# THE KLAMATH KALEIDOSCOPE

A Newsletter of the Klamath Network
Inventory and Monitoring Program
Fall/Winter 2005

## *Klamath Network Vital Signs Selected!*

**By Dennis Odion. Ecologist, Southern Oregon University, and Daniel Sarr, Klamath Network I&M Coordinator**

The Klamath Network Inventory and Monitoring Program was created to increase our understanding of ecosystems in the National Park Service administered areas of southern Oregon and Northern California, and to track their health through time. What are the "vital signs" of ecosystem health that can be monitored in the parklands in this diverse region? This is the complex but fundamental question the Network has been confronted with since its inception in 2000. There is no standard procedure for taking the pulse of an ecosystem. Identifying vital signs is further complicated by gaps in existing knowledge, an uncertain future, and the realities of budget limitations for monitoring of environments so diverse they range from kelp forests along the coast to desert shrublands in the interior, and from alpine rockfields to temperate rainforest containing the world's tallest trees. The Network also contains diverse cave environments and the nation's deepest and clearest lake. The staff of the Network, with the assistance of numerous experts on the resources found in and around the parks, have been busy trying to determine vital signs of ecosystem health, and have recently reached an important milestone in identifying the vital signs to monitor! How did the Network decide on the vital signs that could be monitored to track the health of its varying ecosystems, and what are these vital signs? We provide a brief answer to these questions here.

**Boulder Creek Falls, Whiskeytown NRA**

We started by gathering

information on the most important resources of the Network, and what may be stressing them. We did this in meetings where numerous experts from inside and outside the parks graciously offered their time and knowledge. We asked these experts to identify important monitoring questions about the park's resources based on what may be stressing them now, and what may be anticipated to do so in the future. What happens when numerous experts that care about the park's resources are asked to brainstorm and identify such monitoring questions? In short, we were inundated with monitoring suggestions! We had to determine which of these best represented vital signs of ecosystem health, and which would be feasible to monitor.

We relied on the concept of ecological integrity to provide guidance with regard to these key questions. This concept has been developed in the ecological and resource management literature to provide a framework for evaluating changing environmental conditions and biodiversity through monitoring. Ecological integrity is based on (1) system wholeness, including the presence of appropriate species, populations, and communities; (2) the occurrence of ecological processes at appropriate rates and scales; and (3) environmental conditions that support these taxa and processes. Thus, ecological integrity is a measure of a healthy ecosystem.

With so many types of environments in the Network parks, we also needed to ensure that the monitoring would be as comprehensive as possible in covering different ecosystems and their components. Thus, we defined the 4 major ecosystem types found in the Network that vital signs monitoring needed to cover to be comprehensive: marine, freshwater aquatic, subterranean, and terrestrial ecosystem domains. To make sure we were


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**THE KLAMATH NETWORK PARKS:**

**Crater Lake National Park**
www.nps.gov/crla/
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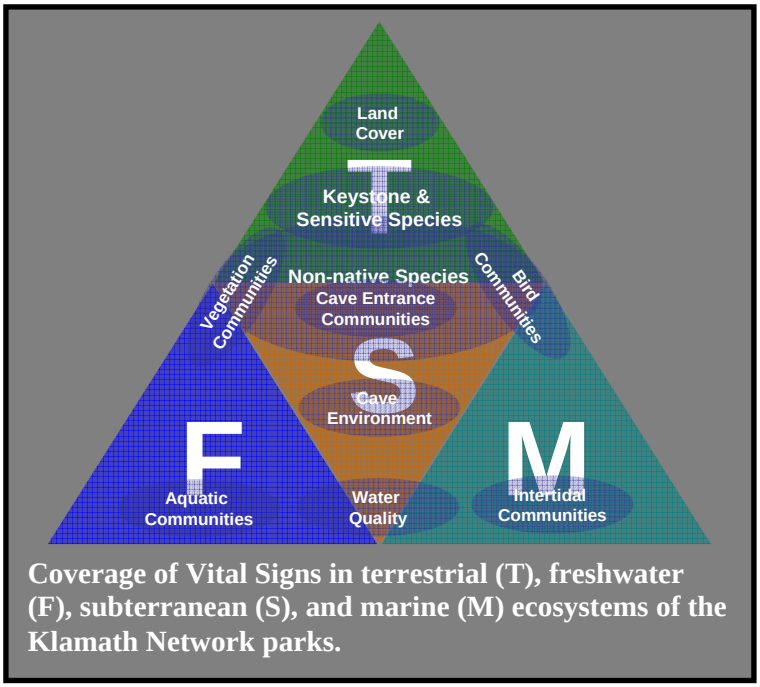
**Lassen Volcanic National Park**
www.nps.gov/lavo/
(530) 595-4444

**Lava Beds National Monument**
www.nps.gov/labe/
(530) 667-2282 Ex.232

**Oregon Caves National Monument**
www.nps.gov/orca/
(541) 592-2100

**Redwood National Park**
www.nps.gov/redw/
(707) 464-6101

**Whiskeytown Natl. Recreation Area**
www.nps.gov/whis/
(530) 246-1225




**Coverage of Vital Signs in terrestrial (T), freshwater (F), subterranean (S), and marine (M) ecosystems of the Klamath Network parks.**

also comprehensive in scope *within* these ecosystems, we relied upon another ecosystem-based framework, one that describes their essential components, as including their *structure* (referring to the organization or pattern of the system), their *function* (referring to ecological processes), and their *composition* (referring to the variety of elements in the ecosystem). Finally, it was important to take into account practical monitoring concerns, including the management significance of potential vital signs, the feasibility and cost of measuring them, and whether there were legal mandates requiring their monitoring, for example, an endangered species whose status is required to be tracked by federal agencies.

All of these factors were evaluated by a number of experts, who assessed a "short" list of 33 key monitoring questions and 172 associated vital signs that was boiled down from scoping sessions. A questionnaire was developed and sent out to these experts on resources in the Network. It provided a means for them to rate the ecological and management significance of the questions and the suitability of the candidate vital signs for answering the monitoring question.

Once the scores for all of the respondents were tallied, a ranking of vital signs based on all the deliberations of those involved in the process was created. Following the ranking we combined some of the vital signs that were similar, and elevated the rating of some pertaining to subterranean ecosystems to make sure that these would not get overlooked. The process ensured that the vital signs are comprehensive in terms of coverage of the broad ecosystems and their structure, function and composition. The final top ten vital signs and their coverage of park ecosystems are presented in the diagram to the left. Although the vital signs necessarily exclude many important phenomena, they do provide some information about all the park ecosystem domains.

## *Klamath Network Recent Highlights and Upcoming Events*

***July 2005 Strategic Interpretive Partnership begins.***

***August 2005 Klamath Network completes Phase II Vital Signs Monitoring Report.***

***December 2005 Klamath Network Board of Directors Meeting.***

***Spring 2005 Klamath Network develops Vital Signs Protocols for vegetation coomunities, non-native plants, intertidal communities, and bird communities.***

# I&M Alpine Workshop Tackles Monitoring in High Elevation Environments

**By Daniel Sarr**

In September 2005, Daniel Sarr and Michael Murray of the Klamath Network participated in a workshop to identify common monitoring issues in subalpine and alpine ecosystems of National Park Service lands in the western U.S. This workshop, convened by the Rocky Mountain Inventory and Monitoring Network, and located at the University of Colorado's Niwot Ridge Field Station, brought together nearly two dozen scientists from several universities as well all the I&M Networks in the western U.S. with significant subalpine and alpine habitat. Workshop participants broke into four working groups to address specific monitoring issues in different ecoystems, including: 1) weather, climate, and glaciers, 2) terrestrial environments, 3) lakes and streams, and 4) atmosphere-land-water biogeochemistry. Because none of the networks participating had identified an explicit "alpine" vital sign, it is most likely that the recommendations of this workshop will be distributed among multiple vital sign monitoring protocols if and when they are implemented. This multi-network workshop provided an excellent forum for the exchange of ideas and for collaborative goal setting for special, high-elevation ecosystems. At the close of the workshop there was also considerable discussion about the possibility of developing another collaborative workshop dealing with mountain wetlands in spring 2006.

**Niwot Ridge, Colorado Front Range.**

# Lava Beds *Botany Blitz* Yields New Plant Species

**By Dennis Odion**

In June 2005, a dozen scientists and plant enthusiasts from California and Oregon converged at Lava Beds National Monument's new research facility for a three-day Botany Blitz, or botany foray, throughout the Monument. Lava Beds National Monument and the Klamath Network Inventory and Monitoring Program hosted the group. Sean Smith of Southern Oregon University, who is cataloguing all the species in the Monument in preparing a Master's Thesis describing its flora, led the group. After learning what is known about the flora of the Monument, the group set off into the nearly 50,000 acres of wildlands in search of new species. On the last day, the group's efforts were rewarded; they discovered a population of Rocky Mountain bitterroot (*Lewisia rediviva*), a new species for the Monument. This showy and attractive species is pictured below growing in the Monument. A previous volunteer

field day, led by Dr. Steve Jessup and Mr. Smith, yielded one confirmed new species for the park (*Crepis bakeri*) and another potential new species not yet positively identified (likely *Alyssum alyssoides*). This project, started with I&M inventory funding, is already generating new species and insights into the flora of the Monument and will culminate in a published flora and vascular plant field guide. The Network wishes to thank all those who participated in the botanical foray.

Rocky Mountain bitterroot (*Lewisia rediviva*).

# *Crater Lake Symposium Convenes Researchers*

**By Dennis Odion**

A symposium of recent research in Crater Lake National Park was held at the 86th meeting of the Pacific Division of the American Association for the Advancement of Science on 15 June 2005. The meeting was held at Southern Oregon University, in Ashland, Oregon.

Crater Lake is the deepest lake in the United States and internationally renowned for its aesthetic beauty and exceptionally clear water. Although aquatic biomass is limited by a scarcity of nutrients, its aquatic biota are remarkable and fascinating in many respects. The Lake provides a natural laboratory for understanding phenomena important in lakes in which solar radiation penetrates most deeply, as well as dark, deep water habitats throughout the world, including the oceans. Aquatic research highlights presented at the symposium included distribution and abundance of phytoplankton, natural variability in fish populations, and many aspects of the remarkable water chemistry and clarity and movement of deep water to mix with surface waters.

Crater Lake National Park also provides an excellent natural laboratory for studying terrestrial environments, with 266 square miles of subalpine meadows, caves, snowfields, pumice barrens, bogs, old-growth, and timberline forest habitat. There were a number of findings presented from the study of terrestrial environments. These included results of bird and bat inventories, and the response of plants, fungi, and bark beetles to prescribed fires conducted in the park.

The symposium illustrated how a resource protected for public use and enjoyment can also function to provide vital information to the understanding and management of natural ecosystems.

Aerial view of Crater Lake.

# *Klamath Network Launches Strategic Interpretive Partnership*

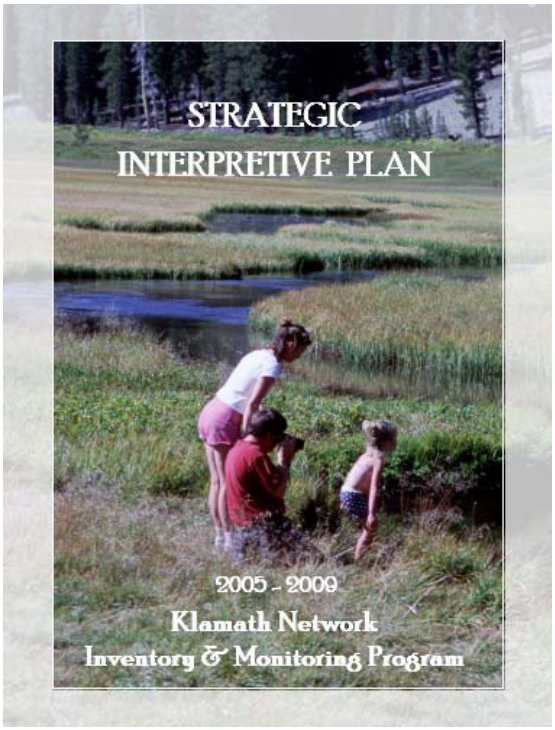
**By Daniel Sarr**

While the knowledge about park resources continually grows and changes, challenges associated with sharing and interpreting this information with park staff and visitors grow as well. Individual parks and interpreters/educators struggle to keep program information up-to-date and relevant, but tight budgets and a communication gap between educational and resource specialists can be obstacles. At the same time, the Klamath Network Inventory and Monitoring Program has been implementing field inventories since 2002, yet has no professional education staff to ensure that this science is making its way to the public. In spring and summer, 2005, Klamath Network Interpretation Chiefs, the Klamath Network I&M Coordinator, and the Chair of the Board of Directors came together on the campus of Southern Oregon University with the goal of overcoming these challenges. An initial meeting set the goals of familiarizing interpretation staff with overall I&M activities and key findings, and with the Southern Oregon University Environmental Education Program. The group also set the goal of finding key interpretive themes to share with the public. Based on the discussions at this meeting, the participants decided to develop a Strategic Interpretive Plan to provide guidance for a new partnership between the Klamath Network I&M and Interpretation and Education Programs. The group agreed that the initial plan would be for five years, with each year focusing on a specific interpretive theme within the Network. The group also agreed to provide funding to support to a second year graduate student in Environmental Education at Southern Oregon University to explore each theme and develop new interpretive materials for the parks. The Network provided funding to Mary Lou Herlihy of the Pacific West Regional Office to write the plan.

The initial themes selected with target years:

| INTERPRETIVE THEME | FY 2005 | FY 2006 | FY 2007 | FY 2008 | FY 2009 |
|---|---|---|---|---|---|
| Biodiversity | X | | | | |
| Invasive Plants | | X | | | |
| Water Quality | | | X | | |
| Wetlands | | | | X | |
| Climate Change | | | | | X |

At the second meeting the group met to refine the plan. Dr. Stewart Janes informed the group that SOU Graduate Student Deborah Zierten had been selected for the 2005-6 position. The team will review the topics annually to confirm (or to change) their prioritization.



# Wetlands Inventory begins in Lassen Volcanic National Park

**By Paul Adamus, PhD**
**Oregon State University**

This year marked the beginning of systematic field surveys of wetlands in parks of the Klamath Network. Initiated by Dr. Daniel Sarr of the I&M Program, the first such survey was completed in Lassen Volcanic National Park under the guidance of Dr. Paul Adamus, a wetland ecologist at Oregon State University. The surveys are needed because wetlands, many of which contain water only briefly, are among the most ecologically important yet sensitive park features. Wetlands are vulnerable to changes in snow pack and groundwater levels. Natural processes, park infrastructure, and climate change can induce such changes. Moreover, many wetlands host an array of rare plants found in no other habitats, and thus contribute more to park biodiversity than their relatively limited area might suggest. The Lassen survey is particularly important because the park has a proportionately large number and diversity of wetlands, and because a 2004 survey revealed that the Cascades frog – fairly common in the park's wetlands just a few decades ago – has virtually disappeared for unknown reasons.

Top: Botanist Cheryl Bartlett gleefully examines a sedge. Bottom: Author and Nick Pacini of Lassen Volcanic inspect a wetland soil sample.

Wetlands commonly include areas as diverse as montane meadows, marshy lakeshores, alder-covered slopes, alpine ponds, and riparian forests. In Lassen, many wetlands recently had been mapped from aerial photographs with no field verification. Checking all of the park's nearly 1000 wetlands was logistically impossible, so a carefully-selected sample was needed if the condition of the park's wetlands overall was to be determined in an unbiased manner. To select the sample, Oregon State researchers applied a new procedure for randomly selecting unevenly-distributed mapped features in a spatially-balanced manner. Researchers from the university and the park then spent 14 weeks visiting and assessing the sample wetlands. They verified wetland maps, inventoried plants, examined soils, recorded hydrologic observations, and used a Geographic Information System (GIS) and existing maps of other features to characterize the wetlands. Several plant species not previously recorded in the park were discovered. After data are analyzed, a quantitative baseline will emerge of the geomorphic diversity, ecological condition, and potential functions of Lassen's wetland resources. The same approach will be applied to wetlands at Crater Lake National Park in 2006.

# USGS Invasive Species Early Detection Program Begins in Klamath Network

**By Daniel Sarr**

In 2005, invasive plant species were selected as the number one vital sign in the Klamath Network. The Klamath Network is not alone. Invasive plant species are a top national level concern in parks and protected areas. Parks nation-wide have been looking for the ways to best monitor and respond to this threat. In recognition of this, the National Inventory and Monitoring Program and the US Geological Survey have joined forces to help parks and networks develop early detection monitoring programs. The Klamath Network was chosen as the location for a major research initiative that will involve ranking of species and habitats, landscape modeling of invasion potential, and developing of an early detection protocol that can be implemented under the I&M Program.

The exceptional breadth of habitats within the Klamath Network, ranging from coastal bluffs, to old-growth forests; from oak and pine woodlands, to alpine areas and sagebrush make it an ideal landscape to explore new techniques for invasive plant detection and management.

In fall and winter, 2005, the Klamath Network compiled information on the presence, distribution, and abundance of non-native plant species in the parks to support a NPS/USGS Invasive Plant Species Early Detection Study. The Network is providing data on invasive plant species' presence and abundance to a scientific team led by Dr. Tom Edwards of the USGS and Drs. Karen Beard and Richard Cutler of Utah State University. The research project will model invasive plant risk in the Klamath Network, starting in Lava Beds National Monument, in 2005-6. The Network is also supporting a related project, started by Dr. Matt Brooks of the USGS Biological Resources Division in Las Vegas, and Rob Klinger of University of California, Davis, that is developing a system for prioritizing invasive species in the parks. We hope that these allied NPS, USGS, and University of California research efforts will serve as a prototype to demonstrate how parks and networks can attack the invasive species problem in an effective and efficient way.

**Yellow star thistle (*Centaurea solstitialis*)**