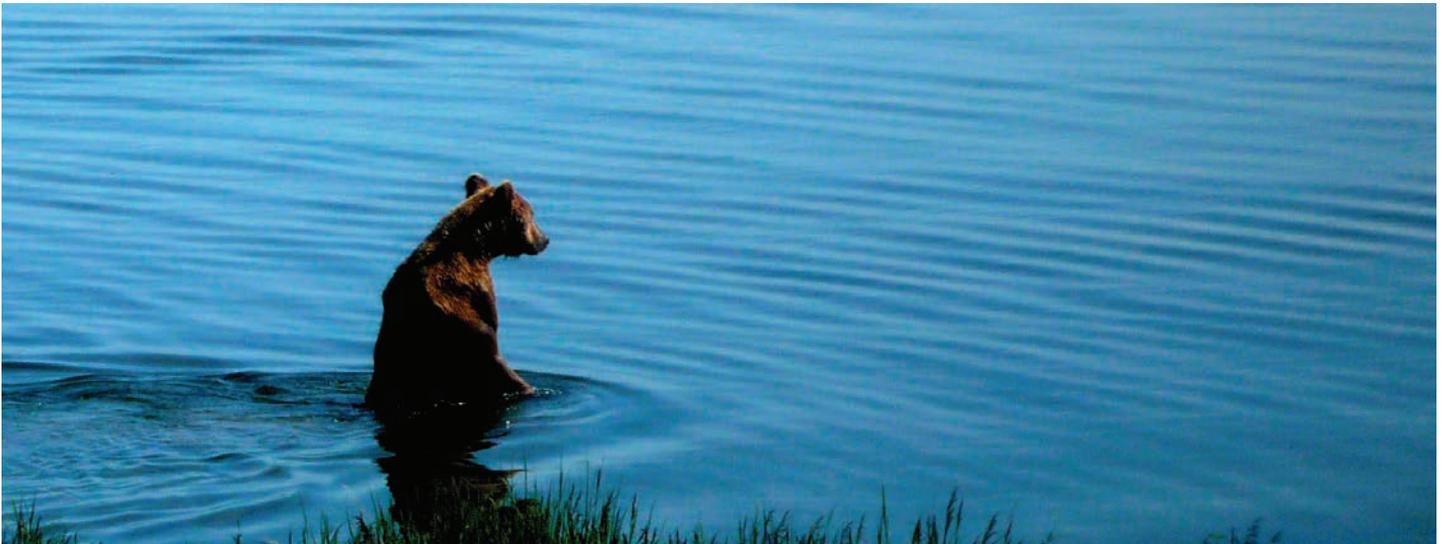




Resource Management News

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, Dalia 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.

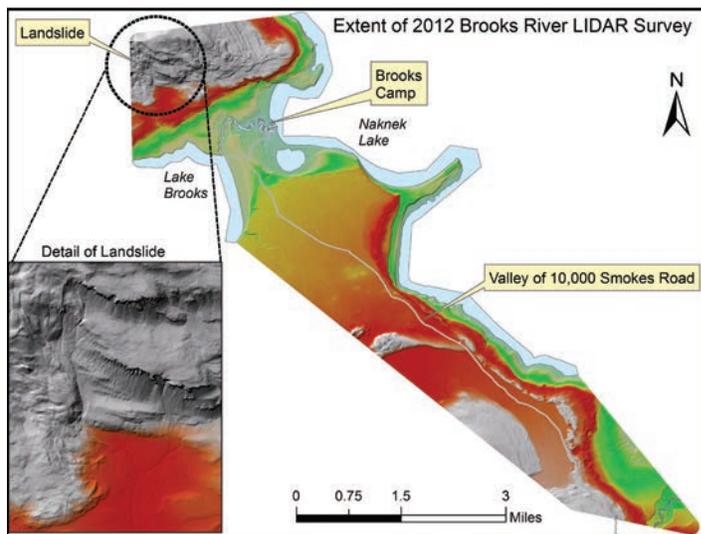
Cultural Resource Projects

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

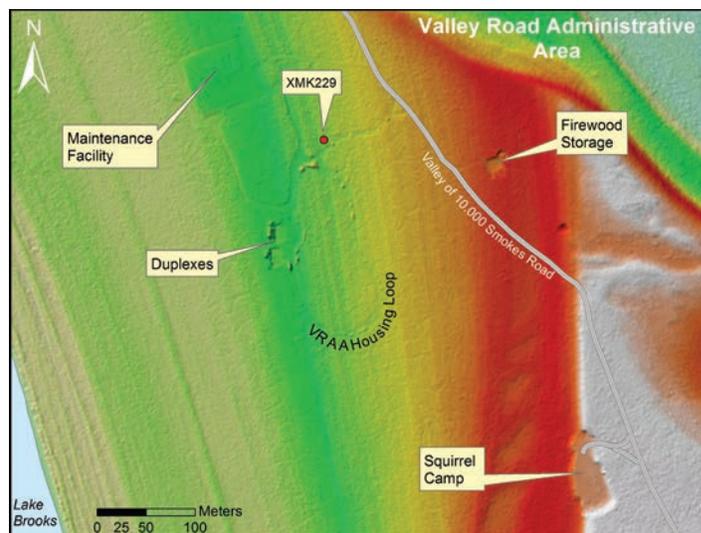


The LIDAR coverage includes a 10.8 mile by 3 mile swath from the southern crest of Dumpling Mountain to near Margot Creek. LIDAR caught the edge of an ancient landslide now hidden by vegetation.

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.



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.



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.



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.

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



MJ took advantage of limited time at Katmai with several hiking trips 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.

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.

Southwest Alaska Network Projects

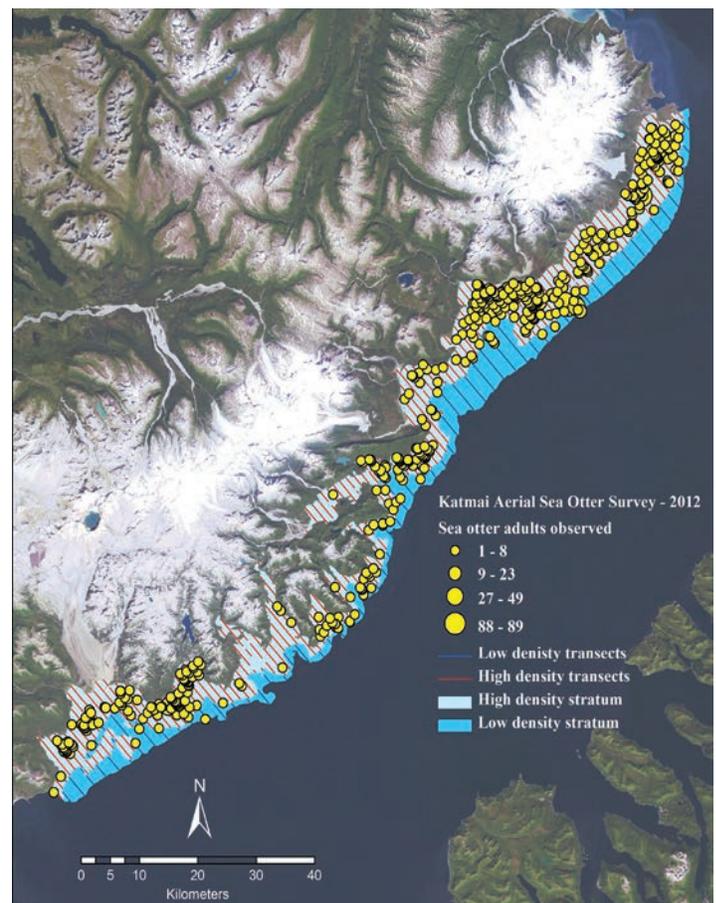
The Southwest Alaska Network (SWAN) is one of 32 Inventory and Monitoring programs across the National Park Service. This national strategy is an effort to understand what natural resources exist within the park units (inventory) and the condition of those natural resources (monitoring). A major role 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/km². The 2012 population estimate is higher than that of 2008 (7095 individuals, 4.89/km²). 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

April 29, 2011



May 29, 2011



August 20, 2011



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

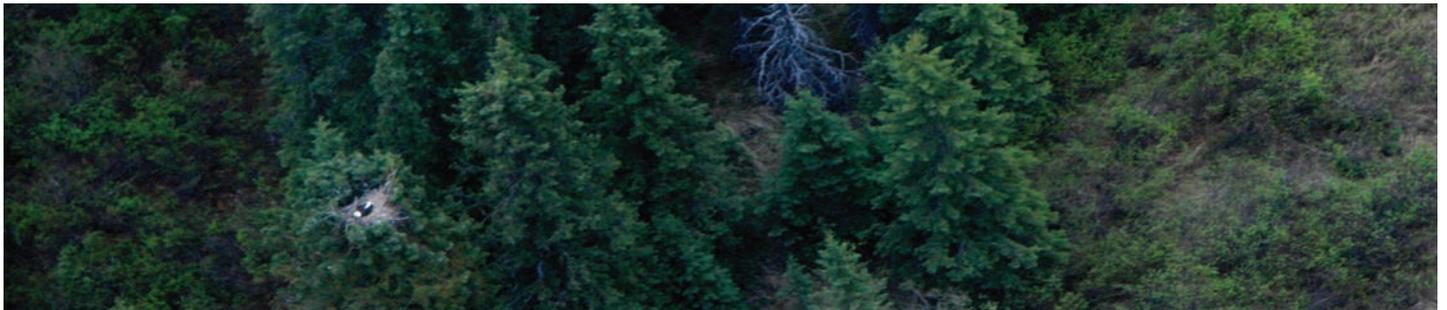
In 2012, Katmai and SWAN staff worked together on two different aerial studies to quantify the number of bears in Katmai. One of these was an experimental method tracking emergence from dens from late-April through May. Although the study was not fully implemented due to logistical issues, the results 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.



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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.