



Resource Management News

Summer 2015



The park boat, M/V Serac, in Northwestern Lagoon. NPS photo.

Summer is the busy field season for staff in the Resource Management Division at Kenai Fjords National Park and in the Southwest Alaska Inventory and Monitoring Network. As you will see, we frequently partner with other federal agencies, non-profit organizations, neighboring land owners, and universities to best steward the park's resources. This newsletter highlights our major projects for the 2015 summer season and includes summaries from last year for ongoing programs.

While the Exit Glacier area has the highest visitation and is the only area accessible by road in Kenai Fjords National Park, the rest of the park is accessible by boat or plane. Unlike other Alaskan national parks, Kenai Fjords does not own a park plane and relies extensively on boats to access the 500 miles of coastline from Resurrection Bay to Nuka Bay. The park owns several boats ranging from 13- to 53-feet in length, with smaller boats greatly restricted by weather.

The M/V Serac, the park's 53-foot boat pictured above, is an invaluable tool for managing the park's resources. The boat is critical for park coastal operations and can handle more variable weather conditions than the smaller boats. This boat was acquired in 1992 shortly after the 1989 Exxon Valdez oil spill to effectively access, monitor, and patrol the park's coastline. The M/V Serac usually runs throughout the summer providing marine support and a field operation base for resource management field crews and law enforcement patrol rangers. This boat provides the park with an ability to respond to emergencies such as future oil spills and other environmental catastrophes. Nearly all of the fieldwork for coastal projects that you will read about in this newsletter will be supported by the M/V Serac this summer.

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

CONTENTS

Bear Glacier	2
Coastal Caves	2
Glacier Mass Balance	3
Exit Glacier Terminus	3
Managing Invasive Plants	4
Bear Management	5
Coho Salmon	6
Marine Debris	6
Archeological Site Monitoring	7
Shea Lots Archeology	7
From the Archives	7
Protect Coastal Archeology Sites	8
National Register	8
Peregrine Falcons	8
Southwest Alaska Network	
Lichens	9
Sea Otters	9

Physical Science

Bear Glacier

Glacier Lake Outburst Flood

Glacier lake outburst floods occur when water that has dammed up behind, below, or inside of a glacier is rapidly released. These events are not uncommon in Alaska and are known to occur regularly (annually, biennially, or triennially) at several locations on the Kenai Peninsula including Bear Glacier located in Kenai Fjords National Park. During a glacier lake outburst flood, down-glacier flooding from water discharged from an ice-dammed lake will increase over a period of a few days followed by a decrease to normal water levels.

Bear Glacier's glacier lake outburst floods have been documented several times in the past decade, often draining during the month of August. This event results in a rapid increase in water surface levels in the pro-glacial lake at the glacier's terminus. Recreationists in the area should be aware that water levels could rise unexpectedly, flooding their camp and possibly floating away kayaks and other water vessels that are not well secured. On August 15, 2014, an outburst flood at Bear Glacier raised water levels in the pro-glacial lake and then breached the moraine separating this waterbody from the mouth of Resurrection Bay, resulting in a series of standing waves that extended from the moraine to almost 2 miles out to Callisto Head. As water



Bear Glacier lagoon and moraine on July 20, 2014. NPS photo.



Bear Glacier lagoon and moraine on August 21, 2014. NPS photo.

exited the lagoon through the newly breached outlet, lagoon levels dropped 1-2 feet below normal, prompting increased calving activity

at the Bear Glacier terminus. The previous lagoon outlet channel was left dry. Opportunistic monitoring will continue this summer.

Coastal Caves



An example of a coastal cave. NPS photo.

Kenai Fjords' rugged coastline, characterized by cliffs, sea stacks, caves, and arches, is an important natural resource area protected by the boundaries of the park. In addition to the raw, rugged, beauty of these geological features, they are also recognized as important wildlife habitat and have cultural significance to local native people. Caves, in particular, are known to provide important habitat for seabirds and bats.

Despite these important values and the inclusion of these features in the initial enabling

documentation that led to the establishment of the park, these features have never been inventoried or formally documented and little is understood about the Kenai Fjords' caves or their use.

This summer, resource managers will map and document the location of caves in the park to develop a baseline dataset that will provide an opportunity to better manage these potential wildlife habitats, to meet compliance requirements for cultural resources, and to mitigate, or at least document, resource damage.

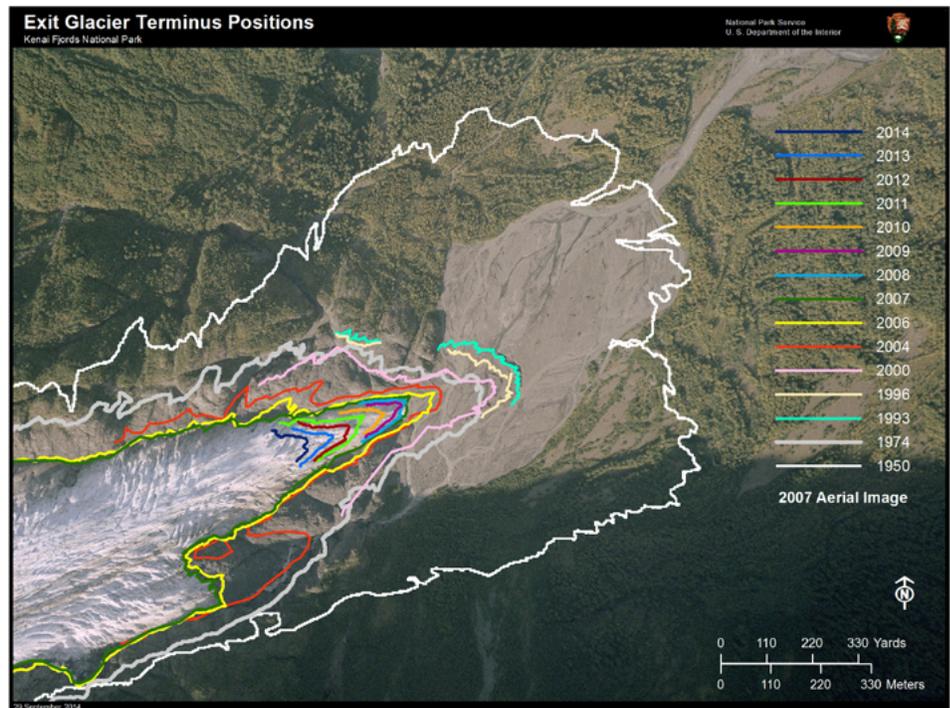
Glacier Mass Balance

Fall 2014 ends the fifth year of glacier mass balance monitoring on the northern Harding Icefield in Kenai Fjords National Park. Fall is the end of a water year (WY), and includes one complete winter and one complete summer. Results of the monitoring reveal the year-to-year variability of weather in this maritime climate and highlights the variability along elevation gradients. In the past five years, we have seen two years of positive balance (more accumulation than melt), one year of equilibrium (accumulation equals melt) and, most recently, two years of a slightly negative balance (more melt than accumulation).

The 2014 water year (WY) was the second consecutive year of a negative balance at Exit Glacier, but it was not as low as WY 2013 due to greater precipitation during the winter and cooler temperatures during the summer. This resulted in a slightly less negative balance in WY 2014, leaving WY 2013 to be the lowest balance year of the past five years. Even so, this year we recorded the greatest loss of vertical ice, 8.5 m, at the lowest site (elev. 532 m), located next to Marmot Meadows. Four of the six sites saw complete melt of the winter 2013-2014 accumulation; only the two sites above 1230 m were able to retain any of previous winter's snow (.33 m and 1.87 m). The contrast of 8.5 m loss at the lowest site to 1.87 m gain at the highest site illustrates the variability found on this mid-sized glacier.



Glacier mass balance fieldwork. NPS photo.



Exit Glacier annual terminus mapping. Earliest years were digitized from historic aerial photos.

Exit Glacier

Terminus Position Mapping

Researchers at Kenai Fjords continue to map seasonal changes to the position of Exit Glacier's terminus. This allows us to track the rate of retreat of Exit Glacier and to be able to quantify and describe the change witnessed by the thousands of visitors who travel to the park each year. Unlike mass balance measurements which record annual inputs, terminus positions change as a result of a lagged response to long-term climate and other factors related to the geometry of the glacier.

Each spring and fall, researchers map the terminus by walking the edge of the lowest

portion of Exit Glacier while collecting data with a GPS. The extent of terminus mapping is determined by what is safely accessible. In recent years, the terminus has retreated into a more narrow and steep valley that limits the amount of terminus that we can map on foot. This is evident by the shorter length of terminus that was measured in 2014. The 2014 end-of-summer measurement indicates that Exit Glacier retreated 187 ft (57 m) this past year (September 30, 2013 – September 25, 2014). This includes a retreat of 38 ft (11.5 m) during the winter, and 151 ft (46 m) during the summer. This is the greatest amount of annual retreat we have observed since we first started annually mapping the terminus nine years ago.

VISIT OUR FIELD BLOG!

Since 2012, we've been blogging about our fieldwork during the summer. This blog, located on the park's website, allows readers to learn first-hand about the experiences that field researchers have. 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. We try to blog about each of our projects at least once during the summer. Read about the experiences of the researchers in the many different field projects at: <http://www.nps.gov/kefj/blogs/Kenai-Fjords-in-the-Field.htm>.

Vegetation

Managing Invasive Plants

The 2015 summer marks the 12th year that Kenai Fjords National Park has had a program dedicated to the control of invasive plants in the park. Training and technical support provided by the Alaska Regional Exotic Plant Management Team (EPMT) has been vital to the continuing success of this project. We will continue to monitor and control invasive plants, and collect data that helps determine how effective control methods have been over time. This information helps to select the most appropriate and efficient control methods to meet management goals. We will continue to focus our efforts on areas with the highest human use and invasive plant populations, and to monitor remote sites that are vulnerable to infestation in order to detect invasive plants before they become established.

In 2015, we will continue to use herbicide to control persistent populations of common dandelions as well as a newly discovered invasive grass, smooth brome, which does not respond to hand pulling. Some of these invasive plant populations are located near developed areas in the park, while others are more remote and challenging to access. Monitoring effects of herbicide use in the park over the



Ready to control coastal invasive plants. NPS photo.

last four years has shown good results. Each year populations controlled with herbicide have decreased in size and density.

The freshwater aquatic invasive plant, *Elodea*, continues to be a concern for the park. In 2014, three lakes on the west side of the Kenai Peninsula outside of the park were treated for *Elodea* at a high cost. *Elodea* is a threat because it forms dense monocultures, degrades

fish habitat, compromises water quality, reduces dissolved oxygen, and displaces native plants and animals. Because it can reproduce vegetatively and only a small segment needs to break off to grow a new plant, *Elodea* is easily spread from one lake to the next by hitching a ride on a boat or floatplane. We plan to conduct surveys opportunistically on three freshwater lakes within the park boundary. These lakes are especially susceptible to infestation since they are accessed by float plane. These lakes provide habitat for sockeye, coho and pink salmon.

Removal of invasive plant populations is only the first step in restoring park lands to native vegetation. When invasive plants are removed from a site it often leaves the area with very little vegetative cover and this can make the site vulnerable to reinfestation. Native habitat can be restored more quickly by reseeded with native plants. We have been collecting native seed to establish a seed bank for revegetation projects in the park. We will continue collecting native plant seeds from the Exit Glacier area to use in future restoration projects.

Engaging youth in parks is a priority and for the Resource Management Division, the invasive plant management program is where we provide opportunities for youth to be introduced to the National Park Service. There are three youth positions: a Student Conservation Association (SCA) Intern, and also two Youth Conservation Corps teens from the Seward area.

Community outreach and partnerships with local agencies provide a great way to keep in touch with our neighbors. We will continue to work together with Chugach National Forest and community of Seward to control invasive plants at our 12th annual community weed pull at the end of June. This is a great opportunity to work with Chugach National Forest staff to control invasive plant populations affecting lands of concern to both agencies, as well as to reach out to the community and talk about the negative impacts of invasive plants on the environment.



Herman Leirer Road Community Weed Pull in 2014. NPS photo.

Wildlife

Bear Management



Black bear in Exit Glacier campground. Photo taken by remote camera. NPS photo.

Managing Park Bears

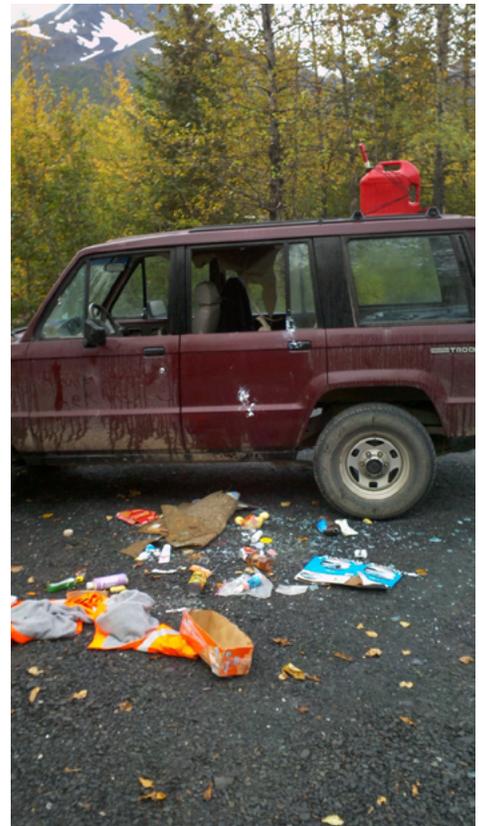
Black bears are abundant in Kenai Fjords National Park and adjacent lands, and represent a significant wildlife component of the coastal ecosystem. Studies of black bears in Kenai Fjords have shown that bears range widely, suggesting that the bears using the frontcountry in Kenai Fjords are likely part of a population that uses habitat in the gateway community of Seward as well as adjacent U.S. Forest Service and State of Alaska lands. In 2007, Kenai Fjords National Park initiated an extensive bear management program to address bear-human conflicts, and this program initially led to a decrease in bear related property damage and negative bear-human interactions within park boundaries.

Management of bear-human interactions on lands adjacent to the park has not been consistent across the various agencies. In the past few years, human-bear conflicts within the local community and surrounding areas adjacent to the park have led to the defense of life and property (DLP) related destruction of black bears by local law enforcement and residents. Black bears have also obtained human food and destroyed private property within Kenai Fjords National Park. An increase in property damage to facilities and vehicles within park boundaries has raised concerns

that inconsistent bear management practices across the various agencies around Seward may be affecting behavior of park bears. In 2012 and 2013, bears in the Exit Glacier area damaged multiple vehicles in the campground as well as bear-resistant trash cans near the Nature Center. Bear management needs to be more consistent and effective both within the park and in the local area.

In 2015, we will initiate a project to create new interdisciplinary training and outreach products to assist in building relationships among local Seward agencies working on bear related issues, including education in aversive conditioning and use of bear pepper spray. We will work with partners to develop outreach materials to specifically address bear issues in the Seward area. We will also expand the scope of our bear aversive conditioning training to support community needs and develop trainings for the public including the safe use of bear pepper spray for protection during a bear encounter.

The primary goal of our bear management program in 2015 is the same as in past years: to provide for visitor and staff safety by minimizing bear-human conflicts. To do this, everyone in the park including visitors will need to work together to prevent bears from obtaining human food and garbage. Please report to park staff any garbage cans that are overflowing, damaged, or have faulty latches as soon as possible to avoid bears obtaining a



Vehicle damaged from a bear in 2012 at Exit Glacier campground. Food on the ground was from within the vehicle. NPS photo.

trash reward. Please also report bears investigating trash cans or vehicles immediately. It is highly recommended that visitors don't leave food inside their vehicles overnight, especially in the park's campground area to avoid bear damage to vehicles.

BE BEAR AWARE!

Minimize negative bear-human interactions:

- Store all food in bear resistant food containers while camping.
- 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.

Thank you for your prompt reporting!

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.

Fish & Marine Debris

Coho Salmon



Measuring and tagging coho salmon. NPS photo.

Resurrection River Coho Salmon

The Resurrection Bay coho salmon sport fishery is one of the largest in Alaska. While hatchery releases of coho support this fishery, wild coho salmon in some years can make up more than 60% of sport catch. Presumably, wild coho salmon that evade anglers in the bay swim up the braided, sediment-laden Resurrection River to spawn. While coho salmon have been documented in the river and some of its tributaries, remarkably little is known of the migratory patterns or spawning distribution of coho in the watershed. In fall 2014, Lake Clark and Kenai Fjords staff teamed up to unlock the mystery of when and where coho salmon go in the Resurrection River. Working with Chugach National Forest and Alaska Department of Fish and Game, a study to capture, radiotag, and track coho salmon to spawning locations was initiated.

Braving cold, flood stage waters, field technicians waded into the river to pull seine nets by hand to catch migrating salmon. Early season surprises included 2 Chinook salmon, 27 sockeye salmon, and more than 50 Dolly Varden. By early September, coho were thrashing in the net and radio tags were being deployed. By mid-October, 182 coho salmon had been captured, 90 of which were radiotagged and tracked up the river using a combination of foot surveys, aerial telemetry flights, and au-

tomated telemetry towers. Results show that tagged coho spawned on the main stem of the Resurrection River favoring areas upstream of glacial inputs and near large woody debris. Genetic samples from 157 coho captured during telemetry project field work were also collected. In 2015 with support from the Ocean Alaska Science and Learning Center, a partner project with Alaska Department of Fish and Game will analyze the genetic samples and allow us to examine the relationship of Resurrection River coho to coho populations on a broader geographic scale.

Marine Debris

5-Park Marine Debris Project

In 2015, Kenai Fjords will be one of five parks partnering in an interdisciplinary marine debris project ranging from southeast Alaska to past the Bering Strait, funded through the National Park Foundation's Coastal Settlement funds. The other parks involved in this extensive project are Wrangell-St. Elias National Park and Preserve, Katmai National Park and Preserve, Bering Land Bridge National Preserve, and Cape Krusenstern National Monument. Project activities will include marine debris removals from heavily impacted shores, outreach with local schools and communities on marine debris issues, NOAA national marine debris monitoring, and a U.S. Fish and Wildlife Service review of marine debris microplastic effects on subsistence food sources.

Marine debris includes fishing gear, plastic remnants, building materials, and any other non-natural, solid material that comes onshore. These debris can affect marine mammals and birds directly through entanglement, strangulation, and digestive blockage. Debris also can present potential visitor hazards. In March 2011, a magnitude 9.0 earthquake struck Japan creating a tsunami that caused nearly 16,000 deaths and generated approximately 1.5 million tons of marine debris across the Pacific Ocean toward the western United States. The 2011 Japanese tsunami marine debris raised public awareness on the Pacific Coast about the issue of marine debris.



Map of the 5-park marine debris project.

This project is extensive in both its geography and scope and has a multitude of partners involved in its successful implementation.

5-PARK MARINE DEBRIS PROJECT PARTNERS

- Alaska SeaLife Center
- National Park Foundation
- Alaska Airlines
- Gulf of Alaska Keepers
- Waste Management
- State of Alaska Department of Environmental Conservation
- U.S. Fish and Wildlife Service
- Resurrection Bay Conservation Alliance (Kenai Fjords)
- Yakutat Tribal Council (WRST*)
- Yakutat Borough (WRST)
- Bureau of Land Management (WRST)
- Kotzebue IRA (BELA/CAKR)
- Northwest Arctic Borough (BELA*/CAKR*)
- Seward High School (Kenai Fjords)
- Yakutat School District (WRST)
- Yakutat Tribal Council (WRST)
- Yakutat Borough (WRST)
- Bristol Bay School District (Katmai)
- Shishmaref Village & School (BELA)
- Wales Village & School (BELA)
- Deering Village & School (BELA)
- Kotzebue Village & School (CAKR)
- Kivalina Village & School (CAKR)
- Kiana Village & School (CAKR)
- Ambler Village & School (CAKR)

*BELA=Bering Land Bridge, CAKR=Cape Krusenstern, and WRST=Wrangell-St. Elias.

Archeology

2014 Site Monitoring

Site Condition Assessments

Kenai Fjords National Park has a long history of human use. Since the park's establishment in 1980, numerous archeological and historic sites have been identified and recorded along coastal areas and within the Nuka and Resurrection river valleys. Many of these sites retain valuable prehistoric and/or historic evidence of the lives of Native Alaskans and early twentieth century pioneers.

Kenai Fjords regularly monitors and assesses the condition of archeological sites under its jurisdiction. Sites are placed on a monitoring schedule to guarantee even the most remote sites will be visited consistently. In 2014, Kenai Fjords cultural resources staff assessed the condition of 17 sites including the Sonny Fox mine, an early to mid-20th century hard rock mine in the Nuka Bay mining district. Sites were examined for threats and disturbances such as structural deterioration, vegetation growth, erosion, and modifications related to animal activity. These recorded observations will assist resource managers in determining what, if any, course of corrective action needs to be implemented.

Law enforcement protection park rangers also play an integral part in the monitoring process. During the busy summer months when park visitation is at its peak, the rangers visit these sensitive cultural sites to ensure that the sites remain undisturbed and in good condition.



Wagon wheel from Sonny Fox mine. NPS photo.



Ore bucket that was on an aerial tramway at the Sonny Fox mill. NPS photo.

Shea Lots Project

Privy Information

Seward was founded in 1903, and by 1905 the town was rapidly progressing forward. Early Seward residents used outhouses (privies) as trash dumps as well as human waste receptacles, and the trash found in these privies can provide a wealth of historical information.

When the National Park Service (NPS) decided that they needed to build a parking lot on the Shea Lots, Section 106 of the National Historic Preservation Act of 1966 required that they evaluate the historical significance of Block 10 properties before undertaking any development. This led to the discovery and archeological excavation of three outhouse remains. The remains of the outhouses dated from 1905 to 1920. Excavations of these privies occurred in 2005, 2007, and 2011.

Read about what NPS archeologists recovered from the privy excavations in the 2014 book, *A Slice of Early Seward: How Archeology Provides a Glimpse into Daily Life in this Frontier Town*. There is also a brochure that was created from this project. Both are now available on the park's website: <http://www.nps.gov/kefj/historyculture/index.htm>

From the archives:

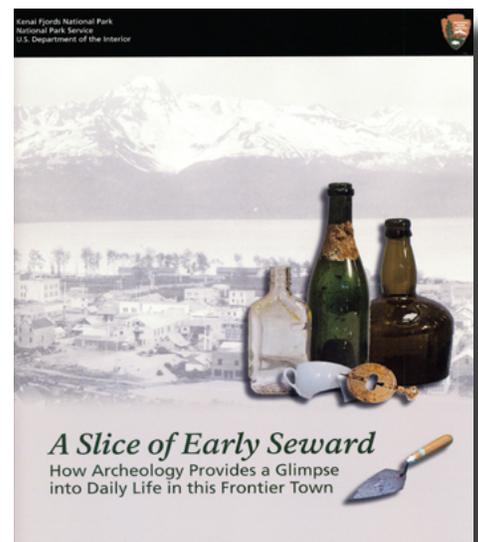
Seward Gateway, June 3, 1923

EXCURSION TO GLACIERS SUNDAY ON DISCOVERER

Sunday morning at 7 o'clock, Capt. Berger of the M. S. Discoverer, will leave port bound for Bear Glacier, Northwestern Glacier, Chiswell Island and Seal Rocks, making the first excursion by water out of Seward this summer.

The trip will take all day and luncheon will be served on the vessel free of charge. A charge of \$3.00 per person has been fixed by Capt. Berger. Reservations can be made at the Seward Grill or with Capt. Berger.

Since the announcement was made yesterday it is evident Capt. Berger has hit upon a popular chord for parties are already being made up. The Discoverer is one of the sweetest looking and most seaworth craft of its size ever operated out of this port; it has comfortable accommodations for at least 20. It is suggested reservations be made at once.



NPS book about the privy project.

Coastal Archeology & Wildlife

Protect Coastal Sites

In 2015, Kenai Fjords National Park will begin a two-park partnership project with the Smithsonian Institution's Arctic Studies Center. This project is funded out of the Coastal Settlement funds administered by the National Park Foundation for both Kenai Fjords National Park and Wrangell-St. Elias National Park and Preserve. For Kenai Fjords, this project will focus on surveying areas in the southern part of the park that have not been surveyed for archeological resources by the Smithsonian Institution in the past. Another part of this project will be determining glacial and sea level histories to inform the coastal settlement patterns of the Sugpiaq people. As part of the archeology component of the project, there will be two internships offered for youth from affiliated villages.

Both Wrangell-St. Elias and Kenai Fjords have centuries, if not millenia, of human habitation. Unfortunately, the Kenai Fjords coast is an area of extreme tectonic influence and time periods of volcanism have affected the area as well. In particular, two major earthquakes (C.E. 1175 and 1964) appear to have caused coastal subsidence of a total of nearly 4 meters (12 feet). Understanding how these natural catastrophes as well as current human-caused impacts are affecting or have the potential to affect archeological resources is important to the protection of cultural resources.

This interdisciplinary project includes not only archeology but also resource protection. One project objective is to conduct a site vulnerability assessment for each known archeological site to determine potential levels of impacts, including recommended management actions for each site. Another objective of this project will be increased law enforcement capacity for ranger staff at Kenai Fjords and Wrangell-St. Elias parks to better protect these irreplaceable archeological resources. Capacity will be increased through additional boat and aerial patrols at both parks, as well as planning for a floating ranger dock at Wrangell-St. Elias.



Park archeologist recording the location of a site in Aialik Bay, 2014. NPS photo.

National Register

Determinations of Eligibility

In 2014, Kenai Fjords National Park began an investigation to determine which archeological sites in Aialik Bay may be eligible for the National Register of Historic Places. The National Register is the official list of America's historic places worthy of preservation, and eligible sites are given special consideration under the law. The park's archeologist researched each site by reading reports and combing through the park's archeological site files. In June 2014, site visits to Aialik Bay were conducted to perform condition assessments and confirm coordinates. Draft Determination of Eligibility forms were prepared, and over the winter of 2014-2015, the Kenai Fjords Superintendent consulted with affiliated tribes, native corporations, and the Alaska State Historic Preservation Officer to ensure that these parties had an opportunity to give input on the park's recommendations.

The project will conclude in 2015 with the submission of select nominations to the State Historic Preservation Office where they will be forwarded to the Alaska Historical Commission for review. Upon a favorable review, the nominations will be sent to the Keeper of the National Register of Historic Places for final review and listing. The listed sites will be posted on the National Register program's website, but all sensitive information, such as geographic locations, will be kept confidential. For more information about the National Register program, visit the nationwide program at the following website: <http://www.nps.gov/NR/>.

Peregrine Falcons

Breeding Ecology of Peregrine Falcons

Kenai Fjords National Park is thought to support the Peale's subspecies of peregrine falcons that are a genetically and ecologically distinct subspecies found in scattered populations along the Pacific Coast. Peale's peregrine falcons are a species of special concern in the U.S. and Canada due to very small population size (estimated at less than 1,000 individuals), restricted distribution, declining prey base, and lack of baseline data to assess conservation status. These marine-based peregrines are thought to be obligate predators of seabirds and therefore may be a good indicator of the health of local seabird populations because their nesting and productivity reflect local seabird abundance and distribution.

An intensive survey of peregrine falcon nest habitat in 2010 found that falcons tended to nest in close proximity to seabird colonies. Park staff have continued to try to monitor known falcon aeries along the coast since then; however, time and money to complete those surveys has been limited in the intervening years. In 2015, we will conduct another intensive survey of falcon nesting habitat along the coastline to determine occupancy of nest sites 5 years after the previous complete survey. Examining the predator-prey dynamics of peregrine falcons and seabirds will allow us to better understand changes seen in seabird monitoring programs and determine appropriate conservation strategies.



Peregrine falcon nest near Cape Aialik. NPS photo.

Lichens



Black lichens create a distinct dark band on coastal rocks just above the high tide line. NPS photo.

Lichen Inventory

Kenai Fjords has an abundant and diverse lichen flora that is strikingly visible to the visitor and functionally important to the park's ecosystems. Lichens are found in most habitats of the park, beginning at the high tide line that is often conspicuously marked with long dark bands of black seaside lichens. Bird perches and nesting sites on cliffs rising up from the sea, are often covered in a kaleidoscope of orange, yellow, green, and brown lichens taking advantage of these nutrient enriched surfaces. Long, pendulous, and intricately branched lichens adorn the trunks and branches of the park's spruce and hemlock forests, and are important food and shelter for a variety of vertebrate and invertebrate species. The unique soil lichen communities found on nunataks and in other alpine areas are important contributors to soil stabilization and development.

Lichens are fungi that live in intimate association with algae and/or cyanobacteria, and are organisms that are especially responsive to environmental stressors, including changes in biodiversity, air quality, and climate. This is a major reason why they are widely used as biological indicators for natural resource assessment throughout the world. Kenai Fjords encompasses a wide range of habitat types, as well as climate gradients known to support spectacular lichen floras elsewhere in coastal Alaska. Several studies in the southern coastal Alaska region have documented an extraordinary diversity in lichen species, and have

included many taxa new to Alaska, new to North America, and several new to science.

Despite their ecological importance and great diversity, there is a general lack of knowledge regarding lichen occurrence in Southwest Alaska Network (SWAN) parks. To address this information need, SWAN has partnered with Oregon State University to conduct lichen inventories and a team of lichenologists from North America and Europe visited Katmai in 2013 and Lake Clark in 2014, and are preparing to survey Kenai Fjords during the summer of 2015. Habitats of interest include old-growth spruce-hemlock forests, sheltered rock outcrops and seaside cliffs, coastal driftwood, dwarf shrub and sparsely vegetated alpine, and the unique sloping peatlands near the ends of major peninsulas. The team expects many notable and exciting lichen discoveries will be made within Kenai Fjords. This project will produce a comprehensive voucher-based lichen species list and accompanying database for each of the three parks. 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.

SWAN Inventory and Monitoring

The Southwest Alaska Network (SWAN) is one of 32 Inventory and Monitoring programs within the National Park Service. SWAN consists of five Alaskan park units: Kenai Fjords National Park, Katmai National Park & Preserve, Aniakchak National Monument & Preserve, Alagnak Wild River, and Lake Clark National Park & Preserve.

These parks were grouped together into a single network because they shared characteristics such as marine coastal habitats and glaciers. Specific vital signs that represent key indicators of condition of park ecosystems are monitored, information critical for the National Park Service to protect and manage resources. SWAN and Kenai Fjords staff work closely together to successfully implement these vital signs monitoring projects.

Sea Otters



Sea otter swimming near Kenai Fjords. NPS photo.

What are Sea Otters Eating?

As part of the Southwest Alaska Network (SWAN) Vital Signs monitoring program, sea otter foraging behavior observations in Kenai Fjords National Park have occurred annually since 2007. Results have consistently shown that Kenai Fjords sea otters consume a high proportion of mussels relative to sea otters in other Alaskan areas. Study results also show that mussel abundance and sizes across the Gulf of Alaska annually vary considerably. During most seasons, mussels have low energy content, when compared to other prey items. If sea otters in Kenai Fjords are dependent on mussels as a major component of their diet, they may be at risk of food limitation as a result of fluctuations in prey availability. Consequently, the apparent high degree of sea otter consumption of mussels around Kenai Fjords has raised questions about potential food constraints on the park's sea otter population. Furthermore, if Kenai Fjords sea otters are at the lower range of energy recovery, there are concerns that the population may be more susceptible to disease, severe weather events, climate change, vessel traffic, and other disturbances.

In Kenai Fjords, sea otters are a keystone predator in the nearshore ecosystem and a priority species for conservation based on park enabling legislation. Kenai Fjords National Park, SWAN, and U.S. Geological Survey are partnering on this 2014-2015 project to expand our understanding of the sea otter monitoring results and the potential threats to this important keystone coastal species.



National Park Service
U.S. Department of the Interior

Kenai Fjords National Park
P.O. Box 1727
Seward, AK 99664

EXPERIENCE YOUR AMERICA



National Park Service
U.S. Department of the Interior

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

Layout Editor
Sharon Kim

Contributors
Heather Coletti, Sharon Kim, Shannon Kovac, Christina Kriedeman, Deborah Kurtz, Amy Miller, Laura Phillips, and James Walton.

Comments? Write to:
Kenai Fjords National Park
P.O. Box 1727
Seward, AK 99664

sharon_kim@nps.gov
907-422-0500

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. National Park Service manages approximately 603,000 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 of 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 traditionally used by the Alutiiq people, and the Native villages of Port Graham and Nanwalek continue to be affiliated with the park. The park borders Kenai National Wildlife Refuge, Alaska Maritime Wildlife Refuge, Chugach National Forest, State of Alaska, and private lands.

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.