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

Fall/Winter 2018

Whiskeytown Streams after the Carr Fire

At the tail end of field season this summer, the Klamath Network stream monitoring crew made a quick diversion to collect data from Whiskeytown NRA streams ravaged weeks earlier by the Carr Fire. Though Whiskeytown streams were not scheduled for monitoring until 2020, Eric Dinger, Ecologist with the network, carved out time for his crew to visit the park this year. He knew that documenting the early postfire conditions would help park managers distinguish immediate effects of the fire from longer term effects after the first winter rains and spring flooding came through. The data will help in understanding the effects of differing impacts from mixed fire severity levels. Beyond collecting some basic water quality parameters at 10 sites—stream temperature, turbidity, pH, conductivity, aquatic insect species present, and more—the crew photographed each site to compare with prefire images. At some sites, the differences were stark (see photos to the left).

Whiskeytown NRA long-term water quality monitoring site #25, on Clear Creek. Top is prefire, 2017; bottom is postfire, 2018.

As part of the Klamath Network's long-term monitoring program, stream crews have been collecting data at 20+ stream sites in Whiskeytown every three years since 2011. These baseline data can be used to compare with future condition as streams

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Carr Fire *(continued)*

recover. They may help answer questions like,

- How have fish, amphibians, or aquatic macroinvertebrates been impacted?
- How will increased sediment or high flows from flooding affect habitat and organisms in the streams?
- How are streams responding to restoration efforts by BAER (Burned Area Emergency Response) teams that occurred in the watersheds?

In addition, local Southern Oregon University students may use the pre- and postfire images as the basis for a GIS Story Map on the effects of the Carr Fire on Whiskeytown National Recreation Area streams.

Photos on the right: Whiskeytown NRA long-term water quality monitoring site #26, on Whiskey Creek. Top is prefire, 2017; bottom is postfire, 2018.

New Science Writing Internship for Students

Making technical information fun to read is no small task! Southern Oregon University students are exploring the art of science writing through a new internship with the Klamath Network. Network Science Communication Specialist, Sonya Daw, jointly developed this opportunity with SOU English Professor, Ed Battistella, to broaden student learning experiences. The paid internship offers 1–2 course credits. It first became available for undergraduate English students in spring of 2018.

The internship is aimed at students with strong writing skills who want to explore science and nature writing. Interns choose between writing a natural history "Featured Creature" article or an article in the Klamath Kaleidoscope biannual newsletter. Writing about science requires a challenging mix of scientific understanding and engaging language. It's not easy explaining a "spermatophylax" in a few short words! Like any good storyteller, students experiment with metaphors and avoid (or explain) technical jargon. Newsletter articles about science in the parks give them a chance to build narrative arc. Featured Creature articles give students a chance to research a species and convey their new knowledge in a compelling way—advancing science literacy all around. We publish these articles on NPS platforms, boosting the interns with a professional publication to their name. Our first intern was senior, Elizabeth Raynal, who wrote a Featured Creature article about bobcats.

Word has gotten around, and next spring we will expand the internship to graduate students in the SOU Environmental Education program as well. This new internship is a win-win collaboration with SOU, complementing two other network internships available to SOU students for collecting scientific data on whitebark pine and bats.

SOU science writing intern, Elizabeth Raynal

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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Staff Profile: Dennis Odion

Dennis Odion, Vegetation Ecologist

Dennis Odion loves burned places. Not just small patches, but decidedly burned areas where fire-adapted plants regenerate with remarkable tenacity. The brilliantly red- and smooth-barked manzanitas whose seeds need fire to germinate are his favorites. As a vegetation ecologist, Odion's life-long passion has been to understand what drives vegetation patterns, and the Klamath Network has benefitted greatly from his expertise.

Odion has had a long and fruitful tenure with the network. As an NPS partner through Southern Oregon University for 16 years, Odion helped shape the network's Inventory and Monitoring program since its start in the early 2000s. From the early vital signs scoping meetings to the last of the park vegetation maps, he's made hefty contributions. He worked on five of the network's nine vital sign protocols, helping with the Intertidal Zone, Whitebark Pine, and Caves protocols, and taking the lead on the Vegetation and Invasive Species protocols.

Odion got his start with an MS in botany and PhD in Plant Ecology/Geography from UC Santa Barbara. He worked as a contracting ecologist all over California, including natural areas in Santa Barbara County, wetlands in the Owens Valley, and studying the effect of cattle grazing in the Sierra Nevada's Golden Trout Wilderness. He also contributed to the California Gap Analysis project mapping vegetation on the Modoc Plateau for conservation planning. Applying his fire ecology knowledge, Odion worked for the Marin Municipal Water District, in part to help the county avoid another catastrophe like the 1991 Oakland Hills Fire. All of these experiences contributed to the in-depth knowledge of regional vegetation that Odion brought to the network.

Odion came to Ashland with his family in 2000, drawn to its natural gems like Lithia Park on Ashland Creek. He started with a stint as stay-at-home

Whiteleaf manzanita (*Arctostaphylos viscida*), which needs fire for its seeds to sprout.

Dennis Odion *(continued)*

dad and volunteered as Conservation Chair for the local Native Plant Society chapter. By 2002, the original network program manager, Daniel Sarr, who had known Odion from work in the Sierra Nevada, hired Dennis to help get the program up and running. Sarr and Odion both shared an inherent skepticism for single-species management, a belief that ultimately crafted a unique design for the network's program. Instead of monitoring a single, or a few "indicator" species, they designed their long-term monitoring as a multifaceted, ecosystem approach. With one exception—the whitebark pine—Klamath Network vital signs largely focus on ecosystems: the rocky intertidal zone, cave ecosystems, landbird communities, stream and lake water quality and aquatic communities, and terrestrial vegetation.

The move towards an ecosystem approach for vital signs was a big challenge during the startup because it broke with a lingering tradition of single species management. With the complexity of their new approach, and all the moving pieces of synthesizing input and developing conceptual models, Odion was at first skeptical. Could the program be pulled together successfully? Looking back on it now, 16 years on, Odion's doubts are gone.

"I feel really proud of what we did. We have the most advanced monitoring—not just us, but the park service in general. The way they put it together, I think it worked. They gave us a lot of freedom. We didn't have to pick specific vital signs, like condors or goshawks or bull trout. Instead we designed a more comprehensive approach."

With all the protocols now finalized and long-term monitoring well established, he hopes the network can maintain its momentum. Long term monitoring—inherently less sexy than a hot topic research project—is often first on the chopping block when budgets tighten. Additionally, he hopes that this carefully designed NPS long-term monitoring program provides a useful example for other agencies.

Concurrent with NPS work, Odion typically keeps other plant ecology projects going. As Klamath Network demands on his time wane, he hopes to spend more time on other research. He's also tinkering with reviving an earlier pursuit, natural history writing. You can still find his 1988 debut, *Guide to the Santa Barbara Botanic Garden*, on Amazon!

Early successional growth of a cohort of whiteleaf manzanita (*Arctostaphylos viscida*) from seeds released from dormancy by fire in a conifer forest. The seeds can live in the soil for centuries until a severe fire opens up the stand and provides the sunny conditions needed by these shrubs. Photo by Dennis Odion.

Automated Reporting to the Rescue!

Long-term monitoring requires a lot of fieldwork—collecting data from various parks every year. This, in turn, translates into a hefty reporting load to get those results into the hands of park managers. Congratulations to Eric Dinger, Klamath Network Ecologist, who received the national IMD *Innovations in Data Management* award this past summer. Dinger's work using R code to produce automated tables and figures for summarizing five-needle pine data will save time all around. This tool speeds up reporting and makes data analysis more transparent, but also serves more than just one network. Four different I&M networks—the Klamath, Upper Columbia Basin, Mojave Desert, and Sierra Nevada—all follow the same five-needle pine monitoring protocol and will benefit from Dinger's work.

Eric Dinger, Ecologist with the Klamath Network, was awarded the IMD *Innovations in Data Management* award in 2018.

Staff Profile: Dominic DiPaolo

Dominic DiPaolo, Vegetation Ecologist

Biologist Dominic ("Dom") DiPaolo is fascinated by patterns in nature, piecing together how soils, slope, and other factors drive where plants grow. He's had lots of opportunity to do just that for Klamath Network parks. Since he began seven years ago, DiPaolo has helped produce vegetation maps for Oregon Caves National Monument and Preserve, Lava Beds National Monument, and Crater Lake National Park as a partner through Southern Oregon University.

DiPaolo grew up in Pennsylvania and studied natural history at the University of Vermont. His dream was always a career in conservation, sparked as a teen by his penchant for disappearing into the woods. His first job as a biologist brought him to western Washington to study birds – specifically the winter wren. He stayed focused on birds for several more years, working at the Point Reyes Bird Observatory's (now Point Blue's) Palomarin field station.

Enchanted by the spectacular colors of Ashland in the fall, he moved to Southwest Oregon in 2004. Here, he worked with BLM ecologist, Paul Hosten, poring over late homesteading era maps from 1900 to discern vegetation patterns in the Applegate Valley of southern Oregon. In particular, the study deepened DiPaolo's understanding of and appreciation for two important habitats in the area—oak woodland and chaparral. Hosten became a mentor to DiPaolo and together they published a comparison of historical with current vegetation conditions in the region.

The next step in DiPaolo's career took him to Western Australia as the first ever Chicago Botanic Garden exchange program intern. His internship had him doing anything and everything related to managing the severely understaffed but expansive national parks. On the side, he became expert at changing and patching tires from driving vast distances—on and off roads—in the remote Australian outback!

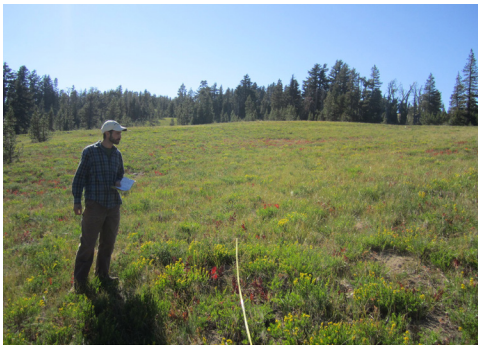
DiPaolo came back to a 4-year stint with the Southern Oregon Land Conservancy. Land trusts hold and manage conservation easements, which are development restrictions attached to a property deed. As conservation coordinator, he made annual rounds to about 50 easements to check for compliance and troubleshoot issues. He also helped develop a strategic plan for acquiring new easements. It was exactly the kind of work he'd envisioned for himself as an undergraduate, years before. But eventually, the pull of field biology began to tug at him again.

DiPaolo began work with the Klamath Network in 2011 at the start of the Crater Lake National Park vegetation mapping project. Through a joint agreement with Southern Oregon University, he worked as a field biologist, sampling plots to sort out distinct plant associations in the park. The next year he moved into a full-time role assisting vegetation ecologist, Dennis Odion, with the map, and eventually took the lead in its completion. Along the way, he also worked on maps, databases, and reports to finalize both the Lava Beds and Oregon Caves vegetation maps. DiPaolo recently stepped in to complete the Lassen Volcanic National Park vegetation map.

One of the most enjoyable aspects of vegetation mapping for DiPaolo is getting to see so much of a park, especially visiting places where people rarely go. He took a special liking to the lush wetlands and patches of older forest on the west side of Crater Lake National Park, both rich in biodiversity. He also enjoys pondering patterns:

"Doing a vegetation map, you really get to think about why things are where they are, in a broad sense. You're looking at different kinds of imagery— the effects of geology, topography…you're not necessarily asking research questions, but to do the job you have to understand why things are where they are. You get to spend a lot of time just geeking out on ecology!"

Completing the Lassen vegetation map will bring DiPaolo's large projects with the network to an end. He hopes to continue mapping vegetation in other natural areas—translating complex landscape patterns into usable tools for conservation.



DiPaolo surveying plants at Crater Lake NP.

Cave Monitoring Protocol Up and Running

Between 2016 and 2018, I&M protocol-based cave monitoring got up and running in Klamath Network parks. *Cave Entrance Communities and Cave Environments* is a complex vital sign that integrates physical and biological indicators of cave health. The idea is to learn how drivers of the cave environment—climate and its effect on ice and standing water, as well as human visitation and the availability of organic matter in the form of scat—affect the biodiversity of life inside the caves. Biodiversity is reflected in bat, invertebrate, and cave entrance vegetation populations. Because the unique cave environment requires specialized knowledge, equipment, and techniques, designing the monitoring protocol required a longer testing and development period than for the network's other vital signs.

Caves are monitored at two network parks with distinctly different types of cave. Oregon Caves National Monument and Preserve has one large marble cave system, and Lava Beds National Monument has hundreds of lava tube caves.

While park staff typically conduct the core elements of monitoring, they often engage volunteers and interns to enhance their learning experience. This summer, the network assisted Lava Beds in hiring cave techs, Austin Smith and Brian Anschel, through the Geoscientists-in-the-Parks (GIP) program.

Smith—a newcomer to caving—is a senior at Humboldt State University, studying wildlife management and conservation. Anschel—an experienced caver—graduated with a Biology major from UC Boulder just weeks before stepping into this position. Smith was game to follow Anschel through all types of cave tunnels, and they had their moments. He recalls straining for the faint glow of sunlight and the feel of airflow on his face to find a particularly elusive cave exit . But they both emphasized how much they learned about the unique and fragile cave environment, and shared highlights from the summer:

Finding the bones of small and mid-sized mammals that died in caves, like this bobcat skull and bones. Photo by B. Anschel.

Encountering fellow cave crawlers, like this rubber boa. B Anschel photo.

Detecting strange-looking invertebrates, like this common dipluran in the family, Campodeidae, (top), and this rare pseudoscorpion (bottom), a predator. The dipluran has reduced eyes and lacks pigment as part of its adaptation to the cave environment. Photos by B. Anschel.

Occasionally encountering bats during their surveys. If many bats were present, Smith and Anschel would stop the survey and leave to minimize disturbance. This little brown bat, *Myotis lucifugus*, was captured during a separate mist-netting project the GIPs joined. Bat hibernacula are systematically monitored in the winter at Lava Beds as part of the caves protocol. Photos by B. Anschel

Cave Monitoring *(continued)*

Squeezing through tight passages, sometimes over sharp ‘A’a lava, was like “crawling through swiss cheese graters” says Anschel (Smith is pictured). Left, center photos by B. Anschel. Right photo by A. Smith

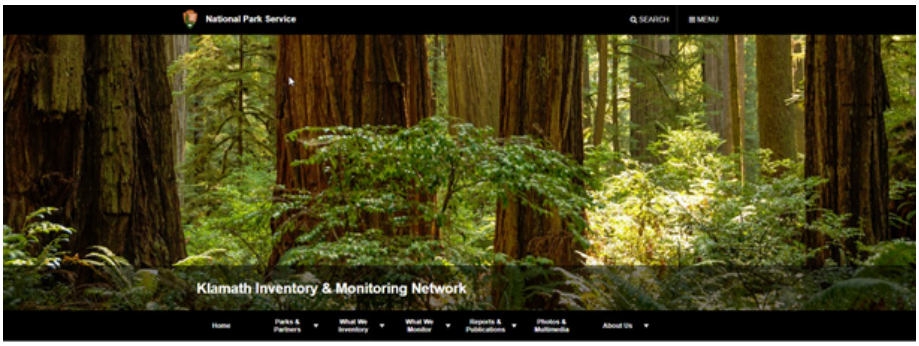
Marveling at ice formations in the deeper caves (while trying to stay warm). Leftmost photo (Anschel), by K. Smith. Right photo of Anschel by A. Smith.

Learning about and measuring the unique vegetation, like ferns (in the Lava Beds desert!), that grow in cave entrances. Photo on left by K. Smith, right two photos by A. Smith..

Outreach

New Website

This summer, the Klamath Network completed its transition to the same website platform used by parks. Explore our parks, our vital signs monitoring program, our publications, and more on our new public-friendly website!



Science for Informed Management

New Video

On the Photos & Multimedia page of our new website, you'll find our new video, "Tracking Nature's Vital Signs." This short 8-minute video takes us down into the ice caves at Lava Beds NM to show how and why we do long-term monitoring. We hope you'll take a peek!

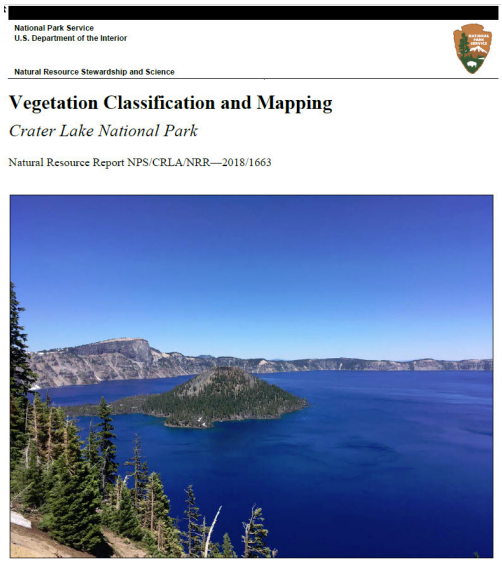
DURATION: 8 minutes, 5 seconds

Learn how the Klamath Inventory and Monitoring Network tracks indicators of ecological health (vital signs) in its parks.

It's a Wrap: Crater Lake NP Vegetation Map

Crater Lake National Park's new vegetation map is ready for use! We published the final map and associated GIS products in June of 2018. In July, project lead, Dominic DiPaolo , and coauthor, Dennis Odion, rolled out the map to park resource managers and other interested folks at Crater Lake, explaining how to use the map and database and answering questions. The following map products are available from the NPS Integrated Resource Management Applications portal (IRMA):

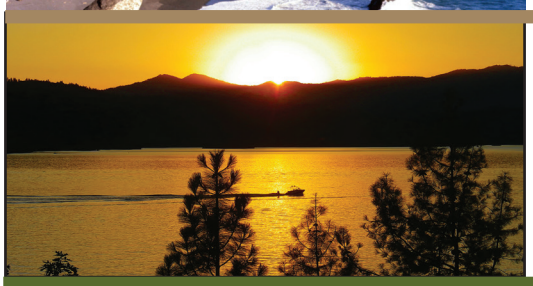
1. The full report, containing
   - A detailed, color vegetation map (also available separately in letter and poster sizes)
   - An accuracy assessment to show managers which vegetation types are most and least accurately mapped
   - A dichotomous vegetation key for placing a site into the plant associations described
   - A description of each plant association, with photos
2. An ArcGIS geodatabase with all the plot locations and detailed vegetation polygons



2018 Vital Sign Monitoring Updates

Redwood National and State Parks

- stream aquatic communities and water quality sampled—3rd revisit since 2012
- rocky intertidal zone sampled—trial run of new community protocol

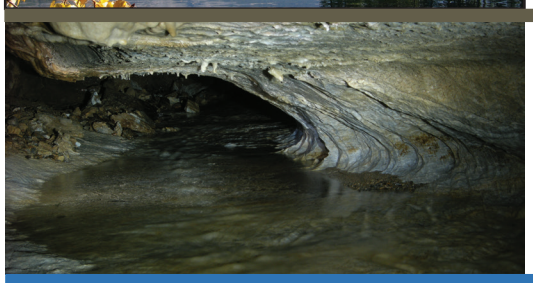


Whiskeytown National Recreation Area

- rapid stream survey completed, post-Carr Fire
- landbird point counts conducted—4th revisit since 2009; 75 species detected
- terrestrial vegetation sampled—3rd revisit since 2012; Carr Fire prevented sampling of high elevation sites

Lassen Volcanic National Park

- landbird point counts conducted—4th revisit since 2010; 58 species detected
- terrestrial vegetation sampled—3rd revisit since 2012
- whitebark pine sampled—3rd revisit since 2012

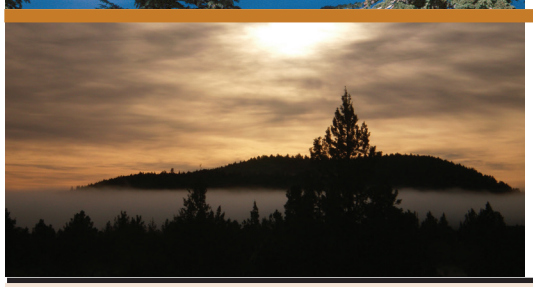


Oregon Caves National Monument & Preserve

- stream aquatic communities and water quality sampled—3rd revisit since 2012
- landbird mist netting conducted—383 birds captured, 30 species
- caves sampled for the first time following the new protocol

Crater Lake National Park

- stream aquatic communities and water quality sampled—3rd revisit since 2012
- whitebark pine sampled—3rd revisit since 2012



Lava Beds National Monument

- caves sampled for the first time following the new protocol

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- Terrestrial Vegetation
- Exotic, Invasive Plants
- Whitebark Pine

Recent Publications

Available from the Klamath Network website: https://www.nps.gov/im/klmn/reports-publications.htm

Annual Reports

Whitebark Pine

- Whitebark pine monitoring: 2017 results from Crater Lake National Park and Lassen Volcanic National Park

Landbirds

- Landbird monitoring: 2017 results from Oregon Caves National Monument and Preserve, Lava Beds National Monument, and Redwood National and State Parks

Terrestrial Vegetation

- Vegetation community monitoring: 2016 results from Crater Lake National Park and Oregon Caves National Monument

Invasive Species Early Detection

- Early detection of invasive species at Klamath Network parks in 2017

Rocky Intertidal Communities

- Rocky intertidal monitoring: 2016 results from Redwood National and State Parks

Stream Water Quality and Aquatic Communities

- Wadeable streams monitoring: 2015 results from Oregon Caves National Monument and Preserve, Redwood National and State Parks, and Crater Lake National Park

Vegetation Mapping

- Vegetation classification and mapping: Crater Lake National Park

Journal and Collaborative Publications

- Gage, E. A., J. C. B. Nesmith, L. Chow, **A. Chung-MacCoubrey**, D. J. Cooper, A. M. Eddy, S. A. Haultain, J. G. Holmquist, J. R. Jones, L. R. Jones, S. T. McKinney, P. E. Moore, L. S. Mutch, L. A. H. Starcevich, and H. Werner. 2018. Wetlands ecological integrity monitoring protocol for Sierra Nevada Network: Narrative version 2.1. Natural Resource Report NPS/SIEN/NRR—2018/1601.
- Mitchell, B., **A. Chung-MacCoubrey**, J. Comiskey, L. Garrett, M. MacCluskie, B. Moore, T. Philippi, G. Sanders and J.P. Schmit. 2018. Inventory and Monitoring Division protocol review guidance. Natural Resource Report NPS/NRSS/IMD/NRR—2018/1644.
- Moritz, M.A., C. Topik, C.D. Allen, P.F. Hessburg, P. Morgan, **D.C. Odion**, T.T. Veblen, and I.M. McCullough. 2018. A statement of common ground regarding the role of wildfire in forested landscapes of the Western United States. Fire Research Consensus Working Group Final Report.
- Starcevich, L. A. H., T. McDonald, **A. Chung-MacCoubrey**, A. Heard, J. Nesmith, and T. Philippi. 2018. Trend estimation for complex survey designs of water chemistry indicators from Sierra Nevada Lakes. Environmental Monitoring and Assessment 190:596.

Science Communication

- Featured Creature natural history articles on northern harrier, mountain pine beetle, madrone, foothill yellow-legged frog, bobcat, American dipper, morel mushrooms, tree lungwort, osprey, cougar
- Wings in the Night Sky. (Natural history of bats) Whiskeytown Nugget, 2018.