



The Klamath Kaleidoscope

Newsletter of the Klamath Inventory & Monitoring Network

Winter/Spring 2015

Sea Star Wasting Syndrome Documented in Redwood National and State Parks



Healthy ochre sea star (L) next to a diseased ochre sea star with white lesions (R) at a monitoring site at Redwood National and State Parks. Photo: David Lohse.

The largest sea star wasting syndrome event ever recorded has been devastating sea star populations at many sites along the West Coast of North America (Stokstad 2014).

This syndrome is characterized by the formation of white lesions in the ectoderm of the star, decay of tissue surrounding the lesions, fragmentation of the body, and death. The disease can appear and progress rapidly, although progression varies by species, and has the potential to decimate sea star populations. The ochre sea star (*Pisaster ochraceus*) is considered a keystone species in the rocky

intertidal (Paine 1966); thus, declines of the ochre star and other sea stars due to wasting syndrome may alter rocky intertidal, as well as subtidal, community structure.

Multi-Agency Rocky Intertidal Network (MARINE) researchers first observed the disease in the ochre sea star at several Washington sites in June 2013. It has since been observed at numerous other intertidal and subtidal locations ranging from Alaska, USA to Baja California, Mexico. In addition to the ochre star, the disease has been observed in several other sea star species.

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Although researchers are currently working to identify a potential pathogen as the causative agent, the underlying cause remains unknown. Past wasting syndrome events in southern California are thought to have been associated with warm water temperatures and coincided with the 1982-84 and 1997-98 El Niño events (Eckert et al. 2000). The current wasting syndrome event is unique and puzzling due to its large spatial scale and the absence of El Niño conditions.

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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 Inventory & Monitoring Network are:
Crater Lake National Park
Lassen Volcanic National Park
Lava Beds National Monument
Oregon Caves National Monument
Redwood National and State Parks
Whiskeytown National Recreation Area

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Sea Star Wasting Syndrome

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There have been periods of warmer water noted prior to wasting events at many of the affected sites.

At some MARINE sites, ochre sea star numbers have shown significant declines in monitoring plots. At other sites, the disease is present but a noticeable decline has yet to be observed. The most recent Summer 2014 monitoring events suggest a decline in sea stars has become apparent in many northern California sites including one Redwood National and State Parks (RNSP) site.

The RNSP site experienced greater than 50% loss of sea stars in the sampled plots with 40% of the remaining stars showing signs of wasting. Other RNSP sites have not yet shown significant declines, but between 8% and 40% of the ochre sea stars had some level of wasting disease.

Continued monitoring at RNSP and other MARINE sites will allow researchers to further track the progression of the disease and its effects on both sea star populations and rocky intertidal communities as a whole. Furthermore, researchers have observed potential signs of recovery, such as high levels of recruitment and tissue regrowth in surviving stars, at some sites. Continued sampling will allow for documentation of any recovery and its effects.

Visit seastarwasting.org for updated information and data.

--Karah Ammann, University of California, Santa Cruz



Example of a diseased ochre sea star showing the body fragmentation, or limb loss, that occurs during the wasting syndrome process. Photo: Rachael Williams.

References Cited

Eckert GL, Engle JM, Kushner DJ (2000) Sea star disease and population declines at the Channel Islands. In Proceedings of the Fifth California Islands Symposium, (Browne DR, Mitchell KL & Chaney HW, eds.), US Minerals Management Service, pp.390-393

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Close-up showing diseased end of an ochre sea star in RNSP. Photo: David Lohse.

Klamath Network Staff Changes

Introducing New Program Manager Alice Chung-MacCoubrey

Greetings! I started with the network in mid-October last year and have been enjoying getting to know the parks, staff, cooperators, and projects. I am a former east-coaster and biochemist who quickly found her true calling in natural resources. I studied wildlife physiology and nutrition for my MS (Virginia Tech) and bats for my PhD in Biology (University of New Mexico). As a wildlife research scientist for the USFS Rocky Mountain Research Station (Albuquerque lab) for 12 years, I primarily studied the roost ecology of forest-dwelling bats. I later joined the NPS I&M program, where I served as program manager at Mojave Desert Network (2006-2009) and Sierra Nevada Network (2010-2014).



Alice Chung-MacCoubrey on a wilderness trip in Sequoia National Park. Backpacking into the wilderness was an important part of our monitoring projects as well as leisure time in the Sierra Nevada - a great way to get to know and appreciate the parks! Photo: Ian MacCoubrey.

My husband, dog, and I are thrilled to be back in this neck of the woods, which is where I actually started my training and career in the natural resources (at OSU and Wallowa Whitman National Forest). This past December, I had the pleasure of meeting the many park staff who attended and presented at our first KLMN Science Day. Daniel has clearly left a wonderful legacy of I&M projects, research collaborations, park relationships, and staff (plus a book on Sasquatch to help me truly understand the region). I look forward to leading the network through its next stages and meeting the rest of you soon! Cheers!

—Alice Chung-MacCoubrey

Data Manager Allison Snyder Joined Klamath Team in June



After working with the streams monitoring crew at Lassen Volcanic National Park, Allison Snyder took some time to explore the park with her family. Although the walk to Bumpass Hell was beautiful, the kids found it to be a bit stinky. Photo: Derek Snyder.

I entered on duty as the new Klamath Network Data Manager last June. I joined the Klamath Network (KLMN) from the Southern Colorado Plateau Network (SCPN), where I served as Data Manager for seven years. Prior to working at SCPN, I assisted with data management in the Pacific Island Network for almost four years-- first as Ecological Monitoring Spatial Data Specialist and then as Database Programmer.

I received a BS in Forestry from the University of Washington and a MS in Forestry from Northern Arizona University. In graduate school, I studied burn severity and landscape level changes due to fire suppression across the San Francisco Peaks in Northern Arizona.

Since my arrival, I have been getting up to speed on the KLMN protocols and trying to visit the network parks. Because of the extended data manager vacancy, I have been focusing on getting files organized, updating databases, and preparing for a smooth field season.

My family and I are enjoying being back in the northwest and getting to know the local people and beautiful surroundings.

—Allison Snyder

Klamath Network Projects Provide Data on Disturbance Impacts



Reading Fire as seen from Harkness Ridge, Lassen Volcanic National Park. NPS photo.

Disturbance events such as fire and flooding are natural processes that have long influenced the landscapes of Klamath Network (KLMN) parks. For example, in 2012, the lightning-ignited Reading Fire created a large disturbance at Lassen Volcanic National Park when it burned 16,993 acres, or 16 percent of the park. In 2013, a smaller scale disturbance occurred at Whiskeytown National Recreation Area when the Bureau of Reclamation performed an emergency release of water in the Crystal Creek watershed. This sudden release of water during the dry summer season was not a disturbance that would have happened naturally in the past, and it dramatically increased the creek's flow from its normal 10-20 cubic feet per second (cfs) to a whopping 1600 cfs.

How can Inventory & Monitoring (I&M) data provide information about the impacts of these two disturbances? I&M projects focus on the concepts of “status” and “trends” – identification of current average park resource conditions and change in those conditions over time. So can I&M data

say anything about isolated small and large-scale disturbance events? Certainly!

Because the Klamath I&M Network selected monitoring sites that are distributed equally across the landscape, we have sites in these disturbed areas that were sampled both before and after the disturbance events, as well as sites in areas outside of the disturbance zones. This situation lends itself to a classic ecological impact study design known as Before-After-Control Impact (or BACI) that allows assessment of disturbance impacts by comparing pre-and post-disturbance conditions and conditions in areas unaffected by the disturbance.



Silver Lake, one of 30 lakes monitored in Lassen Volcanic National Park by the Klamath Inventory & Monitoring Network. NPS photo.

For the Crystal Creek event, the I&M team had pre-flood discharge samples both above and below the water release area, allowing for analysis of impacts on the physical, chemical, and biological components of this stream. Analyses will occur as part of our regular reporting schedule.

In the Reading Fire area, the I&M monitoring crew had collected samples from lakes both within and outside the fire zone. At the KLMN Science Day (see p. 7), we reported that we detected no apparent short-term effects on lake chemistry, aquatic insects and macroinvertebrates, or on lake zooplankton. However, indirect effects of the fire may become apparent over the long-term. We will re-sample Lassen Volcanic NP lakes again in 2016 and continue to assess longer term effects. In addition, we recently concluded stream sampling in Lassen Volcanic NP, which will allow us to assess fire impacts on streams. (See p. 5 for more information on the stream 2014 sampling season).

—Eric Dinger

Stream Monitoring Update

This past summer, three members of the Inventory & Monitoring (I&M) water quality team spent substantial time visiting the streams of Whiskeytown NRA and Lassen Volcanic NP. They were doing comprehensive sampling of the physical, chemical, and biological components of park stream ecosystems. Kathleen Doran served as Crew Leader, and the two biological technicians were Leah Roper and Hollund Rudolph. Their work builds on the sampling done in 2011, under the first full year of the Streams Vital Signs Protocol.

Although they were short a crew member for the entire season, the water quality team visited all 46 sites from the 2011 sampling season. Two streams sampled in 2011 were dry last year, thus could not be sampled (one in Whiskeytown, and one in Lassen Volcanic).



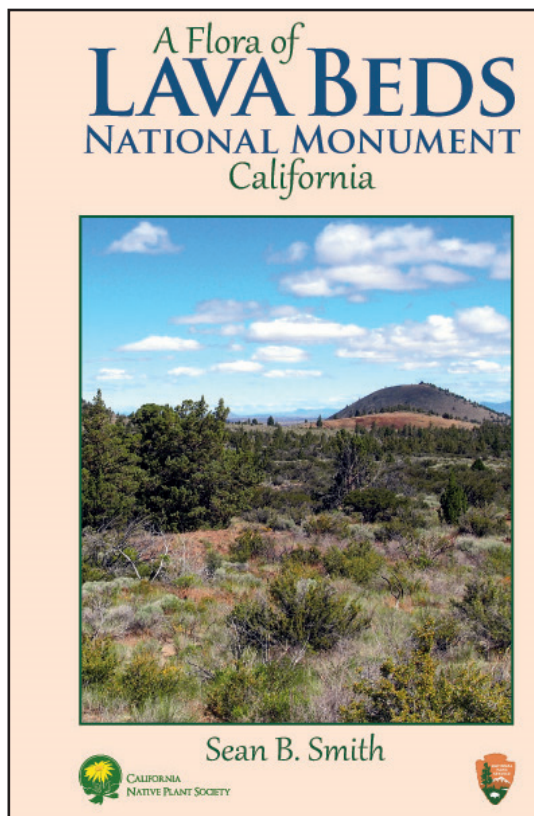
Stream monitoring team ready to embark on a sampling trip. From right to left: Hollund Rudolph in front, Leah Roper, Kathleen Doran, and a volunteer. NPS photo.

This was the first year that sites were revisited, an occurrence that will happen again and again in the coming decades, to allow us to detect

and quantify trends in the condition of these important surface waters. Nine sites were also within or on the edge of the Reading Fire zone, and the forthcoming annual report will examine the effects of the fire on the streams, as a corollary to the analyses of fire effects on the lakes of the park. Likewise, the sampling at Whiskeytown NRA will continue to inform the impacts of a high discharge event from 2013.

This coming summer will see a crew (hopefully with some returnees!) visiting Oregon Caves NM, Redwood N&SP, and Crater Lake NP. Look for them in your park, give them a shout, and come along for a day of sampling (and carrying heavy gear).

—Eric Dinger



New Flora Published for Lava Beds NM

The Klamath Network in cooperation with Lava Beds National Monument and the California Native Plant Society recently published *A Flora of Lava Beds National Monument, California*. The intended use is as a field guide to the 358 species of vascular plants known to occur at Lava Beds. Most of the book is a dichotomous key, but it also includes 37 color images of plants, and description of Lava Beds environmental history, current climate and vegetation zones. Naturalists and botanists with a yearning to identify and learn the plants of Lava Beds will find this book to be a very valuable resource.

The Lava Beds Flora project began in 2005 as my Masters Thesis at Southern Oregon University. I performed four seasons of field work inventorying the Lava Beds plants, covering nearly every square meter of the monument. I also performed a data mining exercise using the Consortium of California Herbaria, to identify specimens previously collected from Lava Beds. Subsequent field work with the Klamath Network and communication with Lava Beds staff has allowed refinement of the Flora.

We at the Klamath Network are excited to see this project to completion after nearly 10 years in development. Big thanks to California Native Plant Society and Lava Beds National Monument for assisting with this publication. If you are interested in obtaining a copy of *A Flora of Lava Beds*, please visit the CNPS website, www.cnps.org.

—Sean Smith

Stream Temperature Monitoring Developed

The Klamath Inventory & Monitoring (I&M) team recently participated in a project to bring continuous stream temperature monitoring to the Klamath Network parks (and to assist in developing a wider set of methods for other NPS units).

Why is water temperature important?

- It controls many physical, chemical, and biological processes in lakes and streams. For example, water temperature affects chemical reaction rates, dissolved oxygen concentrations, algal productivity, and health and reproduction of aquatic life.
- It is a sensitive indicator of the impact of climate change on aquatic systems. Continuous monitoring of water temperature allows us to detect periods of drying or desiccation in the park streams – a direct measure of the loss of habitat resulting from climate change.

The larger purpose of this project is to bridge a gap between Vital Sign priorities identified by the



Setting up a temperature data logger.



Eric Dinger, working with USGS and Whiskeytown staff, deployed several temperature loggers this past winter, including this one in Paige Boulder Creek. NPS photo.

parks as part of the Scoping Process (see the [Vital Signs Monitoring Plan and appendices](#)), and what was implemented as part of the [Wadeable Stream Monitoring Protocol](#). Climate change was the network's highest ranking aquatic Vital Sign. While our Wadeable Streams protocol monitors a wide range of valuable parameters, including aquatic communities, water quality and chemistry, physical habitat, and riparian zone characteristics, it only indirectly monitors the effects of climate change (e.g., through changes in species distribution or increased productivity) and its all encompassing nature precludes frequent, yearly visits which would be needed to maintain remote temperature loggers.

This clearly defined set of Standard Operating Procedures for deploying, maintaining, and downloading automated temperature loggers, as well as reporting on continuous stream temperatures provides parks with all the tools necessary to implement this important, direct measure of climate change alongside the I&M Program monitoring or at additional sites. Upon completion of the protocols, the

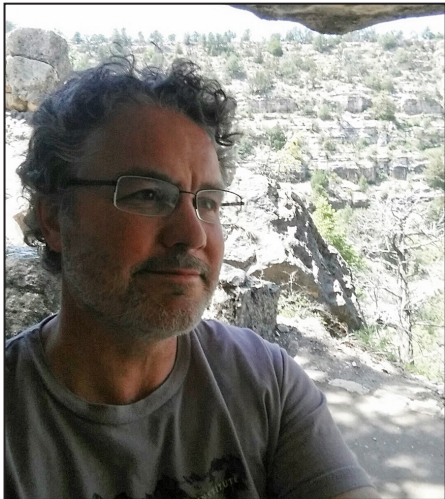
parks can take ownership and begin implementation as their resources allow.

An additional goal is to facilitate the transfer of data the parks collect to regional monitoring efforts, namely the [NorWest Stream Temp Program](#), a regional database of >15,000 stream sites and >60 different agencies coordinated by US Forest Service Research Biologist Dan Isaak, as well as other identified regional databases. This will allow the parks to contribute to the greater understanding of climate change impacts and shifting species distributions, as well as the specific changes within their own watersheds.

The work is being done in collaboration with the US Geological Survey (USGS) and utilizes funding that was available from the National Park Service Inventory & Monitoring Division last fiscal year. Our USGS partners are Dr. Jason Dunham and Mike Heck, with the Forest and Rangeland Ecosystem Science Center in Corvallis, Oregon.

—Eric Dinger

Onward and Upward



Daniel Sarr in his new habitat. Daniel was KLMN I&M Program Manager from 2001 through April 2014.

June 2014

Dear Klamathians,

Greetings from the Colorado Plateau! I am now several weeks into my new position as a Research Ecologist with the USGS Grand Canyon Monitoring and Research Center in Flagstaff. It took me a full week to get used to the 7,000' elevation here, but I am

up and running again.

Although I definitely miss the beauty and comradery of the Klamath Network parks, it has been exciting to see the new (to me) and striking landscapes of the Plateau, and to meet new colleagues working to inform our management and preservation of one of the world's great river ecosystems. I ponder (but don't mention to folks here) the great rivers (and creeks) of the Klamath Region (the Klamath, Trinity Rogue, Eel, Mad, Smith, Chetco, Sacramento, Pit, Umpqua, Wood, Scott, Applegate...such an embarrassment of riches!). Every seep, trickle, rivulet, and wetland is celebrated in the Southwest, which, when you think about it, is a good gospel to spread. I work with an interdisciplinary team examining the linkages between hydrology, geomorphology, aquatic ecology, and cultural resources along the Colorado River. Fine and knowledgeable people all, and an approach that suites me well.

I will also be working more broadly with national parks on watershed and riparian

research and technical support throughout the West. Collaboration with the Klamath Parks will be one ongoing dimension of my work.

Count on it.

Once again, a heartfelt thanks to you all for the wonderful opportunity to work in the Klamath Network, and for a righteous going away party with amazing gifts (my arrowhead and plaques are on my office walls and, of course, my sasquatch air freshener is proudly displayed in my Jeep). I'll remain in your debt for a long, long time... and gladly so.

Keep in touch, and if you ever find yourself in Flagstaff, look me up.

Warm Regards,
Daniel

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Klamath Network's First Annual Science Day

Despite the wind storm that hit Oregon on Dec. 11, 2014, we had a great turnout at our first Klamath Network (KLMN) Science Day! This event, which was hosted by KLMN Inventory & Monitoring on the campus of Southern Oregon University (SOU), featured presentations from network parks on natural resources, cultural resources, and interpretation.

Opening remarks for this $\frac{3}{4}$ day event were provided by Dr. Saigo (SOU President), Alice Chung-MacCoubrey (new KLMN Program Manager), and Patty Neubacher (Pacific West Region Deputy Regional Director).



Klamath Network park staff listen to a presentation at the first annual Science Day. Photo: Alice Chung-MacCoubrey.

Park and network staff spoke on topics ranging from anomalous pika at Lava Beds and forest restoration at Whiskeytown to stewardship of cultural resources GIS data at Crater Lake and development of

a climate change resource library for interpreters at Lassen Volcanic. Based on positive comments and feedback from over 40 attendees, the event was deemed a success.

The KLMN Board of Directors voted to continue the event in future years, and a program committee was identified to develop the 2015 agenda. The committee may also explore audience suggestions such as adding a poster session, livestreaming the presentations, and expanding participation to researchers and cooperators. Look for our Call for Presentations via email and in our Fall Kaleidoscope newsletter!

—Alice Chung-MacCoubrey

Recent Monitoring Reports

Invasive Species Early Detection

- [Annual report for 2013 field season](#)
- [Annual report for 2011 field season](#)

Vegetation Structure, Composition and Function

- [Oregon Caves NM and Crater Lake NP 2013 annual report](#)
- [Whiskeytown NRA and Lassen Volcanic NP 2012 annual report](#)
- [Lava Beds NM and Redwood N&SP 2011 annual report](#)

Stream Aquatic Communities and Water Quality

- [Whiskeytown NRA and Lassen Volcanic NP 2011 annual report](#)

Landbirds

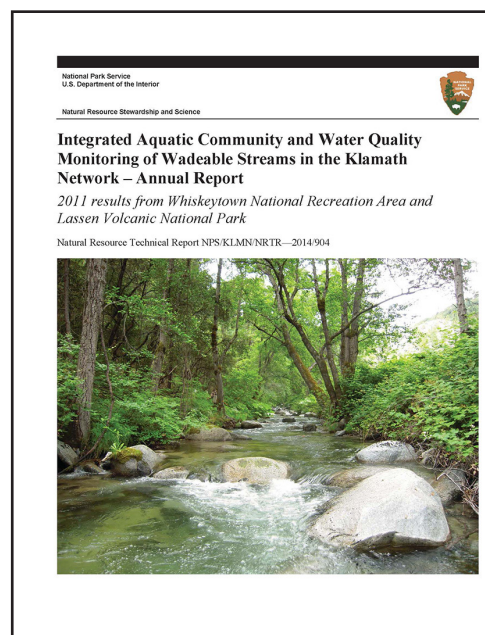
- [Crater Lake NP and Oregon Caves NM 2013 annual report](#)

Rocky Intertidal Communities

- [Redwood National & State Parks 2011 annual report](#)

Resource Briefs and Featured Creatures

Visit the [Klamath Network Reports & Publications web page](#) to download resource briefs. The popular Featured Creatures resumed production in January with the *Ensatina*. Former Featured Creatures are available under Resource Briefs and Newsletters on the publications and reports web page -- Enjoy!



Visit Improved Web Pages

Please visit the new Klamath Network web pages. Thanks to the NPS Inventory & Monitoring Program, our reports and documents are more accessible. One of the most useful new features is the ability to search for documents by topic. Use this new feature and new pull-down menus on our [Reports & Publications page](#) for easier access!

2015 Field Schedule at Klamath Network Parks:

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

Vital Signs Monitoring	April	May	June	July	August	September
Landbirds - Point Counts (KBO)		LAVO, WHIS				
Landbirds - Mistnetting (KBO)		ORCA				
Invasive Species (KLMN - S. Smith)	Sampling order: WHIS, LABE, RNSP, ORCA, LAVO, CRLA					
Veg. Communities (KLMN - S. Smith)		WHIS		LAVO		
Whitebark Pine (KLMN - S. Smith)				CRLA, LAVO		
Wadeable Streams - WQ and Aquatic Communities (KLMN - E. Dinger)			ORCA	RNSP	CRLA	
Mountain Lakes - WQ and Aquatic Communities (KLMN - E. Dinger)	Next field season is slated for 2016.					
Rocky Intertidal (UC Santa Cruz)		RNSP				
Cave Communities and Environment	Slated to start in 2016					
Other Projects						
Vegetation Mapping (SOU)				CRLA		

KBO=Klamath Bird Observatory, SOU=Southern Oregon University