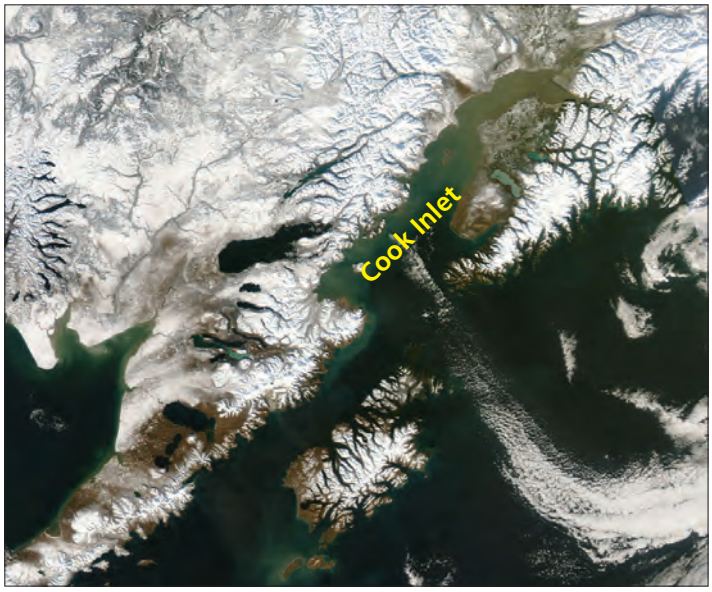
# Landscape Processes

*Resource Brief*

## Importance

Impacts of global climate change are expected to result in greater variation in the seasonality of snowpack, lake ice, and vegetation dynamics in southwest Alaska. All have wide-reaching physical and biological ecosystem effects in the region. SWAN has used MODIS satellite data to monitor these landscape metrics since 2001. The depth, timing, and spatial extent of snowpack can influence soil thermal regimes, lake ice thickness, surface and groundwater hydrology, nutrient turnover, vegetation dynamics and wildlife foraging, movement and predation. Longer growing seasons can result in increases in plant biomass, changes in community composition, and wildlife populations, including caribou, moose, wolves, bears, lemmings, and other prey species. Lake ice is an excellent integrator of regional weather patterns.




Early snow spreads across southwest Alaska and SWAN park units on Oct. 26, 2008.

## Status and Trends

From 2001–present, snow cover duration was stable within ecoregions, with variable start and end dates. Lake ice freeze-up lagged the snow season by 2 to 3 months. For a given lake, freeze-up dates varied in timing and duration, whereas break-up dates were more consistent. Higher than average temperatures during the El Niño winter of 2002-2003 were expressed in anomalous ice and snow season patterns (figure 1). Lake ice seasons showed high interannual variability, whereas snow and growing season metrics were more stable across years.

Lake ice is highly responsive to short-term weather events. Snow cover was moderately variable at the beginning of the winter season, whereas duration of snow cover and the snow off dates were consistent. Timing of these cold weather systems is likely to remain erratic given the speculation for increasing temperature variability that could potentially impact the duration of snow season and timing of snow cover depletion. Results of this study will be out late in 2009:

Reed, B., M. Budde, P. Spencer and A. Miller. In press. Integration of MODIS-derived metrics to assess interannual variability in snowpack, lake ice and NDVI in southwest Alaska. Remote Sensing of the Environment.

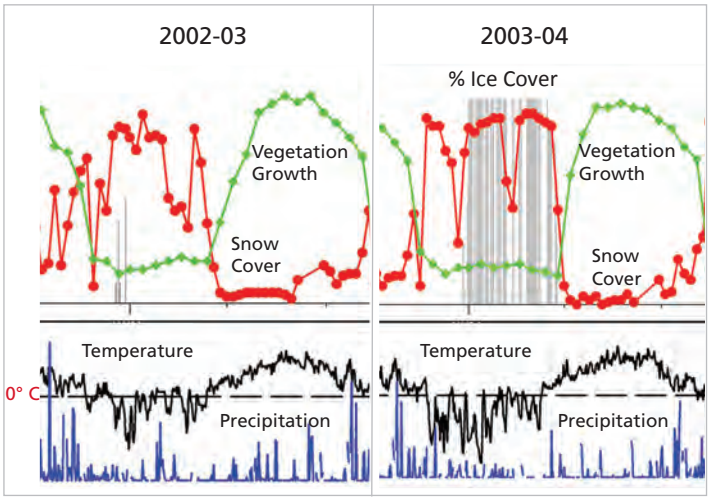



Figure 1. Timing for landscape and climate metrics near Skilak Lake for an "average" winter in 2003-04 (right), and strong El Niño in 2002-03 (left). Snow cover (red), vegetation productivity (green) and ice cover (gray) are shown on the upper image. Temperature (black) and precipitation (blue) are shown on the lower image; the dashed horizontal line is 0 deg. C. Note that very little ice formed during the El Niño winter when winter temperatures hovered at or above freezing.

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