provisions of the Plan, WDFW may issue a permit to livestock producers and their authorized employees to lethally remove a specified number of wolves in the act of attacking livestock (defined as biting, wounding, or killing) on private land and public grazing allotments they own or lease after a documented depredation. These permits cannot be issued in the western two-thirds of the state where wolves remain federally listed. No permits were issued to livestock producers in 2016.

Furthermore, under state law (WAC 232-36-052), owners of domestic animals (defined as any animal that is lawfully possessed and controlled by a person), their immediate family members, or their authorized agents have the right to lethally remove one (1) gray wolf without a permit if the wolf is attacking their domestic animals. This rule only applies to the Eastern Washington recovery area where wolves are federally delisted; it does not apply to those areas of the state where wolves remain classified as endangered under federal law. Any wolf removed under this rule must be reported to WDFW within 24 hours and the owner of the domestic animals must surrender the carcass and cooperate with WDFW during an investigation. No wolves were removed under the provisions of this rule in 2016.

Damage Prevention Cooperative Agreements

Washington supports a healthy ranching and farming industry. The livestock industry is an essential component of Washington's economy and the lands that foster this industry provide habitat for a wide variety of wildlife. WDFW is responsible for protecting and managing wildlife and is committed to working with livestock producers to minimize conflicts between wolves and livestock on both public and private lands. WDFW staff work directly with producers to provide assistance in selecting and implementing non-lethal deterrent measures that are suitable for each individual producer's operation. Interested producers may also enter into a Damage Prevention Cooperative Agreement (DPCA) with WDFW which provides a cost-share for the implementation of deterrent measures.

During calendar year 2016, WDFW had 54 active DPCAs with livestock producers across Washington worth in excess of \$410,000. Operators with an active DPCA received a specified cost-share percentage for each different conflict prevention measure up to a maximum amount. The most common deterrent measures implemented during 2016 were increased human presence (e.g. range rider), and improved sanitation (removal or treatment of injured or dead livestock).

Additionally, WDFW contracted with 9 private entities to provide range rider services in 2016. A total of 13 range riders were used to minimize wolf-livestock conflicts and to monitor livestock on open-range grazing allotments. Contractors were assigned to an area on an as needed basis and many covered multiple grazing allotments during a single assignment thereby offering assistance to multiple operators.

WDFW Livestock Depredation Compensation Program

The Plan expands compensation for wolf depredation beyond what is currently provided for by Washington State laws RCW 77.36 and WAC 232-36 (see Plan: Appendix F). The Plan also expands the definition of livestock eligible for compensation from damage caused by wolves to include cattle, sheep, horses, swine, mules, llamas, goats, and actively working guarding/herding dogs. Currently, compensation is not allowed for domestic pets and hunting dogs that may be injured or killed by wolves. To receive compensation, the injury or mortality must be classified as confirmed or probable by WDFW personnel, or an authorized agent of WDFW, and operators must demonstrate that they are implementing methods that may minimize wolf damage.

Washington's payment plan is two-tiered dependent on the size of the grazing site. For each confirmed depredation on grazing sites greater than or equal to 100 acres, WDFW would compensate producers for the full market value (defined as the value of an animal at the time it would have gone to market) of that animal plus full market value of one additional animal if some were unaccounted for at the end of the grazing season. The additional payment would not apply if all livestock were accounted for at the end of the grazing season. If the depredation was confirmed, but the grazing site was less than 100 acres, or if the depredation was classified as probable on a grazing site greater than or equal to 100 acres, WDFW would compensate for the full market value of the affected animal only. If the depredation was classified as probable and the grazing site was less than 100 acres in size, WDFW would compensate for half the current market value of livestock. The WDFW also compensates producers for veterinary costs associated with treatment of livestock and guarding/herding dogs injured by wolves. Under the provisions of the Plan, compensation to individual operators who experience damage shall not exceed \$10,000 per claim without an appeals review.

In 2015, the WDFW Commission formally adopted revisions to WAC 232-36-210 (application for cash compensation for livestock damage or domestic animal—Procedure). These revisions increased the period of time an operator has to notify WDFW of their intent to file a claim for compensation from 10 days to 30 days and it increased an operator's time to file the completed claims package to WDFW from 60 days to 90 days. Additional revisions include a provision which allows an operator to comply with either a WDFW approved checklist, a damage prevention cooperative agreement, or a director's waiver in order to be considered for compensation.

The WDFW processed 6 claims and paid a total of \$20,037.45 to compensate livestock producers who experienced livestock losses or injuries caused by wolves in 2016. One additional claim was submitted for a loss that occurred in 2016; however, this claim is currently under review. One producer requested claim information for a loss that occurred in 2016 but has yet to file a claim.

Livestock Review Board

The Livestock Review Boards (LRB) primary objective is to review claims filed for indirect losses (e.g. greater than normal losses, reduced weight gain, reduced pregnancy rates) that may have been caused by wolves and provide recommendations to WDFW to pay or deny claims. The LRB is comprised of five citizen members with two representing the livestock industry, two

representing conservation interests, and one at-large member. During 2015, two claims were filed to compensate livestock producers for indirect losses caused by wolves that occurred during the 2014 grazing season. In 2016, the LRB recommended payments in full to each of the two claimants and WDFW subsequently paid a total of \$65,648.19 for indirect losses that may have been caused by wolves.

RESEARCH

Completed Projects

Title: Livestock mortality rates in wolf occupied areas of Washington

Graduate Student: Jeffrey Brown, Washington State University

Major advisor: Robert Wielgus, Washington State University

Cooperators: Washington Department of Fish and Wildlife, U.S. Forest Service, U.S. Fish and Wildlife Service, Colville Confederated Tribes

Project Summary: Large carnivore management is greatly influenced by human-carnivore conflict including both actual and perceived threats. For wolves (*Canis lupus*), livestock depredations are one of the most important and controversial sources of conflict. However, the extent of wolf depredation on livestock is difficult to quantify accurately because detecting livestock carcasses shortly after cause of death is challenging, especially in remote landscapes where range sheep (*Ovis aries*), cattle (*Bos taurus*), and wolves most often interact. To more accurately estimate losses at a population level of range livestock in wolf occupied areas, I radio-tagged 588 calves in 10 cattle herds and 176 sheep in 1 flock to determine cause-specific mortalities in Washington over 2 grazing seasons. I detected 1 sheep and 1 calf death, but no wolf kills during telemetry monitoring, despite all herds having spatial overlap with wolves. Our results indicated that losses due to wolves were not above 0.81% for cattle or 1.6% for sheep within pack territories in the Washington population. Though acute impacts of wolf depredations can occur and be detrimental to individual livestock operators, our results suggest that those severe events were rare and that overall depredation losses were very low in wolf-occupied areas of Washington. This project was completed in the summer of 2016.

Ongoing Projects

Title: Predator-Prey Project

Cooperators: Washington Department of Fish and Wildlife, University of Washington

Project Summary: The Predator-Prey Project seeks to quantify the effects of recolonizing wolf populations on co-occurring ungulate species and another top predator, the cougar. The two primary objectives of this project are to 1) examine the effects of wolf predation on ungulate demography and population growth and 2) investigate the impacts of recolonizing wolves on cougar population dynamics, space use, and foraging behavior. This project consists of two study areas; one in northeast WA encompassing the majority of Stevens and Pend Oreille counties, where the wolf population is larger and more widely distributed, and the other in Okanogan county in north-central WA where the wolf population is smaller and portions of suitable habitat remain unoccupied. There is increasing understanding that a multi-species approach to predator-prey studies is relevant to account for the various interactions among apex predators and their prey. To implement a system-based approach, Washington Department of Fish and Wildlife and University of Washington project personnel are attempting to capture and radio-collar 50 elk and 65 white-tailed deer in NE Washington, 100 mule deer in the Okanogan, and 10 cougars in each study area. The project will also attempt to maintain at least two active GPS collars on wolves in each project study pack. Research efforts were initiated in December 2016 and slated to continue through 2021.

Title: Interactions between wolves and cougars in eastern Washington State

Graduate Student (PhD): Lauren Satterfield, University of Washington

Major Advisor: Aaron Wirsing, University of Washington

Cooperators: Brian Kertson, Washington Department of Fish and Wildlife

Project Summary: Wolves (*Canis lupus*) recolonized Washington in 2008 and have grown to an estimated population of at least 90 individuals grouped into 19 confirmed packs. Cougars (*Puma concolor*) occupy a similar niche to wolves by hunting large prey and likely compete directly and indirectly for space and ungulate prey. Working as part of the WDFW/UW multiple predator-multiple prey research project, we will examine the interactions between wolves and cougars in wolf occupied landscapes in northeast and north central Washington. We seek to determine how the co-occurrence of wolves and cougars influences the diet and behavior of these two predators. Our study will investigate complicated interspecific relationships, which may be synergistic and/or competitive. Cougars and wolves will be fitted with GPS collars and we will visit approximately 1800 wolf and cougar kill sites within our two study areas to determine species, age, and condition of prey selected by both predators. For approximately 20% of cougar kill sites, camera traps will be placed while cougars are still active at the sites to assess handling times, kleptoparasitism, and scavenging by other predators. Location data will be used to quantify both cougar and wolf space use (especially changes to cougar space use in relation to wolf density) and encounters between these two apex predators. Information gained will be valuable when setting harvest quotas for both cougars and ungulates, as well as for understanding how wolves and cougars might alter their use of the managed landscape in which they reside. Project fieldwork began December 2016 and dissertation completion is anticipated by May 2021.

Title: Wolf predation in livestock occupied areas of Washington State

Graduate Student: Gabriel Spence, Washington State University

Major advisor: Robert Wielgus, Washington State University

Cooperators: Washington Department of Fish and Wildlife, U.S. Fish and Wildlife Service, U.S. Forest Service, Colville Confederated Tribes

Project Summary: To determine the extent of depredation on livestock by wolves (*Canis lupus*), we documented kills found at clusters of locations from GPS collared wolves in 5 packs that overlapped grazing areas of cattle (*Bos taurus*) or sheep (*Ovis aries*) for 3 grazing seasons in 2014, 2015, and 2016. We located 439 kills at cluster locations; 6% of the kills were livestock, 94% were wild prey. Preliminary analysis shows the following: of the wild prey, mule deer (*Odocoileus hemionus*) and white-tailed deer (*Odocoileus virginianus*) considered together were the most common prey at 50%, followed by moose (*Alces alces*) at 27%, and elk (*Cervus elaphus*) at 9%. At the pack level, livestock made up between 0% and 67% of the kills located, however 9 out of the 15 pack years had 0 livestock kills, and 3 pack years had less than 5% livestock kills. Variation in proportion of livestock kills per pack may have to do with the number of livestock available in a wolf pack territory, animal husbandry practices, and location of wolf and livestock core areas. Kill rate varied considerably among packs. Mean kill rate for all packs for all prey types was 0.23 kills/pack/day (95% C.I. 0.044), or about 43 kills (95% C.I. 35-52 kills) for the 184 day long summer season. Variance in kill rates may be due to pack size, type of prey available, individual wolf collared, and collar fix success. Analysis of the effects of GPS collar fix success is still underway and may change results.

Title: Forecasting livestock depredation risk by recolonizing gray wolves (*Canis lupus*) in Washington, USA

Graduate Student (PhD): Zoë Hanley, Washington State University

Major advisor: Rob Wielgus, Washington State University

Cooperators: Washington Department of Fish and Wildlife, US Fish and Wildlife Service, US Forest Service, Montana Fish, Wildlife, and Parks, Idaho Fish and Game

Project Summary: Preventing carnivore-livestock conflicts requires identifying conditions placing livestock at risk and focusing outreach and adaptive management at a local scale. I investigated characteristics of cattle (*Bos taurus*) depredations by gray wolves (*Canis lupus*) in Idaho and Montana from 1991 through 2008 to predict cattle depredation risk by a recolonizing wolf population in Washington (90 wolves in 18 packs as of December 2015). Risk models were developed at two spatial scales, (1) wolf pack territory ($n = 137$) and (2) cattle grazing allotment ($n = 69$) to test hypotheses that cattle depredations by wolves were associated with wolf demographics, cattle and wild prey abundance, allotment characteristics, and land cover types. Preliminary analyses indicated within wolf pack territories, cattle depredation risk increased as cattle abundance increased and if the pack depredated the previous year. Adult wolf removal showed weaker evidence in its relationship with cattle depredation probability. Similarly, cattle depredation risk increased for larger livestock grazing allotments with more cattle and wolves. Wolf pack reproduction, livestock turnout date, and percent grassland cover indicated high variability in the direction of their relationship with cattle depredation probability. Forecast maps for Washington identified hotspots of high (81 – 90%) depredation risk in Yakima, Kittitas, and Columbia counties. Cattle grazing allotments only occur east of the Cascade Mountains, and hotspots in Okanogan, Ferry, and Yakima counties were recognized as intermediate (61 – 80%) depredation risk. These risk models and maps provide locations to focus depredation prevention measures and a template for future analyses as wolves continue to recolonize Washington. A final dissertation will be submitted in April 2017 and manuscripts will be submitted for publication soon thereafter.

Project Title: Risk effects of wolves on livestock productivity in Washington.

Graduate Student (PhD): Azzurra Valerio, Washington State University

Principal Investigator: Larry Hufford, Washington State University

Cooperators: Washington Department of Fish and Wildlife, Colville Confederated Tribes, US Fish and Wildlife Service, and US Forest Service, US Dept. of Agricultural Service.

Project Summary: Presently, wolves are recolonizing Washington State and conflicts with livestock are likely to increase as the population of wolves grows throughout the State. Wolves can affect livestock not just through direct predation but also indirectly through risk effects altering cattle behavior. Our project seeks to understand and quantify the causes of risk effects of wolves on free-ranging livestock, and the effectiveness of non-lethal deterrents (e.g. range riders) to reduce depredations and risk effects. To achieve these goals the primary objectives are: a) to determine changes in cattle behavior (e.g., cattle space use, movements, foraging behavior) in relation to wolf proximity; b) measure the underlying physiological mechanisms such as stress and nutrition that can mediate risk effects on livestock productivity (e.g., calf weaning weight and cow reproduction); c) to compare wolf activity and movement in presence and absence of range riders, and to determine if range riders can

improve cattle foraging efficiency. During 3 successive years of field data collection (2014-2016), a total of 139 cows (in 22 livestock herds) and 22 wolves (in 15 wolf packs) were fit with GPS radio collars; movements and interspecies interactions were monitored daily via both GPS locations (using a 2 hour fix rate) and ground-based telemetry. In addition, within two pilot study areas we fit GPS collars with proximity sensors on both wolves and cows. These collars with proximity sensors can send a real time message when wolves and cows are within 128 meters from one another allowing to record a finer resolution of spatial-temporal variation in risk. Every two weeks, and after any wolf-cow interaction, we collected fecal samples from cows and recorded videos of their grazing behavior. Data of average and individual calf weight and reproduction of mother cows were provided by livestock producers. Presently the analysis is underway, and will be performed at different spatial-temporal scales.

Title: Habitat use of wolves (*Canis lupus*) in relation to wildfire in Washington State

Graduate Student (PhD): Carolyn Shores, University of Washington

Major advisor: Aaron Wirsing, University of Washington

Cooperators: Washington Department of Fish and Wildlife

Project Summary: One of the main sources of disturbance in Western North American ecosystems is wildfire. While there is significant research on the effects of wildfire on ungulates, much less is known about the impacts of fire on carnivores. Wildfire may indirectly affect wolf resource use by altering the habitat use of their prey due to a change in the amount of available forage. To date there has been little research on how wildfire affects wolf populations. In 2014 and 2015, Washington state had the two largest fire years on record, with over 1 million acres burned in 2015. With climate change models predicting increased wildfire frequency, severity and size, it is important to understand fire effects on wolf resource use in an effort to understand potential changes to predator-prey dynamics and to effectively manage the population. We will examine the responses of 15 wolf packs to post-fire landscapes in eastern Washington State using GPS wolf collar data from wolves. Our objectives are 1) determine home range overlap of individual wolves in Washington state with areas burned < 25 years ago by fires larger than 10 km² and 2) determine the resource use of wolves in relation to fire burn severity, fire frequency and burn heterogeneity. The data for this project has already been collected by WDFW and the analysis phase will begin in March.

Title: Impacts of wolves on mule deer and white-tailed deer in northeastern WA

Graduate Student (PhD): Justin Dellinger, University of Washington

Major advisor: Aaron Wirsing, University of Washington

Cooperators: WDFW, Colville Tribes, USFS, SCI

Project Summary: Using GPS collars deployed on predators and prey we compared survival and habitat use patterns of mule deer and white-tailed deer in wolf and non-wolf areas, respectively. We determined that survival of either deer species in wolf areas was not significantly different from survival of either deer species in areas without wolves, though we did detect wolves killing GPS collared deer. These analyses have been written up and are in the process of being submitted for peer-review in a scientific journal. Furthermore, we determined that habitat use patterns of mule deer and white-tailed deer, respectively, in non-wolf areas, differed from habitat use patterns of mule deer and white-tailed deer in wolf areas. The scale of shifts in habitat use

patterns depended on the escape behavior of each prey species and its effectiveness in different landscape types in relation to wolf hunting behavior. Mule deer responded to wolf utilization distribution at the landscape level. Animals in wolf areas used steeper slopes, areas farther away roads, and more forested areas, compared to animals in non-wolf areas. This is likely an attempt to reduce encounter rates with wolves. White-tailed deer responded to wolf utilization distribution at the fine scale. Animals in wolf areas used more gentle slopes, areas with greater visibility, and fewer obstacles to escape, compared to animals in non-wolf areas. This is likely an attempt to aid early detection of wolves and greater chance of escape following detection. These analyses have been written up and are in the process of being submitted for peer-review in a scientific journal. Lastly, we will investigate how wolf distribution mediates resource overlap between the two deer species. These analyses should be complete, and submitted for peer-review in a scientific journal, by the end of the summer. The overall project should be completed by Fall 2017.

Title: Impacts of wolf recovery on interspecific competition between carnivores

Principal Investigator: Samuel K Wasser, University of Washington Center for Conservation Biology

Cooperators: Washington Department of Fish and Wildlife, US Forest Service

Project Summary: Apex predators are returning to many ecosystems after a long absence. Many ecosystems underwent considerable changes in human land use patterns and corresponding changes in the abundance of other species during that period. NE Washington (NE WA) underwent significant human land use changes including reduction in timber harvest, fire suppression, increased housing development, and land conversion during the wolf's 80 year absence. Carnivores such as coyotes and black bears that respond well to human activity flourished during this period. Bobcats are also highly abundant. Mule deer populations declined in many areas, while white-tailed deer populations markedly increased. We use noninvasive scat sampling to examine the impacts of wolf recovery on the major mid to large-sized carnivores (coyote, black bear, bobcat and cougar), and vice versa, in an 8,200 km² area of NE WA that has significant variation in human land use. Detection dogs are used to comprehensively and efficiently locate these scats from all medium to large carnivores over the entire study area. All scat samples are georeferenced and undergo DNA analysis to identify the species and the diet of the defecator. Collectively, these data are then used to assess the relative distribution, density, habitat use, and diet of each carnivore across a highly varied landscape. Fecal hormones are also used to assess pregnancy in wolves, as well as competitive-related nutritional stress among the carnivores. The entire area is sampled twice in each of two 8 week sessions per year to capture both spatial and temporal variation, typically yielding over 4,000 carnivore scats annually.

We validated these non-invasive methods during 2015 and 2016, comprehensively sampling a 5000 km² area in NE WA where wolves have rapidly spread over the landscape. Three dog teams collected 3,600 fecal samples that amplified for DNA from the host carnivores and their wild and livestock prey (elk, deer, moose, caribou, snowshoe hare, bighorn sheep, cow, sheep, goat). Samples were used to create smoothed geo-spatial density maps for each carnivore over the entire study area by kernel density estimation. The method readily delineated non-overlapping wolf packs, which were also confirmed by occurrences of pregnant females in spring. Resource Selection Probability Function (RSPF) analyses were

also conducted on each major carnivore species to assess species differences in habitat preferences. One striking preliminary finding was that wolves tend to use areas of lower coyote density (relative to the available distribution), whereas coyotes appear to show low sensitivity to wolf density. The wolf RSPF model also showed avoidance of coyote densities, with wolves avoiding coyote-dense areas more in low human-use than in high human-use areas.

DNA-based diet measures for each carnivore are similarly examined with and without wolf density estimates surrounding each sample. Changes in the MacArthur Index, used to measure the overlap in resource use and diet between each carnivore species, are also examined as a function of carnivore densities. Human wildlife conflict is similarly examined based on presence of livestock in each carnivore diet in relation to RSPF covariates, including human use elements and densities of the other carnivores.

Broader Impacts: Public opinion matters and hence communication is an important part of science-based management practices and human-wildlife conflict resolution. The combination of detection dogs and local megafauna provides an ideal platform to introduce students to scientific questions and management solutions and to encourage mindful dialogue about wildlife management and human practices. With funds from the USFS, we launched an outreach endeavor during spring 2015 to connect our carnivore research with students from rural schools in NE WA. During our first 10-day tour, two detection dog teams visited 9 rural schools and 4 district ranger stations, reaching 1,450 K-12 students and community members throughout the study region. The local community was captivated by our program and expressed a strong desire for us to return. We are now launching a larger-scale, long-term outreach program that will initially reach 24 rural schools, as well as public libraries and ranger stations in the study area.

OUTREACH

In addition to numerous, daily interactions (i.e. phone calls, emails, personal communications) with the general public concerning wolves and wolf management in Washington, WDFW personnel also provided various formal presentations to school groups, universities, wildlife symposiums, state and federal management agencies, livestock association meetings, state legislature committees, Washington's Fish and Wildlife Commission, local interest groups, and conservation groups. Department personnel were also interviewed by local radio, newspaper, and television outlets on many occasions.

The WDFW maintains numerous pages on its website related to wolves and wolf management in Washington. In addition to general wolf information and links to other wolf-related sites, the website also provides interested parties with access to archives of Plan development, WDFW news releases related to wolves, and weekly updates of wolf management activities. The website also has a wolf observation reporting system where members of the public can report information regarding wolf sightings, or evidence of wolf sign, which assists WDFW personnel with monitoring existing packs and documenting potential wolf activity in new areas. The website also provides telephone numbers to report suspected livestock depredations.

Wolf Advisory Group

In 2013, WDFW created the Wolf Advisory Group (WAG) to advise WDFW on implementation of the Wolf Conservation and Management Plan (Plan). The WAG is composed of citizen members appointed by the director that serve a two year term with each member representing a different stakeholder interest.

During 2015, the WAG was increased from 9 members representing the livestock industry and conservation interests to 18 members now including sportsmen/women and members of the public at large who are not officially affiliated with a special interest group. The WDFW also contracted with Human-Wildlife Conflict Collaboration (HWCC) to complete an assessment of the social conflict surrounding wolf recovery and management in Washington. The report titled, "People and Wolves in Washington: Stakeholder Conflict Assessment and Recommendations for Conflict Transformation" was completed in March 2015. The report highlighted the deep-rooted nature of social conflict surrounding wolves and provided recommendations for addressing the conflict. To address the deep-rooted conflict, WDFW hired a consultant from HWCC for stakeholder engagement, strategic guidance, and facilitation of the WAG meetings.

During 2016, the WAG met on 5 occasions. Core to the transformation of deep-rooted conflict is reconciling and building resilient relationships between stakeholder groups, including WDFW. As such, the expanded 18-member WAG spent time developing relationships that foster respect, honest dialogue, and mutual learning. The WAG provided advice to WDFW on expectations for preventative and non-lethal measures to minimize wolf-livestock conflicts, cost-share agreements associated with DPCAs, and an individual pilot producer plan that balanced the expectations of preventative and non-lethal measures and potential agency management actions to address repeated depredations. All WAG meeting agendas, notes, handouts, and meeting minutes are posted on the WDFW website.

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- To report a suspected livestock depredation, a dead wolf in the Eastern Washington recovery area, or any type of illegal activity, please call: **1-877-933-9847, your local WDFW conflict specialist, or your local WDFW enforcement officer**
- To report a dead wolf in western Washington, please contact the nearest USFWS special agent or your local WDFW enforcement officer
- For information about wolf management in Washington and to report a wolf sighting, please visit: http://wdfw.wa.gov/conservation/gray_wolf/
- For information about wolf management on lands owned by the Colville Confederated Tribes and to report a wolf sighting on tribal lands, please visit: <http://www.colvilletribes.com/>
- For information about wolf recovery in the Northern Rocky Mountains, please visit: <http://www.westerngraywolf.fws.gov/>