

North Slope Lakes Project

Water and Environmental Research Center
University of Alaska Fairbanks

Lake L9312 Water Levels, Monthly Water-Use and Cumulative Annual Permit Accounting

North Slope Lakes Project Hydrologic Notes, January 13, 2007.

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The North Slope Lakes project team measures water levels and related hydrologic conditions at a network of study lakes and water reservoirs across the Alaskan North Slope coastal plain. We also collect additional chemistry and physical measurement data at many of these lakes. Lake L9312 is part of the network of study lakes, and represents a small perched lake with no continuous stream flow into the lake. The lake is recharged through direct rain and snow precipitation on the lake, overland and subsurface flow through the active layer from the surrounding lake watershed, and periodic flooding during spring snowmelt from the adjacent Colville River. This lake is the primary water supply for the Alpine facility. Water is used on a continuous basis throughout the year.

There are two primary outlets for L9312. One is located in the southeast corner and one is located on the northwest corner of the lake. The northwest corner outlet is slightly lower and was observed to have flow leaving the lake during surveys in mid September, 2006. The outlet elevation is important for determining the conditions of the lake and when it is full, or in an overfull condition. During conditions when the lake is overfull, water can be leaving both lake outlets, or the just the lower outlet and water removed by pumping is coming from the “Overfull” volume of the lake.

Figure 1 shows the monthly pumping volumes from 2002 through 2006. The annual water use permit period is from January through December each year. The cumulative water use during the annual permit period aids in accounting for water resource assets. This permit period does not coincide with important portions of the hydrologic cycle, such as freeze-up and snowmelt break-up. Habitat permits are written to extend through the winter ice-cover season and do not generally cover the entire annual period. The primary permit restriction for potential fish bearing lakes assumes a static volume under ice and allows either 15% or 30% water use. The range depends on the fish species present, and the understanding of the sensitivity of the fish to low oxygen levels. In practice, some variations exist such as lake L9312, which has a 35% permit limit.

While the intent of usage limits is for winter extraction, facility water use tends to be year-round. In some cases, this results in water available in the source lake, but not accounted for by an annual permit process using fixed volume estimates. Understanding the range in water levels in a lake and the relationship between water inflows (snowmelt, rainfall) and outflows (lake evaporation, watershed evapotranspiration, water use, surface discharge) to the lake can help improve water asset accounting.

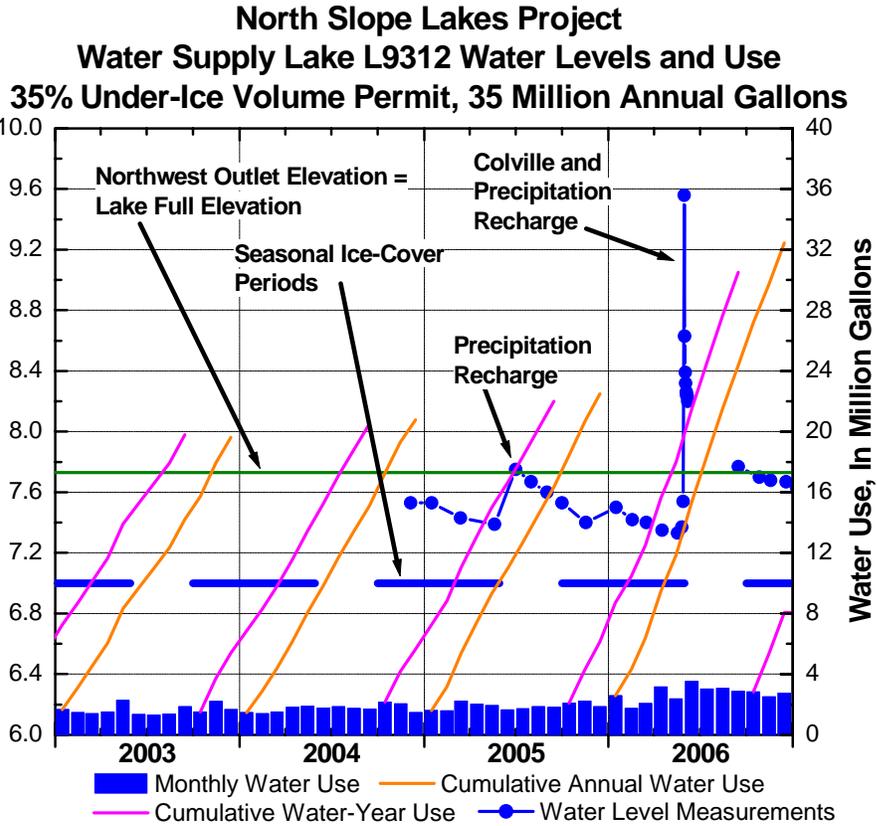


Figure 1. Measured water-surface elevations in Lake L9312. Monthly water use is shown with a cumulative line using the annual permit period of January to December. The seasonal ice-covered periods are shown to help compare the annual permit cycle with the seasonal hydrological cycle.

Developing accounting systems and the supporting information can help better define the amount of available water assets for a facility and manage risks associated with asset use and natural variability in hydrologic and meteorologic conditions. This can allow adaptive management of water assets to improve operational flexibility for facilities. It can additionally help preserve wildlife and fisheries resources, which are also dependant on these same assets.

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