

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE

Wolf-livestock interaction protocol

Revision date June 1, 2017 (sections 3 and 4 amended September 15, 2020)

This protocol was jointly developed by the Washington Department of Fish and Wildlife (WDFW or Department) and its Wolf Advisory Group to guide the Department’s efforts to reduce conflicts between wolves and livestock. The Wolf Advisory Group has expressed a strong value to reducing the likelihood of the loss of both wolves and livestock from adverse interactions. The protocol prescribes a variety of proactive measures livestock producers can take to reduce the probability of wolf-livestock conflicts and establishes a framework for WDFW’s response when conflicts between wolves and livestock do occur.

The protocol draws on a diversity of perspectives expressed by people throughout the state for protecting wildlife populations as a public resource and livestock. These values include achieving a sustained recovered wolf population, supporting rural ways of life, and maintaining livestock production as part of the state’s cultural and economic heritage. This protocol also serves to increase the transparency and accountability of the Department’s activities and management actions related to wolves.

Section 1. Background and purpose of protocol

Gray wolves are listed as endangered under the federal Endangered Species Act (ESA) of 1973 in the western two-thirds of Washington, but are federally delisted in the eastern-third of the state (Fig. 1). Under Washington State rule, gray wolves as endangered statewide. Under the Federal listing status, the U.S. Fish and Wildlife Service (USFWS) is the lead agency for managing wolves in the western two-thirds of Washington, and WDFW has full management authority for wolves in the eastern third.

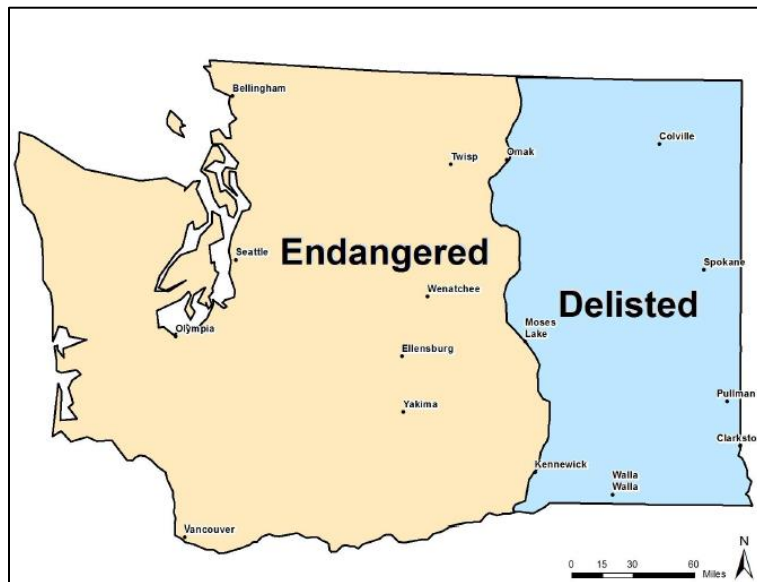


Figure 1. Federal classification of gray wolves in Washington State, 2017.

The Department developed a Wolf Conservation and Management plan (wolf plan) under the requirements of WAC 220-610-110, which requires that listed species be managed to attain “survival as a free-ranging population” (Section 1.1). This requirement is consistent with Department’s responsibility to manage wildlife in trust for the citizens of Washington. Recovery plans need to include target population objectives, de-listing criteria, and an implementation plan for reaching population objectives “which will promote cooperative management and be sensitive to landowner needs and property rights” (WAC 220-610-110, Sections 11.1.1, 11.1.2, and 11.1.3).

The wolf plan was developed with the help of a multi-stakeholder working group and adopted by the Washington Fish and Wildlife Commission in 2011. The wolf plan has four goals, in accordance with state law and regulations: 1) recovery of the species, 2) reducing wolf-livestock conflict, 3) addressing interactions between wolves and native ungulates, and 4) promoting coexistence of livestock and wolves and public understanding of wolf management (see page 14 of WDFW Wolf Conservation and Management plan).

Under the umbrella of the wolf plan, this protocol outlines the various tools and actions WDFW uses to reduce wolf-livestock interactions in order to support wolf recovery and maintain the long-term coexistence of wolves and livestock. ***The goal of the tools and approaches described in this protocol is to influence/change wolf pack behavior to reduce the potential for recurrent wolf depredations on livestock while continuing to promote wolf recovery.*** In addition, some tools have the ancillary benefit of increasing human awareness and/or influencing livestock behavior to increase the coexistence of wolves and livestock.

At this stage of recovery in Washington, most wolf packs share a portion of their territory with livestock on the rural landscape. WDFW encourages livestock producers in those environments to use proactive deterrence measures to reduce the probability for conflict. If conflict should occur, the Department considers the use of responsive deterrence measures and – within established guidelines – lethal removal of wolves (in areas where wolves are federally delisted) if appropriate deterrence measures have first been taken to attempt to change pack behavior and reduce the potential for recurrent wolf depredations on livestock.

This protocol describes a variety of livestock damage deterrence measures and the expectations for their use. While no single deterrence measure or combination of measures will guarantee that zero conflict between wolves and livestock occurs, the Department believes careful application of these techniques will help reduce conflict. This protocol also describes the criteria for and implementation of lethal removal of wolves.

Section 2. Definitions

Confirmed wolf depredation refers to any event where there is reasonable physical evidence that a wolf caused the death or injury of livestock. Primary confirmation would include bite marks and associated subcutaneous hemorrhaging and tissue damage, indicating that the wolf attacked a live animal, as

opposed to simply feeding on an already dead animal. Spacing between canine tooth punctures, location of bite marks on the carcass, feeding patterns on the carcass, fresh tracks, scat, and hairs rubbed off on fences or brush, and/or eyewitness accounts of the attack may help identify the specific species or individual responsible for the depredation. Wolf predation might also be confirmed in the absence of bite marks and associated hemorrhaging (i.e., if much of the carcass has already been consumed by a predator or scavengers) if there is other physical evidence to provide confirmation. This might include blood spilled or sprayed at a nearby attack site or other evidence of an attack or struggle. There may also be nearby remains of other animals for which there is still sufficient evidence to confirm predation, allowing reasonable inference of confirmed wolf predation on an animal that has been largely consumed.

This definition is from the Department's Wolf Conservation and Management Plan. In practice, 96 percent of the confirmed wolf depredations in the last 3 years have included hemorrhaging as the factor that led to that determination. The Department will continue to use the factor of hemorrhaging (along with other supporting factors) for determinations of a confirmed wolf depredation. (See **Section 5** for more information on factors.) Also, only trained WDFW staff make the final determination in depredation investigations.

Depredation means any death or injury of livestock caused by a carnivore.

Dispersal generally refers to the natural movement of an animal from one area to another area outside its natal territory.

Incremental removal refers to a period of active wolf removal (or attempt to remove wolves) followed by a period of evaluation. If, during this evaluation period, wolf depredations continue, the Department may resume removal of additional wolves from the pack as part of the continuation of a series of periods of active removal and periods of evaluation.

Livestock means cattle, pigs, horses, mules, sheep, llamas, goats, donkeys, alpacas, guarding animals, and herding dogs (this definition is derived from WDFW's wolf plan and WAC 220-440-020).

Proactive deterrence measure refers to an action taken to discourage wolf depredation that has been in place long enough prior to a confirmed wolf depredation that the local WDFW Wildlife Conflict Specialist can be confident that it had time to be effective. In most situations, the measures will have been in place for at least one week. The WDFW Conflict Specialist and the livestock producer will determine which techniques are best suited for the specific livestock operation and have the best chance to reduce the likelihood of wolf depredations on livestock.

Probable wolf depredation means there is sufficient evidence to suggest that the cause of death or injury to livestock was a wolf, but not enough evidence to clearly confirm that the depredation could only be caused by a wolf. A number of factors can help in reaching a conclusion, including (1) recently confirmed predation by wolves in the same or nearby area, and (2) evidence (e.g., telemetry monitoring data, sightings, howling, fresh tracks, etc.) to suggest that wolves may have been in the area when the

depredation occurred. These factors, and possibly others, will be considered in the investigator's best professional judgment.

This definition is from the Department's Wolf Conservation and Management Plan. In probable wolf depredations, WDFW's practice in conducting investigations is such that there is a reasonably high likelihood that the depredation was caused by a wolf, but evidence of hemorrhaging was lacking (See **Section 5** for an explanation of all the factors that go into making a probable determination and how these are distinguished from non-wolf predation or non-predation causes of death). Only trained WDFW staff make the final determination in depredation investigations.

Responsive deterrence measure means a deterrent measure put into place after a confirmed or probable wolf depredation has occurred. The WDFW Conflict Specialist and the livestock producer will determine which techniques are best suited for the specific livestock operation and have the best chance to reduce the likelihood of future depredations.

Wildlife conflict specialists are WDFW staff members who are responsible for working with local livestock producers to implement deterrence measures designed to reduce the probability of wolf-livestock conflict. Wildlife conflict specialists are the primary contact and staff that respond to and conduct depredation investigations.

Section 3. Expectations for deterrence measures

The Wolf Conservation and Management Plan states that "any wolf-livestock management program should manage conflicts in a way that gives livestock owners experiencing losses the tools to minimize losses" without jeopardizing recovery efforts. (See WDFW's wolf plan, page 85.) The wolf plan then instructs the Department to work with livestock owners to incorporate non-lethal deterrent strategies (e.g., range riders, electric fladry) into their business practices (specific strategies are discussed in **Section 4**).

The Department envisions a future where livestock producers and their communities work individually and collaboratively to reduce the potential for wolf-livestock conflict, develop innovative solutions, and advance efforts to coexist with wolves while preserving the economic viability and character of Washington's agricultural communities. To facilitate that, experience shows the best approach for expanded use of voluntary proactive deterrence measures is fostering relationships between independent producers and local Wildlife Conflict Specialists, and building receptivity through respectful mutual learning and collaboration. Research also supports the proposition that individuals who feel autonomous and competent are more likely to support and participate in conservation activities (Decaro and Stokes 2008; Dedeurwaerdere et al., 2016). Recent trends in Washington indicate that recognizing and supporting livestock producer's cultural independence leads to the increase the use of applicable proactive measures (Fig. 2)

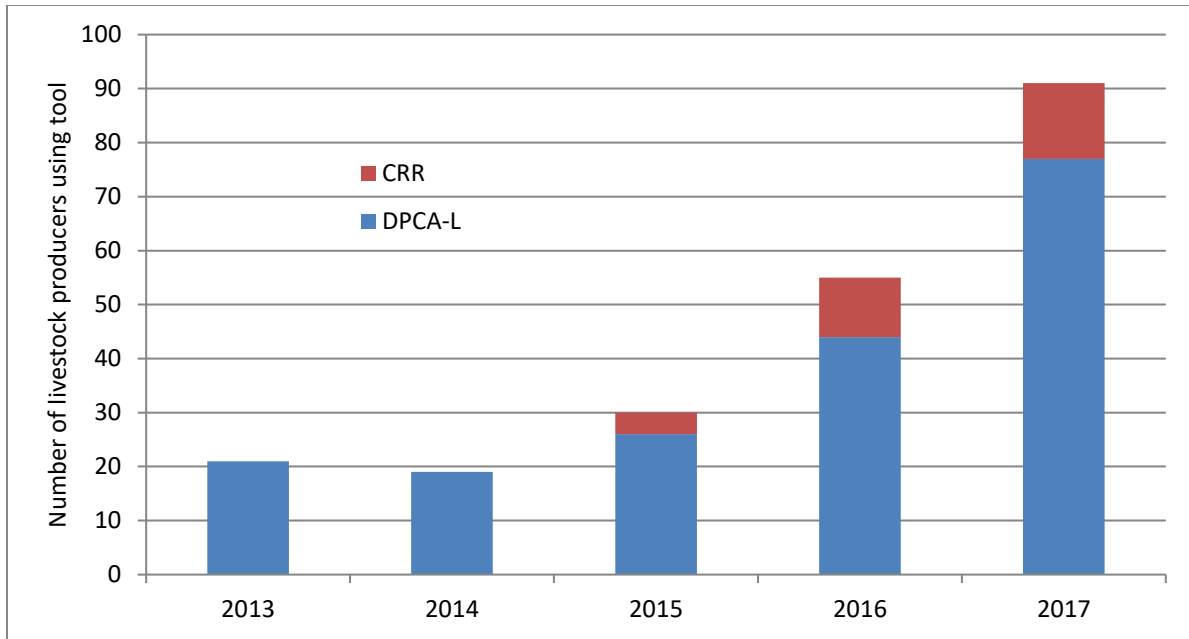


Figure 2. Trend in use of WDFW’s damage prevention cooperative agreements for livestock (DPCA-Ls) and contract range riders (CRR) for northeast Washington, the Blue Mountains, and Okanogan from 2013 to 2017.

WDFW’s role is to:

- “Preserve, protect, perpetuate, and manage the wildlife...” (RCW 77.04.012);
- Implement the Wolf Plan to ensure recovery of wolves in Washington State and reduce wolf-livestock conflict;
- Respond to and resolve reported wolf depredation events in a timely period and work with livestock owners to reduce potential conflicts with wolves. (Wolf Plan, p. 143);
- Following ESHB 2097, implement conflict mitigation guidelines that distinguish between wolf recovery regions that are at, above, or below the regional component of the statewide recovery objectives;
- In addition to emphasizing proactive and responsive nonlethal techniques, the Department may incorporate more flexible approaches in management as wolves progress toward a delisted status. (Wolf Plan, p 143);
- Manage ungulate populations and habitats in Washington to provide an adequate prey base for wolves, to maintain harvest opportunities for hunters, and provide recreationists with continued opportunities to observe wildlife (Wolf Plan, p. 147);
- Provide information on wolf behavior, pack dynamics, population status, etc.;
- Foster mutual learning to build knowledge, trust, and respect;
- Collaborate with livestock producers and provide guidance and assistance with implementation of deterrence measures that follow best management practices and provide high applicability for specific operations and landscapes;
- Provide adequate compensation program for livestock damages caused by wolves ([RCW 77.36](#));

- Assist livestock producers with interim resources for deterrence measures as available in small pastures;
- Coordinate with local government officials as requested on issues of public safety and private property damage relating to wolves;
- Coordinate with NGOs; and
- Communicate with community leaders and elected officials if requested prior to the start of the grazing season to provide an understanding of WDFW's wolf-related management activities and their objectives as they relate to wolf/livestock conflicts that arise during the grazing season (e.g., field response to reported depredations, timing of capture or lethal removal activities, etc.).

Within this context, livestock producers are expected to proactively implement at least two (2) deterrence measures with concurrence from the local WDFW Wildlife Conflict Specialist. The Department's expectation is that livestock producers and the local WDFW Wildlife Conflict Specialist work in collaboration to identify and plan the proactive deployment of the best suited deterrence measures; local Wildlife Conflict Specialists are available throughout the year to work with livestock producers. The proactive deterrence measures must be in place a sufficient amount of time prior to a wolf depredation. The local WDFW Wildlife Conflict Specialist will carefully consider the amount of time necessary for deterrence measures to have had an opportunity to be effective. In most situations, the measures will have been in place for at least one week. Several example deterrence measures with associated expectations for deployment are listed in **Section 4**.

Following a confirmed or probable wolf depredation, the Wildlife Conflict Specialist will:

- Work with the livestock producer to assess the local on-the-ground conditions and risk to determine which deterrence measures in response should be employed (i.e., which techniques are best suited for the specific livestock operation, have the best chance to reduce the likelihood of future depredations, and are the most feasible);
- Collaborate with livestock producers and provide guidance and assistance implementation of deterrence measures in response;
- Increase the frequency of engagement with the affected producer(s);
- Evaluate the timing of de-escalation or lengthier deployment of deterrence measures in response contingent upon wolf behavior, pack size, pack structure, landscape conditions and the proximity of livestock; and
- Attempt to manage the use of deterrence measures in response consistently across packs and regions of the state.

Influencing pack behavior to reduce the potential for recurrent depredations is challenging, especially on allotment-type operations where livestock are dispersed on large landscapes that overlap with a wolf pack territory. In these situations, the Department recommends regular human presence (including range riders, sheep herders, livestock producer employees and family members) around livestock. Regular human presence aids in early detection of sick or injured livestock, monitoring of livestock behavior, and identifying signs of wolf-livestock conflict. As such, WDFW is working to help facilitate

human presence as a proactive deterrence measure in priority areas with individual producers and community-based organizations to:

- Build receptivity and encourage regular human presence around livestock;
- Improve and facilitate opportunities for increased and improved technical capacity in human presence; and
- Secure and provide resources (financial and technical), as available, to jump-start individual and collective efforts of strategic, applicable, and best practices in human presence.

Section 4. Example deterrence measures

This section provides common deterrence measures used to reduce the potential for wolf depredations on livestock. It was developed from a review of the scientific literature on these or other deterrence measures. The literature review can be found on the Department's website at

https://wdfw.wa.gov/sites/default/files/2019-02/wolf_livestock_conflict_avoidance_literature_review_11_2014_final_submitted_version.pdf

(Western Wildlife Outreach 2014).

Additional resources describing non-lethal methods can be found at:

- <https://wdfw.wa.gov/species-habitats/at-risk/species-recovery/gray-wolf/wolves-livestock>
- http://www.dfw.state.or.us/Wolves/non-lethal_methods.asp
- <https://peopleandcarnivores.org/wp/wp-content/uploads/2017/03/WolfResourcesGuide.pdf>
- http://www.defenders.org/publications/livestock_and_wolves.pdf

The tools best suited for a particular livestock operation will depend on many factors associated with the operation, such as the species of livestock, number of livestock, terrain, landscape conditions, and time of year.

The Department's expectation is that livestock producers and the local WDFW Wildlife Conflict Specialist will work in collaboration to identify and plan the proactive deployment of the best suited deterrence measures. Local Wildlife Conflict Specialists are available throughout the year to work with livestock producers so the measures can be implemented a sufficient amount of time prior to when a wolf depredation is more likely to occur. In most situations, the measures will have been in place for at least one week. Also, there may be strategies on the timing and duration of particular deterrence measures, or deterrence measures may be periodically changed or varied to increase their effectiveness.

The efficacy of some of these deterrence measures is not limited to influencing the behavior of wolves. Depending on how the deterrence measures are deployed, they may also influence the behavior of livestock and further reduce the potential for recurrent depredations.

1. Monitoring Livestock (either range riding on large pastures/allotments or human presence on small pastures)

Range riding activities	Range riders funded by		
	WDFW²	Publicly funded programs	Livestock producer
Before livestock are turned out, monitor, scout for and identify (near daily ¹) signs of wolf activity in areas where livestock will graze.	Yes	Yes	Yes
Once livestock are turned out, observe livestock health and behavior (near daily ¹), to look for signs of stress that may indicate wolves are nearby and testing livestock vulnerability and identify potential wolf (and other carnivore) activity around livestock. Notify Wildlife Conflict Specialist as needed in a timely manner.	Yes	Yes	Yes
If wolves are seen in close proximity to livestock, range riders should opportunistically haze the wolves (in the federally delisted portion of the state).	Yes	Yes	--
Locate any livestock carcasses and secure them if the cause of death is suspected to be from a carnivore. Notify the Wildlife Conflict Specialist of the location for an investigation of the cause of death and disposal (when possible).	Yes	Yes	Yes
Assist with sanitation measures outlined in this protocol. Notify the livestock producer and the WDFW Wildlife Conflict Specialist to coordinate disposal if possible and desirable.	Yes	Yes	Yes
Work extended hours (may include nightly) during periods or in areas of significant or increasing wolf activity. Staying on site may be necessary for multiple days as work areas can be remote.	Yes	Yes	--
Manage livestock consistent with the requirements of the lessor's grazing permit and grazing plan on either public or private ground. Livestock management and movement is the sole responsibility of the livestock producer. A range rider may assist with livestock management when authorized by a livestock producer.	May assist when authorized by livestock producer	May assist when authorized by livestock producer	Yes
If sick or injured livestock are discovered, consult with the livestock producer to provide care and/or remove (if necessary and possible).	May assist when authorized by livestock producer	May assist when authorized by livestock producer	Yes

When available and if desired, use wolf location data as a tool to help identify that wolves are in the area (to avoid potential areas of conflict such as den and rendezvous sites).	Yes	Yes	Yes
If negative interactions between wolves and livestock occur, range riders will work with the livestock producer and WDFW Conflict Specialist on feasible strategies to mitigate conflict.	Yes	May assist when authorized by livestock producer and coordinate with WDFW	Yes
Required to complete daily logs and turn them into the WDFW Wildlife Conflict Specialist monthly or more frequently, as requested by WDFW.	Yes	Yes	Yes
Use GPS waypoints, geo-referenced photos, or another locating tool to document daily activities	Yes	Yes	At livestock producer's discretion, if not using state funding
<p>¹ Near daily is generally 4-5 days per week, but allows the rider or riders to remain adaptable to the situation and needs. Range riding presence depends on the number of people assigned to areas, and individuals' time may be allotted to priority areas or specific times of day. Provided resources are available, the intent of this expectation implies that there will be an adequate number of range riders to allow all portions of grazing allotments with livestock presence to be checked on a near-daily basis during times of concurrent overlap with wolf activity. With location-based range rider data, WDFW can determine the extent to which this expectation is being met. Having an exact definition of "near daily" in the protocol may not accurately reflect the dynamic nature of a range rider's job or priority areas.</p> <p>² Includes both WDFW-contracted range riders and those funded by WDFW DPCA-Ls cost share agreements.</p>			

2. Human presence (human presence occurs on smaller pastures or calving areas, typically on private property, during times of increased livestock vulnerability [e.g., lambing, calving, injured livestock in a pen])
 - Increased and regular human presence (e.g., ranch employees, family members, or sheep herders) to protect livestock by patrolling the vicinity occupied by livestock on a daily or near-daily basis.
 - Individuals providing regular human presence communicate frequently with the livestock producer and WDFW about issues including livestock depredations, grazing rotations, and wolf activity.
 - Monitors livestock, protects calving/lambing areas, and uses scare devices to deter wolves from approaching livestock.
 - If practical and feasible, establish calving or lambing areas away from areas occupied by wolves and/or in pastures near ranch houses to provide for easier and more frequent livestock checks and intervention, when necessary.
 - Use protective fencing, fladry, or sheds around calving or lambing areas.
 - Keep the area clean of livestock carcasses.
 - Human presence is intended to monitor livestock, not follow wolves or other carnivores.

3. Protecting Calving/Lambing Areas
 - If practical and feasible, establish calving or lambing areas away from areas occupied by wolves and/or in pastures near ranch houses to provide for easier and more frequent livestock checks and intervention, when necessary.
 - Use protective fencing, fladry, or sheds around calving or lambing areas.
 - Keep the area clean of livestock carcasses.

4. Avoiding Den and Rendezvous Sites
 - Identify areas of concentrated wolf sign that might be an indication of an active den or rendezvous site.
 - Work with WDFW Conflict Specialists prior to grazing season to evaluate the potential for overlap and develop a plan to avoid these areas if the current or potential grazing area overlaps with active den or rendezvous sites.
 - Work with WDFW and the appropriate land management organization to seek time-based and/or geographical separation of livestock and wolves, such as alternative grazing areas, change in route, or delayed turn-out dates.
 - Increase vigilance and time spent guarding livestock in pastures with active den and rendezvous sites in the vicinity.
 - Incorporate strategies to reduce the likelihood of a depredation based on the specific circumstance of the situation (e.g., use of range riders to move grazing livestock out of the high risk areas, place watering sites or mineral blocks to localize livestock to a desired area away from active and known denning or rendezvous sites).

5. Using Scare Devices
 - Coordinate with WDFW to develop a hazing strategy to frighten wolves away from livestock. This might include installing light and noise devices, such as propane cannons, fox lights, radio-activated guard (RAG) systems that alert the range rider/herder to the presence of wolves by emitting flashing lights and loud sounds when a radio-collared wolf approaches the area.

6. Guardian or Herding Dogs

- Guardian dogs are used to alert on-site personnel (herders or range riders) of predator presence and to protect livestock.
- Specific dog breeds and training are required to have effective livestock guardian and herding dogs.
- Guardian dogs and herding dogs are used in conjunction with daily human presence.
- For sheep, guardian dogs and herding dogs may live with the herd to provide protection 24 hours a day, seven days a week.
- Guarding and herding dog owners are trained in effective use of dogs specific to wolf-livestock situations.

7. Strategic Carcass Sanitation

The objective of carcass sanitation is to prevent wolves from being attracted to livestock carcasses in areas frequented by livestock (corral, salt areas, calving pens, etc.) to reduce the potential for wolf-livestock interactions. As such, sanitation is targeted at areas around active and adjacent pastures in close proximity to livestock. Producers (or their family and/or employees) are expected to secure their own livestock carcasses. Example ways to secure carcasses include:

- Create a temporary carcass disposal site on a grazing pasture that is secured so as to not be an attractant.
- Use fladry or electrified turbofladry around a carcass until it decomposes or until it can be removed from the area.
- Bury or burn the carcass consistent with state law, county or city ordinances, and the land management agency's guidelines.
- Work with WDFW to create a permanent carcass disposal site on private property.
- Use predator-resistant fencing as a permanent barrier around a boneyard or carcass pit on private property.
- Develop a composting site consistent with state law, county, and city ordinances.

8. Permanent and Portable Fencing (fladry, electrified turbofladry, calf panels)

- Use predator-resistant or electric fencing as a permanent or temporary barrier to confine livestock and deter predators.
- Create night pens under open grazing conditions.
- Confine a sick or injured animal until it can be transported off range.
- Confine calves born on an allotment under a fall calving operation.
- Use fladry or electrified turbofladry around livestock as a temporary deterrent to wolves.
- Protect a carcass until a depredation investigation can be conducted.

9. Delay Turnout to Forested/Upland Grazing Pastures

- Turnout when livestock calves reach at least 200 lbs (e.g., early calving so calves are older and heavier at turn-out).
- Turnout after wild ungulates are born (approximately mid-June).

10. Coordination with Landowner

Coordination between livestock producer and landowner on potential steps to reduce the likelihood of wolf-livestock conflict, such as:

- Timing of turn-out.
- Grazing areas and restricted areas.
- Pasture/allotment rotation.
- Sanitation.
- Water and mineral block sites.
- And other annual allotment plan instructions related to wolf-livestock interactions.

Section 5. Depredation investigations

Suspected wolf depredations on livestock are reported to the WDFW by the livestock owner (or their family members or employees), local law enforcement, or by other local entities. Department staff respond to these reports usually within 24 hours after a report is made. The reported incident site is treated as a crime scene in order to preserve the physical evidence. The investigation is conducted by a two-person WDFW team (in most situations) with training and experience in wolf depredation investigations. WDFW may coordinate with local law enforcement (as agreed to with local law enforcement agencies) to be present at the investigation to facilitate mutual learning. In areas where wolves are listed under the Federal ESA, WDFW will coordinate with the USFWS on the findings from depredation investigations and seek agreement on the determination of the investigation. WDFW may seek input from other non-WDFW experts. However, the final determination of the investigation will be made by the WDFW staff members who conducted the investigation.

Each investigation is unique based on habitat, time of year, and location of the incident. While performing the depredation investigation, WDFW staff use many different factors to determine if a carnivore(s) was involved in the livestock injury or mortality. These factors could include (but are not limited to) documenting the characteristics of or the presence and/or absence of:

1. The disposition and age class of the livestock;
2. The site where the incident occurred;
3. Animal sign (tracks, scat, hair) at the scene, particularly from wild carnivores;
4. Other species of wildlife in the area, particularly other carnivores (collared and uncollared);
5. Sign of a chase and/or struggle (e.g., tracks in substrate, drag marks);
6. Presence of tissue trauma and hemorrhaging with bite wounds;
7. Blood indicating livestock was alive during attack (can include dried or fresh blood);
8. A scattered or buried carcass in the event of a livestock mortality;
9. Evidence of scavenging (indicating the wildlife associated with said scavenging);
10. Wildlife bedding locations near the scene;
11. Witness accounts;
12. Producer accounts;

13. Any evidence of attack or scavenging present on the hide;
14. Bite wounds associated with attack on a live animal versus scavenging;
15. Location of bite wounds;
16. Presence of broken bones, and;

Based on the factors and physical evidence documented during the investigation, the Department staff who conducted the investigation makes the final determination. In some situations, staff may seek input from individuals or a subset of WDFW staff that did not participate in the investigation. WDFW staff who participated in the investigation may also reach out to non-WDFW experts for further review of the investigation, however the final determination and rationale will be made by WDFW who participated in the investigation.

Once a depredation investigation has been completed (which may take up to 48 hours), the WDFW staff that conducted the investigation make a determination based on classifications from the Wolf Conservation and Management Plan. The classification of the final determination includes 1) confirmed wolf depredation, 2) probable wolf depredation, 3) confirmed non-wild wolf depredation, 4) unconfirmed depredation, 5) non-depredation, or 6) unconfirmed cause of injury or death. Please see **Table 1** and the Department's document, "Livestock injury and mortality investigation: A reference guide for WDFW field personnel" for more information on the investigation process, principles, and factors and physical evidence (online at <http://wdfw.wa.gov/publications/01581/wdfw01581.pdf>).

In an investigation, the level of certainty in the determination of the cause of an injury or mortality of livestock is critically important. As such, the Department will include a description of the "factors" that were and/or were not present and how they contributed to the final determination in the written narrative in the depredation investigation report (See **Section 8** for information communicated to the public).

When a determination of "probable wolf depredation" is made, the factors and physical evidence that distinguish it from non-wolf predation and non-predator determinations will be documented. Examples of those distinguishing factors include sign of struggle, blood at the scene, broken branches, trampled grass, or bite marks characteristic of wolves on remaining portions of the carcass (e.g. bite marks on the tail bone). In addition, other factors must be present that allow for a reasonable ability to rule out other predators, such as the pattern of the attack that is more characteristic of wolves than other predators. When factors are absent that allow for the ability to determine if another predator was responsible, or if it cannot be determined whether or not the animal died from non-predation causes, then the incident would be an "unconfirmed depredation" or "unconfirmed cause of injury or death". Alternatively, if evidence suggests another predator, the classification would be "confirmed non-wild wolf depredation", or if it was clear that the animal died from something other than predation, the death would be classified "non-predation." In probable wolf depredations, WDFW's practice in conducting investigations is such that there is a reasonably high likelihood that the depredation was caused by a wolf, but evidence of hemorrhaging is lacking. Also, for one probable wolf depredation to be included in a pattern of confirmed wolf depredations (see **Section 6**), it must be on the same time scale, with similar periods

of times between depredations, as the confirmed wolf depredations, and in the same area of overlap of wolves and livestock as the confirmed wolf depredations.

Table 1. WDFW classifications for investigation on reported injured or dead livestock.

Classification	Definition from the Wolf Conservation and Management Plan	Principles for determination
Confirmed Wolf Depredation	<p>There is reasonable physical evidence that a wolf caused the death or injury of livestock. Primary confirmation would include bite marks and associated subcutaneous hemorrhaging and tissue damage, indicating that the wolf attacked a live animal, as opposed to simply feeding on an already dead animal. Spacing between canine tooth punctures, location of bite marks on the carcass, feeding patterns on the carcass, fresh tracks, scat, and hairs rubbed off on fences or brush, and/or eyewitness accounts of the attack may help identify the specific species or individual responsible for the depredation. Wolf predation might also be confirmed in the absence of bite marks and associated hemorrhaging (i.e., if much of the carcass has already been consumed by a predator or scavengers) if there is other physical evidence to provide confirmation. This might include blood spilled or sprayed at a nearby attack site or other evidence of an attack or struggle. There may also be nearby remains of other animals for which there is still sufficient evidence to confirm predation, allowing reasonable inference of confirmed wolf predation on an animal that has been largely consumed.</p>	<ul style="list-style-type: none"> • Multiple factors documented at scene consistent with an attack by a wolf. • Often includes attack signature consistent with a wolf (see http://wdfw.wa.gov/publications/01581/wdfw01581.pdf) • Includes subcutaneous hemorrhaging. In practice, 96% of the confirmed wolf depredations in the last 3 years have included hemorrhaging as the factor that led to that determination. The Department will continue to use the factor of hemorrhaging (along with other supporting factors) for determinations of confirmed wolf depredation.
Probable Wolf Depredation	<p>There is sufficient evidence to suggest that the cause of death or injury to livestock was a wolf, but not enough evidence to clearly confirm that the depredation could only be caused by a wolf. A number of factors can help in reaching a conclusion, including (1) recently confirmed predation by wolves in the same or nearby area, and (2) evidence (e.g., telemetry monitoring data, sightings, howling, fresh tracks, etc.) to suggest that wolves may have been in the area when the depredation occurred. These factors, and possibly others, will</p>	<ul style="list-style-type: none"> • Multiple factors documented at scene consistent with an attack by a wolf. • Physical evidence and factors at scene consistent with “confirmed wolf depredation”, except scene is lacking the presence of subcutaneous hemorrhaging. • Factors must be present that allow for a reasonable ability to rule out other predators and non-predation causes of death.

	be considered in the investigator's best professional judgment.	
Confirmed Non-Wild Wolf Depredation	There is clear evidence that the depredation was caused by another species (coyote, black bear, cougar, bobcat, domestic dog), a wolf hybrid, or a pet wolf.	<ul style="list-style-type: none"> • Multiple factors documented at scene consistent with an attack by another wildlife species. • Often includes attack signature consistent with specific carnivore (see http://wdfw.wa.gov/publications/01581/wdfw01581.pdf) • Includes subcutaneous hemorrhaging or other factors that provide physical evidence the livestock was alive when attacked by another species.
Unconfirmed Depredation	Any depredation where the predator responsible cannot be determined.	<ul style="list-style-type: none"> • Single or multiple factors documented at scene consistent with an attack by a predator, but the predator responsible cannot be determined. • May include subcutaneous hemorrhaging (or other factors that provide the same scrutiny of physical evidence the livestock was alive when attacked by a predator). • May include factors from multiple predators (including wolf), but predator responsible for attack cannot be discerned with physical evidence and factors.
Non-Depredation	There is clear evidence that the animal died from or was injured by something other than a predator (e.g. disease, inclement weather, or poisonous plants). This determination may be made even in instances where the carcass was subsequently scavenged by wolves.	<ul style="list-style-type: none"> • Factors and physical evidence indicating livestock was injured or died from something other than a predator.
Unconfirmed cause of injury or death	There is no clear evidence as to what caused the depredation of the animal.	<ul style="list-style-type: none"> • There is no clear evidence at the scene as to what caused the injury or death of the livestock.

Section 6. Lethal removal criteria

The Department's Wolf Conservation and Management Plan indicates that "lethal removal may be used to stop repeated depredations if it is documented that livestock have clearly been killed by wolves, non-lethal methods have been tried but failed to resolve the conflict, depredations are likely to continue, and there is no evidence of intentional feeding or unnatural attraction of wolves by the livestock owner" (See WDFW wolf plan, page 88).

The Department considers the use of lethal removal only in areas of the state where the Department has full management authority for wolves. As noted in **Section 1**, USFWS is currently the lead agency for managing wolves in the western two-thirds of the state. The purpose of lethal removal is to change pack behavior to reduce the potential for recurrent depredations while continuing to promote wolf recovery. The strategy is to attempt to change pack behavior by removing a minimum but sufficient number of wolves before that behavior is reinforced by additional depredations on livestock.

There are a number of variables and complexities related to implementing lethal removal, including the history and pattern of depredations, recovery objectives within a region, estimated pack size (total number, number of adults and pups), the number and timing of depredations, classification of depredations, current year and previous year circumstances, use of deterrence measures (including appropriateness and timing), time of year, and type of livestock.

The Department may consider lethal removal of wolves to attempt to change pack behavior to reduce the potential for recurrent depredations while continuing to promote wolf recovery when all the following criteria are met:

1. Department has documented at least 3 depredation events within a 30-day rolling window of time, or at least 4 depredation events within a 10-month rolling window of time. Stipulations include:
 - At least 1 of the depredation events is a confirmed wolf kill of livestock.
 - One (1) of the depredation events may be a probable wolf depredation if it is a part of a pattern of confirmed wolf depredations (i.e., the probable wolf depredation is on the same time scale, with similar periods of times between depredations, as the confirmed wolf depredations, and in the same area of overlap of wolves and livestock as the confirmed wolf depredations).
2. At least two (2) proactive deterrence measures and responsive deterrence measures have been implemented and failed to meet the goal of influencing/changing pack behavior to reduce the potential for recurrent wolf depredations on livestock. Stipulations include:
 - If proactive deterrence measures are not in place a sufficient amount of time prior to the wolf depredations the Department will only consider lethal removal at a higher number of wolf depredation events and after deterrence measures have been tried and failed at resolving the conflict.

3. WDFW expects depredations to continue (e.g., deterrence measures have not changed pack behavior, and overlap between wolves and livestock is expected to continue in near future),
4. The Department has documented the use of appropriate deterrence measures and notified the public of wolf activities in a timely manner as outlined in **Section 8**, and
5. The lethal removal of wolves is not expected to harm the wolf population's ability to reach recovery objectives statewide or within individual wolf recovery regions.

For depredations on large livestock (i.e., cattle, horses, mules, and donkeys), each depredated livestock equals one "event," unless there is evidence in the investigation that supports multiple livestock in one event (e.g., physical proximity of livestock, reconstructive evidence). For depredations on small livestock (i.e., sheep, pigs, llamas, goats, and alpacas) there may be one or more livestock in one depredation event.

Guarding and herding dogs are also included in the definition of small livestock if, based on the investigation by Department staff, the dog was actively guarding or herding its assigned livestock herd when it was killed by one or more wolves. The same is true for guarding and herding dogs injured by wolves, provided there was one or more confirmed wolf depredations to the other livestock species in the assigned herd, indicating that the dog's injury as part of a pattern of depredations in the assigned herd.

Management approaches for addressing wolf-livestock conflict are based, in part, on the status of wolves within wolf recovery regions and statewide to ensure recovery or long-term sustainability of wolf populations. See appendix G and H in the state's Wolf Conservation and Management plan and Maletzke et al. 2015 for an analysis of anticipated impacts of periodic wolf removal on the status of wolves within wolf recovery regions and statewide.

The decision to implement or not implement lethal removal of wolves is made by the Director.

Section 7. Implementation of lethal removal of wolves

The objective of lethal removal is to change pack behavior to reduce the potential for recurrent depredations while continuing to promote wolf recovery. WDFW's approach is incremental removal, which has periods of active removals or attempts to remove wolves, followed by periods of evaluation.

Periods of an active removal or attempts to actively remove may vary in length of time based on factors such as the number of wolves to remove, the ruggedness of the terrain, the removal method(s) used, and resource availability (e.g., contracted helicopter vendor availability). In most situations, a period of attempting active removal will be two-weeks or less. If no wolves are removed during a period of attempted incremental removal, a period of evaluation will still occur to determine any shifts in the behavior of the pack; the act of attempting to lethally remove wolves may result in meeting the goal of changing the behavior of the pack (Harper et al. 2008).

This protocol recognizes that periods of evaluation are needed to determine if the lethal removal effort met the goal of changing pack behavior. The duration of a period of evaluation will vary in length and is largely based on the depredation behavior of wolves. If there is a documented wolf depredation(s) after a period of active removal, the Department may initiate another lethal removal action, depending on the estimated date of the depredation incident related to the previous period of active removal. As such, the period of evaluation will typically be a minimum of a week unless the pattern of depredations resumes.

The evaluation period may also serve to allow the pack to re-group and possibly allow the next incremental effort to be more effective. Because wolves quickly learn to avoid aircraft and traps (whether used for capture or lethal removal); the extended use of some methods may reduce their efficacy. During evaluation periods, deterrence measures will be re-instituted.

If the Department initiates the lethal removal of wolves, the first incremental removal action will be to remove or attempt to remove 1-2 wolves, followed by an evaluation of the situation to see if the goal of changing pack behavior was met. If depredations continue, the Department may remove additional wolves in the subsequent period(s) of active removal. Under an incremental removal approach, WDFW does not explicitly set as a desired outcome of the removal of the entire pack; however, the removal of the entire pack may occur as a result of repeated incremental removals. In situations such as a relatively small pack, the loss of the pack could potentially occur in two removal attempts (i.e., removal periods). In packs where the lethal removal of wolves is a concern for the recovery of wolves, the number of wolves to remove may be reduced in number or removals may not occur.

The Department will use methods that lethally remove wolves in a humane manner consistent with state and federal laws (e.g., trap types and sizes, trap check requirements, potential impacts to non-target species, etc.). The objective in terms of methodology is to use the best method available that balances human safety, humaneness to wolves, swift completion of the removal, weather, efficacy, and cost. Likely options include shooting from a helicopter, trapping, and shooting from the ground. All methods for removal are consistent with those used by other states and federal jurisdictions. Removal methods are evaluated collaboratively by our wildlife biologists and veterinarian and are consistent with the American Veterinarian Medical Association (AVMA) standards.

Section 8. Communication with public

The Department will notify the public when a confirmed or probable wolf depredation occurs. The notice will include the date the depredation occurred, the name of the wolf pack, what proactive and responsive deterrence measures are deployed (including when they were deployed and information on how the Department assessed the suitability of the measures), and the rationale for the Department's classification of the depredation (i.e., confirmed or probable). This information will be provided in narrative form for each reported wolf depredation and posted on the Department's website. In addition to notifying the public about wolf depredations, the Department will also notify the public when a wolf

pack has met the criteria for consideration of lethal removal and will include the Director's decision to remove or not remove wolves along with the rationale for that decision. This notice will occur prior to any lethal removal action.

The Department will also provide a monthly update about ongoing activities related to wolf conservation and management. These updates will also be posted on the Department's website and will include items such as:

- Known wolf occurrence areas (i.e., packs and non-dispersing lone wolves wearing an active radio collar) including updates to wolf pack maps on the WDFW website.
- Wolf collaring activities.
- Known wolf mortalities.
- WDFW field staff wolf-related work activities.
- WDFW outreach and information, including visual media of wolf related activities and wolves in Washington.
- Relevant information on wolf ecology, terms used, and coexistence measures.
- WDFW activities related to implementation of deterrence measures.
- A narrative of all reported wolf livestock depredation investigations
- For a wolf pack with confirmed or probable wolf depredations, a narrative about the chronology of events including details about which proactive and responsive deterrence measures were deployed.
- WDFW annual wolf report and other wolf related reports or WDFW wolf publications.

To ensure the safety of livestock producers, members of the public, and WDFW personnel, the Department will identify the pack in which the removal will occur, but will not disclose the specific location of the removal, the number of wolves to remove, days of operation, or the method of removal until the end of the grazing season. Once a removal operation has begun, the Department will update the public weekly on the number of wolves removed. Department will provide a final report to the public on any lethal removal action after the operation has concluded.

All wolf related notices and updates will be available on the Department's website at <https://wdfw.wa.gov/species-habitats/at-risk/species-recovery/gray-wolf/updates>. Any member of the public can request to be notified by email about new updates by signing up for an email notification at <https://wdfw.wa.gov/about/lists>.

Section 9. Literature Cited

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