Pebble Project Environmental Baseline Studies
2004-2008
Technical Summary

APPENDIX B.
Iliamna Lake Study

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APPENDIX B. ILIAMNA LAKE STUDY

B.1 Introduction

The objectives of the Iliamna Lake study were to describe existing water quality, sediment, mussel tissue, and zooplankton conditions in the Iliamna Lake study area (Figure 1-4 in Chapter 1).

Mussel tissue samples and sediment samples were collected at four nearshore sampling sites for analysis of laboratory parameters twice during 2005 and once during 2006 at Finn Bay, Flat Island, Bucket Lake and Whistlewing Bay. Five deeper-water sites were selected for sampling of water quality, sediments, zooplankton, and field parameters. Those sites are located in Pile Bay, Knutson Bay, Northeast Bay (just east of the Iliamna boat dock), Roadhouse Bay, and at the mouth of Upper Talarik Creek. From May through October 2005 and 2007, the study team collected data monthly at the five deeper-water sampling sites. Water-quality samples were collected using a Niskin sampler and were submitted for laboratory analysis of trace elements. Sediment samples were collected using grab sampling technique and submitted for laboratory analysis of trace elements. Zooplankton samples were collected using a tow net and were analyzed for taxa identification.

Ambient water-quality measurements were collected at all 9 study sites using handheld meters,

B.2 Results and Discussion

Evaluation of the data from Iliamna Lake for water quality, mussel tissue, and sediment indicates that Iliamna Lake is an oligotrophic, dimictic lake with water-quality conditions similar to the natural conditions of other regional lakes. Only a few analytical parameters (e.g., copper, lead, aluminum, iron, manganese, and alkalinity) had results outside of the criteria established by the Alaska Department of Environmental Conservation for freshwater. The concentrations are likely a result of geological influences and are consistent with previous studies conducted at Iliamna Lake and other area watersheds. Field parameters were within normal ranges, with the exception of a few slightly low pH measurements at Pile Bay, and are considered suitable for lake biota.

Concentrations of nutrients and major ions found during the 2005 through 2007 Iliamna Lake study were similar to concentrations from a study conducted at Iliamna Lake nearly 40 years before; the one exception was sodium, which was present at nearly twice the concentration found by the earlier study. Cation and anion dominance in Iliamna Lake were generally characteristic of temperate lakes. Sodium was more abundant than magnesium, however, which suggests a contribution from igneous rocks in the region. Depth was not found to have an effect on the concentrations of major ions, and this finding indicates that waters at the study sites were well mixed. Concentrations of several major ions and total dissolved solids were lower earlier in

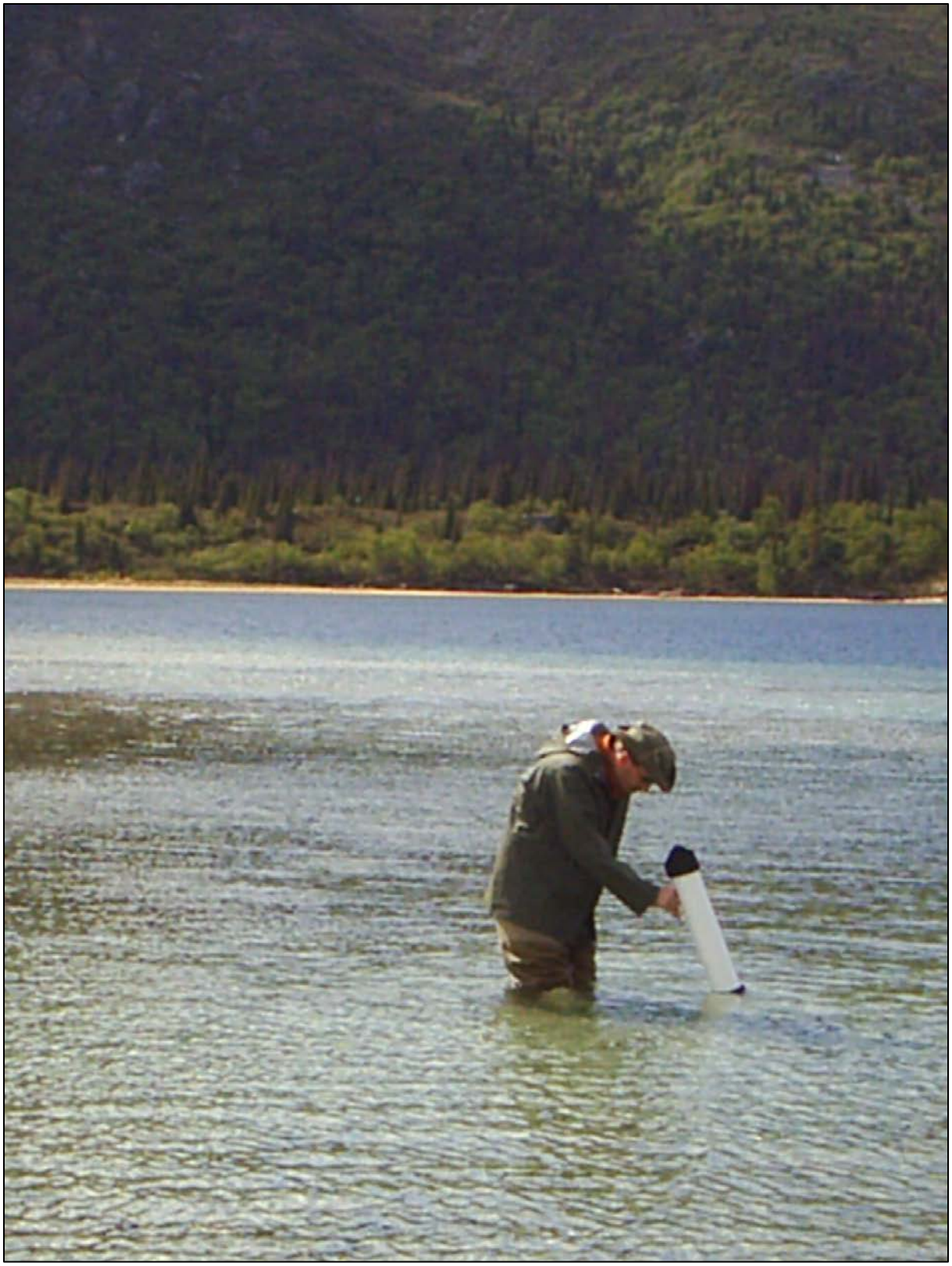
the summers, peaked in September, and declined again in October. The temporary increases may be associated with the influence of precipitation and inflow from streams.

Temporal and spatial variations were evident in concentrations of some of the water-quality analytes. Pile Bay and Knutson Bay tended to exhibit similar concentrations, which were often different (usually higher) than concentrations for the other three deeper-water sites. Zinc reached peak concentrations in June and July. Copper, lead, zinc, and aluminum were found to be periodically above the chronic aquatic life criteria (CALC) or drinking water standards. Alkalinity was almost always below the minimum criteria, indicating that the lake system may not be able to buffer substantial changes in pH. Mercury, cyanide, and organics were rarely found to be above the method reporting limit during the study.

Iliamna Lake zooplankton communities were dominated by copepods and rotifers during many of the sampling events. Copepod abundance in 2005 generally was higher earlier in the summer and declined in later months; however, in 2007 copepods increased in relative abundance from May to October (with the exception of July). In both 2005 and 2007, relative abundance for cladocerans was low in the early spring and summer, but increased in late summer and fall. Previous studies suggest that low numbers of cladocerans and a decrease in copepods throughout the summer may result from predation by juvenile sockeye salmon, and this trend is a typical occurrence in sockeye-rearing lakes.

Although evaluation of the data from this study provide insight into potential trends and baseline conditions of Iliamna Lake, it is important to note that all findings are based on relatively small sample sizes and must be considered preliminary and indicative only.

Water sampling using the Niskin sampler.



Locating freshwater mussels in Iliamna Lake.

Sampling for freshwater mussels in Finn Bay.

Freshwater seal haulout in Iliamna Lake.