

Northern bog lemming*Synaptomys borealis*

Class: Mammalia

Order: Rodentia

Conservation Status*NatureServe:*

G Rank: G5

Agency:

USFWS: Under Review

IUCN: Least Concern

S Rank: S4

ADF&G: Species of Greatest Conservation Need

Final Rank		
Conservation category: VIII. Yellow		
VIII = low status and either high biological vulnerability or high action need		
<u>Category</u>	<u>Range</u>	<u>Score</u>
Status:	-20 to 20	-5
Biological:	-50 to 50	-24
Action:	-40 to 40	32
Higher numerical scores denote greater concern		

Status - variables measure the trend in a taxon's population status or distribution. Higher status scores denote taxa with known declining trends. Status scores range from -20 (increasing) to 20 (decreasing).

	Score
<i>Population Trend (-10 to 10)</i>	0
Unknown.	
<i>Distribution Trend (-10 to 10)</i>	-5
The distribution of northern bog lemmings is thought to be increasing in Alaska since at least the 1970s and their distribution across North America has been shifting northward and westward since at least 1900 (A. Baltensperger, pers. comm.). These trends are predicted to continue as a result of climate change (Baltensperger and Huettmann 2015a; Hope et al. 2015; Marcot et al. 2015).	
Status Total:	-5

Biological - variables measure aspects of a taxon's distribution, abundance and life history. Higher biological scores suggest greater vulnerability to extirpation. Biological scores range from -50 (least vulnerable) to 50 (most vulnerable).

	Score
<i>Population Size (-10 to 10)</i>	0
Unknown.	
<i>Range Size (-10 to 10)</i>	-10
Found throughout much of mainland Alaska, from southeast Alaska north to the Brooks Range (Arctos 2016; ACCS 2017a). Estimated range size >400,000 sq. km.	
<i>Population Concentration (-10 to 10)</i>	-10
Colonial, but does not concentrate (Cassola 2017).	
<i>Reproductive Potential</i>	
<u>Age of First Reproduction (-5 to 5)</u>	-5
Within 1 year (Cassola 2017).	
<u>Number of Young (-5 to 5)</u>	0

Litter size averages 4-5 (range: 2-8) (Rabe 2007). Can have two to three litters per year (Rabe 2007).

Ecological Specialization

Dietary (-5 to 5)

0

Very little information available. Northern bog lemmings are herbivorous and feed on grasses, sedges, and other vegetation (Cassola 2017). Recent studies suggest that northern bog lemmings exhibit some degree of specialization (Baltensperger et al. 2015). However, very few samples were available for analysis (n=4) and diets were highly variable between individuals (Baltensperger et al. 2015). We rank this question as Unknown to highlight the paucity of available information, which precludes us from assessing dietary preferences.

Habitat (-5 to 5)

1

Little is known about habitat requirements, but this species is typically associated with boreal forests (Hope et al. 2015; Baltensperger et al. in prep). Results from three land cover models consistently predicted that evergreen forests was the most predictor of distribution, followed by shrublands and woody wetlands (Baltensperger et al., in prep).

Biological Total: -24

Action - variables measure current state of knowledge or extent of conservation efforts directed toward a given taxon. Higher action scores denote greater information needs due of lack of knowledge or conservation action. Action scores range from -40 (lower needs) to 40 (greater needs).

Score

Management Plans and Regulations (-10 to 10)

10

Listed as unclassified game by the Alaska Department of Fish and Game with no bag limit and no closed season (ADFG 2018c). This species is under review for listing under the Endangered Species Act as a result of concerns over habitat loss and population size in the northeastern U.S. (Jones and Melton 2014).

Knowledge of Distribution and Habitat (-10 to 10)

2

Extensive distribution from 55 to 68°N and from 130 to 160°W (ARCTOS 2016). However, small mammal surveys in Alaska suggest that this species may be patchily distributed across its range (Cook and MacDonald 2005; Baltensperger and Huettmann 2015b), and specific habitat associations have not been investigated. Statewide distribution models have been built to investigate the effects of climate change on habitat availability (Baltensperger and Huettmann 2015a; Hope et al. 2015; Marcot et al. 2015)

Knowledge of Population Trends (-10 to 10)

10

Not currently monitored in Alaska.

Knowledge of Factors Limiting Populations (-10 to 10)

10

Very little is known about the ecology of this species in Alaska and elsewhere across its range (Jones and Melton 2014). Distribution models predict a range expansion in Alaska by the end of this century as a result of climate change (Baltensperger and Huettmann 2015a; Hope et al. 2015; Marcot et al. 2015).

Action Total: 32

Supplemental Information - variables do not receive numerical scores. Instead, they that are used to sort taxa to answer specific biological or managerial questions.

Harvest:	Not substantial
Seasonal Occurrence:	Year-round
Taxonomic Significance:	Monotypic species
% Global Range in Alaska:	<10%
% Global Population in Alaska:	Unknown
Peripheral:	No

References

- Alaska Center for Conservation Science (ACCS). 2017a. Wildlife Data Portal. University of Alaska Anchorage. Available online: <http://aknhp.uaa.alaska.edu/apps/wildlife>
- Alaska Department of Fish and Game (ADFG). 2018c. 2018-2019 Alaska hunting regulations. Alaska Department of Fish and Game. Juneau, AK, USA.
- ARCTOS. 2016. ARCTOS database: Fish, amphibian, mammal, bird and reptile collections. University of Alaska Museum of the North, Fairbanks, AK, USA. Available online: <http://arctos.database.museum/>
- Baltensperger, A. P., and F. Huettmann. 2015a. Predicted shifts in small mammal distributions and biodiversity in the altered future environment of Alaska: an open access data and machine learning perspective. *PLoS ONE* 10(7):e0132054. DOI: 10.1371/journal
- Baltensperger, A. P., and F. Huettmann. 2015b. Predictive spatial niche and biodiversity hotspot models for small mammal communities in Alaska: applying machine-learning to conservation planning. *Landscape Ecology* 30(4):681-697. DOI: 10.1007/s10980-014-01
- Baltensperger, A. P., F. Huettmann, J. C. Hagelin, and J. M. Welker. 2015. Quantifying trophic niche spaces of small mammals using stable isotopes ($\delta^{15}\text{N}$ and $\delta^{13}\text{C}$) at two scales across Alaska. *Canadian Journal of Zoology* 93(7):579-588. DOI: 10.1139/cjz-2
- Cassola, F. 2017. *Synaptomys borealis*. The IUCN Red List of Threatened Species. doi:10.2305/IUCN.UK.2017-2.RLTS.T42638A22377185.en. Accessed 20-Feb-2018.
- Cook, J. A., and S. O. MacDonald. 2005. Mammal inventory of Alaska's National Parks and Preserves, Southwest Alaska Network [...]. Report NPS/AKRSWAN/NRTR-2005/05. National Park Service, Alaska Region, Anchorage, AK, USA.
- Hope, A. G., E. Waltari, J. L. Malaney, D. C. Payer, J. A. Cook, and S. L. Talbot. 2015. Arctic biodiversity: increasing richness accompanies shrinking refugia for a cold-associated tundra fauna. *Ecosphere* 6(9):159. DOI: 10.1890/ES15-00104.1
- Jones, T., and L. L. Melton. 2014. Petition to list the northern bog lemming (*Synaptomys borealis*) under the U.S. Endangered Species Act. Petition submitted to the U.S. Secretary of Interior acting through the U.S. Fish and Wildlife Service. WildEarth Gua
- Marcot, B. G., M. T. Jorgenson, J. P. Lawler, C. M. Handel, and A. R. DeGange. 2015. Projected changes in wildlife habitats in Arctic natural areas of northwest Alaska. *Climate Change* 130(2):145-154. DOI: 10.1007/s10584-015-1354-x
- Rabe, M. 2007. Lemmings. In Woodford, R., ed. Alaska Wildlife Notebook Series. Division of Wildlife Conservation, Alaska Department of Fish and Game, Juneau, AK, USA.

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