North Slope Lakes Project

Water and Environmental Research Center
University of Alaska Fairbanks

Mine Site B (6 Mile Lake) Water-Level and Use Observations, October 2005 through March 2007

North Slope Lake Project Hydrologic Notes, May 3, 2007.

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Water level elevations (Figure 1) are being surveyed at Mine Site B (6 Mile Lake), in both the south and north cells during winter and selected summer months. Additional chemistry and physical measurement data are also being collected. Water-use information is also monitored for both cells. Water withdrawals typically take place year-round in just the North Cell. The South Cell is accessible just during mid to late winter periods by ice roads. Hydrologic interactions between the two cells and effects of water withdrawal on dissolved oxygen in late winter are some of the primary issues under investigation.

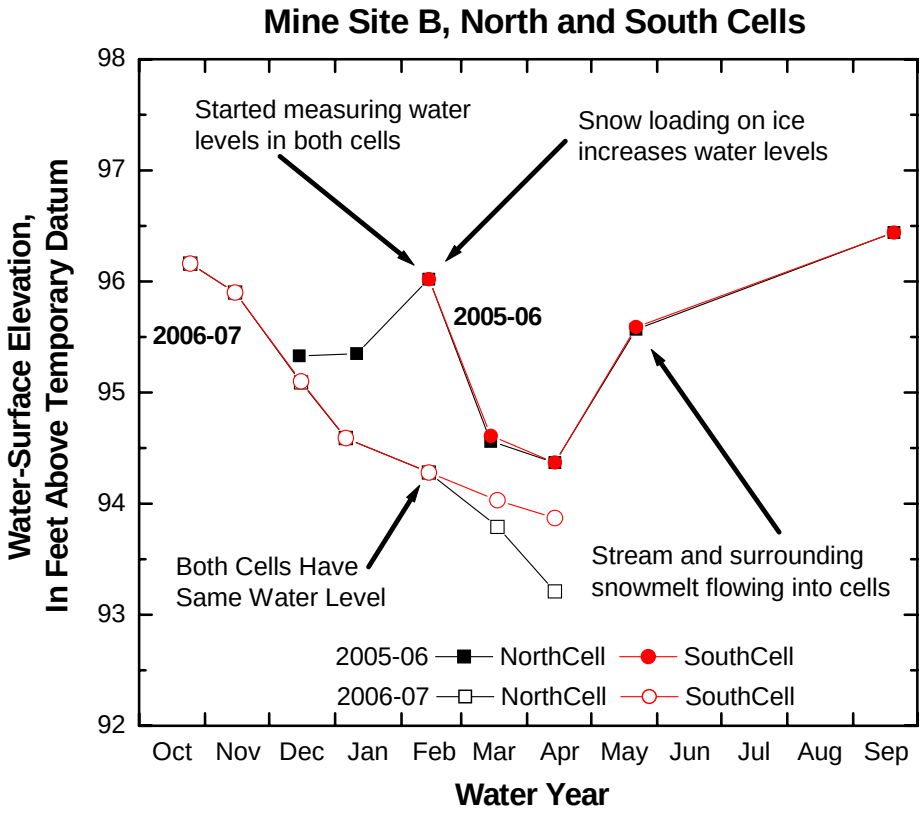

Figure 1. Water-surface elevation (temporary datum) in Mine Site B north and south cells. Data is shown for the 2005-06 and 2006-07 water years. The effects of increased water use can be seen in 2006-07.

Before 2007, the cells were permitted separately, with both the North and South cells having different winter appropriation limits. In 2007, the two cell permits were combined due to the typical interconnection between the cells. During the summer and most winter months, the two cells are connected by two channels. During the winter of 2006-07, these connections diminished but still have allowed flow between the two cells. These connections result in any water pumped from the south or north cells to be contributed by both cells, as long as the water levels are above the connecting channels bottom elevations (approximately 90.6 fatd East Channel; 89.5 fatd West Channel) and winter ice formation is not completely blocking the channels. Since water use comes from both cells when they are connected, the relative amounts will be a function of the area of the two cells. This is an approximation assuming for the drawdown in the cells, the relative bathymetry changes are minor. The North Cell is approximately 36% of the total area, with the South Cell being 64%. Two thousand square feet were removed from the South Cell to account for its shallower water areas. This information is used to determine the amount of water coming from the connected cell volumes (Figure 2).

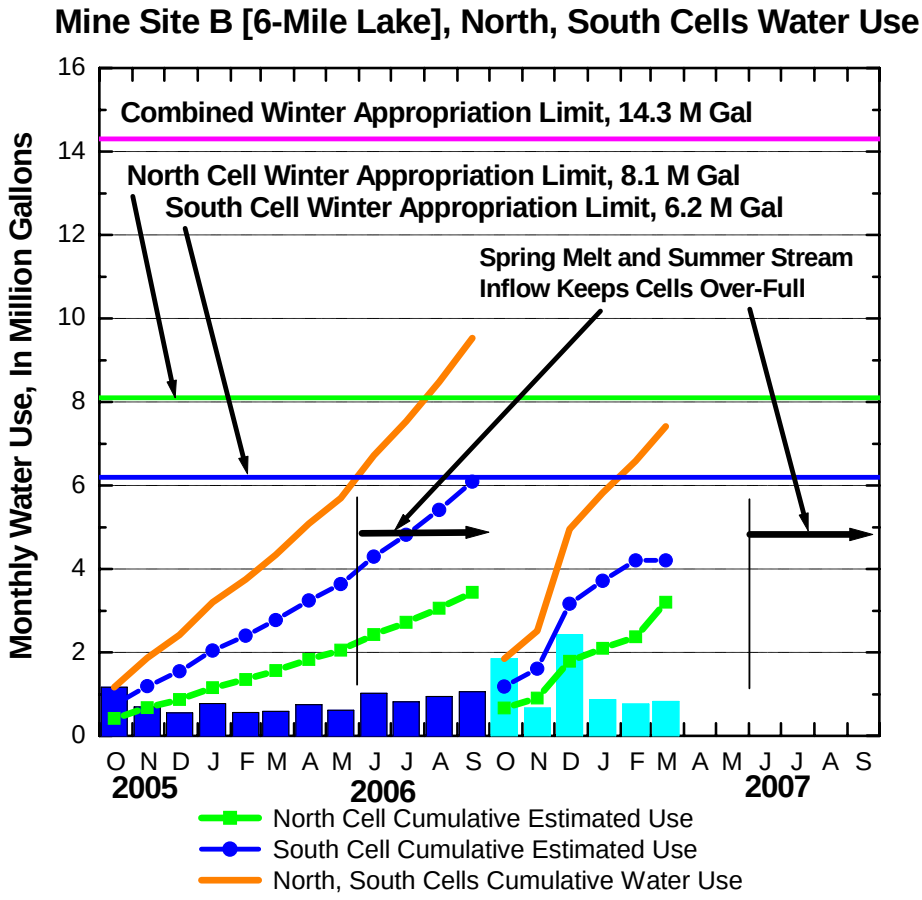

Figure 2. Monthly water use data for October 2005 through March 2007. Cumulative water use starts in October, coinciding with the water year and habitat permits. The combined water use is also shown for both cells, with separate and combined water use limits.

When permitted separately, water actually came from both cells as long as they were connected. The South Cell has a smaller permit volume, though larger surface area. This results in the South Cell coming closer to its permit volume limit, even though the main water use is coming from the North Cell. The implication for both cells during spring snowmelt in May is that both cells fully recharge and stay overfull until after freeze-up during the years observed. The combined permit approach better matches the actual hydrology for the water source, though the incoming flux from snowmelt and stream recharge is not accounted for until the permit period is reset at the end of the water year. Future steps in managing this example water source could take into account these summer fluxes, resulting in greater water resource assets for industry and a better understanding of management risks for regulatory agencies.

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