

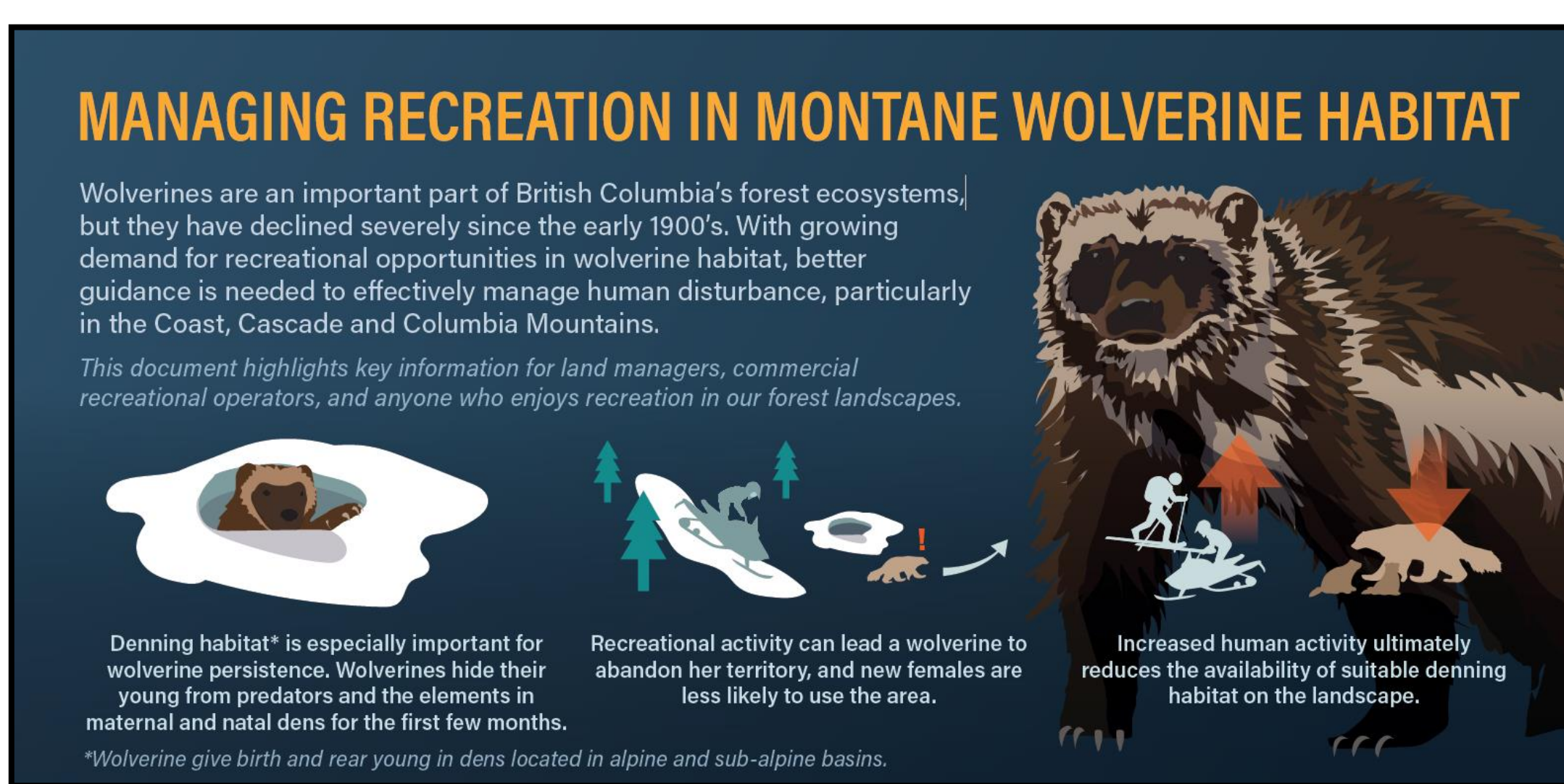
Guidelines for Activities near Wolverine Dens

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Introduction

Wolverine are rare and iconic animals of wilderness, seldomly seen, yet are increasingly coming in contact with people as industry and recreation increases in frequency over greater areas (Fisher et al. 2022). If disturbed, females may abandon dens and move their kits to a different location (Magoun and Copeland 1998; Glass et al. 2022). Relocation impacts energetics puts kits at risk of predation (Persson et al. 2003; Inman et al. 2012).

Den abandonment is of conservation concern; successful female reproduction is important for viable wolverine populations (Persson 2005). Our goal is synthesize existing information in order to guide activities near breeding females.



Managing Recreation in Wolverine Habitat

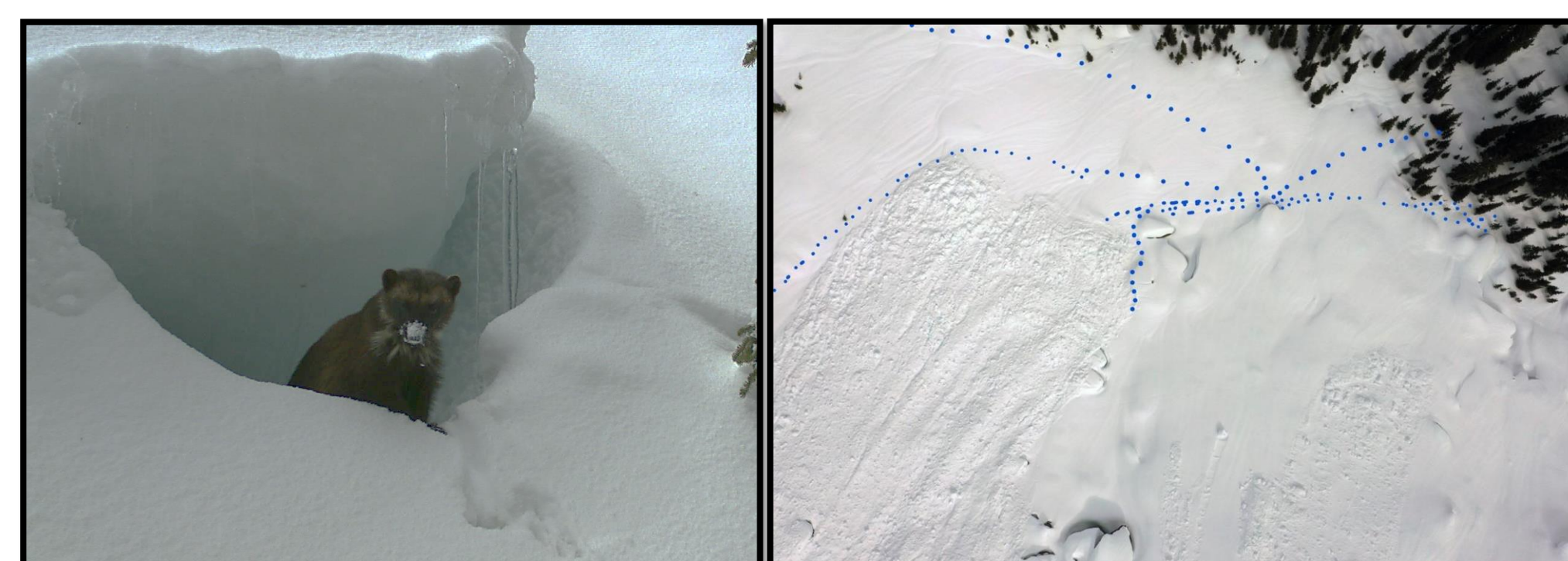
Justification for managing or mitigating recreation in wolverine habitat. Figure adapted from Fuse Consulting Ltd.

Methods

In the Columbia Mountains, 17 reproductive dens from 8 female wolverine (Krebs et al. 2007) and 11 denning areas were monitored using radio- telemetry or Unmanned Aerial Vehicles, remote cameras and citizen science, respectively.

Identification of Denning Areas by Industry and Public

Dens can be identified by tracks leading to a hole in the snow or under a boulder, with activity repeated over a period of at least three weeks from January to mid-May (May et al. 2012).



Wolverine emerging from a den site under a boulder (left). Image captured by remote camera. Wolverine tracks going to the same den location (right). Tracks depicted in blue. Image captured by unmanned aerial vehicle.

Interpretation of Wolverine Sign

- Single track/sighting: Avoid following tracks, report the sighting and direction of travel. It is not necessary to avoid the area.
- Multiple tracks/network of tracks observed once during the denning period: Avoid the area for >1 week; report the tracks.
- Multiple tracks/network of tracks observed over multiple weeks during the denning period: Likely a den: avoid for the duration of denning season; report the tracks to www.wolverinewatch.org.

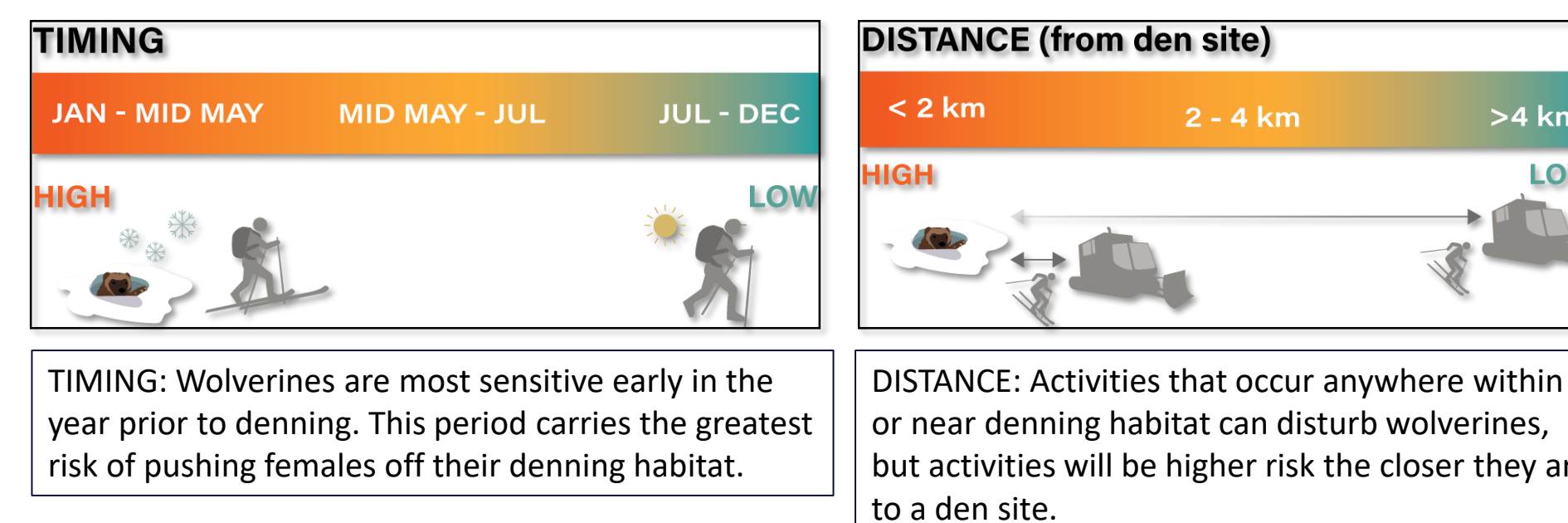
Guidelines for Operating in Known Denning Areas

Timing

The wolverine reproductive season can be broken into three periods: birth - January to mid-March; nursing/natal development - January through June; and post-weaning - mid-April to mid-August (Inman et al. 2012). Dens are used during birth and natal development from January to mid-May (Inman et al. 2012).

Distance

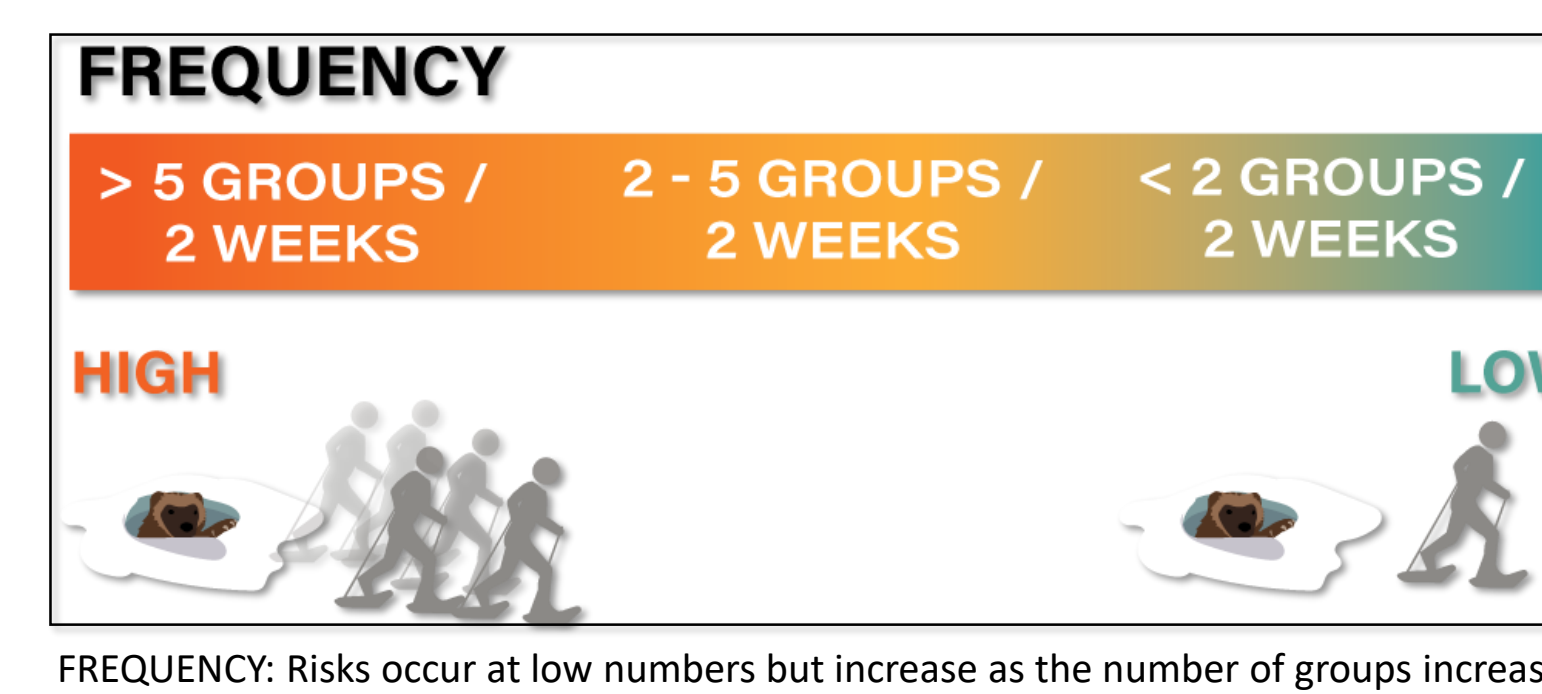
Fidelity to denning areas is high and multiple dens close by are used within and between seasons (Aronsson 2017). In montane regions of B.C. and Idaho (Magoun and Copeland 1998), distance between dens was <4 km. We provide guidelines on distances activities should occur from known dens based on these movements.



Risk assessment of activities in relation to the reproductive period and distance to wolverine den sites. The risk is female wolverines may shift den site, lose kits, or abandon denning territories. Figures Fuse Consulting Ltd.

Frequency

Wolverines have a low threshold for human use in their habitat (Heinemeyer et al. 2019; Barrueto et al. 2022) and these effects are likely amplified for denning. The strongest decline in wolverine detection occurred with low human use in B.C. and Alberta (0-10 non-motorized groups in a 2-week period; Barrueto et al. 2022).



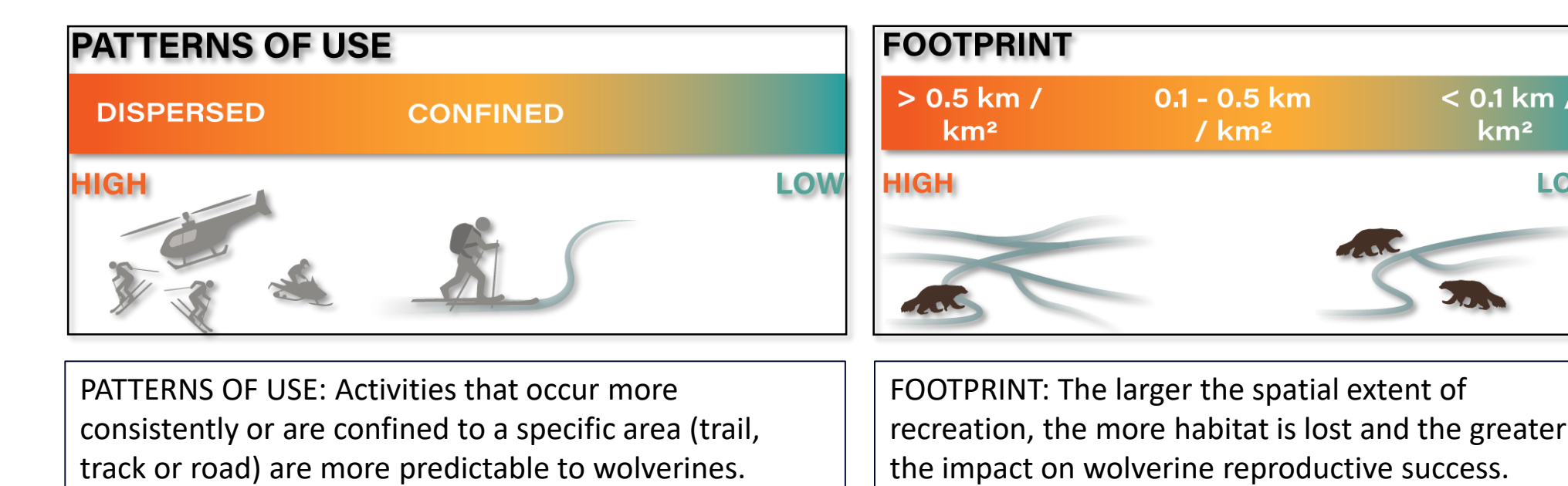
Risk assessment of activities by frequency of groups in relation to wolverines. The risk is females may reduce, shift or abandon territories. Figure adapted from Fuse Consulting Ltd.

Pattern of Use

Remaining on existing access roads/trails is a key component to concentrating recreational users; it enables wolverine to habituate to use patterns and select dens based on predictable movements (Heinemeyer et al. 2019).

Footprint

The human footprint is broadly reflected by road density, even unplowed roads negatively impact wolverine presence and abundance (Dawson et al. 2010; Scrafford et al. 2018; Kortello et al. 2019; Mowat et al. 2020). Females in montane B.C. showed low tolerance for roads during the denning season; their probability of occupancy was halved when road density increased from 0.1 km/km² to 0.5 km/km² (Kortello et al. 2019).



Risk assessment of activities in relation to patterns of use and footprint (road density) in female home ranges. The risk is females may reduce, shift or abandon territories. Figures Fuse Consulting Ltd.

Conclusion

Wolverine territories are enormous, 500-1500 km², but critical denning area are a small part of their home range and a tiny fraction of our mountain landscapes. A culture of recognizing and respecting these scarce habitats can enable wolverines to coexist with recreation and industry in the mountains.

References

Aronsson, M., 2017. "O Neighbour, Where Art Thou?" Spatial and social dynamics in wolverine and lynx, from individual space use to population distribution. PhD dissertation, Swedish University of Agricultural Sciences.

Barrueto, M., A. Forshner, J. Whittington, A. P. Clevenger, and M. Musiani. 2022. Protection status, human disturbance, snow cover and trapping drive density of a declining wolverine population in the Canadian Rocky Mountains. Scientific Reports 12, 17412 (2022). <https://doi.org/10.1038/s41598-022-21499-4>

Dawson, E.N., A.J. Magoun, J. Bowman, and J. C. Ray. 2010. Wolverine, Gulo gulo, home range size and denning habitat in lowland boreal forest in Ontario. The Canadian Field Naturalist 124: 139-145.

Fisher, J. T., S. Murray, M. Barrueto, K. Carroll, A. P. Clevenger, D. Hausleitner, W. Harrower, N. Heim, K. Heinemeyer, A. L. Jacob, T. S. Jung, A. Kortello, A. Ladle, R. Long, P. Mackay, and M. A. Sawaya. 2022. Wolverines (Gulo gulo) in a changing landscape and warming climate: A decadal synthesis of global conservation ecology research. Global Ecology and Conservation 34:e02019.

Glass, T. W., G. A. Breed, C. R. Laird, A. J. Magoun, M. D. Robards, C. T. Williams, and K. Kielland. 2022. Terrain features and architecture of Wolverine (Gulo gulo) resting burrows and reproductive dens on Arctic tundra. Arctic 75: 291-299.

Heinemeyer, K., J. Squires, M. Hebblewhite, J. J. O'Keefe, J. D. Holbrook, and J. Copeland. 2019. Wolverines in winter: Indirect habitat loss and functional responses to backcountry recreation. Ecosphere 10.

Kortello, A., D. Hausleitner, and G. Mowat. 2019. Mechanisms influencing the winter distribution of wolverine Gulo gulo luscus in the southern Columbia Mountains, Canada. Wildlife Biology 1:1-13.

Krebs, J. A., E. C. Lofroth, and I. Parfitt. 2007. Multiscale habitat use by wolverines in British Columbia. Journal of Wildlife Management 71: 2180-2192.

Inman, R. M., A. J. Magoun, J. Persson, and J. Mattisson. 2012. The wolverine's niche: linking reproductive chronology, caching, competition, and climate. Journal of Mammalogy 93:634-644.

Magoun, A. J. and J. Copeland. 1998. Characteristics of wolverine reproductive den sites. J. Wildl. Manage. 62: 1313-1320.

May, R., L. Gorini, J. van Dijk, H. Brøseth, J. D. C. Linnell and A. Landa. 2012. Habitat characteristics associated with wolverine den sites in Norwegian multiple-use landscapes. Journal of Zoology 287: 195-204.

Mowat, G., A. P. Clevenger, A. Kortello, D. Hausleitner, M. Barrueto, L. Smit, C. T. Lamb, B. Dorsey, and P. K. Ott. 2020. The Sustainability of Wolverine Trapping Mortality in Southern Canada. Journal of Wildlife Management 84:213-226.

Persson, J., T. Willebrand, A. Landa, R. Andersen, and P. Segerström. 2003. The role of intraspecific predation in the survival of juvenile wolverines Gulo gulo. Wildlife Biology 9:21-28.

Persson, J. 2005. Female wolverine (Gulo gulo) reproduction: Reproductive costs and winter food availability. Canadian Journal of Zoology 83:1453-1459.

Scrafford, M., T. Avgar, R. Heeres, and M. S. Boyd. 2018. Roads elicit negative movement and habitat-selection responses by wolverines (Gulo gulo luscus). Behavioral Ecology 29: 534-542.

