

Washington Gray Wolf Conservation and Management 2022 Annual Report

A cooperative effort by the Washington Department of Fish and Wildlife, Confederated Tribes of the Colville Reservation, Spokane Tribe of Indians, Yakama Nation, Swinomish Tribe, and U.S. Fish and Wildlife Service



Photo: Savannah Walker, Spokane Tribe

This report presents information on the status, distribution, and management of wolves in the State of Washington from Jan. 1, 2022 through Dec. 31, 2022.

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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 [Endangered Species Act \(ESA\) Section 6](#) activities. This document details the results of its annual gray wolf (*Canis lupus*) 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 to a minimum of 216 wolves reported in 2022. Packs range across public and private land in Ferry, Stevens, and Pend Oreille counties in the northeast corner of the state and Asotin, Garfield, Columbia, and Walla Walla counties in southeast Washington, but increasing numbers are present in Okanogan, Chelan, and Kittitas counties, in the north-central and central Washington region. Washington's first pack to recolonize the south Cascades was documented this winter.

Gray Wolves' Legal Status

Gray wolves have been classified as endangered in all or part of Washington since federal lawmakers enacted the ESA in 1973. In 2011, the U.S. Fish and Wildlife Service (USFWS) ended ESA 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.

Washington'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 is divided into Recovery Regions: Eastern Washington, the Northern Cascades, the Southern Cascades and Northwest Coast. In addition, a WDFW-approved protocol sets forth criteria for the Department to collaborate with livestock producers to minimize conflicts with wolves.

WDFW had lead wolf management authority in the Eastern Washington recovery region, and the USFWS had the lead role in the other two recovery regions up until January 2021. Wolves that inhabit tribal lands in the Eastern Washington recovery region are managed by those specific tribal entities. In January 2021, wolves were federally delisted from the Endangered Species Act and were managed by WDFW as a state endangered species. Then on February 10, 2022, wolves were federally relisted in the western two-thirds and USFWS resumed the lead role in the recovery of wolves in the North Cascades and the Southern Cascades and Northwest Coast recovery regions. Gray wolves outside of the Northern Rocky Mountain population are now protected under the ESA as threatened in Minnesota and endangered in the remaining states. The USFWS is currently evaluating the status of gray wolves in the western U.S., including the Northern Rocky Mountains, to determine whether ESA protection is again warranted for those wolves.

Wolf Recovery and Management in 2022

Key developments in 2022 included:

- The state's minimum year-end wolf population increased again for the 14th year in a row and as of Dec. 31, 2022, WDFW and Tribes counted 216 wolves (five percent increase) in 37

packs in Washington State. Twenty-six of these packs were successful breeding pairs. These numbers compare with the previous year's count of 206 wolves in 33 packs and 19 breeding pairs. 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.

- Pack sizes (number of individuals in a pack) ranged from two to ten wolves. Most packs contained four to six individuals.
- Since the first WDFW survey in 2008, the state's wolf population has grown by an average of 23% per year.
- State, federal, and tribal biologists captured 38 wolves from 17 different packs and monitored a total of 53 unique radio-collared wolves from 27 different packs in 2022.
- Eight new packs formed in 2022 including the Big Muddy pack in Klickitat County, the Napeequa and Maverick packs in Chelan County, the Chopaka and Chewuch packs in Okanogan County, the Wilmont pack on the Confederated Tribes of the Colville Reservation (CTCR) in Ferry County, the Five Sisters pack in Stevens County, and the Mt. Spokane pack in Spokane County.
- Two packs completely disbanded in 2022 (likely due to mortalities) including Nason pack in Ferry County and the Skookum pack in Pend Orielle County.
- Four areas were documented with just one wolf maintaining a territory in Washington including the former Teanaway pack area, former Beaver Creek pack area, former Diobsud Creek pack area, and a new area near Sprague.
- Twelve wolves were documented dispersing from their pack territories in 2022.
- Each year's population total reflects population losses and population gains. WDFW documented 37 wolf mortalities during 2022 (Table 1), including six removed by the Department in response to wolf-livestock conflict, three killed in caught in the act of depredating on livestock, seven of natural causes (two killed by cougars, one killed by a moose, one killed by other wolves, two of old age, and one pup that died from malnutrition), one unknown, 11 legally harvested by tribal hunters (one by the Spokane Tribe and ten by CTCR hunters), and [nine mortalities from unlawful take still under investigation](#).
- Wolf populations are managed to ensure progress toward the recovery goals established in WDFW's [2011 Wolf Conservation and Management Plan](#). Guidance from the plan states that the Department will 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 determined fifteen cattle (primarily calves) and two sheep were confirmed killed by wolves, and one was probably killed by wolves. Also, nine cattle were confirmed as injured and two were probably injured by wolves in 2022 by seven packs. Nineteen percent of known packs were involved in at least one confirmed livestock depredation. Only three packs (eight percent of the packs) were involved in two or more depredations. Eighty-one percent of known packs were not involved in any known livestock depredation (including probable depredations) even though many of the pack territories overlap livestock operations.

- During calendar year 2022, WDFW spent a total of \$1,632,569 on wolf management activities, including \$56,788 in reimbursement to 26 livestock producers for Damage Prevention Cooperative Agreements – Livestock (DPCA-L) non-lethal conflict prevention expenses (range riding, specialized lighting and fencing, etc.), \$231,708 for 16 contracted range riders, \$8,178 for direct claims for livestock losses caused by wolves in 2021 but paid in 2022, \$6,249 for indirect claims for livestock losses in 2021 but paid in 2022, \$119,541 for lethal removal operations in response to depredations on livestock, and \$1,210,105 for wolf management and research activities.

Acknowledgments

Wolf management in Washington is a cooperative effort by the Washington Department of Fish and Wildlife (WDFW), Confederated Tribes of the Colville Reservation (CTCR), the Spokane Tribe of Indians (STOI), USDA-APHIS Wildlife Services (WS), Yakama Nation, and the U.S. Fish and Wildlife Service (USFWS).

WDFW personnel who played a primary role during 2022 include WDFW Director Kelly Susewind, Wildlife Program Director Eric Gardner, Deputy Assistant Director of Wildlife Mick Cope, Game Division Manager Anis Aoude, Statewide Wolf Specialist Benjamin Maletzke, Wolf Biologist Trent Roussin, Wolf Biologist Gabriel Spence, Conflict Section Manager Dan Brinson (ret), Conflict Section Manager Jim Brown, Wolf Policy Lead Julia Smith, and Chief Scientist Donny Martorello. Other WDFW personnel who assisted with wolf recovery and management efforts in Washington included Chris Anderson, Mike Atamian, Staci Lehman, Rich Beausoleil, Candace Bennett, Stefanie Bergh, Jeff Bernatowicz, Eric Boyd, Joe Bridges, Jeff Burnham, Colleen Chandler, Treg Christopher, Jason Day, Jason Earl, Chris Erhardt, Severin Erickson, Scott Fitkin, Ellen Heilhecker, Jeff Heinlen, Eric Holman, Todd Jacobsen, Emily Jeffreys, Sandra Jonker, Brian Kertson, Sarah Garrison, Doug King, Keith Kirsch, Will Smith, Tyler Bahrenburg, Tony Leonetti, Mike Livingston, Brendan Oates, Carlo Pace, Corey Peterson, Courtney Nasset, Brent Scherzinger, Carrie Lowe, Kristin Mansfield, Joey McCanna, Troy McCormick, Matt Monda, William Moore, Paul Mosman, Bryan Murphie, Steve Pozzanghera, Annemarie Prince, Grant Samsill, Mike Sprecher, Kevin Robinette, Tucker Seitz, Nicole Stephens, Michelle Tirhi, Maci Todd, Justin Trautman, Ben Turnock, Mark Vekasy, Robert Waddell, Jeff Wade, Kile Westerman, Steve Wetzels, Marcus Leuck, Kyla West, Paul Whelan, Carly Wickhem, Paul Wik, Andrew Kolb, Scott Whitman, and Fenner Yarborough.

Other agencies also played a key role in wolf management efforts in Washington. In particular, we would like to thank personnel from the USFWS including Abby Sage, Brad Thompson, Jerry Cline, Manisa Kung, Gregg Kurz, and Mike Munts; WS personnel including Mike Linnell, Terry Smith, and Chad Heuser; CTCR personnel including Eric Krausz, Sam Rushing, Rose Piccinini, and Corey Peone; STOI personnel including Derek Abrahamson and Savanah Walker; Yakama Nation personnel including Mark Nuetzmann, Kristi Olney, Casey Heemsah, Leon Ganuelas; 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 Paul Jensen, Dan Boyle, Matt Fromherz, Andrew Hayes, Scott Fisher; the National Park Service including Roger Christophersen, Jason Ransom, Vicki Gempko, 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; Jeff Flood from the Stevens County Sheriff's Office; Dan

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We also sincerely appreciate the safe piloting and aerial telemetry skills of Dave Parker of Northern Air (Bonners Ferry, ID), Doug Uttecht and Brandon Arago of Northwest Helicopters (Olympia, WA).

Finally, we could not list every person who contributed to wolf recovery and management efforts in Washington during 2022. 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 population 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 listed under the ESA but are classified as endangered under state law (see discussion below). Gray wolves were federally listed in the western two-thirds of the state until January 4, 2021 but were relisted again in February 2022.

Gray wolves in Washington initially received federal protection 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 Idaho and Montana populations. However, federal recovery requirements have applied only to the three states addressed in the 1987 recovery plan, and no federal wolf recovery requirements were developed for Washington.

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 restored federal protections.

The situation changed again in 2011, when federal lawmakers 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 ESA protection. Throughout this time, wolves in the western two-thirds of the state remained classified as 'endangered' under the ESA (Fig. 1).

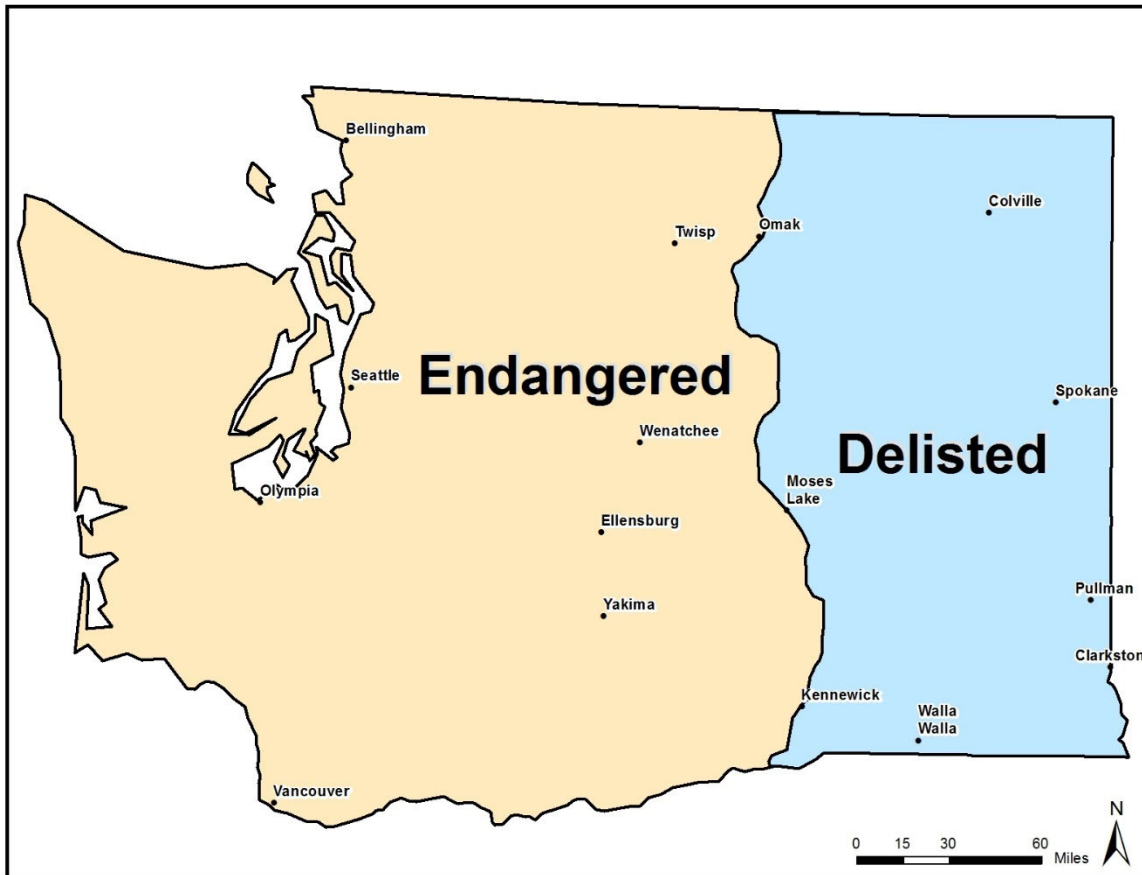


Figure 1. Federal classification of wolves in Washington State from 2011-2021. Wolves were Federally delisted in Washington in 2021 but relisted again in the Western 2/3 of Washington in February 2022.

In 2013, the USFWS issued a proposed rule (Federal Register 78 FR 35663) to end 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 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, 84 FR 9648](#)) 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 indicated that the listed gray wolves no longer met the definitions of a threatened species or endangered species under the ESA due to recovery. On January 4, 2021, wolves in Washington State were delisted from the Federal Endangered Species Act statewide, and their federal status was consistent across the state. This changed again on February 10, 2022, with a court ruling to federally relist wolves in the continental U.S. outside of the Rocky Mountain distinct population segment (DPS). Gray wolves outside of the Northern Rocky Mountain population are now protected under the ESA as threatened in Minnesota and endangered in the remaining states. The USFWS is currently evaluating the status of gray wolves in the western U.S., including the Northern Rocky Mountains, to determine whether ESA protection is again warranted for those wolves.

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). Assisted by an 18-member working group comprised of stakeholders from the public, the WDFW plan was adopted in December 2011 by the state Fish and Wildlife Commission (Commission).

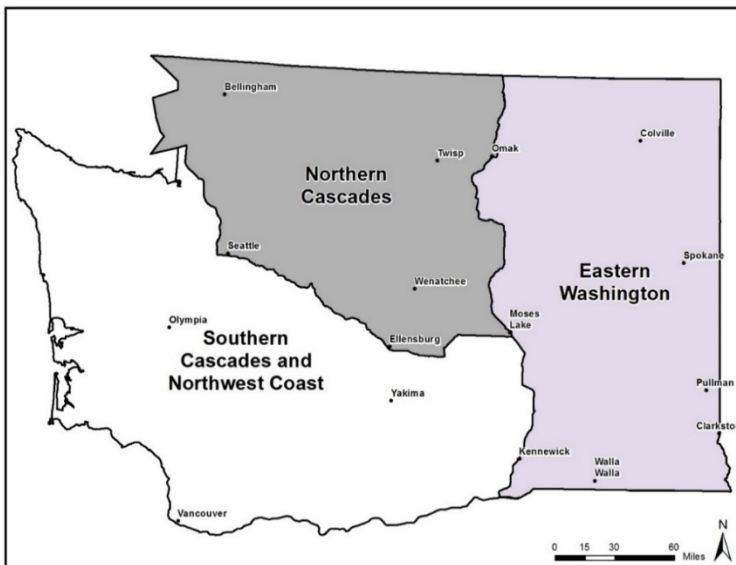


Figure 2. Washington wolf recovery regions as defined in the 2011 Wolf Conservation and Management Plan.

At present, wolves are classified as endangered under state law ([WAC 220-610-010](#)) throughout Washington, regardless of their federal ESA classification. State law [RCW 77.15.120](#) protects endangered species from hunting, possession, malicious harassment, and killing; and penalties for illegally killing a state endangered species range up to \$5,000 and/or one year in jail.

The Plan designates three recovery regions: Eastern Washington, the Northern Cascades, and the Southern Cascades and Northwest Coast (Fig. 2). Before January 4, 2021, WDFW was the primary agency responsible for managing wolves in the Eastern Washington recovery region and worked as a designated agent of the USFWS under Section 6 of the federal ESA in the other two recovery regions. In 2021, WDFW was the primary agency responsible for managing wolves statewide except on Tribal lands. Tribal governments manage wolves that inhabit their Tribal lands in each of the recovery regions. As a result of a February 10, 2022, federal court decision, the North Cascades and Southern Cascades and Northwest Coast recovery regions fell back under USFWS jurisdiction. The Eastern recovery region is currently under WDFW management jurisdiction.

WDFW periodically reviews classification of species under state law. In considering the appropriate classification for gray wolves under [WAC 220-610-110](#), the Commission will assess whether the species meets the definition of “endangered,” “threatened,” or “sensitive.”

- "Endangered" means any wildlife species native to Washington that is seriously threatened with extinction throughout all or a significant portion of its range within the state.
- "Threatened" means any wildlife species native to the state of Washington that is likely to become an endangered species within the foreseeable future throughout a significant portion of its range within the state without cooperative management or removal of threats.
- "Sensitive" means any wildlife species native to the state of Washington that is vulnerable or declining and is likely to become endangered or threatened in a significant portion of its range within the state without cooperative management or removal of threats.

The Commission’s consideration of possible down- or delisting will also evaluate whether gray wolves are in danger of failing, declining, are no longer vulnerable, and/or whether the recovery plan goals have been met. The Plan contemplates 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.

The Plan anticipates full delisting under two possible scenarios:

- When at least four successful breeding pairs are present in each recovery region 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 region and six additional breeding pairs anywhere in the state for a single year.

Funding

During calendar year 2022, WDFW spent a total of \$1,632,569 on wolf management activities, including \$56,788 in reimbursement to 26 livestock producers for Damage Prevention Cooperative Agreements – Livestock (DPCA-L) non-lethal conflict prevention expenses (range riding, specialized lighting and fencing, etc.), \$231,708 for 16 contracted range riders, \$8,178 for direct claims for livestock losses caused by wolves in 2021 but paid in 2022, \$6,249 for indirect claims for livestock losses in 2021 but paid in 2022, \$119,541 for lethal removal operations in response to depredations on livestock, and \$1,210,105 for wolf management and research activities.

Funds came from additional fees for personalized license plates (1.1%), endangered species license plates (48.5%), state general fund apportionments (29.9%), federal contracts (2%), and unrestricted state wildlife funds (18.4%),

Population Monitoring

Monitoring Techniques

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. 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. However, it is always possible that some wolves were present in surveyed areas but evaded detection.

WDFW and tribal partners 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 conservative and the total number of wolves in Washington is likely higher.

Prior to 2019, wolf surveys were conducted with consistent methods across the state. As the population moves toward recovery objectives in different parts of the state, monitoring techniques and population metrics may change. In 2019, the Confederated Tribes of the Colville Reservation (CTCR) considered the wolf population on tribal lands to be recovered and began monitoring that population with techniques that differed from those outside CTCR lands or lands with co-management authority. However, after two years of utilizing different methods, the CTCR began monitoring wolves with the same methods as WDFW again in 2021 so their numbers were folded back into the total count for this report.

The annual survey includes lone wolves when reliable information is available. However, because lone or dispersing wolves are difficult to document and account for 10% to 15% of the known winter population (Mech and Boitani 2003¹), WDFW multiplies the minimum documented count by

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

12.5% to account for solitary wolves on the landscape. If evidence collected during the current calendar year suggest 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. Thus, numbers from past reports are subject to change and may differ from numbers in this report.

Population Status and Distribution

The minimum count of wolves, number of packs, and number of successful breeding pairs increased again for the 14th consecutive year in 2022. As of December 31, 2022, WDFW and Tribal partners counted 216 wolves and 37 packs. Twenty-six of these packs were considered successful breeding pairs. These numbers compare with 206 wolves in 33 packs, and 19 breeding pairs one year earlier. Because these are minimum counts, the total number of wolves in Washington is likely higher.

Compared to 2021, the number of individual wolves (Fig. 3) increased by ten wolves (five percent) and the number of packs (Table 1, Fig. 4) increased by four (twelve percent). Additionally, twenty-six packs were confirmed to be successful breeding pairs as of the end of 2022 and this was an increase of 37% (Table 1, Fig. 5). Pack size ranged from two to ten individuals and averaged 5.2 wolves per pack ($SD \pm 2.3, n=37$).

Two packs completely disbanded in 2022 (likely due to mortalities) including Nason pack in Ferry County and the Skookum pack in Pend Orielle County. Four areas were documented with just one wolf maintaining a territory including the former Teanaway pack area, former Beaver Creek pack area, former Diobsud Creek pack area and a new area near Sprague WA.

The Eastern recovery region and the Northern Cascades recovery region both exceeded the minimum recovery goals (four successful breeding pairs for three consecutive years) set for the individual region by the Plan because they had greater than four breeding pairs for greater than three consecutive years. During 2022, the Northern Cascades recovery region had nine packs, six of which were considered successful breeding pairs. This region has maintained a minimum of four successful breeding pairs for three consecutive years and continues to meet recovery objectives.

WDFW documented the first resident pack (Big Muddy pack) in the Southern Cascades and Northwest Coast recovery region in 2022. WDFW is currently monitoring a collared male wolf that dispersed from the Naneum pack territory in 2021 that had moved into the Southern Cascades. It has been documented traveling with a female wolf (see Wasser et al. in the research updates) throughout the summer and winter.

To reach statewide recovery objectives for wolves in Washington, the Southern Cascades and Northwest Coast 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 located anywhere in the state.

Additional findings from the 2022 population survey include the following:

- A new pack, Big Muddy, named by the Yakama Nation Wildlife Resource Management Program, is the first pack to establish in the South Cascades and Northwest Coast recovery region.

- A new pack, the Napeequa pack, was confirmed in Chelan County northwest of Leavenworth, WA.
- A new pack, the Maverick pack, was confirmed in Chelan County and is located south of the Shady Pass pack.
- A new pack, Chewuch, was confirmed in Okanogan County west of the Loup Loup pack.
- A new pack, Chopaka, was confirmed in Okanogan County north of the Loup Loup pack.
- The Mt. Spokane pack was confirmed in Spokane County.
- The Wilmont pack was confirmed on the CTCR lands in Ferry County.
- The Teanaway pack only has one collared wolf occupying the territory.
- The Beaver Creek pack experienced four mortality events in 2022 and only has one wolf occupying the territory.
- The Skookum pack lost two collared wolves to natural causes (old age) in 2022 and no other wolves were documented in the territory over winter.
- WDFW winter surveys indicated only a single wolf maintaining a territory in the former Diobsud Creek pack; thus, no pack was confirmed again in 2022.
- The Tucannon pack broke apart after January 1st, 2023, and some stayed in the old pack territory while a portion of the pack shifted to the SE and is currently occupying a territory on the Oregon/Washington border.
- Wolves were documented near Stehekin in summer 2022 but were primarily located in remote designated wilderness areas during winter so we were not able to get a minimum count on those wolves during winter aerial surveys due to logistics and access. This may be a pack but because we could not get a count during our survey effort this winter, they are not included in the annual report numbers.
- During annual surveys, a single wolf was occupying an area near Sprague, WA.

Wolves continue to inhabit both public and private lands (Fig. 6), and 27 of the state's 37 packs (including CTCR packs) had at least one collared wolf during 2022. Data from these wolves were used to assist WDFW in defining pack territories. The average (mean) territory size was 193 square miles (501 square kilometers), ranging from an estimated 38 to 476 square miles (99 – 1,233 square kilometers).

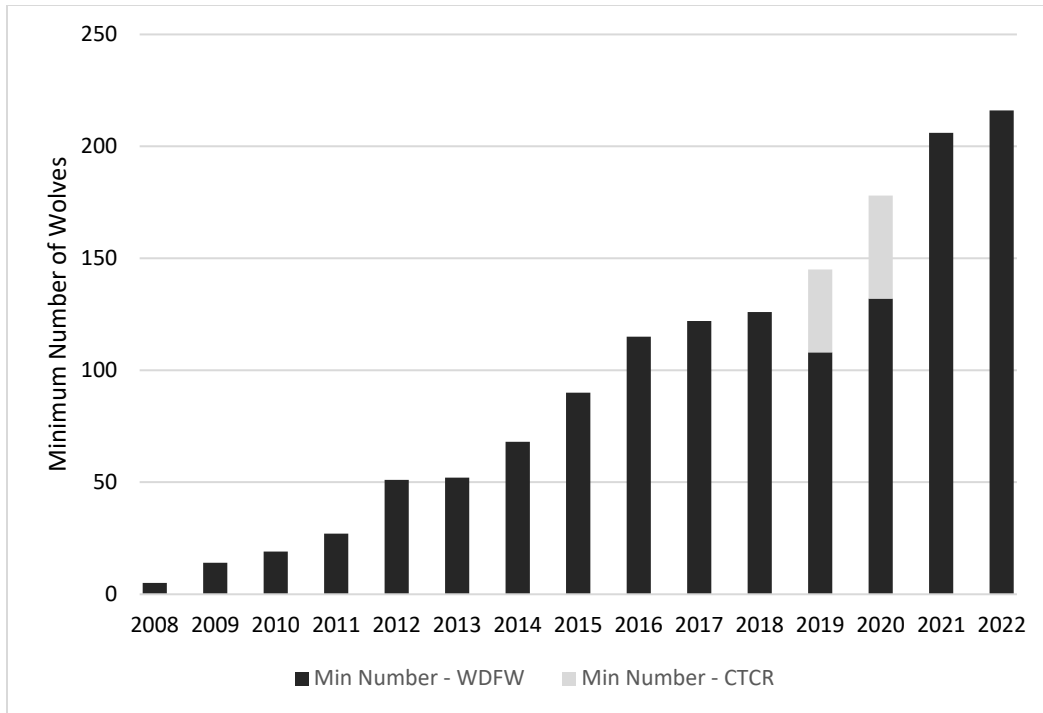


Figure 3. Minimum known number of wolves in Washington managed by Washington Department of Fish and Wildlife (WDFW), the Spokane Tribe, and the Confederated Tribes of the Colville Reservation (CTCR), 2008 – 2022. CTCR packs were monitored differently during 2019 and 2020. Numbers provided by CTCR in 2019 and 2020 reflect winter numbers incidentally gathered by biologists from hunters, trappers, and public observations. In 2021 the CTCR allocated focused efforts to count wolves using year-end track, aerial, and camera surveys similar to WDFW and Tribal partners.

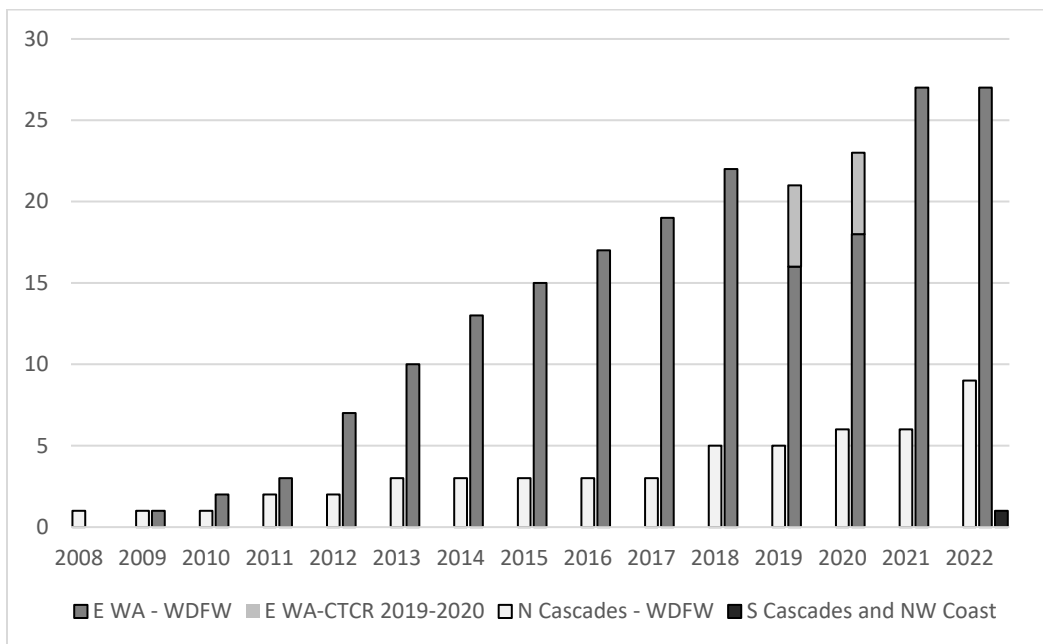


Figure 4. Minimum known number of packs by recovery region in Washington, 2008 – 2022. Wolf packs counted by Washington Department of Fish and Wildlife (WDFW), the Spokane Tribe, and Confederated Tribes of the Colville Reservation (CTCR). CTCR packs were monitored differently during 2019 and 2020.

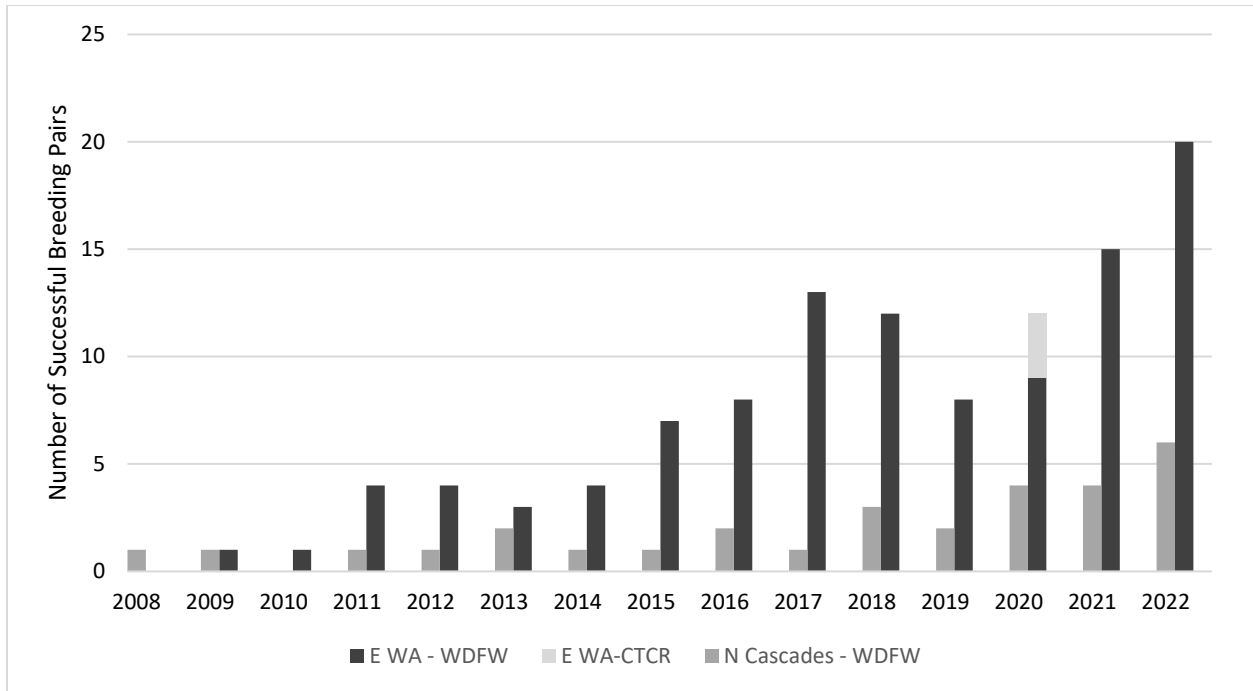


Figure 5. Minimum known number of successful breeding pairs by recovery region in Washington, 2008 – 2022. Confederated Tribes of the Colville Reservation (CTCR) did not count successful breeding pairs in 2019. There was one pack in the Southern Cascades and Northwest Coast recovery region, however it was not documented as a successful breeding pair in 2022.

Table 1. Known wolf packs in Washington by recovery region, minimum pack size of known packs, documented mortalities, and the number of known wolves that dispersed in 2022. Underlined and italicized packs were counted as successful breeding pairs. Pack names with a strikethrough either disbanded or had one wolf maintaining a territory. CTCR = Confederated Tribes of the Colville Reservation. Harvest numbers were documented by CTCR and Spokane Tribe biologists.

Wolf Pack	Recovery Area	Minimum Known Pack Size Dec 2022	Documented Mortalities					Known	
			Natural	Human	Unknown	Harvest	Control	Dispersed	Missing
Beaver Creek	E. Wash	1		1		3			
Butte Creek	E. Wash	4							
<u>Carpenter Ridge</u>	E. Wash	5		1					
Columbia	E. Wash	2	1						
<u>Dirty Shirt</u>	E. Wash	8				1			
Five Sisters	E. Wash	4							
<u>Frosty Meadows (CTCR)</u>	E. Wash	5							
<u>Grouse Flats</u>	E. Wash	9			1				
<u>Goodman Meadows</u>	E. Wash	5							
Huckleberry	E. Wash	3		1		1			
<u>Keller Ridge (CTCR)</u>	E. Wash	4				1			
<u>Leadpoint</u>	E. Wash	5		1			2		
<u>Mt Spokane</u>	E. Wash	4							
<u>Nason Basin (CTCR)</u>	E. Wash	0				2			
<u>Nc'icn (CTCR)</u>	E. Wash	8				2			
<u>Dominion</u>	E. Wash	4	1						
<u>Onion Creek</u>	E. Wash	8							
Salmo	E. Wash	2							
Sherman	E. Wash	3							
Skookum	E. Wash	0	2						
<u>Smackout</u>	E. Wash	7	2				1		
<u>Sprague</u>	E. Wash	1							
<u>Stranger</u>	E. Wash	6	1	1					
<u>Strawberry (CTCR)</u>	E. Wash	5				1			
<u>Togo</u>	E. Wash	5					2		
<u>Touchet</u>	E. Wash	5							
<u>Tucannon</u>	E. Wash	8							
<u>Vulcan</u>	E. Wash	5		1					
Wedge	E. Wash	2		6					
<u>Whitstone (CTCR)</u>	E. Wash	7				1			
<u>Wilmont (CTCR)</u>	E. Wash	6							

Table 1. Known wolf packs in Washington by recovery region, *continued*.

Wolf Pack	Recovery Area	Minimum Known Pack Size Dec 2022	Documented Mortalities					Known	
			Natural	Human	Unknown	Harvest	Control	Dispersed	Missing
<u>Chewuch</u>	N Cascades	10							
Chopaka	N Cascades	2							
Diobsud Creek	N Cascades	1							
Napeequa	N Cascades	2							
Maverick	N Cascades	2							
<u>Lookout</u>	N Cascades	6							
<u>Loup Loup</u>	N Cascades	10							
<u>Navarre</u>	N Cascades	5							
Naneum	N Cascades	0						1	
<u>Shady Pass</u>	N Cascades	5							
<u>Sullivan Creek</u>	N Cascades	5							
Teanaway	N Cascades	1							
Big Muddy	S Cascades	2							
Misc/Lone Wolves	Statewide	24							
WASHINGTON									
TOTALS		216	7	12	1	11	6	1	

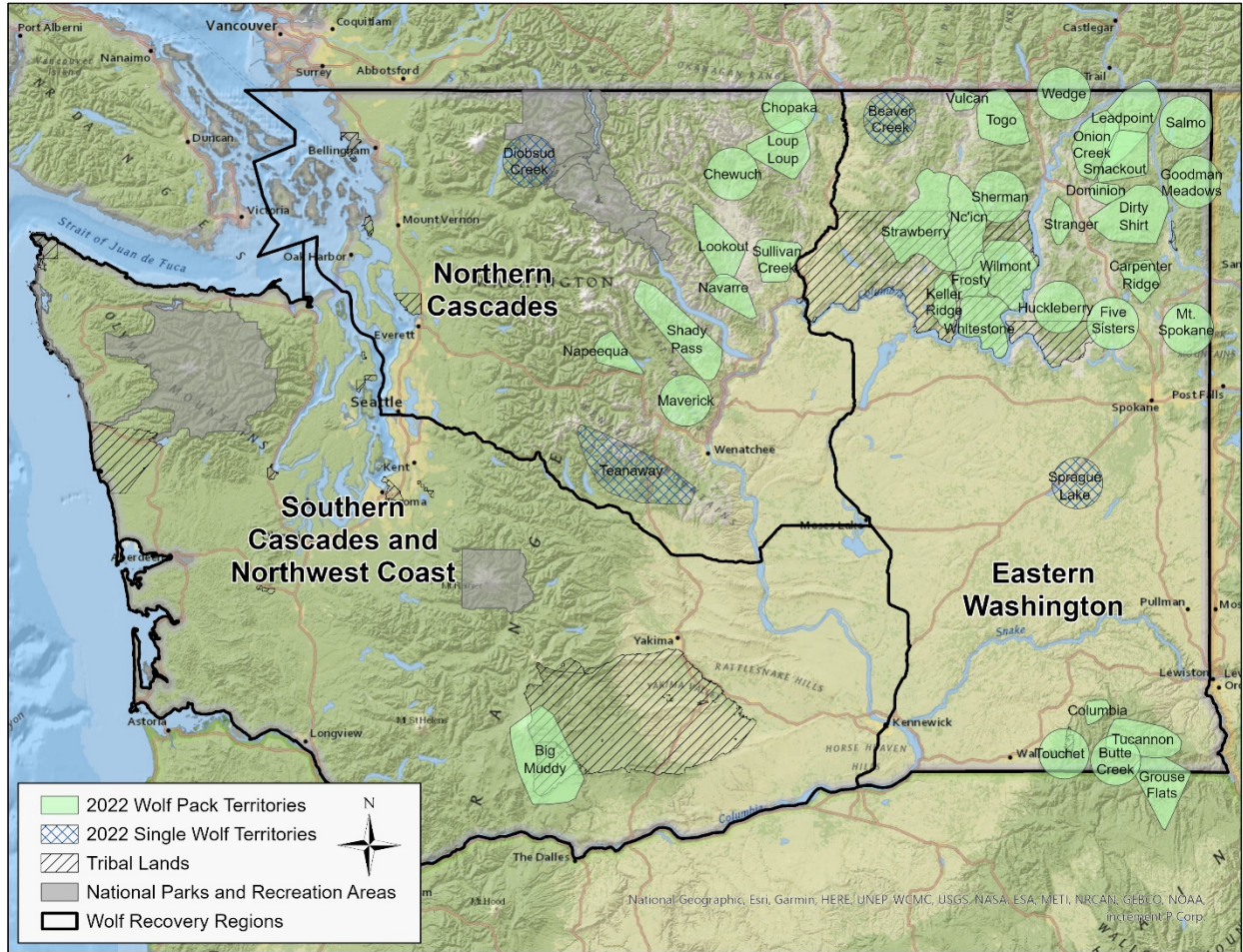


Figure 6. Known wolf packs and single wolf territories in Washington, 2022, not including unconfirmed or suspected packs or border packs from other states and provinces.

Wolf Captures and Monitoring

State, federal, and tribal biologists captured 29 wolves from 20 different packs in 2022. Of those, WDFW captured eleven (11) adults, seven yearlings, and three pups, including eight males and thirteen females. Two of the wolves had been captured and marked in previous years. All adult and yearling wolves captured were fitted with either global positioning system (GPS) collars or very high frequency (VHF) radio collars.

Fifty-three radio-collared wolves were monitored from 27 different packs representing 73% of the known packs in Washington. However, due to mortalities, dispersals, scheduled collar releases, and radio collar failures, only 37 radio-collared wolves (WDFW managed areas had 24 GPS, three VHF collars) from 16 packs were being monitored at the end of the year. This accounts for approximately 17% of the minimum known population from 16 different packs (43% 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. Twelve wolves were documented dispersing from their pack territories in 2022 (Table 1, Fig. 7).

- 1.) WA 109M – Dispersed from the Naneum pack territory at the end of 2021 and established the Big Muddy pack territory in January 2022. A second wolf was confirmed to be traveling with 109M in that territory in the Spring of 2022.
- 2.) WA 123F – Dispersed from the Columbia pack territory in January 2022 and joined up with another wolf in Morrow County in northcentral Oregon in March 2022
- 3.) WA 128M - Dispersed from the Loup Loup pack territory in January 2022 and was tracked as far south as Lake Chelan before a collar failure. He was recaptured by biologists in the Napeequa pack territory in January 2023 while traveling with WA 137F.
- 4.) WA 118M – Dispersed from the Sullivan Creek pack territory in February 2022 and was last tracked northwest of Kelowna British Columbia before a collar failure.
- 5.) WA 114M – Dispersed from the Leadpoint pack territory in April 2022 and was last tracked east of Nelson British Columbia before a collar failure.
- 6.) WA 126M – Dispersed from the Lookout pack territory in May 2022 and was last tracked northwest of Kelowna British Columbia before a collar failure.
- 7.) WA 137F – Dispersed from the Shady Pass pack territory in July 2022 and established the Napeequa territory in November 2022.
- 8.) WA 125M – Dispersed from the Teanaway pack territory in October 2022 and reached the Five Sisters territory by the end of November 2022. He was documented traveling with 3 other adult wolves within that territory in February 2023.
- 9.) WA 110M – Dispersed from the Lookout pack territory in October 2022 and was last tracked north of the Loup Loup territory before a collar failure.
- 10.) WA 134M – Dispersed from the Leadpoint territory in November 2022 and died in the Dominion pack territory that same month.
- 11.) WA 127F – Dispersed from the Lookout pack territory in November 2022 and was last tracked in the Loup Loup territory before a collar failure.
- 12.) WA 142M – Was a wolf originally captured in the Huckleberry pack territory by the STI in 2018. He was recaptured by WDFW biologists in the Navarre pack territory in January 2023. It is unclear when this wolf dispersed from the Huckleberry pack territory.

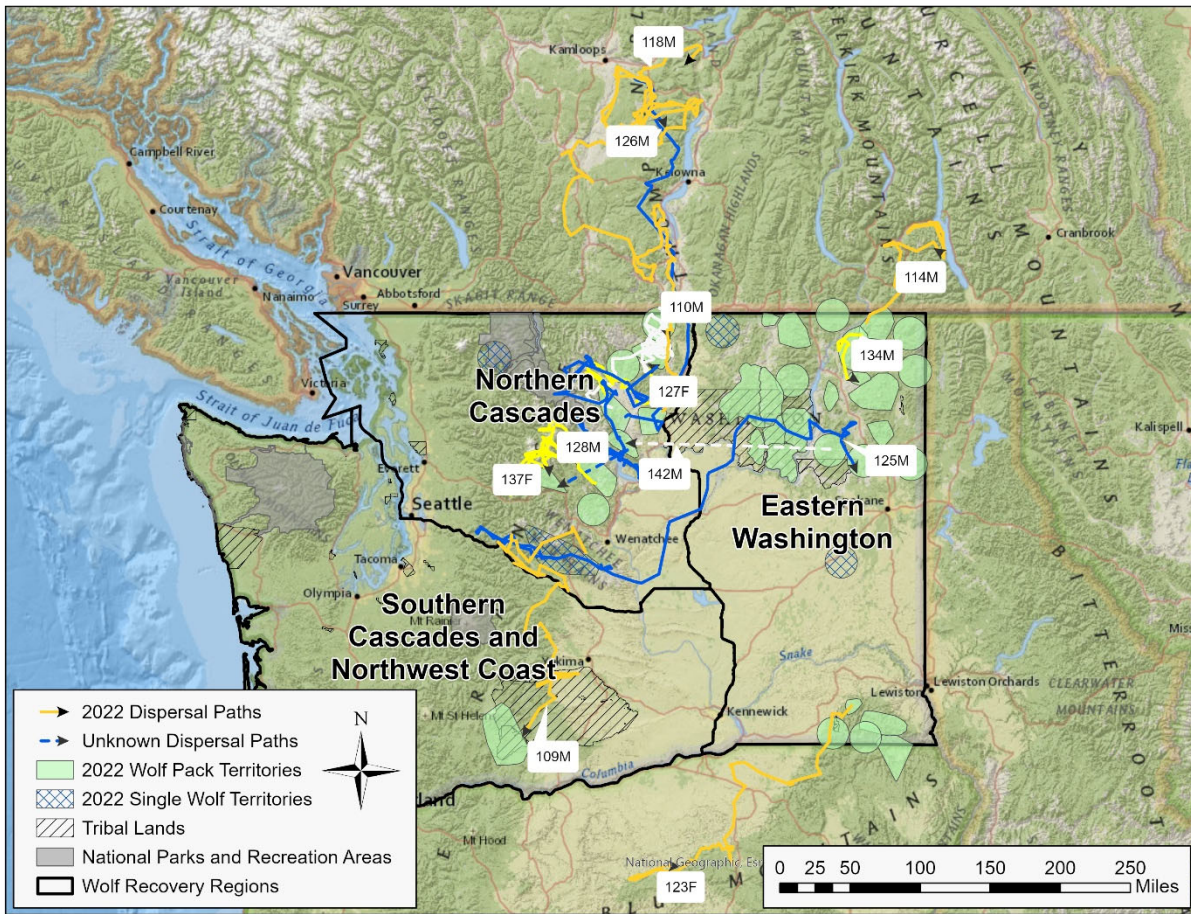


Figure 7. Generalized dispersal paths for four GPS collared wolves that dispersed from known wolf packs in Washington in 2022.

Regulated Harvest

Regulated wolf harvest occurs on CTCR tribal lands for tribal members only. In 2012, the CTCR established a hunting season for wolves in three wolf management zones on the “South Half” Reservation with an annual harvest limit of nine wolves, three wolves for each wolf management zones. In 2015 an additional wolf management zone was included allocating 12 wolves to be harvested within the four wolf management zones.

With the development of the CTCR wolf management plan in 2016, the CTCR set wolf harvest limits for a recovering wolf population based off of 10% of the annual minimum known population at three wolves for the “South Half” Reservation. In September of 2018 the CTCR expanded their wolf hunting season with no annual harvest limit for both the North Half and South Half of the Colville Reservation. In 2019 new CTCR Tribal hunting regulations were created for 2019-2022, allowing for a year-round hunting season for wolves on both the North Half and South Half Reservation.

The current CTCR hunting regulations allow for the use of any legal weapon, harvest of either sex, and no daily or season limits. Trapping and snaring seasons run Nov. 1 to Feb. 28 and include either sex harvest using any legal trap or snare and no daily or season limit. Harvested wolves are

required to be sealed within 15 days of harvest or 15 days after the close of the trapping season, whichever comes first. CTCR reported harvesting a total of 10 wolves in 2022, 22% of the minimum known number of wolves on the CTCR lands. The CTCR Wolf Management Plan identifies a preferred harvest target of 24% for a recovered population. This was the first year CTCR approached this harvest target. Seven of the wolves were harvested on the South Half and three wolves were harvested on the North Half of the Colville Reservation.

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 with a season from Oct. 1 to Feb. 28. STI reported one wolf harvested on the reservation.

No regulated harvest occurred in Washington outside of the CTCR and Spokane Indian tribal lands.

Mortalities

WDFW documented 37 wolf mortalities during 2022 (Table 1), including six removed by the department in response to wolf-livestock conflict, three killed in caught in the act of depredating on livestock, seven of natural causes (two killed by cougars, one killed by a moose, one killed by other wolves, two of old age and one pup died from malnutrition), one unknown, 11 legally harvested by tribal hunters (one by the Spokane Tribe and ten by the CTCR hunters), and nine mortalities from unlawful take still under investigation.

All of the investigations on unlawful take of wolves in 2021 (one in Smackout, one in the Wedge) and 2022 (six in Wedge, one in Vulcan, one in Carpenter Ridge, and one in Leadpoint) are still currently active.

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 Plan.

Reports of wolf depredations on livestock are investigated by WDFW personnel with assistance, as needed, from USFWS staff and local county officials and sheriffs' department personnel. In 2022, investigators confirmed that wolves were responsible for 15 cattle and two sheep deaths (Fig. 8) and injuries to nine cattle (Table 2). Additionally, one calf mortality and two injured calves were considered probable wolf-caused depredations. Most mortalities occurred during the summer-fall grazing season from May through October (Fig. 9).

Livestock depredation statistics in this report are based on livestock injuries and mortalities reported by producers and investigated by WDFW. They do not include lost or missing livestock.

Number of Packs Involved in Livestock Depredations

Seven (19%) of the 37 known packs that existed in Washington at some point during 2022 were involved in at least one confirmed livestock mortality or injury (Fig. 10). Fifteen cattle (primarily

calves) and two sheep were confirmed as killed by wolves and one was probably killed by wolves. Nine cattle were confirmed as injured by wolves and two were probably injured by wolves in 2022 by seven packs. Four of the seven packs associated with livestock depredations were involved in two or less events each. Eighty-one percent of Washington’s wolf packs were not involved in any known livestock depredations even though many of the territories overlapped livestock operations.

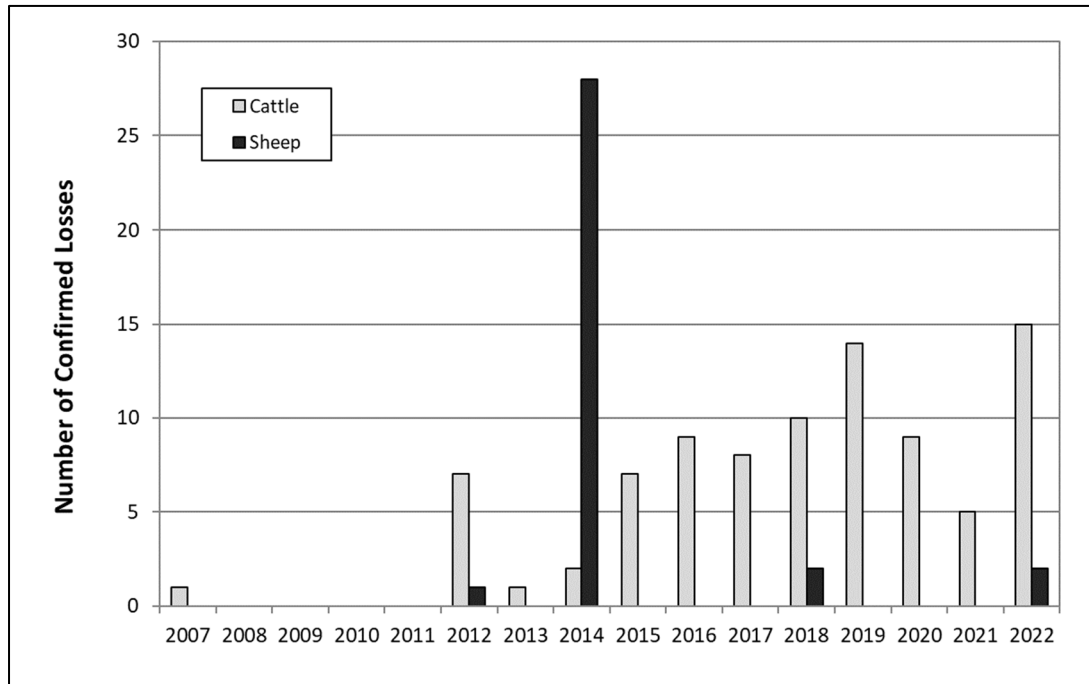


Figure 8. Total number of confirmed wolf-caused livestock mortalities in Washington, 2007-2022.

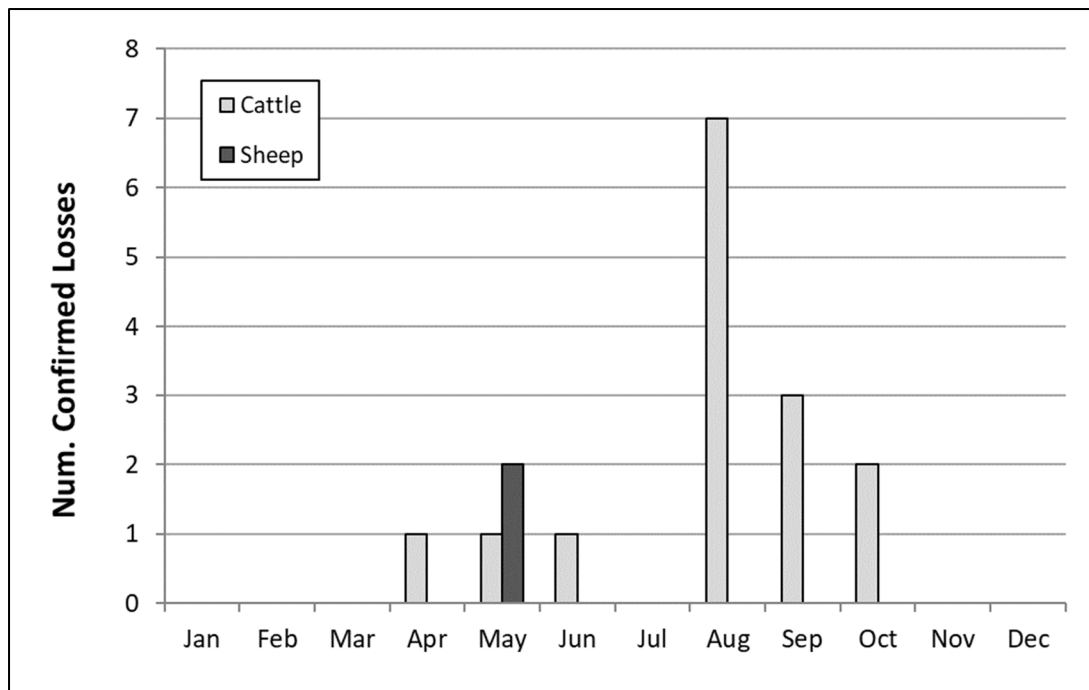


Figure 9. Number of confirmed wolf-caused livestock mortalities by month in Washington, 2022.

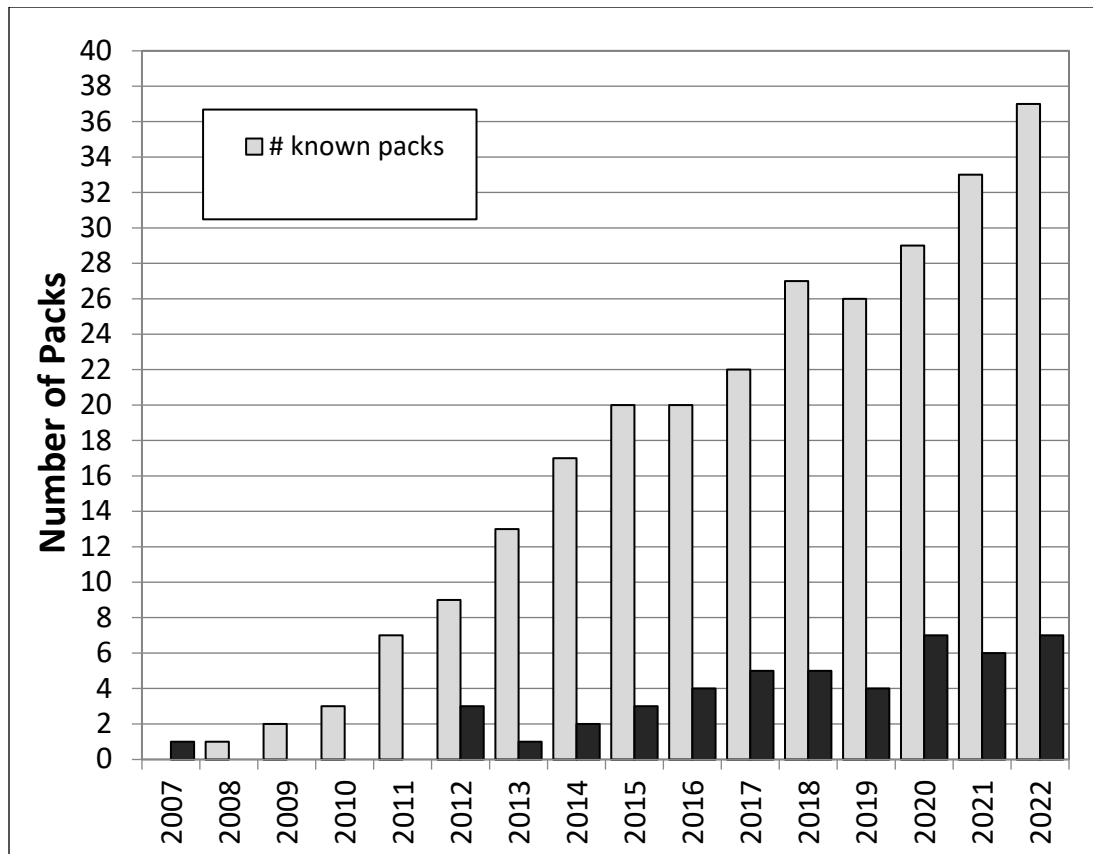


Figure 10. Minimum number of known packs that existed at the calendar year and the number of confirmed depredateur packs (on livestock) in Washington, 2007 – 2022.

Minimizing Wolf Conflicts with Livestock

One goal of the Wolf Conservation and Management Plan is to manage wolf-livestock conflicts without undermining the recovery and long-term perpetuation of a sustainable wolf population. In 2022, as in previous years, preventative measures were used to minimize livestock depredateur.

Measures included, but were not limited to:

- Working with livestock producers to properly dispose of dead livestock and clean up carcasses to reduce attractants,
- Deploying non-electrified and electrified fladry (red flagging strung around a pasture),
- Erecting temporary fencing to create enclosures for livestock,
- The use of radio-activated guard (RAG) boxes,
- Using Fox lights (Foxlights International PTY LTD, Bexley North Australia),
- Using livestock guard dogs,
- Range riding activities to monitor cattle, including those contracted directly by WDFW.

WDFW also provided livestock producers with wolf location data to help identify high wolf-activity areas. The information enables producers to move livestock away 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 only, WDFW used incremental lethal removal of wolves in three packs in an attempt to change pack behavior after repeated depredations.

WDFW has management authority of wolves in the Eastern Washington recovery region (Fig. 2) and under state law (RCW 77.12.240), WDFW can implement lethal removal. The Plan contemplates the use of lethal removal as a tool to change pack behavior after repeated livestock depredations. In 2022, lethal removal was authorized in three packs (Togo, Smackout, and Leadpoint), which resulted in two wolves from the Togo pack (two of seven members of the pack), one from the Smackout pack (one of seven known members of the pack), one from the Dirty Shirt pack (one of nine known members accidentally killed during a Smackout removal operation), and two from the Leadpoint pack (two of eight known members of the pack) being killed by Department lethal action (See Appendix A for a summary).

Table 2. Confirmed wolf-caused livestock and dog injuries and mortalities in Washington, 2013 - 2022.

	2013		2014		2015		2016	
	Injuries	Mortalities	Injuries	Mortalities	Injuries	Mortalities	Injuries	Mortalities
Cattle	0	1	2	2	0	7	6	9
Sheep	0	0	6	28	0	0	0	0
Other	0	0	0	0	0	0	0	0
Dogs	3	0	1	0	1	0	0	0
Total	3	1	9	30	1	7	6	9
	2017		2018		2019		2020	
	Injuries	Mortalities	Injuries	Mortalities	Injuries	Mortalities	Injuries	Mortalities
Cattle	5	8	19	10	11	14	30	9
Sheep	0	0	1	2	0	0	0	0
Other	0	0	0	0	0	0	0	0
Dogs	0	0	0	0	0	0	1	0
Total	5	8	20	12	11	14	31	9
	2021		2022					
	Injuries	Mortalities	Injuries	Mortalities				
Cattle	8	5	9	15				
Sheep	0	0	0	2				
Other	0	0	0	0				
Dogs	0	0	0	0				
Total	8	5	9	17				

Under state laws [RCW 77.36.030](#) and [RCW 77.12.240](#), administrative rule ([WAC 220-440-080](#)), and the provisions of the Plan, WDFW may permit livestock producers and their authorized employees to lethally remove wolves caught in the act of attacking livestock on private land and public grazing

allotments they own or lease following a documented depredation. WDFW issued one permit to a livestock producer in the Leadpoint pack territory in 2022, however the permit expired prior to any wolves being removed under this 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 applied only in the Eastern Washington recovery region where wolves were federally delisted and did not apply in areas where wolves remain classified as endangered under the Federal ESA. In January 2021, wolves were Federally delisted from the ESA and were under WDFW management statewide following the guidance of the Plan. However, federal jurisdiction has since been resumed as of February 10, 2022 in the Western two-thirds of Washington. 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.

Three wolves (one in the Huckleberry pack, one in the Stranger pack, and one in the Beaver Creek pack) were killed by landowners protecting livestock under the caught-in-the-act (CIA) rule in 2022. One other reported CIA was reported in the Togo pack area, but no carcass or potential evidence that a wolf was injured or killed was located upon investigation by WDFW Enforcement. All four CIA events were reported by the livestock producers and investigated by WDFW Enforcement. No evidence was found to suggest anything unlawful occurred in these instances.

Damage Prevention Cooperative Agreements

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 suitable for each producer's operation. WDFW recognizes that ranching and farming are essential and traditional components of Washington's economy, and the lands devoted to these activities provide critical habitat for many wildlife species.

WDFW provides cost-sharing agreements to offset losses due to wildlife damage to producers and promote the sustainability of ranching and farming in Washington State. Interested producers can participate in a Damage Prevention Cooperative Agreement for livestock (DPCA-L) with WDFW, which provides a cost-share for implementing various conflict prevention measures within any available funding limitations or legislated restricted funding proviso. These restrictions may also limit the geographic scope of where expenditures may occur.

During calendar year 2022, WDFW had cooperative agreements with 26 livestock producers across the state. Operators with an active DPCA-L received reimbursement from WDFW for a percentage of each conflict prevention measure's cost, 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), daily livestock checks, and fencing (e.g., fladry). DPCA-L contracts issued in 2022 had a combined total amount of \$101,500, of which WDFW paid producers \$56,788.28 in DPCA-L reimbursements.

During calendar year 2022, WDFW paid 16 contracted range riders \$231,708.10. WDFW contracted with 11 private vendors for range riding services; however, through subcontracts, 16 range riders were employed for the 2022 grazing season.

In addition to WDFW range riding services, the Department of Agriculture funds and oversees two organizations for a total of \$435,110. One of those organizations, Northeast Washington Wolf-Cattle Collaborative (NEWWCC), supported 12 full time and 14 part-time range riders during the 2022 grazing season. The second organization, Cattle Producers of Washington (CPoW), supported eight full and two part-time range riders as well as one court authorized community service rider (for 65 hours) to assist producers in monitoring livestock to minimize interactions with wolves.

Range riders monitored livestock on open-range grazing allotments to minimize negative encounters with wolves. All WDFW-funded (either through cost-share agreements or contracts with WDFW) range riders were required to keep daily logs of activities and coordinate regularly with WDFW Wildlife Conflict Specialists and the producers they assisted. Examples of information collected and provided to both WDFW and the producer by range riders included livestock behavior, carnivore activity and sign in the grazing areas, reports of sick or injured livestock, and suspected depredations. WDFW contracted range riders were also required to collect daily GPS tracks of their work with Garmin InReach units that were allocated to them.

WDFW Livestock Depredation Program

The 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.

When funding is available, producers may be eligible for compensation for deaths or injuries to cattle, sheep, horses, swine, mules, llamas, goats, including indirect losses for missing livestock, and for 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 probably caused by wolves. 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 an appeals process, as provided in WAC 220-440-230

- 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. Payments will be reduced by half if all the remaining livestock are accounted for.
 - **For each probable depredation**, WDFW compensates producers for the full market value of only the affected animal(s). Payments will be reduced by half if all the remaining livestock are accounted for.
 - **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 full 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.

Three direct livestock loss claims that remained from the 2021 grazing season were paid in 2022 to compensate livestock producers who experienced livestock losses or injuries caused by wolves with a combined total of \$8,178.00. WDFW has not received any direct claims for the 2022 grazing season.

Livestock Review Board

[WAC 220-440-170](#) provides for potential compensation of indirect losses experienced by commercial livestock owners subject to the restrictions in the WAC. 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.

Four claims were filed with the board that occurred during the 2021 grazing season for a combined claimed total of \$72,659.78. One claim was paid upon acceptance of an offer from WDFW of

\$6,248.61 for higher-than-normal loss of livestock. One claim is pending receipt of a final order for payment from the Office of Administrative Hearings where higher-than-normal livestock loss, reduced weight gain, and reduced pregnancy rates are being claimed. The remaining two indirect claims from the 2021 grazing season are currently under review. There have been no indirect claims filed for the 2022 grazing season at this time.

State Grants for Non-lethal Conflict Prevention Activities

During 2022, 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. NEWWCC spent \$243,833 on range riding and \$1,277 on equipment costs for the 2022 grazing season and CPoW spent roughly \$190,000 for the 2022 grazing season which was utilized for non-lethal deterrence through range riding.

WDFW Pilot Projects to Reduce Livestock-Wolf Interactions

In 2022, WDFW began collaboration with the Conflict on Working Lands Conservation Innovation Grant research team in their evaluation of the effectiveness of range riding at reducing conflicts between livestock and carnivores across the American West ([link](#) for project info). Through support for this research, the goal is to inform best practices to reduce negative livestock-carnivore interactions.

WDFW provided funding to help a producer dig a carcass disposal pit/trench and reinforce their turnout pasture and calf hutches with predator resistant fencing in an effort to reduce negative wolf/livestock interactions.

Virtual fencing has been implemented in Okanogan County with a number of producers and it is expected to be implemented on the Teanaway Community Forest during the 2023 grazing season. Virtual collars are a relatively new technique developed for directing and tracking livestock grazing in different settings. They may offer some potential to help manage the risk of wolf-livestock conflict on western rangelands. The general concept of virtual fencing involves fitting a tracking device to livestock that applies aversive stimuli (e.g. auditory, electrical) as the animal approaches a predetermined but changeable spatial boundary. The devices themselves have frequently taken the form of ear tags or collars. While not all of types are available for use in this country, most versions of the concept provide real-time animal location information and the ability to reconfigure boundaries as needed. Some products only support location information and do not include aversive stimuli, and full tracking functionality might require GPS and/or cellular signals, at least in certain locations. If reliable, the benefits could include the ability to reach specific animals more rapidly and to encourage their movement remotely. Questions remain about efficacy in areas with rugged terrain or poor cellular signals, equipment durability, battery cost, animal responsiveness, and more, but numerous tests of virtual fence products are underway.

A new and improved Radio Activated Guard (RAG) box was developed over the last couple of years through a multi-agency/NGO collaborative design team. The team worked together with two highly skilled engineers to update and improve this decades-old technology. The new RAG box has many new features including extended battery life, self-charging options, remote monitoring, data

collection, and a compact design. The prototype has been field tested and WDFW ordered several of these new units for use around the state to minimize interactions between wolves and livestock.

Wolf Interactions with Ungulates

Ungulate populations naturally fluctuate over time and space in response to various changes on the landscape. Large carnivores are common throughout Washington's diverse landscapes and managed alongside the state's many ungulate species to ensure stable populations and healthy, functional ecosystems. The Department uses harvest data and annual population surveys of deer and elk herds throughout the state to monitor long-term status and inform management decisions. The results of these surveys and other monitoring and research efforts are published each year in the Department's annual [Game Status and Trend Reports](#). To date, most significant fluctuations observed in ungulate populations in Washington are in response to major shifts in habitat quality and availability, weather, and disease occurrence that affect reproduction and survival across a large area, regardless of species or geographic region.

Through support from 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 [Washington 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 wolf recolonization on cougar foraging and population dynamics. WDFW initiated the research in December 2016 and work occurred in two study areas within Okanogan and Stevens Counties. See the research updates section below to learn more about these projects.

Research Updates

Ongoing Projects:

Title: [Washington Predator-Prey Project](#)

Principle Investigators: Dr. Melia DeVivo and Dr. Brian Kertson

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

Project Summary: The Washington 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 Washington 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 Washington 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 captured and radio-collared 93 elk, 230 white-tailed deer, and 34 cougars in northeast Washington and 137 mule deer and 21 cougars in the Okanogan 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, field work and data collection were completed in 2021, and data analyses and submission of research findings to peer-reviewed journals are underway. Several manuscripts from this work have been published and more are still in review.

Title: Spatial and temporal patterns of predator-prey interactions in a large mammal community in eastern Washington

Graduate Student (PhD): Sarah Bassing, University of Washington

Major Advisor: Dr. Beth Gardner, University of Washington

Cooperators: Dr. Melia Devivo, Dr. Brian Kertson, Trent Roussin, and Dr. Matt VanderHaegen, Washington Department of Fish and Wildlife

Wolves and other carnivores can influence the behaviors of their prey, which can affect when and how prey animals use habitat across the landscape. As part of the Washington Predator-Prey Project, the goal was to better understand how predator-prey interactions influence the spatial distribution and activity patterns of species in a multiple-prey (e.g., deer and elk), multiple-predator (e.g., cougars, bears, coyotes) system where wolves are present on the landscape. Images of wildlife were collected from motion-sensing cameras deployed across Pend Oreille, Stevens, and Okanogan Counties from June 2018 to August 2021, generating data from over 350 camera stations in total. Microsoft AI for Earth (<https://www.microsoft.com/en-us/ai/ai-for-earth>) was used and over 110 University of Washington undergraduate students reviewed and labeled over 4,000,000 images. Wolves were detected at 69 camera sites during the three years of data collection, providing information on wolf occurrence, activity patterns, and interactions with other species.

The images and telemetry data collected by Washington Predator-Prey Project collaborators was used to address four broad research questions: 1) how does survey perspective (camera traps vs GPS collars) influence inferences gained about wildlife-habitat associations and space use, 2) how does predator presence and hunting behavior influence animal movement, 3) how do antipredator behaviors vary with predation risk at different temporal scales in a multi-predator system, and 4) how do livestock and hunter activity influence co-occurrence and activity patterns of predators and prey? This project was completed in fall 2022, resulting in a completed dissertation, one publication, one manuscript in review, and two manuscripts in preparation. Findings include evidence that ungulates reduce their movement in response to large predator distributions, and sometimes shift their activity patterns to avoid predators when and where predation risk is greatest. Hunter activity and differences in land ownership were also found to influence the distribution of wildlife, often reducing spatial or temporal overlap between predators and prey during the hunting season. Finally, we found both camera traps and GPS collars generate information sufficient for estimating coarse habitat associations and wildlife distributions, but differences in data volume and spatial extent of sampling influence the power to estimate fine-scale relationships. Results from our research will help inform wolf monitoring as well as improve our understanding of how recolonizing wolves influence the broader ecological community in eastern

Washington. Future updates and research products will be provided on the University of Washington Predator-Prey Project web page at <https://predatorpreyproject.weebly.com/>.

Related publications:

Bassing, S. B., M. DeVivo, T. R. Ganz, B. N. Kertson, L. R. Prugh, T. Roussin, L. Satterfield, R. M. Windell, A. J. Wirsing, and B. Gardner. 2023. Are we telling the same story? Comparing inferences made from camera trap and telemetry data for wildlife monitoring. *Ecological Applications*. 33(1):e2745. DOI: <https://doi.org/10.1002/eap.2745>

Title: Ungulate - Predator Dynamics in Northern Washington

Graduate Student (PhD): Taylor Ganz, University of Washington

Major Advisor: Laura Prugh, University of Washington

Cooperators: Dr. Melia DeVivo, Washington Department of Fish and Wildlife

Project Summary: Ungulate populations can be influenced by food resources and the presence of predators, who may kill and consume prey and alter prey behavior. As a component of the Washington Predator-Prey Project, this study determined how wolves and other predators (cougars, bobcats, coyotes, and black bears) impacted mule deer, white-tailed deer, and elk across a varied landscape altered by humans. In total, 281 white-tailed deer (150 captured as fawns and 131 captured as adult females), 93 elk (63 adult female and 30 calves), and 149 mule deer (all adult female, fawns are not captured as part of this study) were collared in this study. Tracking collars were used to determine survival rates, causes of mortality and movement patterns of ungulates. Between 2019 and 2020, vegetation structure and plant diversity at 262 sites in GMUs 121 and 117 were surveyed to evaluate the nutritional landscape for white-tailed deer and elk (mule deer were not studied in these GMUs). Four proposed analyses were completed and published in dissertation format: (1) Predator DNA detected at 61 ungulate kill sites was analyzed to (a) identify which factors influenced the amplification of predator DNA, (b) determine the drivers of misidentifications of predators at kill sites, and (c) highlight pitfalls in field investigations at kill sites. Predator DNA was found to have retained more consistently on prey with higher body mass and for samples that had not undergone a freeze-thaw cycle in the field. Field investigation accuracy decreased with prey body mass, and the predator was more likely to be misidentified without accounting for genetic information for fawns and calves < ~21 kg. All predators were equally likely to be missed in a field investigation, but some predators were more likely than others to be falsely assigned as the predator in the field. (2) The response of mule deer to three decades of wildfires in Okanogan County were examined. It was found that mule deer generally used burns in the summer likely as the result of improved forage quality but avoided burns in the winter perhaps due to increased vulnerability to predators in deeper snow that may accumulate in those areas. Deer were more likely to use burned areas where wolf activity was more intense but avoided burned areas where cougar activity was more intense, possibly due to habitat structure facilitating predator-specific hunting modes. (3) The roles of predator exposure and human land management activities on white-tailed deer survival and population growth was investigated. It was found that deer population growth was limited by cougars and wolves but not coyotes and bobcat. Timber

harvest and agriculture improved forage for deer, and a simulated increase in the use of these areas by deer led to increasing population growth, suggesting the population is co-limited by top-down and bottom-up effects. (4) How elk balanced risk from humans and predators was evaluated and found that elk most strongly avoided humans during the day while avoiding cougars and wolves more strongly at night. Analysis (1) has been published in the Wildlife Society Bulletin (Ganz et al. 2022, Wildlife whodunnit: forensic identification of predators to inform wildlife management and conservation) and analyses (2) is published in the Journal of Animal Ecology (Ganz et al. 2022, Interactive effects of wildfires, season and predator activity shape deer movements). Analyses (3) and (4) are in preparation for submission to peer reviewed journals and are publicly available in the dissertation.

Title: Assessing effects of management strategies and system uncertainty on population dynamics of the gray wolf (*Canis lupus*) in Washington State, USA.

Principle Investigators: Dr. Lisanne Petracca. Washington Cooperative Fish and Wildlife Research Unit and School of Aquatic and Fishery Sciences, University of Washington, Seattle, WA.

Dr. Beth Gardner. School of Environmental and Forest Sciences, University of Washington, Seattle, WA.

Dr. Sarah Converse. U.S. Geological Survey, Washington Cooperative Fish and Wildlife Research Unit, School of Environmental and Forest Sciences & School of Aquatic and Fishery Sciences, University of Washington, Seattle, WA.

Cooperators: Dr. Benjamin Maletzke. Washington Department of Fish and Wildlife, Olympia, WA.

Project Summary: Species recovery can be influenced by a wide variety of factors, such that predicting the spatiotemporal dynamics of recovering species can be exceedingly difficult. These predictions, however, are valuable for decision makers tasked with managing species and determining their legal status. An existing spatially explicit projection model was applied to estimate population viability of gray wolves (*Canis lupus*) over the time period 2021 to 2070 in Washington State, where wolves have been naturally recolonizing since the establishment of the first resident pack in 2008. Using this model, it was predicted the effects of 12 scenarios of interest relating to management actions (e.g., lethal removals, translocation, harvest) and system uncertainties (e.g., immigration from out of state, disease) on the probability of meeting Washington's wolf recovery goals, along with other metrics related to population status. Population recovery was defined under Washington's Wolf Conservation and Management Plan as four breeding pairs in each of three recovery regions and six additional breeding pairs anywhere in the state. Most scenarios indicated a high probability of wolf recovery in Washington over the next 50 years, but scenarios related to harvest mortality (removal of 5% of the population every six months), increased lethal removals (removal of 30% of the population every four years), and cessation of immigration from out of state resulted in low probabilities (0.11, 0.18, and 0.27, respectively) of meeting recovery goals in the next 50 years. However, while recovery goals were not predicted to be met in those scenarios, all 12 management scenarios exhibited a geometric mean of population growth that was at or above 1, indicating long-term population stability or growth, depending on the scenario. Results suggest that wolves will continue to recolonize Washington and that recovery goals will be met so long as harvest and lethal removals are not at unsustainable levels and adjacent populations support immigration into Washington.

Title: Merging integrated population models and individual-based models to project population dynamics of recolonizing species.

Principle Investigators: Dr. Lisanne Petracca. Washington Cooperative Fish and Wildlife Research Unit and School of Aquatic and Fishery Sciences, University of Washington, Seattle, WA.

Dr. Beth Gardner. School of Environmental and Forest Sciences, University of Washington, Seattle, WA.

Dr. Sarah Converse. U.S. Geological Survey, Washington Cooperative Fish and Wildlife Research Unit, School of Environmental and Forest Sciences & School of Aquatic and Fishery Sciences, University of Washington, Seattle, WA.

Cooperators: Dr. Benjamin Maletzke. Washington Department of Fish and Wildlife, Olympia, WA.

Project Summary: Recolonizing species exhibit unique population dynamics, namely dispersal to and colonization of new areas, that have important implications for management. A resulting challenge is how to simultaneously model demographic and movement processes so that recolonizing species can be accurately projected over time and space. Integrated population models (IPMs) have proven useful for making inference about population dynamics by integrating multiple data streams related to population states and demographic rates. However, traditional IPMs are not capable of representing complex dispersal and colonization processes, and the data requirements for building spatially explicit IPMs to do so are often prohibitive. Contrastingly, individual-based models (IBMs) have been developed to describe dispersal and colonization processes but do not traditionally integrate an estimation component, a major strength of IPMs. This study introduces a framework for spatially explicit projection modeling that answers the challenge of how to project an expanding population using IPM-based parameter estimation while harnessing the movement modeling made possible by an IBM. Our model has two main components: [1] a Bayesian IPM-driven age- and state-structured population model that governs the population state process and estimation of demographic rates, and [2] an IBM-driven spatial model describing the dispersal of individuals and colonization of sites. - 33 -his model framework was applied to estimate current and project future dynamics of gray wolves (*Canis lupus*) in Washington State. Data from 74 telemetered wolves and yearly pup and pack counts was used to parameterize the model, and then projected statewide dynamics over 50 years. Mean population growth was 1.29 (95% CRI 1.26-1.33) during initial recolonization from 2009-2020 and decreased to 1.03 (IQR 1.00-1.05) in the projection period (2021-2070). Our results suggest that gray wolves have a >99% probability of colonizing the last of Washington State's three specified recovery regions by 2030, regardless of alternative assumptions about how dispersing wolves select new territories. Our spatially explicit projection model, which incorporates data-driven demographic and movement processes within a single framework, can be used to project the dynamics of any species for which spatial spread is an important driver of population dynamics.

Title: Researching the Effectiveness of Range Riding to Prevent Depredations on Livestock

Graduate Student (PhD): Rae Nickerson, Utah State University

Project Summary: Negative impacts of depredating predators are disproportionately borne by livestock producers. Predator-livestock conflicts threaten economic interests, human safety, and reduce quality of life. Finding effective solutions requires tools that support operational flexibility in changing environmental, social, and economic climates. Unfortunately, tools aimed at reducing predator livestock conflict are often designed by non-producers, lacking the local, experiential, and generational knowledge needed to ensure tools are applicable, versatile, and worth investment. Range riding - the use of human presence where livestock are grazed to deter predators - is a tool providing spatial and temporal adaptability as the rider makes decisions in direct response to the behaviors of predators and livestock regarding if, when, and how to manage livestock, deter predators, and monitor the activity of both. Range riding is unique in that it can provide a myriad of operational benefits, both related and unrelated to predator conflict such as carcass detection, rotational grazing, and adaptive management. Yet to date, riding's effectiveness has not been comprehensively studied. Through partnerships with livestock producers, NGOs, and agencies in the western USA, including Washington partners NEWWCC, WDFW, and Conservation Northwest, this study will look at range riding's effectiveness at reducing direct losses (depredation), indirect losses (reproduction, weaning weights, and illness), and livestock stress to define under which operational, environmental, and economical contexts riding can be most effective. Using interdisciplinary methods and co-production processes with ranching, NGO, Extension, and agency partners, findings will be interpreted and disseminated through three rancher-led peer-learning workshops, two to three scientific publications, a fact sheet, and Extension resources.

Title: Linking seasonal snow processes to wildlife population dynamics

Principle Investigator: Dr. Laura Prugh, Associate Professor, University of Washington

Graduate Student (PhD): Ben Sullender, University of Washington

Postdoctoral Researcher: Calum Cunningham, University of Washington

Funding: NASA Interdisciplinary Science (IDS) Program

Project Summary: Seasonal changes in snowpack have a profound influence on the energetics and population dynamics of wildlife that reside in snow-covered regions. This study aims to identify key snow properties that affect carnivore-ungulate dynamics in northern mountainous regions. This project builds from the Washington Predator-Prey Project to examine effects of snow properties such as depth, density, and surface hardness on the energetics of movement for carnivores (wolves, cougars, coyotes, bobcats) and ungulates (deer and moose). From January to March 2022, field crews collected data at 309 wildlife track sites in Okanogan County, including 49 wolf tracks. Using regression models, researchers identified that near-surface snow density best predicts how much animals sink into snow. By matching snow densities with corresponding sink depths for specific predator-pair combinations, researchers delineated danger zones, where predators have a relative movement advantage over prey. Next steps include using these snow data to calibrate a physical snowpack model for Washington state. The snowpack model produces spatially and temporally explicit estimates of snow properties, which will be used as environmental covariates in analyses

with GPS location data from collared animals. Researchers will eventually combine spatially explicit analyses with the danger zone concept to spatially map out areas in the landscape when and where it is expected that snow will have an important role in predator-prey interactions.

Title: Life on the Edge: Large Mammal Populations on a Wolf Recolonization Frontier

Principle Investigators: Brandon Nickerson, Leslie Parks, Erika Faubion, Brennan Watson

Organization: Wildlife Program – Swinomish Indian Tribal Community

Funding: U.S. Fish and Wildlife Service

Project Summary: In 2021, the Swinomish Indian Tribal Community began an ongoing research effort aimed at assessing the status of wolf (*Canis lupus*) recovery in the western Greater North Cascades Ecosystem (GNCE), which has proceeded slowly since the species first reappeared in the region in 2017. Specific goals of the project include estimating the minimum number of wolves in the western GNCE, establishing the geographic extent of wolf presence (i.e. locating the “recolonization frontier”), and documenting any breeding pairs of wolves that may be using the area. Simultaneously, baseline data was collected for other large mammal populations in the western GNCE, including elk (*Cervus canadensis*), black-tailed deer (*Odocoileus hermionus columbianus*), cougars (*Puma concolor*), and black bears (*Ursus americanus*). The goal in collecting these data, which include formulation of relative abundance indices (RAIs) and occupancy estimation, is to assess the current status and trend of these species before wolves return to the landscape in an ecologically meaningful way, so that management strategies may adapt to the shifting predation regime wolves affect on the western GNCE.

Since summer 2021, a network of approximately 30 scent-baited camera traps have been maintained across the study area (Figure 1) deployed exclusively for wolf detection. Deployment has been focused on areas where wolves have previously been detected (collar data, camera trap photos, visual observations) or near topographic features likely to attract wolf activity or guide wolf movement across the landscape (mountain passes, river drainages, lakeshores, etc.). Over this time, a total of six detections of wolves at three different camera trap locations have been made. This includes detections in each season (fall, winter, spring, summer) since fall 2021. From these detections, a minimum of two individual adult wolves of unknown sex based on pelage patterns (i.e. coat color) have been identified. However, wolves of similar appearance cannot be differentiated (e.g. if two different black wolves were detected alone at separate camera trap locations over a timeframe of weeks/months it wouldn't be known if it was one animal detected twice or two different animals), so it is possible that more than two wolves may be present in the area. The camera traps have not detected multiple wolves traveling together or other evidence (e.g. lactating adult female) of pack formation or breeding activity. Additionally, the location of the recolonization frontier does not appear to have advanced westward beyond the greatest previous known extent of wolf recolonization.

For large mammal population assessments, a camera trapping grid was established northeast of Sedro-Woolley, Washington (Figure 2) to assess the effect of recolonizing wolves on other species, as well as to help monitor any possible wolf activity in the area. Each 2.5km x 2.5km grid cell contains one un-baited camera trap deployed in a location within the cell to maximize the possibility of

detecting all study species (e.g. on a dirt forestry road or wildlife trail). This portion of the western GNCE is the focus because 1) it is an important hunting area for the Swinomish Community, 2) it contains the highest density of elk in the western GNCE (persistent wolf packs in Washington tend to geographically overlap robust elk populations), and 3) the area is currently not known to contain wolves but is adjacent to the greatest known extent of wolf recolonization in the western GNCE. Since summer 2021, 13,246 camera trap-days have been accumulated, resulting in 1,202 detections of elk, 595 detections of deer, 111 detections of cougars, 421 detections of black bears, and 0 detections of wolves. This study is currently in the early stages of analyzing these data to produce RAIs and estimate detection rates and occupancy for these five study species.



Figure 1. Approximate area of interest for wolf-focused, targeted camera trap deployments.

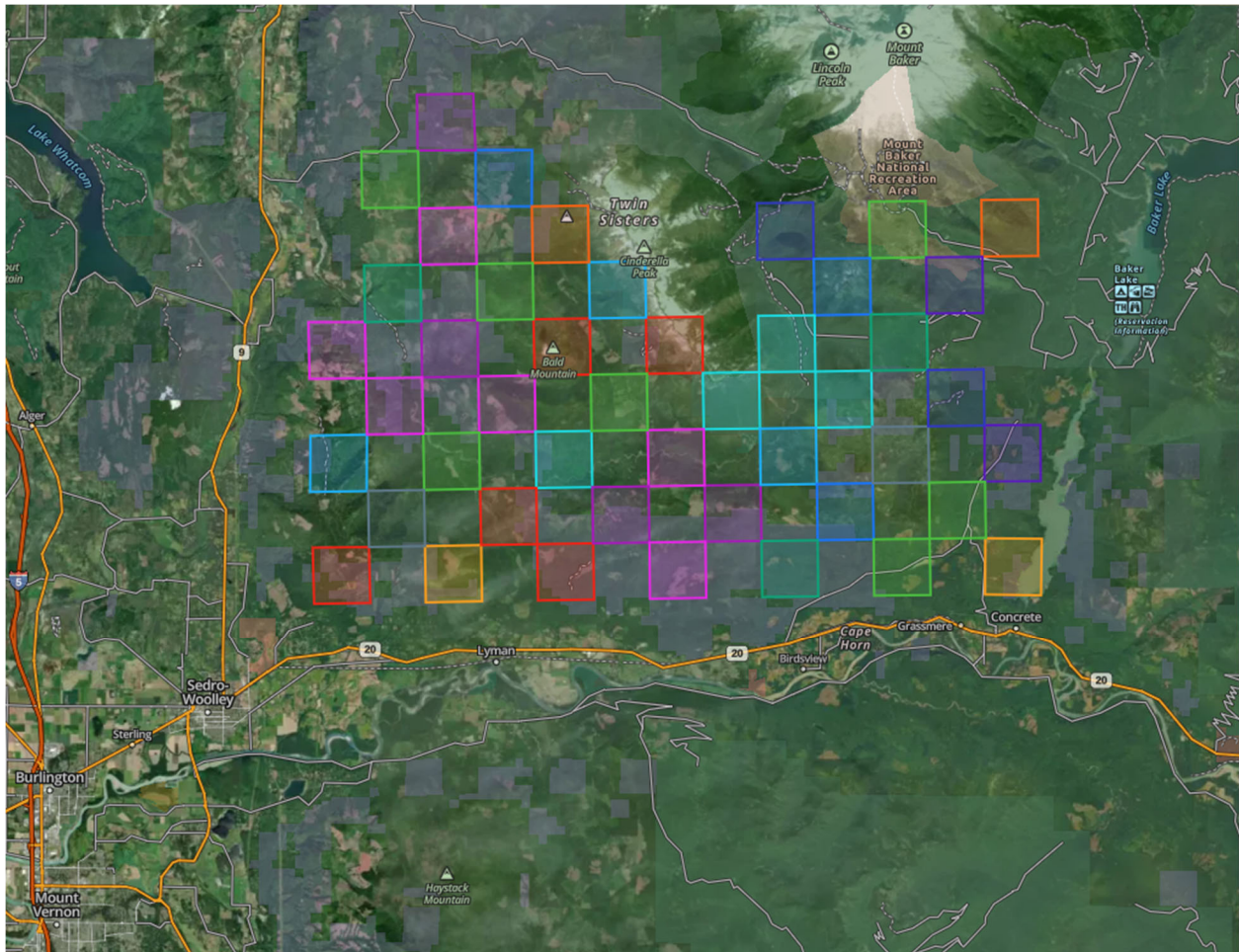


Figure 2. Current camera trap grid (colored squares) for large mammal relative abundance indices and occupancy modeling work.

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: Dr. 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 216 individuals across 37 confirmed packs. Cougars (*Puma concolor*) occupy a similar niche to wolves by hunting large prey, and likely compete directly and indirectly with wolves for space and food resources. Working as part of the WDFW/UW Washington Predator-Prey Project, a multiple predator-multiple prey research study, this project examines 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. The study incorporates CPS collar data from 60 cougars and 16 wolves (representing 6 packs), which allowed visitation of 477 potential cougar feeding sites and 211 potential wolf feeding sites across two study areas totaling 10,000 sq. km. (3860 sq. mi) from 2017 to 2020. Field investigations for both predators involve searches to classify the location as either a probable feeding site (when a carcass is found), or a

probable resting site (when no carcass is found). During investigations, species, age, sex, condition, and location of prey are recorded when possible, along with habitat and terrain characteristics at both feeding and resting sites. At a subset of locations, camera traps are placed while cougars are still active at cougar feeding sites to assess prey handling times, kleptoparasitism, and scavenging by other predators. In total, 54 cameras have been placed at cougar feeding sites and another 73 cameras have been placed on other dead deer (e.g. found opportunistically or GPS collared deer that died) resulting in just under one million camera trap photos of feeding and scavenging events. Wolf and cougar GPS location data, and locations of cougar and wolf feeding sites, 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 concluded in July 2020. In 2021, data processing and preparation was conducted for camera trap photos, scat samples, and GPS collar data. First, 25 undergraduate volunteers and paid workers were trained to identify species photographed in camera trap photos and thus prepared all photo data for analysis. Second, four undergraduate workers were trained and prepared to process 605 wolf, cougar, and black bear scat samples for genetic diet assessment. Diets of wolves and cougars were assessed from scat samples to test for all vertebrate species eaten. In the Okanogan, both wolves and cougars feed primarily on mule deer (*Odocoileus hemionus*) in both summer and winter seasons. In the Northeast, wolves and cougars both utilize white-tailed deer (*O. virginianus*) for prey, but wolves also utilize moose (*Alces alces*) as a second primary prey species in both summer and winter seasons, with cougars also using minor proportions of moose in the summer only. Finally, GPS collar data was prepared for spatial analysis. Dissertation analyses are now underway and completion is anticipated in 2023. 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: Wildlife and Humans in Shared Landscapes

Principal Investigator: Sophie Gilbert, University of Idaho;

Co-Principal Investigators: Chloe Wardropper (University of Idaho), Jeremy Bruskotter (Ohio State University), Neil Carter (University of Michigan);

Collaborators: Luke Sheneman (University of Idaho), Casey Brown (Oregon Department of Fish and Wildlife), Leandra Merz (University of Michigan), Jennifer Hinds (University of Idaho), Jeff Martin (University of California Berkeley), Nick Bergmann (University of Idaho);

Graduate Student: Lara Mengak (University of Idaho)

Project Summary: Multiple stressors are impacting ecosystems shared by wildlife and humans worldwide, threatening human livelihoods and wildlife biodiversity, and limiting the ability to predict future system states under global change. Climate change can strongly interact with other sources of change, such as recolonizing large carnivores, to alter food web dynamics and potentially reduce ecosystem provisioning for humans while increasing stress on human decision-makers. A critical gap exists in our knowledge of how climate affects human-wildlife systems via wild food webs, and how natural resource decision-makers respond to the stress. It is hypothesized that multiple environmental stressors (e.g., climate change and novel predators) will have complex and interactive effects on human-wildlife systems via trophic interactions among predators, prey, domestic animals, and plants within shared food webs, potentially reducing the provisioning of humans from the shared ecosystem and human tolerance for predatory and competitive wildlife as

well as increasing uncertainty for natural resource decision-makers. There is a pressing need to advance models, tools, and theory to 1) understand how multiple stressors interactively affect food webs in which humans and domestic animals are embedded, and 2) identify and quantify feedbacks among natural resource decision-makers and human-wildlife systems in response to multiple environmental stressors, including identifying potential “tipping points” in system resiliency. Using a factorial design of study sites across combinations of wolf presence and drought in the Pacific Northwest, this project will mechanistically study rancher-wildlife-plant dynamics. Data will stem from qualitative interviews with cattle producers and resource managers (in progress), rancher surveys, wildlife camera grids, and ground-surveyed and remotely-sensed plant data. Social and ecological data will be integrated into a structural equation modeling framework, which will drive ecological forecasts of predation and competition risk to livestock. To understand natural resource manager decisions, which occur at larger spatial scales than rancher decisions, we will conduct a broad-scale analysis of the rangeland SES across the Western US using publicly-available wildlife and social data and remotely-sensed environmental characteristics. By analyzing decision-making across these spatial scales, we anticipate being able to identify key feedbacks, emergent phenomena, and potential tipping points in resilience for the human and wildlife components of the rangeland SES.

Project Duration: September 1, 2021-August 31, 2026 (estimated); NSF Grant #2109005

Website: <https://whisl.org>

Title: Coast to Cascades Habitat Connectivity Analysis for a Reestablishing Gray Wolf Population

Principle Investigators: Washington Department of Transportation, Defenders of Wildlife, Conservation Northwest, Wolf Haven International, Washington Department of Fish and Wildlife, Conservation Biology Institute

Project Summary: Efforts begun by the Washington Wildlife Habitat Connectivity Working Group (WWHCWG) to model connectivity for multiple species in western Washington dubbed the “Cascades to Coast,” have developed into a collaboration to build a similar model for the gray wolf. Multiple non-governmental organizations, government agencies and members of academia comprise this team, whose primary goals involve identifying and prioritizing gray wolf corridors, while also ranking core habitat important to a reestablishing gray wolf population. This information is intended to support the goals of the statewide wolf recovery plan, as well as provide a tool for proactive gray wolf conflict mitigation. The model will also inform I-5 permeability analyses and help pinpoint locations for future fine-scale research.

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 Washington Predator-Prey Project and WDFW, camera traps and bioacoustic monitors were used to develop more efficient methods to accurately monitor

Washington's expanding wolf population. This data is being analyzed along with 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 2022, this team worked with other members of the Washington Predator-Prey Project and WDFW staff to retrieve cameras and bioacoustic recorders at 120 random sites across roughly 10,000km² in northeastern and northcentral Washington. Bioacoustic recorders were also placed near known wolf rendezvous sites in Northcentral Washington. In total, roughly 90,000 hours of acoustic data and roughly 1,000,000 images were collected in 2021. Audio data collected from wolf rendezvous sites was used to train machine learning algorithms to identify wolf howls, and these algorithms are being used to efficiently process the acoustic data from the 240 random sites monitored over the course of the study. In addition to training machine learning algorithms, data from the rendezvous sites is also being used to document reproductive success, count individuals within packs, and determine daily and seasonal howling rates. The data from the random sites will be used to develop statistically rigorous models to document habitat use, occupancy, and recolonization of current and new packs on the landscape.

In 2023, the data collected over the previous three years will be processed and analyzed, with a goal of publishing the results when complete. The techniques and models developed from this research will improve the ability to accurately and efficiently monitor and estimate wolf population metrics in Washington.

Title: Monitoring Impacts of Wolf Recovery on Medium to Large Carnivores and Their Prey in Washington State

Principle Investigator: Samuel Wasser, University of Washington

Center for Environmental Forensic Science, University of Washington, Seattle, WA

Project Summary: The 2022 season marked the fifth year of carnivore scat collections by detection dog teams in the South Cascades. Sampling in 2018, 2019, and 2020 covered an 11,000km² area across the Eastern Cascade Region of Central Washington, including 3,000km² of Yakama Nation land and areas within Mount Rainier National Park. Since no wolf samples were detected south of I-90 during that 3-year period, surveys were concentrated in the northern half of the study area in 2021 based on wolf sighting information. The 2018 and 2021 sampling also included the Teanaway wolf pack home range, just north of I-90, as a control site to confirm that the absence of wolf samples was not due to dog-handler error. In both the 2018 and 2021 field seasons, wolf scat was located in the control area. In 2022, teams continued to focus survey efforts in areas with the highest likelihood of finding wolf scat south of I-90, extending further south in the USFS lands, Yakama, state and private lands in the South Cascades (between Highway 12 and the Columbia River). Six hundred of the samples collected in 2022 were processed and successfully amplified DNA from 534 samples. Of those, 13 samples were typed as wolf, 341 as coyote, 144 as bobcat, 16 as cougar, 8 as dog, 8 as marten, 2 as fox, and 2 as fisher. Genotypes of the wolf scats confirmed that the 13 samples were from 2 individuals, one male and one female. The wolf samples were all found within 24km of each other in the area just south-east of Mt. Adams (between Mt. Adams and the Conboy Lake National Wildlife Refuge).

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 2022, in addition to numerous daily interactions with the public (i.e. phone calls, emails, and personal communications), department personnel were 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, and local interest groups.

WDFW maintains numerous pages on its website related to [wolves and wolf management in Washington](#). In addition to general wolf information and links to other wolf-related sites, the website 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.

WDFW staff made a concerted effort to do an increased amount of wolf outreach via social media in 2022. This included sharing media articles and wolf content via WDFW's Facebook, Twitter, Instagram, YouTube, and blog accounts, as well as providing links to new information posted on the WDFW website, and broadcasting wolf presentations and other events. WDFW staff helped coordinate and participated in a Strategic Ranching on the Landscape with Wolves Workshop in Klickitat County. WDFW also produced a couple [videos and recorded presentations](#) about wolves in 2022.

Wolf Advisory Group

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

The WAG met four times in 2022. Core goals of the WAG are to reconcile divergent views and build resilient relationships among stakeholder groups, including WDFW. As such, the WAG spent time developing relationships that foster respect, honest dialogue, and mutual learning.

In 2022, the WAG resumed in-person meetings for the first time since January 2020. Although the convenience of meeting virtually allowed WAG to continue its work during the COVID-19 pandemic, the connections and relationship building that unfold during in-person meetings are irreplaceable and all were more than ready to see each other at meetings once again.

The WAG turned their attention this year primarily to discussion of wolf-ungulate interactions, exploring how predators are impacting ungulate populations in Washington—what we do know

and what won't we know from the Washington Predator-Prey Project, how WDFW will use this information to inform its decision-making regarding wolf management, and whether there is interest and opportunity for WAG to support ungulate habitat restoration where habitat is a limiting factor. The WAG heard several presentations from top experts in the field to inform them on these issues, including [Fundamental Elements of Ungulate Population Dynamics](#), [Factors that Influence Ungulate Populations](#), [Ungulate Population Monitoring](#), [Some thoughts on the relationship between wolves and their prey](#), [Some insights from predator-prey research in Greater Yellowstone Ecosystem](#), and [Density-dependent changes in wolf predation within the complex system of northern Yellowstone](#). WAG members summarized what they learned from these presentations and their discussions in a [Synthesis of 2022 Wolf-Ungulate Interactions Presentations to WAG](#).

The WAG also discussed the challenges and opportunities presented by carcass management and sanitation related to potential conflict with wolves and other carnivores. The WAG reached a full consensus recommendation to issue advice regarding carcass management issues to WDFW through a [letter](#) to the Director, advising WDFW to convene state regulatory agencies in a multi-agency conversation regarding the opportunities, challenges, and regulatory constraints around natural decomposition, carcass composting, and other forms of carcass management; to identify successful county carcass disposal models; and to explore application of these models in highly impacted counties. The Director issued a [response](#) on Nov. 30, 2022.

In 2022, WAG and WDFW worked with a new facilitation team from Ross Strategic to take on facilitating WAG meetings and chart the future course for WAG discussions.

All WAG meetings are open to the public. [Agendas, notes, handouts, and meeting minutes](#) are posted on WDFW's website.

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- To report a suspected livestock depredation, a dead wolf in the Eastern Washington Recovery Region, 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 your local WDFW enforcement officer
- [For information about wolf management in Washington and to report a wolf sighting](#)
- For information about wolf management on lands owned by the [Colville Confederated Tribes and to report a wolf sighting on tribal lands](#)
- For information about [wolf recovery in the Northern Rocky Mountains](#)

Appendix A. 2022 – 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 2022 grazing season. [Much of this information is available on the department's website](#), 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 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 fail, WDFW may remove one or more wolves in an attempt to reduce the potential for depredations on livestock.

Due to reoccurring depredations, WDFW authorized and attempted to remove wolves in three packs in 2022: Togo, Smackout, and Leadpoint. The lethal removal operations resulted in two wolves being removed from the Togo pack, one wolf removed from the Smackout pack, one wolf accidentally removed from the Dirtyshirt pack, and two wolves being removed from the Leadpoint pack.

Togo – 2022 Timeline of Events and Lethal Removal Operation Summary

January 2022 - WDFW biologists deployed one additional collar in this pack during aerial count and capture operations.

February 2022 - In response to several reports of wolves howling and wolf collar data, WDFW staff deployed several Fox lights around a calving pasture. WDFW staff continued to make contact with livestock producers throughout the grazing season.

March 2022 - WDFW staff ordered VHF eartags and other equipment for a pilot project that was implemented in the Togo pack territory.

April 2022 - WDFW staff notified a producer about a cluster of wolf activity within their cattle pasture. Upon investigation, the producer found a wolf-killed deer within the pasture and decided to move their cattle across the river.

WDFW staff also started working with and coordinating with other livestock producers and range riders in the area.

May 16th, 2022 – In the evening, a livestock producer discovered a dead calf in a private pasture about a half mile from the ranch headquarters in the Togo pack territory. WDFW staff investigated the calf on May 17 and discovered several bite marks, lacerations, tears, and punctures on the hide covering the hamstrings and hindquarters consistent with wolf depredation, and subcutaneous hemorrhaging on the left hindquarter from the hamstring to tail head. WDFW staff estimated that the calf was killed one to two days prior to the investigation. WDFW staff who conducted the investigation determined the calf died as the result of a confirmed wolf depredation. The decision was based on the nature and location of the injuries (consistent with wolf depredation) and wolf sign and activity in the area. Following the investigation, WDFW staff removed the carcass remains.

May 18th, 2022 - The same livestock producer discovered an injured calf in a different private pasture when checking cattle. WDFW staff investigated the calf the same day and found several bite marks, lacerations, punctures, and rake marks consistent with wolf depredation. The right hindquarter was extremely swollen, indicating tissue and muscle damage. WDFW staff estimated that the injuries were three to four days old. WDFW staff who conducted the investigation determined that the injuries sustained were the result of a confirmed wolf depredation. Following the depredation investigation, the injured calf was moved to the pasture surrounding the ranch headquarters to be watched and monitored more closely.

The producer and ranch staff checked the cattle several times a day and continued to regularly monitor the cattle until they were moved to summer pasture and allotments. Fox lights had been proactively deployed in the pasture where the injured calf was discovered. The producer and WDFW staff coordinated with Northeast Washington Wolf Cattle Collaborative (NEWWCC) and Cattle Producers of Washington (CPoW) range riders to ensure adequate range rider presence.

On May 17 and May 18, WDFW confirmed two wolf depredations attributed to the Togo pack. In total in the last ten months, WDFW had documented five depredation events resulting in two dead and three injured livestock since August 6, 2021. WDFW staff discussed the depredations and use of non-lethal measures in this pack territory as well as how to most effectively address this situation moving forward in order to provide a recommendation to the Director.

The Department reviewed the situation and Director Kelly Susewind decided not to initiate lethal removal at the time. The Department continued to coordinate with livestock producers, Northeast Washington Wolf Cattle Collaborative (NEWWCC), and Cattle Producers of Washington (CPoW) to encourage daily to near daily range riding presence in pastures and allotments with livestock (especially near wolf activity centers) and documentation of range riding activities. They worked with the producer who experienced depredations to deploy deterrents such as Fox lights and/or a RAG box in an allotment where cattle were moved. The RAG box helped inform the producer and range rider(s) if wolves were in the area and served as scare devices for wolves. WDFW Staff also collaborated with affected producers, non-governmental range rider groups, and Forest Service personnel to provide input on a draft conflict mitigation plan for the Togo pack territory.

On June 8, WDFW staff investigated a dead calf in a private industrial timberland allotment in the Togo pack territory. The investigation revealed several bite marks, lacerations, and punctures covering the hamstrings, hips, and around the tail head on both sides of the calf, with subcutaneous hemorrhaging on the left side from the hamstring to the tail head. WDFW staff who conducted the

investigation determined the calf died as the result of a confirmed wolf depredation. The decision was based on the nature and location of the injuries (consistent with wolf depredation) and wolf sign and activity in the area. WDFW staff estimated that the calf was killed one to two days prior to the investigation. Following the investigation, WDFW staff removed the carcass remains.

This dead calf belonged to a different livestock producer than the producer who experienced depredations WDFW investigated on May 17 and 18. The livestock producer who experienced the depredation had been in regular communication with WDFW staff, conducted carcass sanitation, removed sick or injured livestock when found, and had reported any suspected depredations. The producer also used Fox lights and a radio-activated guard (RAG) box where the cattle gather overnight. The producer increased range riding from one part-time rider to one full-time and two part-time riders when cattle were turned out on May 20. Following the depredation, one of the part-time riders transitioned to full-time.

WDFW had documented three depredation events in 30 days and five depredation events in the last 10 months resulting in two dead and three injured livestock since Aug. 17, 2021 attributed to the Togo pack. WDFW staff discussed the depredations and use of non-lethal measures in this pack territory and how to most effectively address this situation moving forward. They provided a recommendation to the Director.

On June 13, 2022, Washington Department of Fish and Wildlife (WDFW) Director Kelly Susewind authorized the lethal removal of one to two wolves from the Togo pack territory in response to repeated depredations of cattle on private grazing lands in Ferry County.

The proactive and responsive non-lethal deterrents used by the two affected livestock producers (described below) in the area this grazing season had not curtailed further depredations.

Director Susewind's decision was consistent with the guidance of the state's [Wolf Conservation and Management Plan](#) and the lethal removal provisions of the Department's 2017 [wolf-livestock interaction protocol](#).

Consistent with the guidance of the plan and protocol, the rationale for authorizing lethal removal of Togo wolves was as follows:

On June 11th, a range rider discovered another injured calf belonging to Producer 2 in a private industrial timberland allotment. WDFW staff investigated and confirmed the calf was injured by wolves. The calf and calf's mother were removed from the allotment to the producer's home place.

WDFW had documented six depredation events (four within the last 30 days) resulting in two dead and four injured calves since August 17, 2021 attributed to the Togo pack. All events except one were considered confirmed wolf depredation incidents; the other incident was considered a probable wolf depredation. All incidents took place on private land.

At least two (in this case, more than two) proactive deterrence measures and responsive deterrence measures (if applicable) were implemented by the livestock producers affected by the depredations, including the following:

Producer 1:

- Proactively moved livestock out of a private pasture in the Togo territory in early April upon discovery of a wolf-killed deer (discovered based on wolf activity information provided by WDFW);
- provided human presence and focused monitoring around private calving pastures (checked cattle several times a day before they were moved to summer pasture and allotments);
- conducted carcass sanitation;
- removed sick or injured livestock when found;
- proactively deployed Fox lights (prior to the depredation occurring) in the pasture where an injured calf was investigated on May 18;
- deployed VHF ear tags on cattle to assist in locating them;
- used a part-time range rider in private calving pastures prior to turnout on summer pasture and allotments, and one full-time and two part-time riders following turnout to meet WDFW's expectation of daily to near daily range riding (one of the part-time riders has since become full-time);
- signed a contract to cost-share non-lethal deterrence measures that will start July 1; and,
- had been in regular communication with WDFW staff and reported any suspected depredations.

Producer 2:

- Conducted carcass sanitation;
- removed sick or injured livestock when found;
- proactively deployed Fox lights and a radio-activated guard (RAG) box where cattle gather overnight;
- used one full-time range rider and two part-time range riders to meet WDFW's expectation of daily to near daily range riding (one of the part-time riders has since become full-time); and,
- had been in regular communication with WDFW staff and reported any suspected depredations.

The Department documented these deterrents in the agency's "wolf-livestock mitigation measures" checklist, with date entries for deterrent tools and coordination with the producers and range riders. The proactive and reactive non-lethal deterrence measures implemented by these livestock producers were those best suited for their operations in the professional judgment of WDFW staff.

Livestock were evenly dispersed throughout much of the Togo territory. Based on the distribution of livestock in the territory, where the depredations occurred, the amount of non-lethal deterrence measures already deployed and currently being utilized, and the behavior patterns exhibited by the wolves, WDFW staff believed depredations were likely to continue.

The lethal removal of one to two wolves from the Togo pack territory was not expected to harm the wolf population's ability to reach the statewide or local recovery objective. In previous years, WDFW had documented 12 – 30 mortalities per year and the population had continued to grow and expand its range. The Department's wolf plan also modeled lethal removal to help inform decision makers during this stage of recovery. The analysis in the plan included wolf survival estimates from northwest Montana, which incorporated a 28% mortality rate. It is important to note that agency

lethal control was factored into that 28% mortality estimate. To err on the side of caution (i.e., when in doubt assume greater impact to wolf population so true impact is not underestimated), the scenarios modeled in the wolf plan included an even higher level of lethal control (i.e., removing 30% of population every four years in addition to baseline 28% mortality rate). Based on that modeling analysis, as well as an analysis of higher levels of potential mortality on the actual population level of wolves in the eastern recovery zone and statewide, this action was not expected to jeopardize wolf recovery in the eastern recovery zone or statewide.

WDFW discussed the impacts of removing one to two wolves from the Togo pack territory and determined the current level of mortality should not negatively impact the ability to recover wolves in Washington.

On June 13, WDFW Director Kelly Susewind authorized Washington Department of Fish and Wildlife (WDFW) staff to lethally remove one to two wolves from the Togo pack territory in response to repeated depredations of cattle on private grazing lands in Ferry County under the guidance of the state's [Wolf Conservation and Management Plan](#) and the lethal removal provisions of the department's [wolf-livestock interaction protocol](#).

The lethal removal authorization expired when the wolf or wolves in the authorization have been removed or after June 27, 2022 (regardless of whether wolves have been removed), whichever comes first. The authorization could have been extended or amended to include other wolves in the pack area if additional depredations were documented following the initial authorization or other extenuating circumstances are identified.

WDFW lethally removed a yearling female wolf on June 14 and an adult male wolf on June 17 from the Togo pack territory. With the removal of two wolves, the lethal removal authorization expired.

As of this update, WDFW has not documented any additional wolf depredations in the Togo pack territory since June 12.

In July, WDFW Wildlife Conflict Specialists onboarded a new WDFW-contracted range rider in the Togo pack territory. WDFW staff also collaborated with the Northeast Washington Wolf Cattle Collaborative (NEWWCC) to train participating livestock producers and range riders on the deployment of VHF ear tags for cattle and the use of telemetry equipment to locate them. 25 VHF ear tags were deployed on cattle in the Bulldog grazing allotment.

On July 15, WDFW was informed that a range rider shot at a wolf chasing cattle in the Togo pack territory at approximately 9:00 p.m. the previous evening. The range rider was not sure if they hit the wolf. WDFW law enforcement investigated the incident and did not find evidence of a dead wolf but did find wolf tracks and cow tracks in close proximity. WDFW law enforcement determined this incident was a “caught-in-the-act” scenario under [WAC 220-440-080](#).

Through the end of the grazing season, WDFW staff continued to monitor wolf activity in the Togo pack territory and coordinate with livestock producers.

Cost

Total expenditure for the Togo lethal removal operation in 2022 (staff time, contractor time and aerial support) was \$52,754 allocated from unrestricted Wildlife State Funds.

Details of Togo pack depredations:

Depredation Date	Depredation Type	Proactive Non-lethals	10 Month Window
8/6/2021	Confirmed mortality of calf (died from injuries)	Yes	6/6/2022
8/17/2021	Prob injury of calf	Yes	6/17/2022
8/17/2021	Confirmed injury of calf	Yes	8/17/2022
5/17/22	Confirmed mortality of calf	Yes	3/17/23
5/18/22	Confirmed injury of calf	Yes	3/18/23
6/8/22	Confirmed mortality of calf	Yes	4/8/23
6/12/22	Confirmed injury of calf	Yes	4/11/23

Details of the Togo Pack Lethal Removals and Mortalities:

Date	Wolf	Sex	Age
June 14, 2022	1 (Agency Removal)	Female	Yearling
June 17, 2022	1 (Agency Removal)	Male	Adult

Smackout – 2022 Timeline of Events and Lethal Removal Operation Summary

January 2022 - WDFW biologists deployed one additional collar in this pack during aerial count and capture operations.

February 2022 - In response to wolf activity in and around an active calving pasture, WDFW staff deployed fladry and Fox lights around the perimeter of a pasture. Although wolves have tested the fladry and crossed it multiple times, no depredations had occurred. WDFW staff regularly monitored and maintained the fladry to ensure its effectiveness as a non-lethal deterrent.

March 2022 - WDFW staff removed fladry and Fox lights previously deployed around a calving pasture. Scare devices tend to work most effectively as a nonlethal deterrence measure when they are deployed as needed—if they are left out for long periods of time, wolves may become habituated to the deterrence and the scare device loses its effectiveness.

In August, WDFW investigated four wolf depredations in the Smackout wolf pack territory. These depredations affected three different livestock producers, identified as producers 1, 2, and 3 below.

On Aug. 17, WDFW staff investigated a dead calf in a U.S. Forest Service grazing allotment that had been reported by a range rider. The investigation revealed lacerations, puncture wounds, swelling, and subcutaneous hemorrhaging consistent with a confirmed wolf depredation. WDFW staff estimate the calf died within 24 hours of the investigation.

On Aug. 20, WDFW staff investigated an injured calf in another U.S. Forest Service grazing allotment. Based on severe wounds with associated swelling and bite lacerations on the injured calf, information from range riders, and trail camera photos where the injured calf had been seen grazing, the incident was classified as a confirmed wolf depredation. WDFW staff estimated the injury to have occurred more than one week prior to the investigation.

On Aug. 27, WDFW staff investigated an injured calf that had been reported by a range rider in the same U.S. Forest Service grazing allotment as the calf investigated on Aug. 17. Based on the type, severity, and location of the injuries revealed in the investigation, the event was classified as a probable wolf depredation. WDFW staff estimated the injuries were one to two weeks old.

On Aug. 28, WDFW staff investigated a dead calf discovered by a WDFW range rider on private grazing land. Staff identified lacerations and a puncture wound with associated subcutaneous hemorrhaging and classified this event as a confirmed wolf depredation. Staff determined the calf was killed approximately two to three days prior to the investigation.

WDFW staff also conducted four other depredation investigations in the Smackout pack territory in August that were not classified as wolf depredations. The investigations included two dead calves on Aug. 16, one dead calf on Aug. 17, and one dead and one injured calf on Aug. 20 that were classified as non-depredation events. Two of the three dead calves had been scavenged by wolves, but all three died from non-depredation related causes. All carcasses were removed from the allotments. U.S. Forest Service staff surveyed the area for toxic plants that could have contributed to the death of the calves and did not find any.

Producer 1 impacted by depredations utilized multiple range riders to monitor livestock on a daily/near daily basis on the U.S. Forest Service grazing allotment where their livestock grazed. The producer also deployed 20 VHF ear tags on adult cows to help locate groups of cattle in the large allotment. Sick or injured livestock were removed from the allotment when found and carcasses were properly disposed of. When depredations started to occur, the producer began camping near the meadows where a large number of livestock congregated and spent several nights a week there. The producer penned their cattle at night and spotlighted them. A Fox light was deployed on Aug. 25 and a Radio-Activated Guard (RAG) box was deployed on Aug. 29.

Producer 2 utilized a range rider and three individuals for human presence to monitor livestock on a daily/near daily basis on the U.S. Forest Service grazing allotment where their livestock graze. Sick or injured livestock were removed from the allotment when found and carcasses were properly disposed of. The livestock producer delayed turnout until mid- to late July in this allotment and removed several smaller calves from the allotment after depredations started to occur to keep them safe. Fox lights were deployed in areas where livestock congregated, and the producer increased the time they spent monitoring livestock by camping near the cattle.

Producer 3 utilized a range rider to monitor livestock four days per week on leased private pasture. Sick or injured livestock were removed from the allotment when found and carcasses were properly disposed of. During the winter, the property owner (who runs livestock on this property in the winter) deployed fladry and Fox lights on the pasture to help keep livestock safe early in the year in this location.

Northeast Washington Wolf Cattle Collaborative (NEWWCC), Cattle Producers of Washington (CPoW), and WDFW range riders as well as WDFW staff increased communication to ensure consistent monitoring of livestock in areas with increased wolf activity.

WDFW had documented four depredation events affecting three different livestock producers resulting in two dead and two injured livestock in August attributed to the Smackout pack. WDFW staff discussed the depredations and use of non-lethal measures in this pack territory and discussed how to most effectively address this situation moving forward and provided a recommendation to the Director.

The proactive and responsive non-lethal deterrents used by the three affected livestock producers in the area this grazing season had not curtailed further depredations.

On September 1, Washington Department of Fish and Wildlife (WDFW) Director Kelly Susewind authorized the lethal removal of one wolf from the Smackout pack territory in response to repeated depredations of cattle on public and private grazing lands in Stevens and Pend Oreille Counties.

Director Susewind's decision was consistent with the guidance of the state's [Wolf Conservation and Management Plan](#) and the lethal removal provisions of the Department's 2017 [wolf-livestock interaction protocol](#).

Consistent with the guidance of the plan and protocol, the rationale for authorizing lethal removal of Smackout wolves is as follows:

WDFW staff investigated two additional dead calves on Aug. 31 in a private pasture confirmed as a wolf depredation event.

WDFW had documented five depredation events (five within the last 30 days) affecting three different livestock producers resulting in four dead and two injured calves since August 17, 2022 attributed to the Smackout pack. All events except one were considered confirmed wolf depredation incidents; the other incident was considered a probable wolf depredation.

At least two (in this case, more than two) proactive deterrence measures and responsive deterrence measures (if applicable) were implemented by the livestock producers affected by the depredations, including the following:

Producer 1 impacted by depredations utilized multiple range riders to monitor livestock on a daily/near daily basis on the U.S. Forest Service grazing allotment where their livestock graze. The producer also deployed 20 VHF ear tags on adult cows to help locate groups of cattle in the large allotment. Sick or injured livestock were removed from the allotment when found and carcasses were properly disposed of. When depredations started to occur, the producer began camping near the meadows where a large number of livestock congregated and spent several nights a week there. The producer penned their cattle at night and spotlighted them. A Fox light was deployed on Aug. 25 and a Radio-Activated Guard (RAG) box was deployed on Aug. 29. This producer removed several smaller calves from the allotment after depredations started to occur to reduce the likelihood of potential depredations. WDFW staff and range riders have relayed high wolf-use areas to the producer after the first confirmed depredation based on collar data to concentrate resources in those areas.

Producer 2 utilized a range rider and three individuals for human presence to monitor livestock on a daily/near daily basis on the U.S. Forest Service grazing allotment where their livestock grazed. The producer also spent time on the allotment to increase human presence. Sick or injured livestock were removed from the allotment when found and carcasses were properly disposed of. The livestock producer delayed turnout until mid- to late July in this allotment and removed several smaller calves from the allotment after depredations started to occur to keep them safe. Fox lights were deployed in areas where livestock congregated, and the producer and other individuals increased the time they spent monitoring livestock by camping near the cattle.

Producer 3 utilized a range rider to monitor livestock four days per week on leased private pasture. The livestock producer spent time on the pasture when the range rider was not there per a Cattle Producers of Washington (CPoW) agreement. Sick or injured livestock were removed from the allotment when found and carcasses were properly disposed of. During the winter, the property owner (who runs livestock on this property in the winter) deployed fladry and Fox lights on the pasture to help keep livestock safe early in the year in this location.

Historically, range riding had been used in the area. This year, even more effort was put into increasing the effectiveness of range riding through increased communication and rotation of riders. Northeast Washington Wolf Cattle Collaborative (NEWWCC), Cattle Producers of Washington (CPoW), and WDFW range riders as well as WDFW staff increased communication to ensure consistent monitoring of livestock in areas with increased wolf activity.

The Department documented these deterrents in the agency's "wolf-livestock mitigation measures" checklist, with date entries for deterrent tools and coordination with the producers and range riders. The proactive and reactive non-lethal deterrence measures implemented by these livestock producers were those best suited for their operations in the professional judgment of WDFW staff.

WDFW staff discussed the recent depredations by the Smackout pack and associated effectiveness of the nonlethal deterrence tools utilized by the affected producers and range riders in the area. Staff determined that range riding was occurring on a daily/near daily basis, and that the affected livestock producers utilized proper sanitation practices and put forth a concerted effort to keep livestock in the area safe. In addition, one of the producers was utilizing transmitter ear tags to help locate and monitor livestock. Several reactive measures were implemented, including Fox lights, a RAG box, enhanced communication of range riders to ensure good coverage of monitoring livestock near high wolf activity areas, camping near the meadows several nights a week in an affected allotment, and removal of some of the smaller calves from one of the allotments after depredations started.

Unfortunately, even with the additional effort, depredations continued over a widespread area, impacting three different producers in a two-week timeframe, which appeared to be an escalation of depredation behavior. Based on this assessment, WDFW staff believed depredations were likely to continue. The decision to remove a single wolf, rather than one to two, was to increase the chance that enough adult wolves in the pack remain to care for juvenile wolves.

The lethal removal of a wolf from the Smackout pack territory was not expected to harm the wolf population's ability to reach the statewide or local recovery objective. In previous years, WDFW had documented 12 – 30 mortalities per year and the population had continued to grow and expand its range. The Department's wolf plan also modeled lethal removal to help inform decision makers during this stage of recovery. The analysis in the plan included wolf survival estimates from

northwest Montana, which incorporated a 28% mortality rate. It is important to note that agency lethal control was factored into that 28% mortality estimate. To err on the side of caution (i.e., when in doubt assume greater impact to wolf population so true impact is not underestimated), the scenarios modeled in the wolf plan included an even higher level of lethal control (i.e., removing 30% of population every four years in addition to baseline 28% mortality rate). Based on that modeling analysis, as well as an analysis of higher levels of potential mortality on the actual population level of wolves in the eastern recovery zone and statewide, it was not expected that this action would jeopardize wolf recovery in the eastern recovery zone or statewide.

WDFW discussed the impacts of removing a wolf from the Smackout pack territory and determined the current level of mortality should not negatively impact the ability to recover wolves in Washington.

On Sept. 1, Director Kelly Susewind authorized staff to lethally remove one wolf from the Smackout pack territory in response to repeated depredations of cattle on public and private grazing lands in Stevens and Pend Oreille counties under the guidance of the state's [Wolf Conservation and Management Plan](#) and the lethal removal provisions of the Department's [wolf-livestock interaction protocol](#).

The lethal removal authorization expired when a wolf in the authorization had been removed or after Sept. 15, 2022 (regardless of whether wolves had been removed), whichever came first. The authorization could have been extended or amended to include other wolves in the pack area if additional depredations are documented following the initial authorization or other extenuating circumstances are identified.

WDFW reported on September 12 that staff lethally removed a juvenile male wolf on Sept 8 while conducting lethal removal operations. It was unintentional to remove a wolf pup rather than an adult. Staff who saw the wolf evaluated it and based on their professional opinion thought it was an adult from a distance. Following removal, they saw it was a pup. As stated in the update, although this wolf was in the immediate proximity of and appeared to be traveling with members of the Smackout pack, based on the location of the removal and subsequent discovery of Dirty Shirt wolves in the area, it was not clear whether the wolf was traveling with the Smackout pack or the Dirty Shirt pack. Based on these events, lethal removal operations were suspended.

This type of fieldwork is incredibly challenging. Staff does their best to carry out the objectives, but the nature of this work means there is some risk of removing a wolf that was not the focus of the field operation, as seen in this recent example. It is understandable how upsetting this news can be for engaged communities (as it is for WDFW staff).

On Sept. 26, WDFW confirmed a probable wolf depredation on a calf in the Smackout wolf pack territory in Stevens County. In total, WDFW had documented six wolf depredation events in that wolf pack territory since Aug. 17, 2022. Three different livestock producers were affected, five calves killed, and two injured.

In early September, WDFW authorized lethal removal for the Smackout pack following the initial depredations, which all happened in a very short timeframe. A juvenile wolf, suspected of being from the Dirty Shirt pack, but traveling on the edge of the Smackout pack territory, was removed on Sept. 8, 2022 under that authorization.

Following that lethal removal, WDFW did not document any wolf depredations in the Smackout pack territory between Aug. 31 and Sept. 26.

WDFW staff discussed the Sept. 26 depredation and use of non-lethal measures in this pack territory. Because the Smackout pack was involved in a series of depredations earlier this summer, lethal removal was once again considered. The Department reviewed the situation and Director Kelly Susewind decided not to initiate lethal removal at this time. This decision was based on:

- Despite no wolves having been removed from the Smackout pack, there were no known or documented depredations for 26 days. That contrasts with five mortalities and two injuries confirmed within two weeks during August, and
- While the affected producer was utilizing two or more proactive deterrence measures and responsive deterrence measures at the time of the Sept. 26 depredation, it was determined that additional non-lethal deterrents can be utilized, including increased range riding, the deployment of a radio activated guard (RAG) box, and the installation of foxlights to scare off wolves.

If additional depredations occurred, lethal removal would be considered again. The Department continued to:

- Coordinate with livestock producers, Northeast Washington Wolf Cattle Collaborative (NEWWCC), and Cattle Producers of Washington (CPoW) to continue daily to near daily range riding presence in pastures and allotments with livestock (especially near wolf activity centers) and continue to document range riding activities.
- Work with the producer who experienced the recent depredations to deploy deterrents such as Foxlights and/or a RAG box to help inform the producer and range rider(s) if wolves are in the area and to serve as scare devices for wolves.

On Oct. 3, 2022 WDFW confirmed a wolf depredation on an injured calf found in a private pasture in the Smackout pack territory in Stevens County. Staff identified several injuries on the animal's left hindquarter. The location, type, and severity of the injuries were consistent with those made by wolves during a depredation event. The swelling and infection in the leg suggested severe tissue damage under the hide. WDFW staff conducting the investigation estimated that the depredation occurred four to five days prior to the investigation.

This investigation followed a probable depredation of a deceased calf in the same privately-owned pasture that the Department investigated on Sept. 26, 2022. Based on the proximity of the depredation to other confirmed wolf depredations and physical and site-specific evidence identified at the scene, WDFW staff ruled this as a probable wolf depredation and estimated it to have occurred one to two days prior to the investigation.

The September and October depredations affected a single livestock producer. That producer used several proactive and responsive deterrence measures, that included adding an additional range rider to monitor livestock on leased private pasture, a radio activated guard (RAG) box, Foxlights, regular communication with WDFW staff, producer provided human presence and range riding, removing sick or injured livestock when found, and properly disposing of carcasses. The producer also decided to refrain from ranging cattle on a nearby United States Forest Service (USFS) grazing allotment to reduce the likelihood of wolf-livestock conflict.

Since mid-August, WDFW had documented a total of eight depredations in seven separate depredation events. These documented depredations had affected three different livestock producers, resulting in five dead and three injured livestock attributed to the Smackout pack.

WDFW staff discussed the use of appropriate deterrence measures in this pack territory as a pattern of depredations appeared to have resumed. Staff also discussed how to address this situation most effectively moving forward and provided a recommendation to the Director.

On October 7, 2022, WDFW Director Kelly Susewind authorized the lethal removal of one wolf from the Smackout pack territory in response to repeated depredations of cattle on public and private grazing lands in Stevens and Pend Oreille Counties.

The proactive and responsive non-lethal deterrents used by the three affected livestock producers (described below) in the area this grazing season had not curtailed further depredations, nor did the lethal removal of a wolf from the area in September.

Director Susewind's decision was consistent with the guidance of the state's [Wolf Conservation and Management Plan](#) and the lethal removal provisions of the Department's 2017 [wolf-livestock interaction protocol](#).

Consistent with the guidance of the plan and protocol, the rationale for authorizing lethal removal of Smackout wolves was as follows:

- Since the last update provided on [Oct. 5, 2022](#), WDFW staff investigated an additional injured calf on Oct. 6 in a private pasture confirmed as a wolf depredation event.
- WDFW had documented eight depredation events (three within the last two weeks) affecting three different livestock producers resulting in six dead and three injured calves since August 17, 2022 attributed to the Smackout pack. All events except two were considered confirmed wolf depredation incidents; the other two incidents were considered probable wolf depredations.
- At least two (in this case, more than two) proactive deterrence measures and responsive deterrence measures (if applicable) were implemented by the livestock producers affected by the depredations, including the following:

Producer 1 impacted by depredations utilized multiple range riders to monitor livestock on a daily/near daily basis on the U.S. Forest Service grazing allotment where their livestock graze. The producer also deployed 20 VHF ear tags on adult cows to help locate groups of cattle in the large allotment. Sick or injured livestock were removed from the allotment when found and carcasses were properly disposed of. When depredations started to occur, the producer began camping near the meadows where a large number of livestock congregated and spent several nights a week there. The producer penned their cattle at night and spotlighted them. A Fox light was deployed on Aug. 25 and a Radio-Activated Guard (RAG) box was deployed on Aug. 29. This producer removed several smaller calves from the allotment after depredations started to occur to reduce the likelihood of potential depredations. WDFW staff and range riders had relayed high wolf-use areas to the producer after the first confirmed depredation based on collar data to concentrate resources in those areas.

Producer 2 utilized a range rider and three individuals for human presence to monitor livestock on a daily/near daily basis on the U.S. Forest Service grazing allotment where their livestock graze. The producer also spent time on the allotment to increase human presence. Sick or injured livestock were removed from the allotment when found and carcasses were properly disposed of. The livestock producer delayed turnout until mid- to late July in this allotment and removed several smaller calves from the allotment after depredations started to occur to keep them safe. Fox lights were deployed in areas where livestock congregate and the producer and other individuals increased the time they spent monitoring livestock by camping near the cattle.

Producer 3 utilized a range rider to monitor livestock four days per week on leased private pasture. The livestock producer spent time on the pasture when the range rider was not there per a Cattle Producers of Washington (CPoW) agreement. Sick or injured livestock were removed from the allotment when found and carcasses were properly disposed of. During the winter, the property owner (who runs livestock on this property in the winter) deployed fladry and Fox lights on the pasture to help keep livestock safe early in the year in this location.

WDFW staff discussed the recent depredations by the Smackout pack and associated effectiveness of the nonlethal deterrence tools utilized by the affected producers and range riders in the area. Staff determined that range riding was occurring on a daily/near daily basis, and that the affected livestock producers utilized proper sanitation practices and put forth a concerted effort to keep livestock in the area safe. In addition, one of the producers was utilizing transmitter ear tags to help locate and monitor livestock. Several reactive measures were implemented, including Fox lights, a RAG box, enhanced communication of range riders to ensure good coverage of monitoring livestock near high wolf activity areas, camping near the meadows several nights a week in an affected allotment, and removal of some of the smaller calves from one of the allotments after depredations started. Unfortunately, even with the additional effort, depredations have continued, and WDFW staff believe depredations were likely to continue.

The lethal removal of a wolf from the Smackout pack territory was not expected to harm the wolf population's ability to reach the statewide or local recovery objective. In previous years, WDFW had documented 12 – 30 mortalities per year and the population had continued to grow and expand its range. The Department's wolf plan also modeled lethal removal to help inform decision makers during this stage of recovery. The analysis in the plan included wolf survival estimates from northwest Montana, which incorporated a 28% mortality rate. It was important to note that agency lethal control was factored into that 28% mortality estimate. To err on the side of caution (i.e., when in doubt assume greater impact to wolf population so true impact is not underestimated), the scenarios modeled in the wolf plan included an even higher level of lethal control (i.e., removing 30% of population every four years in addition to baseline 28% mortality rate). Based on that modeling analysis, as well as an analysis of higher levels of potential mortality on the actual population level of wolves in the eastern recovery zone and statewide, staff did not expect this action to jeopardize wolf recovery in the eastern recovery zone or statewide.

WDFW discussed the impacts of removing a wolf from the Smackout pack territory and determined the current level of mortality should not negatively impact the ability to recover wolves in Washington.

The lethal removal authorization expired when a wolf in the authorization had been removed or after Oct. 21, 2022 (regardless of whether wolves have been removed), whichever came first. The authorization could have been extended or amended to include other wolves in the pack area if

additional depredations were documented following the initial authorization or other extenuating circumstances were identified.

WDFW staff investigated another injured calf in the Smackout pack territory on Oct. 8 and confirmed the calf was injured by wolves.

Two Smackout wolves (an adult female and a pup) were found dead in September. WDFW staff believed the adult female was killed by a moose and the pup was killed by a cougar on Sept. 13.

On Oct. 10, WDFW lethally removed a yearling female wolf from the Smackout pack territory. With the removal of one wolf, the lethal removal authorization expired.

WDFW staff investigated another dead calf in the Smackout pack territory on Oct. 12. The calf was confirmed killed by wolves and was estimated to have died prior to the wolf removal on Oct. 10. WDFW had documented ten depredation events affecting three different livestock producers resulting in seven dead and four injured calves since August 17, 2022 attributed to the Smackout pack.

If WDFW documents additional livestock depredations indicating a renewed pattern of depredation, WDFW may have initiated another lethal removal action following the guidelines of the [Wolf Plan](#) and wolf-livestock interaction protocol.

Cost

Total expenditure for the Smackout lethal removal operation in 2022 (staff time, contractor time and aerial support) was \$56,082 allocated from unrestricted Wildlife State Funds.

Details of Smackout pack depredations:

Depredation Date	Depredation Type	Proactive Non-lethals	10 Month Window
8/30/21	Two Probable injuries of calves	Yes	6/30/22
8/17/22	Confirmed mortality of calf	Yes	6/17/23
8/20/22	Confirmed injury of calf	Yes	6/20/23
8/27/22	Probable injury of calf	Yes	6/27/23
8/28/22	Confirmed mortality of calf	Yes	6/28/23
8/31/22	Confirmed mortality of two calves	Yes	6/30/23
9/26/22	Probable mortality of calf	Yes	7/26/23
10/3/22	Confirmed injury of calf	Yes	8/3/23
10/8/22	Confirmed injury of calf	Yes	8/8/23
10/12/22	Confirmed mortality of calf	Yes	8/12/23

Details of the Smackout Pack Lethal Removals and Mortalities:

Date	Wolf	Sex	Age
September 8, 2022	1 (Agency Removal accidently from Dirty Shirt pack)	Male	Juvenile of the year
September 30, 2022	1 (natural cause - killed by moose)	Female	Adult
September 30, 2022	1 (natural cause - killed by cougar)	Unk	Juvenile of the year
October 10, 2022	1 (Agency Removal from Smackout)	Female	Adult

Leadpoint – 2022 Timeline of Events and Lethal Removal Operation Summary

January 2022 - WDFW biologists deployed one additional collar in this pack during aerial count and capture operations.

On Aug. 22, WDFW staff investigated a dead calf in a private pasture in Stevens County. The investigation revealed subcutaneous hemorrhaging on the left rear hindquarter and at the base of the tail. The front right quarter showed severe subcutaneous hemorrhaging with tissue damage extending through to the ribcage. Staff also identified lacerations in both rear hindquarters. Staff classified the incident as a confirmed wolf depredation attributed to the Leadpoint pack. Staff estimated the calf was killed less than 24 hours prior to the investigation. The carcass remains were removed and discarded at an appropriate sanitation facility. Staff also confirmed a second depredation attributed to the Leadpoint pack on Sept. 1.

Affected livestock producers utilized a Cattle Producers of Washington (CPoW) range rider and added a second rider on Sept. 2. Riders and producers aimed to keep cattle in the valley bottom and out of a treed area, and trees and brush were removed in an area wolves like to cross. Sick or injured livestock were removed from the pasture when found and carcasses were properly disposed of. WDFW staff deployed a RAG box and several Fox lights in the area where the two confirmed wolf depredation events occurred.

In September, WDFW staff investigated four wolf depredations in the Leadpoint wolf pack territory, in addition to a depredation confirmed on Aug. 22.

On Sept. 1, WDFW staff investigated a dead calf that had been reported by a range rider in a private pasture in Stevens County. The investigation revealed lacerations and punctures in the right groin and hindquarter and around the hock of the leg with associated subcutaneous hemorrhaging. Staff classified the incident as a confirmed wolf depredation attributed to the Leadpoint pack. It was

estimated the calf was killed less than 24 hours prior to the investigation. WDFW staff removed the carcass and disposed of it at a carcass sanitation pit.

On Sept. 16, WDFW staff investigated a dead cow found by a range rider in a private pasture in Stevens County. The investigation revealed lacerations with associated subcutaneous hemorrhaging on the right flank. Staff classified the incident as a confirmed wolf depredation attributed to the Leadpoint pack and estimated the cow was killed less than 24 hours prior to the investigation. The livestock producer buried the carcass.

On Sept. 19, WDFW staff investigated two injured calves in a private pasture in Stevens County. On the first injured calf, staff identified several lacerations on the left hindquarter and evidence of hemorrhaging through the presence of swelling on the calf's inner right hindquarter. Staff estimated the injuries to be no more than 72 hours old. The producer was treating the calf at their home place and it was expected to make a full recovery.

On the second injured calf, staff discovered large, open puncture wounds and lacerations around the groin, hindquarters, and along both hamstrings. Staff noted swelling in the area around the punctures. These incidents were classified as confirmed wolf depredations attributed to the Leadpoint pack. Staff estimate the injuries were sustained within 24 to 48 hours of the investigation.

WDFW had documented five depredation events resulting in three dead and two injured livestock since Aug. 22 attributed to the Leadpoint pack. WDFW staff were discussing the depredations and use of non-lethal measures in this pack territory. Staff discussed how to most effectively address this situation moving forward and provided a recommendation to the Director.

On Sept. 21, 2022, Washington Department of Fish and Wildlife (WDFW) Director Kelly Susewind authorized lethal removal by WDFW and issued a producer permit for lethal removal of up to two wolves total from the Leadpoint pack territory in response to repeated depredations of cattle on private grazing lands in Stevens County.

The proactive and responsive non-lethal deterrents used by the affected livestock producer (described below) in the area this grazing season had not curtailed further depredations.

Director Susewind's decision is consistent with the guidance of the state's [Wolf Conservation and Management Plan](#) and the lethal removal provisions of the Department's 2017 [wolf-livestock interaction protocol](#).

Consistent with the guidance of the plan and protocol, the rationale for authorizing lethal removal of Leadpoint wolves was as follows:

WDFW had documented five depredation events (five within the last 30 days) resulting in three dead and two injured livestock since Aug. 22, 2022 attributed to the Leadpoint pack. All events were considered confirmed wolf depredation incidents.

At least two (in this case, more than two) proactive deterrence measures and responsive deterrence measures (if applicable) were implemented by the livestock producer affected by the depredations, including the following:

Due to wolf activity in the area in previous years, the affected livestock producer opted not to utilize their U.S. Forest Service (USFS) grazing allotment during the 2022 season, instead choosing to keep livestock in a more defensible location (a private, fenced pasture in a valley bottom). The producer utilized a Cattle Producers of Washington (CPoW) range rider and added a second rider on Sept. 2, 2022. These riders, in conjunction with the producer and family, maintained daily/near daily presence in the area where affected cattle grazed. Riders and producers aimed to keep cattle in the valley bottom and out of a treed area, and trees and brush were removed in an area wolves like to cross. Sick or injured livestock were removed from the pasture when found and carcasses were properly disposed of. WDFW staff deployed a radio-activated guard (RAG) box and several Fox lights in the area where the depredation events occurred.

The Department documented these deterrents in the agency's "wolf-livestock mitigation measures" checklist, with date entries for deterrent tools and coordination with the producers and range riders. The proactive and reactive non-lethal deterrence measures implemented by these livestock producers were those best suited for their operations in the professional judgment of WDFW staff.

WDFW staff discussed the recent depredations by the Leadpoint pack and associated effectiveness of the nonlethal deterrence tools utilized by the affected producer and range riders in the area. Staff determined that range riding/human presence was occurring on a daily/near daily basis, and that the affected livestock producer utilized proper sanitation practices and put forth a concerted effort to keep livestock in the area safe. Several reactive measures were implemented, including Fox lights, a RAG box, and the addition of a second range rider following the second depredation. Unfortunately, even with the additional effort, depredations have escalated in a short timeframe in a localized area. Based on this assessment, WDFW staff believed depredations were likely to continue.

The lethal removal of a wolf from the Leadpoint pack territory was not expected to harm the wolf population's ability to reach the statewide or local recovery objective. In previous years, WDFW had documented 12 – 30 mortalities per year and the population had continued to grow and expand its range. The Department's wolf plan also modeled lethal removal to help inform decision makers during this stage of recovery. The analysis in the plan included wolf survival estimates from northwest Montana, which incorporated a 28% mortality rate. It was important to note that agency lethal control was factored into that 28% mortality estimate. To err on the side of caution (i.e., when in doubt assume greater impact to wolf population so true impact was not underestimated), the scenarios modeled in the wolf plan included an even higher level of lethal control (i.e., removing 30% of population every four years in addition to baseline 28% mortality rate). Based on that modeling analysis, as well as an analysis of higher levels of potential mortality on the actual population level of wolves in the eastern recovery zone and statewide, staff did not expect this action to jeopardize wolf recovery in the eastern recovery zone or statewide.

WDFW discussed the impacts of removing a wolf from the Leadpoint pack territory and determined the current level of mortality should not negatively impact the ability to recover wolves in Washington.

The lethal removal authorization for WDFW expired when a wolf or wolves in the authorization had been removed or after Oct. 5, 2022 (regardless of whether wolves have been removed), whichever came first.

The lethal removal permit expires 30 days from the date of receipt by the producer, or when the wolf in the permit has been removed (regardless of whether a wolf or wolves have been removed), whichever came first.

The authorization and/or permit could have been extended or amended to include other wolves in the pack area if additional depredations were documented following the initial authorization or other extenuating circumstances are identified.

On Sept. 21, 2022, WDFW Director Kelly Susewind authorized lethal removal by WDFW and by producer permit for up to two wolves total from the Leadpoint pack territory. The authorization was in response to repeated depredations of cattle on private grazing lands in Stevens County and is consistent with the guidance of the state's [Wolf Conservation and Management Plan](#) and the lethal removal provisions of the department's [wolf-livestock interaction protocol](#).

On Sept. 27, WDFW lethally removed an adult male wolf from the Leadpoint pack territory. On Sept. 28, WDFW lethally removed an adult female wolf from the Leadpoint pack territory. With the removal of two wolves, the lethal removal authorization and lethal removal permit expired.

On Sept. 30, WDFW staff investigated injuries to a cow and calf pair in a private pasture in Stevens County. Bite marks and lacerations consistent with those made by wolf dentition were identified on the right hindquarter of both the cow and calf. The calf's leg was swollen from severe tissue damage and displayed signs of infection. WDFW determined that both cow and calf had been attacked by Leadpoint pack wolves in one depredation event. A veterinarian specializing in large animals was consulted and estimated that the depredation event likely occurred 24 to 48 hours prior to the investigation. That was during, but toward the end of, a lethal removal action for wolves in that pack. Although the calf was treated, it died later from the injuries sustained.

This latest investigation makes a total of six depredation events resulting in four dead and three injured livestock and could indicate a continuing pattern of depredation. WDFW could potentially initiate another lethal removal action following the guidelines of the [Wolf Plan](#) and wolf-livestock interaction protocol. Staff discussed the depredations and use of non-lethal measures in this pack territory and how to address this situation most effectively moving forward. A recommendation was provided to the Director.

WDFW staff investigated an additional dead cow on Oct. 7. This cow is owned by a different producer (Producer 2) than the previous 2022 depredations. This cow was in an approximately 300-acre fully fenced pasture that shares a fence line with the private pasture where all other 2022 depredations had occurred and was within a half mile of those depredations. After performing a depredation investigation, WDFW staff determined the cow was confirmed to have been killed by wolves. The carcass was fresh upon examination, and the cow was thought to have died within 24 hours of the investigation. Following the investigation, the cow was removed from the property and disposed of at a carcass sanitation pit.

WDFW has documented seven depredation events (five within the last 30 days) resulting in five dead and three injured livestock since August 22, 2022 attributed to the Leadpoint pack. All events were considered confirmed wolf depredation incidents.

On Oct. 9, 2022, Washington Department of Fish and Wildlife (WDFW) Director Kelly Susewind authorized the lethal removal of one wolf from the Leadpoint pack territory in response to repeated depredations of cattle on private grazing lands in Stevens County.

The proactive and responsive non-lethal deterrents used by the two affected livestock producers (described below) in the area this grazing season have not curtailed further depredations.

Director Susewind's decision was consistent with the guidance of the state's [Wolf Conservation and Management Plan](#) and the lethal removal provisions of the Department's 2017 [wolf-livestock interaction protocol](#).

Consistent with the guidance of the plan and protocol, the rationale for authorizing lethal removal of Leadpoint wolves was as follows:

At least two (in this case, more than two) proactive deterrence measures and responsive deterrence measures (if applicable) were implemented by the livestock producer affected by the depredations, including the following:

Producer 1: Due to wolf activity in the area in previous years, the affected livestock producer opted not to utilize their U.S. Forest Service (USFS) grazing allotment during the 2022 season, instead choosing to keep livestock in a more defensible location (a private, fenced pasture in a valley bottom). The producer utilizes a Cattle Producers of Washington (CPoW) range rider and added a second rider on Sept. 2, 2022. These riders, in conjunction with the producer and family, have maintained daily/near daily presence in the area where affected cattle graze. Riders and producers aimed to keep cattle in the valley bottom and out of a treed area, and trees and brush were removed in an area wolves like to cross. Sick or injured livestock were removed from the pasture when found and carcasses were properly disposed of. WDFW staff deployed a radio-activated guard (RAG) box and several Foxlights in the area where the depredation events occurred.

Producer 2: Producer 2's pasture is in very close proximity to the private pasture where other depredations have occurred. Directly adjacent, and within 300 yards of the dead cow, there was an occupied residence with consistent human presence. Non-lethal deterrence measures in place prior to the depredation included range riding provided by CPoW (two riders checking on the pasture), and human presence by Producer 2 and from several nearby occupied residences. Range rider logs indicated daily to near daily range riding.

The pastures between the two operations that experienced depredations were adjacent to one another sharing the same road systems and access points. Therefore, the same range riders had been monitoring both operations within the valley and where depredations occurred. The range riding emphasis was on Producer 1's livestock because they are a cow/calf operation and calves were more vulnerable. Producer 2's operation was a herd of larger yearling livestock. They were regularly checked on as the operators traveled through to check Producer 1's livestock. In addition to range riding and human presence, Producer 2 calves outside of areas occupied by wolves, the producer removes sick and injured cattle (if discovered), cattle carcasses were removed or buried in accordance with carcass sanitation practices, and all of the cattle in the pasture where the carcass was found were at least 600 pounds or larger.

The Department documented these deterrents in the agency's "wolf-livestock mitigation measures" checklist, with date entries for deterrent tools and coordination with the producers and range

riders. The proactive and reactive non-lethal deterrence measures implemented by these livestock producers were those best suited for their operations in the professional judgment of WDFW staff.

WDFW staff discussed the recent depredations by the Leadpoint pack and associated effectiveness of the nonlethal deterrence tools utilized by the affected producers and range riders in the area. The Leadpoint pack had demonstrated a pattern of depredating on cattle despite the use of nonlethal tools including range riding, human presence, a RAG box, and Fox lights. They also continued to depredate on cattle despite a lethal removal action that removed two wolves from the pack. Before Oct. 7, depredations were limited to one producer's private pasture, but the pack had since depredated on a neighboring pasture despite range riding activity and a high level of human presence. Based on this assessment, WDFW staff believed depredations were likely to continue.

The lethal removal of a wolf from the Leadpoint pack territory was not expected to harm the wolf population's ability to reach the statewide or local recovery objective. WDFW staff discussed how removing one additional wolf from the Leadpoint pack might affect recovery of the wolf population in Washington. Staff did not believe that the removal of one wolf at this time would pose a risk to recovery. WDFW had documented 20 wolf mortalities to date in 2022, representing roughly 10% of the 2021 annual minimum statewide count. These mortalities currently do not include any tribal harvest that may have occurred on tribal lands this calendar year. If tribal harvest was consistent with previous years and one wolf was removed from the Leadpoint pack, total statewide mortality rates may approach 20.8%. This was within the annual mortality rates (range 19-28%) documented in Idaho and Montana during wolf recovery and population growth, and with these mortality rates, both states reached recovery objectives. Due to recent continued depredation within the Smackout pack territory, the Director authorized lethal removal of one wolf from the Smackout pack. If a wolf was removed from both the Smackout and Leadpoint packs, the mortality rate would be 21.4%.

The Department's wolf plan also modeled lethal removal to help inform decision makers during this stage of recovery. The analysis in the plan included wolf survival estimates from northwest Montana, which incorporated a 28% mortality rate. It was important to note that agency lethal control was factored into that 28% mortality estimate. To err on the side of caution (i.e., when in doubt assume greater impact to wolf population so true impact is not underestimated), the scenarios modeled in the wolf plan included an even higher level of lethal control (i.e., removing 30% of population every four years in addition to baseline 28% mortality rate). Based on that modeling analysis, as well as an analysis of higher levels of potential mortality on the actual population level of wolves in the eastern recovery zone and statewide, staff did not expect this action to jeopardize wolf recovery in the eastern recovery zone or statewide.

WDFW discussed the impacts of removing a wolf from the Leadpoint pack territory and determined the current level of mortality should not negatively impact the ability to recover wolves in Washington.

The lethal removal authorization expired when a wolf in the authorization had been removed or after Oct. 23, 2022 (regardless of whether wolves have been removed), whichever came first. The authorization could have been extended or amended to include other wolves in the pack area if additional depredations were documented following the initial authorization or other extenuating circumstances were identified.

On October 13, WDFW released an update that staff had not removed any Leadpoint wolves since the authorization. WDFW previously reported that Producer 2 (one of the two livestock producers affected by livestock depredation attributed to the Leadpoint pack) removes or buries cattle carcasses in accordance with proper carcass sanitation practices. However, following the authorization, WDFW staff found previously undiscovered livestock carcasses that had not been properly disposed of in Producer 2's affected pasture. WDFW staff worked to gather additional information from the livestock producer and range riders.

Since the discovery of the carcasses, there had been no active lethal removal attempts in the Leadpoint pack territory, and Director Susewind rescinded the lethal removal authorization on Oct. 12, 2022.

A wolf from the Leadpoint pack was found dead in November. The incident is under investigation by WDFW enforcement.

Cost:

Total expenditure for the Leadpoint lethal removal operation in 2022 (staff time, contractor time and aerial support) was \$10,705 allocated from unrestricted Wildlife State Funds.

Details of Leadpoint pack depredations:

Depredation Date	Depredation Type	Proactive Non-lethals	10 Month Window
8/22/22	Confirmed mortality of calf	Yes	6/22/23
9/1/22	Confirmed mortality of calf	Yes	7/1/23
9/16/22	Confirmed mortality of cow	Yes	7/16/23
9/19/22	Confirmed injury of calf	Yes	7/19/23
9/19/22	Confirmed injury of calf	Yes	7/19/23
9/30/22	Confirmed injury of cow and calf (calf died from injuries)	Yes	7/30/23
10/7/22	Confirmed mortality of cow	No	8/7/23

Details of the Leadpoint Pack Lethal Removals and Mortalities:

Date	Wolf	Sex	Age
September 27, 2022	1 (Agency Removal)	Male	Adult
September 28, 2022	1 (Agency Removal)	Female	Yearling
November 12, 2022	1 (Unlawful Take - under investigation)	Male	Adult