Case Study 9: Collecting Baseline Biological and Geologic Data to Understand Coastal Change, *Bering Land Bridge National Preserve, Alaska Cape Krusenstern National Monument, Alaska*

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Coastal bluffs are eroding as a result of permafrost thawing and coastal storm erosion. Image credit: Tahzay Jones, NPS.

Goals

Climate change impacts, including coastal erosion, reduction in sea ice, and thawing of permafrost, are impacting Bering Land Bridge National Preserve (BELA) and Cape Krusenstern National Monument (CAKR) along the northwestern Alaska coast. The parks need baseline information and an updated evaluation of coastal resource vulnerabilities in order to make prudent management decisions related to increased marine traffic, sensitive areas, and natural and cultural resource protection.

Challenges and Needs

Climate change impacts are affecting park resources in several ways. Increasing ocean temperatures are causing a reduction in the summer sea ice extent in the Chukchi Sea. This in turn delays the winter return of the ice and the coastal protection that it provides the northwest Alaska coastline. The resulting increase in storm erosion, combined with the thawing of permafrost, has accelerated the erosion of BELA and CAKR coastal natural resources and cultural sites. The barrier islands supporting the village of Shishmaref and Kivalina are also eroding, and residents are considering relocation to inland sites: Shishmaref to interior Shishmaref Inlet, within the lagoon system that is hydrodynamically connected to the BELA lagoons; and Kivalina to the mainland with a road connection to the CAKR Red Dog Mine port site.

The reduction in ice along the Arctic coastline also has allowed oil development and marine traffic to increase, raising the potential for marine incidents with associated environmental ramifications. Marine traffic has significantly increased because the only connection between the Pacific and Arctic Oceans is the Bering Strait adjacent to BELA and just south of CAKR. This transit point is of high value because the northern sea routes significantly reduce the travel distance between Europe and Asia, creating significant cost savings. The US Coast Guard and US Army Corps of Engineers

are currently evaluating sites for a deep water port in the Arctic, and the current preferred site is Port of Nome on the southern side of the Bering Strait, a short distance south ofBELA.

Loss of sea ice will likely increase the ocean exchange with lagoons, a process that will likely be accelerated by sea level rise. Changes in chemical and physical characteristics of lagoon water, such as salinity and hydrodynamics, will alter biological components of the ecosystem in unknown ways. These systems currently provide habitat for globally important bird populations, threatened and endangered bird species, and are home to the northernmost extent of eelgrass in North America.

Adaptation will require understanding, preparing for, and responding to these changes.

Responsive Actions

National Park Service (NPS) climate change scenario planning has been done for both parks. The NPS Arctic Network Inventory and Monitoring Program is developing long-term monitoring protocols for coastal erosion and lagoon biology, and is already engaged in climate monitoring. Datasets continue to be developed that will enhance understanding of climate change vulnerability in these parks. Datasets include coastal erosion (using satellite and aerial imagery from 1954–2003 and satellite imagery including 2013 data), LiDAR (topographic) coverage of both parks (2003), and improved accuracy of coastal maps (2013). A one-year ShoreZone mapping project was conducted that included coastal orthophotography and maps of intertidal biotic components, geomorphology, and coastal hazard areas along the BELA and CAKR coastlines (2012 and 2013). Projects supported by the park and the Alaska regional office have included post-breeding bird surveys in BELA (2013) and CAKR (2014), lagoon water mass budgets in BELA (2013), permanent marine debris monitoring sites in BELA (2013) and CAKR (2014), and a coastal survey of at risk cultural sites (2012 and 2013).

To accomplish these results, all projects work synergistically to share and utilize logistical resources to the maximum extent possible. Additional projects planned include ecological classifications of the BELA and CAKR coasts; an interdisciplinary biophysical baseline assessment of BELA and CAKR lagoons and estuaries; and updating environmental coastal sensitivity indices. Current park proposals include post-breeding surveys of water birds; understanding whitefish ecology and seasonal dynamics (a primary subsistence fish in both parks); seasonal marine mammal presence, distribution, and coastal use; lower trophic level biophysical surveys; gathering of local community traditional ecological knowledge; engaging with local communities to identify new areas of concern; and working with partners to model ship traffic.

Significant outstanding data needs include lagoonal water quality, hydrodynamics, and bathymetry; lower trophic level seasonality, distributions, and densities; further surveys to identify locations of cultural sites at risk; subsistence needs and restrictions; and political and jurisdictional boundaries. Additional challenges are presented by the difficulty in obtaining funding to conduct work along this coastal region; the extensive land area needing study; and the logistics of reaching these remote parks.

This case study is an example of the following adaptation strategies:

- Monitoring climate change impacts and adaptation efficacy
- Conducting/gathering additional research, data, or products

For more information:

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