



Resource Management News

Summer 2013



Pedersen Glacier in Kenai Fjords National Park. NPS Photo.

Summer is the busy field season for resource management staff in Kenai Fjords National Park. While projects involving weather and glacier monitoring do occur outside of summer months, the majority of resource management field projects take place between May and September.

Resource management for the park can be separated into three main groups: natural resources, cultural resources, and inventory and monitoring. Natural resources consist of biological resources (including wildlife, fish, plants, invertebrates, and algae) and physical resources (including glaciers, water, rocks, and soils). Cultural resources revolve around past and present peoples, including history and archeology. The third major group, inventory and monitoring, is part of a National Park Service effort to understand the status of the park’s significant natural resources. For Kenai Fjords, the Southwest Alaska Network

(SWAN) Inventory and Monitoring Program works closely with the park to conduct long-term studies to monitor the health of important indicators in the Kenai Fjords ecosystem.

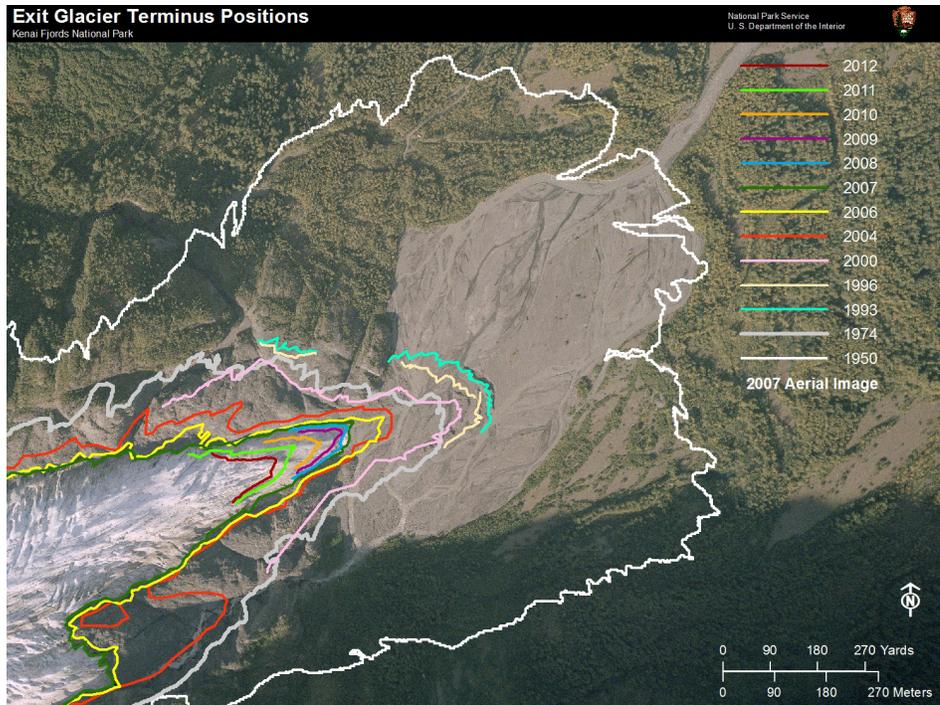
Kenai Fjords National Park was established in 1980 under the Alaska National Interest Lands Conservation Act (ANILCA). The park was created to “maintain unimpaired the scenic and environmental integrity of the Harding Icefield, its outflowing glaciers, and coastal fjords and islands in their natural state; and to protect seals, sea lions, other marine mammals, and marine and other birds and to maintain their hauling and breeding areas in their natural state.” These resource projects help to inform park management and often apply to adjacent lands.

We hope that you enjoy reading about the many projects occurring in the park. See you in the field!

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Natural Resources



Exit Glacier

Terminus Position Mapping

Kenai Fjords continued monitoring Exit Glacier's terminus position in 2013 by using GPS to map the lowest portion of this outflowing glacier's terminus. Results from this end-of-summer measurement indicate that Exit Glacier retreated 133 ft (40.5 m) from September 30, 2011 to October 1, 2012. This number is simply the difference between the two fall terminus positions as mapped using a GPS and measured in GIS. This number does not take into account any advance-retreat cycles that may have occurred during the 2011-2012 winter. The map to the left illustrates changes in the terminus position dating back to 1950.

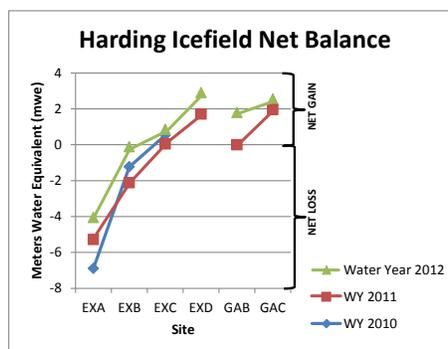
Left: Exit Glacier annual terminus mapping. Earliest years were digitized from orthorectified photos.

Glacier Mass Balance

2012 was the third year of glacier mass balance monitoring on the Harding Icefield in Kenai Fjords National Park. Mass balance monitoring allows us to measure changes in a glacier's mass from year to year. We determine this by measuring how much snow accumulated on a glacier during the winter and how much snow and ice melted during the summer. The difference between these two measurements tells us whether the glacier gained mass (positive balance) or lost mass (negative balance) during the year. These calculations can help us to understand long-term glacial response to climate change.

The chart to the right illustrates the net balance at the four mass balance sites on Exit Glacier (EXA, EXB, EXC, and EXD) and the two mass balance sites on an unnamed glacier located to the west of Exit Glacier (GAB,

GAC) for the three year study period. 2012 was the most positive balance year at each site, perhaps reflecting both the colder than normal winter and colder than normal summer experienced during the 2012 water year. We hope to continue this monitoring effort and compare the data from these two glaciers with other glaciers in Alaska.



Net balance at the six glacier mass balance sites from 2010-2012.



NPS researchers at an Exit Glacier mass balance site. NPS photo.

WE'RE BLOGGING!

Resource Management enhanced their outreach efforts and communication techniques in 2012 by initiating a blog titled "Kenai Fjords in the Field." This blog, located on the park's website, allowed readers to learn first-hand about the experiences that researchers were having while conducting fieldwork. Rather than a data summary or a trip report, these posts provide an experiential sense of how researchers felt while conducting fieldwork in the park.

We invite you to join us again this season as we share our field experiences on the park website. Check us out at: <http://www.nps.gov/kefj/blogs/Kenai-Fjords-in-the-Field.htm>.

Natural Resources

Exit Creek Hydrology

Kenai Fjords resource managers will be working with U.S. Geological Survey scientists in 2013-2014 to investigate the processes that have led up to recent mid-summer flood events on Exit Creek. Exit Creek is the two mile long creek that flows from under the terminus of Exit Glacier to the Resurrection River. Historically, the creek has flooded Herman Leirer Road, the only road in the park, during fall storms. In recent years the road has been overtopped by the creek in the middle of summer, disrupting visitor access to the park facilities at Exit Glacier and causing substantive damage to the road itself. In 2013, interim mitigation measures will be implemented to address the water on the road while scientists study historical creek behavior to understand recent geomorphological changes. Results of this effort will allow park managers to make science-based decisions for long-term management of park infrastructure.



Mid-summer flooding on the park road in August 2011. NPS photo.

Bear Management



Brown bear and cub on trail. NPS photo.

Managing Bears and Humans

Bears occur throughout Kenai Fjords National Park and are focal attractions for visitors. Seeing a bear in its natural habitat often contributes significantly to visitor experience. This interaction, however, can increase the potential for conflict between humans and bears and alter normal bear behavior. These factors present a management challenge when striving to preserve bears as an integral component of the ecosystem while providing for public safety.

In 2009, the Park Superintendent approved an Interim Bear Management Plan to guide bear management in the park. The program consists of proactive measures such as food storage and education, and management actions such as hazing and aversive conditioning of bears. The goals of the park bear management program are to:

- a) Provide for visitor and staff safety by minimizing bear-human conflicts.
- b) Minimize the effects of human activities on the distribution, abundance, and behavior of black and brown bear populations.
- c) Ensure opportunities for visitors to observe, understand, and appreciate black and brown bears, as a part of an intact ecosystem.

BE BEAR AWARE!

Minimize negative bear-human interactions:

- Store all food in bear resistant food containers.
- Make noise while hiking to avoid surprise encounters.
- Do not approach bears.
- Avoid camping in high bear use areas.
- Defend your food and gear from a curious bear.

Help the park

Visitors and staff involved in a bear-human interaction should fill out a BHIMS (Bear-Human Interaction Management System) form when:

- 1) A bear exhibits unusual behavior (e.g. stalking, charging, threat displays, or physical contact),
- 2) Extreme evasive action is taken in response to a bear (use of bear pepper spray or fire arm),
- 3) Garbage or food is involved, or
- 4) Property is damaged or lost.

Thank you for your prompt reporting!

2012 Bear Activity

Park staff considers bear-human interactions as situations when bears and humans are mutually aware of each other; each interaction is classified as either an 'encounter' or an 'incident.' An encounter occurs when a bear responds to the presence of a human with indifference, curiosity, avoidance, stress, or surprise that do not result in a charge, property damage, or physical contact. Bear-human incidents are bear-human interactions involving damage or loss of property, garbage or food, unusual behavior on the part of the bear, charges, physical contact, and extreme evasive action in response to a bear (such as bear pepper spray or firearm use). The bear management team documented nine encounters and five incidents in 2012.

The most common causes of bear-human interactions were due to female bears defending cubs and the improper storage of garbage or food. Other causes included inadvertently surprising bears and approaching bears too closely. Neither humans nor bears were harmed as a result of any of these interactions.

Natural Resources

Wildlife Observations

2012 Data

Kenai Fjords National Park has been recording natural history observation data since 1980 when field biologist Karen Oakley documented a Kittlitz's murrelet in Pedersen Lagoon in Aialik Bay on August 8th of that year. Since then, park staff and visitors have contributed to over 3,000 observation records. Opportunistic observations of rare or unexpected wildlife yield valuable anecdotal data on species occurrence and distribution. This data also contributes to an overall understanding of the natural history of the park.

Park visitors and staff submitted 48 wildlife observation cards during the 2012 season. In addition to Kittlitz's murrelets still being seen, park staff also observed over 300 rhinoceros auklets, a Leach's storm petrel, and a large raft of 26 sea otters in Aialik Bay.

At Exit Glacier, park staff and visitors observed four wolverines and two lynx on the lower trails. Closer to the Harding Icefield, observers documented three caribou in June and a coyote in early August crossing the top of Exit Glacier.

Park staff and visitors are encouraged to report unusual and notable wildlife sightings. Please record your observations on a Natural History Field Observation Card and turn it into the Resource Management Division.

Black Oystercatchers



Adult black oystercatcher. NPS photo.

Chick Provisioning Study

The black oystercatcher (*Haematopus bachmani*) is a common and conspicuous member of the rocky/gravel intertidal marine communities of eastern Pacific shorelines. It is completely dependent on nearshore marine habitats for all critical life history components including foraging, breeding, chick-rearing, and resting. Serving as a "keystone" species, the bird is important in structuring nearshore systems, and is highly susceptible to human disturbance. Oystercatchers can eat large numbers of herbivorous invertebrates,

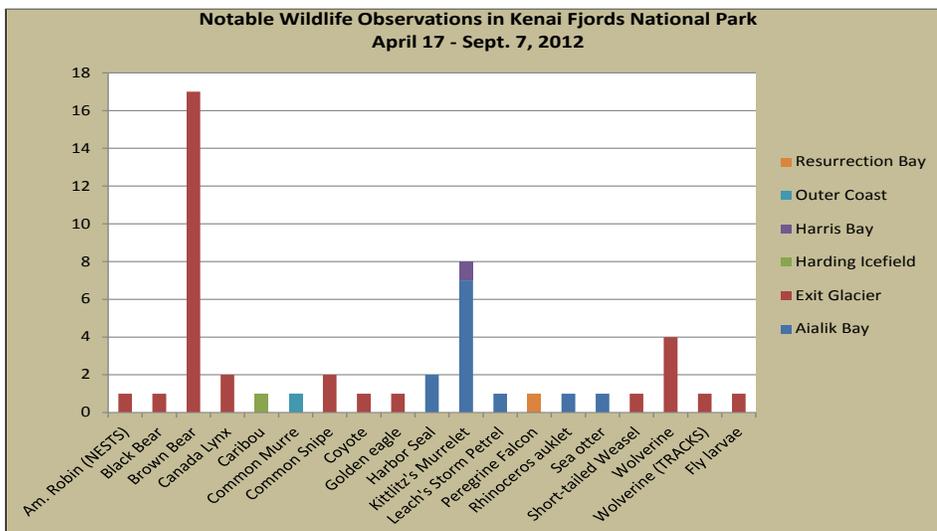
resulting in trophic cascades that include shifts in invertebrate species composition and size distribution which can then lead to diminished grazing intensity on algae and increased algal populations.

Oystercatchers bring limpets, mussels and other prey back to their nests to provision chicks, and researchers can collect shell remains at nests to examine oystercatcher diets. The prey data offers a unique perspective into processes structuring nearshore communities, including the potential consequences of anticipated increases in human disturbance. Kenai Fjords National Park and Southwest Alaska Inventory and Monitoring Network (SWAN) staff annually monitor black oystercatcher population density, nest density and productivity, and chick provisioning as part of our Nearshore Monitoring Program. However, each of these metrics is estimated from a single, annual visit to oystercatcher nests; data resulting from a single observation can potentially be influenced by events that occur outside of the the visit, including breeding failure, and egg and chick mortality. To address these issues, we initiated a two year study in cooperation with University of Alaska Fairbanks (UAF) and U.S. Geological Survey to examine black oystercatcher diet and chick provisioning throughout the nesting season.

In summer 2013, park staff and a UAF graduate student will conduct field research at black oystercatcher nests in Aialik Bay. Researchers will collect information about prey delivery rates by deploying remote cameras or direct observations at nests. Research objectives are:

1. Estimate productivity at 20 nest sites.
2. Determine sources of disturbance and mortality to adults, eggs, and chicks.
3. Estimate rates of energy delivery to chicks through prey shell remains and observations of prey deliveries.
4. Estimate productivity and fledging success as a function of prey provisioning.

Study results will inform and improve long term monitoring studies and management of black oystercatchers at Kenai Fjords, Katmai National Park and Preserve, and Prince William Sound.



Natural Resources

Coastal Raptors



Peregrine falcon nest on Aialik Cape. NPS photo taken by S. Lewis.

Avian Predator-Prey Dynamics

In 2012, Kenai Fjords and U.S. Fish and Wildlife Service initiated a pilot study to investigate the role that seabirds have in the lives of raptors in the park and on adjacent Alaska Maritime National Wildlife Refuge lands. In May, using boat-based and helicopter surveys, we located peregrine falcon and bald eagle nest sites to determine territory occupancy. We collected egg and feather samples for contami-

nant analyses and prey remains to assess diet. We revisited nest sites in July to determine productivity of raptor nests as well as collect additional prey and feather samples. We surveyed 19 falcon nesting territories in the study area, 10 of which were occupied by adult peregrine falcons; and 69 bald eagle nests, 43 of which were occupied by incubating eagles. We collected 2 bald eagle and 4 peregrine falcon eggs from nests for a full suite of contaminants analyses. We collected shed feathers from 13 bald eagle and 4 peregrine falcon nest territories for mercury and genetic analyses.

We identified 255 individual prey items from raptor nest areas. Initial results suggest that fork-tailed storm petrels and common murrens may be important prey for peregrine falcons and bald eagles respectively. Contaminant analyses results are expected this spring. Examining the predator-prey dynamics and contaminant burdens of these species will allow us to better understand changes seen in long-term monitoring programs and develop appropriate conservation strategies.

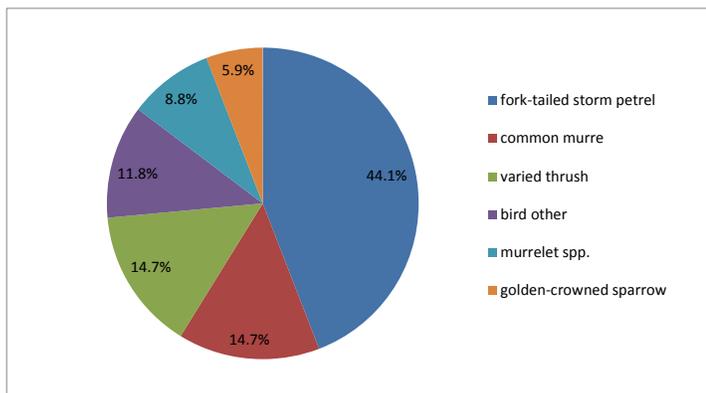


Bald eagle in Kenai Fjords. NPS Photo taken by K. White.

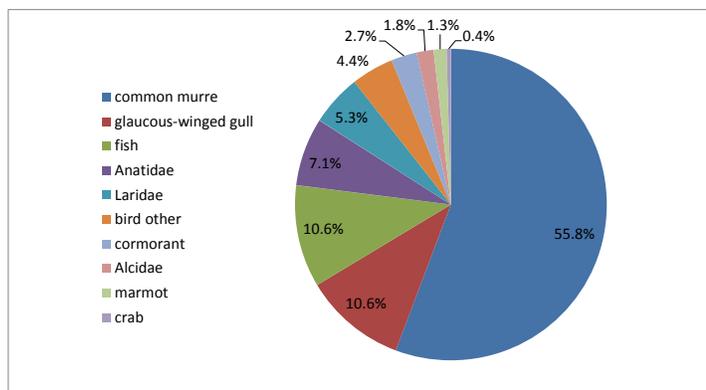
Bald Eagle Nest Surveys

With assistance from the SWAN Inventory and Monitoring Program, bald eagle occupancy and productivity surveys will continue to be conducted in summer 2013. These surveys began in 2009 to monitor nest occupancy and reproductive rates as one of the park's vital signs.

Diet of peregrine falcons in study area in 2012.



Diet of bald eagles in study area in 2012.



Bald eagles (*Haliaeetus leucocephalus*) are keystone predators on avian (e.g., seabirds) and fish (e.g., salmon) populations. They serve an important ecological role in freshwater and marine coastal systems in national parks within the southwest Alaska.

Peregrine Falcon Movement Ecology

U.S. Fish and Wildlife Service, NPS Oceans Alaska Science Learning Center, and the park are cooperating on a project to capture and attach satellite transmitters to peregrine falcons in 2013. It is currently unknown if peregrine falcons in the park are the Peale's (*Falco peregrinus pealei*) or the Anatum (*Falco peregrinus anatum*) subspecies. This distinction is important because Peale's are typically year-round Alaskan residents, while Anatum are long distance migrants. Examining year-round falcon movements in the Kenai Fjords area will increase our understanding of peregrine falcon ecology and what threats they may encounter outside park boundaries.

Natural Resources

Exotic Plant Management

In 2013, Kenai Fjords National Park marks its tenth consecutive year of using Alaska Exotic Plant Management Team (EPMT) protocol to survey, map, and control invasive plants in the park. Over the last nine years the park's invasive plant program has expanded and adapted with the challenges of controlling invasive plants in the park.

In June 2012, with the help of Alaska Regional EPMT staff, the park's exotic plant team mapped and chemically controlled the common dandelion population on the outwash plain at Exit Glacier for the second year. Herbicide was also applied for the first time to a second backcountry common dandelion population located north of the park road.

In 2013, park EPMT staff is planning on applying herbicide to a persistent population of common dandelion located in a remote coastal area of the park that has not been responsive to hand-pulling methods. It is hoped that herbicide use on these remote backcountry sites will significantly reduce the time and effort required to control these difficult-to-access populations.



Park staff and volunteers weighing bags of invasive plants pulled in summer 2012. NPS Photo.

The park's EPMT staff will also continue to partner with agencies, non-governmental organizations, and community volunteers to

control invasive plants outside park boundaries by organizing the 9th annual Exit Glacier Road weed pull on June 21st. The park's EPMT staff will also participate in the new Seward Schoolyard Habitat Program, a community partnership to enhance wildlife habitat around the local schools by working with school kids to create native plant gardens.

Park goals for 2013 include:

- Continue to survey, monitor and control invasive plants through hand-pulling in the Exit Glacier and coastal areas of the park.
- Continue to use herbicides to spot treat common dandelion populations on the outwash plain, and north of the park road.
- Treat a common dandelion population located in McCarty Fjord with herbicide for the first time.
- Continue partnering efforts for invasive plants with a lodge located on Pederson Lagoon on Port Graham Corporation lands and adjacent to the park.
- Continue partnering with other agencies and local groups for invasive plant control.



Revegetation sign to encourage people to stay on trails. NPS photo.

Native Plant Restoration

The Exit Glacier area is the most heavily visited and developed part of the park. Development and visitor impacts have left specific areas devoid of vegetation, priming these areas for erosion and invasion by non-native plant species. Relying on natural processes for native revegetation can take years, especially on sites without topsoil. Additionally, without active restoration of these bare areas, invasive non-native plant species can dominate and affect other naturally disturbed areas associated with Exit Glacier's recently deglaciated landscape.

To address these issues, a comprehensive restoration plan to repair impacted areas will be finalized in 2013. This plan will serve as a guide for planning and completing a revegetation project from start to finish; including revegetation techniques, appropriate species, and monitoring.

As part of this restoration plan, the Alaska Department of Agriculture Plant Material Center (PMC) assisted the park in 2011 to identify plant species that can easily be grown from seed. Revegetation techniques appropriate to the vegetation type in the area were also identified. During the summer of 2012, park staff and the Alaska PMC Agronomist collected seed to develop a seed bank for use on future restoration projects. Collected seed were cleaned by the PMC and will be stored in their facilities until the seeds are needed for projects in the park. Resource management staff will continue to collect seed each summer to add to the seed bank for future projects.

Cultural Resources

Oral Histories



Doug McRae at Placer Creek cabin in the Resurrection River Valley, c 1972. Photo by H. Schetzle and provided by D. McRae.

Exit Glacier Traditional Activities Project

Have you ever wondered how local people used the Exit Glacier area before Kenai Fjords National Park was established in 1980? Learning how people used the Exit Glacier area prior to the establishment of the park can help define the area's "traditional activities," which is very important for the park to understand.

You can now listen to interviews, browse through photographs, and explore interactive maps on Project Jukebox, a digital oral history program made available online through the University of Alaska, Fairbanks. The website is located at: <http://jukebox.uaf.edu/site7/project/532>.

The Exit Glacier Project Jukebox is a component of a three year project to preserve Seward's history and explore the possible definitions of traditional activities in the Exit Glacier area. Doug Deur of Portland State University will complete an analysis of the recorded life histories of the project participants and secondary data. His findings will provide interpretive insight into Seward's history and assist park staff with future planning.

Archeology

Coastal site assessments

Kenai Fjords National Park conducts annual archeological site assessments to document condition of sensitive cultural sites. These sites have been placed on a rotational basis for condition assessments, with a specific number of sites being revisited annually.

In 2012, five condition assessments were done for coastal archeological sites in Nuka Bay and an archeological reconnaissance survey was conducted in a part of McCarty Fjord. Many of these coastal sites are greatly eroded, an effect of coastal subsidence during the catastrophic 1964 earthquake. Coastal cultural sites are also of concern with potentially



An archeological technician recording data on a coastal site assessment. NPS photo.

changing sea levels resulting from climate change. Last summer, the park initiated a test project to measure erosion at a sensitive coastal site. In 2013, an additional six condition assessments are planned for the park's coastal areas.

FROM THE ARCHIVES...

Exit Glacier Road Construction

The person most credited with promoting a public road to Exit Glacier was Herman Leirer, a longtime Seward resident. In October 1965, the Seward City Council established a road project committee, and Leirer spearheaded the largely volunteer effort while the city provided free use of heavy equipment.

The route followed a narrow, heavily-timbered bench with steep slopes rising on one side and the unstable floodplain of the river hemming it in on the other. In some places the hill slope was blasted down as much as 40 feet to make a shelf for the road; in other places Leirer took his bulldozer out onto the gravel bars and pushed the loose rock around to divert the river and make a roadbed. Commenting on the road's alignment, Leirer said simply, "No other place to go." Referring to sections where the roadbed nudged the floodplain, Leirer said, "The river's always moving around anyhow."

It appears that the first four-mile stretch, beginning at the intersection of the Seward Highway, was constructed between October 1965 and about 1969. The next three-mile stretch was tackled in 1970. The third and last segment, across public land that would eventually be included in the national park, was also cleared and leveled in 1970. With the assistance of public funds and State Department of Transportation, a rough road was complete all the way to Exit Glacier in 1971. All that was missing was a bridge across the Resurrection River. A footbridge was financed by the Kenai Peninsula Borough and in place by May 1982. A two-lane road bridge across the Resurrection River and an improved road to Exit Glacier opened in July 1986. (Source: *A Fragile Beauty: An Administrative History of Kenai Fjords National Park* by Catton)



Constructing the Exit Glacier Road, October 1974. Photo by K. Freeman.



Opening of the pedestrian bridge over Resurrection River, June 27, 1982. Photo by W. Huss.

Interdisciplinary

Herman Leirer Road Trail

Multi-Modal Trail Feasibility Assessment

The Herman Leirer Road starts at the Seward Highway and terminates at the Exit Glacier Nature Center in Kenai Fjords National Park. National Park Service; State of Alaska, Department of Transportation and Public Facilities; State of Alaska, Department of Natural Resources; and U.S. Forest Service, Chugach National Forest, are cooperating to determine the feasibility of a non-motorized, multi-modal (bicycle, foot, and ski) trail along the entire 8.2 mile length of Herman Leirer Road.

At this point, there is no funding for this trail project. However, this environmental assessment (EA) will serve as a common vision for state, federal, and local agencies and organizations to pursue funding for such a project by any number of sources.

The preferred alternative outlines a non-motorized trail to be designed and constructed for use by pedestrians, mountain bikes, skiers, and mushers. For most of the distance, the trail would be separated from Herman Leirer Road as a soft surface of recycled asphalt or aggregate (which could be paved later with no increase in project footprint). New bridges would be built over minor drainages for the separated trail. Two other alternatives that differ on road/trail separation are also proposed.

The environmental assessment is open for comment until early June at the park's compliance website (<http://parkplanning.nps.gov>). Barring any unexpected delays or issues, a Finding of No Significant Impacts (FONSI) will likely be finalized in early fall.

Marine Debris



Marine debris removal on Kenai Fjords National Park beach. NPS Photo by J. Pfeiffenberger.

Marine Debris Monitoring and Removal

Marine debris includes any non-natural solid material that comes on-shore both intentionally and unintentionally. Fishing gear, plastics, styrofoam, and jettisoned boat cargo are examples of marine debris. Debris can affect marine mammals directly through entanglement, strangulation, and digestive blockage. Ingested plastics can also cause effects across the foodweb. Occasionally, hazardous materials can come ashore which require special handling and removal processes by specific agencies such as the Coast Guard or State of Alaska, Department of Environmental Conservation.

Since 2009, Kenai Fjords National Park has

annually partnered with a local non-profit organization, Resurrection Bay Conservation Alliance (RBCA), to document and remove marine debris on park and local beaches in Resurrection Bay and on beaches on the park's outer coast.

In March 2011, a magnitude 9.0 earthquake struck the Japanese coast and resulted in a devastating tsunami that killed over 15,000 people. This tsunami also created an estimated 5 million tons of marine debris, much which was carried to sea as the tsunami withdrew from land. In January 2013, approximately 1.5 million tons of the debris was estimated to be transported across the northern Pacific Ocean towards the western coast of North America. Potential non-native marine invasive species coming with the 2011 Japanese tsunami debris are also a concern; non-native species were found on dock remnants that recently arrived in Olympic National Park and on the Oregon Coast.

Anticipated marine debris activities in Kenai Fjords for 2013 include NOAA marine debris shoreline surveys, annual RBCA marine debris removals, and marine invasive monitoring. The 2013 field season will be the first year that the park will conduct the NOAA marine debris shoreline surveys, which will contribute information to a national database tracking regional accumulation rates. The park will continue to partner with RBCA for marine debris removals including marine debris removals on Resurrection Bay beaches in May and on the outer coast beaches such as Taroka and Paguna in August. Monitoring for marine invasive species including green crab and tunicates will continue in Aialik Bay.

SOILS INVENTORY

The regional Inventory and Monitoring program will be conducting a soils inventory for Kenai Fjords National Park this summer through a contractor, ABR, Inc. A ground field survey in August 2013 will collect data on the pedologic, geomorphic, topographic, hydrologic, and vegetative characteristics of ecosystems within the park. This field data will be combined with data modeling and satellite image processing techniques to develop ecological models and derive soils information and soil landscapes.

The objective of the soils inventory is to gain a better understanding of how soils contribute to the richness and character of the park by identifying soil types and describing their distribution within the park. Information from this survey can be used in resource management activities, interpretation of park resources, and in improving our general understanding of park ecological processes.

Southwest Alaska Network

SWAN Inventory and Monitoring

The Southwest Alaska Network (SWAN) is one of 32 Inventory and Monitoring programs within the National Park Service. The SWAN Program consists of five Alaskan park units: Kenai Fjords National Park, Katmai National Park and Preserve, Aniakchak National Monument and Preserve, Alagnak Wild River, and Lake Clark National Park and Preserve. These parks were grouped together into a single network because they shared characteristics such as marine coastal

habitats and glaciers. By grouping five park units together into a single network for inventory and monitoring, project funding and management have been streamlined. The network has chosen specific vital signs to monitor, representing key indicators of the condition of park ecosystems. This information is critical for National Park Service to be able to protect and manage parks. The following highlighted SWAN projects will occur in Kenai Fjords National Park this summer.



In park coastal forests, 10-50 epiphytic lichens are typically found during a survey. NPS Photo.

Lichens as Biological Indicators

The coastal forests of Kenai Fjords National Park support a rich and diverse assemblage of lichens and bryophytes (mosses, liverworts). Lichens are fungi that live in intimate association with algae and/or cyanobacteria. Epiphytic lichens (those growing on trees and shrubs), are excellent indicators of changes in air quality and climate due to their unique physiology and reliance on airborne nutrients. Epiphytic lichen communities provide a wealth of information about forest health, function, and local climatic conditions; thus, they are widely used as biological indicators for natural resource assessments.

Lichen field data can be collected efficiently: only two hours are needed by one person in the field. Observers record presence/absence to estimate the abundance of each species. Unknown species are collected for later identification by a specialist. Survey data can be used for biodiversity monitoring, while multivariate gradient models can address air quality and climate questions.

In 2012, NPS biologists collected over 600

specimens at 26 sites in Kenai Fjords, as a first step toward completing a comprehensive non-vascular inventory. Fifteen lichen inventory plots were also established in mature, low elevation Sitka spruce-mountain hemlock stands using an 'off-frame' survey method developed by the Forest Inventory and Analysis (FIA) Program of the U.S. Forest Service. Trees at these sites often averaged 250-300 years old and the epiphytic lichen community included common species such as *Alectoria sarmentosa*, *Cetraria chlorophylla*, and *Lobaria oregana*, an important nitrogen-fixer. At most sites, the number of epiphytic lichen taxa recorded exceeded that on the forest floor. The presence of a number of atmospherically-sensitive indicator species suggested that air quality remains excellent in the park, and that the lichen flora is unimpaired.

The FIA off-frame survey method will provide a range of park-specific information, but will also contribute information to the national FIA program, which houses the most extensive lichen community data set in North America. These data are invaluable for using lichens as forest health indicators by explor-



Oregon lettuce lichen, *Lobaria oregana*, an important nitrogen-fixer found on trees. NPS Photo.

ing relationships between lichen communities and large-scale environmental factors.

In 2013, NPS biologists will return to the off-frame lichen inventory sites to conduct a series of tree measurements that will characterize stand age, biomass, and reproduction. Together, the off-frame lichen data and tree data will be used to monitor changes in forest composition, structure, and condition.

NEARSHORE FOODWEB

The SWAN Nearshore Monitoring Program is designed around the nearshore marine foodweb and has annually collected data related to black oystercatchers, kelps, eelgrass, intertidal invertebrates, marine birds, sea otters, and marine water chemistry along the Kenai Fjords coast since 2007.

In 2012, the Nearshore Monitoring Program initiated a pilot study with the U.S. Geological Survey to utilize stable isotope analysis in order to enhance our understanding of foodweb dynamics. By examining carbon and nitrogen contributions through stable isotope analysis from primary producers (offshore phytoplankton and intertidal and subtidal kelps) through consumers, we can understand differences in the primary producer contributions to higher levels of the nearshore food web.

Regional differences in isotope contributions may explain species distribution and density variations seen across broad geographic scales. Climate change effects on the marine nearshore, such as ocean acidification or increasing temperatures, may have an impact on available food resources.

The stable isotope analysis could be one aspect of the monitoring program that helps to identify diet shifts for specific nearshore species as climate change impacts become more apparent.



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EXPERIENCE YOUR AMERICA



National Park Service
U.S. Department of the Interior

This is the sixth annual issue of Resource Management News produced by the Resource Management Division at Kenai Fjords National Park.

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The National Park Service cares for the special places saved by the American people so that all may experience our heritage.

Kenai Fjords National Park

Kenai Fjords National Park was established on December 2, 1980 by the Alaska National Interest Lands Conservation Act (ANILCA). The park comprises approximately 670,000 acres within its legislative boundary. The National Park Service manages approximately 607,000 acres, with the remaining acreage owned and managed by the State of Alaska, Port Graham Corporation, and private inholders.

The park is located on the east coast of Alaska's Kenai Peninsula and extends into the Gulf of Alaska. Over half the park's acreage is covered by the Harding Icefield, and the icefield stretches from tidewater glaciers at sea level to broad expanses of ice and snow, interrupted only by the nunataks of the Kenai Mountains. Outflowing glaciers from the icefield and steep, scenic fjords create a rugged coastline. A narrow fringe of temperate

rain forest growing between the icefield and the sea hosts a rich diversity of terrestrial and marine life. This area was also traditionally used by the Alutiiq people, and the Native villages of Port Graham and Nanwalek continue to be affiliated with the park.

The park's enabling legislation identifies the following purposes: "to maintain unimpaired the scenic and environmental integrity of the Harding Icefield, its outflowing glaciers, and coastal fjords and islands in their natural state; and to protect seals, sea lions, other marine mammals, and marine and other birds and to maintain their hauling and breeding areas in their natural state, free of human activity which is disruptive to their natural processes" (ANILCA sec.201(5)). Unlike most park units added to or created in 1980, ANILCA did not allow for sport hunting or federal subsistence in Kenai Fjords National Park.