Vegetation Composition and Structure

Resource Brief

Importance

Vegetation is integral to ecosystem function and element cycling, and it is a sensitive indicator of environmental change. Enabling legislation for SWAN park units establishes the need . . . *to preserve in their natural state extensive unaltered arctic tundra, boreal forest, [alpine meadows], and coastal rain forest ecosystems*. In addition to their scenic qualities, these communities also provide habitat and forage for Dall sheep, caribou, brown bears, and a variety of other wildlife, and vital resources for subsistence users.

Status

Vegetation composition and structure will be monitored at two scales to capture landscape- and local-scale variation. At the landscape scale, remotely-sensed data are being used to detect broad-scale changes in vegetation and landscape features. An Interagency Agreement with the USFS-Pacific Northwest Research Station has been developed to use mid-resolution satellite images (Landsat TM/ETM+) to identify changes in major vegetation types through time. These changes include forest mortality due to insect outbreaks and fire, and establishment of vegetation on barren surfaces (e.g., following deglaciation and river channel abandonment). In addition, orthorectified aeral photos (1950s, 1980s, and 1990s-era) and high-resolution IKONOS imagery are being used to describe finer-scale changes on the landscape, including shrub and tree encroachment, pond drying, and tree-line migration (Fig. 1).

At the local scale, ground-based monitoring is intended to target changes in vegetation structure, species composition, and selected environmental variables that are too subtle spectrally, or occur at too fine a scale, to monitor through remote sensing techniques alone. For example, decreases in lichen cover associated with shrub encroachment are important ecologically, but are difficult to detect in aerial photos or satellite images. Monitoring will occur across an elevation gradient, in environments ranging from coastal forest to alpine tundra. Pilot sampling began in Lake Clark NPP (LACL) in 2007. In addition, a revisit of 15-year old inventory plots was completed in Kenai Fjords NP (KEFJ) in 2008.

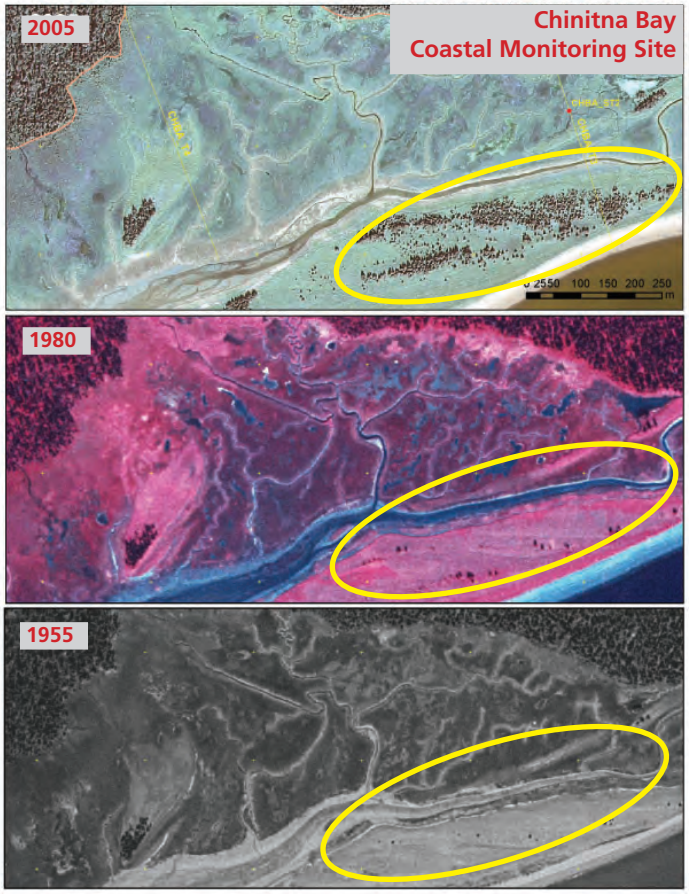

Figure 1. Increase in tree cover on a beach ridge, LACL, as interpreted from a time-series of air photos (1955, 1980) and high-resolution IKONOS imagery (2005). Tree establishment accounted for a 7% change on the landscape at this site.

Discussion

Methods for the use of satellite imagery and ground-based sampling continue to be refined. Pilot data and model simulations from LACL have been used to estimate sample size and frequency for ground-based monitoring. Qualitative estimates of vegetation change, derived from the revisit of KEFJ inventory plots, have shown that measureable changes in species composition can be recorded within 10-15 years.

Contacts
Amy Miller, NPS-SWAN, amy_e_miller@nps.gov
Robert Kennedy, USFS-PNW, robert.kennedy@oregonstate.edu
Warren Cohen, USFS-PNW, warren.cohen@oregonstate.edu