Andrews Forest NEWSLETTER

Issue 6 Spring 2009

Forest Plots Tell a Subtle Story of Change Across the West

A new study published in the journal *Science* documents an increase in tree mortality rate in old-growth forests across the West during the past 50 years. The increase in mortality affects all sizes and common species of trees. The documented doubling of mortality rates over the past few decades could significantly change forest composition and structure. The authors considered several possible causes, including competition and aging of older trees, and concluded that stress related to climate warming is the best explanation. This increase in so-called background mortality is not as obvious as large fire or insect killed stands of trees, but given the large areas of "undisturbed" forests, it could have equivalent impact on the carbon cycle. As more trees die, the forests will take up less carbon dioxide from the atmosphere.

This work is based on long-term forest plots established decades ago, many by Jerry Franklin and associates, at the Andrews, Cascade Head, and Wind River Experimental Forests and several National Parks in Washington and California. The study highlights the importance of maintaining long-term experiments and observation programs.

Mark Harmon, OSU professor and one of the paper's authors, comments, "This exploratory analysis points us in the direction of new studies of the existing long-term data. For example, we need to examine records for trees in the 100–200 year age class and probe the mechanisms of mortality. We also need to examine what is happening to these dead trees—are there enough to turn the stands into carbon sources for the atmosphere? It is essential to keep these and similar observations going."

In the early days of the permanent study plot program, large calipers were used to measure tree diameter. Photo from USFS-PNW.

The *Science* article, *Widespread Increase of Tree Mortality Rates in the Western United States*, is online at *www.sciencemag.org*.

Beetles Go Digital

Recognizing a particular beetle in the forest can be a tough job—but it just got a little easier at the Andrews Forest thanks to Adam Martinez and his NSF-funded Research Experience for Undergraduates (REU) project, "Bringing Cybertaxonomy to the HJ Andrews Experimental Forest."

The goal of the project was to create a digital image archive of the ground beetles found at the Andrews Forest. Martinez, a senior in Biology at OSU, worked with Christopher Marshall, Curator of the Oregon State Arthropod Collection (OSAC). Martinez used the sizeable Andrews Forest beetle voucher collection to produce high-resolution images and web-based access to the ground beetles (*Coleoptera: Carabidae*) known to occur at the Forest. (See the article on Lattin, Page 3, to see how beetle research at the Andrews Forest got started.) Ground beetles are particularly diverse in the Pacific Northwest with over 80 genera and hundreds of species. As with many invertebrates, high diversity and a lack of illustrated guides have inhibited their inclusion in ecological studies. Martinez's REU project has helped reduce this impediment by creating a digital resource to the ground beetle species from the Andrews Forest with over 400 high-resolution images of the species known to occur there. The digital beetle images and information are available at *http://osac.science.oregonstate.edu/projects/2008HJA_REU*.

Photo: Omophron ovale *is an unusual ground beetle (*Carabidae*) that lives on sandy shores of freshwater habitats. During the day the beetles hide under stones and logs. At night they come out and run along the sand feeding on smaller organisms. This pinned specimen is part of the OSAC collection and the web-based digital archive. Photo by Adam Martinez/OSAC.*

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

In January I had the pleasure of leading a workshop in Bariloche, Argentina, to encourage development of an LTER-like science program in northern Patagonia. Thanks to joint funding from the National Science Foundation in the US and two federal agencies in Argentina, we were able to bring together some of Argentina's best and brightest environmental scientists with a select group of scientists from the US. Everyone was excited about potential collaborations, and two young scientists from the US are already formulating research plans with Argentine colleagues they met at this meeting. Traveling home, I reflected on the enthusiastic and diverse involvement of scientists from the Andrews Forest in long-term ecological research around the globe. In past decades Andrews Forest researchers have assisted development of the World Bank funded Chinese Ecological Research Network, Taiwan Ecological Research Network, Tasmania's Warra LTER site, and others. Jeff Miller and Andy Moldenke are collaborating with scientists in both Taiwan and Korea, Tom Spies recently visited Israel to work on LTER-related research, Kate Lajtha maintains collaborations in Hungary, Julia Jones will be hosting a visiting hydrologist from Tasmania—these are just a few examples! There is incredible value in this large (1000 scientists at more than 100 institutions) set of international long-term research activities that cooperatively share work, ideas and data. Although it is challenging to grow and sustain this interactive, international science culture, it is essential in the context of the global environmental issues we now confront. I am proud of the contributions the Andrews Forest research community is making to develop international collaborations and to encourage LTER approaches to environmental science and education around the world.

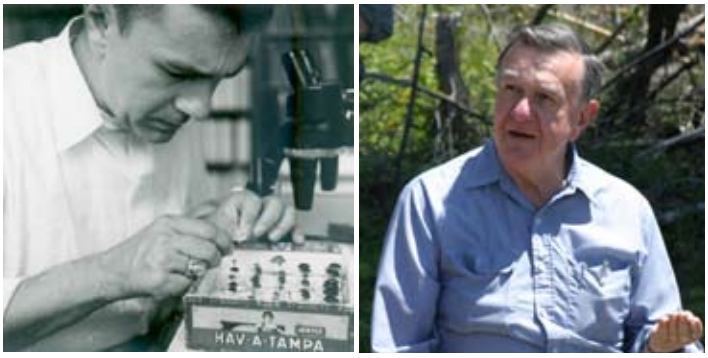
—Barbara Bond, Lead Principal Investigator of the Andrews Forest LTER, Ruth H. Spaniol Chair, Department of Forest Ecosystems and Society, Oregon State University (photo by Cheryl Hatch/OSU).

Student Spotlight—Claire Phillips

Claire Phillips taking images of growing roots using a minirhizotron. Photo by Barbara Bond.

Claire Phillips enjoys being a part of the Andrews Forest research community as much as she enjoys studying forest ecosystems. Phillips' community involvement includes serving two years as a graduate student representative for the Andrews LTER group and as a mentor for two undergraduate summer research interns. Her dissertation research on soil respiration examines how quickly carbon that is taken in by the forest canopy gets metabolized and released from soil. At the 2008 Fall American Geophysical Union Meeting, Phillips was awarded the Second Annual Sulzman Award for best student oral presentation. The award is given to students using isotopes to study biogeochemistry and honors the memory of Dr. Elizabeth Sulzman and her work on soils and carbon isotopes at the Andrews Forest.

Where are They Now? Jack Lattin



Jack Lattin "Then" (left, pinning beetles in 1959) and "Now" (right, discussing arthropods at HJA Day in 2004. Photo by Al Levno).

Jack Lattin, OSU Professor Emeritus, has championed studies of arthropods (the "spineless creatures," as he affectionately calls them) in the Andrews Forest for more than three decades. Latin recalls, "Jerry Franklin invited me to join the Andrews Forest group in 1976. My first impression was of little biological diversity in the massive forest. Fifteen years later we published the 'Big Bug Book' on the arthropods of the Andrews Forest [*Invertebrates of the H.J. Andrews Experimental Forest, western Cascade Mountains, Oregon: V. An annotated list of the insects and other arthropods. 1991. Parsons et al. PNW-GTR-290. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station*]. We documented 3,453 arthropod species of which 16 were non-indigenous. Thirty-two undergraduate and graduate students assisted, as did 81 specialists from around the world. Recent studies have added more species to the list. So much for little biological diversity!"

Lattin's entomological zeal is little diminished since retirement in 1996. Today he can be found making his way to and from the OSU Botany Department with copies of his latest manuscripts in progress. The Entomological Society of Washington (DC) recently recognized Lattin's lifetime achievements in the form of a special volume of papers, totaling more than 400 pages, authored by colleagues in Lattin's honor.

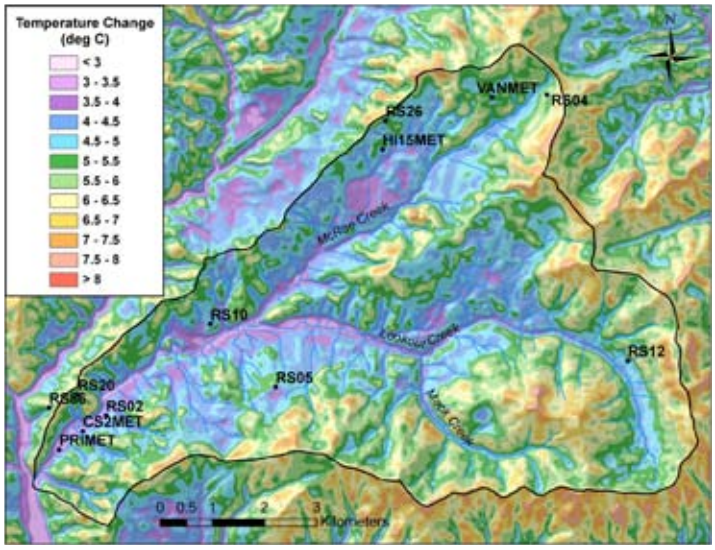
Teachers as Watershed Researchers

The new Teachers as Watershed Researchers Project is designed to provide Oregon high school teachers with the confidence and capacity to engage students in watershed field investigations. Teachers will interact with scientists and watershed council coordinators in three watersheds along a gradient from the forest to the sea: The Andrews Forest, McKenzie River Watershed; the Newton Creek Wetland and Oregon State University Campus, Mary's River Watershed; and the Oregon Hatchery Research Center, Alsea River Watershed. Teachers will learn how science research and science teaching methods come together to make science inquiry more alive and authentic. Kari O'Connell and Susan Sahnow, of the Oregon Natural Resources Education Program (ONREP) at OSU will lead the program. Funding is provided by ONREP and the Oregon Watershed Enhancement Board (OWEB).

Hidden Climate Variability at the Andrews Forest

Climate is a fundamental driver of all natural systems, so we have made it a central feature of work in the new LTER grant period. We have collected measurements of temperature, precipitation, humidity, solar radiation, wind, and other variables and are now critically examining these records that in some cases span more than 50 years. The Andrews climate-monitoring network of about 30 sites is unique in that data are collected in places not normally considered when designing a climate network, such as under deep forest canopy, near streams, and on ridge tops.

The climate-monitoring network is revealing strange things happening in the nooks and crannies of the forest. OSU professor and LTER climate coordinator Chris Daly and colleagues are finding that cold air pools on the valley floor and creates stable microclimates that contrast with conditions on ridge tops and hill slopes just a few tens of meters away. When the weather over the Andrews Forest changes from stormy to sunny, for example, air temperature typically rises quickly on the exposed hillslopes and ridge tops, but often not in sheltered "cold holes," especially at night and in winter. The result is a complicated pattern of temperature responses to weather changes, driven by topography and elevation. As the climate of the Andrews Forest changes over the next century, these findings suggest that topography will moderate climate change. Daly's findings, coauthored with graduate student Dave Conklin and OSU professor Mike Unsworth, are in review for the *International Journal of Climatology*. A main focus of the next six years of the LTER program will be to better understand how organisms within the Andrews Forest respond to fine-grained climate variability, and how they may adapt under a changing climate.



Complex landscape of possible changes in mean December maximum temperature for the year 2100 across the Andrews Forest. Scenario assumes a 2.5°C regional warming, plus a 50% increase in the frequency of calm, clear conditions.

Reflections

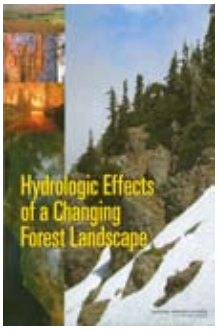
Poet Alison Hawthorne Deming often ponders the intersection of poetry and science. Her Long Term Ecological Reflections Residency at the Andrews Forest brought this topic into sharp focus as she records in the essay *Fear and Trembling in the Experimental Forest*:

"An idea common to science and poetry is that an experiment is an act the outcome of which is unknown. In science the goal is to add to a body of knowledge. In poetry the goal is to add to a body of reflection, to share the innerness of human life in ways that help us to get the drift of how the world is working. Who can know what the outcome will be of such practices when poet and scientist attempt to engage in them side by side, not one in service to the other? This, finally, is the freedom we seek in our seeking: the promise of discovery, the flicker of enlightenment that by its nature opens up a little more intriguing darkness, the desire for unexpected connection. It is a freedom that feels particularly delicious when the small moment of an individual experiment is posed in the context of a 200-year collective one."

New Director—Mark Schulze

Mark Schulze comes to the Andrews Forest after spending much of the past two decades studying tropical forest ecology and management, most recently in the Brazilian Amazon. Many of the research themes he worked on in Brazil—disturbance ecology, population dynamics, plant phenology, managing forests for local livelihoods and ecosystem services—are also important elements of the Andrews Forest Program. Schulze is excited to become part of the diverse and productive Andrews Forest research community and to work in a place with such a rich history. In coming years, he sees the Andrews Forest continuing to push the frontiers of ecosystem science and management while also consolidating its position as a leader in field-based education. Among other things, he plans to contribute to the research-management partnership and phenology programs at the Forest. On a more personal level, he looks forward to the melting of this winter's snowpack so he can take off on world-class hiking and kayaking adventures waiting just outside of his office window.

Water in a Changing World



A recent report from the National Research Council entitled *Hydrologic Effects of a Changing Forest Landscape* takes a broad look at forest hydrology issues for the United States. This study involved Julia Jones (vice chair), Beverley Wemple, and Gail Achterman (all with OSU and Andrews Forest connections) and a field visit hosted at the Forest in conjunction with the Willamette National Forest.

The report emphasizes that the forest management-streamflow connection has become much more complicated than we envisioned a few decades ago. Conservation of native terrestrial and aquatic species locally and downstream, changing climate, and a host of other factors create great social and biological complexity. A report recommendation of particular note for the Andrews Forest program is to sustain and intensify long-term research in small experimental watersheds, which gains new significance in a changing climate. The book-length report is available from National Academies Press, *www.nap.edu*.

Backlit leaves of vine maple (Acer cirnatum) *at the Andrews Forest. by 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 is a way for individuals and organizations to support the important work at the Andrews Forest.

By making a contribution to the Andrews Forest Fund, you can make an investment in the long-term viability of our forested ecosystems and training of future forest scientists, educators and managers. Tax-deductible donations of funds, appreciated securities, or property of any amount can be used to support the Andrews Forest Program. To make a gift, please contact the OSU Foundation (800-354-7281) or go to our online giving page at *http://andrewsforest.oregonstate.edu/about/forestfund.cfm?topnav=171*