Case Study 4:
Cultural Resources Inventory and Vulnerability Assessment,
Bering Land Bridge National Preserve, Alaska
Cape Krusenstern National Monument, Alaska

Contributing Authors: Dael Devenport (Alaska Regional Office) and Frank Hays (Western Arctic National Parklands)

Bluffs along the coast eroded 78 m (256 ft) in only 54 years. Image credit: NPS I&M Program.

Goals

Climate change has increased the vulnerability of cultural resources in coastal locations at Bering Land Bridge National Preserve and Cape Krusenstern National Monument along the northwestern Alaska coast. The Alaska Regional Office is developing and testing a GIS model that is intended to predict locations and vulnerability of these cultural resources.

Challenges and Needs

The 1,600 km (1,000 mi) of coastline along the parks are experiencing increased storm impacts due to climate change effects including rising sea level, melting permafrost, increasing storminess, and the failure of shore ice to form its usual protective barrier against wave erosion during open water season, including storms in the late fall. The Alaskan Arctic has experienced average temperature rise at twice the rate of the rest of the world, and precipitation patterns are changing. Seasonal (winter) sea ice is not forming to its previous extent and thickness, and thick multi-year ice has mostly disappeared. Satellite data indicate that the extent of the sea ice is decreasing by 3% per decade, and submarine data show that the thickness has decreased by up to 1 m (3.3 ft). The ice plays a role in surface reflectivity, cloudiness, humidity, exchanges of heat and moisture at the ocean surface, and ocean currents. Summer ice is projected to disappear over most of the Arctic Ocean by 2020. Permafrost, which protects cultural resources by preserving organic materials, has warmed by up to 2°C (3.6°F) and is melting.

Both parks preserve some of the earliest most significant archeological sites in North America including ancestral villages of the Inupiat people. Some of these prehistoric sites are being lost due to destabilization of the coasts and the resulting erosion that can be up to 3.7 m (12 ft) per year. As the permafrost that encases the soil of the region melts, the stratigraphy, artifacts, and buried house remains that make up a typical site are exposed and then become victim to mechanical erosion from the waves and thermal degradation from the warmer temperatures that prevail on the bluff faces.

Already, recently exposed archeological sites litter the bluff faces that line the coastline of Bering Land Bridge National Preserve. Only a small percentage of the coastlines have been inventoried, and there is little information on the significance or condition of most of the vulnerable archeological sites. Through actions, as described below, the National Park Service (NPS) is documenting unknown and unprotected archeological sites in order to make informed decisions about management actions.

Responsive Actions

To build basic inventory knowledge and inform subsequent management actions, the Alaska Regional Office is creating a GIS-based vulnerability assessment to determine which areas of the park coasts are most vulnerable to erosion and which of those areas are most likely to contain archeological sites. The GIS-based model will combine predictive local climate scenarios produced by the Scenarios Network for Alaska and Arctic Planning, a coastal erosion model from the Arctic Network (NPS Inventory & Monitoring program), and a model to predict the presence of archeological sites based on physical site characteristics. The model will be tested first on its ability to predict the locations of known sites, and then on its ability to identify the high or low probability of sites occurring in particular areas. This study will give a more detailed overall picture of where erosion rates are greatest relative to the density of sensitive archeological zones, and will enable prioritization of future archeological inventories.

House pits are visible near Cape Krusenstern in this 2003 orthophotograph. Image credit: NPS I&M Program.

Lack of relevant baseline data (e.g., site locations and conditions) has impeded this project. Consultation with communities affiliated with both park coastal areas will help the parks incorporate traditional knowledge of climate impacts, record documented and undocumented archeological and ethnographic sites and features, and develop survey strategies and priorities. The project will also compile archeological inventory data, digital elevation models, soil maps, aerial imagery, and documentation including Bureau of Indian Affairs Alaska Native Claims Settlement Act (BIA ANCSA) files, toponym studies, and scholarly journal articles.

The initial phase of this project, identification of at-risk sites, was initiated in 2011 and was recently completed. Site treatment will be an ongoing process.

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

- Conducting/gathering additional research, data, or products
- Conducting vulnerability assessments and studies
- Creating/enhancing technological resources
- Developing/implementing an adaptation plan

For more information:

Dael Devenport, Archeologist, Cultural Resources
Alaska Regional Office
(907) 644-3483
Dael_Devenport@nps.gov

Superintendent
Western Arctic National Parklands
(907) 442-8301