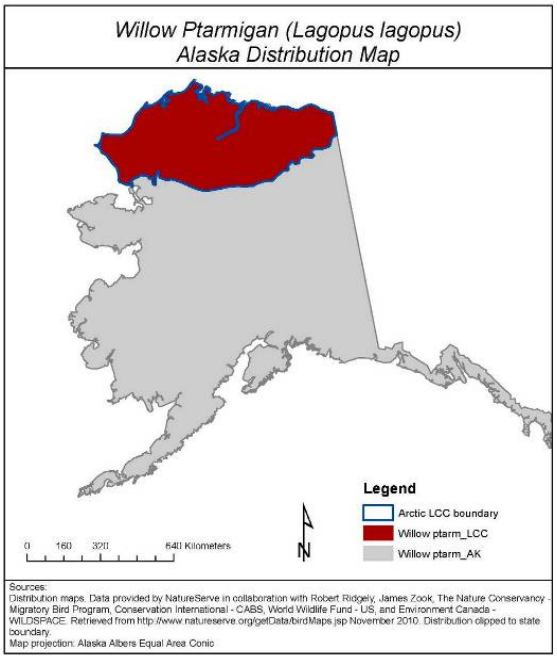
Willow Ptarmigan (*Lagopus lagopus*)

Vulnerability: **Presumed Stable** Confidence: Moderate

The Willow Ptarmigan is an abundant and conspicuous breeding bird in Arctic Alaska and is one of the few birds that remain in the Arctic year-round. During the breeding season this species nests in tall shrub habitats as well as in well-drained tundra sites (Hannon et al. 1998). In early spring Willow Ptarmigan are willow bud specialists (constituting up to 80% of their diet); in summer the dietary breadth widens substantially to include insects, berries, equisetum, and leaves (Hannon et al. 1998). In Alaska, female Willow Ptarmigan may move as far south as the southern side of the Brooks Range in winter while males stay closer to the tundra breeding grounds (Irving et al. 1966). Global population estimate is 40 million (Rich et al. 2004).

Range: We used the extant NatureServe range map for the assessment as it matched the Birds of North America (Hannon et al. 1998) and other range descriptions (Johnson and Herter 1989).
Physiological Thermal Niche: For most of the indirect exposure and sensitivity categories in this assessment, Willow Ptarmigan were scored with a neutral response (see table on next page). This species is associated with dense shrub patches, primarily in valley bottoms that are warmer on average than surrounding upland habitats suggesting this species may be sensitive to changes in localized thermal conditions.
Physiological Hydro Niche: Willow Ptarmigan are sensitive to changes in snow depth in the winter months due to their dependence on shrubs for cover from predators and for food. Furthermore, Willow Ptarmigan delay egg-laying in years with late spring snow melt and this may result in lower breeding success (Martin and Weibe 2004). Current precipitation models do predict increased snowfall in winter in Arctic Alaska (http://www.snap.uaf.edu/).
Biotic Habitat Dependence: In the winter and spring when snow cover is extensive, Willow Ptarmigan on the North Slope of Alaska depend primarily on one willow species, (*Salix alaxensis*), for food and cover. Any changes in the distribution of this one plant species could have a significant impact on this species. With shrub expansion taking place on the North Slope (Tape et al. 2006), it could provide expanded breeding habitat opportunities. However, in the long-term, as spruce and deciduous forest expand into shrub-dominated areas, Willow Ptarmigan habitat will likely be reduced.



Disturbance Regime: Disturbance events such as periodic flooding of riparian areas and deposition of sediment may benefit ptarmigan by enhancing habitat suitability for early-successional willows such as *S. alaxensis*. However, in the longer-term, the expected invasion of trees such as poplar (*Populus balsamifera*) in riparian floodplains would be detrimental to ptarmigan (Mann et al. 2010).

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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.

Phenological Response: Willow Ptarmigan appear to adjust their lay dates according to snow cover, which varies annually (Martin and Weibe 2004). No studies explicitly examining long-term climate change and ptarmigan phenology have been conducted (K. Christie, pers. comm.).

Genetic Variation: There is little information in the literature regarding degree of genetic variation or recent evolutionary bottlenecks for this species.

In summary, this assessment suggests that Willow Ptarmigan have enough flexibility in life history and in response to expected changes in environmental conditions to allow them to remain stable with regard to climate change, at least within the next 50 years.

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