

Washington Gray Wolf Conservation and Management 2021 Annual Report

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



Photo: Sarah Bassing, University of Washington

This report presents information on the status, distribution, and management of wolves in the State of Washington from Jan. 1, 2021 through Dec. 31, 2021.

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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 every year, to a minimum of 206 wolves reported in 2021. Most packs range across public and private land in Ferry, Stevens, and Pend Oreille counties in the northeast corner of the state and southeast Washington, but increasing numbers are present in the north-central and central WA region.

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, and 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 2021

Key developments in 2021 included:

- The state's minimum year-end wolf population increased by 16 percent and marks the 13th consecutive year of population growth. As of Dec. 31, 2021, WDFW and Tribes counted 206 wolves in 33 packs in Washington State. Nineteen of these were successful breeding pairs.

These numbers compare with the previous year's count of 178 wolves in 29 packs and 16 breeding pairs. Because this is a minimum count, the total number of wolves in Washington is likely higher.

- The previous two years (2019 and 2020), Confederated Tribes of the Colville Reservation (CTCR) had not allocated the resources toward counting wolves on their lands nor were they utilizing the same methods as WDFW and other tribal partners. However, this past year and during winter the CTCR allocated resources to monitor wolves the same way as WDFW and other tribal partners. Therefore the numbers are merged back together for this year's annual wolf report as they had been in previous years.
- Pack sizes (number of individuals) ranged from two to ten wolves. Most packs contained three to six individuals.
- As in past years, survey results represent minimum counts of wolves in the state due to the difficulty of accounting for every animal – especially lone wolves without a pack.
- Since the first WDFW survey in 2008, the state's wolf population has grown by an average of 25 percent per year.
- State, federal, and tribal biologists captured 17 wolves from 12 different packs and monitored a total of 29 unique radio-collared wolves from 20 different packs in 2021.
- Four new packs formed in 2021 including the Columbia Pack in Columbia County, the Keller Ridge Pack in Ferry County, the Dominion Pack in Stevens County, and the Shady Pass Pack in Chelan County.
- Five wolves were known to have dispersed from their natal packs in 2021 including one wolf that dispersed from the Naneum pack and crossed Interstate 90 headed south and is currently moving around in South Cascades and Northwest Coast recovery region.
- The Naneum Pack was not located during the winter survey effort and the two collared individuals dispersed from that pack in November.
- Each year's population total reflects population losses and population gains. WDFW documented 30 wolf mortalities during 2021 (Table 1), including two lethally removed in response to wolf-livestock conflict, 22 legally harvested by tribal hunters, four killed by vehicles, and two mortalities 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 confirmed five cattle were killed by wolves during the year. Another eight cattle were confirmed injured by wolves. Additionally, two calf mortalities and six calf injuries were considered probable depredations by wolves after investigation. Six packs (18% of known packs) were involved in at least one confirmed livestock depredation. Seventy-six percent of the known packs were not involved in any known livestock depredation (including probable depredations).

- During calendar year 2021, WDFW spent a total of \$1,421,393 on wolf management activities, including \$111,649 in reimbursement to 30 livestock producers for Damage Prevention Cooperative Agreements – Livestock (DPCA-L) non-lethal conflict prevention expenses (range riding, specialized lighting and fencing, etc.), \$205,969 for 23 contracted range riders, \$20,866 to four claims for livestock losses caused by wolves, \$19,957 for lethal removal operations in response to depredations on livestock, and \$1,062,952 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 2021 include WDFW Director Kelly Susewind, Wildlife Program Director Eric Gardner, Deputy Assistant Director of Wildlife Mick Cope, Game Division Manager Anis Aoude, Carnivore Section Manager Stephanie Simek, Statewide Wolf Specialist Benjamin Maletzke, Wolf Biologist Trent Roussin, Wolf Biologist Gabriel Spence, Conflict Section Manager Dan Brinson (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, 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, Danyl Klump, Matt Konkle, Tyler Bahrenburg, Tony Leonetti, Mike Livingston, Brendan Oates, Carlo Pace, Corey Peterson, Courtney Nasset, Brent Scherzinger, Carrie Lowe, Kristin Mansfield, Joey McCanna, Troy McCormick, Scott McCorquodale, Matt Monda, William Moore, Paul Mosman, Bryan Murphie, Jerry Nelson (ret), Eric Oswald (ret), 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 Wetzell, Marcus Leuck, Kyla West, Paul Whelan, 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 Billy Joe Kieffer 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, and Jeff Wolf; 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; Dan Thornton and Travis King from Washington State

University; Sarah Bassing, Lauren Satterfield, Taylor Ganz, Beth Gardner, Aaron Wirsing and Sarah Converse from the University of Washington; and TJ Gooliaf and Luke Vander Vennen of British Columbia Ministry of Forests, Lands, and Natural Resource Operations.

We also sincerely appreciate the safe piloting and aerial telemetry skills of Dave Parker of Northern Air (Bonners Ferry, ID), Brian Elfers of Inter-State Aviation (Pullman, WA), 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 2021. 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, and were relisted again in the western two-thirds of the state in February 2022.

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

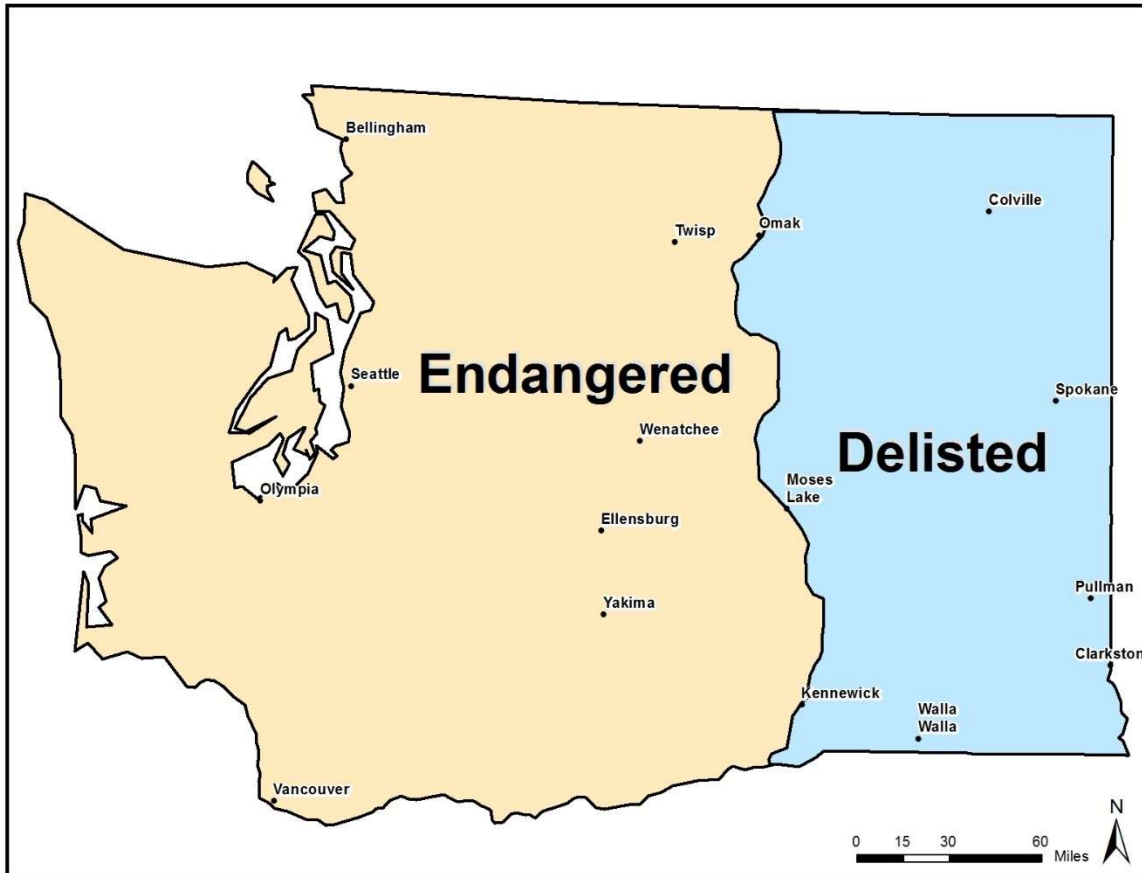


Figure 1. Federal classification of wolves in Washington State from 2011-2021. Wolves were federally delisted in Washington in 2021 but relisted again in the Western 2/3 of Washington in February 2022.

In 2013, the USFWS issued a proposed rule (Federal Register, Vol 78, No. 114) 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 the gray wolf in the United States and Mexico relied in part on these two subsequently vacated final rules, in 2015 the USFWS only finalized the portion of the rule listing the Mexican wolf as an endangered subspecies.

On March 15, 2019, the USFWS published a proposed rule (Federal Register, Vol 84, No. 51) to remove the gray wolf from the List of Endangered and Threatened Wildlife. The USFWS proposed this action because the best available scientific and commercial information 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 in 2021. 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, WDFW initiated development of a state [Wolf Conservation and Management Plan](#) for Washington (Plan). Assisted by an 18-member working group comprised of stakeholders, the WDFW plan was adopted in December 2011 by the state Fish and Wildlife Commission (Commission).

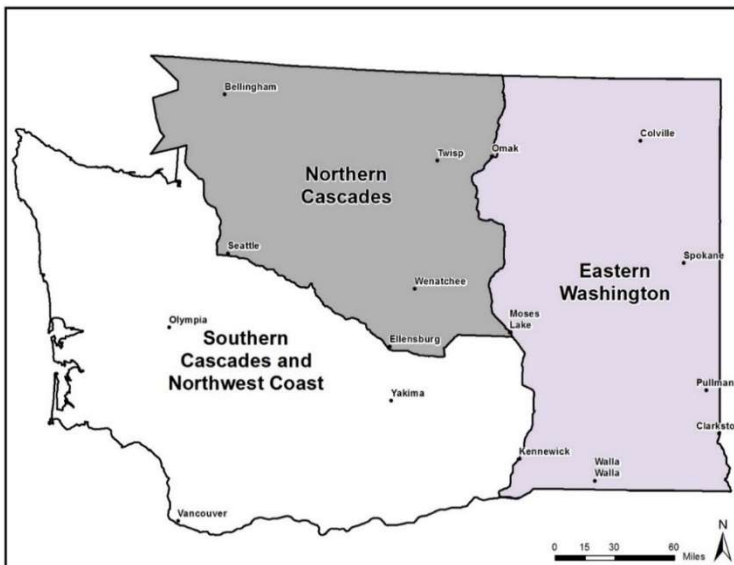


Figure 2. Washington wolf recovery regions as defined in the 2011 Wolf Conservation and Management Plan.

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 2021, WDFW spent a total of \$1,421,393 on wolf management activities, including \$111,649 in reimbursement to 30 livestock producers for Damage Prevention Cooperative Agreements – Livestock (DPCA-L) non-lethal conflict prevention expenses (range riding, specialized lighting and fencing, etc.), \$205,969 for 16 WDFW contracted range riders and a portion of DPCAL's used for range riding, \$20,866 to three direct and one indirect claim for livestock losses caused by wolves, \$19,957 for lethal removal operations in response to depredations on livestock, and \$1,062,952 for wolf management and research activities.

Funds came from additional fees for personalized license plates (58%), endangered species license plates (4%), state general fund apportionments (28%), federal contracts (5%), unrestricted state wildlife funds (5%), and wolf livestock conflict funds (<1%).

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. The minimum count is a census of the known population of wolves to exist in Washington as of December 31st of the year of the annual report.

Population Status and Distribution

The state's minimum year-end wolf population increased for the 13th consecutive year. As of December 31, 2021, WDFW and Tribal partners counted 206 wolves and 33 packs. Nineteen of these were considered successful breeding pairs in 2021. These numbers compare with 178 wolves in 29 packs, and 16 breeding pairs one year earlier. Because these are minimum counts, the total number of wolves in Washington is likely higher.

Compared to 2020, the number of individual wolves (Fig. 3) increased by 28 (16%) and the number of packs (Table 1, Fig. 4) increased by four (14%). Additionally, nineteen packs were confirmed to be successful breeding pairs as of the end of 2021; an increase of 19% (Table 1, Fig. 5). Pack size ranged from two to ten individuals and averaged 5.3 wolves per pack ($SD \pm 2.5, n=33$).

The Eastern recovery region exceeded the minimum recovery goals (four successful breeding pairs for three consecutive years) set for the individual region by the Plan because it has had greater than four breeding pairs for greater than three consecutive years. During 2021, the North Cascades recovery region had six packs, four of which were considered successful breeding pairs. This region would need to maintain four successful breeding pairs for one more consecutive year to meet recovery objectives.

Although WDFW has documented individual wolves in the Southern Cascades and Northwest Coast recovery region, WDFW has not documented any resident packs in this region. WDFW is currently monitoring a wolf that dispersed from the Naneum pack territory and has moved south into the Southern Cascades, however it has not localized in any area thus far.

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 2021 population survey include the following:

- A new pack, Dominion, was confirmed in Stevens County between the Smackout and Dirty Shirt packs.
- A new pack, Shady Pass, was confirmed in Chelan County located south of Lake Chelan.
- A new pack, Columbia, was confirmed in Columbia County north of the Touchet pack.
- A new pack, Keller Ridge, was confirmed on CTCR lands. The general territory is south of Cache Creek Road, west of Highway 21, and east of Buffalo and Owhi Lakes.
- A new pack, Sherman, reestablished in Ferry County south of the Togo pack.
- The Togo pack expanded its territory to include most of the territory previously occupied by the Kettle pack.

- The two collared members that made up the Naneum pack both dispersed, with one crossing the Columbia Basin toward the northeast to join the Stranger pack and the other moving south of I-90 into the Southern Cascades of Washington. No other wolves were located during winter surveys in the Naneum pack territory.
- WDFW winter surveys indicated only a single wolf maintaining a territory in the former Diobsud Creek pack; thus, no pack was confirmed in 2021.

Wolves continue to inhabit both public and private lands (Fig. 6), and 20 of the state’s 33 packs (including CTCR packs) had at least one collared wolf during 2021. Data from these wolves were used to assist WDFW in defining pack territories. The average (mean) territory size was 193 square miles (500 square kilometers), ranging from an estimated 21 to 434 square miles (57 – 1125 square kilometers).

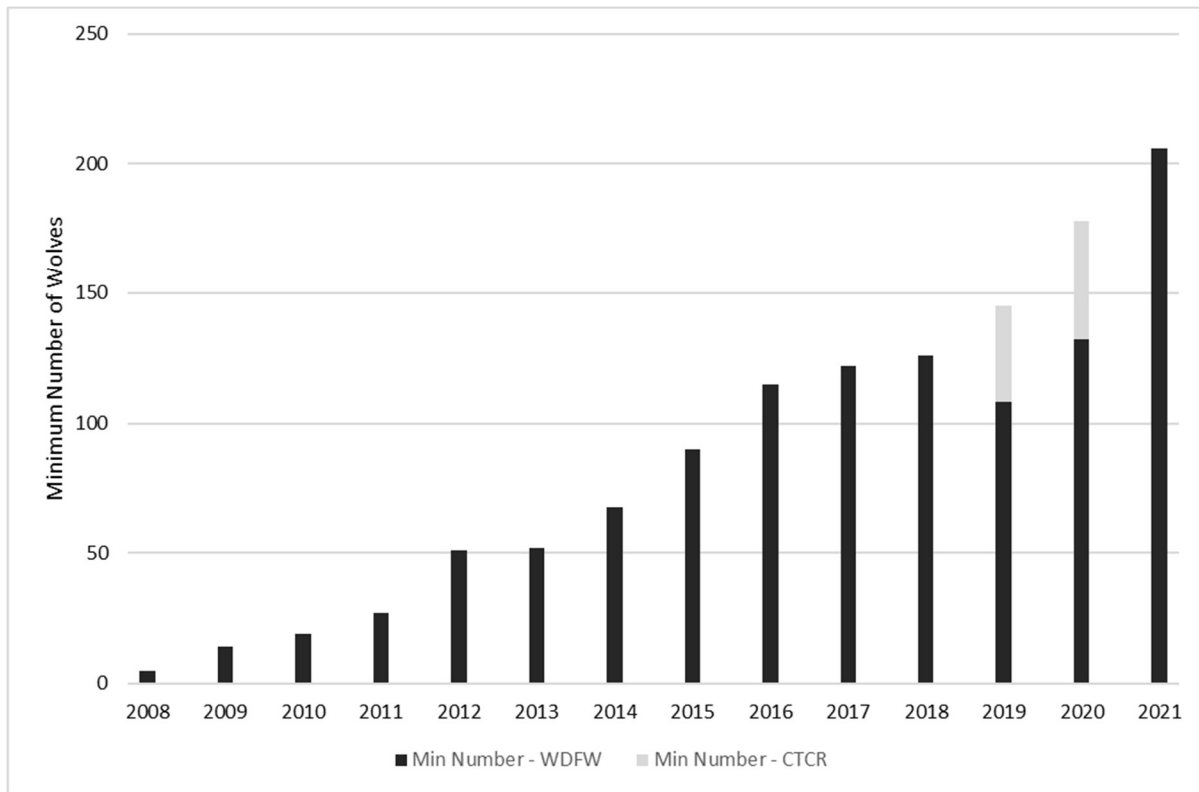


Figure 3. Minimum known number of wolves in Washington managed by Washington Department of Fish and Wildlife (WDFW), the Spokane Tribe, and the Confederated Tribes of the Colville Reservation (CTCR), 2008 – 2021. Numbers provided by CTCR in 2019 and 2020 reflect winter numbers incidentally gathered by 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.

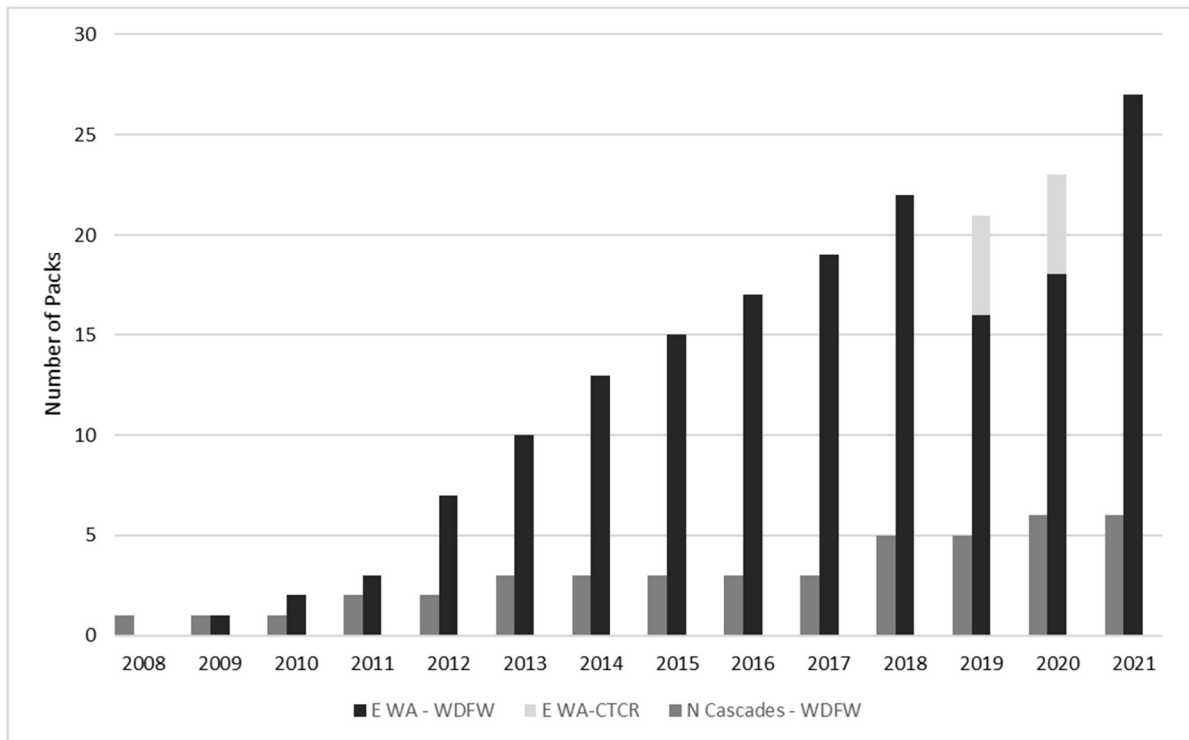


Figure 4. Minimum known number of wolf packs by recovery region in Washington, 2008 – 2021. Wolf packs counted by Washington Department of Fish and Wildlife (WDFW), the Spokane Tribe, and Confederated Tribes of the Colville Reservation (CTCR). CTCR packs were monitored differently during 2019 and 2020. There are no known packs confirmed in the Southern Cascades and Northwest Coast recovery region.

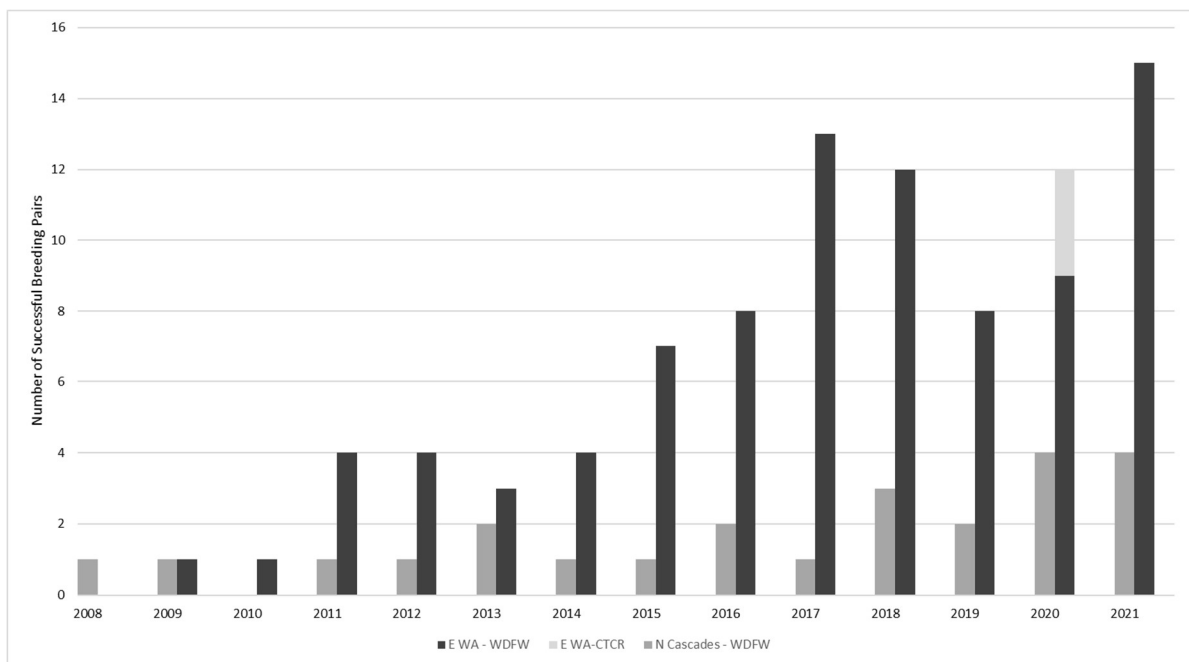


Figure 5. Minimum known number of successful breeding pairs by recovery region in Washington, 2008 – 2021. Confederated Tribes of the Colville Reservation (CTCR) did not count successful breeding pairs in 2019. There are no known packs in the Southern Cascades and Northwest Coast recovery region.

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 2021. Underlined and italicized packs were counted as successful breeding pairs. CTCR = Confederated Tribes of the Colville Reservation. Harvest numbers were documented by CTCR and Spokane Tribe biologists.

Wolf Pack	Recovery	Minimum Known Pack Size Dec 2021	Documented Mortalities				Known		
	Area		Natural	Human	Unknown	Harvest	Control	Dispersed	Missing
<u>Beaver Creek</u>	E. Wash	5							
Butte Creek	E. Wash	6							
<u>Carpenter Ridge</u>	E. Wash	4							
<u>Columbia</u>	E. Wash	5		2			2		
<u>Dirty Shirt</u>	E. Wash	5							
<u>Frosty Meadows (CTCR)</u>	E. Wash	7							
<u>Grouse Flats</u>	E. Wash	4						1	
<u>Goodman Meadows</u>	E. Wash	6							
<u>Huckleberry</u>	E. Wash	4		1		8		1	
<u>Keller Ridge (CTCR)</u>	E. Wash	3							
<u>Leadpoint</u>	E. Wash	10							
<u>Nason Basin (CTCR)</u>	E. Wash	3				9			
<u>Nc'icn (CTCR)</u>	E. Wash	10				1			
<u>Dominion</u>	E. Wash	2							
<u>Onion Creek</u>	E. Wash	6							
<u>Salmo</u>	E. Wash	3							
<u>Sherman</u>	E. Wash	4							
<u>Skookum</u>	E. Wash	3							
<u>Smackout</u>	E. Wash	6		1					
<u>Stranger</u>	E. Wash	4							
<u>Strawberry (CTCR)</u>	E. Wash	9				2			
<u>Togo</u>	E. Wash	7						1	
<u>Touchet</u>	E. Wash	5							
<u>Tucannon</u>	E. Wash	8							
<u>Vulcan</u>	E. Wash	2							
<u>Wedge</u>	E. Wash	9		1					
<u>Whitestone (CTCR)</u>	E. Wash	5				2			
<u>Diobsud Creek</u>	N Cascades	1							
<u>Shady Pass</u>	N Cascades	4							
<u>Lookout</u>	N Cascades	10							
<u>Loup Loup</u>	N Cascades	7							
<u>Navarre</u>	N Cascades	5							
<u>Naneum</u>	N Cascades	0						2	
<u>Sullivan Creek</u>	N Cascades	6							
<u>Teanaway</u>	N Cascades	4							
Known Disperser	S Cascades	1							
Misc/Lone Wolves	Statewide	23		1					
WASHINGTON TOTALS		206	0	6	0	22	2	5	0

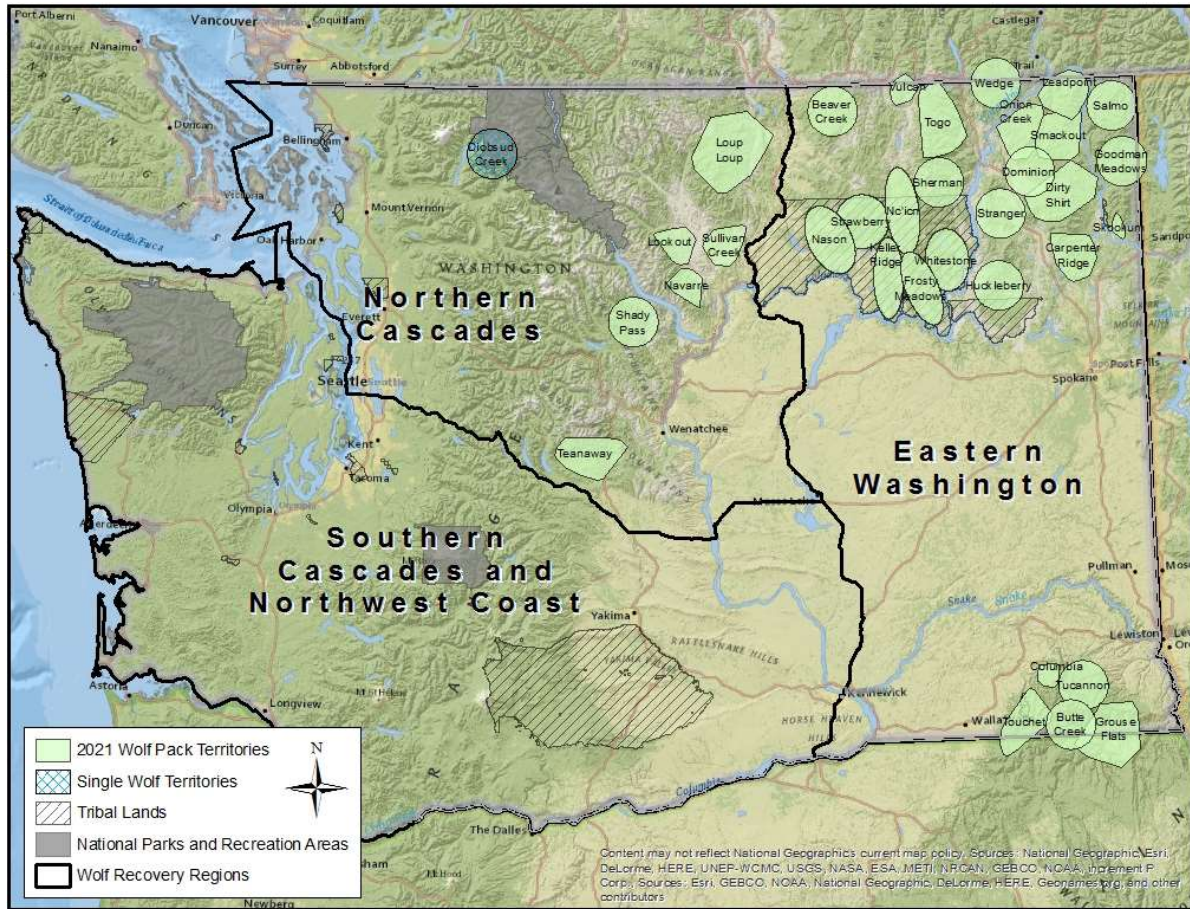


Figure 6. Known wolf packs and single wolf territories in Washington, 2021, not including unconfirmed or suspected packs or border packs from other states and provinces.

Wolf Captures and Monitoring

State, federal, and tribal biologists captured 17 wolves from 12 different packs in 2021. Eleven (11) adults, four yearling and two-three-month-old pups were captured including nine males and eight females. None 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. The two pups were too small to support a collar so they were released without collars.

Twenty-nine radio-collared wolves were monitored from 20 different packs representing 60% of the known packs in Washington. However, due to mortalities, dispersals, scheduled collar releases, and radio collar failures, 27 radio-collared wolves (twenty-four GPS, three VHF collars) from 19 packs were being monitored at the end of the year. This accounts for approximately 13% of the minimum known population from 19 different packs (58% 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. Five wolves were known to disperse from their pack territories in 2021 (Table 1, Fig. 7).

- 1.) WA90M was collared in the Grouse Flats pack in May 2019. In January of 2021, 90M dispersed at least 890 miles before a scheduled collar drop-off in May 2021. His last known location was in South Central Oregon.
- 2.) WA102M was collared in the Teanaway Pack in February 2020. He dispersed to the Naneum Pack territory in March 2020. In November of 2021 He dispersed again, traveling over 190 miles in 14 days before joining the Stranger pack in Northeast Washington.
- 3.) WA109M was collared in the Naneum pack in February 2021. In November of 2021 he left the Naneum territory and had dispersed over 327 miles and was continuing to disperse through the Southern Cascades and Northwest Coast Recovery area as of the end of the 2021 calendar year.
- 4.) WA116M was collared in the Togo Pack in May 2021. Shortly after capture, he dispersed into British Columbia, Canada, travelling over 115 miles before settling down and occupying a territory East of Vernon BC.
- 5.) WA95F was collared in the Huckleberry pack in June of 2019. In January 2021 she dispersed from the pack before being killed by a vehicle west of Spokane, WA in February 2021.

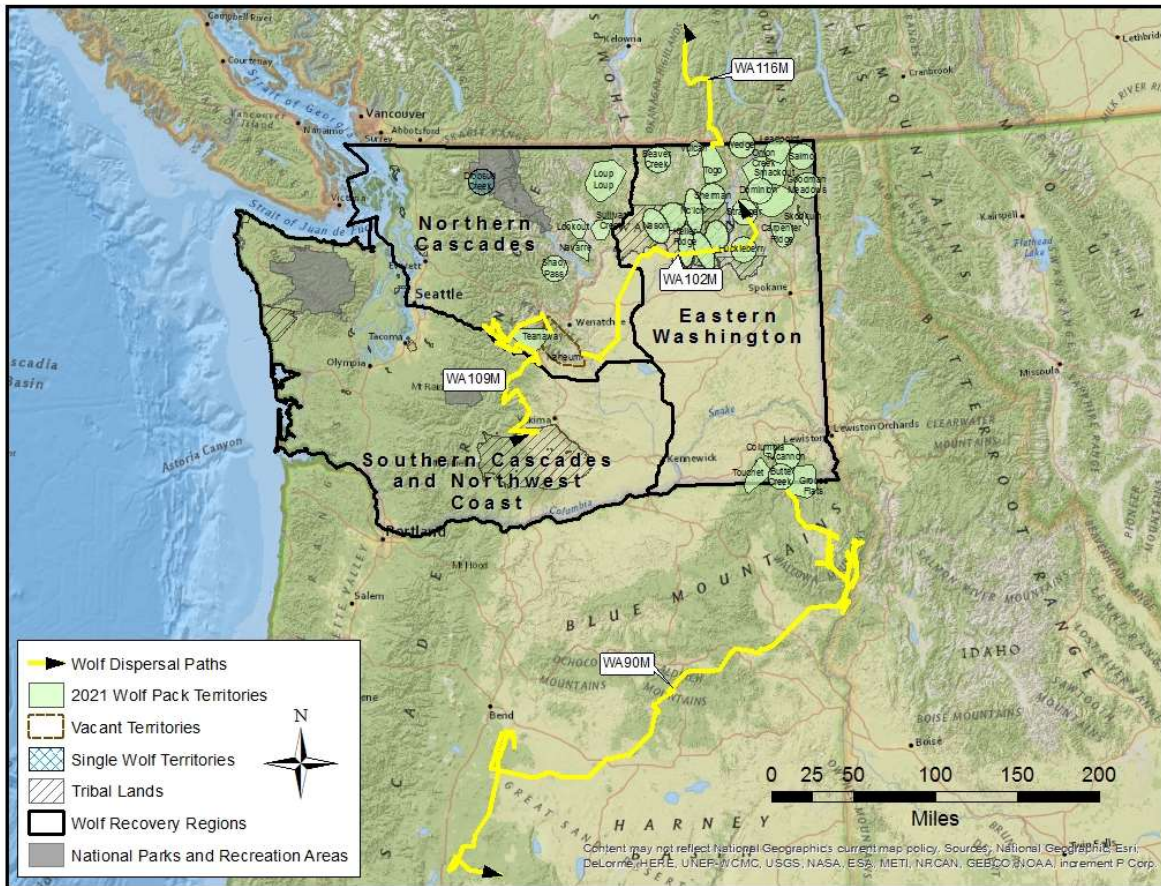


Figure 7. Generalized dispersal paths for four GPS collared wolves that dispersed from known wolf packs in Washington in 2021. No data was available for the movements of the wolf that dispersed from Huckleberry pack and was killed by a vehicle strike.

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 zone. 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 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 2019-2021, 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 November 1 – February 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 14 wolves in 2021, 25% of the minimum known number. The CTCR Wolf Management Plan identifies a preferred harvest target of 24% for a recovered population. This was the first year the CTCR met this harvest target. All 14 of the wolves were harvested on the South Half and no 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 October 1 – February 28. The Spokane Tribe of Indians reported eight wolves harvested on the reservation.

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

Mortalities

WDFW documented 30 wolf mortalities during 2021 (Table 1), including two removed by the Department on permits issued in response to wolf-livestock conflict, 22 legally harvested by tribal hunters, four killed by a vehicle, and two mortalities still under investigation.

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 and Protocol.

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 2021, investigators confirmed that wolves were responsible for five cattle deaths (Fig. 8) and injuries to eight cattle (Table 2). Additionally, two calf mortalities and six injured calves were considered probable wolf-caused depredations. Most mortalities occurred during the summer-fall grazing season from July through Sept (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

Six of the 33 (18%) known packs that existed in Washington at some point during 2021 were involved in at least one confirmed livestock mortality or injury (Fig. 10). Five cattle were confirmed and two were probably killed by wolves, eight cattle were confirmed and six were probably injured by wolves in 2021 by eight packs. Six of the eight packs associated with livestock depredations were involved in two or less events each. Seventy-six percent of Washington's wolf packs were not involved in any known livestock depredations.

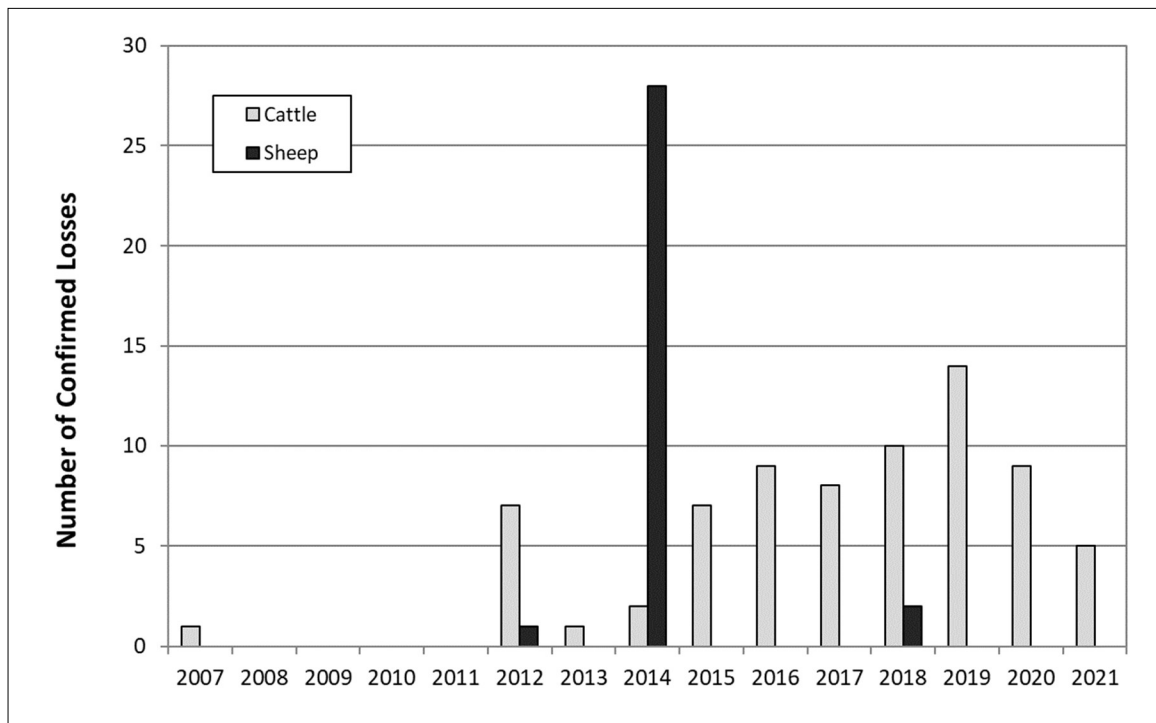


Figure 8. Total number of confirmed wolf-caused livestock mortalities in Washington, 2007-2021.

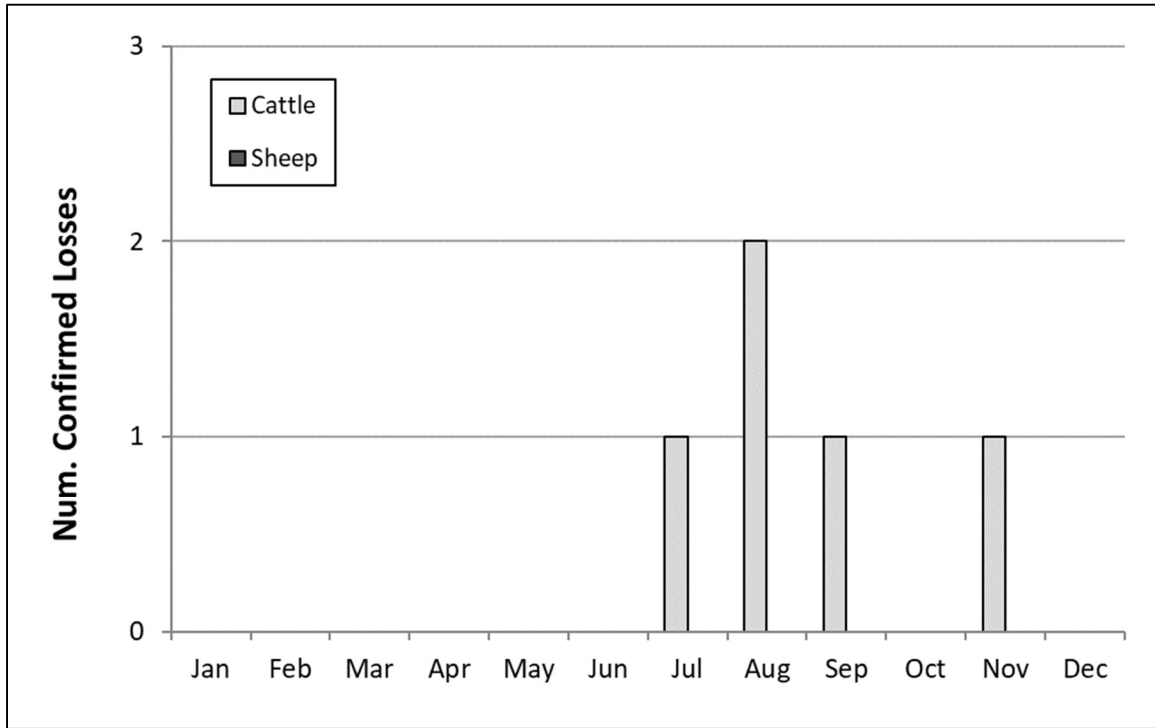


Figure 9. Number of confirmed wolf-caused livestock mortalities by month in Washington, 2021.

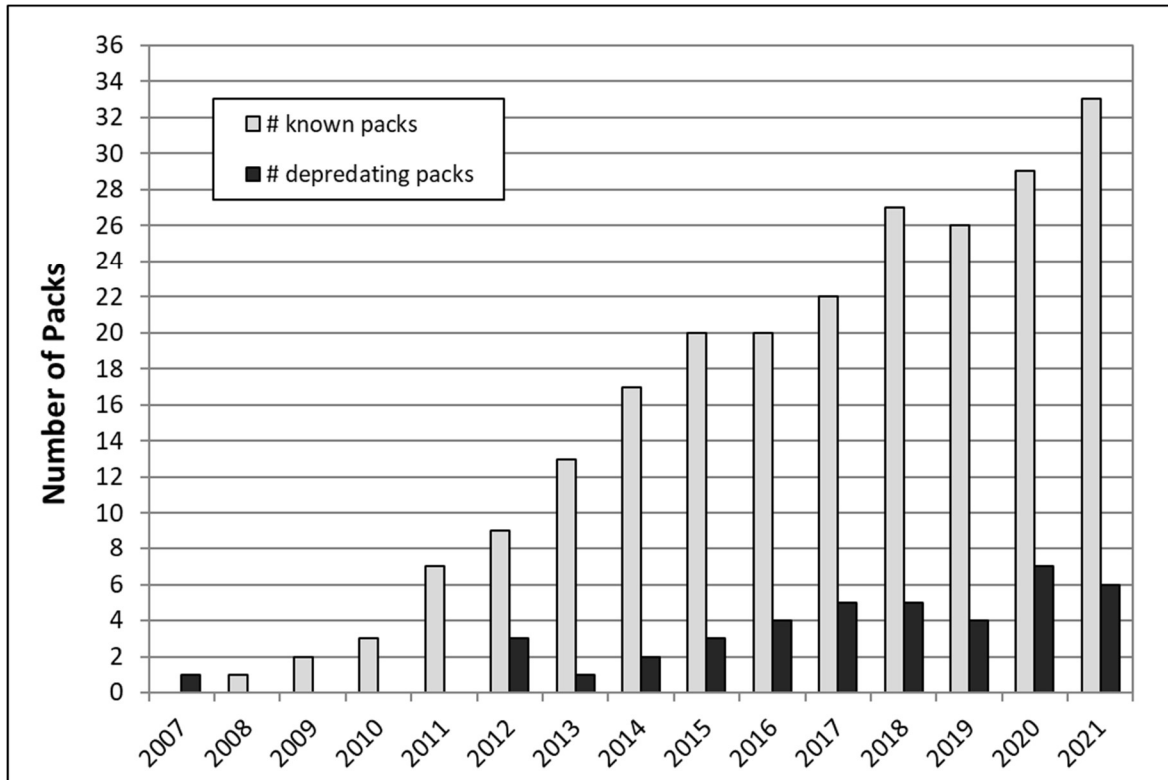


Figure 10. Minimum number of known packs that existed at the calendar year and the number of confirmed depredating packs (on livestock) in Washington, 2007 – 2021.

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 2021, as in previous years, preventative measures were used in an attempt to minimize livestock depredations.

Measures included, but were not limited to:

- Non-electrified and electrified fladry (red flagging strung around a pasture),
- Temporary fencing, to create enclosures for livestock,
- Radio-activated guard (RAG) boxes,
- Fox lights (Foxlights International PTY LTD, Bexley North Australia),
- Livestock guard dogs,
- Providing education regarding removal of attractants, including proper carcass disposal,
- 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 an attempt to change pack behavior after repeated depredations.

WDFW has management authority of wolves in the Eastern Washington recovery region (Fig. 2) and as of January 4, 2021, wolves were delisted from the Federal Endangered Species Act, which transferred the management authority to WDFW for the western two-thirds of the state. Under state law (RCW 77.12.240), WDFW can implement lethal removal, and the Plan contemplates the use of lethal removal as a tool to change pack behavior after repeated livestock depredations. In 2021, lethal removal was authorized in two packs (Togo and Columbia), which resulted in 2 wolves from the Columbia pack (two of nine members of the pack) being killed by one agency lethal action and one landowner permit (See Appendix A for a summary). Two wolves in the Columbia pack were also killed by vehicles this past summer and fall. The Department did not remove wolves from any other pack in 2021.

Table 2. Confirmed wolf-caused livestock and dog injuries and mortalities in Washington, 2013 - 2021.

	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							
	Injuries	Mortalities						
Cattle	8	5						
Sheep	0	0						
Other	0	0						
Dogs	0	0						
Total	8	5						

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 after a documented depredation. WDFW issued two permits to livestock producers in 2021 and one wolf was removed.

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 2/3 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. No wolves were killed by landowners protecting livestock under the caught-in-the-act (CIA) rule in 2021.

Damage Prevention Cooperative Agreements

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

To minimize conflicts between wolves and livestock on public and private lands, WDFW personnel work with livestock producers to identify and implement non-lethal conflict prevention measures suitable for each producer's operation. Interested producers may also participate in a Damage Prevention Cooperative Agreement for livestock (DPCA-L) with WDFW, which provides a cost-share for implementing various conflict prevention measures.

During the calendar year 2021, WDFW had cooperative agreements with 30 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 2021 had a combined total amount of \$147,500, but WDFW paid producers \$111,648.48 for DPCA-L reimbursements.

During calendar year 2021, WDFW paid 16 range riders \$127,042. WDFW contracted with 11 private vendors for range riding services; however, through subcontracts, 16 range riders were employed for the 2021 grazing season. In addition, the Department of Agriculture funds and oversees two organizations including Northeast Washington Wolf-Cattle Collaborative (NEWWCC), which supported 11 full time and 12 part-time range riders during the 2021 grazing season, and Cattle Producers of Washington (CPoW), which supported six full and two part-time range riders to assist producers in monitoring livestock to minimize interactions with wolves.

Range riders monitored livestock on open-range grazing allotments to minimize 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 appeals to the WDFW director.

- On grazing sites of at least 100 acres:
 - **For each confirmed depredation**, WDFW will compensate producers for the full value of the animal if it had gone to market, plus the full market value of one additional animal. 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 the 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.

WDFW received six direct claims for the 2021 grazing season. Three claims have been paid to compensate livestock producers who experienced livestock losses or injuries caused by wolves with a combined total of \$4,258.50. Three claims are pending acceptance or appeal of WDFW's offer.

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.

One claim was filed with the board for indirect losses caused by wolves that occurred during the 2020 grazing season and a settlement of \$16,607.92 was paid after appeal in 2021. Two claims were filed with the board that occurred during the 2021 grazing season for a combined total of \$55,929.78 and they are currently under review.

State Grants for Non-lethal Conflict Prevention Activities

During 2021, 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 was funded \$294,400 and CPoW was funded \$397,440 each for the biennium to be utilized for non-lethal deterrence through range riding, and projects such as fencing for calving areas to provide long-term solutions to prevent wolf-livestock interactions. NEWWCC funding was also supplemented with \$432,000 of proviso monies allocated for non-lethal deterrence measures to be utilized in the Kettle Mountains area of northeast Washington.

WDFW Creative Solutions to Reduce Livestock-Wolf Interactions

With the increasing challenges of wolf management in Washington, WDFW staff began a pilot project initially coined "creative solutions" to identify and develop additional tools for reducing wolf-livestock interactions. Examples of these potential solutions include but are not limited to using VHF ear tags for cattle for ease of locating where they are on the allotment. Reflective collars and bells placed on livestock could provide an additional tool to locate cattle. Notification beacons that work in concert with GPS collars could notify range riders when cattle are grazing near known dens and rendezvous sites. Stockpiles of deterrent tools could be made available in areas convenient for producers to access. Issuing Garmin InReach handheld GPS/Satellite Communication devices to range riders could provide them a convenient way of providing GPS tracks of their daily activity but also having a means of communication (text messaging) when operating in the rugged remote areas where no cell service exists.

One example of these creative solutions utilized during the 2021 grazing season was the use of nearly 75 very high frequency (VHF) ear tags to deploy on livestock in areas of potential conflict. The intention of this project was to focus producer and range rider efforts on cattle management and livestock husbandry, as opposed to wolf management. The premise was that producers would tag some of their cattle with VHF ear tags before they went out on the range. The ear tags were strategically distributed throughout the herd to maximize their effectiveness. Once on the range, VHF ear tagged cattle were located and identified.

In a significant portion of the United States Forest Service (USFS) grazing allotments within the chronic conflict area, the terrain is primarily composed of steep and densely timbered mountains. While the allotments do have roads that transect them, many parts of the range are inaccessible by vehicle. Many areas contain so much cover that cattle may be difficult to locate or observe without something like a VHF ear tag.

Two producers deployed 38 VHF ear tags on cattle during the 2021 grazing season. Producers and range riders (NEWWCC, CPoW, and WDFW CRR) were trained to use telemetry equipment and provided with receivers, H-antennae, and at least one omni-antennae to be used to locate the tagged cattle.

The VHF ear tag pilot project received mixed reviews from producers and range riders. Some producers and range riders were keen to the idea of deploying VHF ear tags and found them to be a huge aid in finding and locating cattle. Others did not trust WDFW with information on their cattle and thought WDFW was tracking their cattle and documenting how many cattle went undetected. Due in part to the weight and size of the VHF ear tags, several of them were ripped out of cattle ears.

For the upcoming grazing season, there are potentially two producers willing to try this pilot project again to improve the detectability of their livestock. WDFW also recently purchased 30 more VHF ear tags as well as several H-antennae and other telemetry equipment for the 2022 grazing season.

Another project underway is the redesign of the Radio Activated Guard (RAG) box through a multi-agency/NGO collaborative design team. The team continues to work together with two highly skilled engineers to improve this decades-old technology. The new RAG box will have many new features, including extended battery life, self-charging options, remote monitoring, data collection, and a compact design. The prototype is currently in field testing. Other pilot projects include the use of an infrared drone to locate wayward or separated cattle to further improve range riding efforts.

Wolf-Livestock Conflict Deterrence Rule Making

The department is proposing a new rule section, WAC 220-440-260, and amendments to the current WAC 220-440-080.

This proposal is in response to a decision by Governor Jay Inslee in September 2020 to grant a petition for rule making for wolf management with the goal of instituting practices that will avoid the repeated loss of wolves and livestock in Washington. Under the umbrella of the 2011 Wolf Conservation and Management Plan goals, the purpose of amending a rule and adopting a new rule related to wolf management in Chapter 220-440 WAC is to:

1) establish procedure for identifying WDFW expectations for use of non-lethal tools to mitigate wolf-livestock conflict in areas of chronic conflict, while recognizing the use of non-lethal tools is encouraged statewide; and

2) establish criteria for the use of WDFW's lethal removal authority in areas of chronic wolf-livestock conflict.

For more information please see WDFW's website at

<https://wdfw.wa.gov/about/regulations/development/wolf-livestock-conflict-deterrence>

Wolf Interactions with Ungulates

Ungulate populations naturally fluctuate over time and space in response to various changes on the landscape. With the exception of the Columbia Basin, 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 is occurring 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. 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.

Title: Spatiotemporal Patterns of Predator-Prey Interactions

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

Project Summary: 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 of this project is 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. Motion-sensing cameras have been deployed and maintained in Pend Oreille, Stevens, and Okanogan Counties for the past three years (June 2018 – August 2021). The cameras collected data year-round and were moved to a new random location once per year, generating photo-capture data from over 350 camera stations in total. To date, 111 University of Washington undergraduate interns have classified and counted the species detected in more than 3,000,000 images. Project staff collaborates with Microsoft AI for Earth (<https://www.microsoft.com/en-us/ai/ai-for-earth>) to use machine learning and image recognition to expedite image classification. All species of primary interest to the project have been detected on camera (white-tailed deer, mule deer, elk, moose, cougar, bobcat, coyote, and wolf). Wolves were detected at 69 camera sites during the three years of data collection, providing information on wolf occurrence, activity patterns, and evidence of reproduction.

Photo-capture and telemetry data is being 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, and 4) how do two ubiquitous forms of anthropogenic activity (hunting and livestock grazing) influence wildlife activity and distributions? Results from this research will help inform

wolf monitoring as well as improve understanding of how recolonizing wolves influence the broader ecological community in eastern Washington.

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 the availability of 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 project seeks to determine how wolves and other predators (cougars, bobcats, coyotes, and black bears) impact 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, including 12 mule deer that were collared in January 2021. Ungulate captures for the project are now complete.

GPS and radio-tracking collars are used to compare the rates and causes of mortality and movement patterns of ungulates. Between 2019 and 2020, habitat structure and plant diversity was surveyed at 262 sites in GMUs 121 and 117 to model the nutritional value for white-tailed deer and elk (mule deer were not studied in these GMUs). To date, two out of four planned analyses have not been conducted. (1) Predator DNA detected at 104 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. It was found that predator DNA was 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 actually more likely to be misidentified than correctly identified 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, WA was examined, and found that mule deer generally used burns in the summer as the result of improved forage quality but avoided burns in the winter 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. In analyses to be completed by the end of 2022, the roles of nutrition quality and predator exposure on white-tailed deer survival and population growth will be examined, as well as how elk balance risk from humans and predators.

Title: A Semi-spatial Integrated Population Model to Assess Population Dynamics of a Recolonizing Species

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

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

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

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

Project Summary: Recolonizing species exhibit unique population dynamics, namely dispersal to and colonization of new areas, that are important to understand from a management perspective. Integrated population models (IPMs) have proven useful for making inference about population dynamics by integrating multiple data streams, including data relevant to population state and demographic rates. More recently, spatially explicit integrated population models (SIPMs) have leveraged the power of spatial capture recapture, resulting in a spatially explicit model of population dynamics. SIPMs, however, require information on the spatial observation process, an element that was lacking for a recolonizing population of wolves in Washington. We developed a semi-spatial integrated population model, a model that uses GPS collar and pack count data to estimate survival, reproduction, abundance, and movement rates. There are two components: [1] a matrix population model that governs the population state process and vital rates, and [2] an individual based component that allows movement of individuals and colonization of new areas. Within the individual-based movement component, each potential disperser draws a dispersal distance and is assigned a new territory based on a multinomial process of relative suitability of all territories at that distance. This model was used to estimate current population dynamics of wolves in Washington State, as well as to project population dynamics for the next 50 years. Included in this projection model were 15 scenarios accounting for translocation, various levels of harvest, increased agency removals, and disease. The model estimated a total of 175 wolves (95% CRI 157-193) in Washington State in 2020. Of the 15 tested scenarios, the only scenario with a non-zero probability of extinction (i.e., probability of zero wolves in 2070) and geometric mean of lambda below 1 (i.e., a declining population) was a cessation of out of state immigration. While there is uncertainty in model projections, there is evidence to support that grey wolves will start to inhabit the Southern Cascades by 2030, followed by the Olympic Peninsula by 2040. Beyond wolves in Washington, the semi-spatial IPM can be used to assess population dynamics with a spatial component and determine how management strategies can affect population dynamics and recovery.

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 206 individuals across 33 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 study 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. To date, 60 cougars and 16 wolves

(representing 6 packs) have been fitted with GPS collars, which has 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. To date, 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 just under 1 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 605 wolf, cougar, and black bear scat samples for genetic diet assessment. Samples were prepared and sent for metabarcoding diet analysis at Oregon State University to identify all vertebrate species in the scats. Ultimately, 539 samples successfully amplified for use in diet studies. Finally, GPS collar data was prepared for spatial analysis. Dissertation analyses are now underway and completion is anticipated in 2023, with chapters on wolf and cougar spatial movements and diets anticipated by Dec 2022. 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: Mesocarnivore Study 2021 Review

Principle Investigators: Dr. Laura Prugh, Associate Professor, University of Washington
Research Scientist: Becca Windell, University of Washington

Funding: National Science Foundation

This study aims to better understand how large predators (i.e., wolves and cougars) influence the behavior, movements, and population dynamics of mesocarnivores (i.e., coyotes and bobcats). The primary objectives of this study are to: 1) deploy GPS collars on mesocarnivores to track survival and patterns of avoidance and attraction in response to large carnivores; 2) collect scat for fecal genotyping to measure key mesocarnivore population parameters; and 3) install remote wildlife cameras at a variety of ungulate mortality sites to investigate mesocarnivore scavenging behavior. The mesocarnivore study works in collaboration with the Washington Predator-Prey Project in both the Northeast and Okanogan study areas, and winter 2021 was the mesocarnivore team’s final field season. GPS collars were deployed on a total of 37 bobcats and 35 coyotes, and location and mortality data is currently being analyzed. A successful community science scat collection program was initiated in partnership with the Methow Conservancy in winter 2021. Over the duration of the study, 2,956 carnivore scats were collected. Together with WDFW, the wolf-cougar (Lauren Satterfield), and ungulate (Taylor Ganz) teams, 203 cameras were deployed on ungulate carcasses

to monitor scavenging. Undergraduate researchers have nearly finished processing photos, and analyses are underway.

Title: Linking seasonal snow processes to wildlife population dynamics

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

PhD Student: Ben Sullender, University of Washington

Postdoctoral Researcher: Calum Cunningham, University of Washington

Funding: NASA Interdisciplinary Science (IDS) Program

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, elk, moose), as well as predation risk. This project was initiated in winter 2021, with pilot data collected in conjunction with the final year of PI Prugh's mesocarnivore project in the Okanogan and Northeast study areas. The field crews collected data on snow track sink depths at 78 track sites (primarily wolves, coyotes, and moose), along with measurements of snow density, depth, and other properties. The crews also visited 51 clusters of wolf locations to sample snow conditions at kill sites. Snow scientists on the project team are using the snow measurements to calibrate and validate physical snowpack evolution models that will be used to generate spatially continuous layers of key snow properties. These layers will be combined with GPS location data from collared animals to determine how snow properties affect movements and predation risk.

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 our 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. We hypothesize 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, rancher-wildlife-plant dynamics are mechanistically being studied. 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: Wolf Haven International, Defenders of Wildlife, Conservation Northwest, Washington Department of Transportation, Washington Department of Fish and Wildlife, Conservation Biology Institute, Washington Conservation Science Institute

Project Summary: Efforts begun by the Washington Wildlife Habitat Connectivity Working Group (WWHCWG) to model connectivity for multiple species in an area of western Washington dubbed the “Cascades to Coast,” have morphed 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. Finally, this broad model will 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 WDFW/UW 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 2021, 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 2022 we will process and analyze all the data collected over the previous two years and hope to publish 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: Dr. Samuel Wasser, University of Washington

Project Summary: In anticipation of eventual wolf recolonization south of Interstate 90 (I-90), baseline data has been collected to answer the question: *How will wolf recolonization impact the predator-prey community and the extent of human-wildlife conflict in Central Washington south of I-90?* This study has focused on collecting signs of wolf presence as well as baseline measures of the distribution and diets of the medium to large carnivores in the Cascade Mountain Range, from I-90 south to the Columbia River. The intention is to use those findings to assess how the distributions and diets of medium to large carnivores change as wolf recolonization of the area progresses.

Scat detection dogs were trained to locate wolf, cougar, bobcat, coyote, wolverine, fisher, and fox scat. Scat was collected and logged for DNA analysis. The study 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. The entire study area was sampled in 2018, 2019, and 2020. The 2018 sampling also included the Teanaway wolf pack home range, just north of I-90, to confirm that dogs were successfully locating wolf samples and thus assure that absence of samples south of I-90 was not due to dog error. Having failed to locate any wolf sign south of I-90 during the 2018-2020 sampling, 2021 sampling design was modified in two ways to increase the chances of detecting wolf presence. The Teanaway wolf pack home range was once again sampled as a control and concentrated the 2021 sampling area over 5,000km² south of I-90 on areas of highest wolf expectation based on information provided by the WDFW and Yakama Nation Wildlife Program. Three dog teams collected 580 carnivore scat samples between October 4 and November 3, 2021. These included 150 samples from Yakama land, 55 samples from Mount Rainier National Park, 103 samples from the Teanaway region and 272 samples from the remaining study area.

Over 4,500 georeferenced carnivore scats in the south-central Cascades between 2018 and 2021 were collected. Samples from all four years were identified to predator species using the ATP6 marker to distinguish cougar, bobcat, coyote, wolverine, fisher, fox scat and dog/wolf. Since the ATP6 mitochondrial marker cannot distinguish wolf from dog, the CanidSNP marker developed by

our lab was used to further discriminate wolf from domestic dog in the samples identified as wolf/dog by ATP6 marker. We also used metabarcoding methods to sequence and analyze the carnivore samples collected from 2018 – 2020 for presence wild and domestic prey. The predator ID and prey data was presented in a report provided to the State in 2021.

DNA from 558 of the 580 samples collected in 2021 was successfully amplified. Of those, 399 were typed as coyote, 112 as bobcat, 19 as wolf, 12 as dog, 8 as cougar, 4 as fox, and 4 as marten. All 19 of the wolf samples were from the Teanaway control region. No wolf samples were detected south of I-90. Figure 1a shows the locations of wolf samples among all samples collected over the entire 2021 sampling area. Figure 1b shows the zoomed-in locations for the Teanaway wolf control region. We are in the process of analyzing all 2021 carnivore samples for presence of prey.

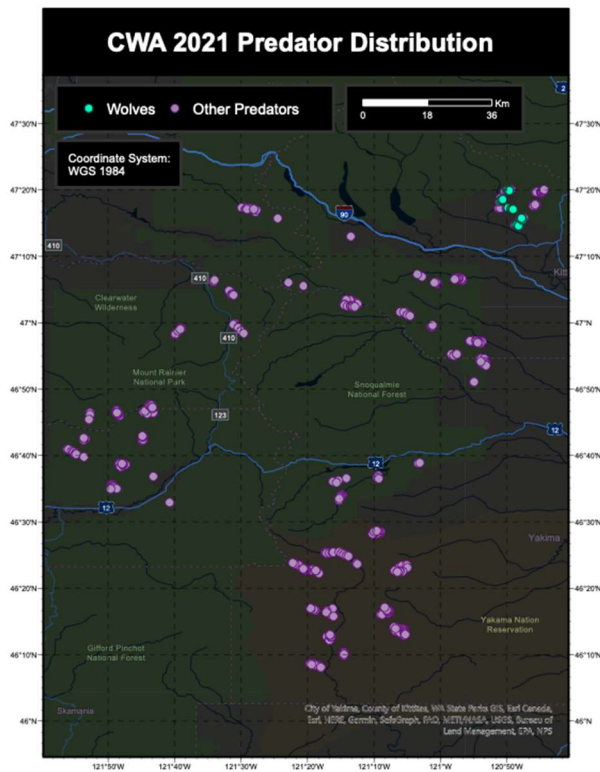


Figure 1 Map of the region surveyed during the 2021 field season. Samples colored in teal were identified as wolf, samples colored in pink were identified as non-wolf predators.

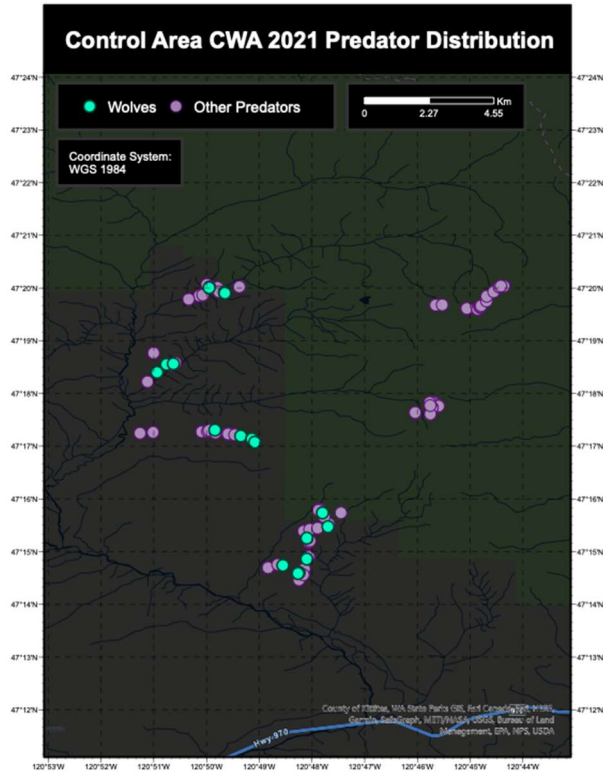


Figure 2 Map of the Teanaway control region surveyed during the 2021 field season. Samples colored in teal were identified as wolf, samples colored in pink were identified as non-wolf predators.

This research is funded by a grant from the Washington State Legislature.

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 2021, 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 2021. 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 using Facebook. WDFW also produced a couple [videos and recorded presentations](#) about wolves in 2021.

Wolf Advisory Group

Since 2013, WDFW has relied on the Wolf Advisory Group (WAG) to provide guidance on wolf management under the terms of the Plan. The WAG is comprised of citizen members appointed by 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 six times (virtually) in 2021. 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.

After the WAG unanimously adopted new language reflected in the most recent revision of the [wolf-livestock interaction protocol](#) (Protocol) clarifying the duties and expectations for range riders during its August 2020 meeting, WAG shifted its focus primarily toward addressing areas of chronic wolf-livestock conflict in the state. The WAG decided to create a new section of the Protocol specifically dedicated to areas of chronic conflict and spent all or portions of their meetings from 2019 through April 2021 working on this subject. Some of the topics WAG members wrestled with include issues of shared goals, root causes of depredation, proactive conflict mitigation plans, how to get reluctant parties involved in decision making, roles and responsibilities of involved parties, and compliance with commitments made by WDFW staff and livestock producers. The WAG invested significant time in the topic and developed several drafts of the section. Although the WAG

did not come to consensus on language for this section, WAG members provided a foundation based on collaborative solutions that inform WDFW's decision-making in areas of chronic conflict.

As of November 2021, WAG and WDFW welcomed 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. 2021 – 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 two wolf packs during the 2021 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 describes 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 two packs in 2021: Togo and Columbia. The lethal removal operations or permits issued resulted in no wolves being removed from the Togo pack and two wolves being removed from the Columbia pack.

Togo pack:

In Togo, an attempt was made to remove wolves after the director authorized lethal removal to reduce chronic depredations. Over multiple days WDFW staff tried to remove one to two wolves via ground operation methods, however no wolves were killed during these attempts. Concurrently with the operation and likely in response to these efforts, the wolf pack moved its rendezvous site and center of activity. The decision was made to move to an evaluation period to monitor if this pack movement would reduce future depredations. The affected livestock producers and range riders continued to utilize nonlethal tools and no further depredations were documented in Togo the remainder of the year. WDFW spent a total of \$3,109.87 on the Togo Removal Operation.

Columbia pack:

In late May, WDFW staff responded to reports of wolf activity on private grazing land in Columbia County. The area was outside of known wolf pack territories in an area north of the Touchet pack territory and west of the Tucannon pack territory. WDFW staff documented a single wolf using the

property in late May and throughout June. In mid-July WDFW staff began documenting frequent use of the area by multiple wolves. WDFW staff were not able to determine which pack the wolves belonged to based on trail camera and track monitoring alone, so they initiated a trapping effort in the area. A WDFW wolf biologist captured and collared two adult wolves in this area on August 22 and 24. During the trapping session, the presence of wolf pups within the grazing area was documented. At this time, the pack size was estimated to be at least 5 adult wolves and 4 pups.

August 25

WDFW staff investigated an injured calf in the private pasture where the wolves were captured. During the investigation, staff documented multiple factors consistent with wolf depredation, including bite marks, punctures, swelling, and lacerations in locations typical of wolf depredations.

The WDFW staff who conducted the investigation determined that the injuries sustained were the result of a confirmed wolf depredation event.

The affected livestock producer used multiple, proactive, non-lethal deterrents across the large private grazing area, including range riding, Fox lights, and delayed turnout of livestock. WDFW staff communicated the location of a core wolf activity center to the livestock producer, who then moved mineral blocks away from the wolf activity center.

September 13

WDFW staff investigated a report of a dead steer on the private property of another producer (producer 2) in the Columbia pack territory. Based upon tracks at the scene, attack signatures, presence of bite and puncture wounds with associated hemorrhaging, consumption patterns of the carcass, available telemetry data, and sightings by producers in the immediate area, staff determined the incident was a confirmed wolf depredation. WDFW staff assisted the livestock producer with carcass removal from the landscape. At the time of the depredation, the affected producer was conducting daily or near-daily range riding activities, had deployed fox lights around livestock congregation areas (e.g., watering sites), delayed turnout of calves until they were 200 pounds, and attempted to keep cattle away from wolf activity centers. Additional fox lights were reactively deployed by the affected producer.

September 16

In response to the depredation on September 13, WDFW staff tried to haze wolves out of the area where livestock were grazing. On September 16, WDFW staff hiked into the rendezvous site to attempt to push the wolves to a new rendezvous site further from the livestock. Staff located several adult wolves and pups and used air horns, gunshots, and yelling to haze the wolves out of the area. The wolves responded to the disruption by moving out of the area temporarily but returned to the same location within a day of the harassment.

October 16

WDFW staff investigated an injured calf from producer 1's grazing land in Columbia pack territory that had been picked up by the producer. Staff documented cuts and puncture wounds as well as a large laceration on the underside of the calf and an open wound on the flank with swelling associated with underlying hemorrhaging. Based on attack signatures, presence of bite and puncture wounds with associated hemorrhaging, available telemetry data, and sightings by producers in the immediate area, staff determined the incident was a confirmed wolf depredation.

November 1

WDFW staff investigated four injured calves pulled off the range from producer 1's grazing land in Columbia pack territory. The livestock producer was sorting calves at their home place when the injuries were discovered. Cattle would normally stay on the pasture until the end of November or early December, but the livestock producer was gathering cattle early to move them off the pasture due to persistent wolf activity. Based on the evidence associated with each individual calf one of the injured calves was classified as a confirmed wolf depredation, two were classified as probable wolf depredations, and the cause of the remaining calf's injuries could not be determined. The estimated age of injuries was approximately three to seven weeks old based on healing/scarring.

At this point WDFW had documented four depredation events affecting two different livestock producers, resulting in one dead and four injured livestock since August 25, 2021, all attributed to wolves in the Columbia pack. This met the four depredation events in 10 months threshold for considering lethal removal to stop depredations. WDFW staff discussed the depredations and the use of non-lethal measures in this pack territory and how to most effectively address this situation moving forward to provide a recommendation to the Director.

November 5

WDFW law enforcement received notification of a dead wolf along the side of a road in the Columbia pack territory. Upon retrieval and investigation, it was clear the wolf (a female yearling) had been killed by a vehicle while crossing the road.

November 10

WDFW Director Kelly Susewind authorized permits to be issued to livestock producers for the removal of up to two wolves from the Columbia pack.

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 permits for the lethal removal of these wolves was as follows:

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

Producer 1

Proactive deterrents

- Range riding (1 – 2 times per week) with herding dogs present
- Regular pre-grazing/turnout checks
- Fox lights deployed on pasture
- Delayed turnout to forested/upland grazing pastures (calves at least 200 pounds)
- Practicing carcass sanitation
- Opportunistically hazing wolves away from occupied pastures

Responsive deterrents

- WDFW staff communicated the location of a core wolf activity center to Producer 1, who then moved mineral blocks away from the wolf activity center.
- Producer 1 was willing to move livestock off their current pasture if WDFW could find different pasture ground, or take the cattle home if feed was available. WDFW staff were unable to find alternate pasture or purchase hay to feed their cattle for the rest of the grazing season.
- Producer 1 worked with an adjacent private property owner with fenced pasture ground and did move some of their livestock onto pasture further away from the core wolf activity center in mid-September.
- Producer 1 pyrotechnically hazed a wolf away from their pasture area on September 13.
- On September 16, WDFW staff tried to haze wolves out of the area where livestock were grazing.
- On October 6, 16, and 26, Producer 1 gathered and moved a significant portion of their livestock off the private pasture and back to their home place (which is not an occupied wolf territory) in response to the wolf activity.

Producer 2

Proactive deterrents

- Range riding (near daily) with herding dogs
- Regular pre-grazing/turnout checks
- Fox lights deployed on pasture
- Delayed turnout to forested/upland grazing pastures (calves at least 200 pounds)
- WDFW staff communicated the location of a core wolf activity center to Producer 2, who then moved mineral blocks away from the wolf activity center.
- Practicing carcass sanitation

Responsive deterrents

- Producer 2 deployed additional fox lights.
- Producer 2 actively worked to keep cattle away from core wolf activity areas and moved mineral blocks.
- Producer 2 cleared brush in areas where cattle are vulnerable to depredation.
- On September 16, WDFW staff tried to haze wolves out of the area where livestock were grazing.

The proactive, non-lethal deterrence measures implemented by these two livestock producers were those best suited for their operations in the professional judgement of WDFW staff except for the frequency of range riding by Producer 1. WDFW has an expectation of daily to near daily range riding for dispersed grazing operations. Producer 1 had expressed a willingness to use range riders and requested a WDFW-contracted range rider prior to experiencing depredation. Efforts were made by both the producer and WDFW staff to solicit one, but they were unsuccessful. Conservation Northwest provided a range rider for eight days in October.

Because the livestock were going to remain in the wolf pack territory where the depredations occurred for at least another month, 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, even with additional non-lethal deterrence efforts.

WDFW staff did not think the vehicle-caused death of the yearling wolf on November 5 would stop depredations from occurring.

The Department's wolf plan modeled lethal removal to help inform decision makers during this stage of recovery. Based on that modeling analysis WDFW did not expect removing one to two additional wolves from the Columbia pack would jeopardize wolf recovery in the eastern recovery zone or statewide.

Permits were issued to livestock producers because they had a daily or near daily presence on the private land where the livestock continued to graze and previous depredations had occurred. The lethal removal permits issued to livestock producers expired when the wolf or wolves in the permits had been removed, livestock were moved from the affected grazing land, or after Dec. 10, 2021 (regardless of whether wolves had been removed).

November 15

WDFW staff received a call from an additional livestock producer (producer 3) reporting a dead 400-500-pound calf behind their house in their private pasture adjacent to their home. The livestock producer brought the cattle in this pasture off a private summer grazing allotment to their home for the winter.

WDFW staff who investigated determined the incident was a confirmed wolf depredation. Staff assisted the livestock producer with carcass sanitation.

In response to the depredation, WDFW staff and the livestock producer deployed fladry around the weaning pasture and the pasture with cow/calf pairs and reduced the size of the pasture with weaning calves.

WDFW had now documented five depredation events affecting three different livestock producers resulting in two dead and four injured livestock since August 25, 2021, all attributed to wolves in the Columbia pack. All events except one were confirmed wolf depredation incidents; the other incident involved one calf confirmed injured by wolves and two others probably injured by wolves. All incidents took place on private land.

November 18

In response to the additional depredation documented on Nov. 15, Director Susewind amended his Nov. 10 authorization to allow WDFW staff to lethally remove one to two wolves from the Columbia pack and to suspend the lethal permits issued to livestock producers during WDFW operations.

Later that day, WDFW lethally removed an adult male wolf from the Columbia pack. Permits issued to livestock producers that were suspended during WDFW operations were then reissued to allow for the removal of one wolf in addition to the one removed by WDFW.

December 5

WDFW law enforcement received notification of a dead wolf along the side of a road in the Columbia pack territory. Upon retrieval and investigation, it was clear the wolf (another female yearling) had been killed by a vehicle while crossing the road.

December 8

A juvenile male wolf was legally killed on private property under an authorized permit. As a result, the remaining issued lethal removal permits were rescinded.

No depredations have been observed after November 15. WDFW continues to monitor the situation and work with affected producers in the area.

Cost

Total expenditure for the Columbia lethal removal operation in 2021 (staff time, contractor time and aerial support) was \$16,847.16 allocated from unrestricted Wildlife State Funds from licensing sales.

Details of Columbia pack depredations:

Depredation Date	Depredation Type	Proactive Non-lethals	10 Month Window
8/25/21	Confirmed injury of calf	Yes	6/25/22
9/13/21	Confirmed mortality of calf	Yes	7/13/22
10/16/21	Confirmed injury of calf	Yes	8/16/22
11/1/21	Confirmed injury of one calf, probable injury of two calves	Yes	9/1/22
11/15/21	Confirmed mortality of calf	Yes	9/15/22

Details of the Columbia Pack Lethal Removals and Mortalities:

Date	Wolf	Sex	Age
November 5, 2021	1 (Killed by Vehicle)	Female	Yearling
November 18, 2021	1	Male	Adult
December 5, 2021	1 (Killed by Vehicle)	Female	Yearling
December 8, 2021	1	Male	Juvenile