



# Resource Management 2019



A coastal wolf carries a juvenile sea otter along the beach in Katmai National Park. Read below for more information on a coastal wolf pilot study beginning in 2019. Photo: K. Griffin

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.

The cultural resource program involves archeology and anthropology and focuses on the history of human occupation in the region. The natural resource program studies biological and physical resources, such as wildlife, fish, plants, wilderness, and backcountry resources.

Look for project and research updates on our website ([www.nps.gov/katm](http://www.nps.gov/katm)), Facebook page, and through the explore.org Katmai bear cams.

## Research Permits

In addition to work conducted by NPS staff, external researchers come to the parklands to conduct a wide array of studies. 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.

## Coastal Wolf Pilot Study

Wolves on the Katmai coast have been documented preying on sea otters, harbor seals, and salmon. Unlike interior wolves, they do not rely as heavily on ungulate populations like moose and caribou. In order to gain a better understanding of coastal wolf diets and individual genetics we will test hair sample collection in a variety of coastal areas. Hair snares will be made by attaching barbed wire on a small board and scenting it with chemical lure which invokes a rolling response by wolves. We will document wolf visits to some hair snare sites with remote cameras. If successful, hair samples will be collected and sent to a lab where hair follicles can be genotyped (individual wolf genetics) and a section of hair can be used for stable isotope analyses to identify prey items in individual wolf diets. At least one camera will be set up in an attempt to document wolves preying on sea otters.

A wolf on the Katmai Coast fights to take down a harbor seal at low tide.

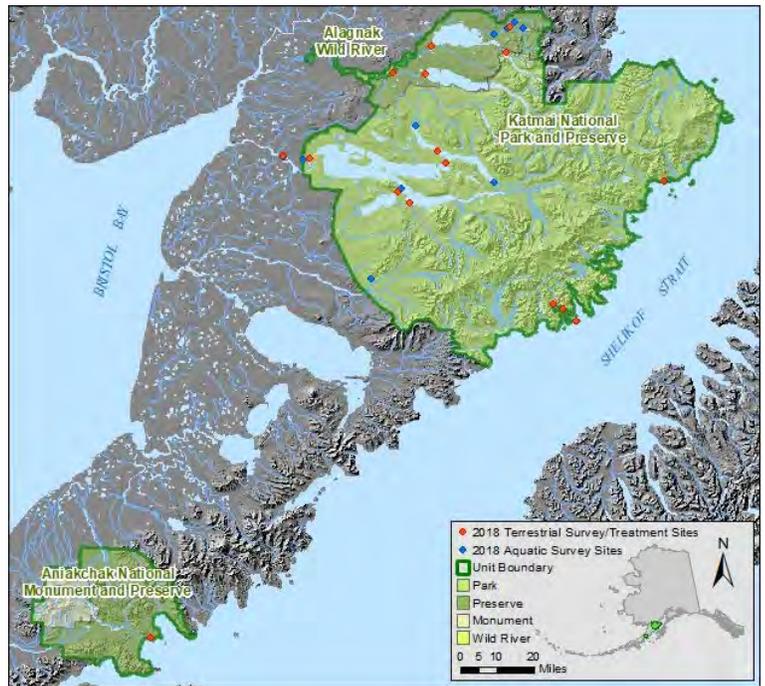


## Invasive Plant Management

Invasive and exotic plants are considered the second greatest threat to biodiversity after habitat loss. They display rapid growth, spread with little or no human assistance, and are expensive to remove and difficult to control once established. In Katmai, we are working to prevent the establishment and expansion of exotic and invasive plants.

In 2018, Katmai's Exotic Plant Management Team (EPMT) conducted field work from June through September, surveying for, and if found, treating invasive plant infestations. Effort was focused on areas of high visitor use. In August, a Student Conservation Association crew assisted at Brooks Camp. The primary invasive plant targets are common dandelions, shepherd's purse, and sheep sorrel. About 100 acres were surveyed and slightly less than 3 acres were treated for infestation. The team was able to survey and in some cases treat infestations on private property within the park boundary thanks to the cooperation of the landowners. The team also surveyed for the aquatic invasive plant, Elodea, where float plane traffic is high. Elodea has not been found in the park but surveys in high risk areas will continue to be priority.

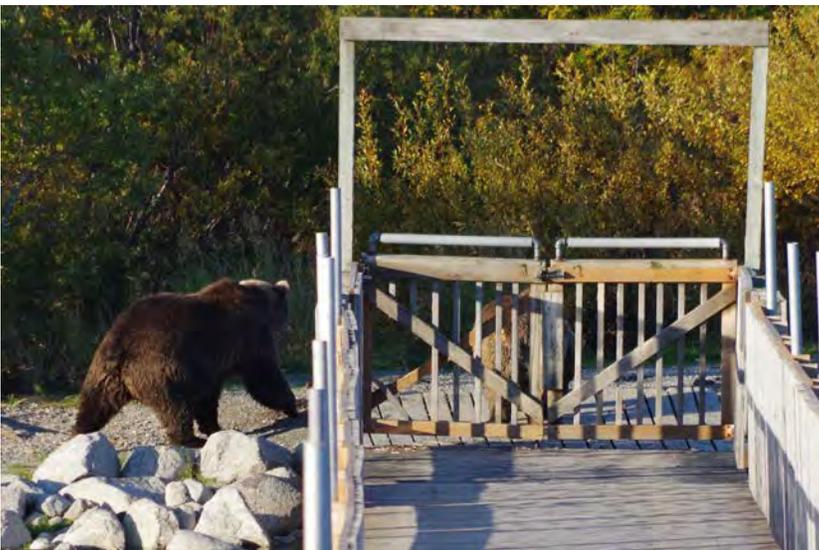
In 2019, the EPMT will plan to visit many of the same sites as in 2018 and continue chemical and manual treatment for invasive plant species as necessary.



Locations surveyed or treated for invasive plants by Katmai National Park's exotic plant management team during the 2018 field season.

For further information on invasive plants in Katmai National Park and Preserve, or to report a suspicious terrestrial or aquatic species, please contact the **Exotic Plant Management Team at 907-246-2152**. Identification materials for both native and non-native species are available upon request to help visitors identify species in the field.

## Monitoring Bears Along Brooks River



Bears outside of the old floating bridge entrance which has been replaced with an elevated bridge and walkway.

This winter a new elevated walkway has been built over the lower river at Brooks Camp, replacing the old floating bridge that has been in use since 1982.

This will change the way people use the travel corridor and may impact bears' use of the area. To help inform decisions regarding how to manage human traffic on this new bridge biologists have set up time lapse cameras to take photos of the lower river. With these photos we can compare bears' use of this primary feeding area before and after the bridge installation and investigate if these kind of structures increase or decrease bear activity.

In 2018, we set up new cameras, matching the viewing angle to an old study to increase the sample size prior to bridge construction. In 2019, we will continue to take photos and refine our techniques for identifying bears in the pictures. This project will run for five years to evaluate impacts to wildlife as bears become habituated to the new structure, and help to determine if use of the bridge causes bears to change their use of the lower river.

Additionally, bear monitoring data along the Brooks River will continue to be analyzed to look at how bear use of the river changes.

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## Changing Tides Project Update

Over the last year, the Changing Tides bear project has been busy collating and summarizing all of the data from the last few years of field-work. So far, analyses show that although some bears use intertidal resources, far more bears prioritize the selection of salt marsh areas. Dietary estimates from May-July show a strong and consistent reliance on vegetation by all bears ( $97.8 \pm 1.0\%$ ,  $n=21$ ) with little reliance on other intertidal resources. July-October diets show higher degrees of variability and an average salmon component of  $65.5 \pm 6.9\%$  ( $n=18$ ) and little to no input from intertidal resources. Bears used low-tall shrub habitat (36-42% of locations) and herbaceous mesic (characterized by flowering and grass-like plants) habitat (17% of locations). Before salmon arrival bears spent  $13 \pm 11\%$  of their time in salt-marsh habitat and  $10 \pm 6\%$  of their time in intertidal habitat. After salmon arrival bears spent  $8 \pm 4\%$  of their time in salt-marsh habitat and  $9 \pm 4\%$  of their time in intertidal habitat. When we compared the ratio of how much they used a habitat to how much of that habitat was available (i.e., did they select that habitat preferentially), they preferred salt marshes, but not intertidal areas when choosing where to live (their 'homerange'), during the presalmon (before ~July 20) season. During the salmon season (after ~July 20), they selected for both intertidal and salt marsh areas, likely due to the ability to fish for salmon in the intertidal. At smaller scales (within their homerange) they did not select for intertidal or salt marsh areas, except after July when they selected for salt marshes, perhaps due to their adjacency to salmon-streams.

The combination of diet and habitat selection information supports the idea that early in the season,

vegetation is important for bears, and used to a greater degree than intertidal resources (e.g., clams, mussels, barnacles). Though we know a small number of bears used seals and/or other food resources, these items did not show up as significant portions of dietary estimates. Observational data from Hallo Bay supports the idea that when choosing and consuming vegetation, sedge meadows are important habitats; bears were 4 times more likely to use sedge meadows than other available habitats before salmon arrival at Hallo Bay. We believe that the value of vegetation—namely salt marshes, should be recognized as a critical habitat for bears, and that, though typically not thought of as “intertidal”, they warrant being considered as such. As vegetation that is tidally inundated, Katmai’s sedge meadows are intimately linked to the marine environment and the threats associated with this ecotype (e.g., warming temperatures, acidifying waters, rising sea-levels, oil spills).



Data from the Changing Tides project provides evidence of the importance of early season coastal salt marshes to brown bears.

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## A Genomic Perspective on Katmai’s Brown Bears



NPS Ranger and researcher Michael Saxton processes samples in the lab.

Katmai is home to one of the densest and most well-known populations of brown bears on the planet, but our understanding of the population connectivity is limited. The Aleutian mountain range bisects the park, and reduced food resources in the mountains may limit movement and restrict gene flow. In 2016, park biologists began a study that to shed light on gene flow throughout the Park and Preserve. This information will help to illuminate movement patterns of bears and help managers understand how bears are connected across the park. By collecting samples from along the coast and at multiple locations in the interior of the park, biologists will be able to analyze gene flow and determine if bears are consistently crossing the mountain range between the coast and interior regions. The use of biopsy darts allows researchers to visually identify bears as they are sampled. With this information, they will be able to construct a pedigree of the local population and evaluate the level of genetic diversity in Brooks Camp bears. In 2018 sampling occurred along the southern coast, where weather had prevented sampling in previous years, and continued at Brooks Camp. Additionally, genotyping began this winter at the USGS Alaska Science Center lab in Anchorage, AK. Once genotyping is complete park biologists can begin to analyze the data to look at gene flow and genetic diversity throughout the park and preserve. The information gained from this study will provide valuable information regarding the health of the population and help inform management decisions that impact these amazing animals.

# Wilderness Visitor Study: Understanding Visitors' Desired Social and Natural Conditions

During the summer of 2018, researchers from Clemson University and Kansas State University initiated the first phase of a two-phase investigation focused on the experiences and use of day and overnight visitors within backcountry and wilderness areas at Katmai National Park and Preserve

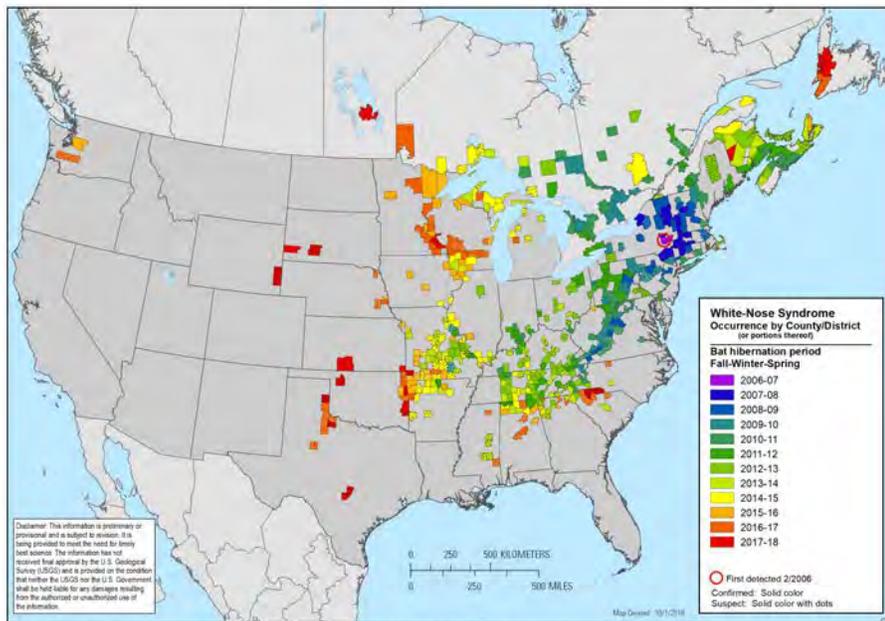
(KATM). The purpose of this assessment is to collect information about the associations between visitors, social conditions, and resource conditions to inform and support KATM visitor use management and associated planning efforts. Researchers distributed onsite and internet-based questionnaires at several intercept locations within KATM and regional travel corridors (e.g. King Salmon Airport). The quantitative questionnaire included questions about visitors' perceptions of current 'soundscapes' in the park (level of non-natural noise) and 'indicators of quality' that significantly and consistently influence the visitor experience.

The response rates for the initial phase of this research was approximately 83%, yielding over 500 questionnaires. Approximately 32% of the overnight users reported camping within the park during their visit. The majority of day visitors (59%) spent two to seven days within the park. The most notable and salient indicators involved the visitor's own (the survey takers) proximity to bears and the amount of the day that wildlife was present during their experience. The distance between a visitor (the survey taker) and bears was the dominant indicator with 48% of respondents reporting this was most important to their experience. The majority of visitors reported that they are satisfied with the existing soundscape in the park and that the park soundscape should be preserved/protected. Overall, the findings from the first phase revealed several indicators that will inform the next phase of the research to be conducted during the summer of 2019.



Students from Kansas State and Clemson Universities talk to visitors and visit coastal brown bear viewing sites.

## Understanding bats in Katmai



As white nose syndrome (WNS) has spread west across North America it is imperative to prepare for it to reach Katmai. This fungal disease has been responsible for the collapse of many bat colonies throughout the range of the fungus. By preventing bats from hibernating at a time of year when they are not able to forage, it leads to starvation on a massive scale. In the summer of 2019 biologists at Katmai will expand our bat monitoring program from a single location at Brooks Camp to multiple locations throughout the park. The goal of the study is to understand to the range of bats throughout the park and preserve and begin to identify possible hibernation locations. It is currently unknown if bats are overwintering within the park or if they migrate to warmer climates for the winter. If bats are in the park year-round then managers will need to develop a monitoring program for WNS.

White-nose syndrome occurrence in bats by year in the contiguous U.S. (2018). Available at <https://www.whitenosesyndrome.org/resources/map>

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## Aerial Surveys: Bears, Bald Eagles, and Moose



NPS Ranger and biologist Leslie Skora takes a break in between completing aerial surveys.



Bald eagles and their young are surveyed in the spring after they begin nesting.

Back in the 1970s, Katmai biologists began flying aerial surveys in order to estimate brown bear abundance within Katmai. Today the park continues to conduct aerial surveys, not only for brown bears along sedge meadows and salmon streams, but for moose and bald eagles as well. Katmai's vast road-less wilderness and often inclement weather makes accessing areas of the park difficult for biologists trying to monitor wildlife populations. Aerial surveys provide a way to access this landscape and study some of Katmai's keystone species. Surveys are flown in small 2 seat aircraft at low levels off the ground. Both pilot and observer work together to spot and record the number of a wildlife species gathered at a location.

Bears, bald eagles, and moose are all surveyed at locations and times when their concentrations are known to be high. Counts of bears and cubs allow the park to monitor the bear population and look for factors that might be affecting it. The sedge meadow and stream surveys that Katmai conducts not only help to understand salmon run timing and abundance, but help to indicate bear numbers and productivity. Bald eagle are surveyed to better understand nest occupancy and reproductive success. They are considered to be important indicators of freshwater and marine ecosystems because their survival and productivity is dependent on freshwater and marine food sources that depend on high water quality. Moose counts of bulls, cows, and calves are conducted during the winter to monitor the moose population and look for environmental factors that might be affecting the population. Regularly repeating these surveys allow biologists to use the counts as measures of the local population. Over time the measures are used to detect changes in the population and to look at how species are affected by different environmental changes.

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## The Dinosaurs of Aniakchak National Monument



Alyssa Reischauer (NPS) next to a mold covering a newly discovered large hadrosaur footprint.

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In 2001 the discovery of the first dinosaur footprint occurred in Aniakchak National Monument, which was also the first record of a dinosaur in any NPS unit in Alaska. In 2002 there was the discovery of an additional two more dinosaur footprints. All three of these tracks could be attributed to duck-billed dinosaurs.

The results of paleontological work from 2016-2018 have recorded 78 track sites of fossil animals in Aniakchak. Most of the combined record of tracks can be attributed to plant-eating duck-billed dinosaurs. And the tracks range in size from those made by full-grown adults to juveniles. Other tracks found can be attributed to armored dinosaurs, meat-eating dinosaurs, and two kinds of fossil birds. The larger bird tracks are like the tracks previously described from Denali National Park, *Magnavipes denaliensis*, a crane-sized bird, while the smaller bird tracks belong to a bird about the size of a modern willet. The track size of the predatory dinosaur suggests a body size approximately 6-7 m long, about the size of *Nanuqsaurus*, the tyrannosaurid known from bones from the North Slope.

The rocks containing the dinosaur footprints found in Aniakchak largely represent rivers and floodplains. Multiple fossil forest horizons have also been found and the presence of leaves of *cf. Metasequoia* (Dawn Redwood) suggest that this tree was an important canopy species, while angiosperm leaves preserved suggest flowering plants formed the understory. Insect damage is common on the leaves of the flowering plants and detailed additional study may provide insight into environmental stress variations through time some 70 million years ago. This summer's activities will continue the study of the dinosaurs of Aniakchak with additional reconnaissance of rock exposures.

## Savonoski Ethnographic and Archeological Survey, 2019 Update; West Naknek Survey, 2020

In 2018, KATM CR staff led by UAF-Museum of the North archeologist Sam Coffman surveyed Ninagiak drainage, north Hallo Bay, and the lower Savonoski-Uyak confluence to improve scientific knowledge and park management of archeological sites and local raw material sources for stone tool production. The survey results are in the reporting phase, to be finished by the close of 2019. 2019 is also the initial planning year for the upcoming West Naknek-American Creek Archeological survey. Per Section 110 of the National Historic Preservation Act, parks must identify all historic properties eligible for nomination to the National Register. For more information, contact Linda Chisholm (907 246-2154, or [linda\\_chisholm@nps.gov](mailto:linda_chisholm@nps.gov)).



The Savonoski River and associated artifacts collected in 2018, Katmai National Park

## Following in the Footsteps of the National Geographic Society's Original Katmai Expeditions, 2019 Update



A Century of Exploration: The Valley of Ten Thousand Smokes, Katmai National Park.

Approximately one century ago (1915-1919), the National Geographic Society sponsored four expeditions to the Alaska Peninsula to study the environmental impacts of the 1912 Novarupta volcanic event, the largest of its kind to occur during the 20th century, and the second largest to occur within recorded human history. The expeditions, led by Ohio State University botanist Prof. Robert F. Griggs, would ultimately lead President Woodrow Wilson to declare Katmai a National Monument in September of 1918. Last summer, an interdisciplinary team co-sponsored by the National Geographic Explorers Grant, Penn State doctoral candidate Laura Stelson and park staff--including archeologists, natural resource specialists, wilderness rangers, and a photojournalist--hiked and surveyed approximately 200 miles of several historic NGS expedition routes to evaluate Griggs' campsites, record botanical succession data, and assess potential threats or impacts to future site preservation and interpretation. Laura and her team developed an

interpretive display of virtual reality headsets and a replica floor map of the Griggs expedition routes. Historic photos were seamlessly embedded within modern, 360 degree images (see left) of the 2018 expedition to allow visitors to see one hundred years of ecological change in the Katmai River valley and beyond. For more information, contact Linda Chisholm (907-246-2154 or [linda\\_chisholm@nps.gov](mailto:linda_chisholm@nps.gov)).

### Partnering with Elders, 2019 Update

Last summer, KATM CR seasonal staff and University of Idaho Masters student Christina "Crissy" Phillips contacted federally-recognized tribes, local village corporations and the Council of Katmai Descendants to improve the park's consultation protocol, and gauge local interest in developing future collaborative ethnographic projects. Christina will return to KATM in 2020 to continue this timely and important work. For more information, please contact Linda Chisholm (907-246-2154 or [linda\\_chisholm@nps.gov](mailto:linda_chisholm@nps.gov)).

## Other Natural Resources Programs for 2019

- **National Oceanic and Atmospheric Administration (NOAA) standing stock survey**

We will continue long-term marine debris monitoring to document type and density of debris wash-up. Coastal sites include Swikshak Bay, Hallo Bay, Dakavak Bay and Aniakchak National Monument.

- **Coastal Observation and Seabird Survey Team (COASST) surveys**

In a partnership with the University of Washington we will continue to monitor Swikshak and Hallo Bays to document seabird mortality (count and identify beached birds). This will provide us with baseline data so that we may better understand the effects of environmental stressors such as changing climate, severe winters, and oil spills on seabird species.

- **Backcountry Impacts Monitoring**

Rangers will continue to collect field data including photos and GPS locations to document human impacts (evidence of camping, etc.) in the backcountry.

- **Spatial Data Collection**

Park GIS specialists will opportunistically collect GPS locations to geo-reference aerial photos, update maps of structures and other features within the park, and relocate benchmarks.

- **Alaska Mapping Initiative Update**

Elevation data (IfSAR) has been collected over the past few years for areas of southwest Alaska including Katmai National Park and Preserve as part of the USGS's Alaska Mapping Initiative. USGS will use this data to produce publicly available 1:25,000 topographic maps for this area over the next few years. More information can be found at <https://www.usgs.gov/core-science-systems/national-geospatial-program/alaska-mapping>.



Seabird carcass remains are surveyed and tagged on some coastal beaches to document seabird mortality. Species are identified from wing measurements and characteristics. Wings pictured are from a fork-tailed storm petrel that washed up.



Accumulation of derelict fishing nets and line on the Katmai coast. Summer marine debris surveys help biologists understand where marine debris washes up and what items are most common.



Remote cameras like the one pictured will be set up in coastal locations this summer to document bear and visitor activity patterns.



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