Southwest Alaska Network
Inventory & Monitoring Program

National Park Service
U.S. Department of the Interior

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

2013 Field Season Highlights

Adaptive monitoring of water quality leads to more information faster

SWAN staff recently completed an assessment of the freshwater quality monitoring design for smaller "Tier 2" lakes (Wilson and Moore, 2013). An important finding of the assessment was the determination that measuring 10 spatial replicates on Tier 2 lakes with uniform basins was not necessary. These lakes are well represented by a single measurement taken near the center of the lake. This revision in the protocol led to a broader sampling effort in 2013 and the ability to obtain multiple years of data on Tier 2 lakes sooner than originally planned. We plan to continue evaluation efforts this winter and will focus on evaluation of spatial and temporal variation in the data for both small and large lakes. Sampling efforts for 2014 will be adapted as needed depending on the results. The new Aquatic Ecologist, Krista Bartz, will spearhead the SWAN effort.

Krista Bartz lowers a Secchi disk to observe water clarity on Lake Clark, Lake Clark National Park and Preserve.

Availability bias affects estimates of nesting eagle abundance in Kenai Fjords

An analysis of four years of bald eagle monitoring data in Kenai Fjords National Park revealed evidence that availability bias may be affecting population estimates. The availability bias likely occurs because two passengers in the same plane are surveying the exact same patch of ground. Therefore, the aircraft altitude, attitude, direction of flight, speed of flight, and lighting conditions are invariant to both observers, making nests that are impossible to see for the first observer also impossible to see for the second. We suggested changes to the monitoring protocol that would mitigate this bias and have summarized our findings and recommendations in a manuscript submitted to the Journal of Wildlife Management. Much progress in animal ecology has been made by accounting for imperfect detection during animal surveys. A common method for accounting for availability bias is to have two observers conduct counts at the same time. Availability bias occurs when animals (or nests) remain uncounted because they are impossible to see by either observer, and therefore unavailable to both. If availability bias is present, then counts will be biased low because an unknown portion of the population was exposed to sampling.

A bald eagle flies over Kenai Fjords National park.

Dr. Lucia Muggia, Universität Graz, Austria, collects lichens from a white spruce in Katmai National Park.

Lichen inventory in Katmai National Park and Preserve

Lichens are an important component of biological diversity in northern ecosystems and are good subjects for monitoring due to their environmental sensitivity. Although ecologically important, there is a general lack of information regarding lichen occurrence in the SWAN parks. In 2012, SWAN developed a CESU Task Agreement with Oregon State University to initiate lichen inventories in Lake Clark and Katmai National Parks and Preserves. In July 2013, cooperators from Oregon State University, Universität Graz (Austria), University of Bergen (Norway) and the National Park Service conducted the first inventory in Katmai. A globally-endangered lichen, *Erioderma pedicillatum*, was found at a new location approximately 24 km southwest of the only previously known location in the park. At both sites, it occurs in mature spruce forest that has been heavily impacted by the spruce beetle. Nitrogen-loving lichens (nitrophiles), often indicative of certain airborne pollutants, were largely absent in Katmai. The team will work in Lake Clark in 2014 and issue final reports in 2015.

New dataset tracks phenology of growing and snow seasons

SWAN and partners are now using Moderate Resolution Imaging Spectroradiometer (MODIS) and Advanced Very High Resolution Radiometry (AVHRR) data to monitor the start and end of the growing season, onset and duration of snow cover, and the formation and breakup of lake ice across the Network. Since 2009, the Alaska Region Inventory and Monitoring Program and SWAN have partnered with the Geographic Information Network of Alaska (GINA) at the University of Alaska Fairbanks Geophysical Institute to obtain, reprocess, and serve MODIS and AVHRR data through web coverage and mapping services (WCS/WMS). In 2013, GINA began serving MODIS-derived growing season and snow season metrics (2001-2012) via the WCS feed. Several external studies are currently using the data to examine the effects of phenology on wildlife movement and parturition dates as well as alternative methods for modeling snow season length. The development of growing season metrics for AVHRR data will continue into 2014.

Glacier changes since 1950s documented for Katmai, Kenai Fjords, & Lake Clark

A new inventory of glaciers in national parks in Alaska by collaborators at the University of Alaska Fairbanks and Alaska Pacific University is almost finished. The inventory for Katmai, Kenai Fjords, and Lake Clark is complete and is based on glacier outlines delineated for two time intervals, the 1950s and late 2000s. 'Baseline' 1950s outlines were derived from USGS topographic maps that were generated from aerial photographs acquired 1949 to 1957. 'Modern' glacier outlines were derived from late-summer Landsat and Ikonos satellite imagery acquired 2004 to 2010. Results document park-wide changes in glacier cover for all SWAN units, including a 10 to 14% reduction in glacier cover for each unit.

New coastal forest plots in Kenai Fjords

Nine new forest monitoring plots were established in Kenai Fjords National Park in 2013. The monitoring plots were established in mature, low elevation Sitka spruce-mountain hemlock stands. Trees at these sites averaged 250-300 years old. Basal area estimates for live and dead trees will be compared with estimates from the U.S. Forest Service's Forest Inventory and Analysis (FIA) plots in western Prince William Sound and will be used to define baseline conditions. Tagged trees will be used to monitor tree demography and changes in stand structure. Epiphytic lichens were sampled at most sites in 2012 using an 'off-frame' survey method developed by the FIA Program. The lichen community included several common species (e.g., *Alectoria sarmentosa*, *Cetraria chlorophylla*, *Lobaria oregana*) as well as a number of atmospherically-sensitive indicator species that will be used to monitor changes in air quality.

Moisture stress predisposes trees to spruce beetle damage in SWAN parks

Tree-ring data from Lake Clark National Park and Preserve, Katmai National Park and Preserve, and the Kenai National Wildlife Refuge have shown that trees that died during the recent spruce beetle (*Dendroctonus rufipennis*) outbreak were more sensitive to temperature than surviving trees. A collaborative study with the University of Alaska and Humboldt State University has built on this finding by using stable isotopes of carbon and oxygen in tree rings to look for evidence for drought stress in trees affected by the beetle outbreak. As trees become stressed, their stomata close to reduce evaporative water loss and as a result restrict the movement of CO_2 into the leaf. The 'signature' of that restricted movement is observed in the carbon and oxygen isotope values, both of which increase with water stress. Results of the isotope work suggest that warm summer temperatures and/or low spring precipitation have predisposed trees to drought stress and beetle-related mortality.

2013 Field Season by the Numbers

128.6	Largest tree diameter (cm) measured (in Kenai Fjords National Park)
84.9	Maximum temperature (F) in SWAN (recorded June 17, 2013 at Pederson Lagoon, Kenai Fjords)
100	Number of vertical profiles of water quality measurements obtained in Katmai and Lake Clark
116	Number of brown bear dens found during surveys in Katmai
20949	Number of observations recorded during intertidal monitoring
64.5	Maximum lake surface temperature (F) recorded on July 31 at 6 pm in Lake Clark
430	Number of zip ties used to attach sensor cables to SWAN weather stations in 2013
394200	Number of water temperature records acquired annually from five temperature arrays in Lake Clark and Katmai
3316	Number of tree and sampling diamters (DBH) measured
6	Number of officially named glaciers in Katmai
261	Total number of glaciers in Katmai (based on 2009 satellite imagery)
156	Estimated number of bald eagle nest structures in Kenai Fjords
30.6	Water temperature gradient (F) during 50m profile in Lake Clark
402960	Number of meteorological records acquired each year from 10 weather stations in three SWAN parks
62	Sea otter carcasses collected along the Katmai coast for age-specific survival estimates

STAFF NEWS

Krista Bartz recently joined the SWAN team as the Network's new Aquatic Ecologist.

Heather Coletti recently welcomed her second son into the world.

Special thanks to summer seasonals: Evan Booher and Jeff Nelson led the Aquatic monitoring effort this summer; Evan Heck assisted on all veg. field work and data entry; Kim Melendez conducted quality control assurance work related to data entry for various vital signs.