Southwest Alaska Network
Inventory & Monitoring Program
National Park Service
U.S. Department of the Interior

Alagnak Aniakchak Katmai Kenai Fjords Lake Clark

Vegetation Composition and Structure

Resource Brief
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Importance

Vegetation is integral to ecosystem function and element cycling and 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*. In addition to their scenic qualities, these ecosystems also provide habitat and forage for Dall sheep, caribou, brown bears, and a variety of other wildlife as well as food and materials for subsistence users.

SWAN ecologists measure percent cover using a specially designed sampling rod. This dwarf shrub plot is co-located with the Snipe weather station (LACL). Vegetation structure and composition respond to both short- and long-term climate patterns.

Status

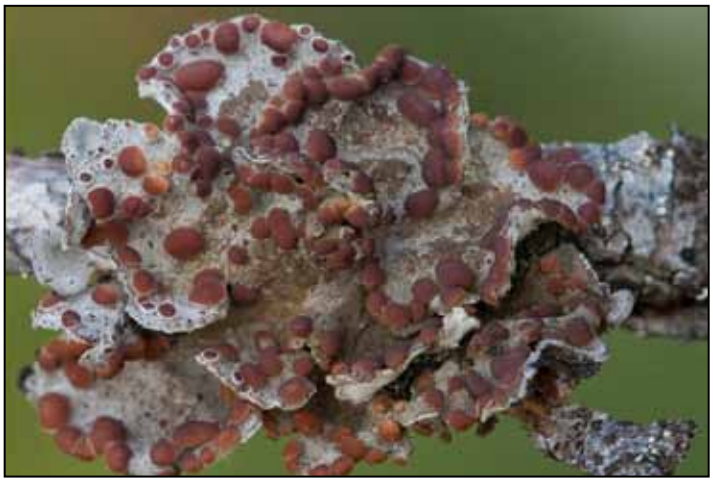
Vegetation composition and structure are being monitored at multiple temporal and spatial scales using a variety of sampling approaches. At the landscape scale, remotely-sensed data are being used to detect broad-scale changes in vegetation and landscape features. Image time-series (e.g., historic air photos; Landsat TM/ETM+; IKONOS) developed by cooperators at Oregon State University and St. Mary's University of Minnesota are being used to identify changes in major vegetation types associated with disturbance and succession.

At the community scale, plot measurements are being used to characterize stand structure, species composition, and selected environmental variables (e.g., soil temperature). For example, loss of tundra habitat and/or lichen cover due to shrub encroachment may be documented through a combination of plot measurements and ground photos. To date, roughly 90 monitoring plots have been established in low (0-450 m); mid- (450-900 m) and high elevation (>900 m) sites in Lake Clark NPP (LACL) and Katmai NPP (KATM). An evaluation of low elevation forested sites in Kenai Fjords NP (KEFJ) is expected to begin in 2012.

Discussion

Ongoing analysis of remotely-sensed data for LACL, KEFJ, and KATM has shown dramatic changes in vegetation and geomorphology in some areas (e.g., shrub establishment following glacial recession in KEFJ; Fig. 1). Baseline data from monitoring plots in LACL and KATM suggest underlying patterns in stand structure, understory species composition and tree establishment across the north-south gradient (e.g., high seedling densities in KATM, near latitudinal treeline, suggest ongoing southern expansion of spruce; Fig. 2), and future work will explore methods for scaling up from the plot- to landscape-level.

Nonvascular taxa (lichens, mosses, liverworts) are important contributors to species richness and have included the globally endangered lichen, *Erioderma pedicellatum*, as well as several species considered rare in Alaska and the Yukon Territory (*Hypogymnia pulverata*, Nelson et al. 2011; *Buxbaumia aphylla*; *Schistostega pennata*).



Erioderma pedicellatum (Hue) P.M. Jørg*, is a globally endangered lichen known from Scandinavia, southeastern Canada, and Alaska. A small population was found in KATM in 2009.*

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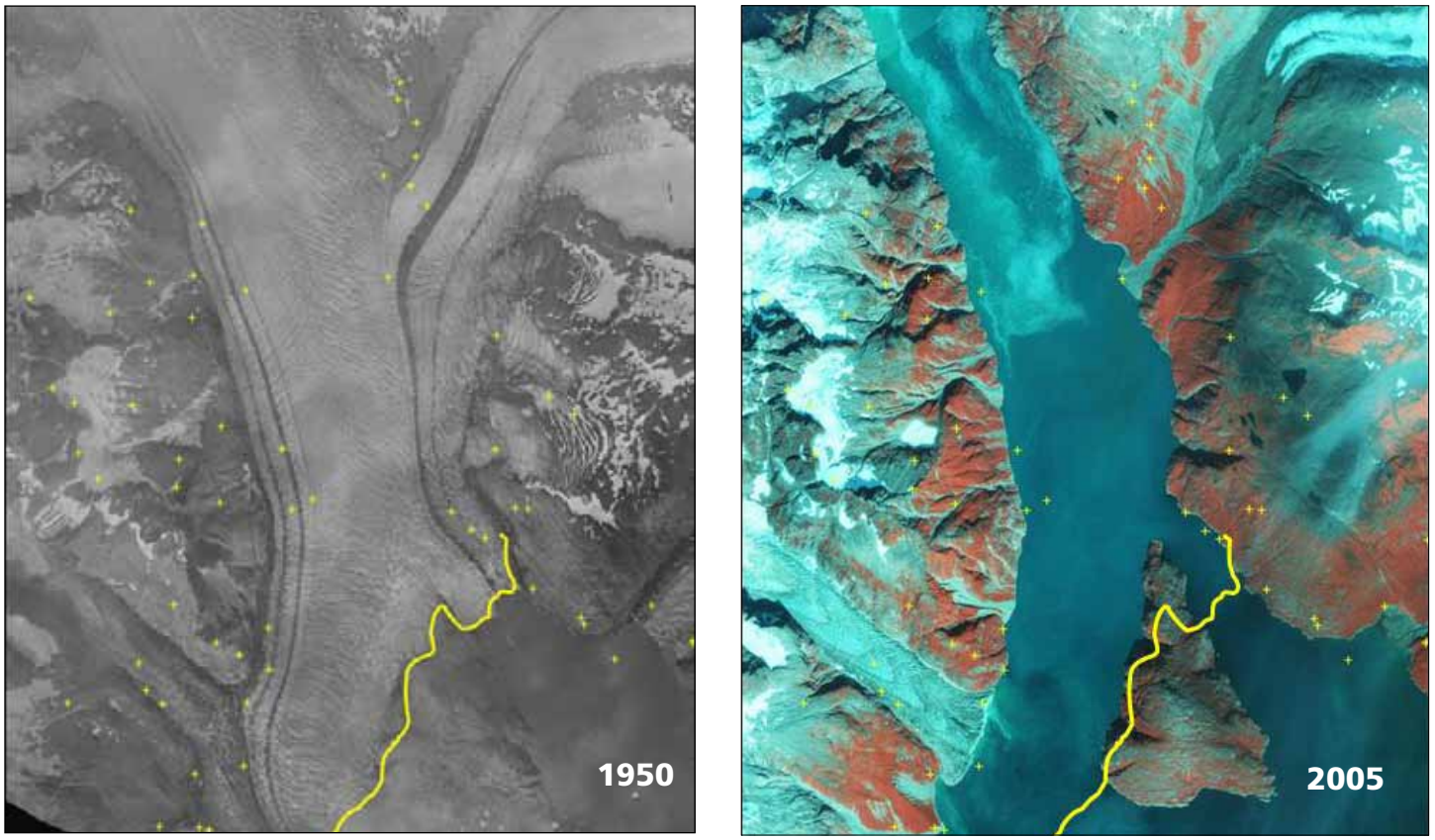

Figure 1. Alder establishment (in red, right) following glacial recession in Northwestern Lagoon, 1950-2005, Kenai Fjords National Park. Across lower elevation (<1000 m) areas of the park, ice loss (7%) and shrub establishment (10%) accounted for the greatest change over the 55-year period. The yellow line indicates the ice margin in 1950. Interpreted points are denoted by crosshatches.

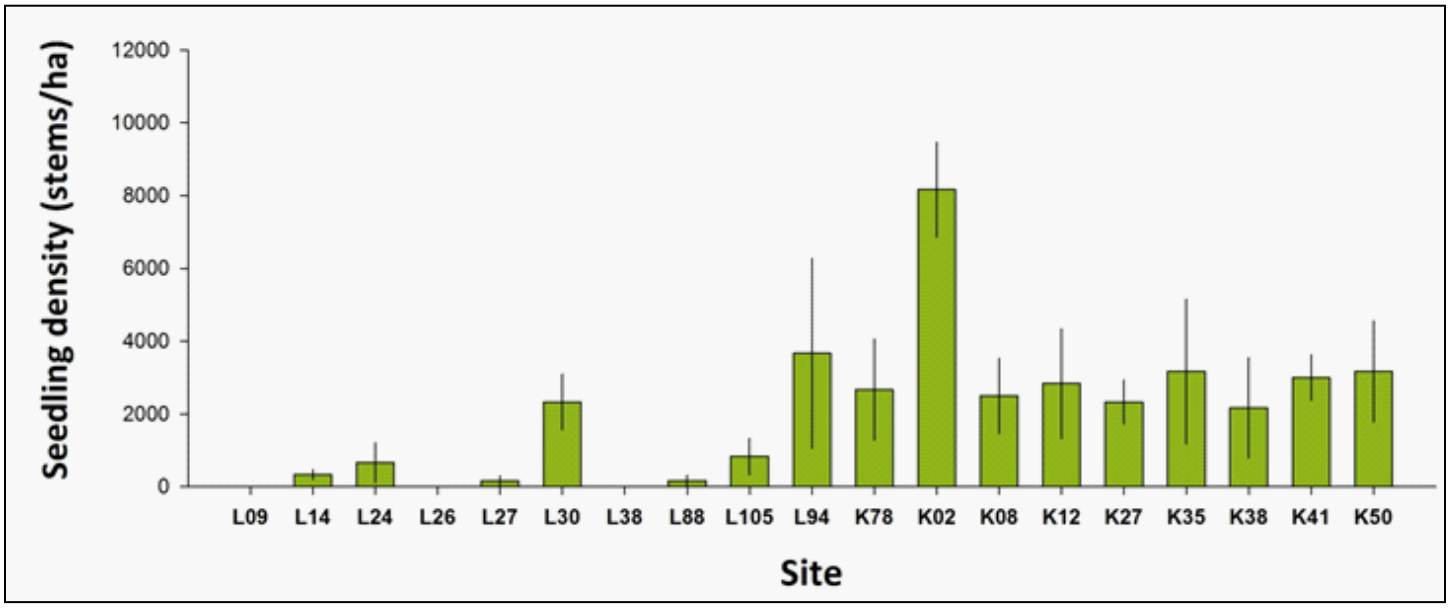

Figure 2. Seedling densities for low elevation white spruce woodland in LACL ('L' sites) and KATM ('K' sites). Relatively high seedling densities in KATM suggest that the spruce forest will continue to expand southward.

References
Nelson PR, Walton J, Root H, Spiribile T. 2011. *Hypogymnea pulverata (Parmeliaceae)* and *Collema leptaleum (Collemataceae)*, two macrolichens new to Alaska. North American Fungi 6:1-8.