Southern White-tailed Ptarmigan

White-tailed Ptarmigan *(Lagopus leucura)* are a memorable sighting in the alpine of Rocky Mountain National Park (RMNP). Many factors, such as human encroachment and warming climate trends, may affect the White-tailed Ptarmigan's long term survival, designating it "the canary in the alpine." Declining populations could signal the degradation of high-elevation ecosystems. Habitat protection and efforts that help mitigate the effects of climate change, coupled with ongoing monitoring and adaptive management of White-tailed Ptarmigan are critical to ensuring their survival. The Colorado subspecies ('southern' White-tailed Ptarmigan; *L. l. altipetens*) is currently being considered for listing under the Endangered Species Act, with a listing decision anticipated by September 30, 2020.

Key messages

- The White-tailed Ptarmigan is endemic to the alpine ecosystem, and is adapted to extreme temperature changes, snow, and wind.
- Climate warming poses a threat to the alpine ecosystem, which in turn threatens RMNP's White-tailed Ptarmigan population.
- RMNP is working with researchers from Colorado State University to monitor RMNP's ptarmigan population and identify and measure factors contributing to its decline.
- Habitat protection and climate change mitigation strategies can help support long-term survival of the White-tailed Ptarmigan.

Desired Action from the Public

- Understand and appreciate White-tailed ptarmigan and the habitats they depend on.
- Support climate change mitigation strategies and efforts that support the protection of alpine habitats.

Background

The southern White-tailed Ptarmigan is endemic to alpine habitats in western North America, and is a resident of RMNP. Their habitats consists of alpine areas at or above tree line in rocky areas, krummholz, snowfields, and meadows. During the winter they feed on willows that protrude from the snow. In the summer, food sources consist of buds, stems, seeds, insects, leaves, fruits, and flowers. Every part of the White-tailed Ptarmigan is adapted to help it thrive in a forbiddingly frigid climate, from its feathered, snowshoe-like feet and its seasonally changing plumage to its remarkable metabolic ability to gain body mass even through the harsh winters.

RMNP point-of-contact:

Mary Kay Watry, Conservation Biologist
mary_kay_watry@nps.gov; 970-586-1285



NPS/A Schonlau

NPS/A Ames

Figure 1. White-tailed Ptarmigan have grayish-brown mottled plumage in the summer (top) and white plumage in the winter (bottom); molting feathers for eight months of the year. They are the smallest grouse in North America, with a length of 11.8-12.2 inches (30-31cm) and weight of 11.6-16.9 ounces (330-480g). In Colorado, White-tailed Ptarmigan begin breeding in May. Nests, laid in May and June, are simple scrapes on the ground with vegetation forming a ring. Two to eight light cinnamon eggs hatch in June/July, after approximately 23 days incubation. Downy chicks leave the nest within 6-12 hours of the last egg hatching. Broods break up in September or October, but can stay together through the first winter.

Cultural Significance

The White-tailed Ptarmigan is an icon of the alpine. They are hunted in Colorado but illegal to hunt in RMNP. Ptarmigan are a traditional food of indigenous peoples of northern North America and a source of legends. In one Tlingit legend, documented in Wrangell, AK, 'Raven said to ptarmigan: "You will be the maker of snow-shoes. You will know how to travel in snow." It was from these birds that Athapascans learned how to make snow-shoes, and it was from them that they learned how to put their lacings on.' (Swanton 1909)

Status, Trends, and Current Research

The White-tailed Ptarmigan population along Trail Ridge Road has been monitored nearly continuously since 1966 (1966-2000; 2010-2016), and began to decline severely in the mid-1970s. The population declined by roughly 66% from the mid-1970s to 2000. Over this same time period the number of young produced per female declined. Biologists began counting ptarmigan again in 2010 and numbers have remained low without any sign of population recovery (Figure 2).

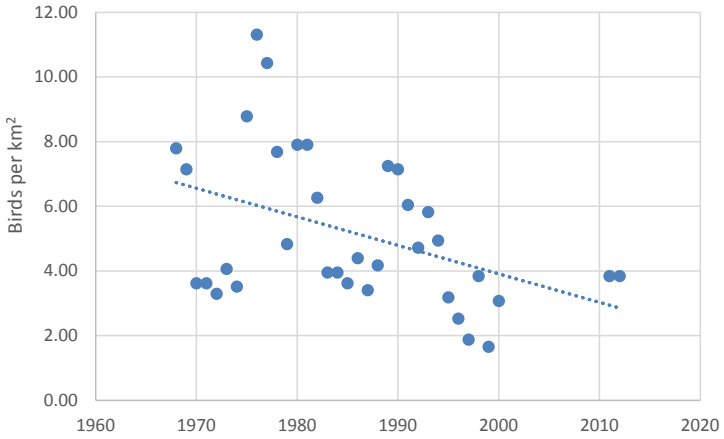


Figure 2. Spring density estimates along Trail Ridge Road from 1966 to 2012 (Wann et al. 2016).

Since 2010, researchers at Colorado State University (CSU) and the U.S. Geological Survey (USGS) have been gathering demographic data for White-tailed Ptarmigan in RMNP (Trail Ridge population) and at Mount Evans (south of RMNP). Data is collected through banding and band re-sight, to allow for estimation of survival and reproductive success. From 2013 through 2016, radio-telemetry tracking of hens took place to more explicitly monitor nest success and chick survival, and evaluate habitat requirements. In 2013, the 10 hens monitored through the breeding season had 60% nest success. Monitoring done in 2014 and 2015 reported 54% and 73% nest success respectively (Spear 2017). Demographic data from 2010 to 2016 has been analyzed and is being prepared for publication.

Many factors could be contributing to the low ptarmigan population seen at RMNP. Spring snow depth and timing of snow melt can alter breeding phenology (i.e., when ptarmigan hens begin to lay eggs; Wann et al. 2016), and breeding phenology can directly influence reproduction if it is mistimed relative to availability of food (Wann 2017). Ptarmigan at RMNP advanced their nesting phenology an average of 12 days since the late 1960s (Wann et al. 2016). Snow quality in roosting habitats, which is an important source of protection and concealment for ptarmigan, can be affected by a warming climate. Ptarmigan molt patterns are constrained by photoperiod and if warming springs are reducing snow cover but ptarmigan are remaining white, survival may be adversely affected through increased predation. Changing habitat conditions, specifically the availability of alpine willow *(Salix spp.)*, which is a critical food source for ptarmigan in the winter and spring, may decline if it is over browsed by ungulates such as elk *(Cervus canadensis)* or moose *(Alces alces)*. Shrubs, particularly alpine willow, are also an important indicator of nest site selection by ptarmigan. Hens at RMNP were more likely to nest in areas with more willow cover (Spear 2017). Thus, a reduction from ungulate browsing or encroachment of trees into the alpine could limit suitable nesting habitat for ptarmigan.

Management

RMNP continues to work with CSU and USGS to monitor the park's ptarmigan population and identify and measure the factors underlying the declines. Additional emphasis to understand how habitat characteristics and potential interspecific competition (i.e., elk and moose) shape food-resource constraints for ptarmigan may be investigated.

RMNP protects the alpine habitat within our boundary and actively mitigates the impacts of climate change by reducing energy use and greenhouse gas emissions within our facilities and fleet. Direct management actions will require a more definitive understanding of the factors and their contributions to the population decline.



NPS

Figure 3. CSU researchers measure and weigh White-tailed Ptarmigan in RMNP.

Resources and References

Franke, M.A., T.L. Johnson, I.W. Ashton, and B. Bobowski. 2015. Natural Resource Vital Signs at Rocky Mountain National Park. Natural Resource Report NPS/ROMO/NRR—2015/946. National Park Service, Fort Collins, Colorado. https://www.nps.gov/romo/learn/upload/ROMO_VitalSigns_040815.pdf

Martin, K., L.A. Robb, S. Wilson and C.E. Braun. 2015. White-tailed Ptarmigan *(Lagopus leucura)*, Version 2.0. In: The Birds of North America (P.G. Rodewald, editor). Cornell Lab of Ornithology, Ithaca, New York, USA. https://doi.org/10.2173/bna.68

*Spear, S.L. 2017. Factors Influencing Breeding Avifauna Abundance and Habitat Selection in the Alpine Ecosystem of Colorado. Graduate Degree Program in Ecology, Colorado State University. MS Thesis.

Swanton, J.R. 1909. Tlingit Myths and Texts. Washington: Government Print Office. https://catalog.hathitrust.org/Record/002494461/Home

*Wang, G., N.T. Hobbs, K.M. Giesen, H. Galbraith, D.S. Ojima, and C.E. Braun. 2002. Relationships between Climate and Population Dynamics of White-tailed Ptarmigan *Lagopus leucurus* in Rocky Mountain National Park, Colorado, USA Climate Research 23:81-87.

*Wann, G.T. 2012. Long-term Demography of a White-tailed Ptarmigan *(Lagopus leucura)* Population in Colorado. Graduate Degree Program in Ecology. MS Thesis.

*Wann, G.T. 2017. Reproductive Ecology and Population Viability of Alpine-Endemic Ptarmigan Populations in Colorado. Colorado State University, Dissertation.

*Wann. G.T, C.L. Aldridge, and C.E. Braun. 2016. Effects of Seasonal Weather on Breeding Phenology and Reproductive Success of Alpine Ptarmigan in Colorado. PLoS ONE 11(7): e0158913. doi:10.1371/journal.pone.0158913

*These and other references can be found in the Integrated Resource Management Application (IRMA) Portal at: https://irma.nps.gov/DataStore/Collection/Profile/4015 and at: Q:_Library of Research and Science_ROMO\Research by Topic\Ptarmigan