Program News

National Park Service
U.S. Department of the Interior

Inventory and Monitoring

Sierra Nevada Network

Photo by Bob Meadows

Inventory and Monitoring Program

Imagine being responsible for protecting an entire national park whose resources are poorly known. That's what park managers faced until recently.

The Inventory & Monitoring (I&M) Program was charged by Congress with inventorying vascular plants, vertebrates and physical resources to give managers the information they need to protect parks effectively.

After the inventories, scientists in 32 park networks select "vital signs" to track park health, much as physicians use blood presssure and pulse for a snapshot of human health. Water quality and rare or non-native species are possible indicators in the Sierra Nevada Network -- Yosemite, Sequoia, Kings Canyon, and Devils Postpile.

New Yosemite Orchid Found

Platanthera sp. discovered during 2004 season. USGS photo

A pungent odor offered the first clue that researchers had found an unusual orchid. The scent was familiar, but hard to pin down."I finally decided that it smelled like a corral of horses on a hot afternoon," says Dr. Alison Colwell, a U.S. Geological Survey (USGS) botanist.

Colwell discovered the new orchid in a remote Yosemite meadow during a 2004 Inventory & Monitoring survey.during a 2004 Inventory & Monitoring survey. Finding a new species in a well-studied park "was like being in a candy shop," Colwell says.

The Yosemite bog-orchid, collected before but not recognized as a distinct species, is 12 to 18 inches tall with pea-sized chartreuse flowers that are easy to miss, except in the slanted light of afternoon. Its pungency might attract fly or mosquito pollinators.

Colwell and USGS ecologist Peggy Moore have found several hundred of the bog-orchids in 8 wet sites in the central part of the park.

With Dr. Charles Sheviak, of the New York State Museum, the researchers will submit the orchid's description to a scientific journal this spring.

Dr. Alison Colwell and Angela Sanders, an SCA working on the rare plant survery. USGS photo

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The National Park Service has implemented natural resource inventory and monitoring on a servicewide basis to ensure all park units possess the resource information needed for effective, science-based managerial decision-making, and resource protection.

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Mailing List
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The National Park Service cares for the special places saved by the American people so that all may experience our heritage.

How Do We Select Vital Signs?

While doctors have well-established vital signs of human health (heart rate, respiration, etc.), ecologists and other scientists have a less complete understanding of how to measure the condition of something as complex as a whole ecosystem. The process the Sierra Nevada Network has used to identify, prioritize and select vital signs has included:

- Park-level workshops with park staff and scientists from universities, US Geological Survey, US Forest Service and other agencies to summarize important components and processes in the ecosystem and to identify potential vital signs that would tell us about how the system is changing.
- Writing reports from the workshops, compiling vital signs from all parks into one comprehensive list. We ended up with a total of 86 vital signs to evaluate
- Conducting a network-level workshop to prioritize all the vital signs. This was done with about 40 park staff and USGS scientists split into 4 work groups—aquatic, vegetation, wildlife and ecosystem processes/human use. Each group prioritized the set of vital signs pertaining to their subject area and using a set of criteria that addressed ecological importance, indicator quality and management significance.
- The network's Science Committee had a series of meetings to select a set of 12 vital signs from workshop prioritized list, considering things such as feasibility, partnership opportunities, importance to ecosystem and prioritization rank.
- The Board of Directors (Park Superintendents and Chiefs of Resource Management) met in late August with the Inventory & Monitoring staff to review and approve the vital signs.

So, what are the vital signs we will be monitoring? They include the following: weather and climate, snowpack, surface water dynamics (flow of streams and rivers), alien invasive plants, forest stand population dynamics, meadow and wetland condition (vegetation, invertebrates and/or water dynamics), amphibians, birds, fire regimes and landscape mosaics. Stay tuned for future issues when we explain these in more detail!

Vital signs prioritization workshop at Bass Lake, CA in March 2005. NPS Photo.

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Definitions

*Vital Signs are a subset of physical, chemical, and biological elements and processes of ecosystems that are selected to represent the overall health or condition of park resources.

*Monitoring goes a step beyond inventory; it detects resource changes or trends by sampling the same sites over time. If change exceeds predetermined limits, managers may act to ensure resource protection.

Inventorying Sierran Bats

Juvenile spotted bat. Photo by Wm. Rainey.

Soft, warm, and with ears like Yoda, they usually weigh less than a first-class letter. Beyond the range of human hearing, the night sings with their calls, which they use to nab tiny prey. But these little-known creatures, whi ch conjure both wonder and fear in the human mind, sometimes blunder into a gentle trap -- a net strung over a stream.

"We catch low-flying bats feeding on aquatic insects and open-air flyers coming in to drink," says Dr. Elizabeth D. Pierson, who surveys bats in Sierra Nevada Network parks for the Inventory & Monitoring Program. Her purpose? To discover which species live here, where they reproduce, and where they feed -- no easy task with tiny, flying night creatures that often evade capture.

Pierson and her colleagues found 17 bat species in network parks: 17 share the Yosemite landscape, while 15 species live in Kings Canyon and 14 in Sequoia. Ten species were found in Devils Postpile, where no one had ever surveyed for bats.

Sierra species vary from the light brown pallid bat to the small, Holstein-esque spotted bat, which sports black fur, large white spots and pink membranes.

Sierra bats roost in caves, on the undersides of leaves, or in inch-wide cracks in rock, among other spots. Most eat moths, mosquitoes, and other insects, but some even feast on scorpions.

Knowing bat habits and habitats "can help park managers decide on the timing of their work," says Les Chow, a U.S. Geological Survey wildlife ecologist based in Yosemite. For example roadwork would have to wait if bridge-roosting bats were hibernating or caring for pups too young to fly, he says. Managers can also direct climbers around cliff-roosting species to protect them, he says.

Such protection is crucial to bats' survival. Of the 18 total species thought to live on the Sierra's western slope, 10 are considered species of special concern by the California Department of Fish and Game, the U.S. Fish & Wildlife Service, or the U.S. Forest Service. Bat populations may be dwindling. New development can destroy their roosts, and insecticides poison the prey they depend on, and may harm them.

Bats serve their fellow creatures, by munching on mosquitoes and other pesky insects, and theyalso fertilize soil with their nitrogen-rich guano.

Bats may fly miles between where they feed and where they roost, thus providing one of nature's few ways to move nutrients uphill from streams and other fertile areas to higher, less fertile slopes. "They're nutrient pepper-shakers," says Dr. William E. Rainey, who works with Pierson on Sierra bat studies.

To study the bats, Pierson and Rainey net bats, they record and computer-analyze bats' echolocation calls to detect species not easily caught because they fly too high -- up to 1,000 feet -- or because they sense and avoid nets.

The recordings are "reshaping how we think about bat habitat," Pierson says. They found that a single bat species -- the little brown bat -- manages to reproduce above 8,000 feet in the Sierra. Though little brown bats dwell in buildings in the low country, no one's sure where they live at high elevations.

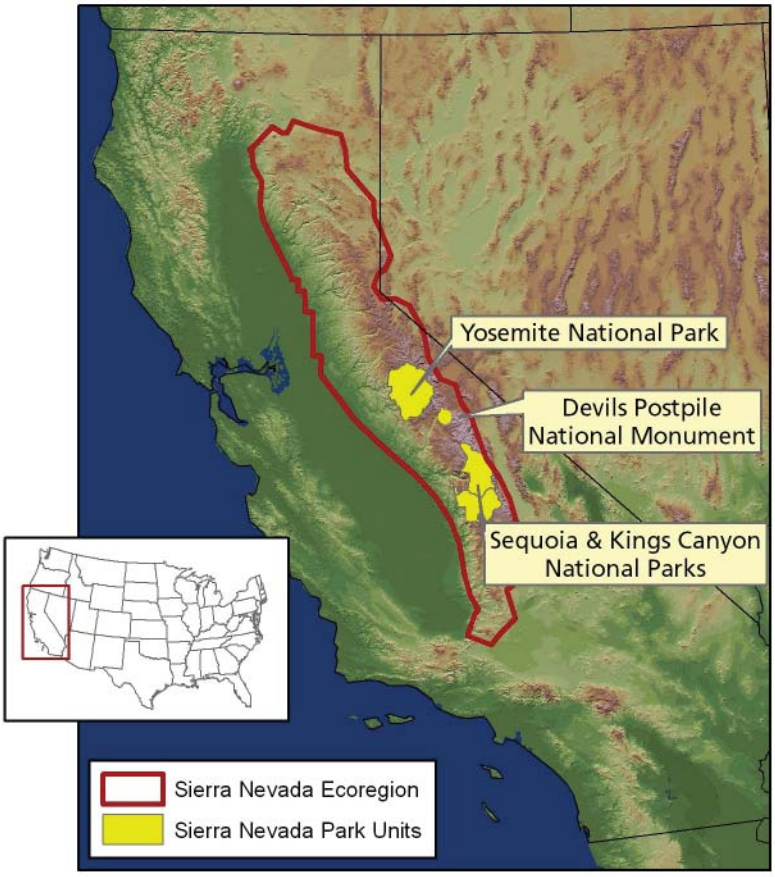
"Are they roosting in trees? Or cliffs?," says Pierson. "We don't know. There's a lot not known about bats."

The Sierra Nevada Network

The Sierra Nevada Network includes four park units:
Devils Postpile National Monument, Kings Canyon National Park, Sequoia National Park and Yosemite National Park.

The Sierra Nevada Network parks have a wide elevation range (1,200 to over 14,000 feet), complex topography, and high biological diversity. Vegetation ranges from foothill oak woodlands and chaparral to conifer forests, montane meadows and low-growing alpine vegetation. The region has a Mediterranean climate—warm to hot dry summers, and cool to cold wet winters.

The parks span seven major watersheds and protect a diversity of water resources, including 4,500 lakes and ponds, thousands of kilometers of rivers and streams, seeps, wet meadows, waterfalls, hot springs, mineral springs, and karst springs. The region is noted for its spectacular geology—massive granite outcrops and domes, volcanic basalt columns, glacial valleys, deep canyons, and hundreds of limestone caves.



Plant Inventories

Sierran national parks and forests are responsible for "ensuring the survival of many plants that occur nowhere else in the world," says Sylvia Haultain, plant ecologist at Sequoia and Kings Canyon national parks. Rare plants are vulnerable to extinction, Haultain says, so park staff must learn as much as possible about them to prevent human actions from accidentally leading to the loss of a species.

The Inventory & Monitoring Program requires parks to document 90% of their vascular plant species and to determine the status of rare and introduced plants.

Having met the former requirement, Yosemite, Sequoia, and Kings Canyon staff focused on rare and introduced species. Devils Postpile, on the other hand, was surveyed thoroughly for the first time. Survey results include:

Devils Postpile
· Brought documented plant taxa from 169 to 380, a 125% increase.
· Added three rare species to the park list.

Sequoia and Kings Canyon
· Surveyed for 25 rare plant species and added one species to the park list.
· Found several new populations of rare plants, including an iris and a lily, both endemic to Tulare County.

Yosemite
· Surveyed 127 populations of 35 rare plant species and added nine species to the park list.
· Developed and tested a software program that helps predict where rare plants might be found.

Juliet Lao on the rare plant survey in Sequoia and Kings Canyon National Parks. Photo by C. Bartlett.