National Park Service
U.S. Department of the Interior

Natural Resource Stewardship and Science
Inventory & Monitoring Division

Checking Lassen's Vital Signs

Klamath Network Science in the Park

National parks are the guardians of our unique American natural and cultural history. But perhaps more than ever before, parks exist in a rapidly changing landscape. Urban growth, replacement of native species by exotics, air and water pollution, increasing visitor use, and climate change all impact the natural web of life. This leads us to ask:

How healthy are our parks? How are they changing?

To answer these questions, the National Park Service clustered parks into 32 Inventory and Monitoring Networks. In 2010 at Lassen Volcanic and nearby parks, the Klamath Network began monitoring natural resources, called "vital signs," that serve as red flags if conditions deteriorate. Through repeated visits to fixed sampling sites over time, we track status and trends in park conditions to support park managers' efforts to make science-based management decisions.

Alice Chung-MacCoubrey, Program Manager, oversees network activities and leads bat monitoring

Eric Dinger, Quantitative Ecologist, leads aquatic monitoring

Lauren Youngblood, Vegetation Ecologist, leads native and invasive plant monitoring

Allison Snyder, Data Manager, ensures data quality, integrity, and security

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What do we monitor at Lassen Volcanic National Park?

Water Quality and Aquatic Life

Collecting stream bugs (aquatic insects) at Summit Lake

Life flourishes in and near water, from the tiny aquatic insects that feed frogs and colorful warblers, to the lush vegetation prized by myriad wildlife. In the summer months, Lassen's high mountain ponds and lakes draw long-toed salamanders (*Ambystoma macrodactylum*) from the forest to breed. In Lassen's cold, clean streams, native rainbow trout (*Oncorhynchus mykiss*) compete with their exotic cousins, brown trout (*Salmo trutta*) and brook trout (*Salvelinus fontinalis*) for tasty aquatic insects. But Lassen's water is vulnerable to climate change and other stressors, like heavy backcountry use near shorelines. We sample fish, aquatic organisms, streamside plants, and water chemistry to track the health of the park's ponds and lakes.

https://www.nps.gov/im/klmn/streams.htm
https://www.nps.gov/im/klmn/lakes.htm

Some resources we measure:

- water quality, like oxygen, pH, and cloudiness (turbidity)
- water chemistry, like nutrients (nitrogen, phosphorous) and salts
- water quantity, like stream discharge
- habitat features, like streamside vegetation and in-stream woody debris
- amphibians, algae, and aquatic macroinvertebrates (stream bugs)

Land Plants and Early Detection of Invasive Species

Lewis' monkeyflower (*Mimulus lewisii*)

Yellow salsify (*Tragopogon dubius*)

Lassen's plant communities range from highly diverse streamside thickets, with the showy Lewis' monkeyflower, to much simpler conifer stands near treeline. This vegetation feeds, shelters, and provides breeding habitat for insects and wildlife. But changes brought on by invasive species and climate change can disturb these communities and ripple through the entire ecosystem. To track this basic building block of Lassen's ecological health, we monitor plant abundance and variety. We also track woody debris conditions intricately tied to fire behavior.

While most of our vegetation plots sample relatively undisturbed areas, including wilderness, other areas in Lassen contend with nonnatives (plants that evolved in a different place), like yellow salsify and bull thistle (*Cirsium vulgare*). Although these nonnative invaders can wreak havoc, outcompeting native plants, monopolizing water, and changing the soil, Lassen is fortunate to have very few—most commonly, the relatively harmless dandelion. We survey park travel corridors, like roads and trails, where nonnatives most commonly appear.

Some resources we measure:

- cover and diversity of native plants
- cover and diversity of nonnative plants
- regeneration, by tree seedling counts
- mortality, by counting recently dead trees
- fuel availability, by measuring woody debris and litter and duff depths
- live tree characteristics, like volume (basal area), canopy health, and height

https://www.nps.gov/im/klmn/vegetation.htm
https://www.nps.gov/im/klmn/invasives.htm

Whitebark Pine

Admiring the view while sampling a whitebark pine plot

On the forested shoulders of Lassen Peak, the iconic whitebark pine (*Pinus albicaulis*) weathers the harsh, subalpine climate just below treeline. Its high-energy seeds feed Clark's nutcrackers (*Nucifraga columbiana*) and squirrels. Its roots stabilize the thin rocky soil. Its shady branches prolong the snowmelt that sustains Lassen's streams. But white pine blister rust, a nonnative fungal infection, and mountain pine beetles (*Dendroctonus ponderosae*) have taken a toll on this keystone species. We monitor tree conditions and the extent of both blister rust infection and beetle damage to support park management and larger-scale research throughout the West to protect this imperiled species.

Some resources we measure:

- tree size (diameter at breast height), height, and condition (live vs dead)
- abundance of seedlings and cone-bearing trees
- mistletoe and blister rust infection, and mountain pine beetle infestation

https://www.nps.gov/im/klmn/whitebark.htm

Birds

Golden-crowned kinglet (*Regulus satrapa*)

Birds delight us with song and beauty, but also with scientific data! Easily detected, they are good indicators of ecological health because they respond quickly to environmental change. With the Klamath Bird Observatory, we monitor landbird communities (excluding water- and shorebirds) at Lassen. These include the tiny but abundant golden-crowned kinglet that flocks elusively through the treetops, whispering its high, thin song. Our results also contribute to regional landbird tracking projects, like the Avian Knowledge Network Northwest.

During the breeding season, we count birds along transects to determine

- the variety of species present
- the relative abundance of each species in the park

https://www.nps.gov/im/klmn/landbirds.htm

Explore the Klamath Network website

- Learn more about inventory and monitoring in the park, including how we monitor adjacent land use as an additional "vital sign"
- Access our Featured Creature natural history articles and Klamath Kaleidoscope newsletters
- Download a species list for the park
- Watch an 8-minute video telling our vital signs monitoring story

Contact us!

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Contact Lassen Volcanic National Park to learn more about

- the park's exceptionally dark night sky
- bat monitoring in Lassen

Park email: lavo_information@nps.gov