Gyrfalcon (*Falco rusticolus*)

Vulnerability: **Highly Vulnerable** Confidence: Low

The Gyrfalcon, the largest falcon, is an iconic bird of the circumpolar arctic and subarctic. This species nests primarily on precipitous cliff faces and typically utilizes nests built by other species (particularly Common Raven, Golden Eagle, and Rough-legged Hawk) (Booms et al. 2008). Gyrfalcon main prey includes bird species ranging in size from passerines to geese while ptarmigan are the preferred prey. Although not well documented, in winter this species moves south throughout Canada and sometimes into the northern lower 48. Current population on the North Slope (*tundrius* subspecies) is estimated at 250 breeding pairs (USFWS 2000).

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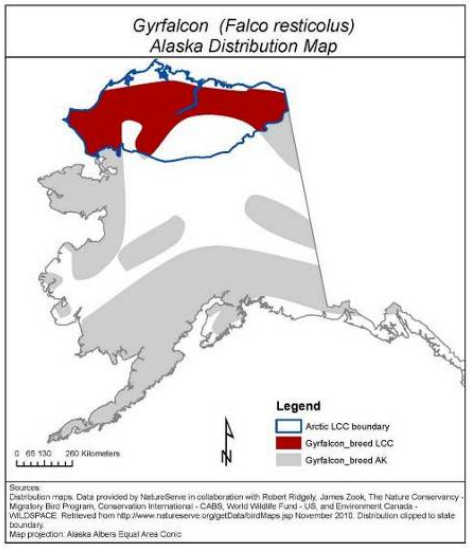
Range: We used the extant NatureServe range map for the assessment as it closely matched that of the Birds of North America (Booms et al. 2008) and other sources (Johnson and Herter 1989).

The results of this assessment suggest that Gyrfalcon may be quite vulnerable to climate change due to factors mostly related to their narrow ecological niche that includes a specialized diet and nesting requirements (see table on next page).

Biotic Habitat Dependence: In late winter and early spring when females are producing eggs, the species is completely dependent on one species of ptarmigan (either Willow or Rock Ptarmigan depending on the region). Some ptarmigan populations, in turn, exhibit cyclical changes in numbers (Mossop and Hayes 1994) which could be altered due to climate change.

Physical Habitat Restrictions: Gyrfalcons select cliff wall nest sites which, for the most part, are rare microsites in the Arctic LCC. The rareness of these sites is further exacerbated by the fact that this species regularly uses stick nests made by other bird species; as such sites may provide higher nest success or other advantages (T. Booms, pers. comm.). Gyrfalcons also have at least some sensitivity to thermal conditions, evidenced by the fact that they do not breed below 55 degrees latitude. It is possible that warmer temperatures (particularly at nest sites on south-facing slopes) could influence nesting site preference.



Disturbance Regime: In terms of climate-mediated disturbances, Gyrfalcons require dry or "normal" spring conditions to successfully hatch young. An increase in spring storms would likely reduce nest success. In addition, this species is known to be highly susceptible to a wide variety of pathogens. The introduction of a new pathogen to the current regime could have drastic effects on survival (T. Booms, pers. comm.). Spread of shrub habitats northward (Tape et al. 2006) will likely reduce available upland tundra and open land foraging habitats.

Phenological Response: Gyrfalcons have relatively low genetic variation (Johnson et al. 2009) making them susceptible to climate-mediated impacts that stress them at the population level (e.g. disease outbreaks).

A 30 year dataset from the Yukon shows

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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.

that Gyrfalcons are nesting 20 days later and have declined by 40% in occupancy. Ptarmigan have apparently stopped cycling in this study area, possibly caused by climate change. This is likely creating a phenological mismatch linked to the later nesting (D. Mossop, unpublished data). A recent modeling effort indicates that the future Gyrfalcon range in Alaska could decrease substantially (Booms et al. 2011).

In summary, the accumulation of sources of potential vulnerability, particularly with regard to specialization in diet, nesting patterns and new modeling studies suggest this species is highly vulnerable to climate changes in the Arctic LCC.

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