Project Title: Development of a statistical adaptive monitoring framework for sea otters in Glacier Bay, Alaska

Discipline: Natural
Type of Project: Research
Funding Agency: National Park Service
Other Partners/Cooperators: Colorado State University
Student Involvement: Yes, Post-Doctoral Fellow
Effective Dates: 8/11/2015 – 7/1/2018
Funding Amount: $200,000

Investigators and Agency Representative:
NPS Contact: Mike Bower; National Park Service, Michael_Bower@nps.gov; 907-364-2621

Investigator: Mevin Hooten, Colorado Cooperative Fish and Wildlife Research Unit, Wagar Bldg., Colorado State University, Fort Collins, CO 80523-1484, 970 491-1415, hooten@rams.colostate.edu

Project Abstract: Marine Predators were chosen as a priority monitoring indicator, or "Vital Sign" of the Glacier Bay ecosystem, during development of the Southeast Alaska Network (SEAN) Vital Signs Monitoring Plan (Moynahan and Johnson 2008). At the time, it was envisioned that multi-species or community-based methods being employed by the USGS would be utilized to deliver this vital sign monitoring effort. However, initial reviews of these methods revealed that the design yielded low power for detecting trends for any one species (Drew et al. 2008), potentially obscuring important ecosystem responses. As such, the focus eventually transitioned towards selection of suitable indicator species and away from a community-based approach. Initial efforts to rank candidate indicator species included a survey of marine ecologists with experience working in Glacier Bay. Results indicated support for monitoring a variety of species, with the sea otter collectively ranked as the highest priority. Furthermore, prior efforts by the USGS provide a solid foundation for development of a sea otter monitoring protocol for Glacier Bay. For the past two decades, the USGS has maintained a comprehensive research effort quantifying sea otter abundance, sea otter foraging behavior, and benthic invertebrate communities to study the role that colonizing sea otters may have in Glacier Bay (Esslinger et al. 2013, Bodkin et al. 2007, Estes & Duggins 1995; Donnellan et al. 2004; Bodkin et al. 2007; Weitzman et al. 2013).

Sea otters were extirpated from southeastern Alaska by commercial fur hunting prior to 1911 and later reintroduced by the State of Alaska in the 1960's. Following reintroduction, sea otter populations grew exponentially in southeastern Alaska, eventually expanding into Glacier Bay around 1993. Since that point, sea otter abundance has grown at an unprecedented rate of 42% per year (Esslinger et al. 2013). Strong effects of sea otter predation on nearshore community structure have been well-documented in areas of rocky substrate in the North Pacific Ocean (e.g. Estes and Duggins 1995) and there is considerable interest in understanding the potential top-down effects and bottom-up responses of sea otters within Glacier Bay where unconsolidated sediments are more common.

This new project builds upon an existing population monitoring data set with the objectives of developing a statistical monitoring framework to produce an adaptive design that maximizes efficiency to estimate sea otter abundance in Glacier Bay as the foundation for understanding both top-down and bottom-up drivers of the nearshore benthic food web.

Keywords: monitoring, sea otters, Glacier Bay, Alaska, Colorado State University, Colorado Cooperative Fish and Wildlife Research Unit