

Landscape Processes

Vital Signs Monitoring- Southwest Alaska Network



Importance / Issues

The vital sign landscape processes incorporates several key phenological metrics, including freeze-up and breakup on large lakes, the timing and duration of snowpack, and growing season length. In cooperation with the USGS-EROS Data Center, the SWAN is developing a protocol for using MODIS imagery to monitor these large-scale processes.

Preliminary interpretations of the MODIS data suggest that landscape-scale phenomena across the SWAN are complex. For example, large lakes vary in their timing and rate of freezing and often do not have single freeze-up or breakup events. Some lakes freeze early in the season and remain frozen until late in the spring, when they break up very rapidly. For these lakes, breakup dates have been surprisingly consistent across years (2001-2006). Other lakes are much more variable, and in some years do not freeze at all. Start of the growing season is likewise location-dependent, with some areas consistently greening up 1-3 weeks before the rest of the landscape. Finally, MODIS imagery is capturing stochastic events, such as the eruption of Mt. Augustine in January 2006, which deposited ash up to 110 km (68 miles) away, in Homer.



MODIS image from January 30, 2006 showing eruption of Mt. Augustine off of the Katmai coast.

Current and Future Monitoring

A draft protocol for acquisition and processing of MODIS imagery was submitted to SWAN in December 2005. Revisions to the protocol will include the use of daily calibrated radiance data (MOD02) to address issues associated with the MODIS snow/ice products, development of a method to quantify lake ice, and an addition to the protocol narrative that reconciles calculated start of season dates (NDVI) with ground-based observations. The final protocol will be submitted for peer review in December 2006.

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Sampling Design and Objectives

Monitoring objectives for landscape processes include tracking long-term changes in lake freeze-up and ice breakup dates in large lakes; estimating long-term trends in the duration of snow cover; estimating long-term trends in growing season normalized difference index (NDVI); and characterizing trends in the beginning and end of growing season.

Reed, B., M. Budde, P. Spencer, and A. Miller. 2005. Satellite-derived measures of landscape processes. Draft Monitoring Protocol for the Southwest AK Network. National Park Service, Anchorage, AK, 30 pp.

Below (L-R): MODIS time series of breakup of lake ice on Lake Iliamna, April 15 - May 10, 2005. (1) April 15; (2) April 17; (3) May 8; (4) May 10.

