Boreal Owl

Aegolius funereus

REGULATORY STATUS

USFWS: Migratory Bird
USFS R2: Sensitive
USFS R4: Sensitive
Wyoming BLM: No special status
State of Wyoming: Protected Bird

CONSERVATION RANKS

USFWS: No special status
WGFD: NSS3 (Bb), Tier II
WYNDD: G5, S2
Wyoming Contribution: LOW
IUCN: Least Concern
PIF Continental Concern Score: 10

STATUS AND RANK COMMENTS

Boreal Owl (*Aegolius funereus*) has no additional regulatory status or conservation rank considerations beyond those listed above.

NATURAL HISTORY

Taxonomy:

There are seven recognized subspecies of Boreal Owl. The only subspecies found in North America is *A. f. richardsoni*. The remaining subspecies are found across Europe and Asia, where the species is known as Tengmalm's Owl [1].

Description:

Identification of Boreal Owl is possible in the field. Boreal Owl is a small owl that stands 21 to 28 cm tall. Males and females are identical in plumage. The species has a conspicuous grayish-white facial disc, which is framed by a brown-black border and white, raised supercilium. The eyes are yellow, the crown has numerous small, white spots, and the bill is a buff-white color [1]. Underparts are a creamy white with broad streaks that are brown to russet, and the back is brown with large white spots and blotches. The wings and tail have rows of white spots. Juvenile birds have a uniformly brown head and upperparts from June to September [2]. Within its Wyoming distribution, Boreal Owl is most similar in size and shape to Northern Saw-whet Owl (*A. acadicus*), Northern Pygmy-Owl (*Glaucidium gnoma*), Flammulated Owl (*Otus flammeolus*), Western Screech-Owl (*Megascops kennicottii*), and Eastern Screech Owl (*M. asio*). Boreal Owl lacks ear tufts, which distinguishes it from screech-owls. Unlike Boreal Owl, Flammulated Owl has dark eyes and a tawny facial disk, and Northern Saw-whet Owl has a black bill and a forehead streaked with white. Northern Pygmy-Owl has a longer tail than Boreal Owl, and two distinctive black patches on the back of the head [3].

Distribution & Range:
Boreal Owl is distributed across the boreal regions of Alaska, Canada, and Eurasia. In North America, the distribution extends south and includes the Rocky Mountains, Blue Mountains, and Cascade ranges. In Wyoming, the species has been documented in the Bighorn, Absaroka, Teton, Wind River, Wyoming, Sierra Madre, and Snowy Ranges [4-10].

Habitat:
Throughout its range, Boreal Owl is associated with mature and old-growth forests. In the Rocky Mountains, the species occurs in old-growth and mature subalpine forests dominated by Subalpine Fir (*Abies lasiocarpa*) and Engelmann Spruce (*Picea engelmannii*) [1, 5, 11-15]. Mixed spruce-fir/mature Lodgepole Pine (*Pinus contorta*) forests also are used in Wyoming [16]. Boreal Owl will use mixed-forest and Quaking Aspen (*Populus tremuloides*) forest in other parts of its range [1, 17]. The species requires tree cavities for nesting [1]. The elevation range of Boreal Owl varies with latitude. In Wyoming, the species occurs above 2,000 m during the breeding season [5, 11]. Habitat use during dispersal and irruption events is poorly understood [1].

Phenology:
Boreal Owl is generally non-migratory but irruptions outside its normal range do occur, normally between October and April [1]. Nesting phenology is not fully understood in Wyoming. In northwestern Wyoming, territorial singing occurs in March and April [18]. In Colorado and Idaho, egg laying occurs between mid-April and early June [1], while in Alberta it is estimated to be in March and early April [19]. Incubation lasts for 29 to 32 days, and nestlings remain in the nest for 28 to 36 days [1]. In Alberta, fledging occurs from late May to early June [19]. After fledging, young are fed by adults for at least two weeks, with full independence achieved three to six weeks after leaving the nest cavity [1].

Diet:
The primary food items of Boreal Owl are small mammals, particularly Red-backed Vole (*Myodes* spp.) and voles in the genus *Microtus* [4, 13, 20, 21]. Occasionally, larger small mammals are taken, as well as amphibians, birds, and insects [1, 4, 19, 22].

CONSERVATION CONCERNS

Abundance:
Continental: WIDESPREAD
Wyoming: VERY RARE
Currently, no population estimates exist for the state. The statewide abundance rank of VERY RARE is based on the rather small area of the state known to be occupied in any given season and limited suitable habitat within that area. However, within suitable habitat in the occupied area, Boreal Owl appears to be uncommon, occurring in relatively low densities and requiring intensive survey efforts to detect the species [10]. Detections of Boreal Owl in Wyoming are limited.

Population Trends:
Historic: UNKNOWN
Recent: UNKNOWN
Population trends of Boreal Owl in Wyoming are unknown.

Intrinsic Vulnerability:
MODERATE VULNERABILITY

In Wyoming, Boreal Owl is restricted to mature and old-growth forests in higher elevations. The presence of this habitat is the limiting factor for persistence of the species in the state [23]. Abundance in some areas may be limited by the availability of nest cavities [4, 24].

Extrinsic Stressors:

MODERATELY STRESSED

Long-term studies in Europe found that prey availability influences Boreal Owl breeding success both directly [25, 26] and indirectly [27]. Logging of mature and old-growth forest removes suitable nesting and foraging habitat [1]. Insect infestations such as the recent Mountain Pine Beetle (*Dendroctonus ponderosae*) epidemic, disease, and wildfires threaten the species by reducing the amount of mature forest. Habitat shifts due to climate change also could affect Boreal Owl in parts of the species' range [28].

KEY ACTIVITIES IN WYOMING

The Wyoming Game and Fish Department (WGFD) and the United States Forest Service conduct winter call back surveys for different owl species, including Boreal Owl. The WGFD conducted surveys in the Wyoming Range in 2009 and 2010, and Boreal Owl was the most frequently detected owl species [7, 8]. Similar surveys were conducted by both agencies in the Shoshone National Forest in 1998, 1999, and from 2008 to 2010 [9], and in the Bridger-Teton National Forest in 2001, 2008, and 2009 [16]. Surveys emphasized use of mature Engelmann Spruce and Subalpine Fir, as well as mixed spruce-fir/mature Lodgepole Pine by Boreal Owl in Wyoming [9, 16]. Winter call surveys are also conducted in Bighorn National Forest [29]. Continued surveys are planned in these national forests, and it is expected that each route will be surveyed on a regular basis [30]. Recent owl surveys along the base of the Teton Range south of Jackson reported Boreal Owl as the second most common species detected in 2013 [31].

ECOLOGICAL INFORMATION NEEDS

Boreal Owl would benefit from research to determine the full extent of its distribution in Wyoming, and the effect of habitat type on breeding productivity [32]. Demographic rates of Boreal Owl are poorly understood, especially in the Rocky Mountains where population viability is unknown [32]. The response of the species to land management activities, incompatible recreational activities, and human disturbance, particularly during the breeding season, is unknown [16, 23].

MANAGEMENT IN WYOMING

This section authored solely by WGFD; Andrea C. Orabona. Boreal Owl is classified as a Species of Greatest Conservation Need in Wyoming due to restricted or declining population size or distribution and ongoing severe limiting factors that include the elimination of coniferous forest habitat from beetle kill, logging, and climate change [33]. Results of past surveys have revealed Boreal Owl distribution in the state. An adequate amount of snowpack is needed during March and April to facilitate conducting the current call-playback survey technique via snow machine; thus, survey efforts have been inconsistent over time due to unfavorable snow conditions. This species would benefit from a survey method that can be more consistently applied to better ascertain occupancy, distribution, and site-specific habitat characteristic associations. Best management practices to benefit Boreal Owl include maintaining large stands of mature and old growth forests and stands of mature aspen in areas where the species occurs; retaining large-diameter snags and all trees with existing cavities; retaining mature and decadent

trees for future snag creation; avoiding the removal and fragmentation of mature and old growth conifer forests through logging, human developments, and ongoing human disturbance; avoiding clearcutting, except where needed for aspen regeneration; and, where tree removal must occur, using forest management practices, such as uneven-aged management and small patch cuts with long rotations, to maintain suitable Boreal Owl habitat [34].

CONTRIBUTORS

Michael T. Wickens, WYNDD
Wendy A. Estes-Zumpf, WYNDD
Andrea C. Orabona, WGFD
Ian M. Abernethy, WYNDD
Douglas A. Keinath, WYNDD

REFERENCES

[1] Hayward, G. D., and Hayward, P. H. (1993) Boreal Owl (*Aegolius funereus*), In *The Birds of North America* (Rodewald, P. G., Ed.), Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America: https://birdsna.org/Species-Account/bna/species/borowl.

[2] Pyle, P. (1997) *Identification Guide to North American Birds, Part I*, Slate Creek Press, Bolinas, California.

[3] Peterson, R. T. (2008) *Peterson Field Guide to Birds of North America*, First ed., Houghton Mifflin Company, New York.

[4] Hayward, G. D. (1994) Review of technical knowledge: Boreal Owls, In *Flammulated, Boreal, and Great Gray Owls in the United States: a technical conservation assessment* (Hayward, G. D., and Verner, J., Eds.), pp 92-127, U.S. Department of Agriculture, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

[5] Garber, C. S., Wallen, R. L., and Duffy, K. E. (1991) Distribution of Boreal Owl observations in Wyoming, *Journal of Raptor Research 25*, 120-122.

[6] Keinath, D., Anderson, M., and Beauvais, G. (2010) Range and modeled distribution of Wyoming's species of greatest conservation need, Wyoming Natural Diversity Database, University of Wyoming, Laramie, Wyoming.

[7] Patla, S., and Derusseau, S. (2010) Wyoming Range Raptor Inventory and Monitoring Study, In *Threatened, Endangered, and Nongame Bird and Mammal Investigations: Annual Completion Report* (Orabona, A., Ed.), pp 104-121, Wyoming Game and Fish Department.

[8] Patla, S., Dobric, N., and Lawrence, R. (2011) Wyoming Range Raptor Survey and Inventory Project, In *Threatened, Endangered, and Nongame Bird and Mammal Investigations: Annual Completion Report* (Grenier, M. B., Ed.), pp 87-99, Wyoming Game and Fish Department.

[9] Cudworth, N., and Orabona, A. (2011) Documenting Presence of Forest Owls in the Shoshone National Forest, In *Threatened, Endangered, and Nongame Bird and Mammal Investigations: Annual Completion Report* (Grenier, M. B., Ed.), pp 106-111, Wyoming Game and Fish Department.

[10] Orabona, A., Rudd, C., Grenier, M., Walker, Z., Patla, S., and Oakleaf, B. (2012) Atlas of birds, mammals, amphibians, and reptiles in Wyoming, p 232, Wyoming Game and Fish Department Nongame Program, Lander, WY.

[11] Anderson, S. H., and Clark, K. A. (2002) Comparative habitat use by owls in a high altitude (1,700-3,000 m) Rocky Mountain forest, In *Ecology and Conservation of Owls, Proceedings of the Owls 2000 Conference* (Newton, I., Kavanagh, R., Olsen, J., and Taylor, I., Eds.), pp 162-174, CSIRO Publishing, Clayton, Victoria, Australia.

[12] Bateman, H. (2001) Habitat preferences of Boreal Owls nesting in artificial boxes, *Birding 33*, 413.

[13] Hayward, G. D., Hayward, P. H., and Garton, E. O. (1993) Ecology of Boreal Owls in the northern Rocky Mountains, USA, *Wildlife Monographs 124*, 3-59.

[14] Herren, V., Anderson, S. H., and Ruggiero, L. F. (1996) Boreal Owl mating habitat in the northwestern United States, *Journal of Raptor Research 30*, 123-129.

[15] Scott, M. K. (2004) Broad-scale habitat associations of Boreal Owls (*Aegolius funereus*) in southwestern Colorado, p 101, University of Wyoming, Laramie, WY.

[16] Knox, L., and Orabona, A. (2009) Forest Owl Surveys, In *Threatened, Endangered, and Nongame Bird and Mammal Investigations: Annual Completion Report* (Orabona, A., Ed.), pp 117-122, Wyoming Game and Fish Department.
[17] Lane, W. H., Andersen, D. E., and Nicholls, T. H. (2001) Distribution, abundance, and habitat use of singing male Boreal Owls in northeast Minnesota, *Journal of Raptor Research 35*, 130-140.
[18] Clark, K. A., and Anderson, S. H. (1997) Temporal, climatic and lunar factors affecting owl vocalizations of western Wyoming, *Journal of Raptor Research 31*, 358-363.
[19] Priestly, L. (2008) The nesting phenology of Northern Saw-whet Owl and Boreal Owl in central Alberta, *Nature Alberta 38*, 20-25.
[20] Cheveau, M., Drapeau, P., Imbeau, L., and Bergeron, Y. (2004) Owl winter irruptions as an indicator of small mammal population cycles in the boreal forest of eastern North America, *Oikos 107*, 190-198.
[21] Côté, M., Ibarzabal, J., St-Laurent, M.-H., Ferron, J., and Gagnon, R. (2007) Age-dependent response of migrant and resident *Aegolius* owl species to small rodent population fluctuations in the eastern Canadian boreal forest, *Journal of Raptor Research 41*, 16-25.
[22] Devine, A., and Smith, D. G. (2008) Boreal Owl food and foraging in southern New England, *Connecticut Warbler 28*, 102-108.
[23] Koopman, M. E., Hayward, G. D., and McDonald, D. B. (2007) High connectivity and minimal genetic structure among North American Boreal Owl (*Aegolius funereus*) populations, regardless of habitat matrix, *Auk 124*, 690-704.
[24] Hayward, G. D. (1994) Conservation status of Boreal Owls in the United States, In *Flammulated, Boreal, and Great Gray Owls in the United States: a technical conservation assessment* (Hayward, G. D., and Verner, J., Eds.), pp 139-147, U.S. Department of Agriculture, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.
[25] Korpimaki, E., and Hakkarainen, H. (2012) *The Boreal Owl: Ecology, Behaviour and Conservation of a Forest-Dwelling Predator*, Cambridge University Press, Cambridge, UK.
[26] Zarybnicka, M., Sedlacek, O., Salo, P., Stastny, K., and Korpimaki, E. (2015) Reproductive responses of temperate and boreal Tengmalm's Owl Aegolius funereus populations to spatial and temporal variation in prey availability, *Ibis 157*, 369-383.
[27] Zarybnicka, M., Riegert, J., and Kouba, M. (2015) Indirect food web interactions affect predation of Tengmalm's Owls Aegolius funereus nests by Pine Martens Martes martes according to the alternative prey hypothesis, *Ibis 157*, 459-467.
[28] Maggini, R., Lehmann, A., Zbinden, N., Zimmermann, N. E., Bolliger, J., Schroder, B., Foppen, R., Schmid, H., Beniston, M., and Jenni, L. (2014) Assessing species vulnerability to climate and land use change: the case of the Swiss breeding birds, *Diversity and Distributions 20*, 708-719.
[29] Decker, L. (2012) Personal communication.
[30] Orabona, A. (2012) Personal communication.
[31] Bedrosian, B., and Patla, S. (2014) Occupancy, Nest Success, and Habitat Use of Great Gray Owls in Western Wyoming, In *Threatened, Endangered, and Nongame Bird and Mammal Investigations: Annual Completion Report* (Orabona, A. C., and Cudworth, N., Eds.), pp 209-224, Wyoming Game and Fish Department.
[32] Hayward, G. D. (1994) Information needs: Boreal Owls, In *Flammulated, Boreal, and Great Gray Owls in the United States: a technical conservation assessment* (Hayward, G. D., and Verner, J., Eds.), pp 148-157, U.S. Department of Agriculture, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.
[33] Wyoming Game and Fish Department. (2010) State Wildlife Action Plan, p 512.
[34] Nicholoff, S. H., compiler. (2003) Wyoming Bird Conservation Plan, Version 2.0, Wyoming Partners In Flight, Wyoming Game and Fish Department, Lander, Wyoming.

Figure 1: Adult Boreal Owl in Larimer County, Colorado. (Photo courtesy of Bill Schmoker)

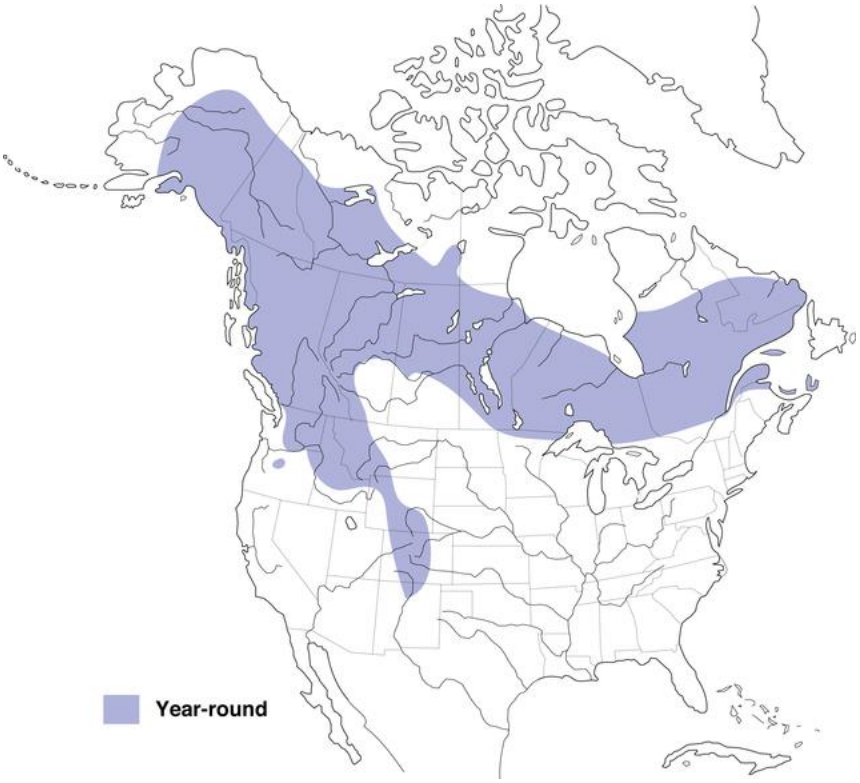

Figure 2: North American range of *Aegolius funereus*. (Map courtesy of Birds of North America, http://bna.birds.cornell.edu/bna, maintained by the Cornell Lab of Ornithology)

Figure 3: Boreal Owl habitat, spruce-fir forest in Yellowstone National Park. (Photo courtesy of Michael T. Wickens)

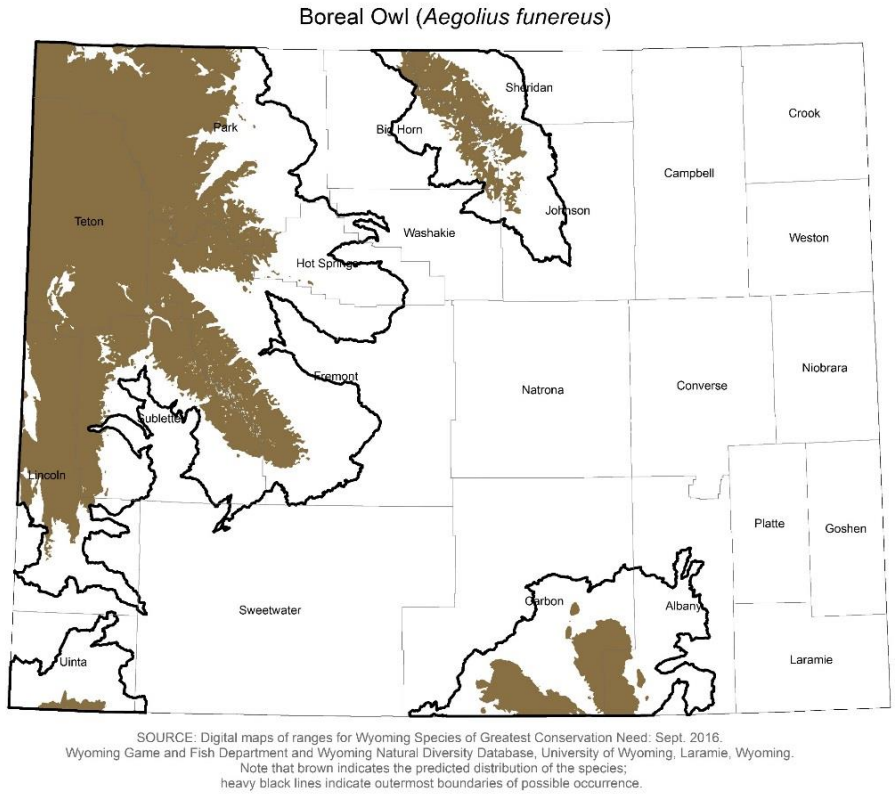

Figure 4: Range and predicted distribution of *Aegolius funereus* in Wyoming.