



Alagnak

Aniakchak

Katmai

Kenai Fjords

Lake Clark

# 2014 Field Season Highlights

## Botanists take a ‘lichen’ to Lake Clark



**Tor Tønberg and Peter Nelson collect lichens in the alpine near Turquoise Lake in Lake Clark 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. They are also an important source of food and/or shelter to a variety of wildlife, including caribou, birds, small mammals,

and invertebrates. In 2012, the Southwest Alaska Network (SWAN) developed an agreement for lichen inventories and in July 2014, cooperators from Oregon State University, University of Bergen (Norway), the Bureau of Land Management, and the National Park Service conducted the first known comprehensive lichen inventory in Lake Clark. The six-member team collected lichens in forests and outcrops near Lake Clark and Portage Lake, in the alpine near Turquoise Lake and Saddle Mountain, in lichen-rich tundra near Pickerel Lakes, and in forests, outcrops and ridges near Chinitna Bay. A new population of a globally-endangered lichen, *Erioderma pedicellatum*, was also found during a routine visit to a vegetation monitoring plot near Telaquana Lake. Two lichen species new to science were described from the 2013 inventories in Katmai, and we expect more exciting discoveries to come out of Lake Clark!

## Sea Otters snarf mussels in Kenai Fjords

Observations of sea otter foraging behavior within Kenai Fjords National Park have been done in June since 2007. Results indicate that sea otters in the park consume a high proportion of mussels relative to otters in other areas of Alaska. If these sea otters are dependent on mussels as a major component of their diet, they may be at risk of food limitation as a result of fluctuations in prey availability. SWAN studies show that mussel abundance and sizes across the Gulf of Alaska vary considerably from year to year. During most seasons, mussels have low energy content, when compared to other prey items. Consequently, the apparent high degree of sea otter consumption of mussels has raised questions about potential food constraints on the otter population in

Kenai Fjords. Also, if these sea otters are at the lower range of energy recovery, there are concerns that the population may be more susceptible to disease, severe weather events, climate change, vessel traffic and other disturbances.



**Ben Weitzman and Laura Phillips use telescopes to observe foraging sea otters in Kenai Fjords National Park**

## Baked Alaska

On January 27, 2014, the Climate Reference Network station at Port Alsworth in Lake Clark National Park and Preserve tied the all-time Alaska state record January high of 62 degrees F. During January of 2014, weather stations in the lower 48 broke or tied more than 2,500 records for cold, while weather stations in Alaska broke or tied tens of daily temperature records for warmth. The relative warmth in Alaska during January was due to a major, persistent kink in the jet stream that brought warm air to Alaska and cold air to much of the lower 48.

## Ack! High mercury levels found in resident lake fish

A baseline of tissue samples from more than 300 fish — representing 9 species from 13 lakes in Katmai National Park and Preserve (NPP) and Lake Clark NPP — have been collected since 2005. These samples indicate that resident fish in SWAN lakes have elevated concentrations of mercury (Hg), the majority of which is methylmercury (MeHg), a toxic and readily biomagnified form. According to a recent analysis of resident fish sampled in 21 park units, Hg concentrations in fish from SWAN lakes are among the highest. Why do fish from lakes in Katmai NPP and Lake Clark NPP, which inhabit some of the most pristine and remote waters in North America, have such elevated Hg concentrations? SWAN is partnering with toxicologists at the Alaska Department of Environmental Conservation to answer this question through additional laboratory and statistical analyses. Given the importance of resident lake fish, both as long-lived predators and as food sources for subsistence users, understanding their contaminant levels is crucial.

## Got vacancy? Bear den occupancy models are scale sensitive

Dens serve as sites of hibernation and parturition for brown bears, and are key components of bear life history strategies. In an effort to understand winter distribution and habitat use of brown bears, the SWAN embarked on a study of bear den occupancy in a small part of Katmai National Park and Preserve. Researchers conducted analyses with several grid sizes, and determined that model results, including maps of bear den

habitat, changed as the grid size changed. In general, predicted occupancy increased with increasing grid size to a maximum of 100% occupancy (we predict at least one den in every cell) at a grid cell size of 24 square kilometers. We learned that dens became easier to spot as the season progressed, and that most dens occur on steep slopes. Knowing where bears den can help managers mitigate activities that have the potential to disturb denning bears.

## Forests and beetles and fire, oh my!

White spruce forests in Katmai National Park and Preserve and southern Lake Clark National Park and Preserve have been hard hit by the spruce beetle (*Dendroctonus rufipennis*) over the past several decades. In 2014, the SWAN revisited many existing forest monitoring plots in areas killed by the beetle and established a number of new sites in undisturbed forest stands. The objective of the monitoring is to document changes in forest structure (the number and size of trees standing) and composition (the species present). These changes

could include an increase in grass cover and downed wood on the forest floor in areas of beetle-kill, which would change fuel characteristics and increase fire risk. A collaborative study between the SWAN and Humboldt State University, Nipissing University, and the University of Arizona is using tree-ring data to better understand the interaction between climate and beetle outbreaks. Results of this work suggest that warm temperatures in the spring can leave trees drought-stressed and susceptible to beetle attack, particularly in low snow years. In areas of the park dominated by black spruce, fire is another important disturbance. Two fires burned in black spruce-dominated areas of Lake Clark NPP last year. In June 2014, a team of fire ecologists from the regional office and SWAN biological technicians sampled a number of plots in the Currant Creek burn (2013) to assess fire severity. The resulting fire severity map may be used to examine the effects of the fire, and to predict where changes in vegetation and wildlife habitat could occur.



**SWAN and Alaska Region fire technicians survey the Currant Creek burn in Lake Clark National Park and Preserve**

## New faces, old hands

Congratulations to Evan Booher, longtime seasonal with SWAN's aquatic monitoring program, who is now an even longer-term employee! Bon voyage to Chuck Lindsay and Sara Wesser. Sara is retiring after leading the Inventory and Monitoring program in Alaska for 13 years. We will miss them both greatly. Peter Kirschner will join our team as the new Physical Scientist in January 2015. Peter hails from California and has most recently been working at the NASA Jet Propulsion Laboratory on remote sensing of mountain snowpack.

Special thanks to our seasonal employees! Eric Groth and Lisa Schomaker assisted with vegetation monitoring field work and data entry. Jeff Nelson returned to the aquatic monitoring program and Kim Melendez conducted quality control assurance work related to data entry for many vital signs.

## 2014 Field season by the numbers

- 1<sup>st</sup> Warmest average January temperature at SWAN weather stations since records began in 2008
- 3<sup>rd</sup> Warmest average July temperature at SWAN weather stations since records began in 2008
- 167,664 Number of adult sockeye salmon observed passing counting tower near outlet of Lake Clark
- 55 Percent below average of adult sockeye salmon observed at counting tower near outlet of Lake Clark since 2000
- 1<sup>st</sup> Warmest July temperature at 5 meters depth in North Arm of Naknek Lake since records began in 2009
- 63.5 Maximum lake surface temperature (F) recorded at 4 PM on August 2 in west arm of Naknek Lake
- 105 Number of vertical profiles of water quality measurements obtained in Katmai and Lake Clark
- 6564 Number of tree and sampling diameters (DBH) measured
- 1707 Number of glaciers in Lake Clark (based on 2009 satellite imagery)
- 10 Number of officially named glaciers in Lake Clark
- 624 Number of plots where percent cover was measured in the rocky intertidal zone across the Gulf of Alaska



**New faces, old hands: Sara Wesser, Chuck Lindsay, and Peter Kirchner**