North Slope Lakes Project

Water and Environmental Research Center
University of Alaska Fairbanks

Lake L9312 Ice-Thickness Measurements

Lake 9312 Hydrologic Notes, August 13, 2007.

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The North Slope Lakes project team measures water levels and hydrologic conditions at a network of study lakes and water reservoirs across the Alaskan North Slope coastal plain. We also measure chemistry and physical parameters at many of these lakes. Lake L9312 is part of the network of study lakes, and represents a small perched lake adjacent to the Colville River. The lake is recharged through direct rain and snow precipitation on the lake, and overland and subsurface flow through the active layer from the surrounding lake watershed. Periodic flooding during spring snowmelt from the adjacent Colville River can also recharge the lake. This lake is the primary water supply for the Alpine facility and water is used on a continuous basis throughout the year.

During winter months, holes are augered in the lake ice to measure water levels and chemistry. Some holes are also drilled for collection of lake bottom sediments, investigating lake features and water-use infrastructure. Ice thickness, snow depth, and freeboard are measured at all primary ice holes. This information, over time, can help describe the variability of lake-ice growth and relationships between snow cover, air temperature fluctuations and the relationships between lake-ice volumes and available under-ice water volumes available for fish habitat and water use.

Figure 1 shows the ice thickness measurements for all recorded holes in L9312 for the 2004-05, 2005-06, and 2006-07 winters. Within any one sampling period, there can be multiple ice thickness observations. None of the measured ice thicknesses were greater than 6 feet (1.8 meters). Ice growth slows in March with warming temperatures and increased solar gain. Snow depth conditions during these three years varied from being mostly clear ice in the 2004-05 winter to about a half foot of snow cover during the winter of 2006-07. Snow cover can vary over the extent of the lake. Small drifts were not found to have an observable impact on ice thickness. Large drifts near shore areas should limit ice growth in these areas. Ice thickness can also change throughout the winter depending on the relationship between snow and wind events. The period of maximum ice growth should occur between March and late April depending on snow and air temperature fluctuations. Melting of lake ice at the bottom surface can occur before breakup due to warm April temperatures. The variability in ice thickness during this period is expected to be within the range of ice thickness across the lakes. An exception would be the occurrence of deep snow drifts on the lake, which insulate the lake ice. These features would increase the amount of under-ice water volume. Excluding these features from general lake analysis provides a conservative water-management approach.

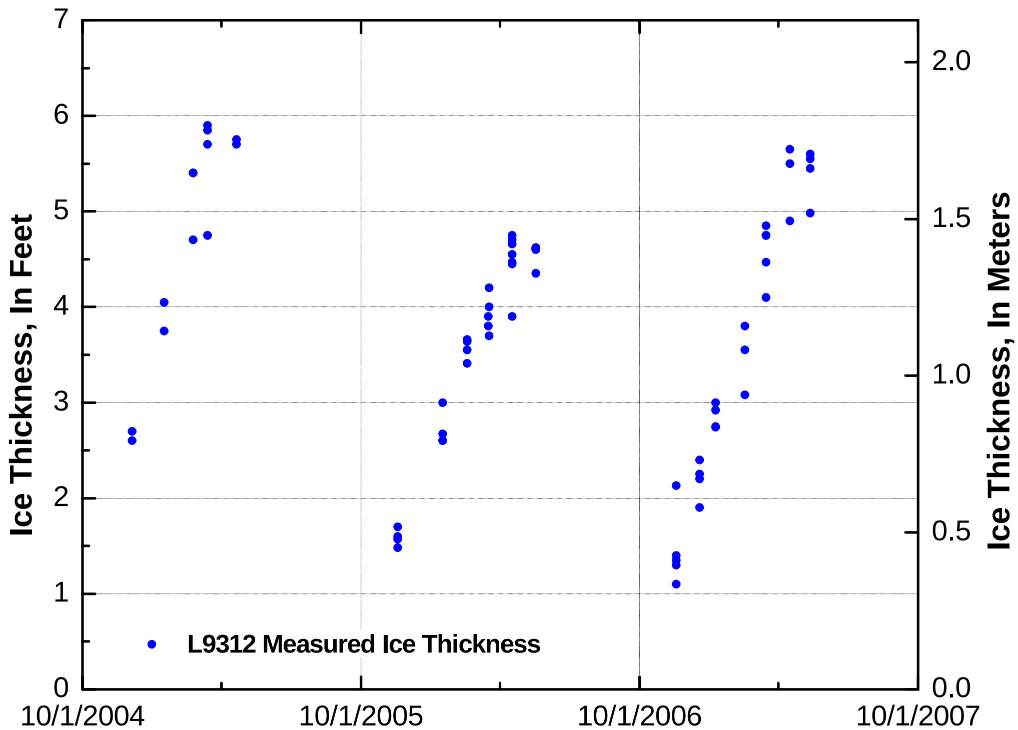

Figure 1. Measured ice thicknesses in Lake L9312. Ice measurements are taken at a number of locations each sampling trip.

The collection and archiving of lake-ice data can help improve the understanding of ice-thickness variability across lakes, seasonal variation, and year to year changes. This information can be used to help water-resources management for winter ice and water use.

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