SIERRA NEVADA NETWORK

National Park Service
U.S. Department of the Interior

DEVILS POSTPILE • SEQUOIA & KINGS CANYON • YOSEMITE

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Sierra Nevada Monitor

Newsletter of the Sierra Nevada Inventory & Monitoring Network June 2012

Forest blowdown east of the Postpile in Devils Postpile National Monument. Photo: Tony Caprio.

Sequoia & Kings Canyon NP Fire Ecology Program staff members Tyler Schmitt and Mike Turner collect data on a Devils Postpile stand structure plot, May 2012. Photo: Tony Caprio.

Why Do Monitoring?

"Preservation depends on acquiring accurate information about the condition of natural resources, monitoring how that condition changes over time, and developing standards to evaluate changes in condition and the effectiveness of management actions."- Natural Resource Challenge, NPS 1999

On November 30, 2011 a major wind event swept through parts of California and resulted in thousands of trees blowing down in the Sierra Nevada from Whitney Portal on the Inyo National Forest north to Tioga Pass in Yosemite National Park.

Devils Postpile National Monument (DEPO) was one of the places affected. The effects on DEPO's forest stands range from areas of no blowdown and low severity (10-20% tree mortality) to a few areas of high severity with loss of numerous large trees and opening of the forest canopy.

Forest monitoring plots were established at Devils Postpile by the Sequoia and Kings Canyon National Parks (SEKI) Fire Ecology Program to monitor the effects of the 1992 Rainbow Fire, and to describe forest stand characteristics. SEKI Fire Ecologist Tony Caprio and his crewmembers Tyler Schmitt and Mike Turner returned to DEPO in May to re-read their plots.

Data from these plots can now help scientists and managers quantify the impacts of this wind event on different areas in the monument and inform decisions about future monitoring of large-scale events.

In addition to providing information on the effects of sudden change from unexpected events, long-term data can also indicate gradual change from factors like climate patterns, air pollution, non-native species invasions, and periodic population fluctuations.

Sierra Nevada Network Ecologist Jonny Nesmith made his first trip to DEPO and advised monument staff on additional monitoring approaches and ideas for a June blowdown workshop.

In This Issue

New Ecologist Joins Sierra Nevada Network

Jonny Nesmith joined the Sierra Nevada Network on April 9th as the new Ecologist. Jonny will lead both the wetlands and high-elevation forest monitoring projects. His duty station will be at Ash Mountain in Sequoia, but he will be traveling periodically to Yosemite and Devils Postpile (and of course Kings Canyon!) to work with park staff there and manage seasonal crews during the field season.

Jonny is a recent graduate from UC Berkeley, where he earned his PhD from the Department of Environmental Science, Policy and Management. His dissertation research focused on the effects of prescribed fire on sugar pine mortality in Sequoia and Kings Canyon National Parks. Prior to attending UC Berkeley he earned a MS in Forest Science from Oregon State University and a BA in Biology from UC Santa Cruz.

He has an extensive history of working in the Sierra Nevada as a biological science technician, field crew supervisor, and ecologist, beginning in 1998 with the USGS Sequoia and Kings Canyon Field Station. More recently, he has worked for the USGS with Dr. Phil van Mantgem (now at the USGS Field Station associated with Redwood National Park) on a project investigating the effects of climate change on fire severity and forest dynamics throughout the western United States.

Jonny grew up in the Bay Area and has spent most of his summers exploring and working in the Sierra Nevada. He is the father of two darling daughters (8 months and 3 years old) and will be celebrating his ten-year wedding anniversary with his wife Kia this summer. His hobbies include sleeping whenever possible, mountain biking, backpacking, and rooting for the San Francisco Giants with wild abandon.

Jonny Nesmith at Forester Pass in Sequoia National Park, doing one of his favorite activities - backpacking in the Sierra Nevada high country.

About the Sierra Nevada Inventory & Monitoring Network

As part of the National Park Service's effort to "improve park management through greater reliance on scientific knowledge," a primary role of the Inventory and Monitoring (I&M) Program is to collect, organize, and make available natural resource data and to contribute to the Service's institutional knowledge by facilitating the transformation of data into information through analysis, synthesis, and modeling.

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Former Ecologist Migrates East

Former Ecologist Shawn McKinney left the Sierra Nevada Network in January for a new job in Orono, Maine. He is working in the US Geological Survey, Maine Cooperative Fish & Wildlife Research Unit as the Assistant Unit Leader for Wildlife, and is also associated with the University of Maine as Assistant Professor of Wildlife Ecology.

The purpose of the Cooperative Research Unit Program is to address the research needs of the State Fish and Wildlife Department while training graduate students at the state university to be fish and wildlife professionals. There are three cooperating entities: The federal government (USGS), the host university (University of Maine), and the Maine Department of Inland Fisheries and Wildlife.

As a unit scientist, Shawn's role is to conduct, guide, and influence fundamental and applied research at the University of Maine. As a faculty member within the Dept. of Wildlife Ecology, his responsibilities are to recruit and advise graduate students, teach one graduate-level course per year, serve as committee member for other graduate students, serve on university committees, and provide input to graduate curriculum development.

Shawn's primary research focus is birds and mammals in forest systems. He has a project on black bears modeling 40 years of data to provide the state with more precise estimates of birth and death rates and to evaluate monitoring approaches. Other immediate projects will include American marten and small mammal studies.

Shawn, his wife Lisa, their kids Finnegan, Morgan, and Naya, and dogs Daisy and Birch are enjoying their new home and community in Bangor, Maine.

Monitoring Project Updates

Birds

Spring/summer of 2012 is the second season of SIEN's bird monitoring project. This project is a shared endeavor between SIEN and The Institute for Bird Populations (IBP). IBP hires and supervises the crews, while SIEN staff provide local training, planning, oversight, and logistics support. This year's four crew members started their training on April 28, which included training in local birds, protocol methods, safety and communication procedures, and wilderness first aid. Crewmembers Jade Ajani and Tyler Stuart will be working at Sequoia & Kings Canyon; Ryan Carlton (returning from 2011) and Ben Dudek will conduct the monitoring at Yosemite and Devils Postpile. For more information, contact the local project lead, Alice Chung-MacCoubrey.

Yellow-rumped Warbler. Photo: Gary Lindquist.

Climate

The climate protocol was revised in response to peer review comments and re-submitted to the Pacific West Region peer review coordinator on April 26. The protocol will be finalized this summer. This protocol does not involve field data collection, but we will report annually on data from existing weather monitoring stations in SIEN parks; 2010-2011 will be the first year of formal reporting. Periodic trend reports will be developed with outside climatologist assistance, as funds allow. SIEN would like to thank all the park staff, primarily resource protection and interpretive rangers who continue to collect the climate data at the SEKI and YOSE stations. For additional questions, contact Physical Scientist Jennie Skancke.

High-Elevation Forests

Foxtail pine. Photo: Tony Caprio

SIEN's former ecologist Shawn McKinney was the lead author on this protocol, which was developed collaboratively with Upper Columbia Basin and Klamath Networks. SIEN will not have a forest crew in 2012 in order to focus more time on wetlands protocol development. SIEN's new ecologist Jonny Nesmith has recently finalized forest protocol revisions, and the protocol was approved through the peer review process. SIEN staff may establish some additional forest plots later this season. The annual report for the first year of monitoring has been revised and submitted for peer review. Contact Jonny Nesmith for additional information.

Lakes

This is our fifth season of lake monitoring in Sequoia & Kings Canyon and Yosemite. This project primarily focuses on monitoring water chemistry of SIEN lakes. The report on 2008-2009 monitoring seasons was drafted late last year and is in-review; the first multi-year synthesis and trend report will be developed in the coming year. Sequoia & Kings Canyon lake crew members will be Dena Paolilli and Samantha Kannry, and Josh Baccei and Scott Cereghino are returning for another season of lake monitoring at Yosemite. For additional information, contact Physical Scientist Andi Heard.

Sampling at Dusy Lake, Kings Canyon NP. Photo: Lyndsay Belt.

Rivers

The rivers monitoring protocol has been submitted for peer review. The protocol focuses primarily on streamflow quantity and timing, but also includes water chemistry at two river monitoring stations. We expect the protocol to be finalized by winter 2012. SIEN will be conducting fieldwork this year on the Merced and Tuolumne Rivers in Yosemite. Reporting will also include monitoring data collected at river gaging stations by parks, USGS, and other state or private organizations in Devils Postpile, Yosemite, and Sequoia. The first annual report for this protocol is planned for fall 2012. Contact Jennie Skancke for additional information.

Middle Fork of the Kaweah River, Sequoia NP. NPS Photo.

Wetlands

Jonny Nesmith will be consulting with park and USGS staff from the local wetlands work group, and will revise the wetlands protocol in response to peer review comments and local recommendations. This protocol describes our approach for monitoring plant communities, water dynamics, and invertebrates in SIEN park wetlands. Jonny hopes to have a draft submitted for review by Fall 2012. The largest change is adjusting the report to reflect the fact that we have dropped the index sites and have reduced our sample size to reduce protocol costs.

Nitrogen and Sierra Nevada Lakes: How Much Is Too Much?

There are many challenges associated with being a graduate student. For the Sierra Nevada Network's physical scientist, Andi Heard, one of those challenges was to construct 'limnocorrals' (or containers that hold water for experiments and can float in a lake). These limnocorrals enabled her to conduct experiments measuring effects of different levels of nitrogen on algal growth in Sierra Nevada lakes. They were made from PVC tubes and large plastic bags (see photos to right).

"It's difficult to set up controlled experiments at remote sites," Andi explained. "There are issues with getting equipment hauled in, challenging weather, working from small rafts to set up the limnocorrals, and controlling for variables such as nutrient addition concentrations."

"These experiments are also labor-intensive, requiring extensive set-up and filtering of water samples from the corrals, so it takes the help of numerous people in the field. I am very appreciative of all the field support from NPS and UC Riverside crews and colleagues." Andi said.

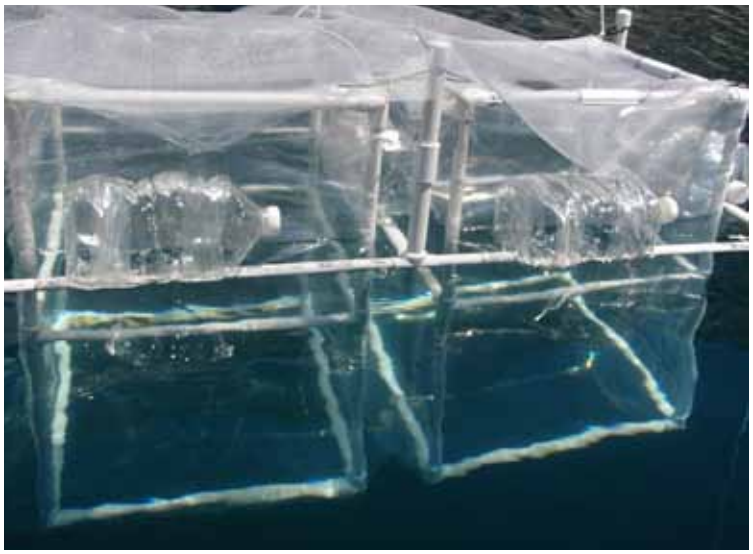
Andi became interested in pursuing a PhD in Environmental Science - Soil and Water Sciences at the University of California, Riverside while working on the Sierra Nevada Network (SIEN) lake monitoring project. She has long been interested in applying her interest and background in chemistry to environmental problems such as air and water quality issues. Andi recognized a PhD would give her more knowledge to pursue her interests in these areas, and she saw information needs in SIEN's lake monitoring program that she wanted to help address.

"My graduate project has local application to our monitoring program," Andi said. "We recognized we had information gaps such as not having enough information about baseline nitrogen levels in lakes and what levels of nitrogen we should be concerned about."

Andi is also interested in broader applications of this research.

"Specific information linking water quality issues to regional air quality can have policy implications that are tied to protecting aquatic resources, such as helping establish better air quality regulations," Andi explained.

For example, data about nitrogen deposition effects on sensitive resources in Rocky Mountain National Park were instrumental in informing air quality policy in the state of Colorado. (***Continued on next page***)



Close-up of limnocorrals in a lake. Photo: Andi Heard.

Limnocorral experimental setup in Sequoia National Park's Hamilton Lake to measure effects of different concentrations of nitrogen on algal growth. Photo: Andi Heard.

Definitions

Andi is working with her major professor Dr. Jim Sickman to develop two types of criteria that will be applied to Sierra Nevada lakes: nutrient criteria and atmospheric critical loads.

Nutrient criteria are the concentrations of nitrogen and phosphorus in the lake at which it is determined a certain threshold is crossed. This standard will be used to evaluate nutrient concentrations in a waterbody. A **critical load** is a quantitative estimate of an input or exposure to a pollutant at which unacceptable impacts occur to sensitive ecosystem components. Critical loads are used to evaluate the quantity of nitrogen that is deposited on the landscape on an annual basis.

Nitrogen and Sierra Nevada Lakes: How Much Is Too Much? (*continued)*

So, if nitrogen is a nutrient, why should we be concerned about it in the lakes of Kings Canyon, Sequoia and Yosemite national parks?

Nitrogen is important to plant processes and growth, is an essential component of amino acids that make up proteins, is a catalyst of biological reactions in cells, and is a major component of DNA, the genetic material that allows cells to grow and replicate. However, in excessive amounts, nitrogen can alter natural systems.

Sierra Nevada lake ecosystems have evolved with nitrogen as one of the main limiting nutrients, constraining the growth of plants and other organisms. A shift from nitrogen limitation to nitrogen excess could alter the balance in these ecosystems, leading to increased growth and abundance of plants and other organisms, a shift from lower to higher productivity, and a cascading set of yet unknown effects in lakes and surrounding ecosystems. Increased nitrogen inputs from external sources are likely to have a regional scale effect on algal growth and lake productivity throughout the Sierra Nevada.

Where does excess nitrogen come from?

It is deposited through both wet deposition (precipitation) and dry deposition (particulates in air that come in contact with and are deposited on the landscape). The primary human sources for nitrogen are transportation, agriculture, and industry. According to research by Mark Fenn and colleagues in 2003, nitrogen deposition has increased in the West because of rapid increases in urbanization, population, distance driven, and large concentrated animal feeding operations.

Sierra Nevada lakes are particularly sensitive to change from

Andi Heard and Sandy Graban removing limnocorrals from Moat Lake on the Humboldt-Toiyabe National Forest -- dismantling project at the end of field season.

Lyndsay Belt, Biological Science Technician (left) and Andi Heard (right) carrying gear into Hamilton Lake. Photo: Dena Paolilli.

inputs associated with nitrogen deposition, and occur in predominantly granitic watersheds with relatively little soil and vegetation. Thus there is little capacity to absorb or buffer nitrogen inputs.

Andi's research will estimate nutrient criteria (concentrations in lake water) and the rate of atmospheric nitrogen deposition that produces an unacceptable impact on high elevation lakes of the Sierra Nevada through observation and experimentation. Her project goals and general approach are to:

1. Establish nutrient criteria (in the form of lake nutrient concentrations) for aquatic ecosystems in the Sierra Nevada using nutrient addition experiments in a series of lakes.
2. Apply the nutrient criteria to spatially extensive lake surveys, monitoring data, and long-term records of lake chemistry (Emerald Lake, 1983-2011) to assess the current status and long-term trends of lake ecosystems in the Sierra Nevada.
3. Validate nutrient criteria to assess how broadly it can be applied to Sierra Nevada lakes, how effective a tool it is at identifying lakes affected by human-related nitrogen inputs, and what complexities should be considered when assessing affected lakes.
4. Determine the critical load of nitrogen deposition that produces an unacceptable impact to Sierra Nevada lakes using lake sediments to reconstruct historic conditions and atmospheric inputs and modeling using present day nutrient criteria results. Assess the challenges and limitations of developing critical loads.

In addition to its broader regional applications, this research will help the Sierra Nevada Network meet one of its monitoring objectives: To identify the proportion of SIEN lakes with chemical characteristics above/below threshold values for selected constituents. Andi's research will provide the information to help I&M and Park staff define what concentration(s) of nitrogen are the thresholds of concern for Sierra Nevada lakes.

New Publications

Andrews, E. D. 2012. Hydrology of the Sierra Nevada Network national parks: Status and trends. Natural Resource Report NPS/SIEN/NRR—2012/500. National Park Service, Fort Collins, Colorado.

Edwards, L. M., and K. T. Redmond. 2011. Climate assessment for Sierra Nevada Network Parks. Natural Resource Report NPS/SIEN/NRR—2011/482. National Park Service, Fort Collins, Colorado.

Holmquist, J. G., J. R. Jones, J. Schmidt-Gengenbach, L. F. Pierotti, and J. P. Love. 2011. Terrestrial and aquatic macroinvertebrate assemblages as a function of wetland type across a mountain landscape. Arctic, Antarctic, and Alpine Research 43(4): 568-584.

Mutch, L. S., and A. Chung-MacCoubrey. 2012. Science communication plan for the Sierra Nevada Network inventory and monitoring program: Version 1.0. Natural Resource Report NPS/SIEN/NRR—2012/499. National Park Service, Fort Collins, Colorado.

*Steel, Z. L., M. L. Bond, R. B. Siegel, and P. Pyle. 2012. Avifauna of Sierra Nevada Network parks: Assessing distribution, abundance, stressors, and conservation opportunities for 145 bird species. Natural Resource Report NPS/SIEN/NRR—2012/506. National Park Service, Fort Collins, Colorado.

*Steel, Z. L., M. L. Bond, R. B. Siegel, and P. Pyle. 2012. Avifauna of Sierra Nevada Network parks: Assessing distribution, abundance, stressors, and conservation opportunities for 145 bird species (Appendix A - species accounts). Natural Resource Report NPS/SIEN/NRR—2012/506.A. National Park Service, Fort Collins, Colorado.

**Funded by SIEN I&M Program and Sequoia and Kings Canyon National Parks*

Reports, resource briefs, and other information are available at: http://science.nature.nps.gov/im/units/sien/.

Meet IRMA...

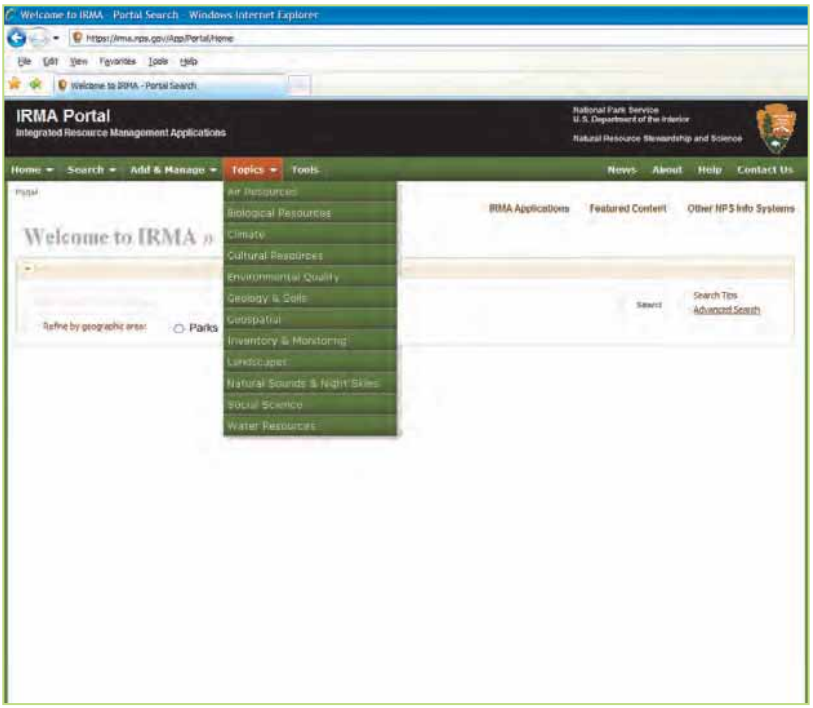
The Integrated Resource Management Applications (nicknamed IRMA) is a web-based "one-stop" intended to make data and information about park natural and cultural resources more accessible.

From IRMA you can search for, view, and download documents, reports, publications, data sets, park species lists, and links to additional data sources. SIEN will continue to update IRMA with more information collected through monitoring projects.

Access to information in IRMA is available to NPS users from an NPS network or NPS computer (via VPN). Many records are also available to the general public, and this number will be steadily increasing as the initial quality assurance steps continue and sensitive data are protected.

For more information, visit this url:
http://science.nature.nps.gov/im/datamgmt/IRMA.cfm

NPS staff can link directly to the IRMA database:
https://irma.nps.gov/App/Portal/Home



The Integrated Resource Management Application database contains a variety of natural and cultural resource data, reports, and other information about national parks. IRMA was developed by the NPS Office of Natural Resource Stewardship and Science.

Gray-crowned Rosy-Finch

In the harsh mountain zone called the alpine – where all life struggles against blasting winds, brittle cold and scarce oxygen – lives a cheery little bird whose bright colors and antics delight mountaineers. Navigating high winds on long, graceful wings, and with feathered nostrils that block out blowing snow, the rosy-finch is a true extreme-environment specialist. Its favorite foods are lowland insects, which become entrapped in rising winds that then deposit them by the thousands onto alpine snow banks. During the summer, rosy-finches frequent the edges of glaciers and snow banks, consuming refrigerated seeds and insects released by the melting snow. With such a smorgasbord, it's no wonder they fill the air with their ringing "chew" calls. --David Lukas, Los Angeles Times, The Outdoor Digest, Field Guide

Ecology and Distribution

If you have traveled to the high country of the Sierra Nevada, you have probably seen Gray-crowned Rosy-Finches (or Rosy-Finches for short). They are one of the few local birds that can live year-round above 8,000 feet. They are known for being somewhat fearless around people. No peak is too high or too rugged for these birds. They regularly visit the highest Sierra Nevada summits such as Mt. Whitney in Sequoia and Mt. Lyell in Yosemite.

Gray-crowned Rosy-Finch in Yosemite National Park. Photo: Ryan Carlton.

The Gray-crowned Rosy-Finch breeds in tundra and high-alpine habitats of northern and montane western North America, specifically in the Brooks, Rocky, Cascade, and Sierra Nevada mountain ranges, as well as the Aleutian and Pribilof Islands, and winters in the breeding range and throughout the Great Basin. The central to southern Sierra Nevada provides particularly important habitat for one California subspecies of Rosy-Finch.

Rosy-Finches forage for seeds and insects in alpine and subalpine meadows, alpine tundra, along alpine lakeshores, and on snowbanks and glaciers where they feed on upslope, wind-dispersed insects. In winter the birds migrate down the east slope of the Sierra and forage on barren ground, sagebrush scrub, and open Pinyon-Juniper woodlands.

Reproduction

Rosy-Finches may be the highest-altitude breeding bird in North America. The young are hatched from nests concealed in crevices on fractured, vertical cliffs or among the large boulder fields below. They also have bred in abandoned mine shafts, rock walls of structures, and under a bridge on the Tioga Road. The adults take long foraging expeditions, using their specialized cheek pouches to haul loads of seeds and insects to hungry chicks.

Photo from: Montana Dept. of Fish, Wildlife, and Parks.

Stressors

Non-native Species: Non-native trout in high-alpine lakes may be a potentially significant impact on the Gray-crowned Rosy-Finch. In recent research conducted by Peter Epanchin at UC Davis, significantly more finches were observed foraging at alpine lakes without fish than fish-containing lakes, and number of foraging birds was correlated to the number of mayfly nymphs collected. While Rosy-Finches eat seeds as well as insects, adults commonly feed insects to their young because they are high-quality, protein-rich, easily assimilated food for chicks. The lack of availability of mayfly prey at many stocked lakes increases travel costs and may decrease breeding success of these finches.

Climate Change: This species may be susceptible to changes in temperature, precipitation, and oxygen levels that could occur in high-elevation areas as a result of climate change. For example, loss of snowpack may reduce insect prey and warmer temperatures may cause other species to encroach on the finch's breeding habitat. Conversely, increasing temperatures may allow Rosy-Finches to conserve more energy on breeding grounds, allowing them to reduce foraging activities or giving them the ability to produce more than one brood per year.

Gray-crowned Rosy Finch is one of many species monitored through SIEN's bird monitoring project.

Some of this information came from recent reports assessing the status of 145 Sierra Nevada bird species by The Institute for Bird Populations. Visit these links for more information: ***main report*** *or* ***species accounts****.*

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The Sierra Nevada Monitor is published twice a year for Sierra Nevada Network park staff, our partners, and others interested in resources management and science in Sierra Nevada national parks.

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You can find resource briefs, reports, and more on our website: http://science.nature.nps.gov/im/units/sien/

Where Are We?

Field monitoring during the next few months includes:

	May	June	July	August	September
Bird Monitoring	YOSE, SEKI	YOSE, SEKI	YOSE, SEKI, DEPO		
Lake Monitoring			YOSE	SEKI, YOSE	SEKI, YOSE
River Monitoring		**YOSE - field sampling**	All Parks- Monitoring by others with existing gages in a subset of major river drainages.		