National Park Service
U.S. Department of the Interior

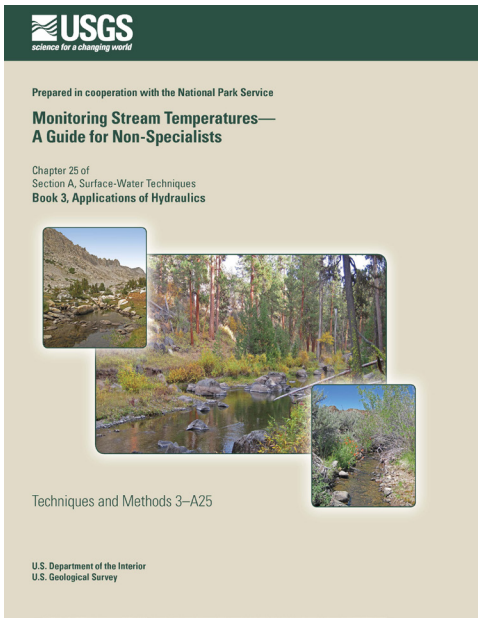
Natural Resource Stewardship and Science
Klamath Inventory and Monitoring Network

# The Klamath Kaleidoscope

*Newsletter of the Klamath Inventory & Monitoring Network*

Spring/Summer 2018

# How Warm is the Water in Your Park?




New user-friendly guidance for measuring stream water temperature is now available for people without stream monitoring expertise. *Monitoring Stream Temperatures—A Guide for Non-Specialists* was jointly published in April by the National Park Service and the US Geological Survey. The goal is to make it easy for park staff and others without technical stream expertise to collect and manage stream temperature data.

Water temperature is a key measure of the health of a stream. It affects how much oxygen is available to stream organisms and drives important processes. Some network parks, like Whiskeytown National Recreation Area, are at the edge of the range of some species that are especially sensitive to water temperature, like the tailed frog (*Ascaphus truei*). Because of its importance, water temperature is a core measure for several large water quality monitoring programs in the West, including the Klamath Network stream monitoring program.

The drive for this guidance developed from a fortuitous mix-up in purchasing. The Klamath Network found itself with 250 water temperature data loggers slated for cave monitoring that could not actually be used for that purpose because they did not collect relative humidity. They could, however, be used for stream monitoring. For budget and staffing reasons, the Klamath Network could not integrate this method into their stream monitoring. They wondered, however, if others could. If only this stock of loggers could be put to use by folks without technical expertise! Eric Dinger, aquatic ecologist with the network, and his USGS colleagues realized that simple guidance would enable someone at a park, or any layperson, to use this type of logger without technical assistance. Subsequently, they obtained funding through NPS Inventory and Monitoring collaboration funds and the USGS National Climate Change and Wildlife Science Center and wrote the step-by-step guidance.

Dinger is excited to share the new guidance with parks, along with the necessary equipment—data loggers. The aim is to collect more stream temperature data. The data could supplement and "add value to" the existing water quality data for Klamath Network parks. It could also feed into some of the other large water temperature monitoring


Onset U22 data logger with the sensor end circled in red.

## In This Issue

# How Warm is the Water *(continued)*

programs in the West. As the effects of climate change ripple through park ecosystems, tracking changes to water temperature is essential.

The new guidance applies to any water body in the nation, including streams, lakes, and springs. Anyone with access to the equipment can use it to figure out how to

- Program the device
- Calibrate the device
- Install it in the stream
- Decide how often it should sample the temperature
- Download data from it in the field
- Upload the data into associated software
- Contribute the data to Aquarius, the water quality database for continuous data used by the NPS Water Resources Division and USGS

This last step is one of the most important ones! Dinger says they included specific guidance on how to manage the data, because,

"The I&M program emphasizes effective data management, and gone are the days of 'Hey, let's do this, collect some data, and store it in fifteen Excel files on my desktop.' Today, we need to make sure the data we collect is sound, high quality, and available for future generations."

Dinger is pleased to see the project come to fruition with a practical tool to help parks. Like the many collaborations between I&M networks and park staff, universities, and other agencies, partnerships are crucial to monitoring park health.

You can find the new publication online at USGS:

https://nccwsc.usgs.gov/content/new-guide-monitoring-stream-temperature

Stream in Whiskeytown National Recreation Area.

# Whitebark Pine on the Air Waves

Jefferson Public Radio introduced its southern Oregon and northern California listeners to the embattled whitebark pine tree and its plight in an interview with Klamath Network botanist, Sean Smith, in March. Smith talked about the tree's unique role in mountain ecosystems as food for wildlife and a crucial player in ecosystem processes, like recovery from fire. He described the challenges it faces from mountain pine beetle (*Dendroctonus ponderosae*) attack, white pine blister rust infection (caused by the fungus, *Cronartium ribicola*), and competition from mountain hemlock (*Tsuga mertensiana*). Though the tree's widespread decline has made it a candidate for listing under the Endangered Species Act, restoration efforts are underway. Smith describes a multistep project for propagating blister-rust resistant seedlings in Crater Lake National Park.

Listeners also had a chance to learn more about the National Park Service vital signs monitoring programs.

Listen to the full 17-minute interview:

http://ijpr.org/post/national-park-watches-whitebark-pines-decline#stream/2

Whitebark pine on the slopes of Lassen Volcanic National Park.

# Bat Ambassadors Return

Emily Johnson, Geoscientist-in-the-Park, summer 2018.

Efforts to address the recent West Coast arrival of white-nose syndrome in bats are getting a boost this summer. For the second year in a row, the Klamath Network is hiring an intern through the Geoscientist-In-The-Parks program. Emily Johnson will team up with Southern Oregon University intern, Danielle Green, to conduct bat surveillance, population monitoring, and public outreach in Klamath Network parks. Johnson is from Albuquerque, New Mexico. She graduated from the University of New Mexico with a BS in Biology. Her position is supported by NPS white-nose syndrome funding.

Johnson arrived first and spent a week trapping bats at Lava Beds NM and Lassen Volcanic NP and swabbing them for evidence of *Pseudogymnoascus destructans*, the fungus that causes white-nose syndrome. With SonoBat software, the two interns will collect acoustic data (bat calls) at Lassen Volcanic NP to learn how forest thinning affects bat species. What they learn about bat populations will also contribute to the national NABat population monitoring effort.

Little brown bat (*Myotis lucifugus*), one of the more common bats in the area. Photo courtesy Dr. J Scott Altenbach

Sharing this knowledge with the public is vital to bat conservation. Johnson will participate in a "bat chat" at Whiskeytown NRA on June 2, and both interns will participate in the Dark Sky Festival at Lassen Volcanic NP on August 3–5.

**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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# Southern Oregon University Intern: Erica Rudolph

Erica Rudolph likes adventure. She grew up surfing with her mom and camping in the high Sierra with her family. This past summer, in 2017, she returned to the high mountains for a more academic endeavor—to study the whitebark pine as a Southern Oregon University student intern.

Southern Oregon University intern, Erica Rudolph.

The whitebark pine is a keystone species of high elevation subalpine zones, just below tree line. Bears, Clark's nutcrackers, and squirrels are among the wildlife that depend on the nutritious seeds in its cones for food. The whitebark pine also plays an important role by prolonging snowmelt with its shade and stabilizing the thin, rocky soil of the subalpine. But drought, mountain pine beetles, and a nonnative, invasive fungus, *Cronartium ribicola*, are taking a heavy toll on this tree. The Klamath Inventory and Monitoring Network tracks the status of whitebark pine and evidence of infection by the fungus at Crater Lake and Lassen Volcanic National Parks as part of its vital sign monitoring program. Rudolph participated in the project through an internship with the network.

Field season started in July, when Rudolph and Sean Smith, botanist with the network, headed out to their high mountain plots, navigating by GPS. On the windswept mountain slopes newly free from snow, they searched for the rebar that marks the corners of 10 permanent monitoring plots, of 30 total plots in each park. Once they located the corner markers, Rudolph and Smith stretched tape into a 50 × 50 m square, which they then divided into rectangular subplots. Next, they moved through the plot to see what had changed from the last visit to this plot three years earlier. They took measure of the trees—identifying species, height, and diameter of all trees, and in the smaller plots, counting seedlings. While collecting this information, they also took measure of white pine blister rust fungus severity. Evidence of its presence includes swollen areas on the tree, fungus fruiting bodies (aecia), roughened bark, and animal chewing. They also noted percent of the canopy still alive. At Crater Lake National Park, evidence of the fungus was widespread.

Collecting data in the mountains is not without challenge. A sudden hailstorm—with chickpea-sized hail—caught them off-guard, forcing them to drop their equipment and make a run for the car. In general, though, Erica loved the work and "just roughing it in tents." One bonus from the summer was the chance to meet other interns at Lassen Volcanic National Park doing similar work.

Back at school, her advisor suggested that she use the experience as the basis for an Independent Honors Senior capstone project. The fieldwork could then earn her two units of course credit. After adding her meticulously collected data to a growing body of long-term monitoring data about these trees in the two parks, Rudolph was ready to ask some research questions.

*Did infection by white pine blister rust affect the growth rate of whitebark pine?*

*Did competition from mountain hemlock, a species that was slowly invading the subalpine zone, affect how fast whitebark pines grew?*

Using data from the past six years of whitebark pine monitoring in the parks, Rudolph tested these questions through statistical analysis. Her capstone thesis is titled, "The possible effects of blister rust fungus infection and mountain hemlock density on whitebark pine growth in Crater Lake and Lassen Volcanic National Parks." While she did not find statistically significant differences, the process of working through the scientific method

# Erica Rudolph (*continued*)

taught her some valuable lessons and new skills:

- Sample size matters! Because whitebark pines are slow growing, more time and more samples would likely be needed to detect the effect of either blister rust or competition on a whitebark pine's growth rate, if such an effect actually existed.
- Carefully constructing her research questions *before* collecting data would have helped her design the most effective study.
- She gained proficiency using MS Excel and R Studio software to do statistical analysis.
- She learned how to write a scientific paper.

One of the benefits of an internship is having a trial run in a profession. As much as she appreciated her academic learning, Erica also found that she liked what she was doing out there as a field biologist.

"It got me more interested in botany…learning about what the vegetation crews were doing… seeing what species were out there and if there were any invasive species, I found that really interesting. So it did heighten my interest in wanting to go more into field biology," she remarked.

After graduation this spring, Erica is keeping her options open. She will apply for biology jobs, but also study for the GRE to keep graduate school as an option. She would like to get more experience in the field before going back to school.

Top image: Erica Rudolph in Lassen Volcanic National Park

Middle image: Erica Rudolph in Crater Lake National Park

Bottom image: White pine blister rust aecia ("blisters") on a whitebark pine tree.

# 2018 Field Schedule at Klamath Network Parks

| Vital Signs Monitoring | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|
| Landbirds—Mist Netting (KBO) (KLMN contact—A. Chung) | | | ORCA | ORCA | ORCA | ORCA | | | |
| Landbirds—Point Counts (KBO) (KLMN contact—A. Chung) | | WHIS | LAVO | | | | | | |
| Invasive Species (KLMN—S. Smith) | Next field season is slated for 2019 | | | | | | | | |
| Vegetation (KLMN—S. Smith) | | WHIS | WHIS | LAVO | LAVO | | | | |
| Whitebark Pine (KLMN—S. Smith) | | | | CRLA | CRLA | | | | |
| | | | | LAVO | LAVO | | | | |
| Streams (KLMN—E. Dinger) | | | ORCA | | | | | | |
| | | | RNSP | RNSP | | | | | |
| | | | | | CRLA | CRLA | | | |
| Lakes (KLMN—E. Dinger) | Next field season is slated for 2019 | | | | | | | | |
| Rocky Intertidal (UCSC) (KLMN contact—E. Dinger) | | | RNSP | | | | | | |
| Caves (Park staff) | | LABE | LABE | LABE | LABE | LABE | | | LABE |
| | | ORCA | ORCA | ORCA | ORCA | | | | |

**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)

# Recent Publications

Available from the Klamath Network website: http://science.nature.nps.gov/IM/units/klmn/index.cfm

## Annual Reports

### Land Cover and Land Use

- Land cover and land use monitoring: 2016 results for Redwood National and State Parks

## Collaborative Publications

- Monitoring stream temperatures—A guide for non-specialists
- Methods for estimating trend in continuous response variables from complex survey designs
- Methods for estimating trend in binary and count response variables from complex survey designs

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