



Alagnak

Aniakchak

Katmai

Kenai Fjords

Lake Clark

Lake Sediments

Resource Brief
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Importance

As sediment and other material settle on the bottom of lakes, an excellent historic record of natural and anthropogenic (human-influenced) events is deposited. Scientists are able to collect and analyze lake sediment cores and date the various layers, providing a detailed timeline of past events, such as volcanic eruptions marked by the presence of ash. Presently, there is a growing concern over contaminants, such as mercury, in the environment. SWAN is monitoring for the presence of contaminants through the Air Quality vital sign and by analyzing contaminant concentrations in resident lake fish (non-migrating) and plant tissue. However, to achieve a long-term historical perspective on contaminant concentrations, SWAN has turned to lake sediment analysis.



Long-term Monitoring

In order to assess the impacts of the modern day industrial era, scientists must first have a good estimate on the historic levels of contaminants that occurred naturally.

Mercury, for example, can occur naturally through the weathering of rocks. By using sediment cores, researchers can provide an estimate of contaminant levels dating back on the order of hundreds of years prior to the modern day industrial era - a period often linked to significant increases in atmospheric contaminant levels. Pacific salmon are known vectors of contaminants, transporting material accumulated during residence time in the ocean to freshwater spawning grounds. A comparison of sediment cores between anadromous and non-anadromous lakes allows researchers to evaluate the role Pacific salmon play in transporting contaminants into SWAN park units.

Discussion

Archived sediment cores from five SWAN lakes were used by University of Alaska researchers to measure historic concentrations and accumulation rates of mercury, copper, lead, and other trace metals. Of the lake cores analyzed, Naknek Lake (KATM) had the longest record dating back to 1248 AD. On average, anadromous



Sediment cores collected from ponds in LACL. Light gray color bands are volcanic ash deposited from past volcanic eruptions.

lakes had higher mercury concentrations than non-anadromous lakes. However, both major and trace element accumulation rate trends indicate that all five lakes are dominated by landscape processes which seem to be the primary contributor of most elements to the lakes. Variations among lakes appear to be dictated primarily by the relative contribution of landscape processes (e.g., glacial runoff) on each lake basin. Trace element concentrations nearly double around the time of the Novarupta Volcano eruption in 1912, but then recover to levels similar to those around mid-1700s. In comparison to Interior and Arctic lakes, SWAN lakes have much higher accumulation rates of trace elements possibly due to higher sediment accumulation and recent volcanic activity. There was no apparent correlation between salmon densities and mercury concentrations. This lack of relationship is likely reflected in changing contaminant concentrations in salmon tissue over time, perhaps as a result of changing oceanic contaminant levels where salmon accumulate the vast majority of their body mass.