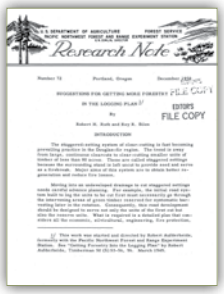
Andrews Forest NEWSLETTER

Issue 22 Spring/Summer 2018

Forest management: a 70-year Research Legacy

When the H.J. Andrews (then Blue River) Experimental Forest was established 70 years ago, the major research emphasis was on planning and conducting harvests of old forests to maximize efficiency and minimize deleterious environmental impacts, particularly on streamflow and water quality. The first research effort was the establishment of paired watershed experiments, which remain a fruitful research legacy to this day. Not surprisingly then, the earliest publication in the Andrews bibliography, dating from 1950 and authored by Bob Ruth and Roy Silen, states the rationale for road layout in staggered-setting clear-cutting systems. This work was based on experience from developing road networks and harvest plans for five experimental areas in the Coast Range and Cascades, including our Lookout Creek watershed.

Two primary motivations cited by Ruth and Silen for replacing industry-style, large, continuous clear-cuts with staggered-setting clear-cuts were: 1) improved tree regeneration by seeding from adjacent uncut stands, and 2) reduced potential for spread of future wildfire by burning the slash in the cutting units. Careful thought is reflected in the Research Note, including detailed considerations of ways to design the road network and logging systems to minimize erosion.


Research Note

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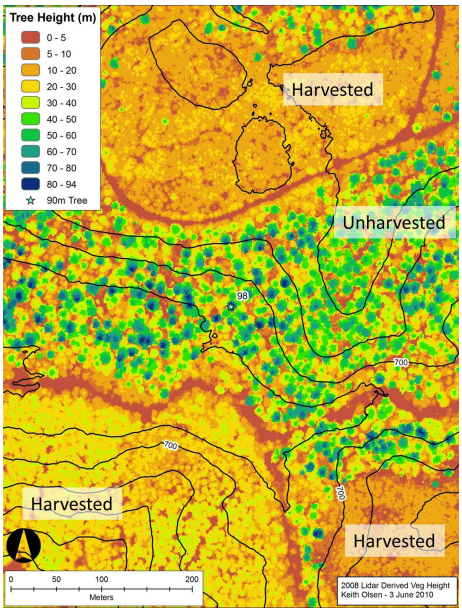
The first publication tracked in the Andrews Forest publications database is "Suggestions for getting more forestry in the logging plan." Ruth, Robert H. Ruth and Roy R. Silen. 1950. Research Note 72. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station.

The publications database now contains more than 3,000 publications related to research at the Andrews Forest.

https://andrewsforest.oregonstate.edu/publications

Yet, reading this paper today, one can pick out words and phrases—such as sidecasting in road construction—that foreshadow unintended consequences. Debris flows initiate at roads at many times the rate of the surrounding forest. This has been particularly true at Watershed 3 where debris flows originating at roads scoured out the stream network and destroyed the gauging stations in the 1964 and 1996 floods.

Another side effect of the staggered-setting harvest system that still resonates today is forest landscape fragmentation, and the edge effects at clearcut-forest boundaries inherent in such a landscape. Recent research by David Bell, Tom Spies, and Rob Pabst demonstrates that edge effects from clearcutting on biomass of the surrounding forest penetrate farther than one might imagine and persist for at least 60 years. By combining data from our network of long-term forest plots with high-precision forest structural mapping enabled by LIDAR (light ranging and detection) remote sensing, they mapped forest basal area across the entire Andrews landscape. Their analysis revealed that the staggered-setting clear-cutting system reduced forest basal area in unharvested areas within 75 meters of clearcuts by 4-6%. This was true whether the harvest had occurred relatively recently or in the 1950s. Given the dense road network required by the original harvest plan for the Andrews Forest, this means that 20% of the unharvested forest in our watershed displays persistent edge effects on forest biomass. These findings illustrate the complexity of managing forested landscapes for multiple values, including timber harvest. One of the benefits of working at a long-term ecological research site is the capacity to track disturbance processes, both of management and natural origins, that can take decades or centuries to unfold.



A 2018 publication by David Bell, Thomas Spies, and Robert Pabst, illustrates that historical timber harvests affect the structure of neighboring old-growth forests. Forest stands within 75 meters of harvest edge had less live tree basal area than forests tucked in the interior away from edges. The length of time since harvest had little or no effect. This study is important in examining the subtle impact of human activity on forest landscapes in western Oregon and showing how widespread and long-lasting the edge influence of past clearcutting has been on neighboring old-growth forest.

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, arts, and the humanities.

Letter from the Leadership

The theme of our current LTER7 grant is connectivity: the movement or flow of cohesive units from one place to another. These units can be in the form of matter and energy (critters and carbon) or information (data sets, scientific information, or even value statements). Connectivity allows us to conceptualize changes within our Andrews Forest system due to exogenous forces such as a changing climate and land-use practices. It also allows us to understand how our system responds to these forces, and how it might respond in the future.

It's a fitting theme, too, for a research community connected over 70 years. This volume of our newsletter reminds us of other connections. Our connections with our partners—primarily the Willamette National Forest and the Pacific Northwest Research Station—are profound and long-standing. It is sometimes hard to know the difference between an OSU faculty member and PNW researcher; and that's a good thing. Our connections over time: As young researchers emerge and others pass on, what we learn builds and flows through time. Our connections across disciplines: from the biophysical and social sciences to the arts and humanities, and the many wonderful and weird intersectional hybrids in between.

Soon we will begin thinking about LTER8, the proposal for our eighth six-year grant from the National Science Foundation (it's taken me months to get used to even saying or writing "LTER8"). New scientific ideas will emerge, new projects will be launched, new themes and goals will drive our work. But the theme of connectivity will continue to be a central part of our program, as it has always been.

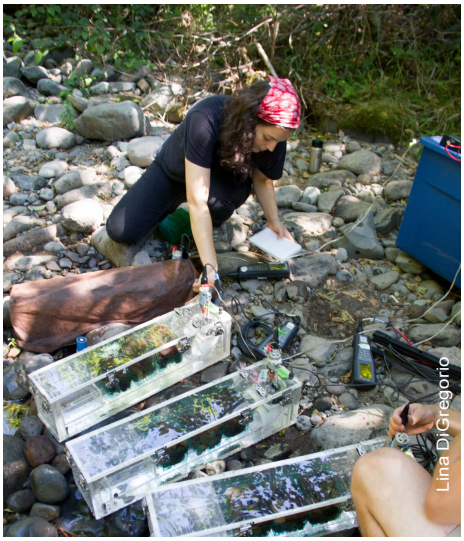
—Michael Paul Nelson, Principal Investigator of the Andrews Forest LTER Program,
Ruth H. Spaniol Chair, Department of Forest Ecosystems and Society, Oregon State University

Student Spotlight—Sarah Minette Kelly

Sarah Minette Kelly presents curriculum on the Discovery Trail at the Andrews Forest.

Sarah Kelly recently graduated from Oregon State University with an M.A. in Environmental Arts & Humanities. Sarah led aspects of the Discovery Trail program at the Andrews Forest for her research project. She coordinated field trips for groups of middle and high school students to engage with the forest via a digitally-delivered Discovery Trail curriculum, which combines arts, humanities and conservation science content. Sarah qualitatively analyzed student responses to understand their experience on the Discovery Trail and interpreted shifts resulting from the interdisciplinary curricular program. Her analysis led to a conceptual progression of care about the students' relationship to place. At the first phase, students were self-oriented and responded positively to place because the Discovery Trail experience and the forest itself made them feel restored. At the final stage, students expressed a responsibility to care for place. Prior to graduate school, Sarah directed the University of Houston sustainability program. She graduated from UH with a B.A. in Communications and a minor in World Cultures and Literatures.

Streams and Carbon Dioxide



Alba Argerich measures primary productivity in incubation tanks at the Andrews Forest.

Streams and rivers could pump carbon dioxide (CO_2) into the air at increasing rates, if they continue to warm, potentially compounding the effects of global warming.

To reach that conclusion, an international research team conducted the first continental-scale study of carbon flows into and out of streams across six major climatic zones. The team collected data in watersheds from Puerto Rico and Oregon to Australia and Alaska. In each one, scientists analyzed the balance between photosynthesis—which uses atmospheric CO_2 to generate plant material such as roots and leaves—and respiration, which pumps CO_2 back into the air.

"This paper is the first to look at the effects of climate change on stream metabolism at the continental scale using field observations," said Alba Argerich, co-author who monitored McRae Creek and Lookout Creek in the Andrews Forest. "This approach takes into consideration the complexity of an ecosystem, as opposed to controlled experiments where you recreate simplified versions of an ecosystem."

The shift toward more CO_2 emissions appears to be more pronounced in warmer streams, the scientists found, while colder streams might actually see an increase in net primary production. Carbon cycling in streams can also be affected by other factors such as the types of plants and microbes in the stream ecosystem and nutrients flowing into the water from surrounding lands.

From OSU Press Release *http://today.oregonstate.edu/news/streams-may-emit-more-carbon-dioxide-warmer-climate*

In Memory—Norm Anderson

With his pipe firmly planted between his teeth, Norm Anderson was a cornerstone of the Stream Team for many decades. He teamed up with Jim Hall to make the Andrews Forest-based stream program a major feature of the Conifer Forest biome in the early 1970s and was a stabilizing force with colleagues Jim Hall, Jim Sedell, and Stan Gregory. His focus on organisms—mainly caddisflies—was an important contribution in the ecosystem-focused world of Andrews science. With students and senior colleagues, he conducted long-term field and laboratory studies of phenology, life histories, and disturbance ecology of single areas or single species. He reared a population of *Clistoronia magnifica* caddisflies in the laboratory for 30 generations over 14 years. A long-time professor of aquatic ecology at Oregon State, Norm "retired" in 1995 only to study in detail the insects in his Corvallis backyard streams. Norm passed away at 84 years in January 2018. He will be missed as friend, colleague, and mentor.

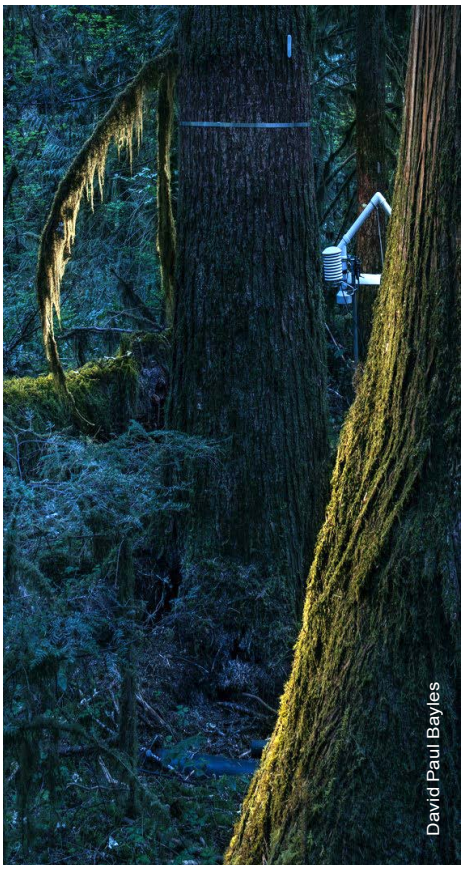
Norm Anderson collecting his beloved aquatic invertebrates in Lookout Creek in the Andrews Forest, in the 1970s.

Voices from the Past

Oral histories taken more than 20 years ago in the lead-up to the 50th anniversary of Andrews Forest reveal tenuous times in the efforts to instigate long-term ecological research at the Forest. Careful editing of 1,000 pages of transcripts from those 36 interviews by historian Max Geier is part of the on-going Andrews Forest history project led by historian Sam Schmieding. Unplanned, but pivotal events played critical roles. A Forest Service research administrator directed scientists to remove tags from tree plots, but the folks in the field ignored the order and those plots continue to yield valuable, published data decades later. A call to disestablish much of the experimental forest was similarly ignored. The 1964 flood affirmed the importance of having an attentive, interdisciplinary staff on hand (even during the tumultuous storm) to learn valuable lessons from that test of watershed management practices. A string of chairs of the Department of Forest Science—John Gordon, Bob Tarrant, and Logan Norris—strongly supported basic, inter-disciplinary, inter-institutional ecological research, even when their superiors weren't so hot on it. Flukes of hiring constraints and construction of the Forestry Sciences Lab forced OSU and Forest Service scientists to co-habitat, fostering friendships and research partnerships at a critical point in the development of the long-term ecological research program. Luck, as well as hard, persistent work, has been a vital part of our history.

Some of the people who gathered in 1997 for oral histories: from left to right (standing), Art McKee, Roy Silen, Martha Brookes, Robert Tarrant, Fred Swanson, Ted Dyrness, Max Geier, and (seated) Al Levno, and Jerry Franklin.

Arts and Humanities



Non-fiction writer Matthew Battles, poet Derek Sheffield, philosopher Molly Sturdevant, drummer/sound artist Lisa Schonberg, and "magical realism" photographer David Paul Bayles all spent productive residences at the Andrews Forest in Spring 2018. A sampling of David's images, paired with plots of microclimate data from the time and place of each image, is on display in the Pop-Up Gallery on 2nd Street in Corvallis in Summer 2018. In his Artist's Statement, David describes his work as "using a very technical 'Painting With Light' technique to create images that dance at the edges of reality." David states, "During the time I was photographing I became intrigued by the technology employed by scientists to gather data. The first time I saw a set of plots generated from the data gathered, I was deeply moved. Immediately, I saw the colorful lines and dots without the numbers and words. To me they were images being 'drawn' by the forest, revealing its secrets."

Research Experience for Undergraduates

Each summer the Andrews Forest research program is host to several undergraduate students who are participants in the Research Experience for Undergraduates (REU) opportunity, funded by the National Science Foundation. REU students are paired with faculty and graduate student mentors and spend ten weeks in the field and laboratory engaged in ecological research. With faculty guidance, students design and implement individual projects, collect and analyze data, and present their findings. In summer 2017, the Andrews Forest program hosted REU students who worked across research areas—small carnivores, the Detrital Inputs and Removal Treatment (DIRT) project, conservation ethics, open-source complex sensor station technology, and water transport and retention in forest soils. In 2018, REU students will work on mammalian ecology, canopy ecology, and stream ecology. For many REU students, the experience is the springboard to graduate school. Lauren Roof, an REU participant in 2017 with mentors Steve Wondzell and Karla Jarecke, reported, "I gained a greater understanding of what scientific research is, and this has inspired me to pursue research at the graduate level." In fact, many of our previous REU students have gone on to become colleagues and participants across the Long-Term Ecological Research Network.

REU student, Lauren Roof (left) gets hands-on experience in soil and hydrology work with graduate student Karla Jarecke (right).

Support the Andrews Forest

Did you know that you can, through a charitable gift, support research, educational programs, and facilities at the Andrews Forest? Some people have specific ideas for support, like a long-term monitoring project, or training for K-12 school teachers, or even new furniture for the apartments. Others give to support a broad range of activities at the Andrews Forest, and every gift helps. Gifts from people like you provide a lasting impact.

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 a range of scientific projects at the Andrews Forest, as well as education and outreach programs.

We encourage you to support the Andrews Forest. To learn more, please call 541-737-8480 or visit *http://andrewsforest.oregonstate.edu/donate.* Thank you for being part of our future.