Snow Goose (*Chen Caerulescens*)

Vulnerability: **Presumed Stable** **Confidence:** Moderate

The Snow Goose is a common breeder in Arctic Alaska, typically nesting in small, dense colonies scattered near the coast. This species nests on flat tundra, near ponds, shallow lakes, streams, and islands in river deltas (Mowbray et al. 2000). During the breeding season, their diet is primarily vegetarian, eating both aquatic and drier tundra vegetation (Mowbray et al. 2000). For brood rearing, one of the more important habitats is salt affected tundra on islands in river deltas (J. Shook, pers. comm.). Most North Slope breeders winter in western North America from British Columbia into California (Mowbray et al. 2000). Current Arctic Coastal Plain population is estimated at approximately 9,000 with an increasing trend (Larned et al. 2012).


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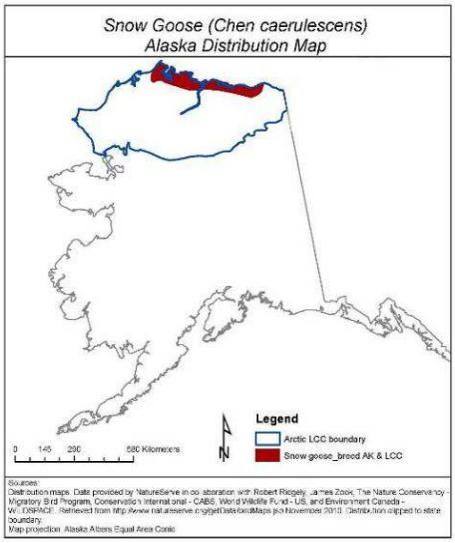
Range: We used the extant NatureServe range map for the assessment as it closely matched the Birds of North America and other range descriptions (Bart et al. 2012, Johnson and Herter 1989).

Sea Level Rise & Natural Barriers: Because of this its restricted range along coastal areas in Arctic Alaska, this species was considered slightly vulnerable to both sea-level rise and to limitations in expansion of their range northward ("natural barriers" factor).

Physiological Hydro Niche: Snow Geese were scored as particularly vulnerable to changes in hydrologic niche because of their significant association with coastal habitats (in particular salt marsh), ponds, and wet tundra habitats for nesting, foraging, brood-rearing, molting, and avoiding predation. If substantial tundra drying occurs, this species could experience a considerable negative impact. Current projections of annual potential evapo-transpiration suggest negligible atmospheric-driven drying for the foreseeable future (TWS and SNAP). Thus atmospheric moisture, as an exposure factor (most influential on the "hydrological niche" sensitivity category), was not heavily weighted in the assessment.

Disturbance Regime: Climate-mediated disturbances, most importantly increasing storms (Jones et al. 2009) on the coastal plain (including high winds) can back up water and cause the flooding of river deltas. This may destroy nests that are often less than a meter above sea level. Breeding densities could decline nearest the coast, but they may be able to successfully nest inland or redistribute to other colony areas on the coastal plain (J. Shook, pers. comm.).



Interactions with Other Species: In terms of interactions with other species, it is possible that red fox nest predation could increase as this predator's range expands northward from boreal regions (Pamperin et al. 2006). Geese would unlikely be able to defend nests as successfully as against the smaller arctic foxes. Also, climate changes may disrupt the regularity of the

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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.

lemming cycles (Post et al. 2009), thus exposing this species to greater nest predation pressure if lemmings become a less common food source for predators.

Phenological Response: Although long-term data sets for this species exist (e.g. Larned et al. 2012), the relationship between seasonal temperature / precipitation and phenological patterns in the Alaska portion of the Arctic LCC has not been examined.

In summary, while Snow Geese will likely experience some negative impacts from climate change this species appears, overall, to have enough versatility in life history traits and behaviors to remain "stable" at least during the timeframe of this assessment (to 2050).

Literature Cited

Bart, J., S. Brown, B. Andres, R. Platte, and A. Manning. 2012. North slope of Alaska. Ch. 4 *in* Bart, J. and V. Johnston, eds. Shorebirds in the North American Arctic: results of ten years of an arctic shorebird monitoring program. Studies in Avian Biology.

Johnson, S.R. and D.R. Herter. 1989. The birds of the Beaufort Sea, Anchorage: British Petroleum Exploration (Alaska), Inc.

Jones, B.M., C.D. Arp, M.T. Jorgenson, K.M. Hinkel, J.A. Schmutz, and P.L. Flint. 2009. Increase in the rate and uniformity of coastline erosion in Arctic Alaska. Geophys. Res. Letters 36, L03503.

Larned, W., R. Stehn, and R. Platte. 2012. Waterfowl breeding population survey, Arctic Coastal Plain, Alaska, 2011. Unpublished Report, U.S. Fish and Wildlife Service, Anchorage, AK. 51pp.

Mowbray, T.B., F. Cooke, and B. Ganter. 2000. Snow Goose (*Chen caerulescens*). In: The Birds of North America, No. 514 (A. Poole and F. Gill, Eds.). Philadelphia: Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

Pamerin, N.J., E.H. Follmann, and B. Petersen. 2006. Interspecific killing of an arctic fox by a red fox at Prudhoe Bay, Alaska. Arctic 59: 361-364.

Post, E., M.C. Forchhammer, M.S. Bret-Harte, T.V. Callaghan, T.R. Christensen, B. Elberling, A.D. Fox, O. Gilg, D.S. Hik, T.T. Høye, R.A. Ims, E. Jeppesen, D.R. Klein, J. Madsen, A.D. McGuire, S. Rysgaard, D.E. Schindler, I. Stirling, M.P. Tamstorf, N.J.C. Tyler, R. van der Wal, J. Welker, P.A. Wookey, N.M. Schmidt, and P. Aastrup P (2009) Ecological dynamics across the Arctic associated with recent climate change. Science 325:1355-1358.

The Wilderness Society (TWS) and Scenarios Network for Alaska Planning (SNAP), Projected (2001-2099: A1B scenario) monthly total potential evapotranspiration from 5 AR4 GCMs that perform best across Alaska and the Arctic, utilizing 2km downscaled temperature as model inputs. http://www.snap.uaf.edu/data.php

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