



Resource Management News

Centennial Summer 2016



View from the park boat, M/V Serac, in Paguna Arm of Two Arm Bay. NPS photo.

We are excited to be celebrating the 100th birthday of the National Park Service this year, the “NPS Centennial.” On August 25, 1916, President Woodrow Wilson signed an act establishing the National Park Service

“to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.”

Kenai Fjords National Park is a relatively new unit of the National Park Service and was created in 1980 through the Alaska National Interest Lands Conservation Act that established a number of parks, monuments, and wildlife refuges across Alaska.

Evidence of human settlement in Kenai Fjords National Park dates back to 200 C.E., showing that the park was used extensively through the millenia by the Sugpiaq (Aluutiq) people.

Affiliated tribal villages continue to have close direct and ancestral ties to lands within Kenai Fjords National Park. Indeed, the 1971 Alaska Native Claims Settlement Act (ANCSA) resulted in numerous coastal parcels within the park boundaries being owned by ANCSA corporations instead of the park.

For the staff in the Resource Management Division at Kenai Fjords National Park and in the Southwest Alaska Inventory and Monitoring Network, summer is the busy field season. 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 2016 summer season and includes summaries from last year’s projects. We’re excited about protecting and managing the natural and cultural resources of Kenai Fjords and hope that you help us celebrate 100 years for the National Park Service.

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National Park Service
CENTENNIAL

Vegetation

Managing Invasive Plants

Since 2003, Kenai Fjords National Park has had an active invasive plant control program and we are seeing reductions in the size and density of invasive plant populations in the park. This success is in part due to the technical support and training provided by the Alaska Region Exotic Plant Management Team (EPMT) program. In 2016, we will continue to monitor and collect data to evaluate the success of our work over time. Our highest priority areas continue to be those that have the highest human use, but we will continue to monitor remote and pristine backcountry sites. Inventory and monitoring efforts play an important role in our ability to find new invasive plant populations while they are small and require less time and fewer resources to control. Herbicide will continue to be one of the tools that we use to control invasive plants in the park in 2016. Monitoring herbicide use in the park over the last four years has shown a decrease in the size of common dandelion populations that have been treated with herbicide to a level where some areas can be maintained through hand pulling.

The aquatic invasive plant *Elodea* has become a major concern in Alaska due to its highly invasive nature. It is present in lakes around the state, including Fairbanks, Cordova, the Kenai Peninsula, and was recently discovered in Anchorage at the largest floatplane hub in the state, Lake Hood. A single *Elodea* plant from a floatplane can spread this prolific weed. *Elodea* impacts freshwater lakes by displacing native plants and animals, degrading fish habitat, decreasing flow and increasing sedimentation. It can also cause safety issues by fouling boat propellers and floatplane rudders. Due to its high invasiveness ranking and likelihood of spread, conducting surveys in three freshwater lakes in the park is a priority. We are planning to survey for *Elodea* and identify native aquatic plants in a freshwater lake in McCarty Fjord this summer.

Restoring native plant communities continues to be an important component of our invasive plant management program as disturbed



Weighing bags of invasive plants. NPS photo.

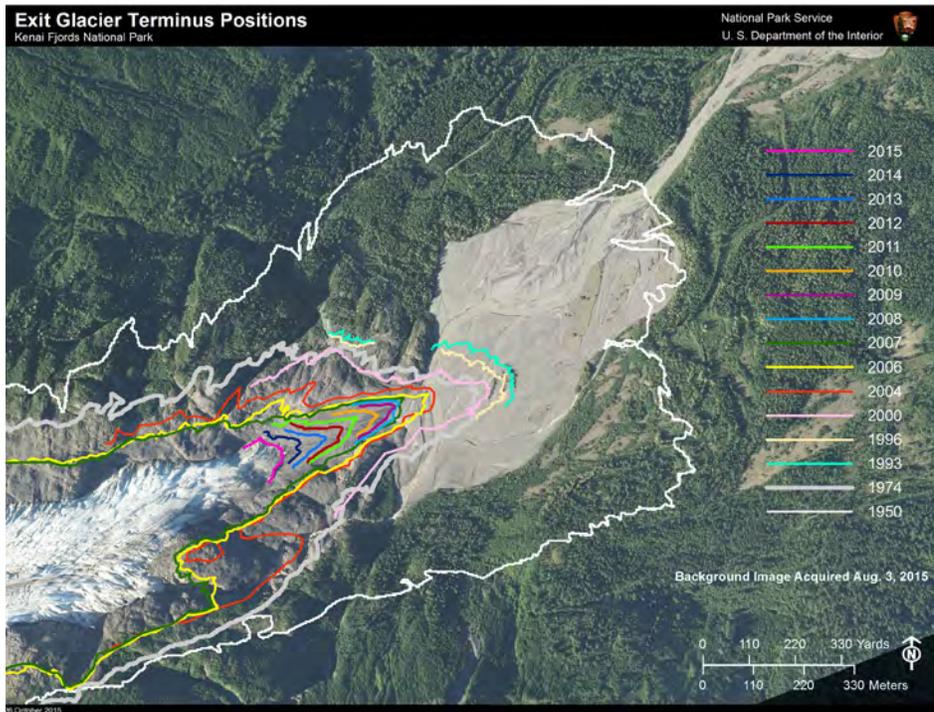
areas with little vegetative cover are more vulnerable to infestation by non-native plants. Replanting with native seed helps native plant communities reestablish more quickly. We will continue to collect native seeds from the Exit Glacier area this fall to revegetate about $\frac{1}{4}$ mile of roadside after completion of a construction project on Herman Leirer Road planned for the summer of 2016.



Student Conservation Association and Youth Conservation Corps EPMT interns. NPS photo.

Partnering and outreach continue to be an important priority of the invasive plant program. The annual community weed pull along Herman Leirer Road has been a great opportunity to work with our neighbors on the Chugach National Forest and in the local community of Seward, and 2016 will be the 13th year that we have participated. Other statewide partners include the Kenai Peninsula Cooperative Weed Management Area (CWMA), which has been instrumental in the effort to eradicate *Elodea* in lakes located on the western side of the Kenai Peninsula toward Soldotna. The park will continue to share information with other land managers at both the state and national levels.

Introducing youth to the National Park Service continues to be a priority for the invasive plant management program. At Kenai Fjords, the invasive plant program provides an opportunity for youth to be exposed to the National Park Service and learn about the resource management division. We are excited to have one Student Conservation Association (SCA) Intern and two Youth Conservation Corps (YCC) high school students from the local community working as part of the invasive plant management team this summer!



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 2015.

Results from the 2015 end-of-summer measurement indicate that Exit Glacier retreated 136 ft (41 m) this past year (September 25, 2014-September 30, 2015). This includes a retreat of 24 ft (7.4 m) during the winter and 112 ft (34 m) during the summer.

Glacier Mass Balance

Fall 2015 ended the sixth 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 season and one complete summer season.

Results of the mass balance monitoring have revealed the year-to-year variability of weather in this maritime climate and have highlighted the variability along elevation gradients. Over the past six years, we have seen two years of positive balance (more accumulation than melt), one year of equilibrium (accumulation equals melt) and, most recently, three years of a slightly negative balance (more melt than accumulation). The 2015 water year (WY) was the third consecutive year of a negative balance at Exit Glacier, but the balance was not as low as WY 2014 due to an increase in accumulation (measured in snow water equivalents) at all sites. This resulted in a slightly less negative balance in WY 2015, leaving WY 2014 to be the lowest balance year of the past six years.



Glacier mass balance fieldwork. NPS photo.

Glacier Mass Balance Fieldwork Slideshow

What does it take to do the glacier mass balance fieldwork in Kenai Fjords National Park? On YouTube, visit our slideshow video that we created in 2015 called "Field Notes: Kenai Fjords Glacier Mass Balance." The photo slideshow focuses on the spring mass balance work which measures the accumulation of snow at specific field sites on the Harding Icefield, including within Exit Glacier's hydrologic boundaries.

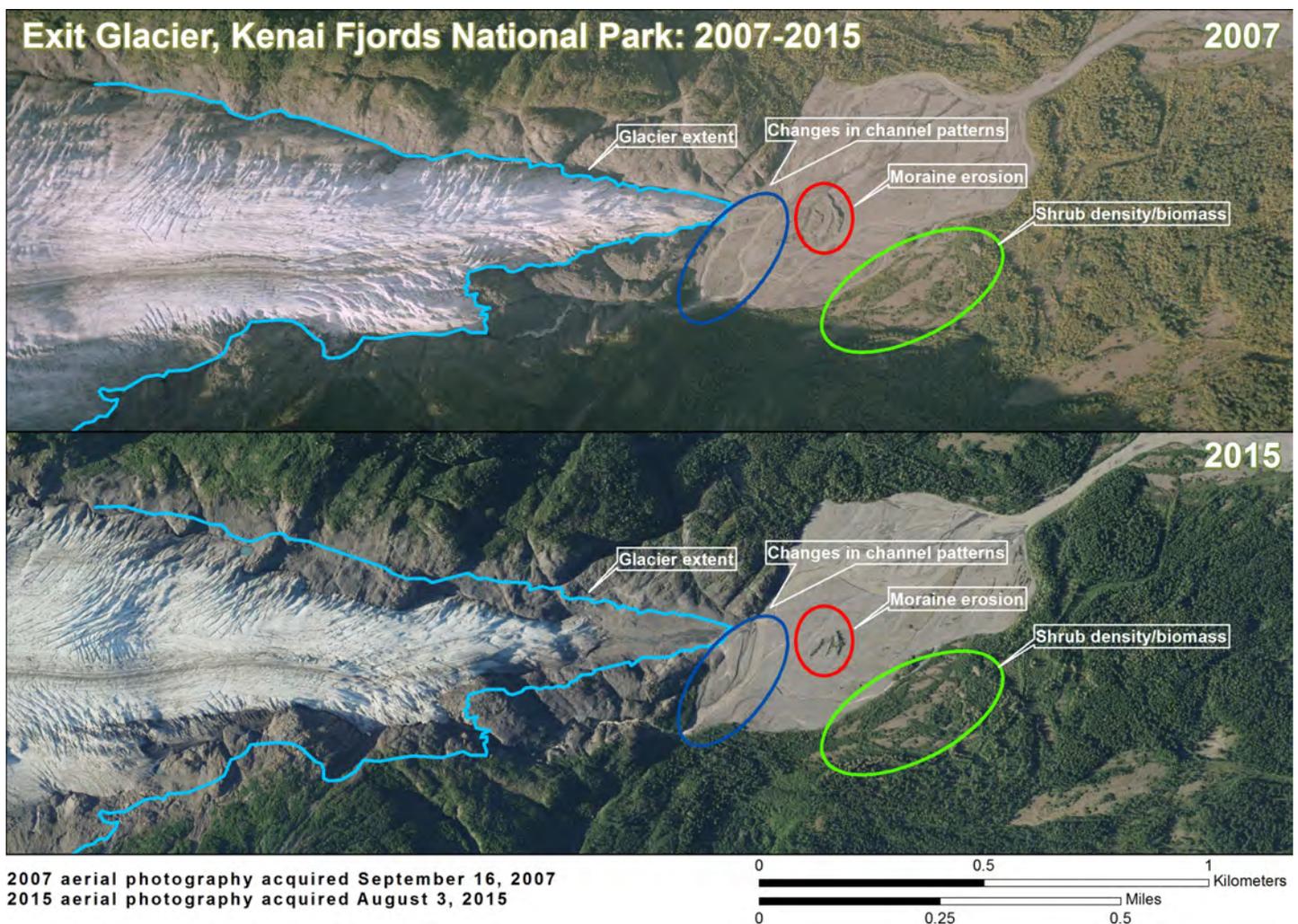
Physical Science

Exit Glacier Imagery

2015 Aerial Photo

The Exit Glacier area is a dynamic place where landscape-level change occurs on an annual basis. Unlike many environments in the lower 48 states where an aerial photograph can adequately represent a location for a number of years, park managers at Kenai Fjords have observed changes to Exit Glacier's extent and pro-glacial stream patterns *annually*, making yearly aerial photo acquisition in this area desirable.

In 2015, Kenai Fjords National Park was excited to acquire new aerial photography of Exit Glacier. This was the first imagery acquisition of this kind since 2007. A comparison of the 2007 and 2015 images (below) reveals an impressive loss of ice. In addition to the 942 ft (287 m) of retreat at the toe of the glacier, the ice boundary has retreated up to 300 ft (91 m) on the northern extent and almost 500 ft (152.4 m) on the southern extent between 2007 and 2015. This photo comparison illustrates how glaciers do not only lose ice at the terminus in a process referred to as retreat, but that ice melts along all surfaces resulting in a shrinking effect. Other landscape changes visible on the imagery include differences in Exit Creek's channel patterns, increases in shrub density and/or biomass, and erosion of the most recent moraines in the middle of the outwash plain.



Paleontology Inventory

With assistance from the NPS Alaska Regional Office, the park will be conducting an inventory for paleontological resources (fossils) this summer in an area that has the potential to hold deposits that are exotic (rare) to North America. This will be the first formal paleontological inventory for Kenai Fjords National Park. Paleontological resources are similar to cultural resources in that they are finite and are not renewable. Understanding what resources are in the park is key to managing and protecting them, and also increases scientific and public awareness about the significance of paleontological resources.

Physical Science / Bioblitz

Repeat Photography

Dramatic landscape changes may be observed over relatively short time scales in Kenai Fjords National Park through repeat photos. These photos of Pedersen Glacier taken in August 2011 (below left) and in August 2015 (below right) illustrate how much the glacier

has noticeably changed over a four-year period. Paralleling the Exit Glacier imagery (see previous page), many glaciers across Kenai Fjords are experiencing these rapid retreats.

To document this change across the park, a repeat photography project focuses on capturing historic photos of glaciers taken in the

previous century. You can see some of these repeat photo comparisons at the following website: <http://science.nature.nps.gov/im/units/swan/monitor/repeatphoto/RepeatPhotography.cfm>. We also have a YouTube video called “Glaciers of Kenai Fjords: A Century of Change” that showcases the repeat photography project.



Pedersen Glacier. August 10, 2011. NPS Photo.



Pedersen Glacier. August 6, 2015. NPS Photo.

Coastal Caves



An example of a coastal arch feature. NPS photo.

In summer 2015, a coastal cave inventory recorded 829 features including 488 caves, 122 shelters, 68 arches, 76 stacks, and 75 unique features. Kenai Fjords' rugged coastline; characterized by cliffs, sea stacks, caves, and arches; is an important resource area protected by the boundaries of the park.



An example of a coastal cave. NPS photo.

In addition to the raw, rugged, beauty of these geological features, they are also recognized as important wildlife habitat, especially for seabirds. Caves furthermore have cultural significance for local native people. This was the first inventory for coastal caves done for this park.

Bioblitz

This summer, Kenai Fjords National Park will be hosting its very first bioblitz. A bioblitz can focus on documenting specific taxa (such as invertebrates or birds), or can attempt to document as many species as possible. The Kenai Fjords bioblitz will focus on invertebrate pollinators. Working with Dr. Jessica Rykken, a Harvard entomologist, the bioblitz will be a community event to teach visitors and local kids about the different species of pollinators that we have in the park.

This one-day event will occur in late July at Exit Glacier, the only area in the park that can be accessed by automobile.

The specimens collected during the Kenai Fjords bioblitz will be housed at University of Alaska Fairbanks for future research. As part of the NPS Centennial, Dr. Rykken will also be lead bioblitzes in Denali, Gates of the Arctic, and Klondike Gold Rush national park units.

Cultural Resources

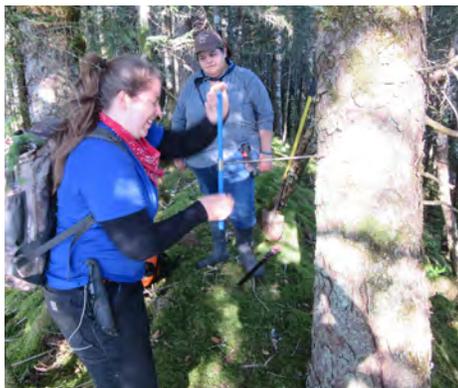
Archeology Partnership

New Findings at Kenai Fjords

In mid-July of last year, Kenai Fjords National Park, the Smithsonian Institution, the University of Alaska Fairbanks, and two Alaska Native interns embarked on an archeology and geomorphology partnership project. Working off the park boat, the M/V Serac, the researchers slogged through clouds of bugs and sheeting rain over ten days of fieldwork.

Aron Crowell from the Smithsonian Institution working with the park archeologist identified two new archeological sites in an area of the park that had never been intensively surveyed. Chris Maio from the University of Alaska Fairbanks, and Woods Hole Oceanographic researcher, Richard Sullivan, collected sediment cores to understand maximum glacial extent in the park's fjords, and past tsunami and storm impacts. The two Alaska Native interns also assisted with archeology lab work for the Smithsonian Institution once the field work was completed, learning about archeological data collection and analyses from start to finish through this project.

This project provided new information to better manage cultural resources in the park and was funded through the National Park Foundation's Coastal Settlement funds. In addition to finding new sites and surveying glacial extent, previously known archeological sites were revisited, delineated with GPS, and assessed for vulnerability to erosion and visitor impacts.



Interns core a spruce tree to assess age. NPS photo.



Scan of highbush cranberry (*Viburnum edule*), KEFJ 11524. Photo from ARCTOS website.

Herbarium Specimens

Museum Collections Conservation Survey

Kenai Fjords National Park is partnering with the University of Alaska at Fairbanks to produce a conservation survey of the park's herbarium specimens. Approximately 1,400 vascular plant and fungi specimens are being curated (cared for) at the university's Museum of the North Herbarium (also known as ALA). UAF students will inventory and assess the condition of each specimen, update the specimen's catalog record, and make recommendations for conserving the plant specimens. With that information, the park will then write a plan to carry out the upgrades in order to preserve the collection for future research. The collection is available on-line and you can view scans of the park's plant collection at the ARCTOS website: <http://arctos.database.museum/home.cfm#UAM>.

Cultural Conversations

The first Cultural Conversations workshop between tribal partners and Kenai Fjords National Park occurred in March 2016. Representatives from the affiliated villages of Port Graham, Nanwalek, and Seldovia plus Alaska Native corporations of Port Graham Corporation, English Bay Corporation, and Chugach Alaska Corporation were in attendance. The Qutekcaq tribe from Seward also attended. Open dialogues took place over two days and covered requested topics such as job opportunities and archeology. We hope that this workshop is the starting point for future cooperation and partnerships.

Seward Publications

Upcoming Local History Books

This one-year project will complete two complementary documents featuring special resource studies carried out on National Park Service (NPS) properties in Seward, Alaska. The first project will draw on previous NPS research to create a historical atlas of Seward's original town site featuring historical photographs and GIS mapping of NPS-owned properties through time, including the original homestead owned by Mary Lowell, an Alaskan Native of Alutiiq descent. Through the historical atlas, readers will be able to see the changing shape of Seward through the years after historic fires and new construction. The second product will be a narrative history of the NPS-owned lots highlighting stories of the property owners and their involvement and contributions to the community.



Seward, Alaska in 1915. Photo owned by NPS.

Wildlife

Interagency Bear Project

Managing Bears in the Park and Beyond
Bears, especially black bears, are common 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.

This is the second year of an interagency project working to improve communication, outreach, and management of bears in the greater Seward area. The project focuses on creating new interdisciplinary training and outreach products across this area. In April 2016, Kenai Fjords hosted an interagency advanced bear aversive conditioning workshop attended by Alaska State Troopers and Chugach National Forest focusing on bear management strategies and deterrent rounds. This course has provided a foundation for better communication across these agencies related to bear sightings and issues. In fall 2016, the park will also be creating an educational public video on the use of bear pepper spray that will be shared with the other agencies and will be linked with our park website.



April 2016 interagency bear advanced aversive conditioning workshop participants. S. Taylor photo.



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

In Kenai Fjords National Park, few negative bear-human interactions were documented in 2014-2015. In both years, only three negative interactions were documented each year. In contrast, we had numerous issues in 2012 and 2013, when bears in the Exit Glacier area damaged several vehicles in the campground as well as nearly all of the bear-resistant trash cans in the Exit Glacier area.

The primary goal of our bear management program in 2016 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 or damaged as soon as possible to avoid bears obtaining a trash reward. 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. These steps should help us maintain our low number of negative bear incidences.

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.

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!

Marine Invasives

Green Crabs and Tunicates

In 2016, the park will have been monitoring the presence of European green crabs for six years and tunicates for five years at Aialik Bay Ranger Station. Both the nonnative European green crabs (*Carcinus maenas*) and nonnative tunicate species are extremely prolific, have the capacity of spreading rapidly through the ecosystem, and are a concern for the western North American coast.

Aialik Bay was chosen as an ideal monitoring site due to the higher level of marine vessel traffic compared to other park areas. Marine vessels and marine debris are known vectors of marine invasive species. While green crabs have not yet been detected in Alaska (the closest area is British Columbia), invasive tunicates have been found in the state at Sitka, Ketchikan, and Homer and are of heightened concern.

Marine Debris Partnerships



Map of the 5-park marine debris project.

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 (Wrangell-St. Elias)
- Yakutat Borough (Wrangell-St. Elias)
- Bureau of Land Management (Wrangell-St. Elias)
- Kotzebue IRA (Bering Land Bridge/Cape Krusenstern)
- Northwest Arctic Borough (Bering Land Bridge/Cape Krusenstern)
- Seward High School (Kenai Fjords)
- Yakutat School District (Wrangell-St. Elias)
- Yakutat Tribal Council (Wrangell-St. Elias)
- Yakutat Borough (Wrangell-St. Elias)
- Bristol Bay School District (Katmai)
- Shishmaref Village & School (Bering Land Bridge)
- Wales Village & School (Bering Land Bridge)
- Deering Village & School (Bering Land Bridge)
- Kotzebue Village & School (Cape Krusenstern)
- Kivalina Village & School (Cape Krusenstern)
- Kiana Village & School (Cape Krusenstern)
- Ambler Village & School (Cape Krusenstern)

2015 Partner Project

Last summer 2.66 tons (5,320 pounds) of marine debris were removed from Kenai Fjords National Park shores extending from Harris Bay to Black Bay on the Kenai Fjords' Outer Coast. At Kenai Fjords, hard plastics made up more than 60% of the total debris collected, followed by foam and rope/netting.

Five Alaska national parks, Bering Land Bridge (BELA), Cape Krusenstern (CAKR), Katmai (KATM), Kenai Fjords (KEFJ), and Wrangell-St. Elias (WRST), were funded by the National Park Foundation's Coastal Settlement funds for an interdisciplinary marine debris project. Across the five parks, over 11.8 tons of marine debris were removed from park shorelines during summer 2015.

For Kenai Fjords, the marine debris removal field work was a cooperative effort among the park and various groups including Alaska SeaLife Center, Ocean Alaska Science and Learning Center, Resurrection Bay Conservation Alliance, and Port Graham Corporation. The 2.66 tons of marine debris were collected and then placed in large "super sacks" for helicopter pickup. For Kenai Fjords, as well as Katmai and Wrangell-St. Elias, a unique international opportunity had emerged to remove marine debris from our shores and transport it out of state. Another extensive project removing marine debris from Kodiak to British Columbia had been funded through the State of Alaska, National Oceanic and Atmospheric Administration, and ultimately by the country

of Japan. This large international effort in 2015 funded the non-profit Gulf of Alaska Keepers and Waste Management, Inc. to remove and transport these "supersacks." By tying in with this larger effort, marine debris "super sacks" from the Gulf of Alaska parks were taken by helicopter to a barge bound for a Seattle waste management landfill facility to be sorted, recycled, and disposed.

In addition to marine debris removals from heavily impacted shores, the five-park project also focused on outreach with local schools and communities on marine debris issues. Kenai Fjords worked with Seward High School to establish a NOAA marine debris monitoring site on a local beach where students collected data that they inputted into the national NOAA marine debris database.

Marine debris includes plastic remnants, building materials, and any other non-natural, solid material that ends up in the ocean. These unnatural debris can affect marine mammals and birds directly through entanglement, strangulation, and digestive blockage. Additionally, plastics and Styrofoam can break apart into pieces small enough to enter the food chain. In Kenai Fjords National Park, we see marine debris most often when it washes ashore our pristine beaches, an unsightly reminder that our actions impact the more remote ecosystems. This project focused on various levels of outreach and debris removal to deal with prevention of marine debris in the environment in addition to cleanup on park shores.



Black Bay marine debris clean up. Alaska SeaLife Center/NPS photo.

Nearshore Monitoring

The Southwest Alaska Network (SWAN) and the Gulf Watch Alaska Program (GWA) have partnered since 2012 to conduct nearshore marine monitoring across the Gulf of Alaska, including in two national parks: Kenai Fjords and Katmai. Our partners also include USGS, NOAA, and University of Alaska Fairbanks.

The SWAN / GWA nearshore monitoring program focuses on the nearshore benthic food web in the northern Gulf of Alaska. Currently, the program evaluates six vital signs and more than 200 species that range from primary producers to top level consumers. By employing a spatial design that allows broad geographic inference and selecting species with direct food web linkages, our monitoring program simultaneously detects change and assesses potential reasons for that change. In recent years, the nearshore monitoring program has documented the following in Kenai Fjords:

Mussels Pacific blue mussels (*Mytilus trossulus*) are common and abundant in shallow nearshore marine waters. They are consumed by many predators including sea otters, black oystercatchers, and several species of sea ducks, sea stars and even terrestrial carnivores such as bears. When monitoring started in 2008, mussel beds were largest in Kenai Fjords compared to other areas. Mussel abundance began to decline after 2008 across the Gulf of Alaska, and has subsequently recovered in some regions to varying extents. However, some of the largest beds in the park have not recovered. This variation in a primary prey resource has likely affected top level predators such as sea otters, sea ducks and shorebirds.

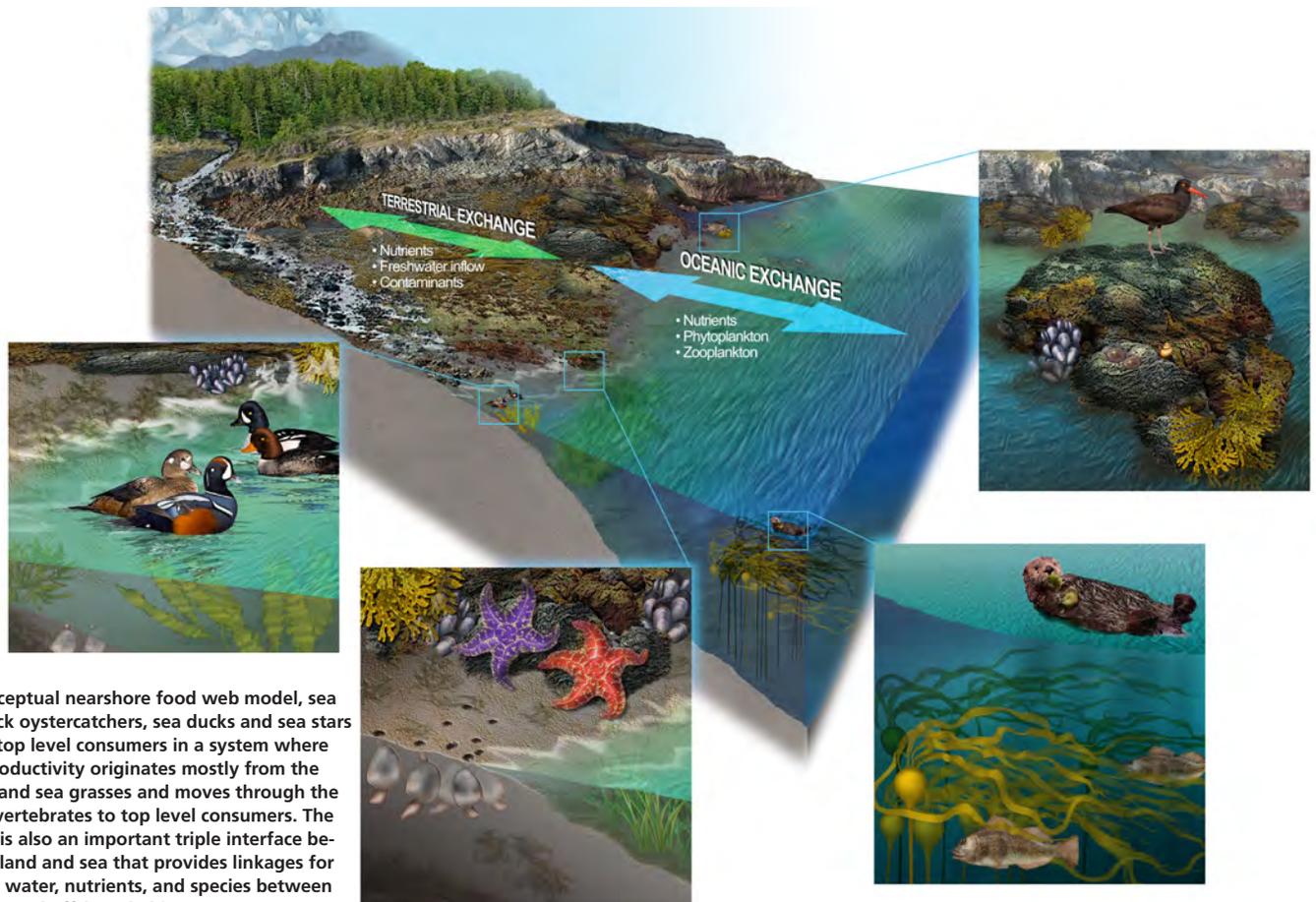
Common murre A dramatic shift was seen in the park's distribution of common murre (*Uria aalge*) during the 2015 summer. We saw an increase of these birds in coastal areas not associated with colonies, where we would expect them. Our records of unusual murre distributions corresponds to observations of a

large die-off of mures throughout the North Pacific during the 2015-2016 winter.

Sea star wasting disease In 2014, we began monitoring for sea star wasting disease due to Pacific Coast concerns. We found an increase in disease prevalence from 2014 to 2015 (0.6% to 3.4%). This diseased star occurrence is still low compared to southeast Alaska and the lower 48. To date, only 9 infected sea stars have been observed in the park.

SWAN Inventory and Monitoring

The Southwest Alaska Network (SWAN) is one of 32 Inventory and Monitoring programs within the National Park Service and consists of five Alaskan park units: Kenai Fjords, Katmai, Aniakchak, Lake Clark, and Alagnak Wild River. Specific vital signs that represent key indicators for the health of park ecosystems are monitored. This information is critical for parks to protect and manage their resources. For more information, see the SWAN website at www.science.nature.nps.gov.



In this conceptual nearshore food web model, sea otters, black oystercatchers, sea ducks and sea stars act as the top level consumers in a system where primary productivity originates mostly from the seaweeds and sea grasses and moves through the benthic invertebrates to top level consumers. The nearshore is also an important triple interface between air, land and sea that provides linkages for transfer of water, nutrients, and species between watersheds and offshore habitats.

Lichen Inventory



An uncommon lichen, *Stereocaulon saviczii*, found in Kenai Fjords. NPS photo.

Species New to North America Found!

Lichens form diverse communities and are good subjects for monitoring due to their environmental sensitivity. In July 2015, cooperators from Oregon State University, University of Bergen (Norway), University of Hamburg (Germany), Bureau of Land Management, and National Park Service conducted the first-known, comprehensive lichen inventory of Kenai Fjords. The five-member team collected 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 near Exit Glacier.

Preliminary discoveries include a lichen species new to North America, *Ephebe multispora*, a dark filamentous species found growing on seepage boulders in Coleman Bay. Previously it was known only to Europe, specifically Greenland and northern Sweden. New records were also made of the uncommon amphi-beringian lichen, *Stereocaulon saviczii*. Several outstanding additional discoveries are currently being identified from the lichen collections. Stay tuned, as we expect more exciting lichen discoveries to come out of Kenai Fjords!

Sea Otter Foraging

Sea otter foraging behavior observations within Kenai Fjords National Park have been conducted annually in June since 2007, as part of the ongoing SWAN Vital Signs monitoring program and Gulf Watch Alaska. To date, results indicate that sea otters in Kenai Fjords consume a high proportion of mussels relative to otters in other areas of Alaska. Because mussels are a major component of their diets, Kenai Fjords sea otters are possibly at risk of food limitation as a result of fluctuations in prey availability related to known high variability in mussel abundance and sizes across the Gulf of Alaska. Further, during most seasons, mussels have low energy content, compared to other prey items. Consequently, the high degree of sea otter consumption of mussels raises questions about potential food constraints on the park's sea otter population. This mussel dependence also raises concerns that the otter population might be more susceptible to disease, severe weather events, vessel traffic and other disturbances.

To examine this further, NPS and USGS partnered in 2014-2015 to answer questions about sea otter foraging habits, prey availability, and prey quality (calorie content) in Kenai Fjords. Two years of field data collection have been completed. Preliminary results indicate that mussel consumption by sea otters does not vary seasonally, and that mussels dominate the diet during all sampling periods. Also, findings indicate that energy recovery rates are low in Kenai Fjords relative to other areas where otters are not food-limited. This suggests that Kenai Fjords otter numbers are not likely to increase from their current abun-



Sea otter pup. NOAA photo / M. Lindeberg.

dance, and that they might be particularly susceptible to food constraints when mussel abundance is low.

Bald Eagle Monitoring



Bald eagle with fish. NPS photo.

Nesting and Productivity

Bald eagles (*Haliaeetus leucocephalus*) are important predators on seabird and fish populations, serving an key ecological role in freshwater and marine coastal systems in national parks within the southwest Alaska marine and terrestrial environments. Bald eagle occupancy and productivity surveys will be conducted along the coastline in summer 2016 by SWAN, Wrangell-St. Elias, and Kenai Fjords staff. These surveys began in 2009 to monitor nest occupancy and reproductive rates as one of the park's vital signs. The May occupancy survey focuses on known bald eagle nests and the number that are occupied for the season. The July productivity survey focuses on how many of those occupied nests have produced chicks.

In summer 2015, preliminary results showed that there were 58 occupied bald eagle nests found. Of those 58, there were 33 nests that had at least one chick (61% success rate). Documenting this information annually gives the park insight into the bald eagle population trends. If the bald eagle occupancy and/or productivity numbers were to substantially shift in either direction, this would indicate a change in environmental conditions that could potentially cascade through through food web.



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EXPERIENCE YOUR AMERICA



National Park Service
U.S. Department of the Interior

This is the ninth annual issue of Resource Management Newsletter 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 legislative boundary of the park extends across nearly 670,000 acres. National Park Service owns close to 603,000 acres, with the remaining acreage owned by the State of Alaska, Port Graham Corporation, Chugach Alaska 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 temperate rain forest grows between the icefield and the sea and 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, Nanwalek, and Seldovia are affiliated with the park. The park borders Kenai National Wildlife Refuge, Alaska Maritime National 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.