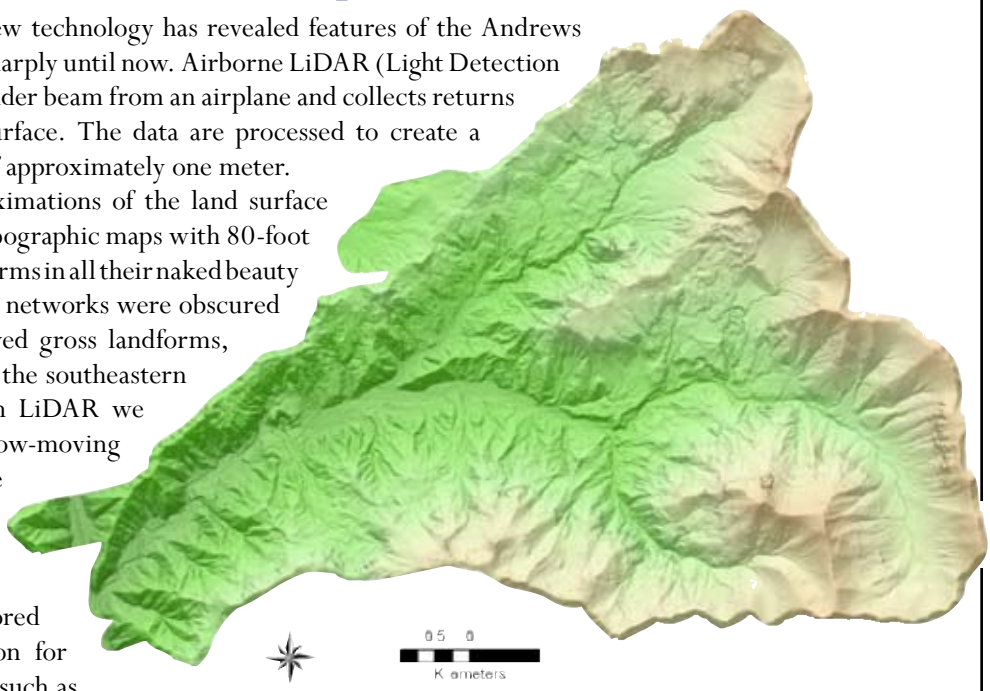
Andrews Forest NEWSLETTER

Issue 7 Fall 2009

LiDAR – Topography of the Naked Landscape

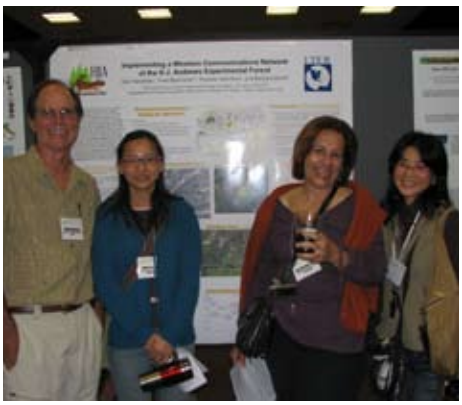
Earthflows, small streams, headscarps. New technology has revealed features of the Andrews Forest landscape that have not been seen sharply until now. Airborne LiDAR (Light Detection and Ranging) technology sends a laser rangefinder beam from an airplane and collects returns reflected from vegetation and the ground surface. The data are processed to create a depiction of the landscape with a resolution of approximately one meter.

Until now we had only rough approximations of the land surface topography represented on standard USGS topographic maps with 80-foot contour intervals. LiDAR images expose landforms in all their naked beauty and complexity. Landscape forms and stream networks were obscured under the towering forest. Old maps displayed gross landforms, such as the U-shaped glacial-carved valleys in the southeastern part of the Lookout Creek watershed. With LiDAR we can see other features, such as the large, slow-moving landslides called earthflows (see image). We are using LiDAR to update interpretations of landforms, soils, and land-shaping processes. Past work in the Andrews Forest by Michael Lefsky, Warren Cohen, and colleagues explored the use of LiDAR to characterize vegetation for ecological and forest management objectives, such as measuring volume of live trees and carbon stores in forest stands. LiDAR analysis of vegetation structure and carbon sequestration is underway.



Shaded relief image of the Lookout Creek landscape based on LiDAR data. Image provided by Theresa Valentine.

LTER All-Scientists Meeting — A Rocky Mountain High



Don Henshaw (left) presents an Andrews Forest Information Management poster at the ASM to (from left) Meei-ru Jeng (Taiwan), Eda Melendez-Colom (Luquillo), and Akiko Ogawa (Japan). Photo taken by Chau Chin Lin (Taiwan Forestry Research Institute).

More than 20 Andrews Forest scientists participated in the LTER All Scientists Meeting (ASM) held in mid-September in Estes Park, Colorado, at the edge of Rocky Mountain National Park. Every three years LTER scientists and colleagues gather from across the 26 US LTER sites and several dozen countries with LTER-like programs. Attendees share ideas about science, education, information management, and self governance. This year's meeting consisted of several plenary talks, evening poster sessions, and more than 100 working group sessions. A list of working groups and session reports are posted at *http://asm.lternet.edu/workgroups*. Linking social and environmental sciences was one strong focus of this year's meeting. Two developments on this front were participation of scientists from Urban Long-Term Research Areas (ULTRA) sites which have just received planning grants from NSF and strong interest in future scenarios of land change in response to human population growth, land use, and other aspects of environmental change. Information managers, science educators and graduate students all conducted additional meetings and found many opportunities to build collaborations.

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

This month marks the end of the first year of our current LTER6 grant from NSF and moves us into the 30th year of continuous LTER research at the Andrews Forest. We're off to a great start in LTER6, which combines new technology with long term measurements to understand interactive influences of climate and land use on our mountainous ecosystems. Over the summer, Andrews Forest researchers recorded bird song, installed water sampling devices, measured tree growth, and analyzed aerial images of the landscape. In this issue of the Andrews Forest Newsletter you'll read about several of these activities. New funding from NSF is allowing us to examine how species, such as moths and birds, move across the landscape in response to climate variations. We continue deliver our science findings through educational and public outreach activities; over the past year the Teachers as Researchers program has been giving lessons in environmental research to high school science teachers, enabling them to bring science inquiry into their classrooms. In keeping with our LTER6 objective to emphasize humans as important components of ecosystems, the Long-Term Community Research (LTCR) project is assessing the resilience of rural communities in the face of changes in climate and land use. In a new twist in our links with the humanities, efforts are underway to begin an Environmental Humanities program at OSU with strong presence at the Andrews Forest. Our amazing team of researchers continues to set the standard for interdisciplinary research. Surprising discoveries and useful new knowledge await.

—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—Alan Tepley

Alan Tepley, tree cores in hand, enjoys being in the forest, even when he has to present his work, as he does here at the HJA 60th Anniversary Event. Photo by Lina DiGregorio.

Alan Tepley is working on a PhD in the Ecosystem Informatics program in OSU's Departments of Geosciences and Forest Ecosystems and Society. Tepley applies high-resolution, tree-ring dating techniques to unravel the history of forest development, wildfire, and insect defoliation events over the past 500 years in the western Cascade Range, including the Andrews Forest. Surprising findings include the observation that forest regeneration was largely complete within 40 years after wildfires in most sites, regardless of date and most site conditions. Earlier studies using lower-resolution dating methods suggested much longer periods of regeneration. Another unexpected finding was tree-ring evidence of decade-long suppression of radial growth of Douglas-fir, probably by spruce budworm. The outbreaks occurred synchronously with similar outbreaks east of the crest of the Cascades, suggesting climate controls.

Working with professor Enrique Thomann, Alan has developed new analytical approaches to modeling forest age distribution and trajectories of change in age structure in response to the mixed-severity fire regime characteristic of this area.

Long-Term Community Research

Rural communities are particularly vulnerable to climate change because their internal capacity and infrastructure to deal with enormous change are limited. To better understand the resilience of rural communities of Oregon, a team of social scientists at Oregon State University led by Denise Lach (Sociology) and Brent Steel (Political Science) are conducting a Long-Term Community Research (LTCR) project. Modeled loosely on the Long-Term Ecological Research (LTER) program, the LTCR is an interdisciplinary study of rural community dynamics that combines: (1) long-term tracking and modeling of community social, economic, environmental and institutional indicators; (2) long-term monitoring of land use, demographic, and economic change; and (3) information from qualitative research and formal interviews of community members that explores both economic and social community dynamics and the impacts of public policy changes "on the ground." In its initial phase LTCR is examining the link between levels of resilience and levels of sustainability plans and policies for climate change and ecological disturbance in Oregon's rural communities.

Rural agriculture near Coos Bay, a LTCR study site. Photo by Oregon State University Archives.

Where Are They Now? Dick Waring

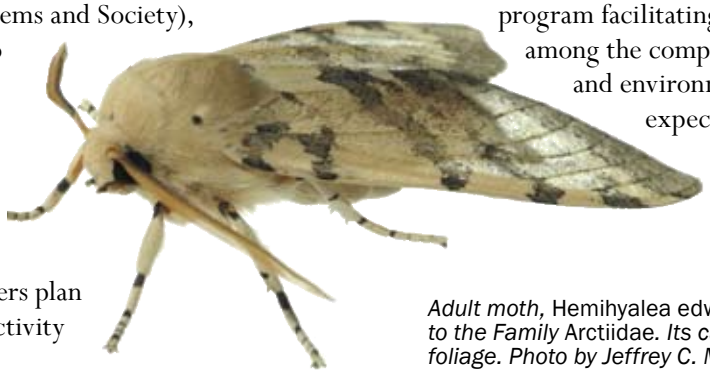
Dick Waring in 1974 measuring water stress of a Douglas-fir twig using a portable pressure chamber. (photo by Bob Logan) and (below) in 2000 (photo by Bev Law).

Dick Waring has played several pivotal roles in the history of the Andrews Forest. In the 1970s he teamed with Jerry Franklin to lead the International Biological Programme's Conifer Forest Biome work at the Andrews Forest. This inaugurated ecosystem science at the Forest and set the stage for the Long-Term Ecological Research program established by the National Science Foundation in 1980. Waring promoted ecosystem and hydrologic modeling and experimentation in the Andrews Forest science team which, at the time, tended to be more focused on observational science. Since the 1980s Waring has diverted his attentions beyond the Andrews Forest. His accomplishments include developing the Oregon Transect Project which examines properties of forests and ecophysiological processes from the coast to eastern Oregon, indulging in remote sensing research, putting out several editions of a book on forest ecosystems, and mentoring graduate students who have gone on to very successful careers. In fact, one of Waring's graduate students, Barbara Bond, is now the leader of the Andrews Forest LTER project.

Despite retirement in 2000, Waring has been very active in a variety of projects using modeling to address questions in forest ecology that have significance to land managers. Currently he is using a forest stand growth model to evaluate forest response to climatic variation on the Andrews Forest since 1958. Apparently old ecosystem scientists never fade away, they just keep on modeling.

Tracking Species Response to Climate Change

A newly funded project in the National Science Foundation's Cyber-Enabled Discovery and Innovation program will use novel models for predicting species distributions in response to climate change. Weng-Keen Wong (Computer Science), Matthew Betts (Forest Ecosystems and Society), and Julia Jones (Geosciences) team up to assess changes in species distributions in response to climate and land use change in the Andrews Forest area. This work builds partly on the foundation of Jeff Miller's (Rangeland Ecology and Management) long-term observations of moths across the landscape. Researchers plan to test the hypothesis that habitat connectivity facilitates the movement of species in response to climate change. They will also examine the degree to which species respond as individuals or as communities. This work is an example of the NSF-sponsored Ecosystem Informatics program facilitating collaboration among the computing, mathematical and environmental sciences. It is expected to improve the quality of predictions about the responses of biodiversity to global change.



Adult moth, Hemihyalea edwardsii. *This moth belongs to the Family* Arctiidae. *Its caterpillars feed on oak foliage. Photo by Jeffrey C. Miller*

Reflections

The Long-Term Ecological Reflections program prospers as we've now had more than two dozen writers in residence, a growing collection of their work posted on the Reflections webpage, and continued strong interest from groups at other sites who want to begin similar programs. This success is opening several intriguing new opportunities. With the leadership of Marlan Carlson (Chair, Music, Oregon State University) music is about to enter the forest in a remarkable parallel with the initial foray into acoustical ecology for study of birds. Larry Rodgers, the new dean of the College of Liberal Arts, and Kathleen Dean Moore (Philosophy) are leading a new effort to begin an Environmental Humanities program at OSU, which will kick off with a brainstorming retreat at the Andrews Forest in November. And new NSF funding supplemental to the LTER grant will support engagement of the arts and humanities in consideration of future scenarios of land change in response to changing land use and climate—how should we envision the future, communicate about alternative futures, and decide what to do about the future? These issues transcend the scope of science. This work will be conducted in collaboration with LTER sites based in Fairbanks, AK, Madison, WI, and Harvard Forest, MA.

Teachers as Researchers

Teachers look at insects collected with beat sheets during an August 2009 workshop at the Andrews Forest. Photo by Mike Baker.

Eighteen Oregon high school science teachers are getting hands-on lessons in environmental research through Teachers as Researchers, a project developed by the Oregon Natural Resources Education Program in partnership with the Andrews Forest. These educators are, in turn, guiding their own students toward meaningful discoveries within their local communities.

This summer teachers from Astoria south to Medford, Oregon, got their feet and hands wet during aquatic sampling in the Mary's River with Andrews Forest scientist Sherri Johnson and teacher Jeff Mitchell. Teachers attend three workshops during their year-long participation and training. In addition to aquatic ecology in the Mary's River, workshops focus on the carbon cycle and terrestrial insects at the Andrews Forest and fish ecology at the Oregon Hatchery Research Center. According to one teacher participant, "the implications for students are better experiences with research methods, a devotion to inquiry based science and a lasting appreciation for environmental education."

The Teachers as Researchers project is supported through grants from the Oregon Watershed Enhancement Board, the Gray Family Fund of the Oregon Community Foundation, and the Andrews Schoolyard LTER Program. Kari O'Connell and Susan Sahnow of Oregon State University lead the project. Teachers as Researchers aims to reach large numbers of Oregon high school students. Teacher participants from the 2009 project work with more than 2,000 students per year.

A forest for the future: The HJ Andrews Experimental Forest. Photo by Matt Betts.

Support the Andrews Forest for the Future

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.

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*