

Andrews Forest NEWSLETTER

Issue 19

Fall 2015

Using the 2015 Summer Drought to Understand Effects of Climate Change

Minimal winter snowpack, absent spring snowmelt, and contraction of the summer stream network: these are some expected impacts of climate change in the western Cascades. In this way, summer 2015 may be a preview of things to come. Lookout Creek of the Andrew Forest set a new low stream-flow in our 60-year record; August flows were less than half the long-term mean. Small, gaged streams slowed to a trickle or, as in the case of Watershed 9, stopped running entirely.

What do these extreme conditions mean for distributions and health of fish and salamanders, in-stream productivity, and trophic interactions? Fortunately, this record-year coincides with one of the most ambitious stream ecology field seasons in recent memory, so preliminary answers to questions about effects

of climate variability on stream ecosystems are already emerging.

Long-term monitoring of stream flow and temperature, and of Mack Creek populations of cutthroat trout and coastal giant salamanders, continued on familiar schedules, led by Sherri Johnson and Stan Gregory, respectively. These long-term studies provide context for this year's observations.

A new cohort of stream ecology studies took advantage of learning opportunities afforded by this special year. A new LTER7 study examines the upstream distribution of fish and salamanders, two key predator taxa, in response to constraints imposed by landforms, summer low flows, and species interactions. Mapping of these populations in future years will provide a glimpse into changes over space and time.

Anticipating the low summer flow of 2015, Dana Warren and Matt Kaylor secured a National Science Foundation grant to study spatial variability in nutrient availability across the stream network, and how this interacts with light level to influence primary productivity. This project complements their multiple-year study of fish and salamander movement and condition, and stream productivity, in relation to light conditions and streamflow.

Two manipulative stream experiments were also in place to take advantage of the 2015 drought. The SCALER project, led by Brooke Penaluna and Alba Argerich, used stream exclosures, enclosures, and density manipulations to study the influence of fish and salamander populations on stream ecosystem processes. The researchers used four



Lina DiGregorio



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Student researchers participate in stream ecology studies at the Andrews Forest.



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A field crew captures, measures, weighs, and later releases, fish and salamanders in a stream at the Andrews Forest.

experimental reaches on typically-perennial streams (although several were partially dry this summer), providing the opportunity to examine treatment effects under extremely low flows. In the related salamander movement experimental study, Ivan Arismendi and Stan Gregory investigated the effects of crowding on stress, movement, and rates of transformation from aquatic to terrestrial form of the coastal giant salamander. Initial findings suggest strong competitive interactions in prime habitat space, leading to displacement of subordinate individuals to poorer habitat.

Like the drought-impacted streams themselves, the results of this work will continue to trickle in. And if next winter plays out the same way, as predicted, we will see even more cascading impacts on our drought-stressed system.



HJ ANDREWS EXPERIMENTAL FOREST

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The H.J. Andrews Experimental Forest

Where Ecosystems Are Revealed

The H.J. Andrews Experimental Forest is the hub of a cooperative program of research, education, and research-management partnership involving Oregon State University and the USDA Forest Service's Pacific Northwest Research Station and Willamette National Forest. The mission of this partnership is to support basic and applied research concerning forests, streams, and watersheds, and to foster strong collaboration among ecosystem science, education, natural resource management, and the humanities.



Letter from the Leadership

We often say that the Andrews Forest is a place of inquiry. Inquiry, in many forms: scientific to be sure—the struggle to understand how a system works, and how it changes over time, but also humanistic inquiry—writers, poets, philosophers, historians, painters, social scientists, musicians are all a welcome part of this effort to understand our ecosystem.

Support for inquiry of ecosystems is rare—only a small fraction of scientific research money goes to ecosystem science. Only a small fraction of ecosystem science money is dedicated to long-term research. In fact, of all studies in ecology fewer than 2% last more than 5 years. And scholars are not necessarily rewarded for such persistence.

So, why is it important to pay attention over the long-haul? Two reasons: First is a very pragmatic reason: long-term ecological research seems an absolutely vital component of understanding those long-term processes that might help secure our continued long-term existence and the well-being of the planet. That is, if we care about human survival, we need to care about understanding our impacts, over time, on those systems supporting our survival. So, even from a narrowly anthropocentric view, long-term research is absolutely critical. But, second, there are other, deeper, ethical, non-anthropocentric reasons—reasons rooted in empathy not in manipulation. Long-term ecological research, such as that done here at the Andrews Forest, teaches us more about the other members of our “biotic community,” to use Aldo Leopold’s words. Understanding the flourishing of the fellow members of our biotic community, and the flourishing community itself, is, we believe a worthy pursuit in and of itself, a sensible extension of a morally mature mind and culture. In this way our science is driven by an ethic, it informs and becomes an ethic—an ethic requiring, we believe, no apology.

—Michael Paul Nelson, Principal Investigator of the Andrews Forest LTER Program,
Ruth H. Spaniol Chair, Department of Forest Ecosystems and Society, Oregon State University



Tom Spies

Student Spotlight—Chelsea Batavia

Chelsea Batavia is entering her third year as a graduate student with Lead PI Michael Paul Nelson. Chelsea is studying the ethical underpinnings of natural resource management and conservation. In spring 2015 she completed her Master’s degree with research on “ecological forestry,” a recent paradigm in forest management that is based substantially on science that has come out of the Andrews. Her thesis highlighted problematic ambiguities in the concept of ecological forestry, stemming from a general inattention to its normative (values) foundations. Moving forward, Chelsea is interested in finding ways for the normative dimensions of forest management to be more explicitly integrated into management decisions. For her PhD



Mark Schulze

Chelsea Batavia, far left, leads an argument analysis exercise for undergraduates visiting the Andrews Forest in October 2015.

she hopes to work closely with Andrews researchers and partners to study how democratic and discursive processes can influence forest policy and management.

Faculty Face—Chris Still. Taking the Temperature of Forest Canopies

Christopher Still, Associate Professor in the department of Forest Ecosystems and Society at OSU, studies the temperature of forest canopies. As part of a renewed focus on canopy ecology and physiology at the Andrews Forest, and in collaboration with postdoctoral scholar, Youngil Kim, and Forest Director, Mark Schulze, Chris is examining the fundamental role of temperature in forest function, ranging from controls on enzymatic reactions, to ecosystem biogeochemistry, to tree distributions. While scientists often focus on air temperature, the radiative temperature of a plant is more relevant to ecosystem function. Until recently, radiative measurements of plant temperature have been challenging.

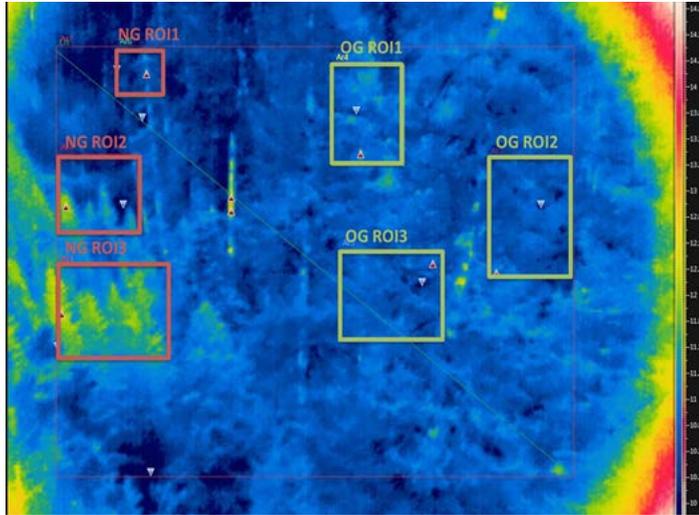
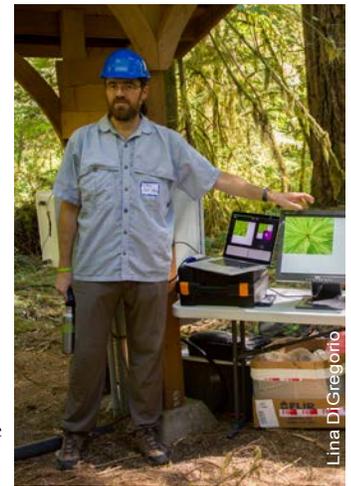


Image from a thermal camera mounted 55m above ground in an old-growth Doug-fir tree growing along the Discovery Trail.

Now, scientists can measure plant temperature using thermal cameras with technology similar to that found in night-vision goggles. The image (left), from summer 2015, was collected by a thermal camera deployed in a very tall, old-growth Doug-fir tree at the Andrews Forest. The left hand side of the image shows a second-growth Doug-fir plantation canopy, while the right side shows an old-growth Doug-fir and western hemlock canopy.

There are many interesting patterns in this image, such as the hotter (yellow) trunks and branches and the cooler leaves (blue). The patterns change over the day; trunks and woody parts can become colder than the foliage. We are also seeing that second-growth and old-growth canopies differ in rates of heating and cooling.

The team hopes to collect an entire year's worth of thermal imagery, which would be unprecedented. These data will help us better understand the forest canopy, and enhance our understanding of connections among canopy temperature and photosynthesis, respiration, and transpiration. The project supports numerous applied research objectives, such as understanding the thermal response of forests to drought and heat waves.



Chris Still presents his canopy ecology work at HJA Day 2015.

In Memory—Ross Mersereau

Roswell is a name familiar to visitors to the Andrews Forest—Roswell Ridge bisects the Lookout Creek basin, separating McRae and upper Lookout Creeks, and Roswell is the name of an intensely-used bunkhouse. These names honor Ross Mersereau, who passed away on August 12, at the age of 91—a remarkably long life for a Marine who lost a lung to severe wounds on Iwo Jima during World War II. After discharge from the service, Ross taught at Springfield High School before completing a Masters degree at Oregon State University and then joining the field staff of the Andrews Forest in 1966. Ross worked for many years on the experimental watersheds and other study sites in the Andrews Forest. He and his wife, Marjorie, raised nine children, who spent part of their youth in a house on the Blue River Ranger Station compound. Ross's legacy also includes a rich resource of long-term environmental data.



Ross Mersereau measuring the Watershed 1 sediment basin, 1969.

Growing Diversity in Science

Strategies for Ecology Education, Diversity and Sustainability (SEEDS) is an education program of the Ecological Society of America. Its mission is “to diversify and advance the ecology profession through opportunities that stimulate and nurture the interest of underrepresented students to participate, and to lead in ecology.” In early October, sixteen SEEDS undergraduate students participated in a multiple-day hands-on learning experience organized by volunteer researchers, staff, and graduate students at the Andrews Forest. SEEDS students collected and presented data, engaged in writing exercises, did formal argument analysis about forest management, queried a career panel, and hiked to the fire lookout on Carpenter Mountain. The students, who had not visited an old-growth PNW forest before, expressed awe of the place; Andrews personnel were equally impressed by the students' enthusiasm for truly interdisciplinary approaches to ecological inquiry.



SEEDS students collect data at the Andrews Forest, October 2015

Ecological Reflections

The Ecological Reflections program is making strides at the Andrews Forest, across the LTER network, and beyond. With input from many people associated with the Andrews Forest and colleagues at other LTER and field station sites, Fred Swanson published an essay in the journal *Ecosphere* titled “Convergence of Arts, Humanities, and Science at Sites of Long-Term Ecological Inquiry,” as one of six papers celebrating the centennial of the Ecological Society of America (<http://www.esajournals.org/doi/pdf/10.1890/ES15-00139.1>). This essay describes the recent emergence of arts and humanities engagement at many LTER sites, biological field stations, marine labs, and National Park Service properties.

Andrews Forest researchers Lissy Goralnik, Michael Nelson, Leslie Ryan, and Hannah Gosnell recently published findings from a survey of the interest of LTER leaders in having arts and humanities be part of their programs. A majority of LTER leaders expressed strong interest, including the desire to engender a sense of empathy for the ecosystems of LTER sites.

In addition to this scholarly work, artist Bob Keefer recently showed about 50 of his painted photographs in an exhibit called “Forest Investigations” at the Jacobs Gallery in Eugene; these

works are based on a rainy Andrews Forest residency. And now several of Leah Wilson’s paintings in her “Ambient” series are displayed in the lobby of the Greenhouse—check them out and note the caption describing her science-like rigor in creating her art.



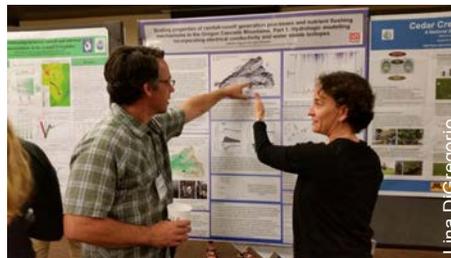
One of Bob Keefer’s hand-colored photographs of Andrews old-growth mid-story, entitled “Forest 2015.17.”

Stay tuned for major new developments in the Long-Term Ecological Reflections: art exhibiting in Corvallis and Portland; a new book; a project combining music, visual art, neuroscience, and environmental sciences; and more.

The LTER All-Scientists Meeting

Every three years, researchers in the NSF’s Long-Term Ecological Research (LTER) program gather to discuss science and share discoveries. This year, almost 600 scientists from across the LTER network attended the 2015 LTER All Scientists Meeting from August 30 through September 2 in Estes Park, Colorado. There were over 300 poster presentations and more than 75 formal and ad-hoc working group meetings. The meeting’s theme was “From Long-Term Data to Understanding: Toward a Predictive Ecology.” Twenty six students, faculty, and researchers from the Andrews Forest LTER Program at-

tended the meeting. They participated in and led working groups, and they presented posters on their work with a goal of sharing ideas, networking with colleagues, and furthering the science and ideas across the LTER network.



Catalina Segura (right) shares her research findings with colleagues at the LTER All Scientists Meeting 2015.



Lina DiGregorio

Support for the Andrews Forest

The Andrews Forest Program is dedicated to research and education about forests, streams, watersheds, and our engagement with the land.

The Andrews Forest Fund enables individuals and organizations to support the important work at the Andrews Forest.

With your gift you will support projects such as the Canopy Connections program that gives middle school students lessons about the forest, or the Andrews Forest History Project, which is in the process of creating a formal collection of records documenting the history of the Andrews Forest program.

The Andrews Forest Fund provides an opportunity to support many other projects. Your gift can be donated in whatever way is most convenient for you; donations of funds, appreciated securities, bequests, real estate or property, and more can support the Andrews Forest Program.

If you have questions, or would like to make a donation, please call 541-737-8480, or donate online at <http://andrewsforest.oregonstate.edu/donate>