WASHINGTON GRAY WOLF CONSERVATION AND MANAGEMENT 2018 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: Spokane Tribal Wildlife Program (Savanah Walker)

This report presents information on the status, distribution, and management of wolves in the State of Washington from January 1, 2018 through December 31, 2018.

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EXECUTIVE SUMMARY

Overview

Each year, the Washington Department of Fish and Wildlife (WDFW) submits a report to the federal government for section 6 activities, which details the results of its annual gray wolf population survey and summarizes wolf recovery and management activities from the previous year.

Washington's wolf population was virtually eliminated in the 1930s but has rebounded since 2008, when WDFW wildlife managers documented a resident pack in Okanogan County. Since then, the number of wolves has increased every year, to a minimum total of 126 in 2018. Most packs range across public and private land in Ferry, Stevens, and Pend Oreille counties in the northeast corner of the state, but increasing numbers are present in southeast Washington and the north-central region.

Gray Wolves' Legal Status

Gray wolves have been classified as endangered in all or part of Washington since federal lawmakers enacted the U.S. Endangered Species Act (ESA) in 1973. In 2011, the federal government ended the protection for wolves in the eastern third of the state but preserved it for those in the western two-thirds.

Under state law, wolves were listed as endangered in 1980. They retained that classification throughout the state in 2018, regardless of their status under federal law.

Within this legal framework, WDFW had lead wolf management responsibility in the Eastern Washington recovery region, and the U.S. Fish and Wildlife Service had the leading role in the other two recovery regions in 2018. Wolves that inhabit tribal lands in the Eastern Washington recovery area are managed by those specific tribal entities.

Washington State's wolf recovery activities are guided by the Wolf Conservation and Management Plan, adopted in 2011 by the Washington Fish and Wildlife Commission. Under the plan, Washington contains three recovery areas: Eastern Washington, the Northern Cascades, and the Southern Cascades and Northwest Coast. In addition, criteria set forth by the WDFW-approved protocol, specifies strategies for the department to collaborate with livestock producers to minimize conflicts with wolves.

Wolf Recovery and Management in 2018

Key developments in 2018 included:

- The state's minimum year-end wolf population increased for the 10th consecutive year. As of December 31, the state was home to at least 126 wolves, 27 packs, and 15 successful breeding pairs. These numbers compare with 122 wolves, 22 packs, and 14 breeding pairs one year earlier. Because this is a minimum count the actual number of wolves in Washington is likely higher.

- Pack sizes (number of members) ranged from two to 11 wolves. Most packs contained three to five individuals.

- The wolf count reflects the results of field surveys conducted during winter months by state, tribal, and federal wildlife managers. Information is collected from aerial surveys, remote cameras, analysis of wolf tracks, and signals from radio-collared wolves. State, tribal, and federal wildlife managers captured nine wolves (six new wolves and three recaptures) from eight packs during the year and monitored a total of 20 unique radio-collared wolves from 15 different packs.

- As in past years, survey results represent "minimum counts" of wolves in the state, due to the difficulty of accounting for every animal – especially lone wolves without a pack.

- Since the first WDFW survey in 2008, the state's wolf population has grown by an average of 28 percent per year.

- Six packs formed in 2018 including the Diobsud Creek, Butte Creek, Nason, Naneum, OPT, and Sherman packs and one pack (Five Sisters) disbanded due to unknown causes.

- The state's first wolf pack in Western Washington in the modern era was confirmed. Wildlife managers determined that a single wolf found and collared in 2017 in Skagit County was traveling with a second wolf in late 2018, enabling them to confirm the existence of the two-member Diobsud Creek pack.

- Each year's population total reflects population losses as well as population gains. WDFW documented 12 mortalities during 2018, including four removed by the department in response to wolf-caused livestock deaths; six legally killed by tribal hunters; and two other human-caused deaths that remained under investigation when this report was prepared.

- Wolf populations are managed to ensure progress toward the recovery goals established in the department's 2011 Wolf Conservation and Management Plan (https://wdfw.wa.gov/conservation/gray_wolf/mgmt_plan.html). The plan requires the department to minimize the loss of cattle and other livestock without undermining the long-term prospects for the recovery of a self-sustaining wolf population.

- WDFW investigators confirmed 11 cattle and one sheep as being killed by wolves during the year. Another 19 cattle and two sheep were confirmed to have been injured by wolves. Additionally, one injured cow and one mortality of a calf were considered probable depredations by wolves after investigation. Five packs (19 percent of the packs known to exist at some point during the year) were involved in at least one confirmed livestock mortality.

- WDFW spent a total of $1,217,326 on wolf management activities during the 2018 fiscal year, including $257,421 in reimbursement to 31 livestock producers for Damage Prevention Cooperative Agreements – Livestock (DPCAL) non-lethal conflict prevention expenses (range riding, specialized lighting and fencing, etc.), $241,010 for eight contracted range riders, $7,536 to five producers for livestock losses caused by wolves, $5,950 to one producer for indirect losses, and $705,409 for wolf management and research activities.

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 2018 include WDFW Director Kelly Susewind, former WDFW Director Jim Unsworth, Wildlife Program Assistant Director Eric Gardner, Deputy Assistant Director of Wildlife Mick Cope, Game Division Manager Anis Aoude, Carnivore Section Manager Stephanie Simek, Statewide Wolf Specialist Benjamin Maletzke, Wolf Biologist Trent Roussin, Wolf Biologist Gabriel Spence, Conflict Section Manager Dan Brinson and Wolf Policy Lead Donny Martorello. Other WDFW personnel who assisted with wolf recovery and management efforts in Washington included Chris Anderson, Mike Atamian, Craig Bartlett, Rich Beausoleil, Candace Bennett, Jeff Bernatowicz, Bruce Botka (retired), Eric Boyd, Joe Bridges, James Brown, Cole Caldwell, Colleen Chandler, Dan Chistensen, Treg Christopher, Jason Day, Paul DeBruyn, Jason Earl, Chris Erhardt, Severin Erickson, Scott Fitkin, Morgan Grant, Ellen Heilhecker, Jeff Heinlen, Eric Holman, Todd Jacobsen, Ryan John, Sandra Jonker, Brian Kertson, Sarah Kindschuh, Doug King, Keith Kirsch, Danyl Klump, Matt Konkle, Tony Leonetti, Mike Livingston, Carrie Lowe, Madonna Luers (retired), Kristin Mansfield, Joey McCanna, Troy McCormick, Scott McCorquodale, Matt Monda, William Moore, Paul Mosman, Bryan Murphie, Jerry Nelson, Eric Oswald, Nick Parkert, Steve Pozzanghera, Annemarie Prince, Dan Rahn, Scott Rasley, Kevin Robinette, Ralf Schreiner, Tucker Seitz, Nicole Stephens, Michelle Tirhi, Justin Trautman, Ben Turnock, Mark Vekasy, Dave Volsen, Robert Waddell, Jeff Wade, Don Weatherman, Kile Westerman, Steve Wetzel, Paul Whelan, Paul Wik, Gary Wiles, Scott Whitman, and Fenner Yarborough.

Other agencies and their personnel also played a key role in wolf management efforts in Washington. In particular, we would like to thank personnel from the USFWS including Brad Thompson, Jerry Cline, Manisa Kung, Gregg Kurz, Eric Marek, and Mike Munts; WS personnel including Mike Linnell, Terry Smith, and Chad Heuser; CCT personnel including Randy Friedlander, Eric Krausz, Sam Rushing, Jarred Erickson, and Corey Peone; STOI personnel including Billy Joe Kieffer and Savanah Walker; the U.S. Forest Service including Elizabeth Berkley, Mike Borysewicz, John Chatel, Travis Fletcher, 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, Jason Ransom, and Jack Oelfke; Roblyn Brown from Oregon Department of Fish and Wildlife; the U.S. Air Force including Todd Foster and Major J.B. Marshal; Dan Thornton, and Travis King from Washington State University; and Leo DeGroot of British Columbia Ministry of Forests, Lands, and Natural Resource Operations.

We also sincerely appreciate the safe piloting and aerial telemetry skills of Dave Parker and Travis Wisberg of Northern Air (Bonners Ferry, ID), and Jess Hagerman of Northwest Helicopters (Olympia, WA).

Finally, we could not list every person who contributed to wolf recovery and management efforts in Washington during 2018, we thank all who participated, particularly private landowners for their access and cooperation and the many people who provided wolf observation reports.

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INTRODUCTION

Background

Historically, gray wolves (*Canis lupus*) were common throughout much of Washington, but their numbers began to decline as the human populations increased after 1850. Due to high mortality from increased prices for hides, bounties, and government sponsored predator control programs, wolves were believed to be extirpated from Washington by the 1930s. People reported seeing wolves sporadically over the next several decades, and reports increased in the 1990s and early 2000s, but no resident packs were documented.

Wolves that dispersed from growing populations in Idaho, Montana, and British Columbia, Canada were likely responsible for confirmed reports of wolves in northern Washington after 1990. However, the first resident pack in the state since the 1930s was not documented until 2008 in Okanogan County in north-central Washington. Since that time, wolves have continued to naturally recolonize the state by dispersing from resident Washington packs and neighboring states and provinces.

Definitions – 'Pack' and 'Breeding Pair"

Two terms often used when discussing gray wolves and wolf management are "pack" and "breeding pair."

A "pack" is defined as two or more wolves traveling together in winter and is primarily used to evaluate the number of wolves on the landscape. A "breeding pair" is defined as at least one adult male and one adult female wolf who raised at least two pups that survived until December 31 (Wiles et al. 2011), and is used to reflect reproductive success and recruitment. In any given year, there will be at least as many packs as breeding pairs.

Federal Status

The status of gray wolves under federal law has been debated and litigated for many years and the level of protection for the species has changed several times. Since 2011, wolves in the eastern third of Washington have not been protected under the federal Endangered Species Act (ESA), but are classified as endangered under state law (see discussion below). Gray wolves have remained federally protected in the western two-thirds of the state.

Gray wolves in Washington initially received federal protections in 1973, when Congress passed the ESA. The 1987 Northern Rocky Mountain (NRM) Wolf Recovery Plan addressed gray wolves in Idaho, Montana and Wyoming, but did not include Washington. In 2007, the USFWS published a final rule, which included wolves from the eastern third of Washington and Oregon and those from the three states in the Northern Rocky Mountain populations (known as a "Distinct Population Segment" or DPS). The eastern third of Washington was included in the DPS designation to account for dispersing wolves from populations in Idaho and Montana. However, federal recovery requirements have applied only to the three states addressed in the

1987 recovery plan, and no federal wolf recovery requirements have been developed for Washington.

In 2008, the USFWS proposed a rule to end the ESA protection for wolves in the Northern Rocky Mountain DPS. In 2009, the USFWS published a final rule to remove the Northern Rocky Mountain wolf population, excluding Wyoming, from protection under the ESA, However, the rule was blocked the following year by a federal judge whose action once again restored federal protections.

The situation changed again in 2011, when federal lawmakers (in a section of the Department of Defense and Full-Year Appropriations Act) directed the Secretary of the Interior to reissue the 2009 delisting rule. As a result, wolves in the Northern Rocky Mountain DPS, including the eastern third of Washington, were once again removed from federal ESA protections. Throughout this time, wolves in the western two-thirds of the state have been classified and remained classified as 'endangered' under the ESA (Figure 1).

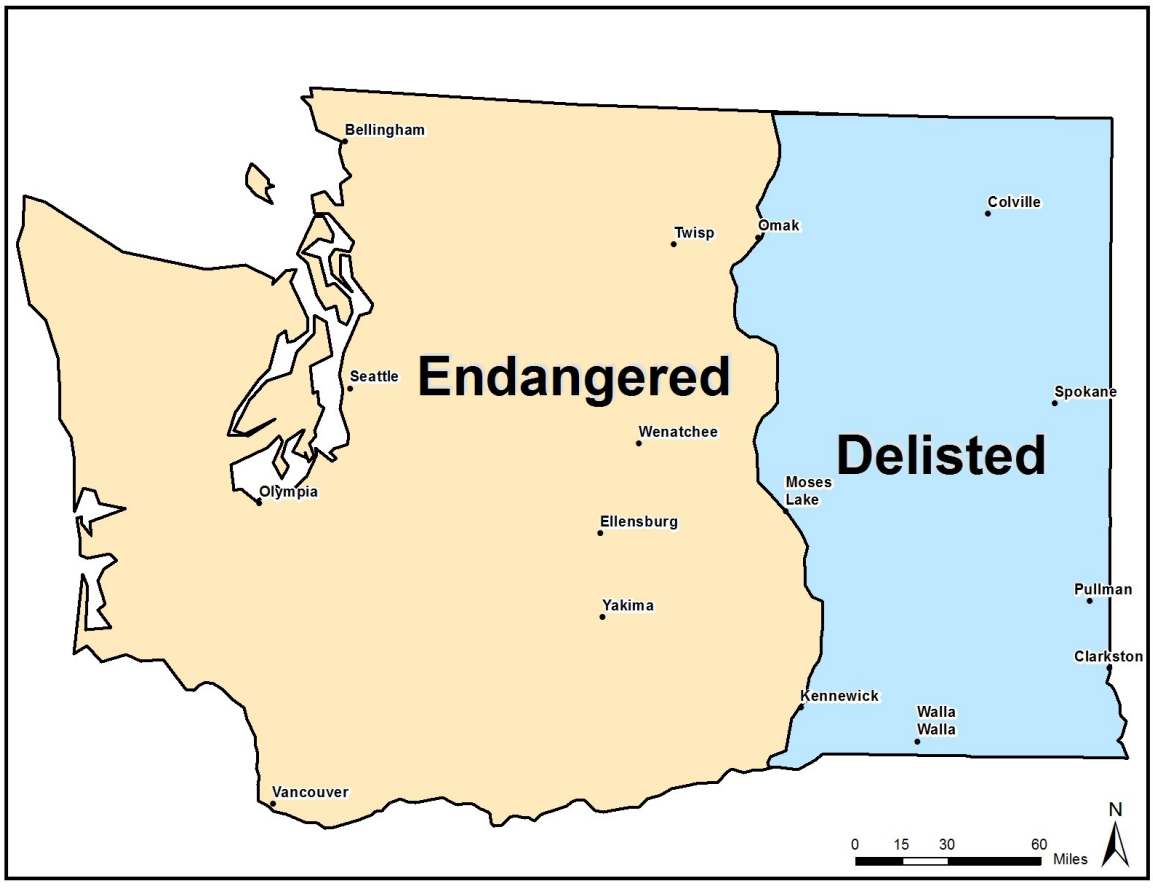

Figure 1. Federal classification of wolves in Washington State, 2018.

In 2013, the USFWS issued a proposed rule (Federal Register, Vol 78, No. 114) to end federal ESA protection for gray wolves including those in the western two-thirds of Washington by

removing them from the list of endangered and threatened wildlife. Further, the proposed rule would maintain endangered status for the Mexican wolf (*Canis lupus baileyi*) and would reclassify the Eastern wolf (*Canis lupus lycaon)* from a subspecies of the gray wolf to a separate species (*Canis lycaon*).

The USFWS subjected the proposed rule to an independent expert peer review managed by the National Center for Ecological Analysis and Synthesis. The peer review was designed to evaluate the proposed rule and determine if the best available science was used to evaluate the status of gray wolves. After the peer review was published in early 2014, the USFWS reopened the public comment period to allow for public input on the results of the peer review. However, that same year the United States District Court for the District of Columbia vacated the final rule that removed ESA protections from the gray wolf in the western Great Lakes. The 2012 decision to delist gray wolves in Wyoming was also vacated by the U.S. District Court for the District of Columbia. Because the 2013 proposal to delist the remaining listed portions of the gray wolf in the United States and Mexico relied in part on these two subsequently vacated final rules, in 2015 the USFWS only finalized the portion of the rule listing the Mexican wolf as an endangered subspecies.

On March 15, 2019, the USFWS published a proposed rule (Federal Register, Vol 84, No. 51) to remove the gray wolf from the List of Endangered and Threatened Wildlife. The USFWS proposed this action because the best available scientific and commercial information indicates that the currently listed gray wolves no longer meet the definitions of a threatened species or endangered species under the ESA due to recovery. The effect of this rulemaking action in Washington (if the rule is finalized as proposed) would be to remove the gray wolf from federal ESA protection statewide.

State Status

In 2007, anticipating dispersal of wolves into Washington from surrounding states and provinces, and the likely formation of resident packs, the Washington Department of Fish and Wildlife (WDFW) initiated development of a state Wolf Conservation and Management Plan for Washington (Plan; available at https://wdfw.wa.gov/publications/00001/). Assisted by an 18-member working group comprised of stakeholders, the WDFW plan was adopted in December 2011 by the state Fish and Wildlife Commission (Commission).

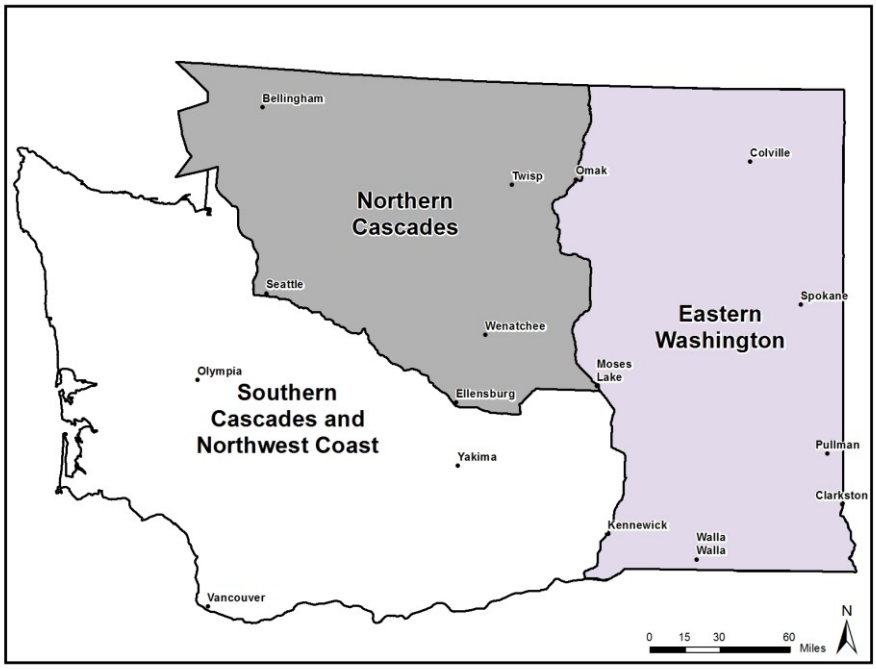

Figure 2. Washington wolf recovery areas as defined in the Wolf Conservation and Management Plan.

At present, wolves are classified as an endangered species under state law (WAC 220-610-010) throughout Washington regardless of their federal ESA classification. The state plan designates three recovery areas: Eastern Washington, the Northern Cascades, and the Southern Cascades and Northwest Coast (Figure 2). WDFW is the primary agency responsible for managing wolves in the Eastern Washington recovery area, and WDFW works as a designated agent of the USFWS under Section 6 of the federal ESA in the other two recovery areas. Tribal governments manage wolves that inhabit their tribal lands in the Eastern Washington recovery area.

The Plan allows for "down-listing" of gray wolves under the following terms:

- They could be reclassified from endangered to threatened when six successful breeding pairs are present for three consecutive years, with two successful breeding pairs in each of the three recovery regions.
- They could be reclassified from threatened to sensitive status when, 12 successful breeding pairs are present for three consecutive years, with four successful breeding pairs in each of the three recovery regions.

Wolves could be fully "delisted" under the wolf plan under two possible scenarios:

- When at least four successful breeding pairs are present in each recovery area and there are three additional breeding pairs anywhere in the state for three consecutive years; or
- When there are at least four successful breeding pairs in each recovery area and six additional breeding pairs anywhere in the state for a single year.

Funding

During calendar year 2018, WDFW spent $1,217,326 on wolf recovery and management activities. The total includes funds for Damage Prevention Cooperative Agreements (DPCA-L), compensation for depredations, contracted range riders and other conflict prevention measures, and wolf surveying and monitoring. Funds came from additional fees for personalized license plates (59%), endangered species license plates (5%), the federal general fund (15%), unrestricted state wildlife funds (3%), wildlife compensation for livestock damage funds (1%), supplemental DPCA-L general funds (16%), and wolf livestock conflict account (1%).

POPULATION MONITORING

Monitoring Techniques

Wolf monitoring activities occur year-round and may include direct observational counts from either 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. However, it is always possible that some wolves were present in surveyed areas, but avoided detection.

Biologists use a combination of the techniques described above to derive a **minimum number** of wolves known to exist at the end of each calendar year. Thus, documentation of total wolf numbers and reproductive success (e.g., breeding pair status) is likely conservative and the actual number of wolves in Washington is likely higher.

The annual survey includes lone wolves when reliable information is available. However, because lone or dispersing wolves are difficult to document and they account for 10% to 15% of the known winter population (Mech and Boitani 2003[1]), WDFW multiplies the minimum documented count by 12.5% to account for unknown wolves on the landscape. If evidence collected during the most recent calendar year suggested that packs and/or breeding pairs were present on the landscape during the previous year, the numbers (e.g., total number of wolves, 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 in this report.

Population Status and Distribution

As of December 31, 2018, a minimum of 126 wolves in 27 known packs were present in Washington State. The number of individuals increased by four (2%) and the number of packs increased by five (23%) from the 2017 totals. (Figure 3 displays the number of individuals. Table 1, Figure 4 shows the number of known packs.)

Fifteen (15) packs were confirmed to be successful breeding pairs as of the end of 2018 (Table 1, Figure 5), and at least 34 pups survived to the end of the calendar year. Pack sizes ranged from two to 11 members and averaged between three and five wolves per pack (4.1 ± 2.2, n=27).

The Eastern Recovery Region exceeded the minimum recovery goals (four successful breeding pairs for three consecutive years) set for the individual region by the plan because it has had greater than four breeding pairs for greater than three consecutive years. During 2018, the North Cascades recovery region had three successful breeding pairs within the five packs. This region is one successful breeding pair short of meeting the minimum. However, it would need to maintain that level for three more consecutive years to meet recovery objectives. Although we have documented individual wolves in the South Cascades and Coastal recovery region, WDFW has not documented any pack behavior in this region. To reach statewide recovery objectives for

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

wolves in Washington, the South Cascades would need a minimum of four successful breeding pairs while the other two regions maintain a minimum of four successful breeding pairs and at least six additional successful breeding pairs were located anywhere in the state.

Additional findings from the 2018 population survey include the following:

- The total number of successful breeding pairs (15) increased by one from 2017 to 2018, reflecting an increase from one to three in the North Cascades recovery area and a decline from 13 to 12 in the Eastern Washington recovery area. (Figure 5).
- A wolf collared in Skagit County in 2017 was found to be traveling with another individual in late 2018, forming the Diobsud Creek pack. It becomes the first confirmed pack west of the Cascade crest.
- A new pack (Naneum) was confirmed north of Ellensburg, near the area occupied by the Teanaway pack.
- A single wolf dispersed from the Touchet pack this past year and found another wolf to form the Butte Creek pack in the Blue Mountains of southeast Washington.
- The Nason pack formed on the Colville Confederated Tribe reservation.
- The Sherman Pack re-established near Sherman Pass in northeast Washington.

Wolves continue to inhabit both public and private lands (Figure 6), and 15 of the state's 27 packs had a collared wolf to assist in defining pack territory boundaries. The average (mean) territory size was 310 square miles (803 square kilometers), ranging from an estimated 57 to 769 square miles (148 - 1,992 square kilometers).

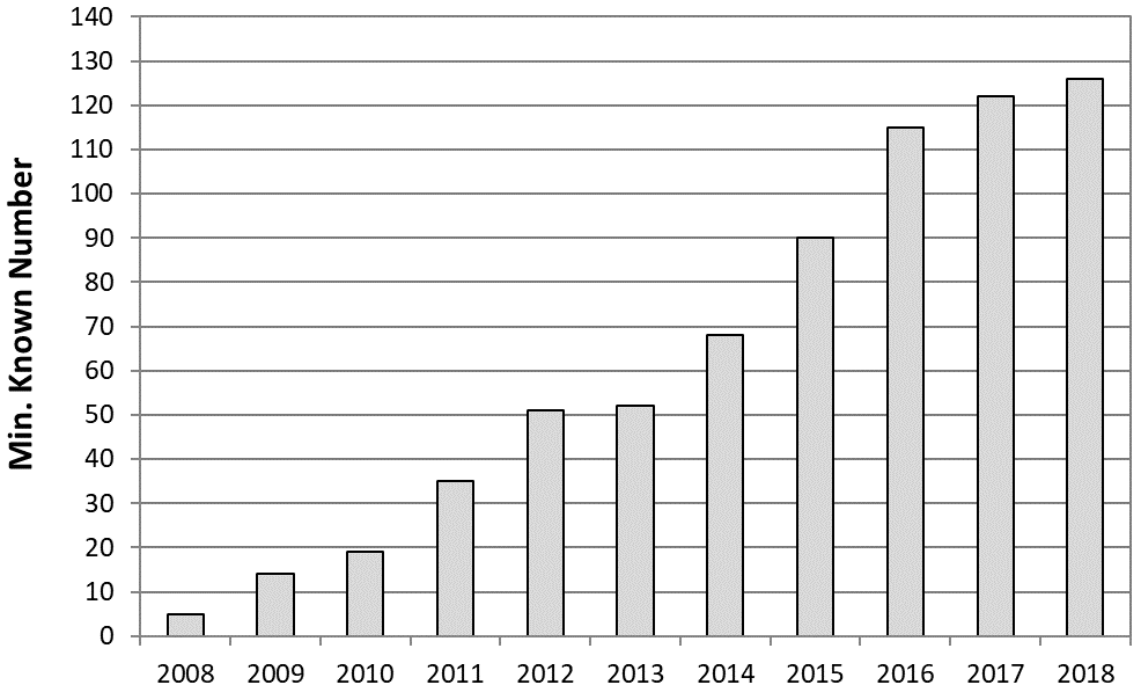

Figure 3. Minimum known number of wolves in Washington, 2008 – 2018.

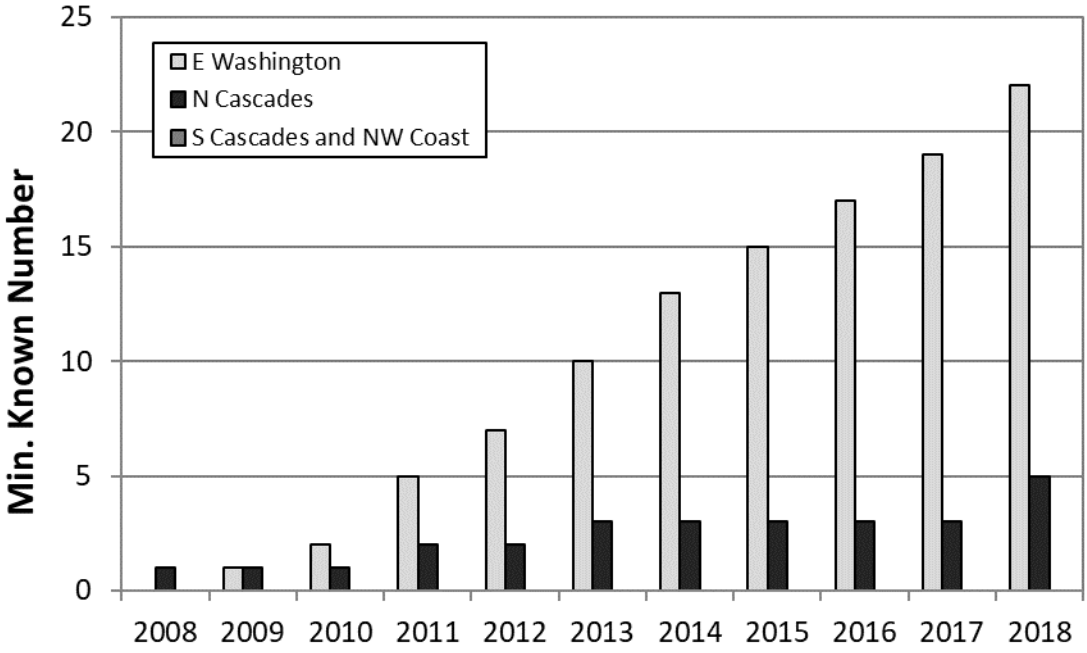

Figure 4. Minimum known number of packs by recovery area in Washington, 2008 – 2018. There are no known packs in the South Cascades and Northwest Coast recovery area.

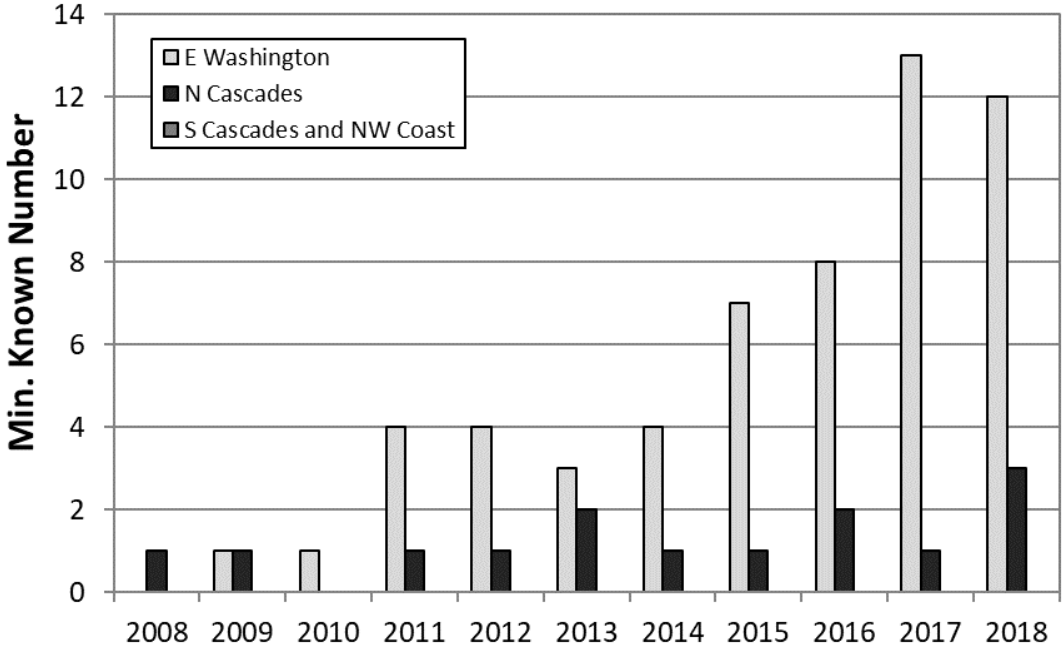

Figure 5. Minimum known number of successful breeding pairs by recovery area in Washington, 2008 – 2018.

Table 1. Known wolf packs in Washington by recovery area, minimum pack size of known packs, documented mortalities, number of known wolves that dispersed, and number that went missing in 2018. Underlined packs were counted as breeding pairs. Strikethrough packs did not meet the criteria of a pack in Washington at the end of the calendar year. CCT = Colville Confederated Tribes.

Wolf Pack	Recovery Area	Minimum Known Pack Size Dec 2018	Causes of Documented Mortalities					Known Dispersed	Missing
			Natural	Human	Unknown	Harvest	Control		
Beaver Creek	E. Wash	4							
Carpenter Ridge	E. Wash	11							
Dirty Shirt	E. Wash	3							
~~Five Sisters~~	E. Wash	0							
Frosty (CCT)	E. Wash	6				1			
Grouse Flats	E. Wash	8							
Goodman Meadows	E. Wash	4							
Huckleberry	E. Wash	6				3			
Leadpoint	E. Wash	2							
Nason (CCT)	E. Wash	6				1			
Nc'icn (CCT)	E. Wash	4				1			
OPT	E. Wash	4					2		
Salmo	E. Wash	3							
Sherman	E. Wash	2							
Smackout	E. Wash	2		1			1		
Stranger	E. Wash	4							
Strawberry (CCT)	E. Wash	7							
Togo	E. Wash	2					1		
Touchet	E. Wash	4						2	
Butte Creek	E. Wash	2							
Tucannon	E. Wash	2							
Wedge	E. Wash	3							
Whitestone (CCT)	E. Wash	3							
~~Chiliwist~~	N. Cascades	1							
Diobsud Creek	N. Cascades	2							
Lookout	N. Cascades	5							
Loup Loup	N. Cascades	5							
Naneum	N. Cascades	2		1					
Teanaway	N. Cascades	5							
Misc/Lone Wolves	Statewide	14							
WASHINGTON TOTALS		126	0	2	0	6	4	2	0

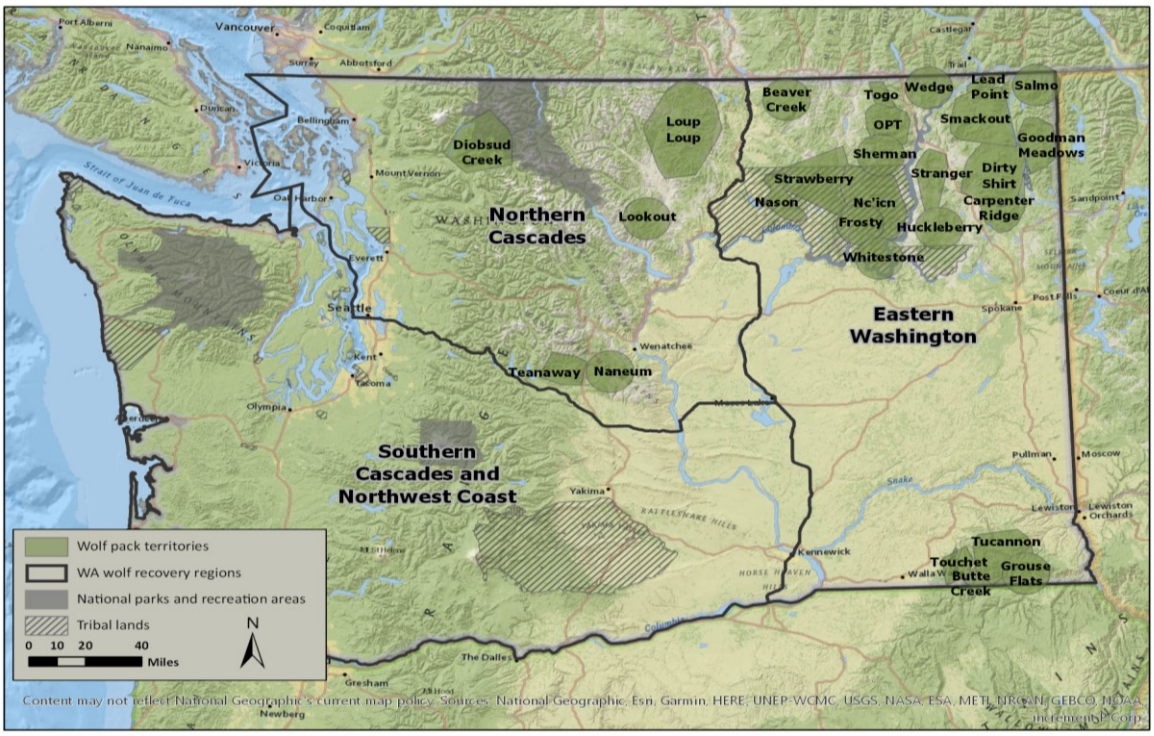

Figure 6. Known wolf packs and pack territories in Washington, 2018, not including unconfirmed or suspected packs or border packs from other states and provinces.

Wolf Captures and Monitoring

State, federal, and tribal biologists captured nine wolves (six new wolves and three recaptures) from eight different packs. Eight adults and one yearling were captured including six males and three females. All captured wolves were fitted with either global positioning system (GPS) collars or very high frequency (VHF) radio collars.

Twenty unique radio-collared wolves (approximately 16% of the minimum known population) were monitored from 15 different packs. This represents 56% of the known packs. However, due to known mortalities, dispersals, scheduled collar releases, and radio collar failures, by the end of the year, biologists were monitoring 18 radio-collared wolves (approximately 14% of the minimum known population) from 11 different packs (41% of known packs) in Washington.

Known Dispersals

A dispersal occurs when a wolf leaves the pack territory where it was born (or previously resided) in search of a new pack or territory. Two wolves wearing GPS radio collars dispersed from their pack territories in 2018 (Table 1: Figure 7).

The dispersing wolves are identified as OR35f and WA79m. The female (OR35f) moved into Washington, established the Touchet pack with another individual, and reared pups in 2017. In 2018, the Touchet pack did not appear to den. OR35f moved away from the former Touchet pack territory. By the end of the year, she was traveling with another wolf in a new pack known as the Butte Creek pack. In addition, a yearling male, (WA79m), dispersed from the Touchet pack and traveled through northeast Oregon and into Idaho (Figure 7).

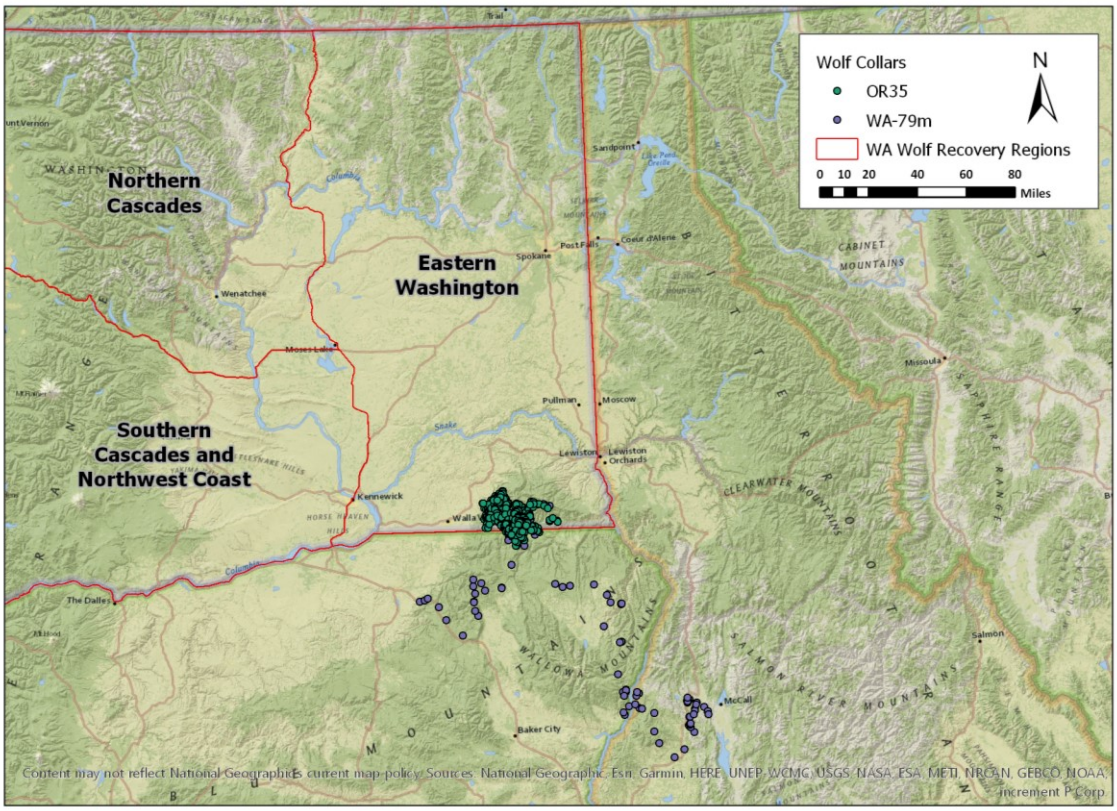

Figure 7. Collared wolves that dispersed from known Washington packs, 2018.

Regulated Harvest

Regulated wolf harvest occurs on Colville Confederated Tribal lands for tribal members only. The season ran from August 1, 2017 – February 28, 2018 with hunting and trapping as legal forms of harvest. An allocation of three wolves with a bag limit of one per day per tribal member was set for the entirety of the south half of the reservation. A harvest allocation of three wolves was also set for the entirety of the north half of the reservation with a bag limit of one wolf per tribal member per day. The Colville Confederated Tribes modified the harvest allocation on September 6, 2018 allowing unlimited annual harvest for both the north and south half for the remainder of the 2018/19 season. Three wolves were legally harvested on the south half of the reservation, and no wolves were harvested on the north half (Table 1). In February 2019, the

Colville Confederated Tribes established a year-round season with no annual harvest limits for both the north and south half of their Tribal Lands.

Regulated wolf harvest is also allowed for tribal members on the Spokane Indian Reservation. Wolf seasons remain open year-round or until a maximum of 10 wolves are taken during the calendar year. Trapping and/or snaring is allowed by special permit only. Three wolves were legally harvested on the reservation (Table 1).

No regulated harvest occurred in Washington outside of the Colville and Spokane Indian Tribal Lands.

Mortalities

There were 12 known wolf mortalities in Washington State during 2018 (Table 1). Four wolves were killed by WDFW staff to address livestock depredations, and six were legally harvested by tribal hunters. Two other human-caused mortalities remained under investigation when this report was prepared.

MANAGEMENT

Livestock Depredations

Reports of wolf-caused livestock depredations are classified as confirmed, probable, confirmed non-wolf (domestic dog, cougar, bear, etc.), unconfirmed depredation, non-depredation, or unconfirmed cause of death. Specific criteria for these classifications are outlined in the state Wolf Conservation and Management Plan.

Reports of wolf depredations on livestock are investigated by WDFW personnel with assistance, as needed, from USFWS staff and sometimes attended by interested local county officials and sheriffs' department personnel. In 2018, investigators confirmed that wolves were responsible for the death of 11 cattle and one sheep (Figure 8), and injuries to 19 cattle and two sheep (Table 2). Additionally, one injured cow and one calf mortality were considered probable wolf-caused depredations. Most mortalities occurred during the summer-fall grazing season from August through November (Figure 9).

As in past years, livestock depredation statistics in this report are based on livestock injuries and mortalities reported by producers. They do not include lost or missing livestock.

Number of Packs Involved in Livestock Depredations

Five of the 27 (19%) known packs and one independent wolf that existed in Washington at some point during 2018 were involved in at least one confirmed livestock mortality or injury (Figure 10).

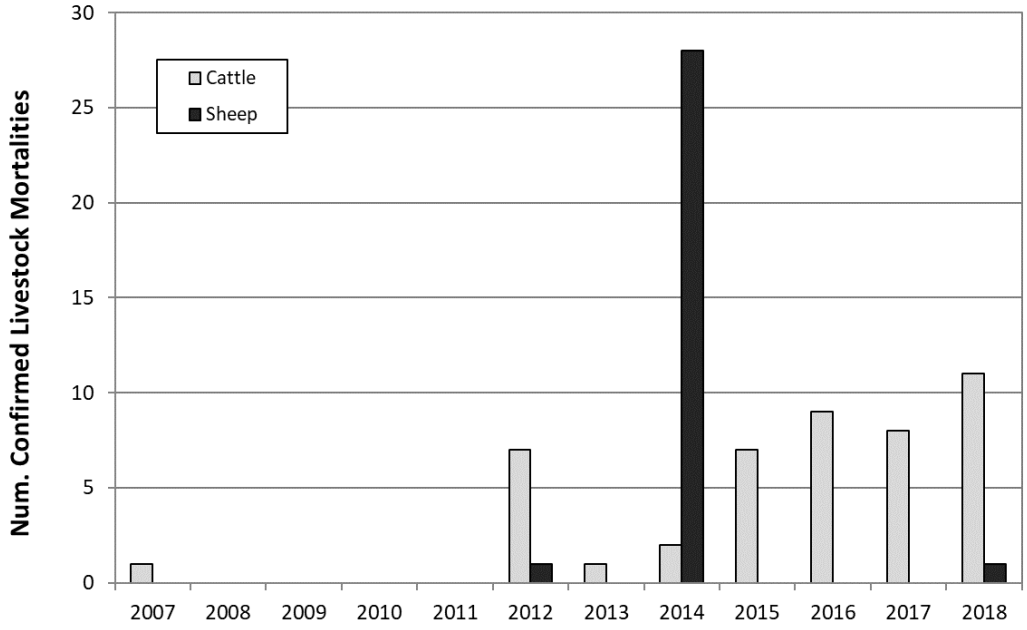

Figure 8. Total number of confirmed wolf-caused livestock mortalities in Washington, 2007-2018.

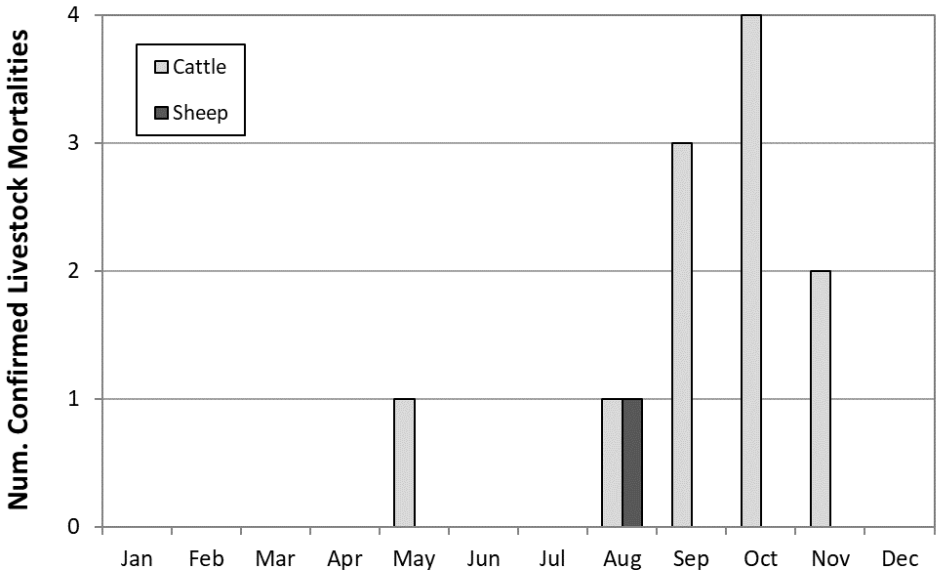

Figure 9. Number of confirmed wolf-caused livestock mortalities by month in Washington, 2018.

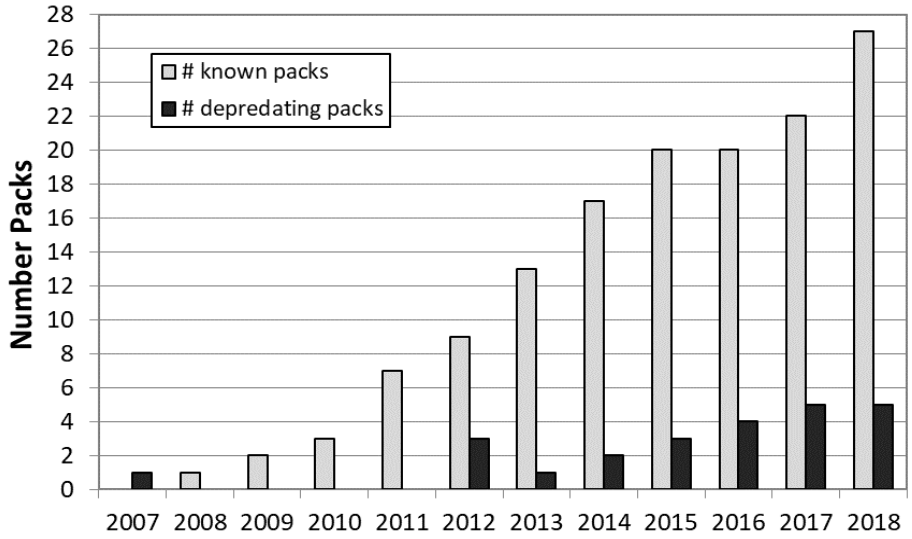

Figure 10. Minimum number of known packs that existed at some point during the calendar year and the number of confirmed depredating packs (on livestock) in Washington, 2007 – 2018.

Minimizing Wolf Conflicts with Livestock

One goal of the Plan is to manage wolf-livestock conflicts without undermining the recovery and long-term perpetuation of a sustainable wolf population. As in past years, in 2018, several preventative measures were used in an attempt to minimize livestock depredations.

Measures included non-electrified and electrified fladry, radio-activated guard (RAG) boxes, Fox lights, the use of livestock guard dogs, and range riders. WDFW also provided livestock producers with wolf location data to help identify high wolf-activity areas. The information enables producers to move livestock from high wolf-activity areas or monitor livestock more closely. Some producers protected livestock by penning animals, especially at night, and by removing injured and/or dead livestock from grazing sites. In the Eastern Washington recovery region, WDFW lethally removed depredating wolves in an attempt to change pack behavior after repeated depredations.

WDFW has full wolf management authority in the Eastern Washington recovery area (Figure 2). Under state law (RCW 77.12.240), the WDFW can implement lethal measures in an attempt to change pack behavior after repeated livestock depredations. In 2018, four wolves were removed through lethal actions (Table 2).

Table 2. Confirmed wolf-caused livestock and dog injuries and mortalities in Washington, 2013-2018.

	2013		2014		2015		2016		2017		2018	
	Injuries	Mortalities	Injuries	Mortalities	Injuries	Mortalities	Injuries	Mortalities	Injuries	Mortalities	Injuries	Mortalities
Cattle	0	1	2	2	0	7	6	9	5	8	19	11
Sheep	0	0	6	28	0	0	0	0	0	0	2	1
Other	0	0	0	0	0	0	0	0	0	0	0	0
Dogs	3	0	1	0	1	0	0	0	0	0	0	0
Total	**3**	**1**	**9**	**30**	**1**	**7**	**6**	**9**	**5**	**8**	**21**	**12**

In the western two-thirds of Washington, where wolves remain classified as an endangered species under the federal ESA, the USFWS is the lead management agency (Figure 2). The ESA prohibits lethal removal in this part of the state. No wolves were captured or relocated through USFWS actions.

Under state laws RCW 77.36.030 and RCW 77.12.240, administrative rule (WAC 220-440-060), and the provisions of the Plan, WDFW may permit livestock producers and their authorized employees to lethally remove a specified number of wolves caught in the act of attacking livestock 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. WDFW issued one permit to a livestock producer in 2018; however, no wolves were removed under the permit.

Also, state law and related regulations (WAC 220-440-080), permit owners of domestic animals (defined as any animal that is lawfully possessed and controlled by a person) and their immediate family members, or authorized agents to kill one gray wolf without a permit, if the wolf is attacking their domestic animals. This rule applies only in the Eastern Washington recovery area where wolves are federally delisted; it does not apply in areas where wolves remain classified as endangered under federal ESA. Any wolf removed under this rule must be reported to WDFW within 24 hours. The owner of the domestic animals must turn in the wolf carcass and cooperate with WDFW during an investigation. Although no wolves were removed under these provisions, one wolf was injured and later removed under agency action.

Damage Prevention Cooperative Agreements for Livestock

Ranching and farming are essential components of Washington's economy, and the lands devoted to these activities provide critical habitat for many wildlife species.

To minimize conflicts between wolves and livestock on public and private lands, WDFW personnel work with livestock producers to identify and implement non-lethal conflict prevention measures that are suitable for each producer's operation. Interested producers may also enter into a Damage Prevention Cooperative Agreement for Livestock with WDFW, which provides a cost-share for the implementation of conflict prevention measures.

During calendar year 2018, WDFW had cooperative agreements with 31 livestock producers across the state. Operators with an active DPCA-L received reimbursement from WDFW for a percentage of the cost of each conflict prevention measure, up to a maximum of $10,000. The most common non-lethal conflict prevention measures used were range riders, improved sanitation practices (such as treatment or removal of injured or dead livestock), checking on livestock daily, and fencing (e.g. fladry). Producers received a total of $257,421 in reimbursements. Due to the demand from producers interested, the program exceeded the funding available.

WDFW contracted with eight private organizations for range riding services. Under these contracts, WDFW employed 15 range riders at a total cost of $241,010. Range riders monitored livestock on open-range grazing allotments to minimize encounters with wolves. Contractors were assigned to locations as needed, and often covered multiple grazing allotments during a single assignment to assist multiple operators.

WDFW Livestock Depredation Compensation Program

The Washington Wolf Conservation and Management Plan explains what compensation is available for wolf depredations under state law (RCW 77.36) and administrative rules (WAC 220-440), as detailed in Appendix F of the Plan.

Compensation is available for deaths or injuries to cattle, sheep, horses, swine, mules, llamas, goats, and actively working guarding/herding dogs. To receive compensation, WDFW personnel or an authorized agent of WDFW must have classified the deaths or injuries as confirmed or probable. Operators must show that they have used methods to minimize wolf damage. Compensation is not provided for injuries or the deaths of domestic pets or hunting dogs that are not guarding or herding livestock.

The state's compensation program is multi-tiered, based on the size of the grazing site; whether the wolf depredations were classified as confirmed or probable; and whether the animals were killed or injured. Compensation is limited to $10,000 per claim, although higher amounts may be awarded based on appeals to the WDFW director.

- On grazing sites of at least 100 acres:

    - For each **confirmed** depredation, WDFW will compensate producers for the full value of the animal if it had gone to market, plus the full market value of one additional animal.
    - For each **probable** depredation, WDFW compensates producers for the full market value of only the affected animal(s).
    - For livestock and guarding/herding dogs **injured by wolves**, WDFW compensates producers for veterinary costs associated with their treatment.

- On grazing sites of less than 100 acres:

    - For each **confirmed** depredation, WDFW will compensate producers for the full market value of the affected animal. In these cases, WDFW compensation covers only the affected animal.
    - For each **probable** depredation, WDFW will compensate producers for half of the current market value (if it had gone to market) of the livestock.
    - For livestock and guarding/herding dogs **injured by wolves**, WDFW compensates producers for veterinary costs associated with their treatment.

The WDFW program is designed to avoid reimbursement from multiple sources for the same incident. Therefore, compensation to producers is reduced by the amount of other financial support, including payments from insurers or proceeds from the sale of partially salvaged carcasses or other products. Additional payments do not apply if all livestock are accounted for at the end of the grazing season.

Administrative rules (WAC 220-440-180) revised in 2015 by the Washington Fish and Wildlife Commission require producers to notify WDFW within 30 days of a depredation if they intend to seek compensation, and to submit the completed claim within 90 days.

To receive compensation, operators must have (a) complied with a WDFW checklist of non-lethal conflict prevention measures, (b) have a current Damage Prevention Cooperative Agreement with WDFW, or (c) received a waiver of these requirements from the WDFW director.

WDFW also compensates producers for veterinary costs associated with treatment of livestock and guarding/herding dogs injured by wolves (WAC 220-440-040, WAC 220-440-010). Livestock producers would be able to recoup veterinary treatment costs for injured animals, not exceeding their current market value. If injured livestock need to be euthanized, owners will receive compensation for the current market value of the animal. If livestock are injured to the extent that they must be sold prematurely, the operator will receive the difference between the selling price and current market value. Under (RCW 77.36), compensation to individual producers who experience damage shall not exceed $10,000 per claim without an appeals review.

WDFW received five direct claims and paid a total of $7,536 to compensate livestock producers who experienced livestock losses or injuries caused by wolves.

Livestock Review Board

The primary objective of the Livestock Review Board 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 recommend to WDFW whether the claim should be paid. The board is composed of five citizen members, with two representing the livestock industry, two representing conservation interests, and one member at-large. One claim was filed with the board for indirect losses caused by wolves during the grazing season and $5,950 was paid in compensation.

State Grants for Non-lethal Conflict Prevention Activities

During 2018, Washington state legislators created an account through Washington State Department of Agriculture to provide grants to interested non-profit organizations or producers for non-lethal deterrents in Okanogan, Ferry, Stevens, and Pend Oreille counties. One non-profit and four producers were awarded grants totaling up to $300,000, funding non-lethal deterrence through range riding, and projects such as fencing for calving areas to provide long term solutions to prevent wolf-livestock interactions. The state legislator also provided $80,000 for a special deputy position hired by the Ferry and Stevens county Sheriff's Offices to work on wolf related issues.

Wolf Interactions with Ungulates

The natural recolonization of any carnivore will have effects on other species inhabiting the area. WDFW recognizes the value of ungulate species for ecosystem function and recreational viewing and hunting. Through support from the state legislators WDFW began a five-year research study on predator-prey dynamics. WDFW staff have been working in cooperation with faculty and graduate students at the University of Washington to better understand carnivore and ungulate interactions as wolves recolonize Washington. The predator-prey project is quantifying the effects of wolf predation on ungulate species demographics in the areas where wolves are naturally recolonizing. This study also examines the effects of the wolf recolonization on cougar foraging and population dynamics. WDFW initiated the research in December 2016 and work is occurring in two study areas within Okanogan and Stevens Counties. There is an additional study focused on ungulate-predator dynamics; which focuses on causes of mortality and movement patterns of ungulates between wolf occupied and wolf un-occupied areas. See the research updates section below to learn more about these projects.

RESEARCH UPDATES

Projects Completed in 2018 - Information Provided by the Researchers:

Title: Stress-Mediated and Habitat-Mediated Risk Effects of Wolves on Free-Ranging Cattle in Washington
Graduate Student (PhD): Azzurra Valerio, Washington State University
Major Advisor: Caren Goldberg, Washington State University
Cooperators: Stephanie Simek, Washington Department of Fish and Wildlife

Project Summary: Wolves (*Canis lupus*) can affect free-ranging cattle (*Bos taurus*) through direct consumption or indirectly through risk effects (i.e., the cost of anti-predator behavioral responses). Currently there remain a paucity of studies that investigated how cattle respond to wolf predation risk, therefore in the present research we evaluated both stress-mediated and habitat-mediated risk effects of recolonizing wolves on range cattle in Washington, USA. First, because traditional measure of stress hormones (fecal glucocorticoids - GCMs), provide inconclusive results when applied on free-living animals, we validated a new methodology to characterize cattle stress response. Conducting a stress-induced experiment on captive Angus beef cows, we compared fecal GCM analysis with the new cutting-edge technology of fecal metabolomics. We found that contrary to GCM concentrations, cattle fecal metabolome changed before and after a stressful event proving that fecal metabolomics is a more reliable methodology to assess stress response. Subsequently, to characterize cattle stress response in relation to wolf presence, we collected cattle fecal samples and contrasted the fecal metabolome of cattle herds grazing in areas with low and high wolf use. We found that significant metabolic pathway shifts occurred between livestock herds grazing in areas of low and high wolf-impacted areas, and that this difference was primarily correlated to wolf proximity and not to cattle nutrition and other environmental variables (e.g., landscape and climate variables). Finally, in the same study areas we investigated whether cattle habitat use changed in the presence of wolves to balance the conflicting demands for food and safety. Resource selection functions based on 65 GPS radio-collared cows revealed that contrary to our prediction herds grazing in high wolf-impacted areas did not respond consistently to wolf predation risk with habitat shifts that facilitate encounter avoidance.

We conclude that although we found a varying wolf-effect on cattle habitat use, cattle metabolism changed as function of stress due to the presence of wolves. Therefore, further research is needed to know if heightened risk and related stress response resulted in lower pregnancy rates or calf weaning weights.

Ongoing Projects:

Title: Predator-Prey Project
Principle Investigators: Melia Devivo & Brian Kertson
***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: Ungulate - Predator Dynamics in Northern Washington
Graduate Student (PhD): Taylor Ganz, University of Washington
Major Advisor: Laura Prugh, University of Washington
Cooperators: Melia Devivo, Washington Department of Fish and Wildlife

Project Summary: As a component of the WDFW/UW Predator-Prey Project, we seek to determine how wolves impact mule deer, white-tailed deer, and elk within the context of other predators, varied habitat and nutrition, and human use of the landscape. We use GPS and radio-tracking collars to compare the rates and causes of mortality and movement patterns of ungulates between wolf occupied and wolf un-occupied areas. 2018 was the second of four years of fieldwork for this project. We collared 27 neonatal white-tailed deer, 13 adult female white-tailed deer, 82 adult female mule deer, 16 neonatal elk and 22 adult female elk in 2018. In total, we have deployed collars on 46 neonatal white-tailed deer, 30 adult female white-tailed deer, 102 mule deer, 16 neonatal elk, and 56 adult female elk, with continued capture efforts underway.

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 122 individuals across 22 confirmed packs as of 2017. Cougars (*Puma concolor*) occupy a similar niche to wolves by hunting large prey and likely compete directly and indirectly for space and food resources. Working as part of the WDFW/UW multiple predator-multiple prey research project, we are examining the interactions between wolves and cougars in landscapes in northeast and north-central Washington. This PhD project aims to

understand whether and how a) the recolonization of wolves in Washington State is impacting cougar resource selection, b) the co-occurrence of wolves and cougars impacts risk landscapes for ungulate prey, and c) anthropogenic landscape impacts and human presence influence resource use for both predators. To date, 49 cougars and nine wolves (representing four packs) have been fitted with GPS collars, which has allowed visitation of 349 cougar feeding sites and 99 wolf feeding sites across two study areas totaling 10,000 square kilometers. (3860 square miles) from 2017 to 2019. Field investigations for both predators record species, age, sex, condition, and location of prey along with habitat and terrain characteristics. When possible, camera traps are placed while cougars are still active at cougar feeding sites to assess prey handling times, kleptoparasitism, and scavenging by other predators, and to date 27 cameras have been placed at cougar feeding sites. Location of cougar and wolf kills will be used to quantify both cougar and wolf space use (especially changes to cougar space use in relation to wolf pack density) and potential encounters between these two apex predators. Information gained will be valuable when setting management goals 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. More information can be found on the "Wolf-Cougar Interactions" page of Washington Predator-Prey Project website: https://predatorpreyproject.weebly.com/wolf-cougar-interactions.html.

Title: Interactions among large and small carnivores in Washington
Principle Investigator: Laura Prugh, University of Washington
Cooperators: Brian Kertson, Washington Department of Fish and Wildlife

Project Summary: The objective of this study is to gain a better understanding of how large carnivores (wolves and cougars) affect the dynamics of meso-carnivores (coyotes and bobcats). We are using a combination of GPS collars, fecal genotyping, and cameras at kill sites to examine population dynamics, scavenging behavior, and movements of meso-carnivores. 2018 was the first of three years of fieldwork for this project, which is being conducted in collaboration with the Predator - Prey Project in two study areas of northern Washington. We deployed GPS collars on four bobcats and seven coyotes, collected 332 scats samples, and deployed 40 cameras at ungulate carcasses to monitor scavenging.

Title: Spatiotemporal dynamics of predator-prey interactions as wolves recolonize Washington
Graduate Student (PhD): Sarah Bassing, University of Washington
Major Advisor: Beth Gardner, University of Washington
Cooperators: Brian Kertson and Matt VanderHaegen, Washington Department of Fish and Wildlife

Project Summary: As part of the WDFW/UW predator-prey project, we are using camera traps deployed throughout 2 study areas in eastern Washington to better understand how prey (e.g., deer and elk) and competing predators (e.g., cougars, bears, coyotes) respond to wolf presence across the landscape. Starting June 2018, we deployed 55 remote-sensing cameras in the Northeast study area and 65 in the Okanogan study area. We placed cameras across a variety of

habitats, elevations, and land-use and ownership types. The cameras are collecting data year-round and will remain deployed through summer 2020. We checked all cameras at least once before December of 2018 to exchange memory cards and check batteries. Eight undergraduate volunteers from the University of Washington are currently identifying photographs from these cameras and have processed over 25,000 images, to date. We have detected all species of primary interest for the project on camera (i.e., white-tailed deer, mule deer, elk, moose, gray wolf, and cougar), as well as numerous other important species in the ecological community (e.g., black bear, coyote, and bobcat). We will use these photo-captures of animals to assess how environmental factors and species interactions influence where predators and prey co-occur and the habitats they use. In addition, we will evaluate how daily activities of prey species are influenced by the occurrence of wolves and other predators, as well as whether these species demonstrate avoidance or attraction behaviors towards one another at camera locations. Results from our research will hopefully improve our understanding of how recolonization of wolves influences the broader ecological community in eastern Washington and may help inform a monitoring program for wolves across the state.

Title: Influence of gray wolves on interspecies movement patterns in the Central Cascades
Undergraduate Student: Story Warren, University of Montana
Major Advisor: Mark Hebblewhite, University of Montana
Cooperators: Ben Maletzke, Washington Department of Fish and Wildlife, Sarah Bassing, University of Washington

Soon after gray wolves (*Canis lupus*) began recolonizing Washington in 2008, wolves reappeared in the Central Cascades. As wolves return to Washington ecosystems, they may impact how other species use the land. For example, coyotes (*Canis latrans*) may avoid wolves to minimize the risk of direct conflict. Conversely, coyotes may follow wolves in order to increase their opportunity to scavenge wolf kills. We are developing an undergraduate research project to investigate whether and how gray wolves influence the spatial and temporal movement patterns of other species in a Central Cascades ecosystem. Within the known territory of a Central Cascades wolf pack, a study area composed of a grid of sixteen 25 km^2 cells was established. In the summer of 2018, 16 remote cameras were deployed. In order to maximize the probability of detecting animals moving through the landscape, cameras are set to photograph animals traveling on gated roads and trails within each 25 km^2 cell. We will conduct a multi-species evaluation to examine the interspecies effects of wolf occurrence. Analyses will include examining the influence of wolf occurrence on coyote movements. Cameras are expected to remain deployed through the summer of 2019. Data analysis is anticipated to begin in the autumn of 2019.

Title: Monitoring impacts of wolf recovery in Washington State
Principle Investigator: Samuel Wasser, University of Washington

Project Summary: Between 2015-2107, we collected demographic data on abundance, distribution, survivorship, pregnancy status, and diet composition of wolves NE WA, focusing on the following packs: Smackout, Dirty Shirt, Carpenter Ridge, Salmo, Goodman Meadows and

Skookum. Simultaneous data were also collected on the distributions and diets of coyotes, cougar, bobcat and black bear. Detection dogs located over 8,000 samples from these five carnivores over the study area in six sampling session, each roughly 6-8 weeks in length. DNA was used to determine the host species and diet composition of all geo-referenced samples. Wolf samples were also genotyped for sex and individual identity. Hormones extracted from female wolves, collected in spring of 2015 and 2017 were also analyzed for progesterone concentrations to determine pregnancy status of females over the landscape. The wolf data are currently being used to optimize capture-mark-recapture models to estimate population abundance, in collaboration with WDFW. Hormone-based nutritional health assessments of wolf and coyote samples are also being conducted. Between October and December 2018, similar collection methods were used to sample the distribution and densities of carnivores along the eastern side of the Cascade Range from I-90, south to Mount St. Helens, with special emphasis on detecting presence of wolves. Lab analyses of the 1200 scat samples collected over this study area are currently underway.

Title: Methods for long-term monitoring of wolves
Graduate Student (MS): Trent Roussin***,*** University of Washington
Major Advisor: Beth Gardner, University of Washington
Cooperators: Washington Department of Fish and Wildlife

Project Summary: In coordination with the WDFW/UW predator-prey project and WDFW, we are using camera traps and bioacoustic monitors to develop more efficient methods to accurately monitor Washington's expanding wolf population. We will use these tools in addition to GPS telemetry data to gain a better understanding of the biotic and abiotic factors that influence wolf distribution and densities on local and statewide scales. During 2018, we worked with other members of the predator prey project and WDFW to deploy cameras in six known wolf pack territories in northeastern and north-central Washington, while also working to deploy additional GPS collars in those areas. In January 2019, we began testing bioacoustic monitors and placed 15 in one pack territory and four in a captive wolf facility as proofs of concept. Those deployments were promising, yielding over 40 hours of wolf vocalization data. We will working with collaborators to develop computer algorithms to facilitate efficient data processing going forward. In May 2019, we anticipate starting to deploy up to 200 bioacoustic monitors throughout the predator-prey study area. These devices will be checked or moved periodically over the next two years to facilitate seasonal data collection objectives. Results from our research will improve our understanding of factors that influence how wolves utilize the landscape, while also informing wolf population monitoring efforts across the state.

Title: Effects of Summer Habitat Selection on Survival and Reproduction of Moose in Northeast Washington
Graduate Student (MS): James Goerz***,*** University of Montana
Major Advisor: Dr. Mike Mitchell, University of Montana
Cooperators: Dr. Richard Harris, Washington Department of Fish and Wildlife

Project Summary: In December 2013, Washington Department of Fish and Wildlife (WDFW) partnered with The University of Montana (UM) and began a five-year study on the demography and behavior of moose in the northeast region of the state (map attached). The specific objectives of this project are to increase our understanding of the interactions of several hypothesized drivers of moose movement and population vital rates including direct and indirect effects of predation, sources of habitat heterogeneity and temporal and spatial variation in thermal conditions. Fieldwork recently concluded which monitored 67 GPS/VHF radio-marked adult female moose year-round and provided multi-year data on movement, reproduction, adult/calf survival (fitness) and cause-specific mortality. Additionally, randomly-placed remote camera arrays allowed estimation of predator and competitor densities within our study areas which will be used, alongside ground and remotely sensed variables, as potential explanatory context for observed habitat selection patterns and fitness outcomes. This project is currently funded through WDFW, UM, The Boone and Crockett Club (B&C), The Montana Cooperative Wildlife Research Unit (USGS), The Upper Columbia United Tribes (UCUT), and The National Science Foundation (NSF) and will be completed in Spring 2020.

OUTREACH

Wolf conservation and management continues to attract extensive public interest, and WDFW has increased its outreach and communication activities accordingly over the past several years.

In 2018, in addition to numerous, daily interactions (i.e. phone calls, emails, personal communications) with the public, department personnel were also interviewed by local radio, newspaper, and television outlets on many occasions. WDFW staff also made formal presentations to school groups, universities, wildlife symposiums, state and federal management agencies, livestock associations, conservation groups, state legislative committees, the Washington Fish and Wildlife Commission, local interest groups, and professional conferences.

WDFW maintains numerous pages on its website related to wolves and wolf management in Washington (https://wdfw.wa.gov/conservation/gray_wolf/). In addition to general wolf information and links to other wolf-related sites, the website also provides interested parties with access to the archives of the plan, agency news releases, and weekly and monthly updates of wolf management activities. The website includes a wolf observation reporting system, through which the public can report sightings, or evidence of wolves to help WDFW personnel monitor existing packs and document possible wolf activity in new areas. The website also provides telephone numbers for reporting suspected livestock depredations.

Wolf Advisory Group

Since 2013, WDFW has relied on the Wolf Advisory Group (WAG) to provide guidance on wolf management under the terms of the plan. The WAG is comprised of citizen members appointed by the director who serve two-year terms, with the members representing a broad spectrum of stakeholder interests – livestock producers, conservation groups, hunters, and others.

The WAG met four times and held two conference calls, and hosted open-house-style public comment periods before each WAG work session. Core goals of the WAG are to reconcile divergent views and build resilient relationships among stakeholder groups, including WDFW. As such, the 18-member WAG spent time developing relationships that foster respect, honest dialogue, and mutual learning. The WAG advised WDFW on expectations for preventive and non-lethal measures to minimize wolf-livestock conflicts and potential agency management actions to address reoccurring depredations. In addition, the group began discussing how wolf management might change after wolves are delisted under federal and state endangered species laws; helped restructure WDFW representation on the WAG; and began reviewing how WDFW shares sensitive wolf location data. All WAG meetings are open to the public. Agendas, notes, handouts, and meeting minutes are posted on WDFW website (https://wdfw.wa.gov/about/advisory/wag/).

At the end of 2018, three WAG members vacated their seats, opening opportunities for new members to join. WDFW received over 25 nominations to fill the vacancies. A team of WDFW staff implemented a comprehensive candidate assessment and selection process, which was

underway at the end of the year. The candidate recruitment process will be completed and new members announced in 2019.

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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/

Appendix A. 2018 - Wolf Removal Operation Summary

Introduction

This appendix describes the context and details of lethal management actions taken by the Washington Department of Fish and Wildlife (WDFW) to address repeated depredations by three wolf packs during the 2018 grazing season. Much of this information is available on the department's website (https://wdfw.wa.gov/conservation/gray_wolf/updates), but this appendix consolidates that material and identifies expenditures related to each lethal removal action. This appendix also fulfills a provision of the WDFW Wolf-Livestock Interaction Protocol, which the criteria set forth calls for WDFW to provide a final report to the public after lethal removal operations have concluded.

As in previous years, WDFW's actions were guided by the state's Wolf Conservation and Management Plan, adopted in 2011 by the Washington Fish and Wildlife Commission, and the Wolf-Livestock Interaction Protocol developed by WDFW in collaboration with its 18-member Wolf Advisory Group.

The wolf plan and protocol describe strategies for minimizing wolf-livestock conflict that starts with the use of non-lethal deterrents to prevent repeated depredations on livestock. If preventive measures do not succeed, WDFW may remove one or more wolves in an attempt to alter the pack's behavior.

Lethal removal operations occurred in three packs – Togo, OPT ("Old Profanity Territory"), and Smackout. WDFW confirmed the three packs were responsible for the deaths of nine cattle (six adult, three calves) and injuries to 17 others (calves) between May 20 and November 1, 2018. One other calf sustained injuries that was classified as a probable wolf depredation. There were two depredations in 2017 that were attributed to the Togo pack and these events were considered in the decision making process.

Togo Pack

Background

In 2016, WDFW biologists suspected wolf activity in what is now considered the Togo pack territory. Initially, collar data from the Profanity Peak pack seemed to indicate Boulder and Deer creeks formed a distinct boundary along the northern edge of the Profanity Peak territory. Typically, such a clear demarcation of a boundary is consistent with the presence of a neighboring pack defending its own territory and keeping other wolves out.

In addition, people reported seeing wolves north of Boulder Pass, but those reports could not be verified during the 2016 grazing season. During a Ferry County Cattlemen's Association

meeting in December 2016, one producer reported hearing wolves north of Boulder and Deer creeks. He stated his livestock behaved unusually strangly during the summer grazing season.

In response, WDFW staff attempted to confirm the presence of a pack during the winter of 2016-2017. Although they were unable to confirm pack activity through tracking surveys, WDFW staff continued to follow up on reports and spend time in the area.

During the 2017 grazing season, WDFW contracted range riders and a non-governmental group looked into reports of wolf activity and restless cattle behavior. However, WDFW was unable to document verifiable wolf activity.

Timeline: Confirming the Pack's Formation

On October 27, 2017, a livestock producer shot and killed an adult female wolf that was in the act of attacking his livestock in northern Ferry County. On November 2, a producer reported a potential wolf depredation north of Boulder and Deer creeks in the same area where WDFW wolf biologists suspected pack activity.

WDFW investigated the reported depredation and confirmed that a wolf or wolves were responsible for injuries to a calf. During the investigation, a range rider told the producer and WDFW staff that he had heard wolf howls and found tracks and scat from what he believed to be multiple wolves in the pasture where the depredation occurred. Range riding was increased in the area, including daily checks of the cattle, until the herd was moved to winter range. The injured calf was kept in a pen away from the large grazing location for monitoring.

On November 8, 2017, the same producer contacted WDFW about another potential wolf depredation, in which a calf was killed in the same general area as the confirmed depredation six days earlier. WDFW's investigation confirmed the second depredation as a wolf kill due to the location and characteristics of the calf's injuries. Investigators also found signs of a struggle in the snow at the scene and tracks believed to be from multiple wolves. After this depredation, the calf carcass was removed from the grazing location and range riders remained in the area daily until the cattle were moved to winter range.

WDFW continued its effort to confirm the presence of a wolf pack in the area during the winter of 2017-2018. In February 2018, WDFW confirmed through analysis of tracks and scat that at least two wolves were traveling together consistently in the area north of Boulder and Deer creeks. WDFW personnel encountered evidence of wolf activity spanning the Kettle Range between Laurier and Orient in the east and Danville in the west, and from the Canadian border in the north to Boulder Pass in the south. These surveys also revealed fresh and older tracks along the edge of the pasture where the second depredation occurred.

After confirming the presence of two adult wolves traveling together and consistently using the area in winter, WDFW officially confirmed the Togo pack's existence and included it in the 2017 annual report.

Timelime: May through July 2018

In May 2018, before the start of the grazing season, WDFW staff worked with state and federal range managers to share information about the pack and take steps to minimize wolf-livestock conflict, despite not having a radio-collared animal in the area. Preventive measures included adjusting grazing schedules to prevent cattle from grazing near possible wolf denning sites, when those locations were known. WDFW staff worked with producers to implement other preventive measures, including range riding, securing calving locations, maintaining a regular human presence near the cattle, and relocating salt-lick sites. Most of the cattle herds were monitored daily during this time.

On May 20, a producer reported to WDFW a possible wolf depredation north of Boulder Creek and within one mile of where WDFW had found the tracks and scat that confirmed the Togo pack. During the investigation, WDFW learned that a witness had seen a black wolf leaving the scene. WDFW confirmed the dead calf as a wolf depredation due to the injuries present and signs at the scene. This producer deployed additional human presence, including range riders. Shortly after the confirmed wolf depredation, the producer created a pasture off the allotment to confine the cattle while the calves grew larger.

On May 24, a WDFW wolf biologist located wolf sign typically associated with denning activity, roughly halfway between the location of the May 20 depredation and the depredations in November 2017. The following day, the biologist tracked a single wolf from the vicinity of the depredation (within 0.25 km) to within 0.5 km of the area of high wolf use discovered the previous day.

On May 29, WDFW staff began capture efforts in the area, and on June 2 captured a black adult male wolf in the drainage where the November 2017 depredations occurred. The wolf was fitted with a Global Positioning System (GPS) collar, which provided location data that was shared with livestock producers and county officials. The collar data indicated that animal was consistently present in the high wolf use area found on May 24, and was using the same areas where WDFW discovered wolf signs during February 2018.

During May, WDFW committed to providing one business day (eight court hours) advance public notice prior to initiating lethal action on wolves, so the public would have the opportunity to seek relief from the court. This requirement will remain in place until the issues raised in the case are finally adjudicated. WDFW already provides advance notice to the public before taking lethal action on wolves.

Sometime during the spring, the two Togo wolves produced a litter estimated to include two pups based on tracks and seeing pups near a culvert while trapping. On June 2, 2018, WDFW staff captured and collared an adult male wolf from the Togo Pack.

By mid-June, two livestock producers had moved more than 1,000 cow-calf pairs onto state and federal grazing allotments and private pastures within the Togo territory.

During June and July, range riders from multiple organizations and WDFW staff monitored the herds that had been moved onto large grazing areas. In addition to the deterrents described above, dead livestock were removed from the grazing areas as needed. WDFW continued to monitor the pack based on radio-collar data and reports from WDFW staff and producers.

Timeline: August through December 2018

On August 8, 2018, WDFW was contacted by the wildlife specialist employed by the Stevens and Ferry County sheriff's offices about a potential wolf depredation on a United States Forest Service (USFS) grazing allotment in the Togo pack territory near Danville. Later that day, WDFW staff found a dead adult cow. During the investigation, WDFW documented bite lacerations with associated hemorrhaging, signs of a struggle down a steep hill and around the cow carcass, and recent wolf activity in the area. Based on that evidence, they confirmed that the death was a depredation by one or more wolves from the Togo pack.

Due to the remote location and rugged terrain, the cow carcass was left on-site. Meanwhile, the livestock producer and his range rider herded the cattle to a different area of the allotment. The cow had been turned out as part of a cow-calf pair, but the producer and range rider could not immediately locate the calf.

Throughout the grazing season the producer used a variety of deterrent measures to protect the livestock. He delayed turnout until late June so the calves would be larger and used Foxlights on his private pasture to deter wolves. Following turnout, he removed sick or injured cattle from the allotment and deployed one or more range riders each day to check the cattle. They moved the cattle when necessary.

August 9, WDFW was contacted by a WDFW- contracted range rider about another potential wolf depredation in the Togo pack area that injured a 350-pound calf owned by the same producer. The producer and range rider moved the injured calf, and the cow that accompanied it, from the allotment to a holding pen at their residence. The producer requested collar data for the Togo pack at this time.

On August 10, WDFW staff and the county wildlife specialist examined the cow and calf. The cow did not appear to have any injuries, but they documented bite lacerations to both of the calf's hamstrings and left flank, and puncture wounds and associated hemorrhaging to the left hindquarter and stomach. Based on the evidence and related factors, the investigators confirmed that the calf's injuries were the result of a wolf depredation. The cow and injured calf were kept at the holding pen for monitoring.

The August incidents brought the number of confirmed depredations by the Togo pack to five since November 2017. In four of the incidents, producers had used at least two preventive

strategies to deter wolf predation as criteria set forth in the WDFW protocol. Livestock producers in the area continued to use non-lethal deterrents to help reduce the likelihood of further wolf depredations.

WDFW had confirmed the pack included two adults and an unknown number of pups, but it also received an unconfirmed report of a third adult wolf traveling with the pack. Due to uncertainty about the number of adults in the pack and the importance of receiving ongoing location data from the collared adult male, WDFW Director Kelly Susewind directed the staff to attempt to confirm the number of adults and learn as much as possible about the pack's activities before he considered further action.

On August 11 and 12, WDFW staff deployed remote cameras in the Togo pack area to help determine the number of wolves in the pack. They also set traps in an effort to capture and radio-collar additional members of the pack.

On August 17, WDFW staff created login credentials, which allowed the producer to access wolf location data from the collared wolf in the Togo pack.

On August 18, 2018, WDFW documented the third wolf depredation by the Togo pack within 30 days (and the sixth since November 2017). WDFW confirmed that one or more wolves were responsible for injuring a calf on a USFS grazing allotment in Ferry County. The depredation prompted Director Susewind to initiate lethal removal as criteria set forth in the plan and protocol.

The rationale for lethal removal was as follows:

1. WDFW confirmed three livestock depredations by the Togo pack within 30 days and six within the previous 10 months. The depredations resulted in two dead calves, one dead cow, and three injured calves. The three most recent depredations occurred over approximately a 10-day period.

2. Producers used at least two preventive deterrent strategies prior to five of the six confirmed depredations, and they took additional steps after the incidents occurred. But those actions failed to alter the pack's behavior or to reduce the potential for additional depredations.

3. WDFW expected depredations to continue, based on the history of depredations and the failure of non-lethal measures to change the wolves' behavior.

4. The department documented the use of appropriate deterrents and notified the public of wolf activities as outlined in the protocol.

5. The lethal removal of wolves was not expected to harm the wolf population's ability to reach recovery objectives statewide or within the Eastern Washington recovery region,

where the wolf population is more than double the regional recovery objective in the wolf plan.

Based on all five factors, on August 20 the director authorized an incremental removal of wolves from the Togo Pack, which was estimated to include two adults and at least two pups. WDFW expected to begin the effort the following day due to a court order from May 2018, whereby WDFW committed to providing one business day (8 court hours) advance notice prior to initiating lethal removal actions on wolves.

However, later that day a Thurston County Superior Court judge granted a temporary restraining order prohibiting WDFW from beginning the lethal removal effort. The restraining order was granted in response to the Center for Biological Diversity and Cascadia Wildlands, which filed the request for injunction following Director Susewind's authorization of lethal action. The judge said the plaintiffs' complaint met the criteria for a temporary restraining order under the state Administrative Procedures Act, and a hearing was scheduled for August 31 to determine whether to replace the temporary order with a longer-lasting court order. In announcing a decision, the judge specified that it applied only to the Togo lethal removal decision.

On August 22, WDFW published on its website the reports for the six confirmed Togo pack depredations from November 2, 2017, to August 18, 2018.

On August 24, WDFW received a report from the Ferry/Stevens County wildlife specialist that a Ferry County livestock producer had shot at an adult wolf in self-defense the previous day in the Togo pack area. He said the wolf was black and was wearing a collar, which matched the description of one of the confirmed Togo wolves. WDFW staff traveled to the scene on the 24th and searched for two hours, but did not find enough evidence to confirm that a wolf had been shot. In fact, WDFW staff said they received data that morning indicating that the wolf was alive. The wolf's collar was equipped with a mortality indicator that sends an email to WDFW wildlife managers when a mortality is detected, but no message was sent as of the morning of the 24th.

The producer told WDFW staff they were responding to collar data indicating the wolf's presence near their livestock. When the producer searched the area, they saw pups and heard barking, and said they shot at the adult male as it barked and approached them. Afterward, the producer reported the incident to the Ferry County Sheriff's Office, which notified WDFW staff.

On August 27, WDFW staff and the Ferry/Stevens County wildlife specialist located the wolf – injured but mobile – in the Togo pack territory. Radio signals and recent GPS locations from the collared wolf led biologists to the vicinity where they saw and identified the wounded animal as the adult black male from the Togo pack.

WDFW staff got to within approximately 20 yards of the injured wolf and saw that its left rear leg appeared to be broken below the knee. Within seconds, the wolf ran into a wooded area. A

remote camera in the area showed that the adult female from the Togo pack had been nearby the night before.

Based on their experience with other animals, WDFW believed the injured wolf had a good chance of surviving, and WDFW decided to continue to monitor its movements. If the wolf did not remain active, WDFW would then decide whether it should be euthanized.

After confirming the wolf's identity, WDFW personnel continued their investigation into the shooting incident.

On August 31, a second Thurston County Superior Court judge issued an order permitting WDFW to initiate lethal action to remove the adult male Togo wolf. In rejecting the plaintiffs' request for a preliminary injunction, the judge said the two groups had not met the legal standard required to issue an injunction. As a result, the temporary restraining order issued on August 20, which prohibited WDFW's lethal removal action, expired at 5 p.m. on August 31.

WDFW began the lethal removal action when the temporary restraining order expired, based on the following factors:

- There was no evidence that the pack would change the pattern of preying on livestock.
- The adult female would have had trouble feeding both the injured adult male and her two pups unless she continued to prey on livestock.
- It is more difficult for wolves to capture wild game animals, such as deer and elk, than cows and calves.

On the evening of August 31, following expiration of the temporary restraining order, WDFW personnel on foot attempted to locate the wounded wolf. They returned to the area on Saturday, September 1, but did not see the animal either day.

On September 2, a WDFW marksman removed the collared male wolf in the Togo pack from a helicopter.

Following the wolf's death, WDFW immediately began a formal evaluation period, during which WDFW staff continued to monitor the pack's activities and worked with the livestock producer to prevent further conflicts. This approach followed the criteria set forth in the wolf plan and protocol, which call for an incremental approach to resolving predation events, with periods of removal followed by periods of evaluation to determine if the action changed the pack's behavior and reduced the chances of continued depredations. During this time, WDFW initiated a trapping effort in the area to attempt to capture, radio-collar, and release one of the Togo pups. Also, throughout the month, WDFW staff spent time on grazing allotments, assisting range riders and directing the hazing of wolves.

On September 7, WDFW personnel documented a new livestock depredation by the pack on a USFS grazing allotment in Ferry County, resulting in an injured calf. That brought the total number of confirmed depredations by the pack to seven since November 2017.

WDFW investigators determined that the incident was a new depredation – not one that occurred during or before the removal period – allowing for the possible removal of additional wolves from the pack under the management protocol.

WDFW determined there was no clear path for removing the remaining Togo adult female without the risk of orphaning the pups. WDFW continued to evaluate the situation and work with the producer, who used several non-lethal deterrent measures:

- Keeping cattle within private fenced lands.
- Checking on the cattle multiple times every day during feedings.
- Removing sick or injured cattle from the area to avoid attracting wolves.
- Periodically using range riders to monitor his livestock.

Through October 5, WDFW continued to evaluate whether removing one wolf from the Togo pack on September 2 changed the remaining wolves' behavior and reduced the potential for further wolf depredations on livestock. As of October 5, the most recent depredation occurred 28 days earlier, on September 7.

On October 19, WDFW issued its last Togo update after determining there had been no documented depredations in the 42 days following September 7.

At that time, WDFW said it might initiate another lethal removal action if it documented additional wolf depredations on livestock within the 30-day and/or 10-month rolling windows described in the protocol.

On October 26, WDFW confirmed a new wolf depredation that caused injury to a calf and attributed it to the Togo pack. This depredation brought the total to eight since November 2017 and six within the previous 10 months. The director began a review to consider next steps.

The owner of the calf was the same producer who experienced seven of the pack's earlier depredations. The producer continued to employ the non-lethal deterrence measures and was moving the livestock to his large fenced pasture adjacent to the allotment when the October 26 depredation occurred. The producer was checking the livestock in the pasture daily. WDFW contracted range riders and range riders provided by a NGO were also assisting the producer. To further protect his livestock, the producer had recently entered into a Damage Prevention Cooperative Agreement for Livestock with the department on a fencing project to subdivide his larger pasture into smaller sections.

On November 7, WDFW Director Susewind reauthorized the lethal removal of the remaining wolves in the Togo pack. He found that the October 26 depredation showed the pack had not stopped preying on livestock following the earlier lethal removal action, and that the producer had used multiple non-lethal deterrents as specified in criteria set forth in the Wolf Plan and Protocol. Director Susewind issued a permit allowing the livestock owner, his immediate family, and his employees to kill wolves if they approached livestock within his private fenced pasture. The director decided not to have WDFW staff conduct the removal because of resource limitations related to having multiple concurrent lethal removal operations underway.

There were no additional depredations by the Togo pack between November 7 and the end of 2018 and no additional wolves were removed by WDFW or the producer after the one was removed on September 2.

Timeline: Website updates

WDFW posted updates on the Togo pack on the following dates:

2017: November 9 and 15; and December 6

2018: April 2, May 24, June 1, July 2, August 2, 11, 13, 20, 22, 24, 28, and 31; September 2, 7, 11, 13, and 25; October 1, 5, and 19; November 1, 6, and 7; and December 3

All are available online at https://wdfw.wa.gov/conservation/gray_wolf/updates/update_on_washington_wolves.pdf.

WDFW Lethal Removal Operation

Total expenditure for the lethal removal operation on the Togo pack (staff time, contractor time and aerial support) was $8,362. Funds came from the State Wildlife Account.

Togo Pack Lethal Operation			
Date	**Wolf**	**Sex**	**Age**
September 2, 2018	1	Male	Adult

OPT ("Old Profanity Territory") Pack

Background

WDFW confirmed wolf activity during in the historic Profanity pack area during May 2018 and notified the public on June 1. The wolves were referenced as the Old Profanity Territory (OPT) pack during the 2018 grazing season and officially named in this report. The new pack's name reflects the fact that part of its range in northeast Washington overlaps some of the range used by the former Profanity Peak pack, most of whose members were lethally removed by the department in 2016 after repeatedly preying on livestock and failing to respond to non-lethal deterrents.

WDFW surveys indicated the OPT pack included three to four adults and at least two pups. WDFW notified the public after informing the producer and providing information about the general location of the pack's suspected den site.

Timeline: Fall 2017 – September 2018

Beginning in fall 2017, WDFW contracted for range riding services in grazing allotments within the OPT pack's range. The producer's calving operation takes place in the Columbia Basin, away from the allotment and from the territory of other wolf packs. The cow-calf pairs are trucked to the allotment, where they are released for the grazing season, which runs from May through September/October.

The producer calves early and delayed the turnout of livestock until July 10, 2018 (normally June 1) so calves are larger (over 200 lbs.), and ungulate fawns/calves are on the landscape to provide alternate prey for wolves. WDFW personnel confirmed cattle were present on the landscape consistent with the date described by the producer.

Given the history of wolf-livestock conflict in the area, WDFW coordinated with the producer and a WDFW contracted range rider on the deployment of non-lethal deterrents for the 2018 grazing season. That plan included:

- Using range riders,
- Calving away from areas occupied by wolves,
- Delaying the turnout of cows and calves until July 10, so calves are larger,
- Removing or securing livestock carcasses that may attract wolves, and
- Removing sick or injured livestock from the grazing allotment.

WDFW believes range riders are one of the best proactive deterrents for this particular operation and the remote, rugged, large acreage open range country. A typical day for a range rider

includes livestock particularly smaller groups of livestock that may wonder too far from the rest of the herd or desired grazing locations. Range riders move animals to different locations (if agreed to by the producer) based on grazing needs and/or carnivore activity. They also check livestock for injury or stress. Range riders communicate with the producer and WDFW regarding livestock behavior, predator signs, depredations and other relevant information.

Although grazing allotments can cover thousands of acres, livestock movements are associated within smaller pastures and usually reflect the type of forage available at different elevations. Range riders focus their activities in the areas where the livestock are actually present. Areas where wolf-livestock conflict occurs are usually smaller than the full allotment, and wolves may be influenced by the presence of range riders.

In April 2018, range riders started patrolling the allotments where cattle were going to be turned out, checking for carnivore sign.

On June 2, 2018, WDFW staff captured and placed a GPS collar on an adult male wolf in the OPT pack. By utilizing the GPS point locations during June and most of July, WDFW determined a possible den location north and adjacent to the USFS grazing allotment.

Little wolf sign was present in this the grazing allotment prior to cattle turnout on July 10. Range riders began receiving location data from the collared male wolf starting around July 23 and utilized this information to check for wolf activity. GPS location data from the collared male wolf suggested a possible rendezvous site had been established by the pack about two and a half miles northwest of the den location during the first two weeks of August.

By mid-August, the GPS locations from the collared male suggested a high use area, most likely a new rendezvous site, roughly five and a half miles southeast from the previous possible rendezvous site. This area is located in the grazing allotment where the livestock had been turned out in July. Based upon this information, WDFW staff ramped up coordination with the producer and contract range riders to manage the potential for wolf-livestock conflict. Range rider presence increased in this high use area checking cattle behavior (evening, night, and daily) and monitoring salting sites for cattle activity.

On August 20, the Ferry/Stevens County wildlife specialist hiked to point locations of the collared OPT male wolf. He found a calf carcass, which was determined by WDFW staff to be an unknown cause of death. The August 20 depredation remains consisted of a portion of one leg bone, portion of lower spine and pelvic bones and one hoof. No meat remained and bones were chewed into smaller pieces. Remains of this calf were left on site.

On August 21, the producer and range riders started to push livestock west towards adjacent grazing allotments.

On August 26, a WDFW contracted range rider located the remains of two dead calves and after investigation, were determined to have died of unknown causes. The remains of the first calf

included chewed up rib bones, leg bones, small portion of hide, portions of head and jawbone. WDFW staff removed the remains from the allotment and soaked the hide in water for further investigation looking for bite marks or scoring consistent with injuries caused by wolves. No meat remained on the rib bones, head and jawbones so WDFW staff left them on site. The second calf remains consisted of portions of a skull and jaw. These remains were also left on site as no meat remained. In both cases, these carcasses were found by range riders actively following collar locations to ascertain if there was an increase in wolf-livestock overlap to be prepared to take action to reduce the likelihood of conflict. Because of the vast landscape, finding a dead calf is not easy, but smell can help guide a search, particularly after decomposition and scavenging by birds begins. However, a carcass can be reduced to a bone pile relatively swiftly.

After the August identification of dead calves and the GPS collar data locations demonstrating high wolf/livestock overlap, the producer and range riders responded by ramping up their presence, including range rider shifts throughout the day and during nighttime hours. The observed activity was in an area where the prior Profanity Peak pack (in 2016), and the prior Sherman pack (in 2017), previously depredated on cattle.

Salt licks were placed throughout the grazing allotments in approved locations by the USFS. Salt licks were present at the current location of the cattle and in multiple locations throughout the grazing allotments to assist in moving and holding cattle in new locations. Livestock have grazed these allotments for generations (75 years), with salt blocks in the same location every year to assist with cattle movements.

In conference with the producer, WDFW discussed whether salt blocks should be removed from locations with high wolf-livestock overlap as this has been a concern with past wolf depredations in this area. They concluded that this would likely be of little help in the present circumstances. Even when salt blocks are moved, cattle continue to visit and linger at these sites due to the amount of salt in the ground from years of salting. The herd memory of salt blocks also tends to home them to these sites, and if salt blocks are missing, the experience is that cattle actually linger while searching for the salt blocks.

Furthermore, the presence of salt blocks at alternate locations means there may be other reasons cattle return to an original location rather than being attracted to the salt blocks alone. The grazing pattern is to start cattle in the lower country and move to the higher country toward the end of summer and early fall. The producer and range riders continued to push cattle west towards the adjacent allotments with approximately 20 head of cattle remaining in the high wolf use area.

On September 4, range riders contacted the Ferry/Stevens County wildlife specialist, who coordinated with WDFW staff about two injured calves in the OPT pack area. WDFW staff investigated on September 5 and confirmed the injuries on both calves were caused by

wolves. That afternoon, a dead calf was located in the same vicinity of the other injured calves and an investigation by WDFW staff confirmed wolves had killed it.

- Depredation #1 – T he calf suffered bite lacerations and puncture wounds to the right hindquarter, hamstring, and flank. Bite lacerations and puncture wounds were also present on the left flank and just above the left hock. Locations of injuries were consistent with wolf depredating on cattle. Based in the evidence and factors from the investigation, WDFW staff conducting the investigation classified the injured calf as a confirmed wolf depredation.

- Depredation #2 – The calf suffered bite lacerations and puncture wounds to the left hindquarter and the front shoulder under the leg. Locations of injuries were consistent with wolf depredating on cattle. Based in the evidence and factors from the investigation, WDFW staff conducting the investigation classified the injured calf as a confirmed wolf depredation.

- Depredation #3 – The dead calf had bite puncture wounds and hemorrhaging to rear right leg. Multiple sets of wolf tracks were present at the carcass. Multiple wolf-livestock interactions occurred near the carcass. Based on the evidence and factors from the investigation, WDFW staff conducting the investigation classified the dead calf as a confirmed wolf depredation. The calf remains were placed in the Department of Transportation Trout Lake carcass pit.

On September 6, another injured calf was located and the subsequent investigation by WDFW staff confirmed that wolves had injured it. One injured calf was removed from the grazing allotment. Further medical attention was not needed for the remaining injured calves.

- Depredation #4 - The calf had bite lacerations and bite puncture wounds to both hindquarters and groin areas. On the right rear leg, there was hemorrhaging to the underlying tissue as indicated by swelling and limping. The location of injuries were consistent with wolf depredation on cattle. Based in the evidence and factors from the investigation, WDFW staff conducting the investigation classified the injured calf as a confirmed wolf depredation.

On September 7, range riders located a fifth calf and WDFW staff confirmed the calf had been injured by wolves in the OPT pack.

- Depredation #5 - The calf had multiple bite lacerations to the rear legs with most of the injuries on the inside of the legs. The most severe injury was on the rear left leg. The calf had multiple puncture wounds and a large swollen lump on the leg. Necrotic muscle tissue caused by the bite was removed. Based on the evidence and factors from the investigation, WDFW staff conducting the investigation classified the injured calf as a confirmed wolf depredation.

Responsive deterrent measures were implemented after the first depredation. Measures included increasing range rider presence in the high wolf/livestock overlap area with an emphasis towards spending time at salting areas. Range riders continued their attempts at pushing cattle to different pastures within the allotment.

On September 9, WDFW staff placed Foxlights at two salting areas. The following day, they setup Foxlights at a cattle-gathering site. Even though the majority of cattle were being pushed to neighboring allotments, Foxlights had not be tried at salting areas so WDFW staff considered this a responsive deterrent measure.

On September 12, WDFW Director Susewind authorized WDFW staff to lethally remove one to two wolves from the OPT pack. However, WDFW needed to provide one business day (eight court hours) advance public notice before initiating lethal action. Two organizations, the Center for Biological Diversity and Cascadia Wildlands, sought the injunction several hours after WDFW announced Susewind's authorization. The judge said the petitioners had not met the criteria for temporary injunctive relief under the state Administrative Procedures Act. However, the judge said the court would expedite a hearing on the merits of the petitioners' underlying complaint.

On September 16, a WDFW marksman removed a juvenile wolf. The young wolf, weighing 50 pounds, was one of four pack members spotted that day by a WDFW helicopter crew.

One day after the juvenile wolf was removed, WDFW confirmed an adult cow was killed by wolves in the same general area. However, WDFW staff investigating the cow carcass determined that it was likely killed prior to the removal.

On September 21, WDFW documented five additional livestock depredations by the OPT pack, bringing the total to 12 wolf depredations. These five most recent depredations were confirmed injuries to calves, which likely occurred five to seven days earlier.

On September 28, a WDFW marksman killed an adult female. The wolf was one of two pack members spotted that day by a WDFW helicopter crew. The wolf was believed to be the breeding female. Following the removal of the second wolf from the OPT pack, WDFW began an evaluation period to determine if those actions changed the pack's behavior. WDFW documented three additional livestock depredations between October 5 and 11, bringing the total to 15 wolf depredations.

On October 5, WDFW staff confirmed a calf was injured. The calf appeared to have been attacked on two separate occasions as some of the injures appeared to be approximately four to seven days old and other injuries appeared to be within the last 24 hours. The injuries to the calf included multiple bite lacerations, bite puncture wounds, and underlying tissue damage adjacent to the injuries. The locations and the types of injuries inflicted were confirmed as a wolf.

On October 7, department staff documented another injured calf as a probable wolf depredation. The calf had older, healed bite lacerations and wounds to the outer right hindquarter, right flank and outer left hindquarters. The injuries were consistent with a wolf depredation.

On October 11, a producer contacted WDFW staff about an injured calf found in the same drainage as the previous depredation. The tissue damage and associated bite lacerations were consistent with a wolf depredation. Based on healing, the depredation occurred more than two weeks earlier.

WDFW determined that the October 5 depredation by the OPT pack was new and not one that likely occurred during or before the removal period. Due to the complexities of the situation, the Director did not make an immediate decision regarding any new action, and WDFW remained in the evaluation period.

On October 23, WDFW documented a confirmed livestock depredation, which resulted in the death of a calf. This incident brought the total to 16 depredations since September 4. During the examination of the dead calf, WDFW staff documented bite lacerations and associated hemorrhaging along the tail and on both rear legs. The bite lacerations and locations were consistent with a wolf depredation. WDFW staff estimated the incident occurred 2-4 days before the carcass was located. The location data from the collared male wolf indicated it was in the area of the depredation at the estimated time of the incident. WDFW staff also found wolf tracks and scat in the area.

The producer was scheduled to remove his livestock from the USFS allotment by October 15. In practice, about 90 percent of the livestock are usually removed by that date. Due to the dense timber and rugged terrain, it may take several weeks past the turnoff date to round up the remaining cattle. The producer was transporting a portion of his cattle to private grazing lands west of the Kettle Crest and another portion out of state. The private grazing lands were on the periphery of the OPT pack territory and at a lower elevation, which may reduce the likelihood of depredations during the winter.

On October 26, WDFW Director Susewind reauthorized department staff to lethally remove the remaining two wolves that had repeatedly preyed on cattle. Using aircraft, WDFW staff attempted to remove a collared adult male and an uncollared juvenile wolf multiple times over a two-week period. Staff were unable to locate the uncollared wolf due to the dense forest canopy.

On November 13, WDFW Director Susewind paused lethal removal actions for the two remaining wolves. However, the agency did not move into a formal evaluation period.

<u>WDFW posted web updates on the OPT pack on the following dates:</u>

2017: November 9 and 15

2018: April 2; May 24; June 1; July 2; August 2; 11, 13, 20, 22, 24, 28, and 31; September 2, 7, 11, 13, and 25; October 1, 5, and 19; November 1, 6, and 7; December 3

All are available online at https://wdfw.wa.gov/conservation/gray_wolf/updates/update_on_washington_wolves.pdf.

WDFW Lethal Removal Operation

Total expenditure for the lethal removal operation (staff time, contractor time and aerial support) was $74,561 of Wildlife State Funds.

OPT Pack Lethal Operation			
Date	**Wolf**	**Sex**	**Age**
September 16, 2018	1	Female	Pup
September 28, 2018	1	Female	Adult

Smackout Pack

Background

In 2011, WDFW confirmed the Smackout pack in northern Stevens County as Washington's fifth wolf pack. At the time, biologists estimated the pack included an adult male, an adult female, and at least three pups. By the end of 2012, the pack included a minimum of 12 wolves – seven adults and five pups. Despite being one of the state's largest packs, the Smackout pack had no known livestock depredations within its 350-square-mile territory.

On September 21, 2016, WDFW staff confirmed that the Smackout pack had killed one calf. A second dead calf was found dead several days later on September 28, but upon investigation WDFW staff determined it to be a probable wolf depredation due to the age of the kill and lack of remains at the site. A third calf was found with injuries that WDFW staff determined were caused by wolves one day later. Livestock were moved off the allotment for the end of the grazing season in early October and no further depredations were documented in 2016.

In July 2017, WDFW staff confirmed that the pack was responsible for two more depredations, which brought the number to at least four confirmed livestock depredations during the previous 10 months. That month, WDFW lethally removed two Smackout wolves (one adult female and one female pup) when it became clear that non-lethal deterrents had not altered the pack's pattern of preying on livestock (https://wdfw.wa.gov/publications/01929/).

WDFW lethally removed another adult male from the pack in 2018 following livestock depredations owned by two producers. By the end of 2018, lethal removals, other deaths, and the dispersal of some pack members including one in 2017 that traveled at least 1,700 miles to southwest Montana, had reduced the estimated minimum pack size to two.

Timeline: May – July 2018

From May to July 2018, WDFW staff met and coordinated activities for the grazing season with livestock producers, USFS personnel, and county sheriff's officers in northeast Washington. Information was shared about data sharing, DPCALs, WDFW contracted range rider deployment, and the location of areas frequently used by wolves.

During this time, several non-lethal deterrents including Fox lights, fladry, air horns, pyrotechnics, and a radio-activated guard (RAG) box was deployed on one grazing allotment. Range riders were employed by the producer, by WDFW, and two non-government organizations to monitor the livestock turnout. Producers also removed dead or injured livestock as needed and hazed wolves.

Four producers entered into Damage Prevention Cooperative Agreements for Livestock with WDFW for the 2018 season.

Once the grazing season began, additional non-lethal preventive strategies included:

- Almost daily monitoring of livestock by range riders in fenced and unfenced allotments,
- Monitoring by the producer and his family to increase human presence near the livestock, and
- Confining livestock to more defensible fenced pastures in spring and fall.

Timeline: August – November 2018

On August 20, WDFW staff investigated a report of an injured calf at a private pasture within the Smackout territory and confirmed that the injuries were caused by a wolf or wolves.

On October 1, WDFW staff met again with producers, local sheriff's office personnel and USFS managers to discuss continued use of non-lethal deterrents and the status of ongoing depredation investigations by the Ferry/Stevens County wildlife specialist.

On October 14, WDFW documented a second wolf depredation. A different producer than the August 20 depredation owned the adult cow. The producer grazed livestock in a valley within relatively small fenced pastures near homes and paved roads. Several non-lethal deterrents were in place including:

- The producer conducted his calving operation outside of known wolf territory,
- The producer and his family and employees, along with the county wildlife specialist and WDFW staff, checked on the livestock about once a week,
- Fox lights were deployed when cattle occupied pastures where wolf sightings had been reported in 2018 and previous years, and
- Removing or securing livestock carcasses.

On October 21, WDFW documented that wolves were responsible for killing an adult cow owned by the producer who lost livestock on October 14.

On October 31, WDFW confirmed a fourth depredation. Wolves killed an adult cow owned by the second producer. Investigators attributed the depredation to the Smackout pack.

On November 1, WDFW confirmed wolves had killed a heifer. This incident brought the total number of depredations to five since August 20.

All five depredations occurred in a large area along a valley bottom that contains a series of private fenced pastures. Following the fifth depredation, WDFW again worked with producers and a local collaborative group who pooled resources to maximize livestock protection and wolf deterrence. Responsive deterrents were deployed, including range riders in and around the

affected pastures, and installing fladry in strategic areas. These techniques were adjusted as needed through the rest of the grazing season.

On November 7, WDFW Director Susewind authorized department staff to begin "incremental" removal of wolves in an attempt to break the depredation pattern. The operation began the following day. Incremental removal is defined by the wolf plan and protocol as meaning one or two wolves. When the operation began, WDFW wolf biologists estimated the pack included four or five adult wolves and no known pups.

Director Susewind's based the lethal removal authorization on the following factors:

- The pack had five confirmed livestock depredations in the previous 10 months and four depredations in the previous 30 days. The incidents resulted in the deaths of four cows and the injury of one calf.
- At least two documented proactive deterrents, and various responsive measures initiated after the first depredation, failed to change the pack's behavior.
- Based on the previous events and recent depredations that involved larger cattle located on private pastures, the WDFW wolf specialists expected the pack to continue preying on livestock.
- Incremental lethal removal was not expected to limit the wolf population from reaching recovery objectives statewide or within the state's Eastern Washington recovery region.

On November 9, a WDFW marksman in a helicopter removed an adult male wolf.

As described above, the producers used several proactive non-lethal wolf deterrent measures while their livestock were on the range. After moving their cattle to private pastures, the producers also maintained human presence around livestock, deployed range riders and fladry, and observed approved sanitation practices place.

After WDFW staff removed the adult male wolf, the director suspended removal operations and initiated an evaluation period to determine if the action would disrupt the pack's pattern of preying on livestock.

WDFW did not document any additional depredations between November 8 and the end of 2018.

Timeline: Website updates

WDFW posted web updates on the Smackout pack on the following dates in 2018: April 2; June 1; July 2; August 2; September 7; October 1; November 1, 6, 7, and 15.

All are available online at
https://wdfw.wa.gov/conservation/gray_wolf/updates/update_on_washington_wolves.pdf

WDFW Lethal Removal Operation

Total expenditure for the lethal removal operation (including staff time, contractor time, and aerial support) was $10,158. Funding came from the State Wildlife Account.

Smackout Pack Lethal Operation			
Date	**Wolf**	**Sex**	**Age**
November 9, 2018	1	Male	Adult