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Natural Resource Stewardship and Science
Klamath Inventory and Monitoring Network

The Klamath Kaleidoscope

Newsletter of the Klamath Inventory & Monitoring Network

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Welcome to Lisa Garrett, New I&M Program Manager for the Pacific West Region

Lisa Garrett in Yosemite National Park. Photo by Jim Garrett.

This past summer, Lisa Garrett started as the Pacific West Region Inventory and Monitoring (I&M) Program Manager. For the past three years, she served in an analogous position for the Southeast Region. Lisa is actually returning to the Pacific West Region, where she was the Program Manager for the Upper Columbia Basin I&M Network from 2003 to 2012.

Growing up in New Jersey, Lisa knew she wanted to be a biologist since she was in fourth grade. Following this ambition, she earned a BS in Natural Resource Management from West Virginia University. After starting a family and moving west, she earned her MS in Wildlife Resources from the University of Idaho.

Lisa's immediate goal as Regional Program Manager is to get to know the people and important resources (vital signs) within parks. She has wasted no time getting out into the backcountry, traveling with crews at Channel Islands NP and Yosemite NP. An avid outdoorswoman, Lisa understands the normal rigors of backpacking and traveling in rugged conditions. Nonetheless, she was impressed by the added strength it took for field crews to carry heavy monitoring equipment over high mountain passes in the Sierra, and the skill it took for the Channel Islands crew to navigate treacherous road conditions, including stream crossings.

Lisa's long-term vision for the region is for parks to make the best possible use of I&M data.

"I would like for the parks to consider the I&M networks an extension of their natural resource programs."

To achieve this vision, Lisa sees the need for more regular communication between I&M scientists and park resource management staff. Building and tending to these relationships, particularly during times of staff turnover, will give I&M scientists a better understanding of how park managers think and the specific kinds of information they need.

In This Issue

Scaling Up: How Monitoring inside of Parks Contributes to Conservation outside of Parks

Monitoring crews in Lava Beds National Monument track the Gray Flycatcher, a Partners in Flight species of continental importance, as part of long-term monitoring of bird communities in Network parks. These data provide early warning of changes that may be happening to the flycatcher in the park. But like so many other resources monitored in the parks through the Inventory and Monitoring (I&M) Program, this species ranges far outside the boundaries of this park. Do local changes reflect regional trends? Can park-specific data help fill in the big picture of how this bird is doing?

Fortunately, many of the protocols developed by I&M to monitor specific resources within parks align with regional or national protocols. I&M data can therefore be "scaled up" for use in larger datasets. By collecting the same measurements with the same techniques as larger scale monitoring projects, we are essentially speaking a common language.

While I&M protocols are primarily tailored to serve park needs, the alignment of many metrics with broader scale non-NPS protocols is an added value that also serves I&M goals. One goal of the Natural Resource Challenge, a foundation of the I&M program, is that "Knowledge gained in national parks through scientific research is promulgated broadly by the National Park Service and others for the benefit of society." Furthermore, I&M monitoring strategies encourage overlap between NPS and outside agencies, "To promote consistency and data comparability and to reduce costs, existing protocols developed by other programs and agencies should be adopted or modified whenever monitoring objectives are similar."

Here are some examples of vital signs that also contribute to larger monitoring efforts:

Landbirds

Through our landbird monitoring partnership with Klamath Bird Observatory, park data are shared with several other regional and national programs, such as the Avian Knowledge Northwest, and Monitoring Avian Productivity and Survivorship (MAPS). The Observatory is currently collaborating with the Network on research to compare bird communities in parks to bird communities in the overall Klamath-Siskiyou bioregion. Identifying which bird communities are well-represented in protected areas (parks) informs conservation in the context of increasing disturbance outside parks.

Intertidal Communities

Rocky intertidal zone organisms—algae, the ochre star, surfgrass, and sessile invertebrates—are monitored at Redwood National and State Parks through a cooperative agreement with researchers at the University of California, Santa Cruz. Park sites are part of a larger network of intertidal communities monitored along the western coast of North America by the Multi-Agency Rocky Intertidal Network (MARINe), and follow the same methods.

Whitebark Pine

I&M crews monitor the condition of whitebark pines in Crater Lake and Lassen Volcanic National Parks. Threats to the pine from the mountain pine beetle, white pine blister rust, and potential climate change affect this species throughout its Western range. KLMN I&M crews follow a common five-needle protocol that is shared with two other Pacific West Region Networks and the resulting data help to identify the status and trends of whitebark pine populations throughout the tree's range.

Stream Water Quality

I&M crews monitor water quality, physical habitat, and the biological condition of streams in Network parks. Because the protocol is largely based on EPA methods, the condition of streams within parks can be compared with regional stream conditions outside of parks, and can utilize EPA developed thresholds. As a practical example, water quality data from creeks in Oregon Caves National Monument and Preserve are currently being compared with EPA standards to help Congress decide if segments of the stream qualify for Wild and Scenic River designation.

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

Klamath I&M Network
Southern Oregon University
1250 Siskiyou Boulevard
Ashland, Oregon 97520-5011

http://science.nature.nps.gov/IM/units/klmn/index.cfm

Program Manager
Alice Chung-MacCoubrey
(541) 552-8575
alice_chung-maccoubrey@nps.gov

Aquatic Ecologist
Eric Dinger (541) 552-8574
eric_dinger@nps.gov

Botanist
Sean Smith (541) 552-8570
sean_b_smith@nps.gov

Data Manager
Allison Snyder (541) 552-8576
allison_snyder@nps.gov

SOU Cooperators
Dennis Odion (541) 552-9624
odiond@sou.edu
Dominic DiPaolo (541) 552-8577
dipaolod@sou.edu

Newsletter Writing, Editing and Design
Sonya Daw, I&M Science Writer/Editor,
sonya_daw@nps.gov

Connecting with Local Students through Botany

High school students in Redding, California, got some hands-on learning this spring. Jen Gibson, Ecologist at Whiskeytown NRA, paved the way for this opportunity through her multiyear collaboration with the Redding High School AP Biology class. She invited Sean Smith, Klamath Network Botanist, to teach the students how to identify and monitor invasive plant species based on the Network's Invasive Species Early Detection protocol.

After some basic lessons in plant ID, measuring slope, aspect, and plant cover, Sean and the students set off on a field trip along the Mount Shasta Mine Loop Trail in Whiskeytown NRA. Sean quizzed them on invasive plants they came across, like the scotch broom. Students then practiced their new skills by setting up and sampling their own plot.

Why does this kind of outreach matter for Sean?

"Just engaging with the students. Letting them know what the park service is all about…."

Students also begin to understand how widespread invasive species have become and how the parks are addressing the problem.

"It's interesting to get these kids out there and start recognizing these weeds," says Sean. "And then they realize that that's primarily what their home environment is made up of. There is very little native vegetation within the city of Redding and the housing areas where these kids live. So it's interesting to make that connection between what a heavily disturbed area where you're living looks like, and then what we're trying to do here in Whiskeytown… protect biodiversity, reducing and (hopefully) eliminating nonnative species."

Jen Gibson has an additional goal for the outreach. She hopes it will excite students to work at the park and realize that they can have a job and make a living working outdoors.

Redding High School AP Biology students zoom in on a tiny scotch broom, an invasive plant, guided by Klamath Network Botanist, Sean Smith. Photo by Jen Gibson/NPS.

Hyperdiverse Streamside Plant Communities at High-Elevation Network Parks

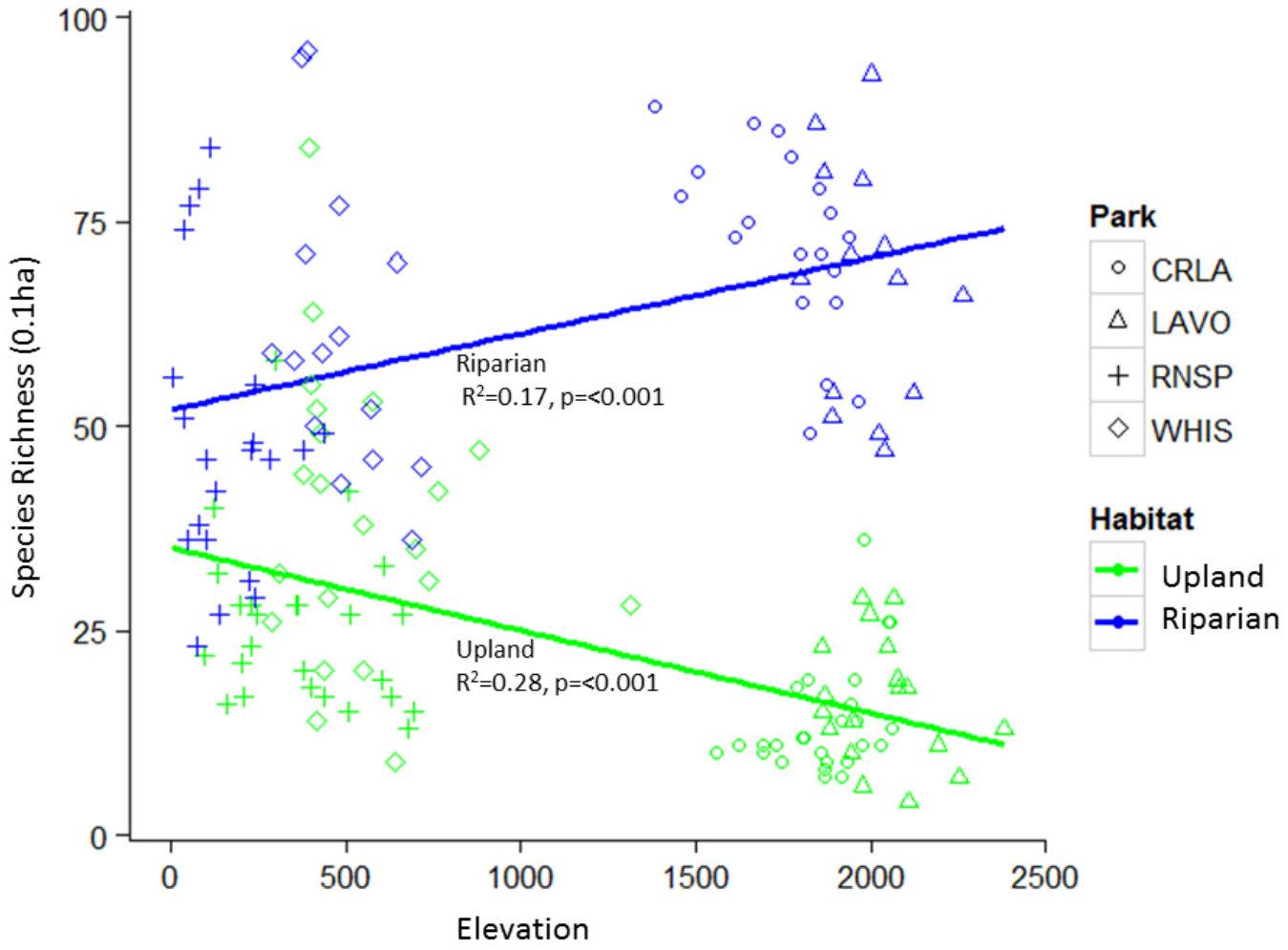
A rich assembly of streamside plants grows within the narrow "green-line" on either side of the West Fork of Hat Creek at 2263 m elevation in LAVO. Photo by Sean Smith/NPS

In ecology, we look for patterns in nature to help us understand how things work. But finding a break in a pattern can often lead to new understanding. Klamath Network scientists Sean Smith and Daniel Sarr found an unexpected relationship between streamside (riparian) plants and elevation in their recently published Park Science article, "Vascular plant hyperdiversity in high-elevation riparian communities of National Park Service units in the Klamath Network" (http://www.nature.nps.gov/ParkScience/index.cfm?IssueID=36). At the two high-elevation Network parks included in the study, species richness of riparian plants was "hyperdiverse" compared with species richness at lower-elevation parks. This is contrary to the more typical pattern where species diversity declines at higher elevations.

Methods

Many parks and protected areas preserve high-elevation, scenically captivating landscapes with a relatively low variety of upland plants. Little is known, however, about plant diversity in riparian areas at high elevations. Smith and Sarr used 2011–2013 vegetation monitoring data from low-elevation parks (Redwood National and State Parks (RNSP),Whiskeytown National Recreation Area (WHIS)) and high-elevation parks (Crater Lake National Park (CRLA), Lassen Volcanic National Park (LAVO)) to explore the relationship between riparian plant diversity and elevation. They also looked at differences in riparian versus upland plant community diversity at different elevations. Elevations ranged from 0 to 2,382 m (0–7815 ft).

Streamside Plant Communities (—*continued from page 4*)



Divergent trends in species richness of riparian compared with upland plants as elevation increases across four parks in the Klamath Network. Source: Smith and Sarr (2015)

Riparian plants increased in diversity at higher elevations

Based on plant species identified in 0.1 ha (0.25 acre) plots in the parks, Smith and Sarr noticed several patterns. Most importantly, they found that, at a regional scale across parks, upland plant diversity decreased with elevation, whereas riparian plant diversity went in the opposite direction, increasing with elevation (see Figure above).

Riparian communities were more diverse than upland plant communities at all scales

Species richness was significantly higher in riparian plots compared with upland plots at all parks. Riparian sites had an average of 62 vascular plant species compared with an average of 23 species at upland sites. The difference was especially marked in the two high-elevation parks (CRLA, LAVO). These parks supported three times as many species as the comparable upland plots. In particular, Smith and Sarr found the high-elevation parks to be hotspots for

- graminoids like sedges (*Carex* spp.),
- rushes and woodrushes (*Juncus* and *Luzula* spp.)
- perennial grasses (*Deschampsia*, *Glyceria*, and *Calamagrostis* spp.)
- moisture-loving forbs (*Senecio*, *Aconitum*, and *Viola* spp.)

Lower elevation sites had proportionately more nonnative plants

Another notable find was that nonnative plants were relatively more common in lower elevation plots. They were detected more frequently,

Streamside Plant Communities (—*continued from page 5*)

and represented a higher proportion of the overall species than in high-elevation plots.

Conclusions
Smith and Sarr suggest that these rich, riparian plant communities at high elevations may be remnants of cooler, wetter conditions that occurred during the Pleistocene. As such, they represent unique hotspots of biodiversity that highlight the importance of protecting high-elevation landscapes, particularly riparian areas, within the region.

Their findings also lead to questions about how climate change could affect Network parks.

"A fundamental driver of these systems appears to be winter snowpack, which delays runoff of winter precipitation and allows it to continually recharge groundwater reservoirs and feed perennial streams through the summer, which in turn harbor the rich, predominantly native riparian flora."

Predicted snowpack changes in the mountains of northern California and southern Oregon as a result of warming temperatures may ultimately affect the amount and timing of water available to high-elevation streams in the region. This, in turn, may impact the rich biodiversity these streams currently support.

This kind of research question is one of many questions that can be explored using I&M data to understand ecological patterns in parks and surrounding ecosystems.

Reference
Smith, S.B., and D.A. Sarr. 2015. Vascular plant hyperdiversity in high-elevation riparian communities of National Park Service units in the Klamath Network. Park Science 32(1):65-70.

Southern Oregon University Intern: Travis Taylor


Travis Taylor, SOU Intern

Few people have the chance to spend a day next to bubbling sulfur pools in Lassen Volcanic National Park, but Travis Taylor is one of them. He spent last summer as a paid intern working with the Klamath Network. Travis and Sean Smith, the Klamath Network Botanist, visited vegetation monitoring plots in the subalpine zones of Crater Lake and Lassen Volcanic National Parks to document disease in whitebark pine trees. Examining the lower, middle, and upper third of each whitebark pine tree within a plot, they searched for evidence of white pine blister rust, such as fruiting bodies, or scarring and scratching by small mammals, as well as other kinds of damage from insects or pathogens. For Travis, getting off-trail, experiencing unique places like the geothermal areas, and enjoying the spectacular views at high elevation were like being on a "paid vacation." Sean valued Travis's help: "he was very bright…he asked a lot of good questions, and was a very quick learner."

Travis took a roundabout path to biology, starting out with a BS in adolescent education from St. John's University in Queens, New York. He realized soon after graduating that he would rather do science himself than teach it. He moved west, went back to school, and graduated last spring with a BS in Field Biology and Ecology from Southern Oregon University. His future plans include studying endemic plants through a master's degree program—perhaps specializing in orchid ecology.

Student internships with I&M are a win-win opportunity. The Klamath Network offers internships for Southern Oregon University students through its cooperative agreement with the university. Student interns gain hands-on experience with data collection and applied science working with a federal agency. In exchange, interns help the Network perform long-term monitoring to preserve and protect park resources for future generations.

Evaluating Wild and Scenic River Eligibility Using Stream Monitoring Data

Upper Cave Creek is one of the stream reaches in Oregon Caves National Monument and Preserve being considered for Wild and Scenic River designation. Photo by Eric Dinger/NPS

What does it take to become part of the Wild and Scenic Rivers system? Among other things, a stretch of river must contain exceptional recreation, scenery, fisheries, wildlife, or other "Outstandingly Remarkable Values." Klamath Network monitoring data may help to determine this for streams in the newly expanded Oregon Caves National Monument and Preserve.

As part of the expansion legislation, the monument must determine if its streams have Outstanding Remarkable Values at regional or national levels. Fortunately, the Klamath Network's water quality data are collected in the same way as data the Environmental Protection Agency and other monitoring groups use to help make this determination. Oregon Caves, however, may not represent the most typical values that lead to Wild and Scenic River designation.

Streams in the monument do not support fisheries or recreation, such as rafting, but they do support a different kind of value: remarkable biodiversity. A rich variety of stream-dwelling invertebrates, including insects, worms, mites and others, occur in Lower Cave Creek, No Name Creek, and Lake Creek within the monument and preserve. Some of these insects, including mayflies, stoneflies, and caddisflies, are highly sensitive to disturbance and are therefore good indicators of pristine systems. The Klamath Network collected data in 2012 on the presence and abundance of these insects in the monument, and again recently in the summer of 2015. These data will be shared with the National Wild and Scenic River team for further evaluation.

The Network collects much more than just these biological indicators of stream quality. The wadeable streams protocol calls for monitoring physical habitat, like the amount of streamside vegetation, as well as water chemistry, such as phosphorous and nitrogen levels. All of these variables, by themselves and in combination, help us monitor the condition of streams in parks. Data collected for many of them are also comparable with regional datasets, which has the added value of helping us understand the condition of park streams in the context of the larger Klamath region.

Caddisfly (Trichoptera)
BLM/USU BugLab

Mayfly (Ephemeroptera)
BLM/USU BugLab

Stonefly (Plecoptera)
BLM/USU BugLab

Left to right: Brad Phillips, Martha Crusius, and Oregon Caves NM Chief of Resources John Roth at a site visit to Upper Cave Creek as part of the Wild and Scenic River designation process. Photo by Eric Dinger/NPS.

Recently Published Reports

These reports are available on the KLMN website: http://science.nature.nps.gov/IM/units/klmn/index.cfm

Whitebark Pine

- Crater Lake and Lassen Volcanic National Parks 2012-2014 project report

Vegetation Structure, Composition and Function

- Lava Beds National Monument and Redwood National and State Parks 2014 annual report

Landbirds

- Oregon Caves National Monument, Lava Beds National Monument, and Redwood National and State Parks 2014 annual report

Rocky Intertidal Communities

- Redwood National and State Parks 2012 annual report

Stream Aquatic Communities and Water Quality

- Oregon Caves National Monument, Redwood National and State Parks, and Crater Lake National Park 2012 annual report

Vegetation Mapping

- Lava Beds Vegetation Classification and Mapping