Southwest Alaska Network
Inventory & Monitoring Program

National Park Service
U.S. Department of the Interior

Alagnak WR | Aniakchak NMP | Katmai NPP | Kenai Fjords NP | Lake Clark NPP

# The Cygnet

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## Newsletter of the Southwest Alaska Network

## Water, Water Everywhere: Monitoring Large Lakes

The physical and chemical composition of lakes within SWAN parks is a direct reflection of the surrounding geology and climate. For example, many lakes in Lake Clark National Park and Preserve (LACL) have distinct "U-shaped" valleys reflecting their glacially-carved origins. The Iliuk Arm of Naknek Lake in Katmai National Park and Preserve (KATM) is gray in color due to ash runoff from the nearby Valley of Ten Thousand Smokes. Important processes such as duration of ice cover, thermal stratification and water level fluctuations are all dictated by the geologic and climatic setting of each particular lake. These processes, in turn, largely influence the biological productivity of lakes and associated wildlife species (e.g., salmon).

The goal of SWAN's lake monitoring program is to evaluate the long-term trends in water quality and surface hydrology in the large lake systems of KATM and LACL. We are monitoring the chemical and physical parameters of water that ultimately dictate the biological productivity of large lake systems and are tracking how those parameters are affected by natural and anthropogenic influences. In an effort to maintain a holistic approach to monitoring these freshwater systems, we will integrate freshwater monitoring data with trends observed in other SWAN project areas, such as landscape processes (e.g., ice cover, glacial extent) and climate monitoring, to provide a more complete synopsis of changes throughout the watershed and potential implications of those changes on lake system dynamics.

*Lake monitoring, cont. on page 3*

## Historic Bird Observations Now Available to Public

If you are a birder and have visited a national park, you have probably filled out a wildlife observation card to document your bird sightings. Although parks keep a species list of birds found within their boundaries, there has been little effort to aggregate these observations into a wider regional or national database. In 2002, the National Audubon Society and Cornell University launched eBird (www.ebird.org) to centralize historic and current bird observations into a user friendly program. This real-time check-list provides a rich data source for basic information on the abundance and distribution of birds at a variety of spatial and temporal scales. Its goal is to provide easy access to the vast numbers of bird observations made each year by recreational and professional bird watchers by sharing these observations with a global community of interested user groups. In time, these records will become the foundation for a better understanding of bird distribution across the western hemisphere.

As part of SWAN's inventory phase, breeding bird surveys were conducted in KATM, LACL, ANIA and KEFJ. These surveys provided valuable information on the occurrence and distribution of breeding birds; however, there is still a lack of basic data on the seasonal occurrence and distribution of birds within the many areas of SWAN park units. In an effort to fill in these data gaps, SWAN has partnered with the Alaska Natural Heritage Program to enter historic bird observations submitted by park staff and visitors into the eBird database.

*eBird, cont. on page 4*

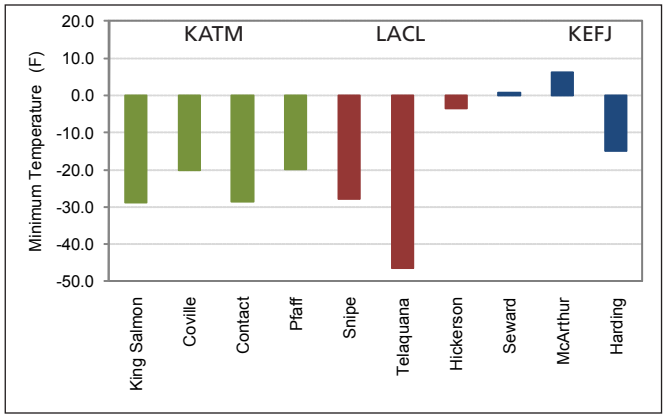
## Monitoring Climate Change in Southwest Alaska

We've all heard the phrase climate change and many people understand the effects will be most severe in the northern latitudes. Here in Alaska, we are experiencing noticeable changes in seasonal patterns – lake ice is forming later and melting earlier and the growing season is getting longer. Mean annual temperature in southwest Alaska has increased by 3.8° C in the last 50 years. This warming trend is due to increased minimum winter temperatures.

RAWS installation at Chigmit Mtns, LACL.

Continuously operating weather stations are key to providing weather data that can be summarized to examine trends in climatic conditions. Note that weather refers to atmospheric conditions at a specific point in time or over a short duration of time, whereas the aggregation of these conditions over time defines a region's climate. The climate of the SWAN region is complex and largely influenced by the region's high latitude, proximity to oceans, wide range of topographic and geographic gradients, and the interaction of these features with global circulation. To address climate variability, SWAN staff conducted an extensive study to determine locations within SWAN that would provide representative climate data and be suitable for continuously operating weather stations. The results of the study led to the installation of nine remote area weather stations (RAWS) over the last several years.

SWAN weather stations are located at sites across the topographic gradient (low-land tundra to alpine) as well as geographic gradient (maritime to continental). Although it will be several years before these stations will contribute to the overall understanding of climate change in southwest Alaska, a look at minimum winter temperatures recorded in 2009 reveal just how varied the climate is within the SWAN. Minimum temperatures ranged from 6° F to -46° F (-14° C to -44° C). Monitoring this wide range in minimum temperatures will be key to understanding the effects of climate change on SWAN ecosystems.



The SWAN region displays a wide range in minimum winter (Dec. - Feb.) temperatures due to the effects of topographic and geographic gradients.

## SWAN Vital Signs Monitoring Field Season 2010

| Vital Sign | Where | When |
|---|---|---|
| Brown bear survey | LACL | May |
| Weather station maintenance | KEFJ / KATM / LACL | May / June |
| Bald Eagle Nest Survey | KEFJ | May |
| Bald Eagle Productivity Survey | KEFJ | July |
| Landcover survey | ALAG | July |
| Nearshore sampling | KEFJ / KATM | July |
| Freshwater sampling | LACL / KATM | June / July / August |
| Vegetation sampling | LACL / KATM | June - September |

## Rare Lichens Found in Katmai

SWAN biological technician, James Walton, discovered a globally endangered lichen, *Erioderma pedicellatum* (Hue) P.M. Jørg, at a single site in Katmai NPP in 2009. Only two other known locations of the Alaska population have been found to date; these sites occur on the south side of the Alaska Range. He also found *Hypogymnia pulverata* (Nyl. ex Crombie) Elix, a lichen known from the southern hemisphere but rare in North America, in several locations in the park. James' keen eye and taxonomic skills have added to the growing inventory of non-vascular plants found in SWAN park units. We look forward to his discoveries this field season.

*Erioderma pedicellatum*

## Investigating Causes of Sea Otter Decline

SWAN marine biologist, Heather Coletti, has partnered with USGS biologists to continue studying the causes of decline in the southwest Alaska stock of sea otters, which reside in the waters along the Alaska Peninsula. Recent aerial surveys indicate that the KATM sub-population is stable – totaling approximately 7,000 individuals. Biologists are hoping to uncover the conditions that favor a robust sea otter population in KATM, and identify why sea otter populations are decreasing in other areas along the Alaska Peninsula.

Sea otter observed along KATM coast.

*Lake monitoring, cont. from page 1*

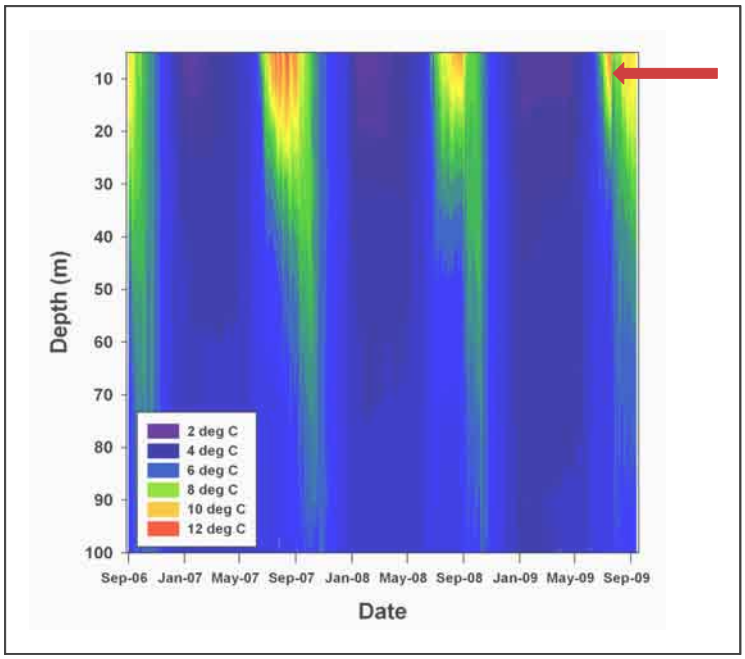
The volume of freshwater in southwestern Alaska parks is extraordinary, covering 12% of KATM's surface area alone. Lakes in SWAN parks were prioritized for monitoring based on accessibility, management priority, and spatial representativeness. The majority of SWAN's efforts focus on the Lake Clark and the Naknek Lake systems, which represent the largest and third largest lakes, respectively, by surface area within the national park system.

With only one to three years of water quality data to date, trend analysis is not yet possible. However, several observations from Lake Clark reveal the degree to which these lakes systems are influenced by geologic and weather-related events. Typically, Lake Clark exhibits a turbidity gradient ranging from turbid, glacial water in the upper lake to clear water in the lower lake. However, the 2009 eruptions of Mt. Redoubt blanketed much of the Lake Clark watershed with a layer of volcanic ash. Spring runoff carried this volcanic ash into the lake, creating turbid conditions and reducing water clarity lake-wide.

This satellite image of Lake Clark shows the commonly seen uneven distribution of sediment that enters the upper basin from the Tlikakila River each summer.

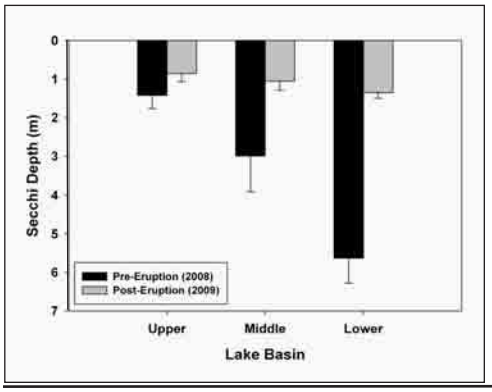
We monitor water temperature in these lakes through a series of permanent temperature arrays, which were deployed in Lake Clark and Naknek Lake in 2006 and 2008, respectively. In 2009, we observed how weather events, such as wind can influence lake temperatures in these large lake systems.

Strong wind events result in vertical mixing within the water column in large lakes, which disrupts thermocline formation. A thermocline is a layer of water with a steep temperature gradient that strongly influences primary productivity and fish distribution within lakes. An example of these strong wind events occurred on July 21, 2009; weather stations in LACL recorded wind gusts in excess of 128 kph. Waves generated from this event led to warm surface water mixing with cooler water causing surface temperatures in Lake Clark to drop 6.6° C in less than a day. Such abrupt wind-driven change is more common in shallow ponds, but is relatively rare in large, deep lakes.

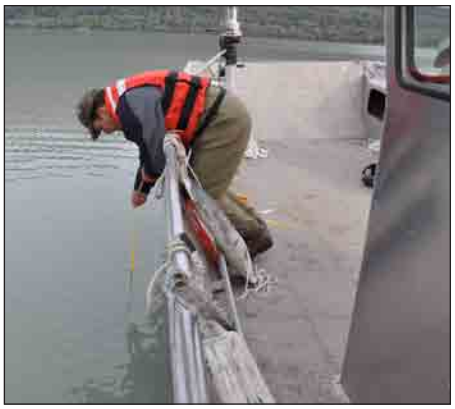



This isotherm, which displays 3-D information in a 2-D format, shows lake temperature data collected on Lake Clark between September 2006 and September 2009. Lake temperature is stratified during the summer months (warm water cools incrementally with depth), whereas during the winter months it is inversely stratified (cool water warms incrementally with depth). The red arrow points to the resulting temperature drop due to the July 21, 2009 wind event.

Our 2009 field observations remind us that these large lake systems are driven by extremes. Although researchers often report the average of their collective observations, it is often the extremes that drive lake processes. Understanding how those extremes affect critical park resources often leaves park managers with more questions than answers. Through a sustainable, long-term monitoring program, SWAN aims to provide answers for park managers who oversee the preservation of those "great lakes" of Alaska.




Secchi depth is a measure of water clarity. In 2008, prior to the eruption of Mt. Redoubt, water clarity in the lower basin was more than twice that observed in the upper basin.



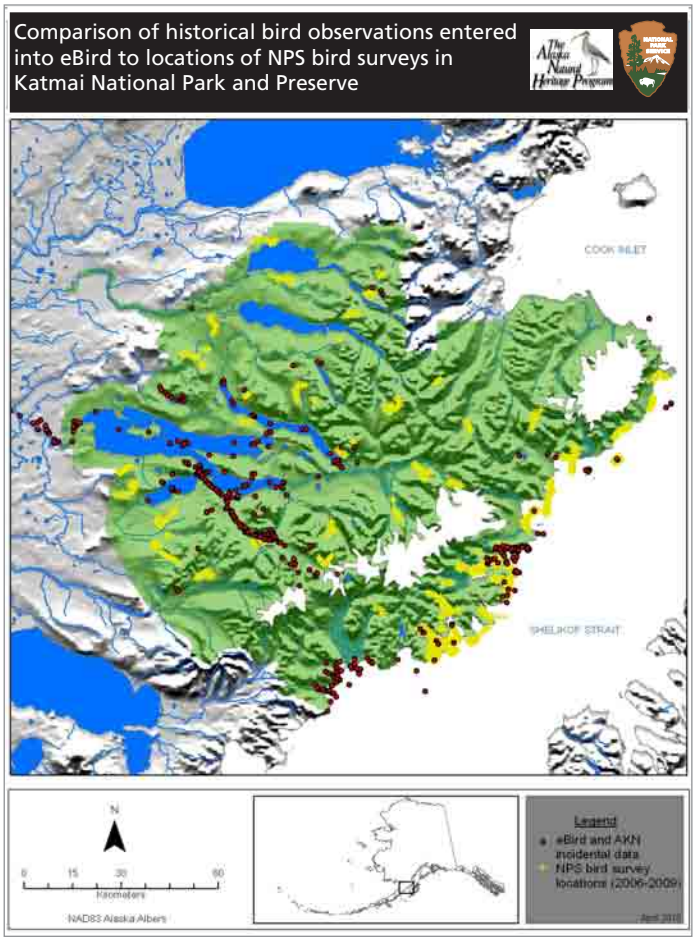
SWAN Aquatic Ecologist, Jeff Shearer, measures Secchi depth. Water clarity is an important indicator of lake productivity and affects populations of phytoplankton and zooplankton, which are a vital part of the aquatic food web.

*This article is an excerpt from an article written by Aquatic Ecologist, Jeff Shearer. It is scheduled to be published in Alaska Park Science in June.*

*eBird, cont. from page 1*

The value of entering historic data into an archival database such as eBird cannot be overstated. These records dating back to the 1910s provide a historic perspective and allow users to consider past distribution patterns when looking at changes in bird species distribution resulting from climate change. SWAN's effort to oversee the compilation of these valuable historic records will help parks to realize their primary mission by providing baseline information for better understanding bird distributions across SWAN park units.

In addition to entering historic observations, SWAN will oversee the development of a template for park visitors and researchers, which will allow them to enter their own observations directly into eBird. This feature will create a dynamic database with real-time ability to assess the abundance and distribution of bird species within SWAN. This information also will be used to update the park's checklist of birds when new species are reported. So keep those binoculars out and your bird observations coming - they are a critical link in helping parks achieve their mission.




This map displays the importance of historic bird observations to fill in gaps of our knowledge of bird distribution in Katmai NPP, including areas of high visitation such as Brooks Camp and the Valley Road. Red dots denote eBird records; yellow dots denote SWAN bird survey observations (2006-2009).

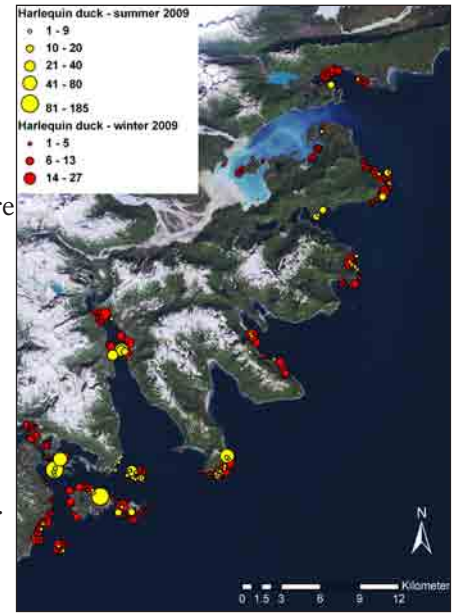
## *Sea Ducks Found in Abundance During Winter Bird Surveys*

Marine birds are long-lived predators near the top of the marine nearshore food web. Because of their reliance on the nearshore ecosystem, they are sensitive to disturbance from human activities such as oil spills and bioaccumulation of contaminants in their food sources (clams, other invertebrates and fish). SWAN has been conducting annual summer bird surveys since 2005 as part of its larger nearshore monitoring protocol to estimate the abundance and density of marine birds . Although these annual surveys in KATM and KEFJ have provided excellent information on species composition as well as the size and locations of summer colonies, they have only provided a seasonal snapshot into the world of marine birds and sea ducks.

To gain a broader understanding of the importance of the nearshore ecosystem, SWAN began conducting late winter surveys to estimate the species composition, density and distribution of marine birds. Although data from summer surveys have been compiled over the years, the only known winter surveys conducted along the SWAN coastline were completed just before and after the Exxon Valdez oil spill in 1989.

Three winter surveys have been conducted to date – two in KEFJ (2008 and 2010) and one in KATM (2009). Biologists were surprised by the increased presence of sea ducks such as the Harlequin Duck and Barrow's Goldeneye during winter; these species are present in low numbers during summer. In contrast, gulls, which are abundant during the summer surveys, were less abundant during the winter surveys. During the 2009 KATM winter survey, Harlequin Ducks were observed in smaller densities (few birds in a group); however, they were more widely distributed along the rocky coastal areas.

Winter surveys indicate that the nearshore ecosystem plays an important role in supporting marine birds and sea ducks year-round. SWAN will continue to conduct winter surveys as part of the nearshore protocol and build upon the baseline information provided by these surveys.




More Harlequin Ducks were observed during the KATM winter survey (red dots) and utilized more of the rocky coastline.

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