National Park Service
U.S. Department of the Interior

Natural Resource Stewardship and Science
Klamath Inventory and Monitoring Network

The Klamath Kaleidoscope

Newsletter of the Klamath Inventory & Monitoring Network

Spring/Summer 2016

Connecting People with Nature at the Whiskeytown National Recreation Area BioBlitz

When a teenager approached Jen Gibson and Alice Chung-MacCoubrey at the Whiskeytown BioBlitz to ask how she could become a biologist, Jen and Alice knew they had sparked something special.

"…That was the objective of the BioBlitz," says Jen, Chief of Interpretation and Resource Management at the park, "if you reach out to one or two people it's a huge success… getting kids excited… it was perfect, it made it all worth it, right there."

The May 13/14 BioBlitz festival at Whiskeytown National Recreation Area invited local students and the public to learn about the plants and animals that also call northern California their home. This exploration of biodiversity was one of over 250 BioBlitzes held nationwide to celebrate the National Park Service Centennial. It was focused more on engaging the community than typical BioBlitzes, which tend to conduct parkwide inventories of a specific resource. Activities were held at the Whiskeytown Environmental School grounds inside the park, providing an opportunity to showcase this school for outdoor education in Shasta County since 1971.

Playing in Streams

Klamath Network scientists joined the fun by leading hands-on activities in their areas of expertise. Eric Dinger, Aquatic Ecologist for the Network, splashed around in the creek with twenty-five 4th graders to teach them about stream ecosystems and their aquatic macroinvertebrate inhabitants. Eric had a dynamic presentation that even included a costume change from a nerdy scientist into Indiana Jones to exemplify how science can be

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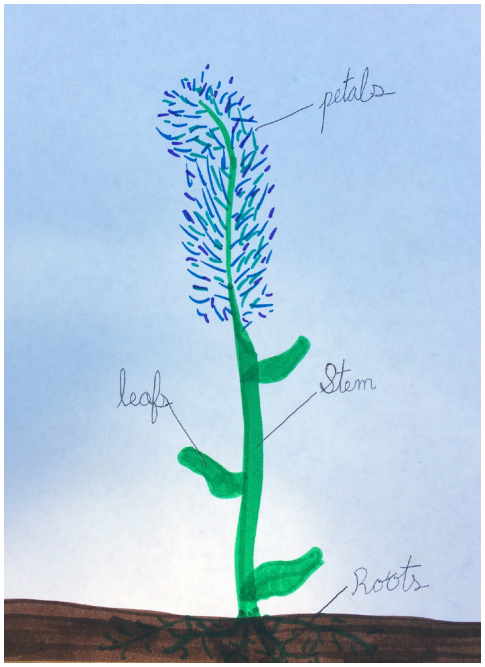
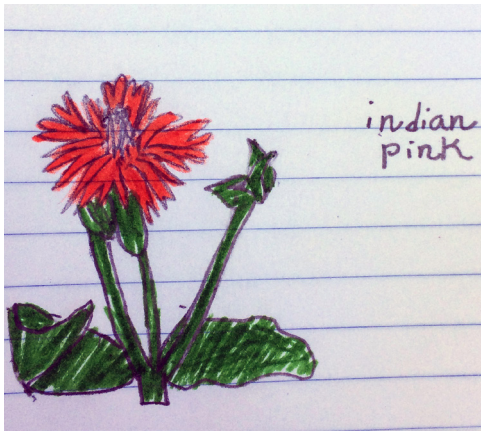
Searching for aquatic macroinvertebrates in the stream.

adventurous and exciting. Students turned over rocks to find these tiny insects, plopped them into petri dishes, and then examined them under a microscope set up on shore. They learned about the unique life history of these bugs, where, unlike humans, the fleeting time they spend as adults is a small fraction of their much longer period as juveniles (nymphs).

Sketching Plants

Sean Smith, the Network Botanist, helped unleash the inner artist in his group of 3rd and 4th grade students as they drew the different parts of plants they had encountered on their hike together. The students took this artistic time very seriously, with lots of children quietly comparing drawings of the flowers that they encountered. Students also learned about plant biology. Sean used a concept near and dear to a kid's heart—food— to explain how plants use photosynthesis to convert light into food for the animals that eat them. Some surprised students learned that cereal actually came from plants.





Students sketched and labeled their favorite flowers from a botany hike.

Eric Dinger shows students a petri dish containing aquatic macroinvertebrates.

Netting Bats

Alice Chung-MacCoubrey, Program Manager for the Network, helped Humboldt State University bat researchers (Joe Szewczak, Leila Harris) conduct an evening of mist-netting, which also included discussion about bat biology, ecology, and emerging threats (White Nose Syndrome in western states). While the moon, abundant water, and light breeze made it difficult to catch bats, two female California myotis (*Myotis californicus*) found their way into the nets. Visitors who lingered late into the night got to see these tiny bats, each weighing about as much as a nickel. Sound recorders put out for the event also detected bats in the area, including the first ever documentation of a canyon bat (*Parastrellus hesperus*; formerly western pipistrelle) in the park!

Klamath Network Inventory & Monitoring Program

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 management, decision-making, and resource protection.

Parks in the Klamath I&M Network:

- Crater Lake National Park
- Lassen Volcanic National Park
- Lava Beds National Monument
- Oregon Caves National Monument and Preserve
- Redwood National and State Parks
- Whiskeytown National Recreation Area
- Tule Lake Unit of WWII Valor in the Pacific National Monument

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Whiskeytown BioBlitz *(continued)*

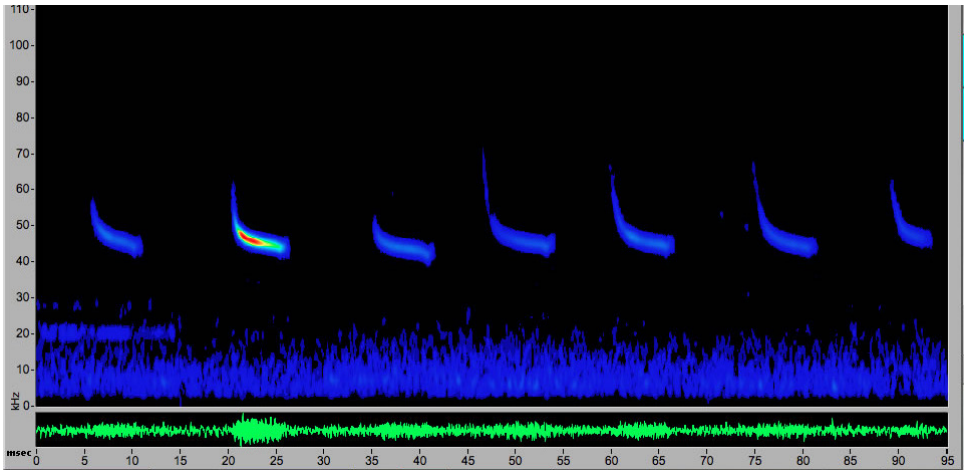
More Fun

Many other activities rounded out the event, including

- bird-watching with the Wintu Chapter of the Audubon Society
- lichen discovery along Brandy Creek with the California Lichen Society
- searching for bees and butterflies with UC Davis scientists
- exploring native plants with the California Native Plant Society
- geocaching fun with Shasta College Natural Resource staff
- a wolverine discussion with the wildlife biologist from Sierra Pacific Industries who caught one on camera
- a presentation about Native American traditional cultural practices by Local Indians for Education
- touring salmon restoration efforts in Lower Clear Creek with the US Fish and Wildlife Service
- nature crafts, art and music

Observations of species encountered over the weekend were loaded into iNaturalist, an online database available to the public that functions a little like a social network tool for biologists and aspiring naturalists. Teachers who brought their classes to the BioBlitz will also be able to have fun with iNaturalist by viewing and comparing their students' contributions.

Jen Gibson met with collaborators once a month for a year to plan the event. Though time consuming, Jen sees the effort as a big success, connecting 400 to 500 attendees with a wide variety of local conservation groups. She also hopes the festival awakened an interest in biodiversity and the importance of conservation. If the young woman's curiosity about how to become a biologist is any indication, it accomplished that goal as well.



Sonogram of a canyon bat (*Parastrellus hesperus*) detected at Whiskeytown NRA. Scientists can identify individual bat species by the shape, frequency, and intensity of the bat's ultrasonic calls. Image: Joseph Szewczak.

On the Prowl for Invasive Plants

With adversaries like the Klamath weed (*Hypericum perforatum*) and Himalaya berry (*Rubus armeniacus*) relentlessly seeking a foothold in Klamath Network parks, controlling the spread of invasive plants is a "never-ending battle," says Sean Smith, Network botanist. The good news is that I&M crews are steadfastly on the lookout for new infestations as part of their Invasive Species Early Detection monitoring program. Moreover, tools for predicting their occurrence keep improving.

Himalaya blackberry (*Rubus armeniacus).* Photos courtesy Tom May, J. Brew, Creative Commons.

The threat to parks from nonnative, invasive species was the number one priority during the Network's original vital signs planning because of the many ways these species can harm native ecosystems, including

- Replacing native vegetation
- Impacting rare species
- Changing ecosystem structure
- Altering nutrient cycles and soil chemistry
- Shifting community productivity
- Changing water availability
- Altering disturbance regimes

Klamath weed (*Hypericum perforatum*). Photo courtesy retemirabile, Creative Commons.

The Network's monitoring protocol for this vital sign focused on invasive plants, as they are the most pervasive problem facing parks.

Every other year since 2009, Klamath Network staff have embarked on a full six months of travel around to all six of the Network parks to battle the spread of invasive plants. When they find a new or especially worrisome area of infestation, they pass their findings on to park managers right away. This early warning can make a big difference in a park's ability to stop the spread, since new invasions typically have a waiting period before rapidly expanding. At the end of the field season, the Network makes both spatial and tabular data available to the parks showing the location of invasive species detected that year.

Smaller parks in the Network without a dedicated botanist on staff, like Lava Beds NM (LABE), rely on the extra eyes and technical expertise I&M crews can offer. Nancy Nordensten, Chief of Resources at LABE, applies for project funding to help control invasives, but since the funding is not guaranteed, sometimes I&M crews provide the only alert of what is popping up in the park. Last year, for example, I&M crews were the only weed survey crews in the monument, and LABE used their findings to steer its Youth Conservation Corps crew out to treat the infestations.

"Having somebody out there looking and seeing and letting us know has been the most valuable help," says Nordensten.

Contrary to what people might think, the invasive species early detection program has zero overlap with the areas monitored by the Network's vegetation monitoring program. Vegetation monitoring randomly samples areas >100 m from roads and trails to track changes in plant communities parkwide. The invasive species program focuses instead inside a 20 m buffer around roads and trails, where the disturbance that attracts invasive plants is most likely to occur.

Sean admits that every time one infestation gets dealt with another one pops up, but he's enthusiastic about new and improved tools. Using GIS-mapping and predictive modeling, for example, he says,

"We are collecting data that can assist with predictive habitat modeling to be able to say that this invasive species is very likely to be in this area, and it's probably not going to be over there."

I&M crews will be back out to the parks next summer with a determined outlook and GPS units in hand.

Tailed Frog Surveys at Crater Lake National Park

Unlike a frog's body, human hands are not designed to linger in freezing cold water for more than a few seconds. But lingering underwater, turning over rocks and debris all day long is the fate of any hands in search of coastal tailed frogs (*Ascaphus truei*) at Crater Lake National Park.

Coastal tailed frog (*Ascaphus truei*).

Dave Hering, fisheries biologist with the park, has been documenting the frog's whereabouts since 2010 with the help of undergraduate interns from Scripps University and Southern Oregon University. While his main focus is on conservation of native bull trout in the park, Hering has supervised two tailed frog projects, in addition to squeezing in his own surveys for them without a dedicated budget. His work provides more detailed information about the frog than the incidental presence/absence data collected by the Klamath Network I&M stream monitoring program in the park.

Hering is interested in studying these frogs at Crater Lake for several reasons. Amphibians are of special interest from a conservation perspective because of their worldwide decline, and little is known about tailed frogs in the park. More specifically, Hering's work on the impact of nonnative fishes, such as the eastern brook trout, on native aquatic ecosystems in the park has led him to question whether they might also be having an effect on tailed frogs.

Tailed frogs hail from an ancient lineage that diverged a long time ago from other frogs, with few close relatives. The only other species in the family is the Rocky Mountain tailed frog (*Ascaphus montanus*), found further inland. Several traits make these creatures unique. They inhabit cold, fast-flowing streams, unlike most other pond and lake-dwelling amphibians in the park. Several adaptations make it possible to survive in this habitat. The "tail" on the male frog is actually an extension of the male cloaca, enabling it to internally fertilize the female's eggs. Tailed frogs are the only North American frogs that have internal fertilization, which presumably provides some advantage in fast-flowing stream conditions. Unlike most other tadpoles, tailed frog tadpole mouths are essentially modified suction cups that enable them to grip cobble in the streambed.

"These are pretty amazing looking little frogs actually," says Hering, "they have real granular skin, and because they live in flowing water for much of their life, their bodies are dorso-ventrally (top to bottom) flattened so they can hunker down and stay close to the rocks and not get blown downstream by the current."

Early surveys for the tailed frog, beginning in the 1950s, documented their occurrence in tributaries of the Rogue River on the west side of the park, where they continue to be found, particularly in the Castle Creek watershed. The first project Hering supervised, in 2010 and 2011, found differences in tailed frogs above and below a waterfall that formed a natural barrier to brook trout, suggesting that the frogs below the waterfall were being impacted by the nonnative trout.

Last year, Hering helped a student set up the most thorough survey to date of potential tailed frog sites throughout the west slope drainages, including several sites monitored by the Klamath Network I&M program. By co-locating frog surveys with I&M monitoring sites, the project

Suction-like mouthparts of a tailed frog tadpole that allow it to grip cobble on the bed of fast-flowing streams while grazing. Photo courtesy Gary Nafis, californiaherps.com.

Tailed Frogs *(continued)*

Scripps University student Isobel Whitcomb and NPS biologist Dave Hering search for coastal tailed frogs in a headwater stream at Crater Lake National Park. Isobel Whitcomb photo.

gained access to a suite of habitat data collected by I&M that may help interpret patterns of frog occupancy. Interestingly, survey data suggested that streams in the upper reaches of the park may actually be too cold for tailed frogs, as they were rarely found in waters colder than 6 °C.

"Often in the Pacific Northwest, we associate tailed frogs with pristine cold streams, where the water temperature doesn't get over about 14 °C," says Hering, " but at Crater Lake, many of our headwaters may actually be too cold for the species."

During the past year, Hering has collected environmental DNA (DNA suspended in the water) from streams with potential tailed frog populations. This is a relatively new and exciting tool that can help detect the presence of a species once molecular markers have been established for it—a process that is still in development for the coastal tailed frog. Building on this tool and the recent survey work, Hering ultimately hopes to identify stream reaches with tailed frogs that might benefit from the experimental removal of nonnative brook trout.

He's also looking forward to getting more familiar with the drainages of the upper Rogue River on the west side of Crater Lake, a sort of "untapped frontier" for aquatic ecology in the park. Stream monitoring by the I&M program, which began in 2012, has only recently started to provide information about headwater stream habitat in that area of the park. Hering is hoping that his work with tailed frogs will be broadly applicable to other areas in the western Cascades, where this ancient master of swift streams also makes its home.

Scenario Planning—A Tool for Managing Uncertainty

American pika (*Ochotona princeps*). NPS photo.

"Uncertainty" has always been a thorn in the side of planners. Park managers grapple with uncertainty in many arenas, including future conditions, knowledge about species, and sociopolitical factors that affect their options for action. On top of that, climate change adds a walloping dose of complexity to the mix. In response, the National Park Service Climate Change Response Program has taken an entirely new approach to long-term planning: stop agonizing over the shape of a single future and start rehearsing for multiple futures.

Scenario Planning

This multiple futures approach, known as scenario planning, is being explored by three I&M networks—Klamath, Sierra Nevada, and Upper Columbia Basin—in collaboration with the Oregon Institute of

Scenario Planning *(continued)*

Technology (OIT), Crater Lake Science and Learning Center, and regional experts. Jherime Kellermann, professor of natural sciences at OIT and science coordinator at the Crater Lake National Park Science and Learning Center, is coordinating the effort.

"I think at its core, scenario planning approaches management challenges from a flexible perspective that incorporates our uncertainty about future conditions, many of which are related to climate change" says Kellermann. "Through near-term prioritization we may find currently actionable items that allow greater adaptability and effectiveness later on down the road."

Here's what the process looks like in five steps, according to the NPS Climate Change Response Program's handbook on scenario planning:

Orient yourself to the main issue and the scale for addressing it. Craft your focal question(s).

Explore what is known and not known about the resource, including what drives its condition.

Synthesize the available information into possible future scenarios based on the most important factors.

Act to apply management actions that make the most sense across multiple scenarios ("no regrets" actions) and avoid actions that don't make sense given the range of possible futures ("no gainers").

Monitor the results with an adaptive management approach.

In the past year, the multinetwork collaboration has mined a wealth of information from attendees of two different workshops aimed at completing the first two steps—Orienting and Exploring. Their focal questions were

How might climate change affect montane and high elevation ecosystems of the Klamath, Sierra, and Upper Columbia Basin regions over the next 20-30 years?

How can managers conserve key species with climate change?

What change and management challenges are shared across regions and which are unique to particular parks or regions?

The networks chose two well-studied species as a vehicle to answer these questions: American pika and whitebark pine. Both species are known to be vulnerable to climate change and both occur in all three regions.

Whitebark Pine Workshop

The whitebark pine workshop in September of 2015 was held in concert with the Whitebark Pine Ecosystem Foundation meeting at Southern Oregon University in Ashland. Examples of the most important drivers and factors affecting whitebark pine include the following:

Climate—effects of temperature and precipitation on snowpack and snowmelt dates in high elevations

Biological—need for more understanding of genetics of white pine blister rust resistance

Ecological—dependence on Clark's nutcracker for seed dispersal; impact of fire regimes, mountain pine beetles, and their interactions

Political—constraints on what can be done in Wilderness Areas, where much whitebark pine habitat occurs

Social—current debate over assisted migration will affect management options

American Pika Workshop

The pika workshop in April, 2016, in Bend, Oregon, produced a conceptual model of the drivers and factors affecting pika. Some examples of the most important factors identified include the following:

Climate—effects of warming temperatures on snowpack, vegetation, and disease

Geological—influence of underlying geology on distribution of habitat patches

Biological—how dispersal capacity affects connectivity of metapopulations

Ecological—impact of invasive species, grazing, and fire on vegetation

Technological—pikas are sensitive to capture and manipulation; also hard to detect dead animals

Sociopolitical—how to reframe the pika from an icon in peril to an icon of persistence.

Contribution of I&M Data

According to Kellermann, I&M long-term monitoring data made key contributions during this information-gathering phase:

Whitebark pine (*Pinus albicaulis*). NPS photo.

Scenario Planning *(continued)*

"The monitoring data are absolutely essential…knowing how populations are changing, in what direction, and what factors might be associated with that is just fundamental."

Not only did initial I&M trend data on whitebark pine feed population models, but the partnerships I&M scientists have cultivated with universities and agencies also proved invaluable. For example, the Upper Columbia Basin's work with genetic researchers at Oregon State University provided more in-depth understanding about population connectivity for the pika.

Next Steps

Kellermann is integrating the workshop results into a foundation document that can support the next step: synthesizing this knowledge into actual future scenarios. Each scenario would constitute a set of detailed conditions and a corresponding range of potential management actions to address them. Moving forward depends on funding, but Kellermann hopes to get started on the synthesis phase by 2018. Ultimately, the project would provide multiple future scenarios tailored to ecologically relevant regions and scales useful to park managers.

More Information

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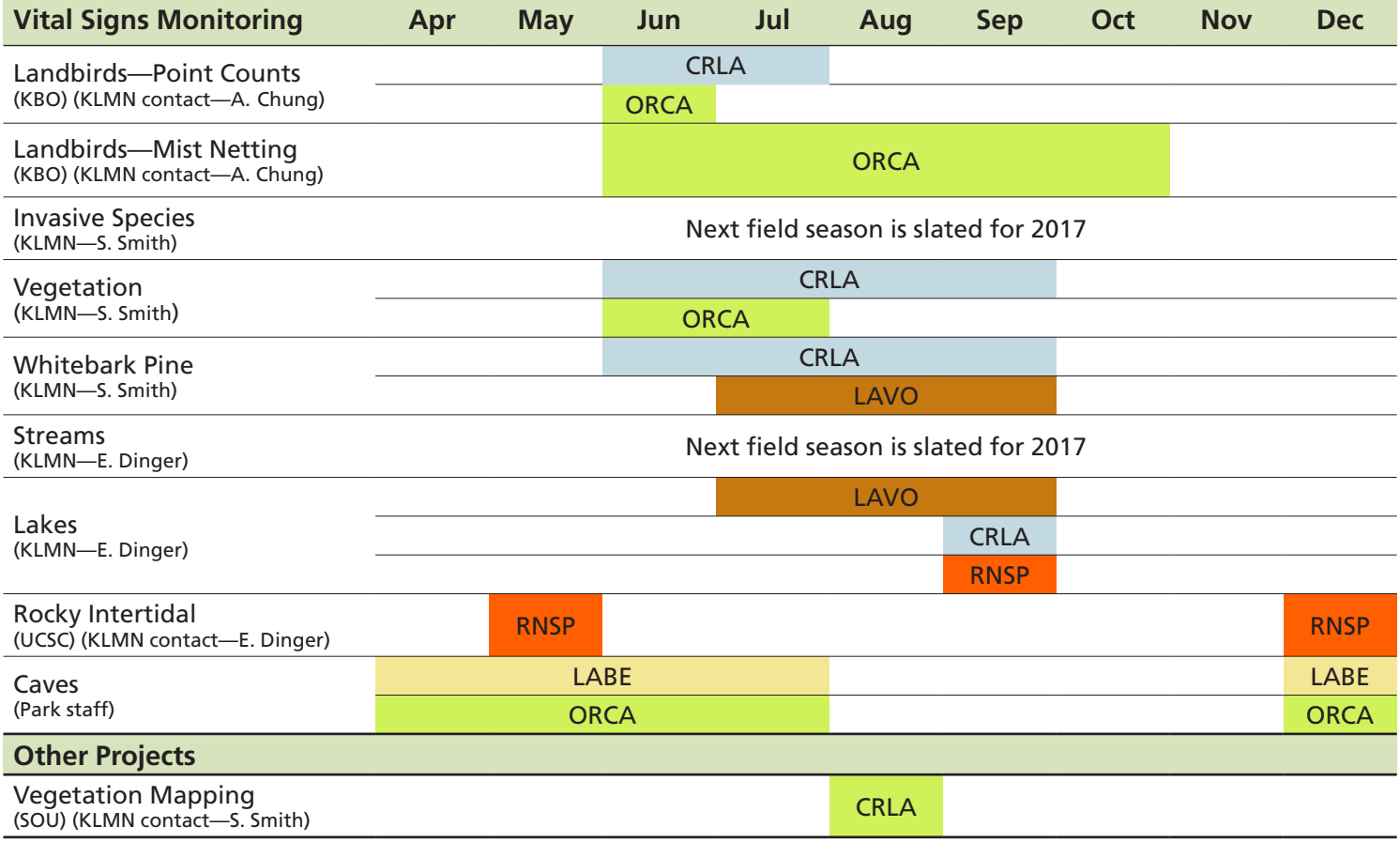
NPS Climate Change Response Program scenario planning handbook:
https://www.nps.gov/subjects/climatechange/upload/CCScenariosHandbookJuly2013.pdf

2016 Field Schedule at Klamath Network Parks



Park acronyms

Crater Lake National Park (CRLA), Lassen Volcanic National Park (LAVO), Lava Beds National Monument (LABE), Oregon Caves National Monument and Preserve (ORCA), Redwood National and State Parks (RNSP), Whiskeytown National Recreation Area (WHIS)

Cooperator acronyms

Klamath Bird Observatory (KBO), University of California at Santa Cruz (UCSC), Southern Oregon University (SOU)