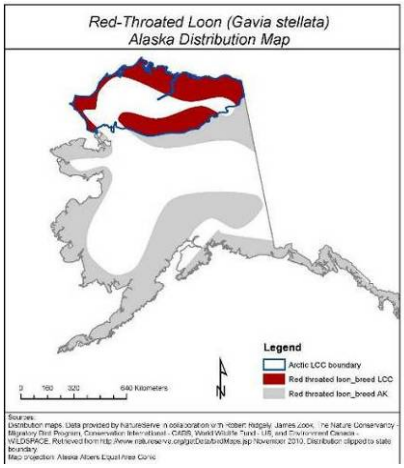
Red-throated Loon (*Gavia stellata*)

Vulnerability: **Presumed Stable** Confidence: Very High

The Red-throated Loon is the smallest of the world's five loon species. This species typically breeds in low wetlands in both tundra and forested terrain (Barr et al. 2000). They nest on pond edges, sometimes along very small ponds (<1 ha), particularly in parts of their range sympatric with Pacific Loons (Barr et al. 2000). Red-throated Loons are unique in that they regularly forage on fish away from their nesting ponds.In Arctic Alaska this often involves flights to the Arctic Ocean (Andres 1993). Like Yellow-billed Loons, the North American breeding population, north of 68° latitude, appear to winter primarily in East Asia from the western Kuril Islands to the Yellow Sea (J. Schmutz et al., unpublished data). In 1993, the Red-throated Loon population in Alaska was estimated at approximately 10,000 individuals (Groves et al. 1996) while more recent surveys indicated an estimated population size of 2-3,000 on the Arctic Coastal Plain of Alaska (Larned et al. 2012).

Range: We used the extant NatureServe map for the assessment as it matched other range map sources and descriptions (Johnson and Herter 1989, Barr et al. 2000).

Physiological Hyrdo Niche: Among the indirect exposure and sensitivity factors in the assessment, Red-throated Loon scored neutral in most categories (see table on next page). They were considered most vulnerable to climate change in the hydrological niche category ranging from "increased" to "greatly increased" primarily because of their reliance on small, shallow lakes (average area 0.4 ha, range 0.1 to 0.8 ha; Bergman and Derksen 1977) for nesting. Water dynamics in these lakes is dictated primarily by water balance (snow melt, precipitation, evaporation) rather than lateral expansion or drainage due to thermokarst thawing (Arp et al. 2011). Thus, the availability of suitable nesting lakes in the Arctic LCC will likely be related to spring snow melt input and the balance between precipitation and evaporation in summer maintaining sufficient water in this size class of lakes. Current projections of annual potential evapo-transpiration suggest negligible atmospheric-driven drying for the foreseeable future (TWS and SNAP), and its interaction with hydrologic processes is very poorly understood (Martin et al. 2009). Thus atmospheric moisture, as an exposure factor, was not heavily weighted in the assessment.



Disturbance Regime: Shoreline stabilization is likely to occur in response to increasing storm frequency and erosion (Jones et al. 2009). But such impacts may be limited to Native Alaskan village sites and industrial facilities that are dispersed along the coastline and have relatively small human populations. Shoreline stabilization is unlikely to have a meaningful effect on loon foraging or post-breeding activity along the Arctic Ocean coastline.

Physical Habitat Restrictions: Red-throated Loons are not tied to any uncommon geological features in their Alaskan range for nesting or foraging.

Red-throated Loon (*Gavia stellata*)

Vulnerability: **Presumed Stable** Confidence: Very High

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: With regard to nesting phenology, no time-series data exist for the Arctic LCC, but Red-throated Loons nesting on the Yukon-Kuskokwim Delta in Alaska have shown a trend of earlier average hatch date over the past 27 years (Fischer et al. 2009). Even if the North Slope population is able to adjust nesting to earlier spring phenology, it is unknown if they can adjust timing to the changing schedules of the other organisms on which they depend.

In summary, the results of this assessment suggest Red-throated Loons will likely be able to cope with climate and associated habitat changes predicted to occur in Arctic Alaska, at least during the next 50 years.

Literature Cited

Andes, B.A. 1993. Foraging flights of Pacific, *Gavia pacifica*, and Red-throated, *Gavia Stellata*, loons on Alaska's Coastal Plain. Canadian Field-Naturalist 107(2): 238-240.

Arp, C.D., B.M. Jones, F.E. Urban, and G. Grosse. 2011. Hydrogeomorphic processes of thermokarst lakes with grounded-ice and floating-ice regimes in the Arctic coastal plain. Hydrological Processes 25: 2422-2438.

Barr, J.F, C. Eberl, and J.W. McIntyre. 2000. Red-throated Loon (*Gavia stellata*). In The Birds of North America, No. 513 (A. Poole. and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.

Bergman, R.D. and D.V. Derksen. 1977. Observations on Arctic and Red-throated loons at Storkersen Point, Alaska. Arctic 30: 41-51.

Fischer, J.B., R.A. Stehn, and G. Walters. 2009. Nest population and potential production of geese and Spectacled Eiders on the Yukon-Kuskokwim Delta, Alaska, 2009. US Fish and Wildlife, Migratory Bird Management, Waterfowl Management Branch, 1011 E. Tudor Rd., Anchorage, AK, 99503.

Groves, D.J., B. Conant, R.J. King, J.I. Hodges, and J.G. King. 1996. Status and trends of loon populations summering in Alaska, 1971-1993. Condor 98: 1889-195.

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.

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.

From: Liebezeit et al. 2012. Assessing Climate Change Vulnerability of Breeding Birds in Arctic Alaska. A report prepared for the Arctic Landscape Conservation Cooperative. Wildlife Conservation Society, North America Program, Bozeman, MT., 167pp.