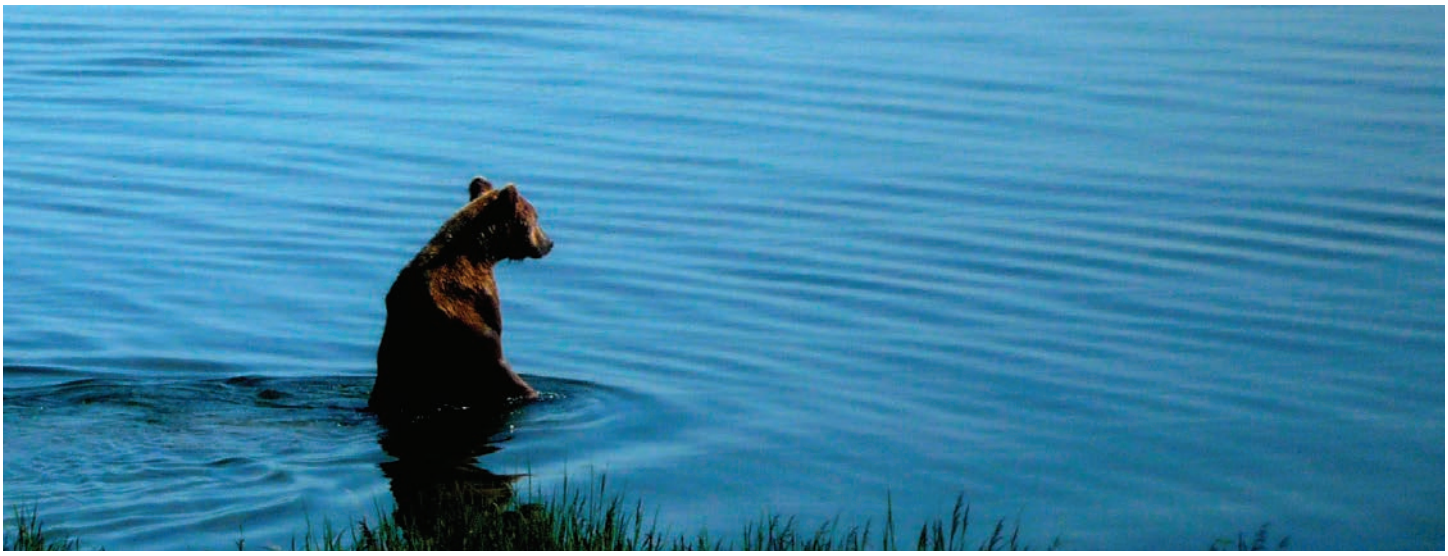
Katmai National Park and Preserve
Aniakchak National Monument and Preserve
Alagnak Wild River

National Park Service
U.S. Department of the Interior

# Resource Management News

## Summer 2013 Projects



**A bear fishing at the mouth of the Brooks River. Photo courtesy of MJ Peters.**

Each summer, National Park staff working in Katmai National Park and Preserve, Aniakchak National Monument and Preserve and the Alagnak Wild River, spend time in the field to study, inventory and monitor cultural and natural resources. Summer is the time to do it: rivers are flowing, wildlife is active and study sites are accessible. With more than 4.73 million acres between the three park units, this is a busy time of year.

Resource Management falls under three main groups: cultural resources, natural resources, and inventory & monitoring. The cultural resource program focuses on the human history of this region, including archeology and anthropology. The natural resource program studies biological and physical resources, such as wildlife, fish, plants, wilderness, and backcountry resources. The third group, inventory and monitoring, is part of a National Park Service effort to understand the status of the park's significant natural resources. The Southwest Alaska Network (SWAN) Inventory and Monitoring Program cooperates with the park to conduct various surveys to understand how park resources may change over time.

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

*Research Permits*

In addition to work conducted by NPS staff, external researchers come to conduct studies. In 2012, 40 research permits were issued for work conducted in Alagnak, Aniakchak, and Katmai. Some of the projects being studied include investigations of the ongoing volcanism in the area, geological formations, climate change, fish ecology, plant health, and contaminant accumulation. The diversity of work helps to answer local management questions as well as those of greater interest to science. The parks are a vibrant living laboratory.

**Katmai National Park & Preserve, Aniakchak National Monument and Preserve and Alagnak Wild River**

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# Cultural Resource Projects

## Cultural Inventories

**Panorama of a prehistoric village on the north side of the Meshik River.**

*Chignik – Meshik Rivers Region Cultural Resource Inventory*
Katmai completed the final season of archeological field surveys of the Chignik – Meshik Rivers Region with the goal of constructing a cultural chronology and landscape history of the area affected by the Aniakchak eruption and other volcanic events. This project is a cooperative effort between the NPS, the University of Alaska Museum of the North and Antioch University New England that located a surprising number of large villages and very old archeological components. 2013 will be the final year of the project, primarily geared towards laboratory and data analysis, cataloging and reporting. The results of the research were presented at the 2013 Alaska Anthropological Association meetings and additional presentations will be included in final visits to the local communities.

## Ethnography

**Elders and Youth at Igiugig's Culture Camp on Kukaklek Lake, October 2012. Left to right, front row: Mary Ann Olympic, Annie Wilson, Kaleb Hill, Dolly Ann Zharoff, Fewnia Zharoff, Mike Andrew, Dallia Andrew, George Wilson. Second row: Patrick Plattet, Karl Hill, Tate Gooden, Tess Hostetter, Blaise Decker, Kannon Lee, AlexAnna Salmon. Photo by Amber Lincoln.**

*Reindeer Herding Studies*
Katmai cooperated with the University of Alaska's Department of Anthropology to work with elders in Igiugig, King Salmon and South Naknek who provided oral histories about their experiences herding reindeer. Reindeer herding camps were documented near Lake Camp and at Smelt Creek near King Salmon. Igiugig elders and students shared knowledge with researchers at a Culture camp at Kukaklek Lake. The project organized a symposium on Reindeer Herding at the 2013 Alaska Anthropological Association meeting which including reindeer herding reports from the Seward Peninsula, Port Heiden, Igiugig and as far away as Norway.

## Archeology

*Archeological Survey, Testing and Evaluation of Amalik Bay National Historic Landmark*
Archeological investigations of archeological sites in Amalik Bay will continue. Little is known about the very long archeological record in this ecologically productive bay. Data will be recovered to evaluate known sites. New sites will be recorded and mapped.

**Collections Management: The South Aniakchak Bay Village Archeological Excavation**
In 2013 the Katmai Curator will begin processing, cataloging, and rehousing the over 160,000 archeological artifacts recovered during the South Aniakchak Bay Village archeological excavation. The project was conducted from 2004 to 2007 in cooperation with Dr. Bryan Hoffman, professor at Hamlin University.

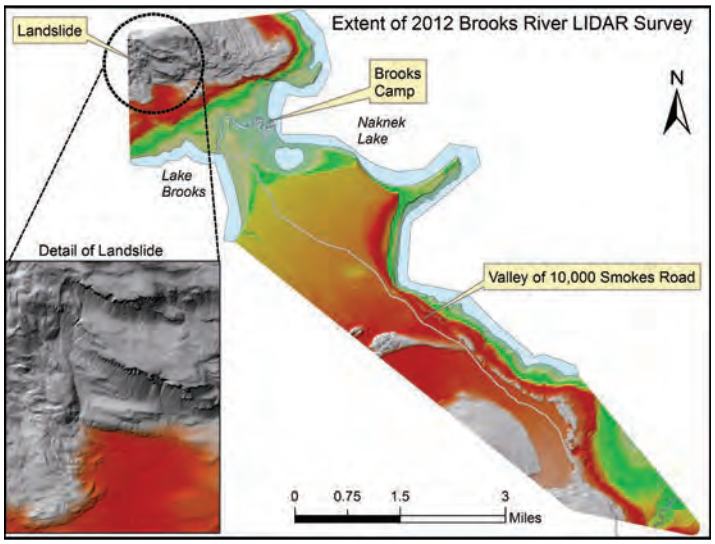
# Cultural Resource Projects

## Brooks Camp LIDAR Survey

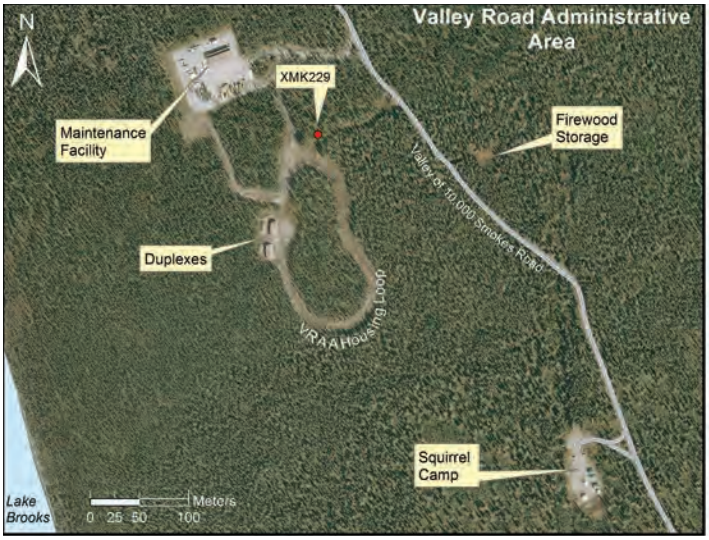
In summer 2012 Katmai conducted an aerial LIDAR survey of Brooks Camp and the northwest end of the Valley of Ten Thousand Smokes Road. LIDAR (Light Detection and Ranging) produces a detailed three-dimensional model of the landscape by receiving reflections from millions of airborne laser pulses. The high number of pulses emitted as aircraft passes over the terrain enables LIDAR to penetrate vegetation layers to map the ground surface. The goal of the Brooks Camp LIDAR survey was to accurately map archeological features and time-sensitive landscape features to improve understanding of the Brooks River archeological record. The high precision terrain model produced by LIDAR also forms a precise base for GIS, engineering and design applications.

LIDAR reveals the bedrock outcrops, beach ridges and terraces shaped by retreating glaciers, the receding waters of greater Naknek Lake and down-cutting of Brooks River. LIDAR provides some surprising details despite areas of dense fallen spruce trees. Bear trails lead to Brooks Camp from miles away. Previously unknown Alaska Native house ruins appear. Beach ridges can be seen in forests where they are invisible to the on-the-ground observer. The LIDAR coverage catches the edge of a great land slide on the southern slope of Dumpling Mountain.

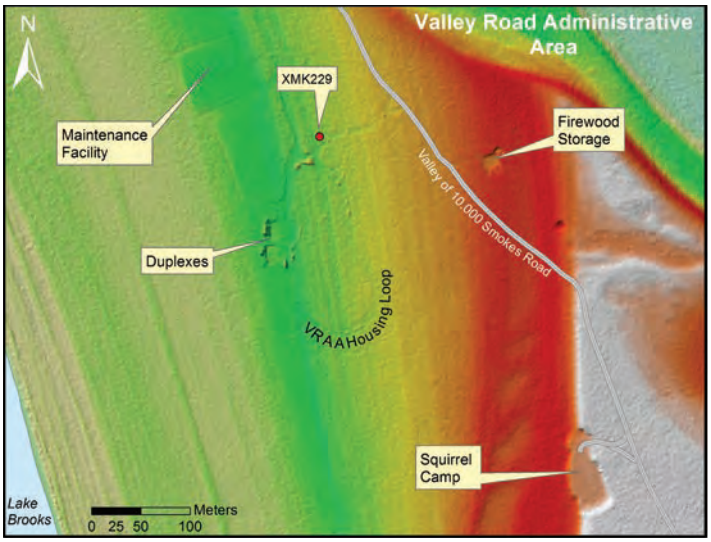
The following images show the area of new development at the Valley Road Administrative Area. Archeologists working in the area used GPS (Geographic Positioning Systems) to place their test pits. The forest was so dense and featureless that the archeologists used GPS to navigate and avoid getting lost. The "bare earth" image provided by LIDAR show that the Valley Road Administrative Area was once submerged with beach ridges representing shorelines as the water gradually receded. A small archeological site was found on the shore of the ancient lake.




**The LIDAR coverage includes a 10.8 mile by 3 mile swath from the southern crest of Dumpling Mountain to near Margot Creek. LIDAR caught the edge of an ancient landslide now hidden by vegetation.**




**Aerial view of the area east of Brooks Lake with mixed spruce/hardwood forest. Vegetation obscures most landscape features. Archeological site XMK229 was discovered as a result of systematic testing on a 10 meter grid superimposed on the project area.**




**Bare Earth Shaded Relief view showing ancient shorelines and new facilities east of Brooks Lake. Archeological site XMK229 was located by systematic shovel testing on a 10 meter grid.**

# Natural Resource Projects

## Bears and the Brooks Camp Experience

**Bear 409 with her three spring cubs in 2012. 409 was first identified at the Brooks River as a subadult in 1999. This is her third known litter of cubs. We hope to see her back with three healthy yearlings this summer! NPS photo.**

*Observational Monitoring of Bear and Human Use*

Long-term observational monitoring of bear and human use of Brooks River began in 2000 and will continue in 2013. Sampling includes recording bear use of river zones to the individual bear level. The detailed individual bear identification records that have been maintained have allowed researchers to recognize many of the bears that frequent Brooks River across study seasons and years. In 2012 there were 49 different bears identified regularly using the river during July, and 57 bears identified regularly using the river during the fall (each seasonal count includes some bears that were recognized in both seasons).

2012 was an interesting year at Brooks River. The British Broadcasting Corporation (BBC) spent June and July at Brooks River documenting the bears and some of their behaviors and day-to-day activities. They will be using this footage for a documentary that is scheduled for release in 2013. Visitors were delighted as four different sows showed up during the summer with cubs of the year (referred to as COY by researchers) that were born the winter of 2011-2012. This is an increase from the previous year. 2012 was also the year of the bear cam. The bears at Brooks River can now be watched 24 hours a day anywhere in the world by visiting http://explore.org/#!/live-cams/player/brown-bear-salmon-cam-brooks-falls.

**Visitors enjoy an "extended bear viewing opportunity" on the lower Brooks River platform during a bridge closure. NPS photo.**

*Brooks River bridge surveys*

Bear jams are a part of the visitor experience at Brooks Camp. Visitors to Brooks Camp must cross the Brooks River on a floating bridge to access viewing platforms. At times the bridge is closed to the visitors as bears utilize the river near the bridge. This study documented the frequency and duration of these bridge closures, as well as the number of visitors affected. During the hours sampled in July 2012, the bridge was open a total of 2,926 minutes (56%) and closed 2,264 minutes (44%). The comparable data in September 2012 was 1,730 minutes open (54%) and 1,450 closed (46%). Most closures were less than 10 minutes and there were more closures per day in September than July.

**Collecting data on bear-human interactions at Brooks Camp**

Twenty-three years of bear-human interaction data has been collected at Katmai. Data is being analyzed to see what changes are occurring. Early results have shown a decrease in bear-human interactions since the building of the elevated walkway to the Brooks Falls platform in 2000. There has also been a significant decrease in the number of interactions in the Brooks Camp campground area. Efforts to facilitate visitor traffic in areas around the floating bridge on the Brooks River have marked significant increases in the number of bear-human interactions. Data is still being analyzed at this time with hopes of publishing results by the end of the year.

# Natural Resource Projects

## Wildlife projects

*Golden-crowned sparrow migration*
This summer, Katmai will be teaming up with the Point Reyes Bird Observatory (PRBO) to study migration routes of the golden-crowned sparrow. In 2012, PRBO placed geolocators on 30 sparrows; 6 of the 9 recaptured birds travelled to Katmai! This spring we hope to place 20 geolocators on golden-crowned sparrows in Katmai to see if the birds fly back to Point Reyes during fall migration. The goal is to see if the birds are using the same migration path south and if so, identify obstacles along the route that might impact the population.

*American Dippers study*
American Dippers are great indicators of ecosystem health and are found in many of Katmai's streams and rivers. Populations of this species can be greatly affected by changes in the habitat, such as logging, mining, and changes in water chemistry. The Natural Resource staff will be doing a baseline study to determine population numbers in the streams and rivers of the Katmai Preserve. The information gathered can be used in the future to monitor changes in the population and the natural habitat.

**Many song birds, like this golden-crowned sparrow, travel thousands of miles each year between breeding and wintering grounds. Photo courtesy of Roy Wood.**

**Wildlife biologist John Campbell takes a break after setting up cameras at Swikshak Lagoon in May 2012. NPS photo.**

*Investigating bear use using time-lapse photography*
An ongoing project looking at bear activity patterns of seasonal foraging sites through the use of time-lapse photography has provided new insight into bear use on the Katmai Coast. In 2010 and 2011, cameras were installed overlooking lower Alagogshak Creek in Katmai Bay. Unlike previously studied sites where salmon streams were the focal point for bear activity, bear use of the lower Alagogshak Creek area was focused on the surrounding sedge meadows.

Camera data from Geographic Harbor collected in 2007 to 2009, showed peak bear use in mid-August, consistent with the timing of the local salmon run. Also, a distinct decrease in bear use was observed in 2008 compared with the other two years. This decrease is consistent with an observed decrease in pink salmon numbers in even years. Preliminary analysis of the Katmai Bay photos shows consistent bear use throughout the 2010 season (June to September); however, a decrease in bear use was observed in August and September of 2011. If this decrease is a result of bears moving to salmon streams, it may shed light on the importance of sedge meadows to bears in years with smaller salmon runs.

Cameras will be reinstalled at Katmai Bay this May for further investigation. Cameras will also be installed for a second year at Swikshak Lagoon.

*Bear and Human use studies*
A long-term monitoring study looking at bear and human use of the Moraine and Funnel Creek areas in Katmai National Preserve will continue in 2013. During August, data is collected on age and sex composition of the bears in addition to data on specific habitats that bears and humans utilize. Researchers were not able to perform this study in 2012, but are anxious to get back and see how many bears are using the area. In 2011, researchers observed the highest number of bears in the area in over ten years of monitoring, counting up to 33 bears at one time!

To compliment this long-term dataset, park biologists will expand data collection to several bear and visitor use areas on the coast. Hallo Bay, Swikshak Lagoon, Kukak Bay and Geographic Harbor are popular bear viewing areas we hope to visit this summer.

**Bear viewing and photography are popular activities on the Katmai Coast, where bears can be seen fishing for salmon, grazing in sedge meadows and digging for clams. NPS photo.**

# Natural Resource Projects

## Exotic Plant Management Team

**Repeated manual treatments and reseeding efforts at the Brooks Camp cultural site have shifted the plant composition from primarily dandelion to mostly native species. NPS photos.**

Invasive plants put the complex balance of plant and animal communities in Alaskan national parks at risk. Invasive plants are not native to an area, display rapid growth, and spread with little or no human assistance. They are a concern because they threaten the genetic integrity of native flora through hybridization, can out-compete native plant species for limited resources, and can change the structure and function of ecosystems. Establishment of invasive plants can also result in loss of habitat and food sources for native insects, birds, fish, and mammals.

Since 2005, Katmai has worked to inventory and control non-native plant species. A total of 20 invasive plant species have been documented on park lands with an additional 11 species growing on nearby lands. Many of these species are still restricted to disturbed areas, such as the trails at Brooks Camp, so the Exotic Plant Management Team (EPMT) works to control these infestations and prevent them from moving into more remote areas of the park.

Katmai remains one of the most pristine parks with regards to invasive plant species, and it hopes to retain that distinction. The EPMT conducts outreach events to raise public awareness. Prevention is another critical component to the program's success. Boot brushes have been installed at key locations to reduce the risk of seeds being transported to new areas on footwear. Heavy equipment leaving for Brooks Camp undergoes cleaning and inspection. Finally, the team vigilantly searches during the growing season for new species.

## Marine Debris

*Cleanup at Hallo Bay*

This summer, Katmai is excited to have the support of the GYRE project to conduct a beach cleanup at Hallo Bay! GYRE, a collaborative effort between the Alaska SeaLife Center and the Anchorage Museum, will promote awareness about the issue of marine debris through science and art. In June, scientists and artists will board the R/V Norseman for a week-long expedition to investigate the effects of marine debris on remote Alaskan beaches. Along the way, the GYRE team will join Katmai staff in a beach cleanup. Marine debris is an ongoing problem along the Katmai Coast, but removal is difficult without boat-based support to transport debris to landfills. We look forward to working with GYRE and the R/V Norseman to clean up Hallo Bay!

*Marine Debris surveys*

In March 2011, an earthquake in the Pacific Ocean created a tsunami that inundated coastal cities and villages near Sendai, Japan. As the water receded, material from land was washed into the Pacific Ocean. While most of the debris sank, an estimated 1.5 million tons was left afloat following ocean currents toward North America. In 2012, in response to concerns of increasing amounts of marine debris, Katmai began surveys at four beaches. The first year of surveys documented plastics as the most numerous type of debris, followed by processed lumber. These surveys will be used as a baseline to detect future change. Although tsunami debris has already been confirmed on Alaskan beaches, the bulk of debris is expected to reach North America over the next few years.

**Ranger Sean McNeil investigates a washed up mass of rope and fishing line during marine debris surveys at Hallo Bay, June 2012. NPS photo.**

**Report suspicious marine debris**

If you are on the Katmai or Aniakchak coasts and see unusually large amounts of debris or any hazardous materials, please contact the park at (907) 246-3305. Suspected Japanese tsunami debris can also be reported to disasterdebris@noaa.gov. Please include a description of the debris, its location, and photos.

# Natural Resource Projects

## Academic partners

Katmai is recognized as a 'living laboratory' and studies by outside researchers can provide valuable insight into our park's natural and cultural resources. Since 2010, Katmai's natural resource division has partnered with the University of Calgary's Biological Sciences department. Ella Bowles, a PhD student, and Stevi Vanderzwan, an MS student, have been investigating adaptation in aquatic environments. Ella shares their research and findings below:

*Adaptive divergence to new freshwater environments in Katmai National Park and Preserve and Aniakchak National Preserve, using the threespine stickleback*

Our projects address different aspects of adaptation to new environments, and provide information on freshwater systems of Katmai National Park and Preserve and Aniakchak National Preserve. We currently have two main projects in the park, my (Ella's) PhD, and Stevi Vanderzwan's MS. Both of us are working on threespine stickleback *(Gasterosteus aculeatus)*, and both of our projects are possible because of the unique system that Katmai provides. We are interested in the process of adaptation and change over time, and in Katmai there are a system of aged lakes (dated using isotopes), and a series of water-bodies that have been mapped fairly extensively. For these lakes, we know roughly how connected they are to one another and to the ocean, and the distribution of fish species (i.e., predators and prey) within. In addition, the threespine stickleback is a fish that is ancestrally present in the marine environment, but post-glacially has moved into the lakes that formed after the last glacial recession (over the last 15,000 years). After moving into these lakes, they have evolved in different ways, likely adapting to the specific conditions of their particular environments. Together, this is an incredibly unique natural laboratory for studying the process of evolution.

**Bob Peterson, Nellie Yee and Ella Bowles process fish samples for genetic and morphometric analysis at Fure's cabin in the Bay of Islands, Naknek Lake. Photo courtesy of Ella Bowles.**

**MJ Peters and Ella Bowles carry in a seine full of threespine sticklebacks at Meshik Lake in Aniakchak National Preserve. These fish will be used for genetic and morphometric analysis. Photo courtesy of Ella Bowles.**

My project has three main parts. First, I am mapping the genetic differences between eleven different study sites in the park so that I can understand how long populations have been separated, and how much they still interbreed with one another. My results so far show me what I expected, with populations that are no longer connected to the ancestral environment being more differentiated than those that are. I have much analysis yet to complete, but this is an interesting start. The second part of my thesis is to look at genetic patterns that have allowed these populations to differentiate. To do this, I am sampling pieces from the whole genome (the complete genetic code for the species). This part is in progress, and I don't quite have these results yet. In the third part of my thesis, I am breeding live fish that I brought back to the University of Calgary to determine what the genetic measures of differentiation mean at a practical level– that is, if populations look really different, can they still make healthy offspring. Breeding is well in progress now, and I have many baby fish from each of three populations that I have brought back to the lab, as well as some from crosses made between very different populations. The genetics isn't done for this part yet, and is to come later in the year. My project is well-underway, and results thus far are pretty exciting.

Our projects are complimentary. Stevi is mapping how the populations have changed morphologically/phenotypically (e.g., shape, or different features of their bodies), with respect to the biology of the local environment. She will then tie this back to specific genetic markers that we know underlie certain phenotypes. Stevi's sites are more extensive, and she'll be analyzing fish from many lakes on the Alaska Peninsula, as well as Lake Iliamna. This will provide a very complete picture of how this little fish has evolved in the region.

# Natural Resource Projects

## Internships at Katmai

Each summer, Katmai provides internship opportunities to students and young adults interested in biological research and resource conservation. Interns assist with a variety of natural resource projects. Since the late 1990s, one to two students from Northwestern University have joined Katmai National Park natural resource staff each summer, as part of a field school internship program. In 2012, Martha Jane Peters (MJ) spent 7 weeks at Katmai as part of this program, and is happy to share her experience:

After my freshman year of college at Northwestern University in Evanston, Illinois, I had the incredible opportunity to intern at Katmai National Park and Preserve. I worked with Carissa Turner, the park's coastal biologist, primarily on a research project investigating bear use of feeding areas throughout remote areas of the park. I used the program ArcMap Geographic Information Systems to pinpoint bears in over 5,000 photos taken by a time-lapse photography unit in Katmai Bay. The data from this project has been, and continues to be, analyzed in order to show patterns of bear use in areas of concentrated food resources. Data from previous years has been comprehensively analyzed and presented, and so far the results are compelling. I hope that my photo scoring will contribute to the further success of the project.

The internship experience at Katmai National Park is truly unique, especially given the park's small and remote nature. Instead of spending all my days in the office, I was truly fortunate to be able to participate in almost weekly fieldwork, flying in floatplanes and small bush planes to areas of the park rarely experienced by visitors. I even got to spend a night in Aniakchak National Preserve, the least visited of all the National Park units, assisting with fisheries research. Additionally, a few of my weekends were spent at Brooks Camp, the center of visitor activity in the park, where I conducted bridge surveys. These weekends were a superb perk of the internship experience, as I had the opportunity to indulge in brown bear viewing in both peak seasons, July and September.

**MJ took advantage of limited time at Katmai with several hiking trip into the Valley of Ten Thousand Smokes, including a hike up to the Katmai caldera. Photo courtesy of MJ Peters.**

The best part about interning at Katmai National Park is definitely the opportunity to experience one of the most remote and spectacular wilderness areas in the country. When I was not working, I made every effort to take trips around the park, especially backpacking trips in the Valley of Ten Thousand Smokes. There, I spent nights in the Baked Mountain Huts, hiked to the volcano, Novarupta, which created the ash-covered valley when it erupted 100 years ago, and even climbed to the rim of Mount Katmai's caldera, one of the most spectacular sights I have ever seen. Most park visitors rarely make backpacking trips into the Valley of Ten Thousands Smokes, but as an intern I had time to visit the valley on three separate weekends. Interning at Katmai National Park was an incredible way to experience a beautiful and remote part of the country and gain relevant educational and professional experiences.

**MJ explores the Valley of Ten Thousand Smokes during a weekend break. Photo courtesy of MJ Peters.**

**Working and volunteering in Katmai National Park**

Every year, Katmai hires seasonal staff as Biological Science Technicians, Park Rangers and Maintenance Workers. All of our jobs are posted on the Federal Government's employment website at www.usajobs.gov between December and February.

Internship opportunities with Katmai's Exotic Plant Management Team and Visitor Services are recruited through the Student Conservation Association (www.sca.org).

Volunteer opportunities with the Federal government are posted on www.volunteer.gov/gov.

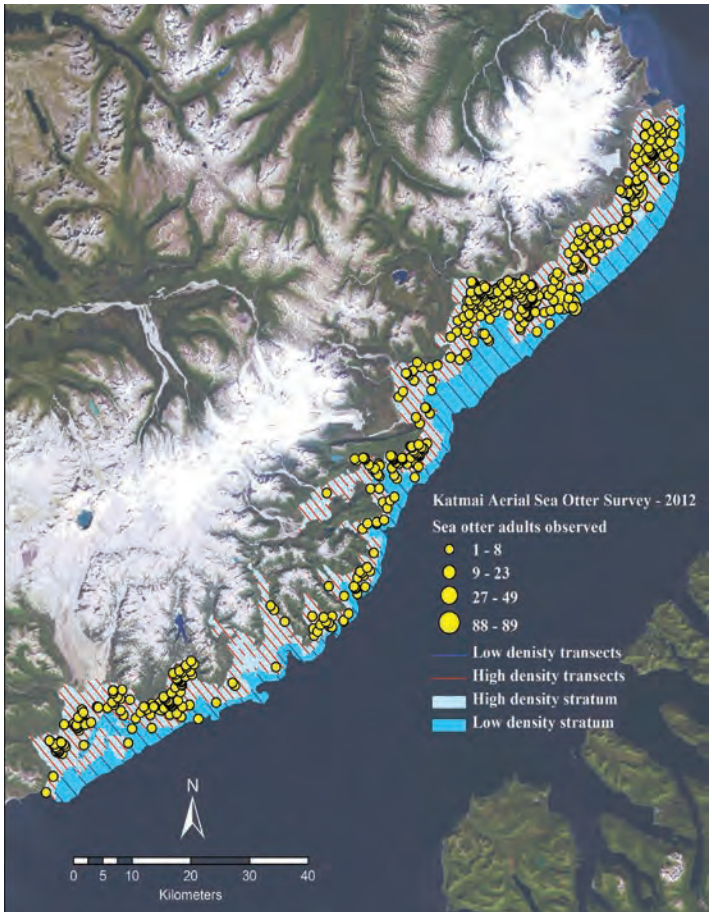
# Southwest Alaska Network Projects

The Southwest Alaska Network (SWAN) is one of 32 Inventory and Monitoring programs across the National Park Service. This national strategy is an effort to understand what natural resources exist within the park units (inventory) and the condition of those natural resources (monitoring). A major role of the National Park Service Inventory and Monitoring (I&M) Program is to provide broad-based natural resource information necessary to make scientifically sound management decisions. The SWAN Inventory and Monitoring Program comprises five Alaskan park units: Katmai National Park and Preserve, Aniakchak National Monument and Preserve, Alagnak Wild River, Lake Clark National Park and Preserve, and Kenai Fjords National Park. These parks were grouped into a single network because they share similar ecological characteristics, such as marine coastal habitats and large runs of anadromous fish. The network has chosen specific vital signs (key biological, physical, and chemical indicators) in six resource areas for long-term monitoring to assess the condition of park ecosystems.

## Investigating sea otter abundance along the Katmai Coast

Sea otters *(Enhydra lutris)* are important mammalian members of the nearshore community throughout the north Pacific, and are the only marine mammal that relies exclusively on shallow or intertidal macro-invertebrates as prey. Sea otters were selected as a vital sign because they are a textbook example of "keystone" carnivore. By consuming 'grazers,' the animals that feed on kelp, sea otters dramatically change the structure and complexity of their ecological community resulting in communities characterized by diverse and abundant algae and relatively few large grazing invertebrates such as urchins. Other well documented sea otter mediated predation effects include reduced biomass and size distributions of many large and conspicuous invertebrates, such as clams, mussels, urchins, and crabs. Sea otters tend to be relatively sedentary in comparison to other marine mammals; eat large amounts of food; have an incidence of disease that is correlated with contaminants; and have broad appeal to the public. In September 2005, the western Alaska stock of sea otters, which includes Katmai National Park and Preserve, was federally listed as threatened. One of the major components to sea otter monitoring in the nearshore is estimating the abundance, distribution and density of sea otters through aerial surveys. We employ a small two-passenger floatplane to conduct these aerial surveys.

A sea otter aerial survey was completed in Katmai National Park and Preserve during August 2012. This was the second aerial survey completed since 2008 along the Katmai coast. Survey methodology followed the Bodkin and Udevitz (1999) method which accounts for imperfect detection. The survey took just under three days to complete. Preliminary analysis estimates the current sea otter population for Katmai to be 8632 individuals, with an overall density of 5.95/km$^2$. The 2012 population estimate is higher than that of 2008 (7095 individuals, 4.89/km$^2$). Sea otters were not uniformly distributed along the coastline. Higher concentrations of sea otters were found near Swikshak, Kukak Bay, and Dakavak Bay. Approximately 96% of observed otters were in the high density stratum, defined as the 0m to 40m depth contour and minimum distances from shore, while only about 4% of sea otters were observed in the low density stratum, which is defined as the area within the 40m to 100m depth contour. In 2008, 98% were observed in high density stratum while only 2% were observed in low. Another survey is tentatively scheduled for 2015.



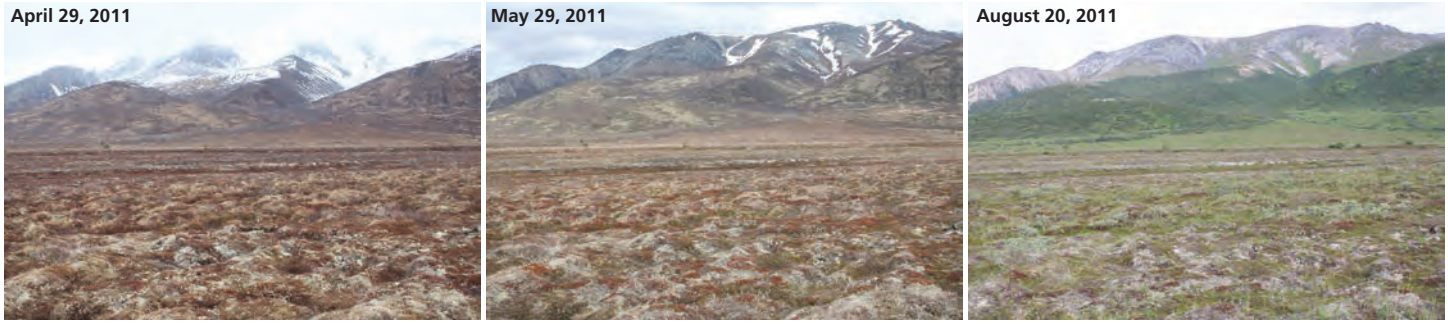

**An aerial survey of sea otter abundance was conducted along the coastline of Katmai National Park and Preserve during August, 2012.**

### Salmon nearshore ecology study

This summer, a pilot study will be initiated to gather baseline information on juvenile salmon use of three nearshore habitat types (eelgrass, kelp and non-vegetated) along the coast of Katmai. Additionally, this project will produce an inventory of fish species using the selected habitat types, information that is lacking and of interest to park managers. This project is funded by the Ocean Alaska Science and Learning Center.

# Southwest Alaska Network Projects

## Vegetation Monitoring: tracking changes in phenology across southwest Alaska




**Progression of green-up from the start of season (April 29) to the growing season peak (August 20) at a site in Katmai National Park and Preserve, 2011. The photos are from a time-lapse camera installed at a remote weather station near Contact Creek.**

*'Phenology is nature's calendar'* (USA National Phenology Network) Phenology, or the timing of biological events (e.g., spring leaf-out dates for trees), is sensitive to changes in climate. Globally, leaf-out and flowering dates are occurring earlier in the spring, and fall colors are turning later, due to warming. In southwest Alaska, the SWAN is using a combination of remote time-lapse cameras and satellite data (Normalized Difference Vegetation Index, or NDVI) to track variation in growing season length. Cameras were installed at two remote weather stations in Katmai in 2010. Four photos are collected daily at 1-hour intervals around high noon. The cameras are downloaded every fall and the daily images are analyzed to estimate the timing of green-up (start of the growing season) and leaf-fall (end of the growing season) at each site. A similar approach is taken at the landscape scale, where NDVI data collected by the Moderate Resolution Imaging Spectroradiometer (MODIS) sensor are also being used by SWAN to estimate the timing of green-up and leaf-fall. As NDVI, an indicator of vegetation productivity, increases in the spring and declines in the fall, it provides an approximation of when the growing season starts and ends. Together, these data provide an estimate of when forage and cover become available to nesting birds and wildlife, and whether some years produce a greater flush of vegetation than others.

## Weather and Climate

Climate is considered the most important factor influencing ecosystems. Because global climate models indicate that climate change and variability will be greatest at high latitudes, climate monitoring in Alaska is critical to understanding the changing conditions of park ecosystems. Potential effects in SWAN park units include a reduced snowpack, earlier lake ice break-up, warmer winters, and wetter summers. These changes may affect the distribution, abundance, growth, and productivity of plants and animals.

SWAN installed four weather stations in Katmai (Pfaff Mine, Coville, Contact Creek, and Fourpeaked) during the 2008 and 2009 field seasons. These weather stations record weather observations in locations characteristic of the diverse landscape and topography within the park. This information will support real–time needs, identify natural variability in weather patterns and long-term climate trends, and help interpret ecosystem changes.

Weather stations are serviced annually in June when sensors are replaced based on their maintenance schedule. Each weather station is checked for stability and function as severe winters and large wildlife can take their toll on the site infrastructure and operational capacity. In 2012 the National Oceanic and Atmospheric Administration established a US Climate Reference Network (USCRN) station at Contact Creek. The primary goal of USCRN is to provide long-term uniform temperature and precipitation observations that can be linked to long-term historical observations to help explain current and future climate change. The SWAN Contact Creek weather station will remain co-located with the USCRN until September 2013 and then be relocated to another location in 2014.

**The newly established US Climate Reference Network (USCRN) station located near Contact Creek. The station is named "AK King Salmon 42 SE" and current weather observations can be viewed at http://www.ncdc.noaa.gov/crn/station.htm?stationId=1788. NPS Photo.**

# Southwest Alaska Network Projects

## Brown Bear aerial surveys

In 2012, Katmai and SWAN staff worked together on two different aerial studies to quantify the number of bears in Katmai. One of these was an experimental method tracking emergence from dens from late-April through May. Although the study was not fully implemented due to logistical issues, the results show promise so investigators will survey again during the spring of 2013. The den survey was followed by a standard line-transect aerial bear survey in late-May. A hard/late winter and deep snow seemed to keep the bears in their dens longer which is consistent with what was seen in other parts of the state. This was good for the den survey, but prevented a good count on the second survey since a lot of the bears didn't emerge until after leaf out which makes it hard to see them.

A third survey type was conducted by Katmai biologists and consisted of stream surveys in the Preserve which were performed in August and September. These involve counting all the bears that are using river/stream corridors and lake shores that time of year. Although these surveys don't provide an actual count of the population, they do provide a minimum count and allow managers to detect trends. Because data from the stream surveys has been so useful, efforts will be expanded to cover more of the park and a similar method has been developed for the sedge meadows on the coast. Stream and sedge meadow surveys will also be flown at Aniakchak in 2013.

**Wildlife work in Alaska's vast parks often requires use of small bush planes and surveys can take many days to complete. When possible, surveyors will try to make use of several planes at a time to take advantage of good weather and daylight. In this photo, pilots Alan Gilliland and Curtis Cebulski take a break during bear den surveys, April 2012. NPS photo by Tammy Wilson.**

## Eagle nest surveys

**The white heads and tails of nesting bald eagles stand out against Katmai's green landscape and help biologists spot them from the air. NPS photo by Tammy Wilson.**

Bald eagles are abundant in southwest Alaska, and nest throughout Katmai National Park. Nests are large stick structures, typically located on large supporting branches near the tops of trees, or rarely on cliff ledges. Prior to nesting in early spring, adults line nests with dry grass and lichen. Eggs are laid in late April through early May. Both parents contribute to egg incubation and chick care. Chicks fledge in early August and leave the nesting territory shortly thereafter.

In 2011, Southwest Alaska Network and Katmai National Park and Preserve staff resumed nesting bald eagle surveys in the Naknek basin. We timed surveys so that we could see the eagles incubating eggs on nests before cottonwoods produced nest-hiding leaves. From the air, the white heads and tails, and shiny black bodies of incubating bald eagles are easy to spot. We used the park plane to fly around the shoreline of the major lakes, and both banks of major rivers looking for nests. The presence or absence of incubating eagles were noted at each nest found during surveys.

During both survey years, we found 73 nests in the study area; 59% were occupied by a nesting pair in 2011 and 58% in 2012. In 2013, we will modify our flight protocol by visiting all nests late in the summer to monitor the proportion of nests likely to fledge chicks.

**National Park Service**
**U.S. Department of the Interior**

**Katmai National Park & Preserve**
**Aniakchak National Monument & Preserve**
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This is the third issue of Resource Management News produced by the Division of Natural Resources.

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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.

## Katmai National Park & Preserve, Aniakchak National Monument & Preserve, and Alagnak Wild River

Katmai National Park was originally established as a monument in 1918 to preserve the Valley of Ten Thousand Smokes, created by the 1912 eruption of Novarupta. Since its creation, Katmai has undergone many expansions to preserve and protect the resources within this region. In 1931, the monument was expanded to protect brown bear, moose and other wildlife. In 1942, islands within five miles of the shoreline in the Shelikof Strait were added to protect marine mammals resting on the islands. The boundary was expanded in 1969 to include all of Naknek Lake. Another 1.4 million acres were added in 1978 to the monument to protect brown bear habitat and watersheds vital to red salmon spawning. In 1980, the Alaska National Interest Lands Conservation Act (ANILCA) redesignated 3.7 million acres as Katmai National Park. ANILCA also designated 308, 000 acres as Katmai National Preserve.

Aniakchak National Monument and Preserve was established in 1978 to preserve the Aniakchak caldera and its associated landscape, including the Aniakchak River and other lakes and streams, in their natural state. It was also created to assure continuation of the natural process of biological succession; and to protect brown bears, moose, caribou, sea lions, seals, and other marine mammals, geese, swans, and other waterfowl. The area is one of the least visited areas in the National Park System because of poor weather conditions typically hindering access.

Alagnak Wild River was established in 1980 through ANILCA to preserve the free–flowing condition of the river.

**Southwest Alaska Network**
Inventory & Monitoring Program

National Park Service
U.S. Department of the Interior

*Alagnak* *Aniakchak* *Katmai* *Kenai Fjords* *Lake Clark*

# 2012 Field Season Highlights

## Spruce woodlands respond favorably to recent warming in Katmai and Lake Clark

SWAN and collaborators at Humboldt State University are using tree-ring and plot-level data to better understand stand tree growth-climate interactions in white spruce woodlands. Forest monitoring plots located in low-elevation, open spruce stands are arrayed across a 300-km north-south transect that spans Lake Clark and Katmai National Parks and Preserves. In 2012, SWAN staff sampled six new sites, filling in several gaps across the two parks. All trees analyzed to date have shown increased growth in the last 10-30 years. Trees in the northernmost sites show the earliest response to warming with increases in growth appearing a decade or more ahead of trees in plots at the southern end of the transect. The positive growth of white spruce in response to warming in this area contrasts with the decreases in growth often seen in drought-stressed trees in interior Alaska.

**A white spruce tree is cored near the base of the trunk for an estimation of tree age and annual growth.**

## Uncommon bryophytes and lichens found in Kenai Fjords

In August 2012, SWAN staff conducted a preliminary survey of lichens and bryophytes in coastal forest of Kenai Fjords. During this initial effort, several regionally uncommon species of moss, liverwort, and lichen were collected in the park, and these collections will form the basis of a future comprehensive inventory. These species included the Pacific Rim moss, *Takakia lepidozioides,* the globally scattered liverwort, *Anastrepta orcadensis*, and the western North American endemic lichen, *Hypogymnia duplicata*. In the summer of 2013, SWAN will collaborate with Oregon State University to conduct a lichen survey in Katmai. The inventory will focus on likely habitat for rare or unusual species and is expected to result in many new collections for the park.

**Pacific Rim moss, *Takakia lepidozioides*, is one of three regionally rare species of non-vascular plants collected in Kenai Fjords this summer.**

**SWAN staff conducted a spring bear den survey in Katmai using new methods that add greater statistical power to the program.**

## New methods tested for mapping bear den habitat in Katmai

In 2012, SWAN tested an alternative method of monitoring brown bears using observations of dens in a 3,000-km$^2$ area in central Katmai. Overall, the ability to detect dens, given that they were there, was about 34%. About 64% of the grid cells in the study area were suitable for bear dens. A rudimentary habitat model fit to the den site data shows that bears preferred sites with steeper slopes for denning. However, some dens were found in sites with low overall slope, so bears sometimes place dens on small habitat features, such as moraines, that are not reflected in the mean slope values of the larger site. A benefit to using this method is the ability to fit a basic occupancy model with data collected from a single season. By contrast, a population estimate for bears takes several years to fit using line transects due to the amount of data required.

October 2012
http://science.nature.nps.gov/im/units/swan/

**Time-lapse cameras record intra-season variability in snow cover as well as the timing of green up. Photos are taken hourly 12 times per day. Images shown are from the Contact Creek RAWS in southern Katmai**

# Time-lapse cameras provide insights into seasonal processes

Photo series from time-lapse cameras provide details about the timing and variability of natural processes that occur seasonally, such as the start of the growing season, snowpack development and snowmelt, and ice break-up on small lakes. The photos are being used by SWAN to supplement data from weather and vegetation monitoring. For example, in the winter of 2010-2011, the photos show thin and often brief snowcover at three camera sites in Katmai and Lake Clark National Parks and Preserves. The cameras also show green up lagging snow melt by as much as two and a half months. In 2011-2012, the continuous snow season started earlier than the previous year, with snowpack persisting into early April. A fourth camera is now mounted on the Port Alsworth RAWS and adds to the existing cameras, which are located at the Pfaff Mine, Snipe Lake, and Coville stations. The time-lapse cameras have produced an archive of daily photos spanning two years (2010-2012). This year, SWAN entered a partnership with the PhenoCam Network, a collaborator with the USA-National Phenology Network (NPN), and is providing digital images to the PhenoCam Network's archive. Soil temperature loggers are also co-located with weather stations to further integrate findings from weather, vegetation, and landscape processes monitoring efforts.

# Decrease in mussel density in Kenai Fjords and Katmai

One of the more remarkable observations of the 2012 nearshore marine sampling trips was the lack of mussels previously abundant at established mussel bed sampling sites in both parks. In particular, new growth of first year barnacles had largely replaced mussels on Katmai sites. Staff hypothesize that wide-spread ice scour removed mussels and created bare substrate for barnacle settlement to occur. Predation is not believed to be the primary driver of the shift because of the continuous and widespread declines in mussels observed. In addition, low densities of mussel predators (snails, stars, etc.) were also observed. Staff have placed time-lapse cameras at specific mussel beds in anticipation of being able to capture disturbance events, such as ice scouring, during the winter months.

# High water observed throughout the ice-free period

Over the last five years, SWAN Aquatic Ecologists have been monitoring lake out flow and water temperature in Lake Clark (LACL) and Naknek Lake (KATM). This year high snow-pack coupled with persistent rainfall throughout the summer resulted is the highest observed lake levels and coolest lake temperatures observed to date. Between September 20 and September 28, Naknek Lake rose approximately 2.5 ft producing a 2900 cubic feet per second (cfs) increase in lake outflow. This sudden increase was likely due to reduced water storage capacity in the watershed. Long-time residents in the Bristol Bay area have not seen lake levels this high for many years.

# 2012 Field Season by the Numbers

| | |
|---|---|
| 13,000 | Approx. number of mussels measured in KATM and KEFJ since 2006 |
| 4.55 | Largest 24-hour water temperature change (°F, 2.55 °C) ) in Naknek Lake, 7/11/12 |
| 5,928 | Tree diameters (DBH) measured |
| 96,360 | Number of water temperature readings recorded each year from the Lake Clark and Naknek Lake |
| 122 | Number of bald eagle nests occupied by nesting eagles |
| 205 | Trees cored |
| 1,000 | Approx. number of new lichen and bryophyte collections |
| 20+ | Pounds peanut butter consumed by field crews |
| 27 | Epiphytic macro lichen inventory plots completed in KATM, LACL, & KEFJ |
| 10.66 | Max daily rainfall (in), 9/19/12 at McArthur Pass, KEFJ |
| 49 | Number of dens seen during the spring bear den survey, KATM |
| 103.1 | Max wind gust (mph), 9/22/12 at Harding Icefield, KEFJ |
| 16,022 | Highest recorded discharge (cfs) value from Naknek Lake outflow, 9/28/12 (6 yr avg peak, 12,009cfs) |
| 14.2 | Minimum temperature (°F), Sept. 19, 2012 at Chigmit Mountains, LACL |
| 28 | Number of new bald eagle nests found in 2012 |
| 75.2 | Maximum temperature (°F), 9/22/12 at Contact Creek, KATM |

## STAFF NEWS

Welcome Tim Shepherd, SWAN's new data manager.

Best of luck to Claudette Moore who is leaving SWAN after six years of service for a position with USGS in Colorado.

# Visitor Use

## New Reporting Tools in Development

The Southwest Alaska I&M network (SWAN) has been working with park managers and staff for the past year to revise and streamline the recorded visitor data submitted by Commercial Use Authorization (CUA) holders. These data are being reviewed and consolidated and will shortly be available to park managers and the public in a user-friendly format (Fall 2013). Types of information collected on annual CUA activity reports include number of visitors, locations visited, mode of transportation, and type of recreational activity.

The database shows visitor use information for Katmai, Lake Clark, Aniakchak, and Alagnak national park units. Summary reports will be publicly available on the SWAN website. Plans to expand this effort to include Kenai Fjords are scheduled for the near future.

## Importance

Understanding visitor use patterns allows park managers to assess where park staff needs to be deployed and where impacts, such as trampling or increase in social trails, may need to be monitored or mitigated in the future. Visitor use patterns may also inform commercial operators by providing insights to the areas visited and the timing of visits—details which are helpful when planning guiding operations.

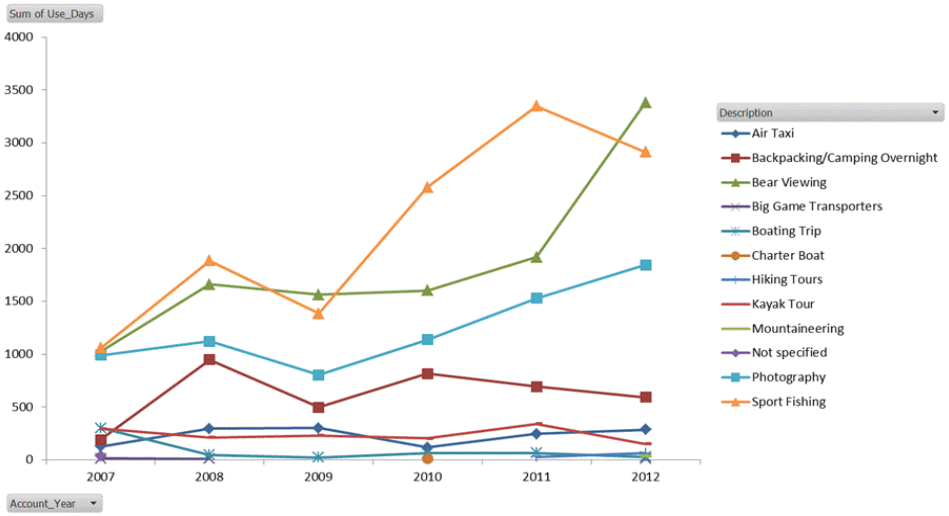
Because these remote Alaska park units do not have entrance stations, the data collected from commercial service providers are the only real means to quantify and understand visitation patterns and public uses in these vast backcountry areas.

## User Days & Visitor Use Areas Defined

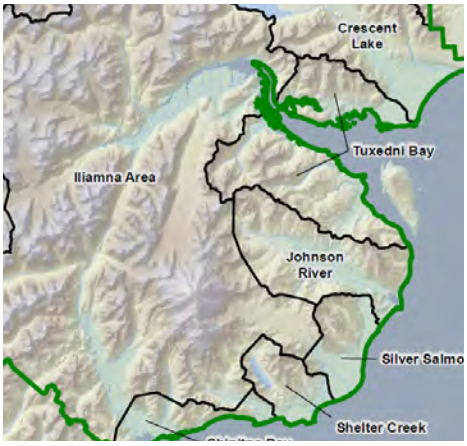
For these park units, managers are focused on the broad trends and overall patterns of use rather than specifics about activities and trips.

Some visitors may travel to more than one location in a given day—bear viewing on the coast in the morning and fishing in the interior of the park in the afternoon, for example. In these cases the number of reported "user days" may be slightly more than the number of actual visitors to the park. This definition of user day provides the park the best information of the potential impacts by location across the park.

Each park unit is divided into areas. When reporting, commercial operators choose the area of the visitors' main activity. These areas roughly correspond to watersheds in each park unit. Areas with concentrated use have been sub-divided into smaller areas.




**Figue 1. The graph above shows the number of visitors and the main activity for the visitors as reported by the commercial operators working in Lake Clark National Park and Preserve from 2007 through 2012.**




**The map above shows a section of Lake Clark National Park and Preserve with visitor use areas outlined.**

# Visitor Use Trends in Lake Clark National Park and Preserve

## Activities

The three main activities reported by the commercial operators are bear viewing, sport fishing and photography (Figure 1). The reported information suggests there has been a significant growth in the number of visitors coming to Lake Clark for these three main activities.

The number of visitor use days reporting bear viewing as their main activity has tripled from approximately 1,000 people in 2007 to over 3,100 in 2012. The number of reported user days focused on sport fishing and photography has likewise more than doubled in this same period of time. In contrast, the number of reported visitor use days for other activity categories have stayed relatively constant over the six years (Figure 1).

## Visitation and Timing

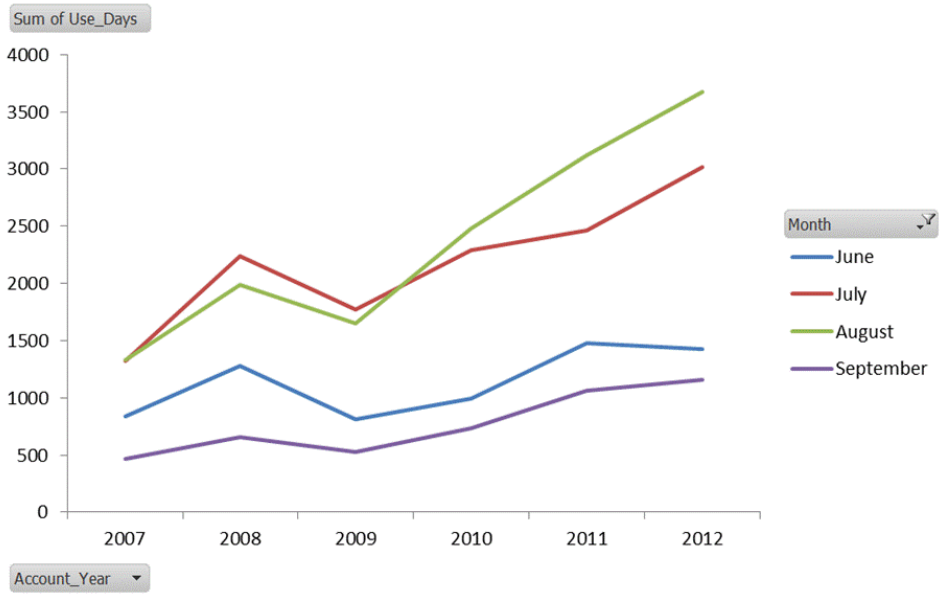
Over the last six years the number of visitor use days reported by CUA operators has more than doubled from approximately 4,000 days to 8,400 visitor use days, most of the increase in visitation has been to the coast and most has occurred in July and August. The area of Crescent Lake has seen the most significant increase during the six years, going from 6% of the reported visitor use days in 2007 to approximately 36% in 2012 (Figure 3).

The time of year when visitors come to Lake Clark has remained consistent; almost all of the visitor use days reported occur between June through September. Two months—July and August—account for approximately 60-70% of the total visitation (Figure 2). Over the last six years most of the increase in visitor use has occurred in these two summer months (Figure 2).

## Locations

CUA holders report usage on 24 of the 33 different locations within the park and preserve over the last six years. Thirteen of these locations were visited regularly. Silver Salmon Creek, Crescent Lake and Chinitna Bay are the most highly visited places in the park and preserve, and together accoun for over ¾ of the reported user days in Lake Clark. In contrast, the visitor use days for the three most popular interior locations for 2012 represent just over 11% of the visitor use days for the park (Figure 3).

**Figure 2. The number of visitor use days for the four busiest months from 2007 through 2012. Data from the Lake Clark National Park & Preserve CUA database 12/21/12.**



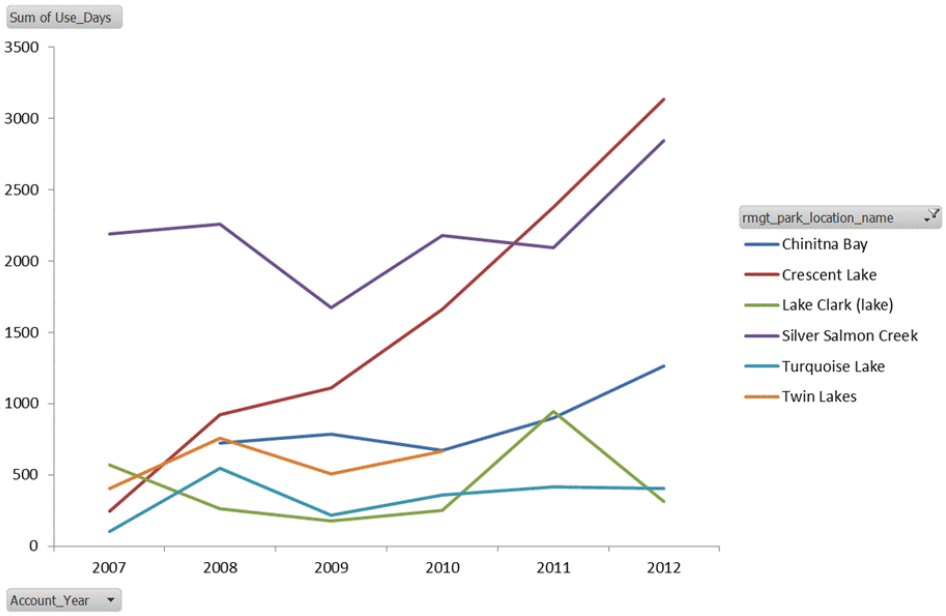




**Figure 3. Total User Days by Location (2007-2012) for the three most visited locations on the coast and the three locations in the interior of the park as reported by the commercial use operators.**

# About Brown Bears

The preservation of a naturally regulated population of brown bears was a primary purpose for several expansions of Katmai since its establishment in 1918 as well as for its designation as a national park in 1980. Thus, protection of bears and their access to important habitats is a primary consideration in the management of human activities in Katmai.

When bears emerge from their dens in late March or early April, very little food is available, and they seek out areas where plants green-up earliest to carry them through this critical period of food shortage. The fortuitous discovery of a carcass of an animal that died during the winter provides a lucky bear with an unexpected feast. As June approaches, some bears prey on newborn moose calves. Salmon migrating up the Naknek drainage first arrive in the park in late June and, for the rest of the summer, the distribution of bears reflects the pattern of salmon spawning. Berries, such as crowberries and cranberries, as well as sedges and other vegetation, add variety to the bears' diet.

An abundance of high-protein food is necessary for brown bears, which must not only maintain their large weight, but must gain several hundred pounds during the few short months of summer. In order to obtain the food it needs, a bear must roam widely and take advantage of any opportunity that arises to obtain food. A bear is very curious and will investigate anything that arouses its interest, relying primarily on its phenomenally acute sense of smell, as well as its sense of hearing and its often-underestimated sense of sight. Bears are capable of learning from a single experience and, once a bear discovers a convenient source of food, it will remember it and will seek food there again.

As October passes and winter approaches, the amount and quality of available food diminishes to the point where it can no longer support an active bear. As the days become shorter and colder, a bear digs a den in a location where the soil is deep enough and cohesive enough and where the blowing snow will accumulate and seal the den's entrance from the severe cold outside. The bear's body undergoes profound physiological changes, and it enters a state of hibernation which will last through most of the winter.

Once every three of four years, if she has found adequate food, a female brown bear gives birth to two or so cubs while she hibernates. After the family emerges the following spring, the cubs will learn, by watching their mother, everything they will need to know to survive on their own – how to find food, where to dig a winter den, and how to recognize and respond to danger.

A mother bear fiercely protects her cubs from anything she perceives as a threat. Because brown bears typically live in fairly open country where there are few trees that the cubs can climb to escape danger, they must rely on their mother's protection if they are to survive. What would threaten a brown bear? Besides people, other bears. Bears are very antisocial animals. In fact, if a large bear has the chance, it will catch and even kill a smaller bear. Commonly a bear will flee as soon as it sights another bear, without taking the time to evaluate the other bear's size. In spite of this wariness, however, three-fourths of the young bears in a population die before they reach the age of six. Thus it is the large bears, particularly the adult males, which have a major role in regulating the size of bear populations.

Such antisocial animals face quite a dilemma when they arrive at a salmon-spawning stream and encounter the other bears that are also attracted to the stream. If a bear is going to remain at the stream and be able to

successfully catch fish, it must be able to tolerate, to some extent, the proximity of other bears. Still, most bears at salmon-spawning streams spend a considerable amount of effort in evaluating the threat posed by other bears and avoiding close encounters with them.

Knowledge of the world in which a bear lives helps us understand conflicts between bears and people so we can take steps to prevent them, thereby protecting bears as well as ourselves.

There are two major ways in which bears and people come into conflict. The first involves surprise close-range encounters. If you suddenly encounter a bear at very close range, it is possible that the bear may not know whether you are a person or another bear. If it thinks you are a threat and that it cannot escape, it may believe that it will have to fight for its life in order to survive the encounter. You should avoid such situations by being alert and making noise that any bear in the area will recognize as indicating an approaching person. If you do encounter a bear, help the bear to recognize that you are a person and not a threat, and back away to give the bear more space.

Even if a nearby bear does not seem disturbed by your presence, keep in mind that, unlike people, bears are not sociable. Your presence can make it difficult for a bear to concentrate on fishing and may cause the bear to stop fishing and leave sooner that it otherwise would have. If you stay at least 50 yards from bears, you will make it easier for them to remain in this area. You will also help ensure that people will continue to have opportunities to enjoy watching bears.

The second major type of conflict arises when people allow a bear to obtain their food, thereby teaching it that people are a convenient source of food. After such an experience, the bear is likely to be attracted toward people and may approach people aggressively with the hope that, by doing so, it will be rewarded with food. This situation is very dangerous for people and is likely to result in the eventual destruction of the bear in order to protect people. The only solution is to prevent the situation from developing, recognize that a bear will eat any food that it discovers, and do your best to ensure that no bear obtains food from you or in any way associate it with you.

Brown bears are one of the components that make Katmai a very special place, and Katmai is one of the few places were we have the opportunity to show that we are able to live with bears, on their terms.

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# Bear Viewing

## BEST PRACTICES

J. Gavin

**Goal of "Best Practices"**

**Minimize disturbance to bears and their habitat while providing opportunities to enjoy, observe and photograph bears in the wild while learning about their natural history, behavior and habitat requirements.**

Although brown bears are inherently wild and potentially dangerous, they have developed distinct social cues and practices that allow them to live and eat near other bears. This is especially true around seasonally abundant food sources such as sedge meadows and salmon spawning streams.

If people learn and adhere to the rules bears observe for themselves, bears will more likely accept our presence as an unobtrusive part of their environment, and will continue to feed and carry on their natural behavior while being watched. Understanding bear behavior also reduces dangerous encounters and benefits both bears and people.

Best Practices for Viewing Bears

### Reduce disturbance of bears & their habitat

- **Respect a bear's "personal space"**

Never closely approach, crowd, pursue, disturb or displace bears. Bears have limited opportunities to gain calories necessary to maintain life and prepare for denning. Displacing bears from feeding sites has serious consequences for them.

The distance at which bears can allow people varies dramatically in different situations and between individual bears. Human behavior also has a large impact on a bear's "personal space." Bears use body language and vocalizations to communicate with each other. The better humans understand these signals, the more conflicts can be avoided. Spatial and temporal restrictions on human activity may be necessary to ensure that the less tolerant bears have access to the feeding sites.

- **Stay together in bear country**

Groups of people numbering three or more are generally safer than individuals. Members of a viewing group should stay within a few arms' lengths of one another. Bears may perceive a greater threat from two or more nearby groups than a single cohesive group.

Best Practices for Viewing Bears

### Reduce disturbance of bears & their habitat

- **Consistently use the same viewing sites**

In places where people regularly visit, consistent use of the same site makes human use more predictable for bears, and thus may help minimize disturbance. People should avoid monopolizing a site where the bears prefer to fish or feed.

- **Access viewing sites in a consistent manner that minimizes disturbances**

When accessing viewing sites, people should strive to minimize disturbance to bears, bear habitat and other people. When going to a viewing area on foot, it is usually best to be visible while approaching rather than sneaking to the area and possibly surprising bears. When using an aircraft, vehicle, or boat to access viewing sites, be respectful to both bears and people.

- **Minimize disturbance when bear viewing from planes, boats, or vehicles**

Guidelines for reducing bear disturbance while engaged in bear viewing from planes, motorized watercraft, kayaks or land-based vehicles are equivalent to other bear viewing practices. Consistency, minimal displacement, and disturbance to bears are the key factors to be considered.

NPS., R. Wood

Best Practices for Viewing Bears

### Reduce disturbance of bears & their habitat

- **Promote predictable human behavior**

Each encounter is a learning experience for both bears and people. Appropriate and consistent human responses to bears minimize the chances of dangerous surprise encounters and can provide safer and better bear viewing experiences.

In most cases it is best to stay in the open where bears can see people and avoid them if they wish. Hiding from bears increases the likelihood that people will have a surprise encounter that could result in a dangerous situation for the bear and/or the person. Minimizing noise and movement while viewing bears will help limit disturbance to bears using the area.

- **Avoid displacing & food-conditioning bears when recreating next to critical bear use areas**

Overnight camping and fishing may attract and/or displace some bears near important feeding areas, and should be carefully monitored and managed. Campsites should be located well away from bear travel corridors and feeding sites. Sport anglers must be careful to avoid attracting bears when playing fish they have caught and/or storing fish in an unsecured manner.

- **Optimal numbers of people should be evaluated at well-known bear viewing sites**

This may be necessary to maintain high quality bear viewing experiences and to minimize disturbance. Optimal numbers of people should be determined by observing bear behavior and access to the area. If optimal numbers of people need to be established at viewing sites, they will be be based on impacts to bears, visitor experience, and general habitat protection, and will be developed with public participation.

Best Practices for Viewing Bears

## Be unobtrusive components of the bears' environment

- **Ensure bears don't obtain food from people**

Bear-resistant food and garbage storage is critical to ensure that bears do not obtain fish or food from humans. No food or objects should be abandoned in order to distract an approaching bear. Do not cook near bear travel corridors or feeding sites. Ensure that no trace of food or garbage is left during or after the visit.

- **Discourage curious or aggressive bears from approaching**

If a young bear learns it can push people around, the bear can become a problem. If a bear is approaching people, people need to make sure they are not inadvertently blocking its travel path or monopolizing a feeding site. If, after people attempt to get out of its way, a bear continues to approach too closely, people should assert themselves to defend a consistent personal space. Assertive actions should begin with the most innocuous such as holding one's ground (not moving away from the bear), raising one's arms and waving, speaking to the bear, and standing on a higher object. If approach continues, assertive actions should escalate appropriately.

- **Trained bear viewing guides can reduce viewer impacts & improve experiences**

Well-trained, experienced guides or government staff can ensure people follow guidelines and behave in an appropriate, consistent manner. Guides provide agencies with information on human activities in the field and are an excellent conduit for agencies to inform and hear from the public.

R. Wood

USGS, H. Coletti

Best Practices for Viewing Bears

## Incorporate education into every bear viewing opportunity

- **Human impacts on bears and their habitat should be monitored**

Agency resource managers have an obligation to learn as much as possible about how people are affecting bears and to take action when warranted. Monitoring may entail simply keeping in touch with guides and other people or it may be appropriate to develop and implement a detailed scientific protocol. Information collection should be ongoing and open to public interaction.

- **Concise, accurate bear education information should be provided at key locations**

Lodges, air-taxi offices, agency offices, visitor centers, web sites, and charter boats are excellent outlets for providing people with education materials.

- **Guide training should be available for taking people into the field for bear viewing**

Training programs that offer information about basic bear behavior, habitat considerations, and human impacts on bears will greatly enhance visitor experiences and encourage better stewardship of resources. In some areas, mandatory training may be considered for commercial operators and agency personnel dealing with bear viewers.

### Background

Public interest in watching brown bears has increased dramatically in Alaska during the past decade. Some of this activity is incidental to other pursuits such as sport fishing, hiking, or flight seeing, but much of it is specifically targeted at bear viewing. Whenever bears and people interact with each other there are potential benefits and dangers for both species.

The "best practices" were produced principally for the west side of Cook Inlet and the Katmai Coast, Alaska, an area that stretches from the Susitna River to Cape Kubugakli, but they may be applicable to other areas as well. They provide natural resource managers, bear viewing guides, and the general public with a template for dealing with bear-people interactions. In some areas site-specific guidelines or regulations may be necessary to address unique circumstances, and close cooperation between agencies and the public will be needed to develop those.

Alaska Department of Fish and Game and the National Park Service natural resource managers, with input from bear viewing guides and the general public, have developed the "Best Viewing Practices." The "Best Practices" are an effort to minimize adverse impacts on bears and their habitat while maximizing the opportunity for people to learn about and enjoy bears.

NPS, R. Wood

# INVASIVE AQUATIC PLANTS and FLOATPLANE OPERATIONS:
## *Help prevent new infestations*

Canadian waterweed infestation in Chena Slough, Alaska (T.Wurtz, USFS)

**BACKGROUND:** Aquatic plants grow in a variety of habitats including lakes, ponds, streams, rivers, bogs and wetlands. Some aquatic plants grow out of the water along the shoreline; others have leaves that float on the surface, while many live completely underwater. Native aquatic plants provide food and shelter for fish, birds, moose and other wildlife. They also help stabilize habitat along lake and river banks. However, invasive aquatic plants can become a serious nuisance to natural systems and also a danger to safe floatplane operation.

**PROBLEM:** Invasive plant species (sometimes called exotic or non-native species) can out-compete native aquatic plants and choke waters with excessive plant growth. Uncontrolled growth of invasive aquatic plants can:

Fouled rudder - Lake Hood float plane (USFWS)

- *Impact habitat and reduce fish populations*
- *Ruin boat engines and jam steering equipment*
- *Make lakes/rivers unusable for recreation (e.g., fishing, boating, or swimming)*
- *Reduce native plant species and degrade natural habitats*
- *Reduce property values*
- *Reduce water quality*
- *Increase maintenance costs for floatplane operations*
- *Complicate safe floatplane operation, especially for taxiing near tight slips and at take-off*

There are many ways seeds or fragments of invasive aquatic plants can be introduced into Alaska's waters including: birds, winds, boats, waders, and even floatplanes. Although fewer invasive aquatic plants have been found in Alaska than in other states, we are not immune to this problem.

## Keep watch for these invasive species

F. Koshere

Eurasian watermilfoil (*Myriophyllum spicatum*)

Clayton Antieau

Canadian waterweed (*Elodea canadensis*)

L.J. Mehrhoff, Univ. of Connecticut

Curly leaf pondweed (*Potamogeton crispus*)

Richard Old, www.xidservices.com

Reed canary grass (*Phalaris arundinacea*)

www.eol.org

Parrot feather (*Myriophyllum aquaticum*)

Smithsonian

Hydrilla (*Hydrilla verticillata*)

# INVASIVE AQUATIC PLANTS and FLOATPLANE OPERATIONS:
## *Help prevent new infestations*

It is important to take steps now to prevent introductions to Alaska and to prevent the further spread of invasive plants that are already found in the state. Floatplane pilots can help to reduce potentially harmful infestations by learning more about invasive aquatic plants, reporting them and following these simple steps:

### Before entering the aircraft

Inspect/remove plants from floats, wires or cables, and water rudders.
Also, check the transom, bottom, chine, wheel wells, and float step area.
Pump water from floats.

### Before takeoff

Do not taxi through heavy aquatic plant growth prior to takeoff.
Raise and lower water rudders to clear off plants, minimize cable stretch and improve steering effectiveness.

### After takeoff

Raise/lower water rudders several times to free aquatic plant fragments while over the waters you are leaving or over land.

**REPORTING OPTIONS:** If you encounter the plants shown here or other plants you suspect may be invasive, note the location and any distinguishing characteristics. If possible, take photos of the plant and the site. Report your observations by phone or online:

Alaska Exotic
Plant Information Clearinghouse
http://akweeds.uaa.alaska.edu/

EDDMapS Alaska's
Early Detection Reporting Form
www.eddmaps.org/alaska/report/report.cfm

or

Alaska Department of Fish and Game
Invasive Species Program
1-877-INVASIV (1-877-468-2748)

Produced by Portland State University - Center for Lakes and Reservoirs March 2011

# What is an Invasive Plant?

A plant is defined as invasive if it is not native to the ecosystem under consideration and if it causes or is likely to cause economic or environmental harm or harm to human health. Human actions are the primary means of invasive plant introduction. Invasive plants cost the United States an estimated $35 billion each year and are one of the greatest threats to the natural ecosystems of our national parks. These unwelcome plants can:

- Out-compete native plants
- Displace wildlife
- Harm fish habitat
- Affect soil and water quality
- Alter disturbance regimes such as wildlife

The terms exotic, introduced, and nonnative are frequently used interchangeably with the term invasive. Five of the most prevalent invasive plants you may encounter during your time here at Katmai National Park and Preserve include:

Common dandelion.

Common Dandelion grows in lawns, grasses, and disturbed sites at many locations in the park, including Brooks Camp, Fure's Cabin, and Nonvianuk Cabin. Numerous wind-carried seeds spread rapidly along pathways and quickly overwhelm other plants in mown areas and disturbed sites.

Shepherd's Purse extends into disturbed sites and river banks at Brooks Camp along both sides of Brooks River. It can be identified easily with its four white petals and distinctive heart-shaped seeds. This invasive plant spreads aggressively in gravelly areas, and deposits seeds that can remain viable for up to 20 years.

Shepherd's purse.

Pineappleweed is the most prevalent invasive in Katmai. It multiplies quickly on trampled trails and disturbed sites at Brooks Camp, such as under bear viewing platforms, around buildings and along pathways and river banks. It typically grows in a dense carpet that prevents the establishment of native seeds.

Pineappleweed.

Common plantain.

Common Plantain thrives on trampled or disturbed sites in numerous locations throughout Brooks Camp, including the campground, along pathways and around cabins and lawns. It can spread outside of disturbed sites and prevent growth of native vegetation.

Sheep Sorrel spreads in rocky or gravelly soil and disturbed or trampled sites, such along the roads and parking lot at Lake Camp. It has the ability to spread by underground roots, forming dense infestations.

Sheep sorrel.

## Biological Pollution

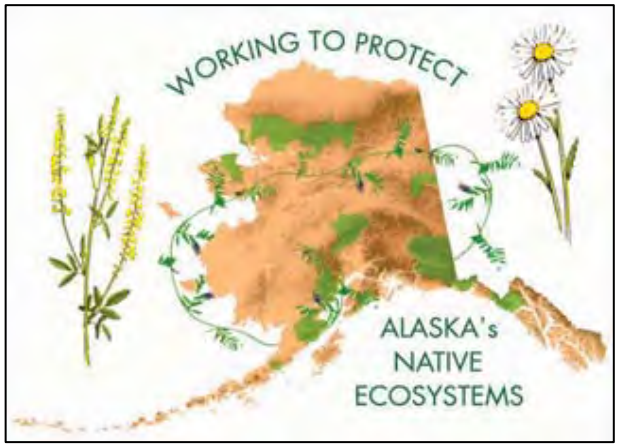
Invasive species have been moved intentionally or unintentionally from their native range. Immigrants brought plants to North America from their homelands for culinary, medicinal, ornamental, and other purposes. Other plants arrived as hitchhikers among shipments of plants, seeds, or fill material. Free from their natural predators and competitors, invasive plants tend to experience rapid and unrestricted growth in their new environments. As a result, they are considered biological pollutants. Unlike litter or other forms of pollution, invasive species can reproduce and exponentially increase in density. Fortunately, Katmai is not yet overrun by invasive plants. We have a unique opportunity to prevent problems that have occurred elsewhere, but the threat grows every year.

## How You Can Help

To prevent the introduction and spread of invasive plants into natural areas, please follow these recommendations:

- Clean and check all of your gear before traveling into the park to prevent bringing in unwanted seeds or plant material.
- Avoid disturbance of natural areas, such as clearing or trampling native vegetation.
- Notify the Exotic Plant Management Team of invasive plants found in remote areas of the park.

## Thank You!




## Further Information

For further information about invasive plants in Katmai National Park and Preserve or to report a species observation please contact:

Whitney Rapp
Exotic Plant Management Team
Katmai National Park and Preserve
PO Box 7 / 1 King Salmon Mall
King Salmon, Alaska 99613
(907) 246-2145
whitney_rapp@nps.gov

Or Check us out on the web at:
www.nps.gov/akso/NatRes/EPMT/index.html

Thick mat of dandelion at the Brooks Camp cultural site.

# Invasive Plants

Katmai National Park and Preserve
National Park Service
U.S. Department of the Interior

Bird vetch along the Valley of Ten Thousand Smokes Road.

Infestation of sheep sorrel at Lake Camp.

# Katmai

National Park Service
U.S. Department of the Interior

Katmai National Park and Preserve
Alaska

# Wilderness Camping in Katmai

Are you ready for the challenge of the Katmai wilderness and the freedom to choose your own travel route in this vast trail-less backcountry? Any trip into Katmai requires a certain level of preparation to ensure a safe and enjoyable experience. The following information is intended to assist you with trip planning tips and safety information.

## Regulations for Backcountry Travel

No permits are required for camping within Katmai National Park and Preserve.

Stay 50 yards away from bears or other large animals. Do not approach wild animals.

Food, garbage, and fish must be stored in approved bear resistant containers (BRC) or lockable sections of a vehicle, vessel, or aircraft. Coolers and Action Packers are NOT bear resistant.

BRCs are available for checkout (no charge) at the King Salmon Visitor Center or Brooks Camp Visitor Center.

Pack it in, pack it out. Do not burn or bury garbage.

Dispose of human body waste in 6 to 8 inch deep holes at least 200 feet from any freshwater source. Toilet paper must be packed out as garbage.

Do not disturb, deface, dig, or alter any features of any archeological sites or historical structures or remains.

Pumice and fossils are protected by state and federal laws. Leave them where you find them.

Edible fruits, berries, and nuts may be collected for personal consumption.

Camping is not permitted within the core meadows in Hallo Bay from April 1st to October 31st or within 1.5 miles of Brooks River Falls except in the designated campground on Naknek Lake.

Backcountry camping is limited to 14 consecutive nights in any one location. Your next camp must be two miles away.

Fish you keep should be immediately cleaned and consumed or stored in a bear resistant container. After cleaning fish, deposit remains in swift flowing or deep water. No fish may be cleaned at Big River or within 1.5 miles of Brooks Falls.

Campfires are permitted. Campfires leave lasting impacts, so please use a stove for cooking and a headlamp for light. Keep fires small, collect only dead & down wood, and completely break up fire rings when you leave.

You must possess a valid state license to hunt, fish, or clam. You must comply with all state and/or federal regulations that apply for the area.

No firearms, explosives, or fireworks are permitted in Katmai National Park. Firearms are allowed in Katmai National Preserve, the Alagnak Wild River and Aniakchak National Monument and Preserve.

## Plan Ahead and Prepare

Know the regulations and concerns for the area you are planning to visit.

Design your trip to match your skill level with the rugged environment and travelling safely in bear country.

Prepare for extreme weather, hazards, and emergencies. Weather along the Alaska Peninsula changes rapidly and can be very wet and cold at any time of the year. River crossings can be very dangerous.

Know the warning signs of hypothermia and how to treat them.

Giardia is found here. Treat or filter all drinking water.

This is bear country. Understand how to travel and camp safely. Know how to prevent and react to encounters with bears.

Leave detailed trip plans and emergency information with a responsible person. The National Park Service will not initiate a search unless someone reports you as overdue.

## Travel and Camp on Durable Surfaces

When you travel and camp, confine use to durable surfaces that resist impact. These include established trails, campsites, rock, gravel or snow. In popular/impacted areas, concentrate use. In pristine areas, disperse use.

Whenever possible, do not camp within 100 feet of a lake or stream.

Good campsites are found, not made. Do not dig, flatten or otherwise create a campsite.

Avoid animal trails and animal food sources when choosing a campsite and sleep in a tent.

Separate your food storage, cooking and sleeping areas by at least 100 yards. Your basic camp set–up should resemble a triangle with food & cooking areas downwind of your tent.

Consider the use of electric fencing for camps.

## Dispose of Waste Properly

If you pack it in, pack it out. Leave your campsite as clean or cleaner than when you found it.

Reduce trash by repackaging foods before you leave on your trip. Dispose of all trash properly.

Use bear resistant containers to store all items with an odor and keep your camp clean.

Wash yourself and dishes at least 200 yards from lakes and streams.

Use biodegradable soap and scatter wash water.

Bury solid human waste properly in 6 to 8 inch holes and pack out all toilet paper.

## Leave What You Find

Minimize your impact on the wilderness around you. Leave only footprints, take only pictures.

Avoid damaging live plants, flowers, and trees.

Leave archeological and historical artifacts, rocks, bones, antlers, fossils, and other items of interest for others to enjoy.

## Respect Wildlife

Be respectful of all wildlife and minimize any disturbance or impacts on them. Observe from a distance.

Do not follow or approach wildlife. If an animal reacts to your presence, you are too close.

Avoid wildlife a during sensitive times like mating, nesting and raising young.

Never feed animals. Feeding damages their health and alters natural behaviors.

Pets are not allowed within 1.5 miles of Brooks Falls. Elsewhere, control pets at all times, or leave them at home.

Let nature's sounds prevail.

Avoid surprise encounters with bears. Make noise appropriately when travelling in areas with poor visibility. Give bears the right of way. Never run. Do not let bears get your food, garbage, or gear.

Practice good catch and release techniques when fishing. Use barbless hooks and do not remove fish from the water before releasing them.

When playing a fish, be prepared to break or cut your line when a bear approaches. Do not let a bear associate you with an easy meal!

Report any unusual encounters, property damage or injuries involving bears or other wildlife to park service personnel.