Rock Ptarmigan (*Lagopus mutus*)

Vulnerability: **Presumed Stable** Confidence: Moderate

The Rock Ptarmigan is a common breeding bird in Arctic Alaska and, like the Willow Ptarmigan, is one of the few birds that remain in the Arctic year-round. This species typically breeds in habitats that include a mix of rocky outcrops, graminoid meadows, and small patches of *Salix* or *Betula* less than 1 m in height (Montgomerie and Holder 2008). Unlike the Willow Ptarmigan, this species is less dependent on shrubs associated with riparian areas. In summer, Rock Ptarmigan consume a variety of foods including *Dryas*, *Oxytropis*, and *Salix* leaves, insects, *Betula* and *Salix* catkins, and berries (Montgomerie and Holder 2008). This species winters mainly within the breeding range but withdraws from the northernmost regions (Montgomerie and Holder 2008). Global population estimate is >8 million (Rich et al. 2004).

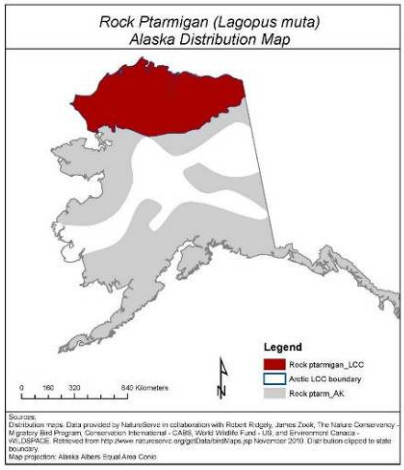
Range: We used the extant Nature Serve range map for the assessment as it matched the Birds of North America (Montgomerie and Holder 2008) and other range descriptions (Johnson and Herter 1989).

Physiological Thermal Niche: For most of the indirect exposure and sensitivity categories in the assessment, Rock Ptarmigan were ranked with a neutral response (see table on next page). This species breeds in alpine and arctic tundra regions, and is associated with cooler, higher elevation thermal environments within the arctic LCC. The availability of these environments may decline as temperatures increase and shrubs and trees encroach on tundra habitats (Tape et al. 2006, Danby et al. 2007).

Physiological Hydro Niche: If winter precipitation were to increase as some models predict (http://www.snap.uaf. edu/), access to shrubs, and thus food and protection from predators would be reduced. It is important to note that in general, Rock Ptarmigan are less dependent on water driven environments (compared to Willow Ptarmigan).

Disturbance Regime: In general climate-mediated disturbance events are unlikely to have a significant impact on Rock Ptarmigan, although increased freezing rain events early and late in winter could lead to greater mortality (K. Christie, pers. comm.).

Biotic Habitat Dependence: In the winter and spring, Rock Ptarmigan occur in tall shrub patches associated with river and lake edges. At this time, dwarf birch (*Betula nana*) and willow (*Salix* spp.) are important for both food and cover. Conversely, Willow Ptarmigan exhibit a stronger dependence on just one plant species (i.e. *Salix alaxensis*).



Physical Habitat Restrictions: Unlike Willow Ptarmigan, Rock Ptarmigan tend to prefer more open tundra areas with short or sparse shrub cover for breeding (Montgomerie and Holder 2008), so they will likely not benefit as much from shrub expansion. Over the long-term, as tree-line advances, suitable habitat for this species will likely be reduced, causing range contraction to higher elevations and latitudes (Lloyd et al. 2002).

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Vulnerability: **Presumed Stable** Confidence: Moderate

Vulnerability Factors	D	SD	N	SI	I	GI	Unknown or N/A
B1. Sea level rise			*				
B2a. Natural barriers			*				
B2b. Anthropogenic barriers			*				
B3. Human response to CC			*				
C1. Dispersal/Movement			*				
C2ai. Historical thermal niche (GIS)			*				
C2aii. Physiological thermal niche			*	*			
C2bi. Historical hydro niche (GIS)			*				
C2bii. Physiological hydro niche			*	*			
C2c. Disturbance regime		*	*				
C2d. Ice & Snow habitats			*				
C3. Physical habitat restrictions		*					
C4a. Biotic habitat dependence			*	*			
C4b. Dietary versatility		*	*				
C4d. Biotic dispersal dependence			*				
C4e. Interactions with other species			*	*			
C5a. Genetic variation		*					
C5b. Genetic bottlenecks							*
C6. Phenological response			*	*			*
D1. CC-related distribution response							*

D=Decrease vulnerability, SD=Somewhat decrease vulnerability, N=Neutral effect, SI=Slightly increase vulnerability, I=Increase vulnerability, GI=Greatly increase vulnerability.

Genetic Variation: Significant genetic variation exists in North American populations of Rock Ptarmigan (Holder et al. 1999) and so they may be resilient responding to climate-mediated impacts at the population level.

Phenological Response: Timing of snow melt can influence breeding phenology and reproductive output for this species, which experiences decreased clutch size in years with late snow melt (Wilson and Martin 2010).

In summary, the flexibility in behavior and life history exhibited by the Rock Ptarmigan, in combination with a widespread distribution in the Arctic LCC, suggests they will likely remain stable under the current predictions of climate change within the 50 year timeframe of this assessment.

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