

**Recovery Outline for the Contiguous United States Distinct
Population Segment of the North American Wolverine
(*Gulo gulo luscus*)**



North American Wolverine in Mt. Rainier National Park. *Photo credit: Kayla Shively, Cascades Carnivore Project; used with permission.*

Species Common Name: North American wolverine

Species Scientific Name: *Gulo gulo luscus*

Listing Status: Threatened under the Endangered Species Act (ESA); November 30, 2023 (USFWS 2023b)

Cooperating Region(s): Mountain-Prairie Region 6, Pacific Region 1, and Pacific Southwest Region 8

Cooperating Office(s): Montana, Wyoming, Colorado, and Utah Ecological Services Field Offices; and Idaho, Washington, Oregon, and Sacramento Fish and Wildlife Offices

Species Range: Listed wherever found in the contiguous United States (U.S.). Known breeding range occurs at high elevations in north-central Washington, northern and central Idaho, western Montana, and northwestern Wyoming. Scattered observations elsewhere, primarily in California, Oregon, and Utah.

PURPOSE AND DISCLAIMER

The recovery outline is a succinct document that presents a preliminary recovery strategy and actions to direct recovery efforts for a newly listed species until a recovery plan is completed. Recommendations in the recovery outline are non-binding and are intended to guide (not require) regulatory (e.g., ESA section 7 consultations and section 10 permitting) and conservation actions to be implemented by the U.S. Fish and Wildlife Service (Service) and our partners.

This document lays out a preliminary course of action for the survival and recovery of the North American wolverine within the contiguous U.S. distinct population segment (DPS) (hereafter, wolverine). Formal public participation for recovery planning will be invited upon the release of the draft recovery plan. However, we will consider any new information or comments that members of the public offer in response to this outline during the recovery planning process. For more information on Federal recovery efforts for wolverine, or to provide comments, interested parties may contact us by mail at our Pacific Regional Office (U.S. Fish and Wildlife Service, 911 NE 11th Avenue, Portland Oregon 97232); Mountain-Prairie Regional Office (U.S. Fish and Wildlife Service, 134 Union Boulevard, Lakewood Colorado 80225); or Pacific Southwest Regional Office (U.S. Fish and Wildlife Service, 2800 Cottage Way, Sacramento California 95825).

1. BACKGROUND

A draft recovery outline for this DPS (USFWS 2013a) was prepared in February 2013, in conjunction with the proposed listing rule (USFWS 2013b). This recovery outline supersedes the previous document. For complete background information and citations, please see the Species Status Assessment for the North American Wolverine (USFWS 2018), the Species Status Assessment Addendum for North American Wolverine (USFWS 2023a), and the final listing rule (USFWS 2023b). Electronic copies of these assessment reports and the listing rule are available on the Service's Environmental Conservation Online System (ECOS) species webpage for the wolverine (<https://ecos.fws.gov/ecp/species/5123>).

Important Information Gaps and Treatment of Uncertainties

While wolverines are a well-studied species, areas of uncertainty remain.

Key Areas of Uncertainty

- Snow—especially persistent spring snow—is an important predictor of broad-scale wolverine distribution and density in most habitats. Key uncertainties remain regarding how changes in persistent spring snow, other snow dynamics, and other climate-related factors will affect wolverines in the contiguous U.S. These include: (1) the extent to which wolverine population connectivity and gene flow may be affected; (2) impacts of climate change on ecosystem drivers of wolverine persistence; (3) the volume and persistence of snow required for wolverines to acquire and cache food; (4) how climate change may affect the ability of wolverines to thermoregulate, and whether they may experience sublethal effects from changes in temperature; (5) whether the observed associations of the

wolverine's distribution with snowy and cold environments are driven by reproductive denning needs, other ecological requirements, and/or physiological constraints; (6) the adaptive capacity of wolverines to move to higher elevations for denning given predicted snow loss at lower elevations; and (7) the importance of snow and the impact of projected future decreases in snow on reproductive success.

- Dispersal from Canada is thought to be essential to the conservation of wolverines in the contiguous U.S. However, information on how a recent wolverine trapping closure in parts of southern British Columbia may affect population growth and dispersal from Canada to the contiguous U.S. is lacking, as are long-term data on how major highways affect gene flow in the contiguous U.S. and whether road-crossing structures for these multi-lane highways could facilitate gene flow.
- Some types of winter recreation can affect wolverine occupancy, density, dispersal, and population connectivity. However, the extent of these impacts and their causal mechanisms are still being studied.
- Dispersing wolverines (particularly males) can traverse through low-quality habitats in some instances. However, there is presumably some limit at which wolverines will not cross certain habitats or traverse certain barriers. This threshold is unknown.
- The total and effective population sizes of wolverine populations in the contiguous U.S. as well as population trends are unknown.
- Our knowledge of the rates of wolverine gene flow within Canada, between the contiguous U.S. and Canada, and within the contiguous U.S. is improving, but gaps remain.
- Regulated wolverine trapping is closed in the contiguous U.S. and southern British Columbia, but accidental bycatch likely still occurs incidental to trapping targeted for other furbearers. The amount of incidental wolverine bycatch and its significance for the DPS is not fully known.

Limiting Ecological Traits

Physical and ecological needs of wolverines in the contiguous U.S. include large territories in relatively inaccessible, high-elevation landscapes; access to a variety of seasonally variable food resources (rodents, ungulates, carrion); and structural features such as talus slopes and rugged terrain that provide a substrate for reproductive dens. Wolverines are snow-adapted, cold-climate animals, and in the contiguous U.S. they likely require habitats with persistent spring snow for survival and successful reproduction. Because wolverines have a low reproductive rate, suitability of denning habitat for bearing and rearing young is an important consideration for a demographically viable population. In reproductive dens, deep spring snow improves breeding success by providing suitable thermal microclimate and protection against predation. To make their food supply more predictable and improve survivorship and reproductive success, wolverines routinely cache perishable meat acquired by scavenging or predation; deep snow and cold conditions allow for longer storage of cached food and discourage less cold-adapted predators from raiding caches.

Because wolverines in the contiguous U.S. have a small population size and are widely dispersed across large core areas with suitable high-elevation habitat (see delineation of modeled wolverine habitat cores in Figure 1), effective dispersal is important to maintain connectivity and gene flow among populations, recolonize currently unoccupied areas, and allow for natural interchange and supplementation from the larger wolverine populations in Canada. While wolverines are capable of dispersal over tens or hundreds of miles, it is predominantly males rather than females that engage in such long-distance dispersal. Maintenance of habitat corridors for successful dispersal by females is thus critical for establishing new populations. Human development in low-elevation areas surrounding montane breeding populations likely reduces their ability to function as dispersal corridors. Dispersing individuals also appear to avoid crossing highways with heavy traffic volume, which may thus constitute a barrier to gene flow. Spatial analysis of wolverine genetic structure indicates that the degree of gene flow is better explained by spatial distribution of terrain features on the landscape rather than geographic distance per se; features most conducive to effective gene flow are snow depth, terrain ruggedness, and low housing density.

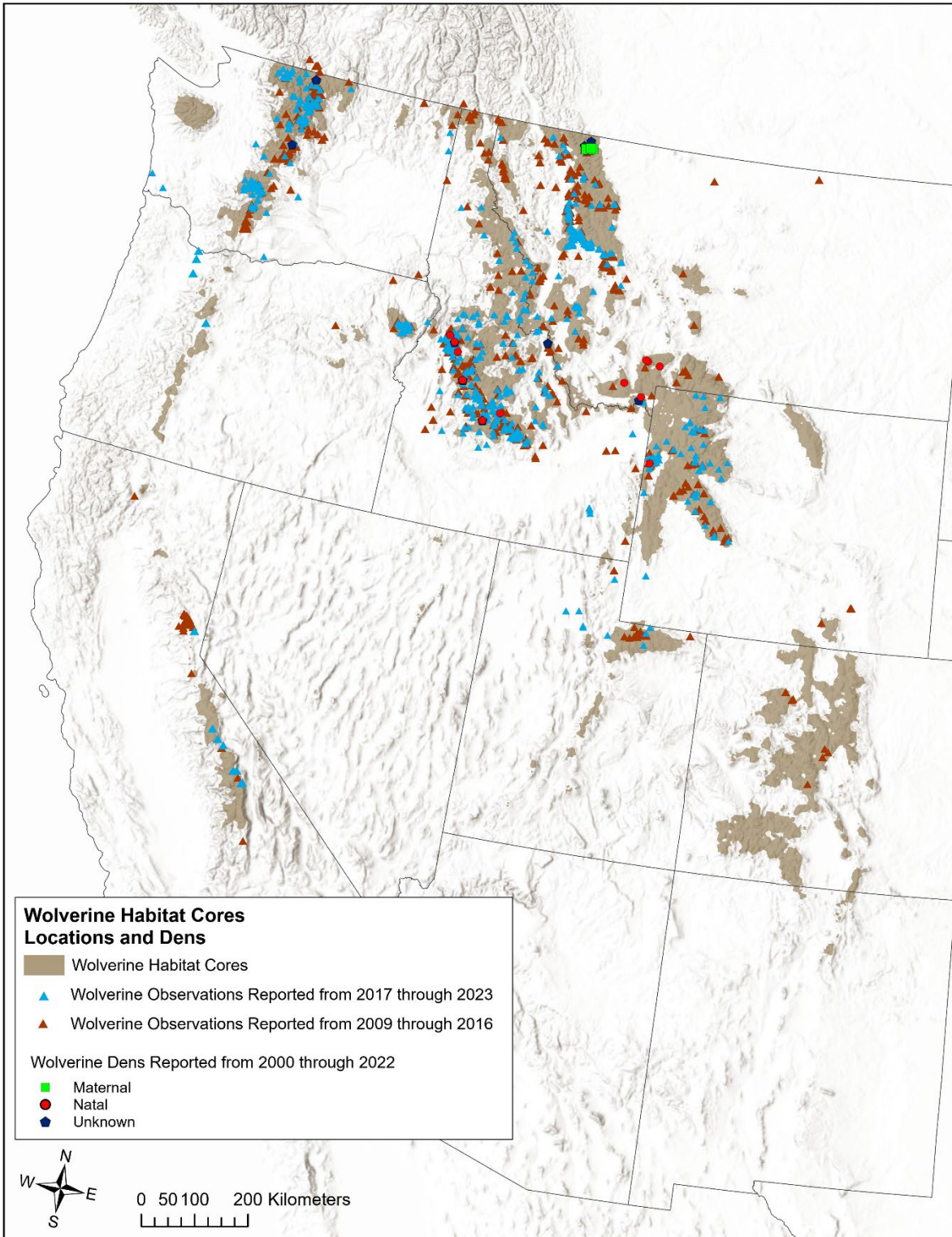


Figure 1. Wolverine observations (2009–2023) and dens (2000–2022) from various sources (State wildlife agencies, U.S. Forest Service, National Park Service, and others), and modeled wolverine habitat core areas. Natal dens are those used during parturition, maternal dens are those used after the natal den and before weaning, and unknown den status indicates a confirmed den as either a natal or maternal den.

Threats

The primary threat to the wolverine in the contiguous U.S. is the projected effect of climate change on its habitat. Other threats, which may be exacerbated by climate impacts, include effects from multi-lane highways, disturbance due to back country winter recreational activity, and other human disturbances and development. Without connectivity to populations in Canada, which may be affected by trapping levels in Canada, genetic diversity and small population effects are of concern.

Current Biological Status

Overview

The historical maximum extent of distribution for wolverines within the contiguous U.S. included, in the east, the boreal forests of New England and much of the Great Lakes region, and in the west, high-elevation alpine areas of the Rocky Mountains, Cascades, and Sierra Nevada. The eastern populations are now extirpated, and the current distribution of breeding populations includes the Cascades in Washington and the Rocky Mountains in Idaho, western Montana, and northwestern Wyoming (Figure 1). Since 2000, isolated individuals have been observed in California, Oregon, Utah, Colorado, North Dakota, and Michigan, but these states are not currently known to have established breeding populations.

Wolverine distribution and probability of occupancy across known breeding populations was assessed in 2016 to 2017 through grid-based surveys on a network of camera stations; the survey was repeated in 2021 to 2022 and extended to Oregon, Utah, and Colorado. The number of detections was highest in Idaho and Montana, and lower in Washington and Wyoming. No wolverines were detected during the formal occupancy survey in Oregon, Utah, or Colorado. Occupancy probability showed geographically variable shifts between the two sampling periods but did not display a clear overall trend; future planned surveys to be repeated at 5-year intervals should provide more information about longer-term trends.

Because wolverines are highly mobile, wide-ranging, and occur in remote mountainous habitat, systematic population surveys that would specifically measure population size and trend (as opposed to distribution and occurrence probability) are extremely difficult and have not yet been attempted in the contiguous U.S. Currently our best estimate of population size in the contiguous U.S. is based on extrapolations from a habitat suitability model developed from wolverine telemetry data in the Yellowstone ecosystem. Total population size was estimated at approximately 300 individuals, with wide uncertainty (confidence interval 249 to 926). The effective population size (N_e) for population genetics is considerably smaller, estimated at 35 in the Northern Rocky Mountains and 4 in the Northern Cascades. Population trend in the contiguous U.S. is unknown.

Resiliency, Redundancy, and Representation

Resiliency and Redundancy: Wolverines currently occur in five primary core regions within the contiguous U.S. (Northern Cascades in Washington, Salmon-Selway in Idaho, northern Continental Divide in northwest Montana, Central Linkage region in Idaho and Montana, and

Greater Yellowstone Ecosystem in northwestern Wyoming and Montana). Additional areas of potentially suitable habitat in Oregon, California, Utah, and Colorado are not currently known to support wolverine breeding populations.

All occupied core regions in the contiguous U.S. that support breeding populations include large, high-elevation areas with rugged topography, low human activity, and deep snowpack persisting to late spring. The habitats in these regions are all vulnerable to loss of persistent snowpack, increased human activity, and development in valleys that could impact population connectivity and gene flow. Finally, all wolverine populations are small, relatively isolated, and potentially vulnerable to inbreeding.

These core regions function as a metapopulation, with the local populations linked by occasional dispersal of individuals that provides genetic and demographic connectivity and potential to recolonize extirpated sites. The broad geographic range across multiple core regions provides redundancy against catastrophic events that may affect individual regions. However, connectivity is impaired by highways and other human development along potential dispersal corridors.

Representation: The adaptive capacity of wolverines to respond to environmental change is restricted by their habitat specificity, intolerance of disturbance, small population size, low genetic diversity, and low reproductive rate. This is partially mitigated by their dispersal ability, dietary adaptability, and broad geographic distribution. Of five western U.S. ecoregions that include large contiguous blocks of potential wolverine core habitat, four are currently occupied by wolverine breeding populations. These ecoregions may be differentially exposed to stressors, and wolverines may have developed behavioral adaptations to local conditions. While some genetic variation exists among regions, overall genetic diversity is low. Because the contiguous U.S. was likely recolonized within the past 60 to 70 years from Canadian sources after extirpation, there has been only short-term opportunity for evolution of local genetic adaptations.

Conservation Actions to Date

Western U.S. states continue to invest in monitoring wolverine occupancy. A notable effort includes that of the Western Association of Fish and Wildlife Agencies Western States Wolverine Working Group, now referred to as the Forest Carnivore Sub-Committee. The purpose of this subcommittee is to *“develop a statistically defensible multi-state monitoring plan for states supporting wolverine populations; seek funding to implement the monitoring plan; coordinate development of individual state wolverine conservation plans for states with suitable wolverine habitat; and coordinate and prioritize research efforts.”*

In 2020, the Wyoming Game and Fish Department developed a wolverine management plan for the State with the goals being: (1) promote long-term wolverine viability, (2) support expansion of wolverines into suitable habitat, (3) support multi-state monitoring efforts, and (4) support management of the wolverine as a protected animal.

Since 2018, Montana Fish, Wildlife and Parks has completed 10 habitat conservation projects conserving wolverine habitat through fee title acquisitions or perpetual conservation easements.

In January 2023, the Idaho Fish and Game Commission adopted a revised *Management Plan for the Conservation of Fisher, Wolverine, and Canada Lynx*, which provides updated guidance and management priorities for the conservation of this suite of species through 2028.

The Utah Wildlife Migration Initiative, founded in 2017, identifies and protects corridors that allow fish and wildlife to disperse to necessary habitat areas around the State. The mission is to document, preserve, and enhance wildlife movement for species throughout Utah. The Migration Initiative and its partners are mapping wildlife movements, including wolverine, to inform the placement of crossing structures that facilitate movement across roads. Similar work is being conducted in other states and is coordinated between states.

Since 2019, the Woodland Park Zoo has been coordinating the Washington Wolverine Research and Monitoring Group, a coalition of researchers and conservationists who lead wolverine projects in Washington. The goal of this group is to advance wolverine research and monitoring in Washington by strengthening communication and collaboration among wolverine researchers statewide. This group meets several times a year to discuss research efforts, share results and insights, and strategize around wolverine research and conservation in Washington.

Wildlife crossing structures spanning the Trans-Canada Highway along the crest of the Continental Divide may improve wolverine connectivity across this highway. Evidence suggests that female wolverines may be starting to use wildlife crossings; however, the efficacy of these structures in restoring gene flow has not yet been determined. There are few wildlife crossing structures spanning major highways in the contiguous U.S.; a series of three under-crossings and one dedicated wildlife overpass on highway I-90 in the Washington Cascades (connecting the northern and southern Cascades) were completed in 2019. To date, however, no wolverines have been detected using these relatively new crossings.

2. PRELIMINARY RECOVERY PROGRAM

Recovery Priority Number

Number: 12

Rationale: We designate recovery priority numbers based on taxonomic distinctiveness, recovery potential, degree of threat, and conflict with economic development (USFWS 1983). The wolverine within the contiguous U.S. is a DPS of a subspecies. Recovery potential is low (threats difficult to manage and alleviate) and it faces a moderate degree of threat (threats are continuing but extinction is not imminent). Its core habitats are primarily in undeveloped areas at high elevations; development is presently limited in scope within core habitat areas although lower-elevation infrastructure could limit connectivity in the future.

Preliminary Recovery Strategy

While the effects of climate change are the overriding threat to wolverine in the contiguous U.S., addressing the direct causes of climate change are outside the scope of this recovery outline. We anticipate that climate change will continue to reduce snowpack and increase ambient temperatures in wolverine habitat over the foreseeable future. As such, recovery of the wolverine

will require attempting to minimize the adverse effects resulting from climate change, largely by addressing and alleviating other stressors and improving connectivity and distribution to increase resiliency and redundancy and to facilitate local adaptation to novel climate conditions (i.e., representation).

The preliminary recovery strategy for the wolverine will include collecting data that will inform the development of a recovery plan based on the best scientific information. While collecting data to address uncertainties will take time, this should not delay the development of broad recovery actions; activities that will be identified in the species' recovery implementation strategy can be refined as needed based on new information. Information needs that are of particular importance, not necessarily in priority order, are: (1) population estimates and trends, (2) genetic health of populations, (3) locating high-risk populations, (4) evaluating effectiveness of dispersal corridors from Canada and among core areas in the contiguous U.S., (5) identification of the overlap of winter recreation with wolverine distribution and its effects on habitat use/occupancy and wolverine demographics, and (6) the causal relationships linking patterns of wolverine distribution, survival, reproductive success with anthropogenic disturbance, infrastructure, and habitat features such as persistent spring snow cover. As part of evaluating dispersal from Canada, close coordination with the appropriate agencies in the provinces of Alberta and British Columbia will be necessary to ensure management there is compatible with adequate wolverine dispersal into the contiguous U.S. If possible, management approaches should be identified and tested for mitigating impacts of reduced snowpack and warmer temperatures on wolverine habitat use, survival, and breeding success.

In addition to maintaining existing wolverine breeding populations in the contiguous U.S., the probability of long-term persistence could be improved by reestablishing self-sustaining wolverine breeding populations in additional core regions of high-elevation habitat. Areas of apparently suitable habitat in Colorado, Utah, California, and Oregon currently lack confirmed breeding populations, and some or all of these populations might be reestablished by translocation or natural dispersal. Current and long-term habitat suitability and feasibility of population reestablishment in these areas should be assessed in coordination with species experts and land managers, and stakeholders. Management of dispersal corridors connecting wolverine populations in the contiguous U.S. with one another and with source populations in Canada should be adapted (e.g., wildlife-crossing structures over highways, land use planning) to improve likelihood of natural dispersal.

Preliminary Recovery Actions

Table 1. Preliminary Recovery Actions – prioritized in order of need for the DPS’s recovery.

Recovery Action	Threat(s) Addressed
Establish monitoring programs for wolverine numbers, demographic parameters, and genetics.	Reduced gene flow, small population effects (genetics and demography) (addresses information gaps to inform management)
Research anthropogenic threats to wolverines and their habitats to inform management and continue research to address information gaps.	Habitat loss (i.e., avoidance of winter recreation), reduced gene flow (reduced dispersal), climate change
Where supported by feasibility studies, facilitate wolverine expansion in occupied and unoccupied areas and restore connectivity to isolated areas of suitable but unoccupied habitat.	Reduced gene flow, small population effects (genetics and demography)
Maintain or improve connectivity of currently occupied core habitats	Reduced gene flow, small population effects (genetics and demography)
Assess and determine the feasibility and risks associated with translocating wolverines to unoccupied habitats.	Reduced gene flow, small population effects (genetics and demography)
Reduce human-caused mortality.	Road mortality, reduced gene flow, small population effects (genetics and demography)

3. RECOVERY PRE-PLANNING CONSIDERATIONS

The recovery plan will be prepared following our three-part recovery planning framework, using biological information from the SSA and SSA addendum, and will include a recovery implementation strategy identifying and prioritizing short-term recovery activities for the DPS.

Biological Scope of the Recovery Plan

A single-species recovery plan will be developed for the contiguous U.S. DPS of the North American wolverine.

Who Will Develop the Recovery Plan

The recovery plan will be developed by the Service, in collaboration with partners. We plan to actively seek information and input from land management agencies and other stakeholders.

Plan for Stakeholder and Tribal Partner Involvement in Recovery Planning

Partners and stakeholders may include, but are not limited to: States, Tribes, First Nations in Canada, U.S. Forest Service, Bureau of Land Management, National Park Service, U.S. Geological Survey, U.S. Department of Agriculture Animal Plant Health Inspection Service-Wildlife Services, Federal Highway Administration, researchers, timber industry, non-governmental organizations, Canadian provincial and federal governmental agencies, wildlife

and land managers, recreational interests, land owners, local communities, and other members of the public. At the local or regional level, stakeholders will be able to participate in wolverine conservation efforts. Service field offices and regional offices within the range of the wolverine will seek input from stakeholders on land management actions and scientific information about status and conservation of wolverines as the draft recovery plan is being developed. Input from non-Federal stakeholders will be requested on an individual basis rather than seeking consensus recommendations from a group, consistent with the requirements of the Federal Advisory Committee Act. As the recovery plan is being developed, we will also coordinate with partners on development of a recovery implementation strategy identifying short-term priorities and project-level activities to implement recovery actions. The draft recovery plan will be made available via a notice of availability formally opening the public comment period posted on our [national website](#). We will consider all public comments as we finalize the recovery plan.

Recovery Planning Milestones

Our objective is to complete a draft recovery plan within 18 months of the DPS's final listing effective date, and a final plan within 2.5 years of the listing effective date.

Approved: _____
Assistant Regional Director, Ecological Services

Citation:

U.S. Fish and Wildlife Service. 2023. Recovery Outline for the Contiguous United States Distinct Population Segment of the North American Wolverine (*Gulo gulo luscus*). Portland, Oregon. 12 pp.

4. LITERATURE CITED

- [USFWS] U.S. Fish and Wildlife Service. 1983. Endangered and threatened species listing and recovery priority guidelines. Federal Register 48:43098-43105 and 48:51985.
- [USFWS] U.S. Fish and Wildlife Service. 2013a. Draft recovery outline: North American wolverine (*Gulo gulo luscus*) contiguous United States distinct population segment. Montana Ecological Services Field Office. 16 pp.
- [USFWS] U.S. Fish and Wildlife Service. 2013b. Endangered and threatened wildlife and plants; Threatened status for the distinct population segment of the North American wolverine occurring in the contiguous United States. Proposed rule. February 4, 2013. Federal Register 78:7864-7890.

For detailed citations of additional references that support and inform this recovery outline, see the following documents:

- [USFWS] U.S. Fish and Wildlife Service. 2018. Species status assessment for the North American Wolverine (*Gulo gulo luscus*). Version 1.2. 168 pp. Available at: <https://ecos.fws.gov/ServCat/DownloadFile/187253>.
- [USFWS] U.S. Fish and Wildlife Service. 2023a. Species status assessment addendum for North American Wolverine (*Gulo gulo luscus*). 96 pp. Available at: <https://ecos.fws.gov/ServCat/DownloadFile/241046>.
- [USFWS] U.S. Fish and Wildlife Service. 2023b. Endangered and threatened wildlife and plants; Threatened species status with section 4(d) rule for North American wolverine. Final rule. November 30, 2023. Federal Register 88:83726-83772. Available at: <https://www.govinfo.gov/content/pkg/FR-2023-11-30/pdf/2023-26206.pdf>.