

Coastal Change since 1950 in the Southeast Chukchi Sea, Alaska, Based on GIS and Field Measurements.

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Coastal environments at high latitudes are experiencing rapid change. Coastal erosion threatens a variety of near shore marine, terrestrial, and freshwater habitats, and may be accelerating with Arctic warming. To better understand impacts for national parks in northwestern Alaska, a collaborative study has begun to document coastal change in the southeast Chukchi Sea. A field-based component includes: repeat photography; mapping and description of sediments and landforms; and periodic ground-truth measurements of shoreline change since 1987 at 27 coastal monitoring sites. A geospatial component began with creation of digital orthoimagery over a large area (>6000 km²) at high resolution (1.0 m or better) for three "time slices": approx. 1950, approx. 1980, and 2003. Spatial analysis of bluff retreat was then conducted for selected areas near the monitoring sites using the USGS DSAS extension to ArcGIS. Results indicate that the GIS-based measurements have acceptably low errors (+/- 0.1 m/yr or better). Transects with 20-m spacing reveal high spatial variability related to coastal morphologies and processes. A comparison of the two time intervals suggests temporal variability also. For example, bluff erosion rates appear to have decreased after 1980 for the north-facing coast of Bering Land Bridge National Park while increasing after 1980 for the west-facing coast of Cape Krusenstern National Monument. In general, most of the >600-km-long coast from Wales to Kivalina has experienced erosion in the past five decades, with long-term average rates of 0 to -3 m/yr. Direct impacts include beach and bluff retreat, overwash deposition, migration or closure of inlets and lagoons, capture of thaw-lake basins, and release of sediment and organic carbon to nearshore waters. Higher temporal resolution is needed, but the coastal ecosystems in the region appear to be sensitive to: the frequency and intensity of storm events, increasing temperatures, permafrost melting, sea-level rise, and increasing length of the summer ice-free season.

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<http://coast.gkss.de/events/arctic07/>