

These Conservation Measures may not apply to all activities, situations, and scenarios associated with a proposed action. Additional project design features and/or Best Management Practices may be developed by the action agency or applicant and implemented to meet species and habitat conservation needs while meeting the objectives of the proposed action pursuant to administrative and agency direction. The Conservation Measures included in this document may be updated and future iterations may be available through IPAC. The IFWO is developing example conservation measures for many of the listed entities in Idaho; these can be found here as completed: <https://www.fws.gov/library/collections/conservation-measures-idaho-species>. If you have questions contact the IFWO via email at fwlidahoconsultationrequests@fws.gov. This document contains a list of example conservation measures for North American wolverines grouped by activity type.

North American Wolverine Conservation Measures (*Gulo gulo luscus*)

(November 18, 2025 update)

Habitat and Background:

North American wolverines are listed as threatened under the Endangered Species Act (Act) as amended (16 USC 1531 et seq.; [Act]; 88 FR 83726) and section 7 consultation is required if a Federal agency action may affect the species. The U.S. Fish and Wildlife Service (Service) has identified the following conservation measures to help avoid or minimize effects to wolverine from specific actions. During Section 7 consultation, the action agency will develop a biological assessment (BA) or biological evaluation (BE) that will describe effects of the action on wolverines and other listed species. The BA or BE will assist the Service in conducting an effects analysis resulting in a letter of concurrence and/or biological opinion. The BA or BE should clearly explain which conservation measures will be implemented by the action agency and how the conservation measures will avoid or minimize effects to wolverine from the proposed action.

This document outlines general conservation measures that may be considered during project development and planning. First, the measures in this document are categorized by activity. Next, Table 1 defines terms, definitions, sources, and notes and how each applies to the analysis of effects on the species, followed by a figure outlining wolverine reproductive chronology (Figure 1). This is a living document, and the Service may update it with new best available science and information as needed. To provide feedback on this document, please contact your local Ecological Services office. Conservation measures are NOT required by the Service although adoption and implementation provides opportunities for Federal agencies to meet their responsibilities outlined in section 7(a)(1) of the Act. However, once conservation measures are committed to in a BA, BE, or other documentation from the action agency, conservation measures become part of the proposed action. Failure to implement conservation measures or deviation from conservation measures included in a final BA, BE, or other final consultation documents may result in effects beyond those originally considered in the consultation and could lead to the need for re-initiation of consultation.

Denning Conservation Measures

Females with kits can be sensitive to human disturbance and may abandon den sites if disturbed (Krott 1960, p. 26; Pulliainen 1968, p. 343; Copeland 1996, p. 93), though this sensitivity appears variable at the individual level (Magoun 1985, p. 73). Den-shifting behavior represents a tradeoff between moving, risking potential energy loss, and vulnerability of offspring during den shifts versus staying in the original den site and risking exposure to disturbance or changed conditions that might make the original den site unsuitable (USFWS 2023a, p. 23).

- Maintain or enhance important habitat features used for denning, such as large diameter downed trees and upturned roots of trees (USFWS 2018, p. 28). Include design measures that identify and protect important habitat structures prior to implementing vegetation treatments in or adjacent to maternal/denning habitat.
- Avoid activities generating noise above ambient levels within wolverine maternal/denning habitat (see **denning habitat** and **maternal habitat**, Table 1) from January 15 to May 15.
- Establish a temporary no-entry zone in modeled wolverine maternal/denning habitat for actions taking place in modeled wolverine maternal/denning habitat from January 15 to May 15 (i.e., no actions will take place in modeled maternal/denning habitat during the denning season). See Table 1 for reference to recommended application of various models. If the action agency is unable to spatially or temporally limit project activities so that no activities will take place within maternal/denning habitat during the denning season, below are some alternatives with varying degrees of protection:
 - Implement a temporary no-entry zone across in as much wolverine maternal/denning habitat in the action area as possible from January 15 to May 15.
 - Limit the duration of or phase activities that must occur in maternal/denning habitat during the denning season. For example, for a large-scale action, schedule impacts such as major equipment operations in one drainage or average female home range size (see **home range**, Table 1) at a time. All work should be completed before moving on to an adjacent drainage or work site. Areas free of disturbance will be identified in the proposed action's design.
 - Limit activities in wolverine maternal/denning habitat during the denning season, especially those using motorized vehicles (plows, heavy machinery, etc.).
- Establish a temporary 3.1 mi (5 km) no-entry zone around a known, occupied den site from January 15 to May 15 (Arronson et al. 2023, pp. 5-6).¹ Because denning areas may be re-used, areas around these den sites should be re-surveyed in future years prior to removing the buffer. If the action agency is unable to implement a 3.1 mi buffer, implement a 1.2 mi (2 km) radius buffer to minimize effects. A 1.2 mi buffer may also be used for some actions that take place during the early part of the denning period (February-April) when kits are immobile.¹ As wolverines shift den sites multiple times

¹ Arronson et al. (2023) found that the mean distance females traveled from a new den site from a previous den site during the denning season was approximately 3.1 mi (5 km). Females stayed within 1.2 mi (2 km) of their den site between February and April 15 (Arronson et al. 2023, Table 2).

per season, this buffer applies to active dens only and may need to be updated as the female and kits move on the landscape or expanded if the certainty of the current den site is unknown.

- Avoid project-related off-road activities during the denning season within wolverine maternal/denning habitat from January 15 to May 15 (Heinemeyer et al. 2019, entire).²
- Survey slash piles (especially old slash piles with large logs or piles far from actively used roads) for evidence of denning wolverines prior to winter pile burning in wolverine denning habitat (Scrafford and Ray 2022, p. 12).

Activity-Specific Conservation Measures

Winter Recreation Conservation Measures

Winter recreation includes but is not limited to: skiing, snowboarding, snowmobiling, cat-ski, heli-ski, yurt-supported skiing, and snow shoeing. Wolverines avoid dispersed, unpredictable recreation and overall increases in human presence during winter (Heinemeyer et al. 2019, entire), which overlaps the denning season (January 15 to May 15). Road and route use associated with recreation activities can be a cause of mortality or injury to wolverines when strikes occur (USFWS 2018, p. 58) or result in wolverine avoidance and lower occupancy probability in otherwise suitable wolverine maternal/denning habitat (Scrafford et al. 2018, p. 541; Carroll et al. 2001, p. 969; Kortello et al. 2019, p. 10). Studies have also documented wolverines selecting den sites away from roads (Jokinen et al. 2019, pp. 8–9; May et al. 2012, p. 202).

- Avoid the development of new or the extension of existing motorized and non-motorized trails, roads, and designated routes within modeled wolverine maternal/denning habitat.
- Prohibit permitted motorized and non-motorized dispersed winter recreation in wolverine maternal/denning habitat from January 15 to May 15 (Heinemeyer et al. 2019, pp. 14-15).
- Outfitter and guide permit holders: inform clients during orientation about wolverines, including basics on their biology, ecology, conservation status, and identification. Identification training will include identifying wolverine tracks, possible denning areas, and emphasize the importance of avoiding disturbing denning individuals.
- Require that motorized and non-motorized recreation, as a part of the action, keep to designated linear paths (roads and trails) in maternal/denning habitat from January 15 to May 15 if recreation in wolverine denning habitat cannot be avoided (Heinemeyer et al. 2019, pp. 14-15).²
- Limit future expansion of dispersed winter recreation areas in wolverine denning habitat (Heinemeyer et al. 2019, pp. 14-15).²

Construction/Mining Conservation Measures

While the effects of anthropogenic noise on wolverines have not been studied, the species' sensitivity to human presence and infrastructure is well documented (Krott 1960, p. 26; Pulliainen 1968, p. 343; Copeland 1996, p. 93; Heinemeyer et al. 2019, entire; USFWS 2023, p. 35). A literature review on the effects of noise to wildlife indicated that anthropogenic noise may

² Heinemeyer et al. (2019, pp. 14-15) found that dispersed or off-road recreation activities elicited a stronger response than recreation along roads and groomed routes, with females showing more sensitivity to disturbance than males.

have a range of effects on wildlife, from avoidance of noisy habitats to changes in foraging behavior and impacts on individual fitness (Shannon et al. 2016, entire).

- Use appropriate sound dampening and muffling equipment to minimize noise from equipment and facilities. When possible, high noise activities will be scheduled at the same time. Equipment will be monitored and maintained to reduce noise related impacts.
- Use electric line power when practicable during operations to eliminate generator noise in maternal/denning and primary/core habitat, except in emergency situations when grid power is down or for temporary use in remote areas where it is not practical to run power lines.
- Use perimeter fencing around mud sumps used for drilling operations to keep wildlife from accidentally falling into the excavation.

Road Use, Decommissioning, and Restoration Conservation Measures

Road and route use can be a cause of mortality or injury to wolverines when vehicle strikes occur (USFWS 2018, p. 58). Increased densities of roads are associated with wolverine avoidance and lower occupancy probability in otherwise suitable wolverine primary/core habitat (Scrafford et al. 2018, p. 541; Carroll et al. 2001, p. 969; Kortello et al. 2019, p. 10). Studies have also documented wolverines selecting den sites far from roads (Jokinen et al. 2019, pp. 8–9; May et al. 2012, p. 202). Infrastructure and roads also negatively impact wolverine dispersal and connectivity at high intensities of use and densities (Sawaya et al. 2019, pp. 621–622; Balkenhol et al. 2020, p. 799; Barrueto et al. 2022, p. 8), though wolverines have been documented traversing areas with greater amounts of human infrastructure when dispersing between core habitat areas than they would select for within their home ranges.

- Avoid road construction or increased road use (i.e., multi-lane, high-traffic roads, and high road density within and between core regions) within wolverine maternal/denning, primary/core, and dispersal habitat. This is especially important in dispersal habitat areas of higher connectivity value as defined by Carroll et al. (2020, entire).
- Leave undeveloped areas within the project area to facilitate travel and dispersal when developing infrastructure in wolverine maternal/denning, primary/core, and dispersal habitat.
- Remove dead animals from roadways as soon as possible to reduce attractants.
- Prohibit project-related off-road activities during the denning season (January 15 to May 15) within wolverine maternal/denning habitat.
- Avoid using administratively closed roads from January 15 to May 15 in maternal/denning habitat.
- Construct wildlife passage infrastructure such as specialized culverts and overpasses to facilitate wildlife crossings in situations where the construction or improvement of roads, in particular multi-lane, high-traffic, high speed roads that separate core regions, is unavoidable.
- Restore wolverine maternal/denning, primary/core, and dispersal habitat after project completion. This includes decommissioning, obliterating, or rehabilitating temporary roads, and returning restricted roads to administrative access only. Rehabilitation activities may include, but are not limited to:
 - removing temporary structures,
 - recontouring the road prism to natural ground contour,

- recontouring within sight of the beginning of the route,
- installing permanent closure structures to eliminate the unauthorized motorized use of the route,
- seeding or planting disturbed soil with a native plant mix, as specified by a qualified botanist, and
- placing woody material across the road template to allow revegetation.

Wildfire Conservation Measures

Firefighter and public safety should always be the first priority of incident response over conservation of listed species. Road, route, and fireline use for fire suppression can have a variety of effects to wolverines, including wolverine avoidance and lower occupancy probability in otherwise suitable wolverine primary/core habitat (Scrafford et al. 2018, p. 541; Carroll et al. 2001, p. 969; Kortello et al. 2019, p. 10), den site selection away from roads (Jokinen et al. 2019, pp. 8–9; May et al. 2012, p. 202), and negative impacts to dispersal (Sawaya et al. 2019, pp. 621–622; Balkenhol et al. 2020, p. 799; Barrueto et al. 2022, p. 8).

- Rehabilitate firelines in wolverine primary/core habitat as soon as possible prior to the January 15 through May 15 denning season and where feasible to return wolverine habitat to baseline conditions.

Monitoring and Research Conservation Measures

- Avoid travelling within 3.1 mi (5 km) of known, active den sites between January 15 to May 15 when travelling to check camera taps, hair snares, or other passive monitoring devices. Females with kits can be sensitive to human disturbance and may abandon den sites if disturbed (Krott 1960, p. 26; Pulliainen 1968, p. 343; Copeland 1996, p. 93), though this sensitivity appears variable at the individual level (Magoun 1985, p. 73).
- Develop and implement a wolverine inventory and monitoring program that includes annual (or as necessary so as not to disturb denning females) den surveys (see Western States Wolverine Working Group 2018).
- Report wolverine sightings to the Service as soon as possible.

Other Conservation Measures or Best Management Practices

- Do not use rodenticides, poisoned baits, or other chemicals known to be harmful to carnivores in wolverine maternal/denning or primary/core habitat.

Terms and Definitions

Table 1 provides terms and their definitions for use in analysis and consultation. Standardized definitions and common understanding about how these terms apply during consultations and specifically in effects determinations provides consistency between the Service and action agencies or applicants. Not every term will be applicable for every project, but some action agencies or applicants may find certain terms helpful in developing a BA to determine the effects of the actions on wolverine.

Table 1. North American Wolverine habitat terms, definitions, sources, and notes for use in consultation.

Term	Definition	Source	Notes
core habitat	Areas of predicted highest-quality wolverine habitat. <i>Synonymous with primary habitat.</i>	Carroll et al. 2020, pp. 3, 5	Covariates used by Carroll et al. (2020) to model core habitat included human land use, geomorphology, snow, and vegetation. Defined as habitat above 0.95 sensitivity threshold using a second-order resource selection function (Carroll et al. 2020, p. 3). This map is available upon request.
core regions	Patches of wolverine habitat grouped by Inman et al. (2013, pp. 280-283) based on capacity, connectivity, and land ownership pattern. Wolverines are distributed in five primary core regions in the contiguous U.S.: the Northern Cascades in Washington, the Salmon-Selway in central Idaho, the northern Continental Divide in northwest Montana, the Central Linkage region of Idaho and Montana, and the Greater Yellowstone Ecosystem in Wyoming and Montana.	Inman et al. 2013, pp. 280-283; USFWS 2023, pp. 62-63	This term is often used to discuss wolverine populations on a landscape level. Note: these groupings are not based on gene flow or relatedness of populations, as there may be gene flow between core regions. (Inman et al. 2013, p. 280).
denning season	A time period characterized by wolverine shelter use, often for birthing and rearing young. Wolverines use both natal dens and maternal dens for rearing young. The denning season ranges from January 15 to May 15.	Aronsson 2017, pp. 45-46; USFWS 2018, pp. 24 (Table 2), 25, 27.	When possible, proposed actions should occur outside the denning season to avoid or minimize potential adverse effects to wolverines.

Term	Definition	Source	Notes
denning habitat	Areas containing habitat features wolverines require for denning. Denning habitat is generally characterized by areas that maintain snowpack during the winter through late spring (typically April-May), though other habitat features are also important such as habitat structure (e.g., uprooted trees, boulders, and talus fields), topographic structure, and elevation. <i>Synonymous with maternal habitat.</i>	USFWS 2018, p. 38	<p>Denning habitat (also known as maternal habitat) should be defined using a habitat model most appropriate for the action area and proposed action.</p> <p>Copeland et al. (2010) modeled late spring snow globally and found nearly all known wolverine dens occurred in areas with persistent late spring snow. Most dens within North America included in the study were found within layers representing 3-7 years of persistent late spring snow (Copeland pers. com. 2024, unpublished). This map is available from the Service upon request.</p> <p>Inman et al. (2013) modeled maternal habitat as a subset of primary/core habitat. Primary/core habitat was modeled using climatic, topographic, and other covariates. This model uses data from the Greater Yellowstone Area. This map is available upon request.</p>
den	A shelter used by wolverines, often for birthing and rearing young. Wolverines use both natal dens and maternal dens for rearing young (<i>see maternal dens and natal dens</i>).	USFWS 2018, pp. 25-26	Effects to denning wolverines and kits should be considered if the proposed action takes place in modeled wolverine maternal/denning habitat or if a known den site is within the action area. This may include considerations for both wolverine maternal and natal den use. In North America, dens are typically made of a snow tunnel ending in structures such as a large boulder pile or woody debris.

Term	Definition	Source	Notes
dispersal habitat	Areas of lower-quality habitat in between patches of primary/core habitat that wolverines may move through.	Carroll et al. 2020, pp. 9-10; Inman et al. 2013, p. 281; USFW 2018, pp. 22-23	<p>Inman et al. (2013) defined this as habitat with the lowest habitat value wolverines would disperse through in modeling exercises (i.e., 0.966 for females and 0.933 for males) (Inman et al. 2013, p. 281).</p> <p>Carroll et al. 2020 developed a resource selection function that identified areas of higher connectivity value.</p> <p>Dispersal habitat is generally in lower elevations than primary/core habitat.</p> <p>Dispersing wolverines behave differently than resident wolverines. They more readily travel through lower-quality habitat than residents would select for their home range, though they still follow low resistance pathways. Wolverines have been observed dispersing over very long distances across non-alpine areas, such as grasslands and shrublands. Females tend to establish home ranges near their natal ranges; therefore, wolverine dispersal is male-biased.</p>
home range	The area a single resident individual wolverine maintains as its territory.	USFWS 2018 Table 1, p. 22	The average female home range size varies by geographic area from 54 mi ² (139 km ²) to 148 mi ² (384 km ²) within the contiguous United States, while the average male home range size varies from 201 mi ² (521 km ²) to 610 mi ² (1,582 km ²) within the contiguous United States (USFWS 2018 Table 1, p. 22).

Term	Definition	Source	Notes
maternal habitat	Habitat suitable for use by reproductive females. <i>Synonymous with denning habitat.</i>	Inman et al. 2013, p. 281	Maternal habitat is a subset of primary/core habitat based on habitat scoring >0.968 in modeling exercises (Inman et al. 2013).
primary habitat	Areas suitable for long-term survival by resident adults. <i>Synonymous with core habitat.</i>	Inman et al. 2013, p. 281	Used by Inman et al. (2013) and defined as a predicted habitat scoring > 0.967.
rendezvous sites	Locations where a female leaves her young while she hunts for food. These areas provide security for young and serve as locations where females bring food to the young or where she will guide them to a food source. Females may move their young to new rendezvous sites repeatedly over a two-month period, with distances as far as 5.3 mi (8.5 km) reported in the literature. These sites are typically used from April-June, with a peak in early May.	Copeland 1996, p. 94; Inman et al. 2012a, p. 638; Magoun 1985, pp. 16, 73, 76, 77; USFWS 2018, p. 26	Rendezvous sites should be considered when analyzing effects from actions in maternal/denning habitat during the time of year when rendezvous sites are used.

A figure showing the reproductive and life history cycles of the North American Wolverine. Events include mating, nidation, gestation, parturition, reproductive den use, weaning, rendezvous sites, independence, dispersal, lactation, and post-weaning growth.

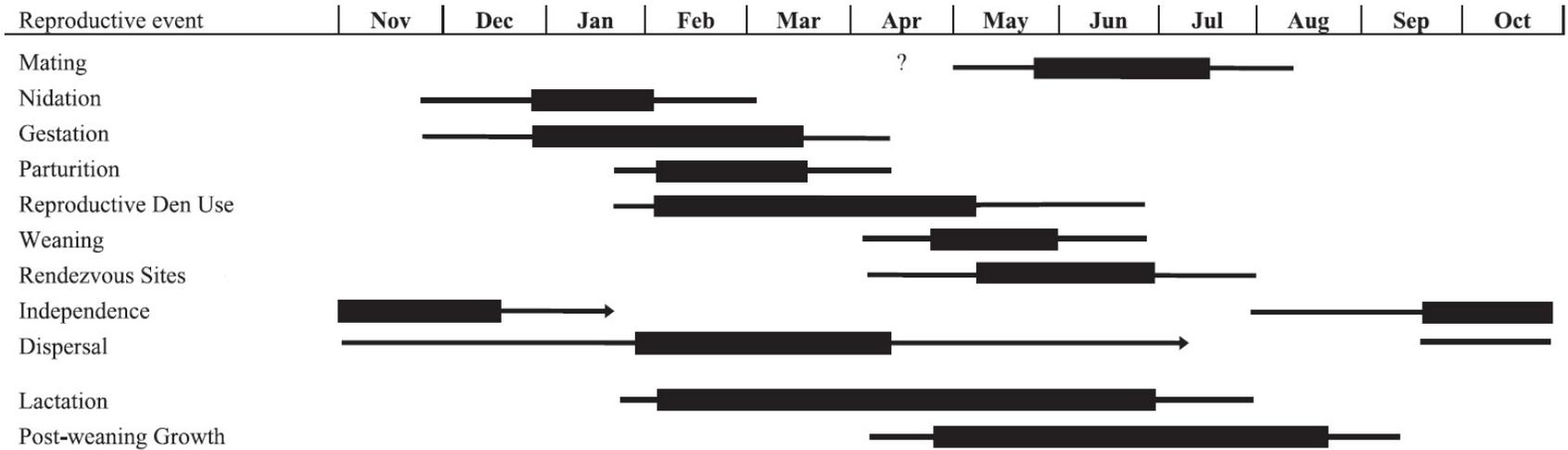


Figure 1. Range (thin line) and peak (thick line) time period of wolverine reproductive events (modified from Inman et al. 2012b, Figure 2, p. 637). Understanding when wolverine reproductive and life history events occur throughout the year is essential to conducting a thorough effects analysis and may also help when developing conservation measures such as work windows and no-entry zones.

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