



Alagnak

Aniakchak

Katmai

Kenai Fjords

Lake Clark

Lichens

Lichens are everywhere in Kenai Fjords National Park. They can be found in intertidal zones, the tops of mountains, and even on *numataks* (the exposed rock outcrops of icefields). They grow on soil, rock, bark and wood, even on barnacles and buildings. Lichens are a major component of high-latitude ecosystems and contribute significantly to the biological diversity of the region. They are highly sensitive to environmental conditions including airborne contaminants, substrate chemistry, and climate; are ecologically important as food, shelter, and nesting material for wildlife; and play important roles in mineral and hydrological cycles, notably nitrogen fixation.

Management Needs

Kenai Fjords National Park was created, in part, to preserve in perpetuity its unique fjord and rainforest ecosystems. Central to achieving this goal is an improved understanding of the lichen flora through the completion of an inventory and through monitoring of rare species and those that can indicate environmental change. The potential for new resource development in southwest and southcentral Alaska is expected to result in increased pollutant loads and increases in temperature regionally. This underscores the need for baseline data on lichen occurrences in the park. Because of their unique physiology, lichen communities are highly sensitive to their surroundings, making them ideal bioindicators for climate and environmental change.



The very common (A) coral lichen (*Sphaerophorus tuckermanii*) and (B) yellow witch's hair lichen (*Alectoria sarmentosa* var. *sarmentosa*) were found at all eleven FIA lichen survey sites. Two rare to uncommon Kenai Peninsula coastal forest lichens, the (C) lettuce lichen (*Lobaria oregana*), and the (D) Pacific Northwest endemic tube lichen (*Hypogymnia duplicata*), were observed at only one survey site each.

Inventory

In 2015, a team of lichenologists from North America and Europe began to inventory and catalogue the lichens of Kenai Fjords under the guidance of Oregon State University and the National Park Service. To date, the team has surveyed lichens in the old-growth forests, riparian areas, and rocky shorelines of Nuka Bay and McCarty Fjord, Harris Bay and Granite Passage, Aialik Bay, and in the alpine ecosystems near Exit Glacier. Future

visits are planned to coastal alpine areas and nunatak sites in the Harding Icefield. Already one lichen species new to North America has been identified: *Ephebe multispora*, a dark filamentous species found growing on seepage boulders in Coleman Bay. Previously it was known only from Greenland and northern Sweden. Additionally, *Ameliella andreaeicola*, a rare lichen known to grow only on a certain genus of moss, was recorded as new to the United States. It was discovered along the Harding Icefield trail near



Surveying sloping peatland ecosystems in Kenai Fjords National Park for lichens (depicted in photos above and below).



Exit Glacier. Lichenologists are in the process of curating and identifying collections from Kenai Fjords, and many more exciting discoveries are expected. Final products from this inventory will include a comprehensive voucher-based lichen species list and accompanying database for the park,

as well as a peer-reviewed paper describing inventory findings. Specimens collected during the course of the inventory will be provided on loan to the University of Alaska, Museum of the North Herbarium and several other institutions where they will be available for research and educational purposes.

Monitoring

Southcentral Alaska hosts diverse and abundant lichen communities that are faced with a rapidly changing environment, moreso than those in southerly latitudes. Because of their unique physiology, lichens make ideal bioindicators due to their sensitivity to climate as well as a number of atmospheric pollutants, including sulfur dioxide, and nitrogen- and sulfur-containing compounds. During August 2012, the NPS established eleven lichen community monitoring

plots in mature, low-elevation Sitka spruce-mountain hemlock forests. This forest type was chosen to monitor because it is some of the oldest and most commonly encountered along the Kenai Fjords coastline. Researchers used a lichen survey method developed by the Forest Inventory and Analysis (FIA) Program of the U.S. Forest Service which allows assessment of several key questions concerning natural resource contamination, biodiversity, and the ability to provide ecosystem services. Because this FIA lichen survey method is used throughout western North America, data from Kenai Fjords will be used to support large-scale tracking efforts of climate and environmental change. Initial baseline findings in Kenai Fjords revealed that the epiphytic lichen communities of these forests included several species sensitive to airborne pollutants such that their presence indicates unimpaired air quality. Prominence of these pollution-sensitive species, and a low abundance of nitrophilous species, is due in part to low nitrogen deposition throughout most of the region. Lichen community monitoring plots will be resampled every ten years to re-evaluate any change in condition.



In 2015, new records were made in Kenai Fjords of the rare amphi-beringian lichen *Stereocaulon saviczii*.