Steller's Eider (*Polysticta stelleri*)

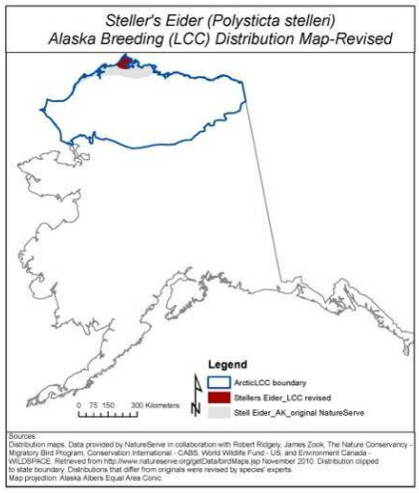
Vulnerability: **Moderately Vulnerable** Confidence: Moderate

The Steller's Eider, is the smallest of the four eiders and in many ways resembles dabbling ducks more than sea ducks. This species was listed as "threatened" in 1997 under the Endangered Species Act as it has virtually disappeared from historic breeding areas in the Yukon-Kuskokwim Delta, once the most populated breeding ground in Alaska. In Arctic Alaska, Steller's Eiders nest in polygonal tundra near the coast or up to 30km inland on sites with a complex of interconnected ponds (Fredrickson 2001). During the breeding season, their diet consists primarily of aquatic insects including chironomid and tipulid larvae (Fredrickson 2001). Alaskan breeders spend their winters along the Alaskan panhandle and the eastern Aleutian Islands (Fredrickson 2001). Current Arctic Coastal Plain population is estimated at <1000 individuals (Larned et al. 2012).

Range: We adjusted the NatureServe Map to more closely reflect a more restricted breeding range within the "Barrow Triangle" area. Over the past decades, breeding locations for this species have only been documented in this region (P. Martin, pers. comm.). Because of their restricted range near the coast, there is potentially little room for Steller's Eiders to relocate if climate-mediated changes result in habitat loss.

Natural Barriers: Increasing rates of shoreline erosion may result in relocation of infrastructure in the vicinity of Barrow which could adversely affect Steller's Eider breeding habitat. However, such impacts would be localized and presumably, adequate nesting and foraging habitat would remain.

Physiological Hydro Niche: Of all the factors used in the assessment those related to "hydrological niche" indicated the greatest possibility of significantly increasing vulnerability in this species (see table). Steller's eiders depend on shallow ponds for feeding and brood-rearing. Increased temperatures may alter prey base and/or dessication of these key habitats. The wide range in potential responses (see table) represents the significant uncertainty of such impacts. At present, information on how a warming climate will affect wetland primary productivity and aquatic insect prey base is speculative. 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 disturbance processes, namely thermokarst, could both create and destroy good foraging and nesting habitats through both ice wedge degradation and draining of thaw lakes (Martin et al. 2009). In fact, anecdotal evidence suggests Steller's Eiders may benefit from a flush of productivity that accompanies sudden lake drainage (P. Martin, pers. comm.). Likewise, predicted increased coastal erosion and resulting

Steller's Eider (*Polysticta stelleri*)

Vulnerability: **Moderately Vulnerable** 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.

salinization (Jones et al. 2009) could both negatively and positively affect post-breeding aggregations of staging birds by destroying and creating foraging habitat.

Interactions with Other Species: Steller's eider breeding success is strongly influenced by nest predation, and average nest success is higher when there is abundant lemming prey. Lemming cycles may become less regular (Post et al. 2009), potentially exposing eiders to greater nest predation.

Phenological Response: As of yet, the relationship between seasonal temperature / precipitation and phenology for this species in the Arctic LCC has not been studied.

In summary, the sources of potential vulnerability identified by this assessment, particularly with regard to this species heavy reliance on coastal and wetland habitats for breeding, foraging, and post-breeding activity and their small range in Arctic Alaska, yielded a moderately vulnerable result in all three climate change projections we considered.

Literature Cited

Fredrickson, L.H. 2001. Steller's Eider (*Polysticta stelleri*). In: The Birds of North America No. 571 (Poole, A. and Gill, F. eds.), Philadelphia, and American Ornithologists' Union, Washington D.C.: Academy of Natural Sciences.

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.

Martin, P., J. Jenkins, F.J. Adams, M.T. Jorgenson, A.C. Matz, D.C. Payer, P.E. Reynolds, A.C. Tidwell, and J.R. Zelenak. 2009. Wildlife response to environmental Arctic change: Predicting future habitats of Arctic Alaska. Report of the Wildlife Response to Environmental Arctic Change (WildREACH), Predicting Future Habitats of Arctic Alaska Workshop, 17-18 November 2008. Fairbanks, Alaska, USFWS, 148 pages.

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.

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.