Assessing inshore habitat loss from the 1920s to the 1990s in the Chignik area of the Alaska Peninsula

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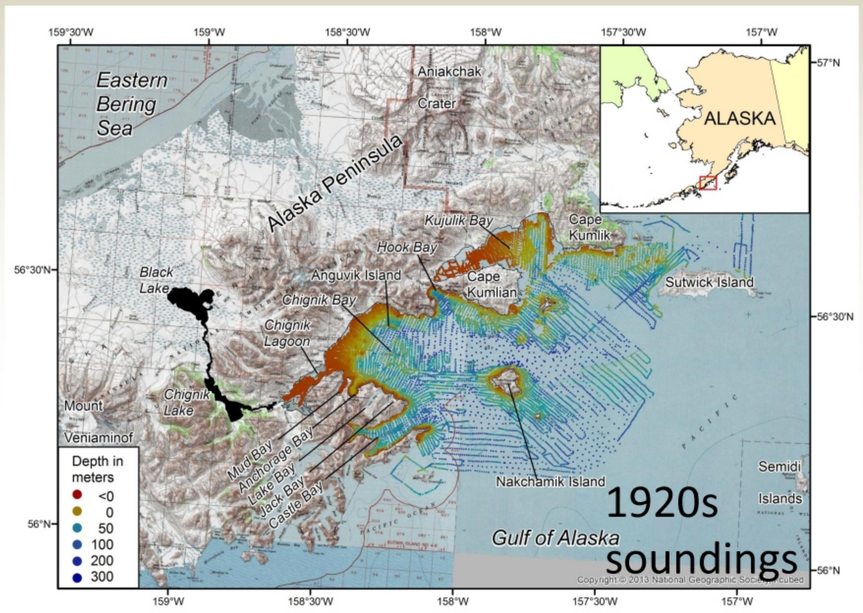
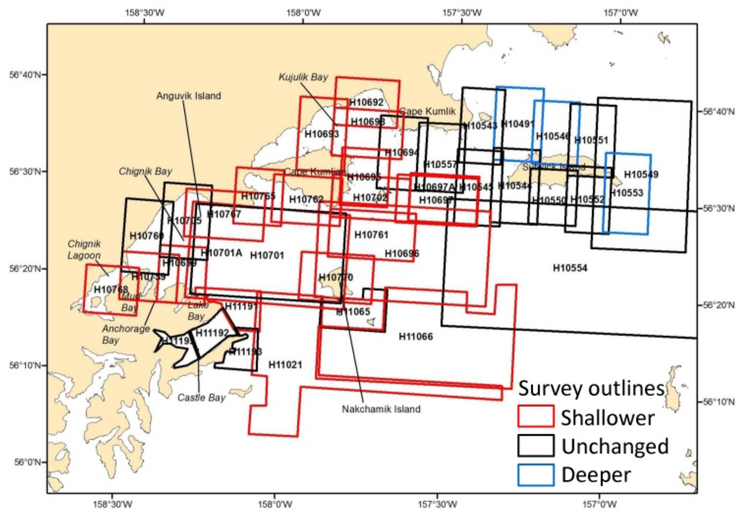
Introduction

The Chignik area on the Alaska Peninsula includes several small, shallow bays, an important salmon-producing lake system (Chignik and Black lakes), and two large stratovolcanoes - Veniaminof and Aniakchak. The seafloor was originally mapped in the 1920s by National Ocean Service hydrographers with 22,000 soundings over 13 smooth sheets.



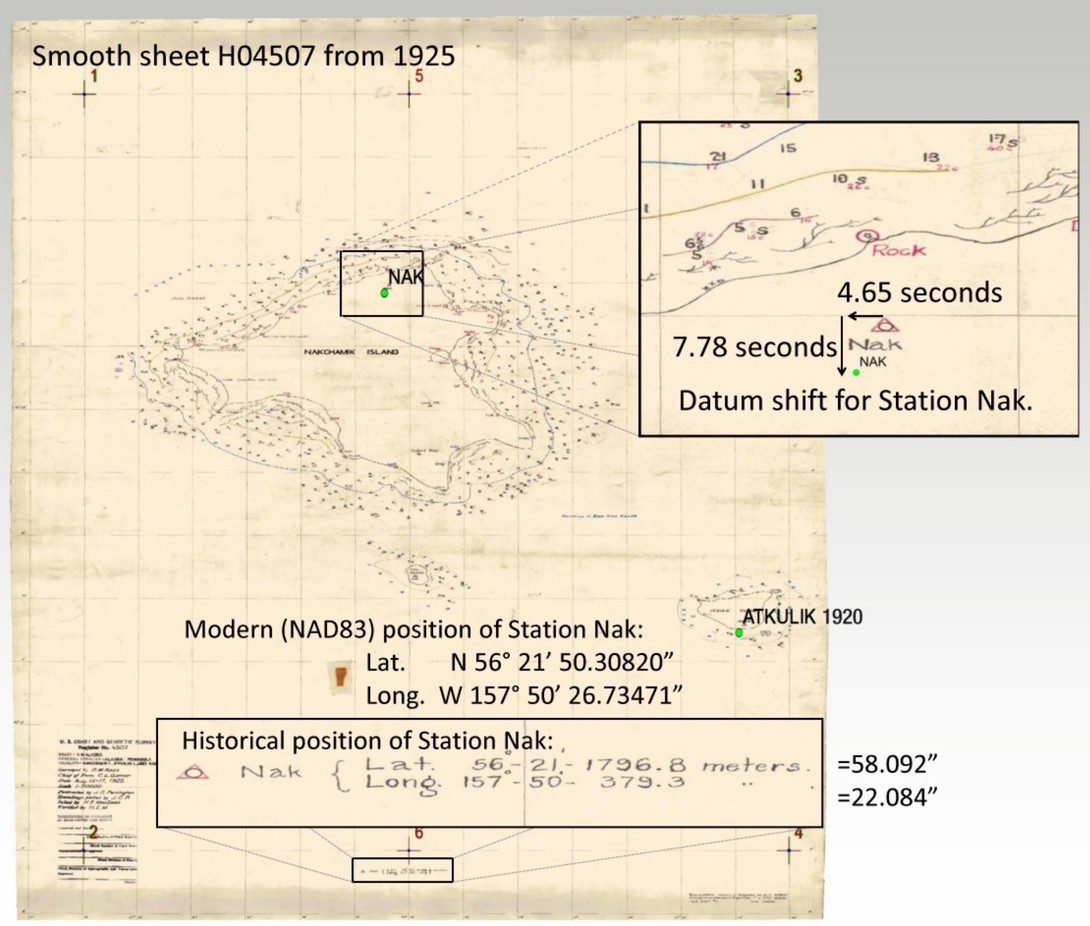
Resurvey

When the area was remapped by the NOS in the 1990s (832,000 soundings in 33 smooth sheet surveys), several surveys indicated shallowing by as much as 5 fathoms (9.1 m). Loss of inshore habitat may negatively impact forage fish, bird feeding, and growth and survival of Pacific salmon smolts (*Oncorhynchus* spp.).



Datum shifting

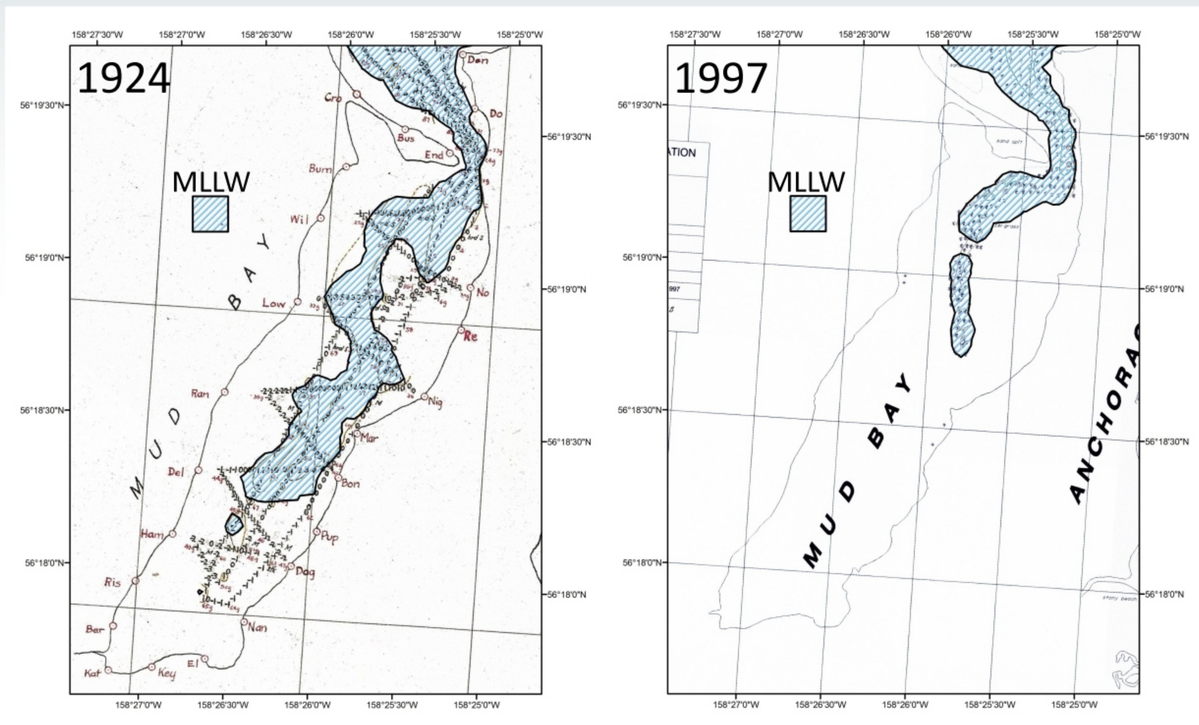
Simple Latitude/Longitude shifts, based on the differences in the published position of common reference marks, were used to align each of the 1920s smooth sheets to a common datum (NAD83). For example, smooth sheet H04507 (Nakchamik Island) needed to be shifted 240.7 m (7.78 secs.) south and 79.9 m (4.65 secs) west.



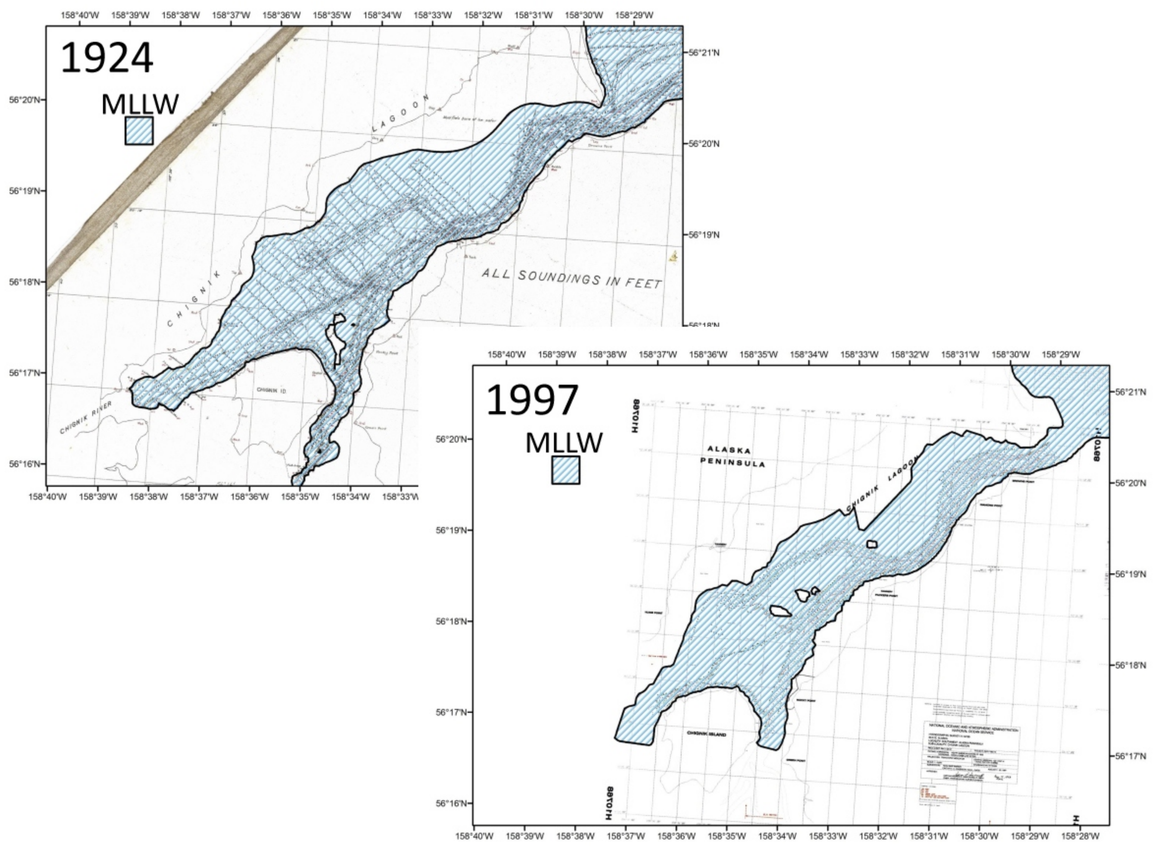
Comparison

Castle Bay, Chignik Lagoon, Hook Bay, Kujulik Bay and Mud Bay all decreased in volume when measured from MLLW (Mean Lower Low Water) to the deepest depths, but Anchorage Bay did not. All sites except for Anchorage Bay and Kujulik Bay lost volume when measured from MHW (Mean High Water) to the deepest depths.

Mud Bay lost 72.3% of its area at MLLW, and lost 15.6% of its volume when measured between MLLW and the deepest depths. This infilled area is an average of 0.06 m shallower.



Chignik Lagoon lost 23.1% of its area at MLLW, and lost 16.3% of its volume when measured between MLLW and the deepest depths. This infilled area is an average of 1.27 m shallower.



Potential causes

- **Tectonic shifts?** Not impacted by the great Alaska earthquake (9.3 magnitude) of 1964, nor a nearby (120 km south) 8.3 magnitude earthquake in 1938.
- **Mean sea level rise?** Only 0.68 mm/yr rise since 1972, or 0.0476 m in 70 years. http://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?stnid=9459450.
- **Land movement?** No net vertical movement recorded from 2006-2016: http://www.unavco.org/instrumentation/networks/status/pbo/overview/AB13.
- **Anthropogenic siltation?** No forestry (no trees), few roads, no farming or ranching, and just a few, small, old mines.
- **Volcanoes?** Maybe! These are likely suspects as both Veniaminof and Aniakchak had massive 50 km^3 eruptions which reshaped the landscape about 3,700 and 3,430 B.P., respectively (Miller and Smith 1987). Major ashfall eruptions of Aniakchak (1931) and Veniaminof (1939 and 1956), and the remobilization of new and old ash deposited on land as sediment, may be responsible for the shallowing between the 1920s and 1990s. The infilling is the equivalent of ash deposition of 0.8 mm/yr in Mud Bay and 17.5 mm/yr in Chignik Lagoon.