

Andrews Forest NEWSLETTER



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Sources of Summer Streamflow in a Mountain Catchment



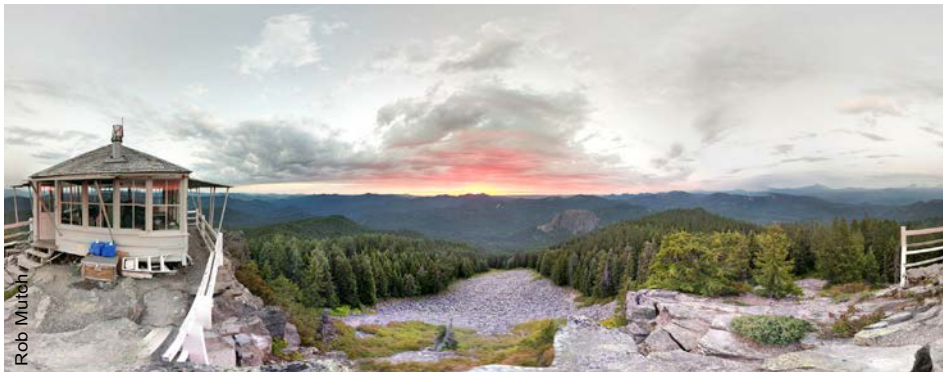
Catalina Segura

Isotope analyses show that Cold Creek contributes more water to Lookout Creek than the size of its drainage area would suggest.

Summer streamflow in rivers is essential for ecosystems and for human use, and it is particularly important in regions where there is little or no summer precipitation. Despite its importance, the factors that determine summer streamflow are poorly understood. To learn more, researcher Catalina Segura measured oxygen and hydrogen isotopic composition ($\delta^{18}\text{O}$ and $\delta^2\text{H}$) in 607 water samples from Lookout Creek at the Andrews Forest to evaluate the effects of climate variability on summer streamflow. Catalina and her team found substantial differences in the sources of summer streamflow in a year with average precipitation (2016) compared to a year with low snowpack and subsequent summer drought (2015). In 2016, $\delta^{18}\text{O}$ levels were correlated with elevation, reflecting the influence

of prior precipitation and snow on summer streamflow. In contrast, in 2015 the $\delta^{18}\text{O}$ values depended on topography, reflecting the importance of water stored in thick landslide and glacial deposits. Catalina also found that baseflow was not related to drainage area: a spring-fed tributary called Cold Creek delivered 15 times more water per unit area during baseflow than the remainder of Lookout Creek above the confluence with Cold Creek, illustrating the importance of water stored in porous volcanic bedrock. As drought increases in a warming climate, summer flow in mountain catchments may become more dependent on storage in geologic features. The article, "Climate, Landforms, and Geology Affect Baseflow Sources in a Mountain Catchment" appears in the journal *Water Resource Research*.

Big-Picture Views from the Lookout



Rob Mutch

The Willamette National Forest has stationed Rob Mutch at the Carpenter Mountain fire lookout every summer since 2015. From that majestic perch, Rob has practiced his craft as an ecosystem photographer, beautifully documenting sunrises, sunsets, raptors hovering outside his wrap-around windows, and pikas, chipmunks, and bugs sharing the space. Rob's images capture scenes of the Andrews Forest less commonly associated with the site: talus slopes, high meadows, and sweeping vistas. Pictured above is a panorama of sunset over the distant Pacific with the talus slope and Wolf Rock at his feet. See more at: www.facebook.com/robmutch2

The Forest through a Different Lens

See the Andrews Forest through the lens of photographer David Paul Bayles in the online magazine, *Terrain.org*: www.terrain.org/2019/arterrain/david-paul-bayles

Or, through the photography and writing of Ian Vorster in Oregon State University's research magazine, *Terra*: terra.oregonstate.edu/2019/05/seedbeds-of-collaboration

Or, through the art of Leah Wilson at www.leahwilson.com



Ian Vorster



HJ ANDREWS EXPERIMENTAL FOREST

The Andrews Forest Newsletter Issue 25 Fall 2019

The **Andrews Forest Newsletter** is a semi-annual publication of the Andrews Forest Program.

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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 Andrews is a forest full of surprises. The more we study our system the more complex and amazing it seems to be. Another species of surprise occurs when ecological theory suggests one thing, and over time we see quite another in the forest. These are the types of the ecology of surprise that we study and discover, that fill this issue of our newsletter. The outsized impact of a single cold stream, the discovery of hundreds of endophyte species living in the needles of a Douglas-fir tree, and the complexity of our terrestrial and stream food webs are all good examples of our discoveries of surprise. That's what we do, we discover surprises.

I believe this really matters. A common response to a story of surprise is a simple, but ethically loaded, "wow." And "wow" is as important as it is simple. "Wow" is positively charged, and in at least two ways. We seldom think or say "wow, that's amazing!" and then quickly follow with "we should destroy that." The discovery of surprises might also deliver a dose of humility to our larger society which so often seems "humility-limited." The long-term nature of our place, and our work, and our community creates unique opportunities for surprise, in turn creating the opportunity for larger and important ethical impacts on the world.

—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—Lauren Zatkos



Lauren Zatkos studies stream food webs, which is a model of which organisms eat, or are eaten, by other organisms.

Lauren Zatkos is a Master's student with Ivan Arismendi in the Department of Fisheries & Wildlife at Oregon State University. Lauren spent two summers at the Andrews Forest, working in streams to study fish and macroinvertebrate communities. Her research explores how the structures of aquatic food webs change along a headwater stream network, and if these patterns may be related to features of the surrounding landscape. Lauren is using data she collected in the field as well data housed within the extensive Andrews Forest's Databank from previously conducted surveys funded by the LTER program, the USGS, the USFS PNW Station, the SCALER project, and NEON. Lauren's investigation of food web structures will enhance our understanding of how food webs may change with variation in the landscape and what these changes could mean for aquatic community response and resilience to disturbances.

Focus on Faculty — Posy Busby

Portland **Posy Busby** has been an Assistant Professor in Botany and Plant Pathology at OSU since only 2016, but her roots with the Andrews Forest go back to the summer of 2001 as a Research Experience for Undergraduates (REU) student. Posy's REU project led to a publication on the fate of standing live trees in partially cut sites on the Willamette National Forest, and to her 2002 undergraduate thesis at Harvard on the role of Andrews Forest research in conservation of old-growth forests. Posy extended her interests in history of science through an analysis of public communications (e.g., newspaper and magazine articles) involving the Andrews Forest for 1988-2002.

Posy is currently studying endophytes—cryptic microbes living within plants—in Douglas-fir needles. Using cutting-edge environmental DNA techniques, she and graduate student Kyle Gervers have identified hundreds of fungal and bacteria species living within the needles of the Discovery Tree and other trees. In an innovative experiment, they deploy endophyte-free seedlings at various positions up the 66-m tall tree to assay endophyte colonization along that microclimate gradient. Further studies will examine how needle endophytes influence a host tree's ability to tolerate heat and drought stress, and to defend against pests and pathogens.



Posy Busby studies microbes living within leaves of plants, including the 66-m tall Discovery Tree at the Andrews Forest.

Seventy Years of Stream Gaging

It was 70 years ago (25 August 1949 to be precise) that the US Geological Survey (USGS) started gaging Lookout Creek of the Andrews Forest. Harry S. Truman was president. While the official record starts on 1 October 1949, gaging was already underway; we have a copy of the A-35 chart to represent the 25 August start. The USGS maintains the stream gage to this day, but the Andrews Forest PNW/LTER record is the only complete record of stream discharge on Lookout Creek. The PNW/LTER mined records from the National Archives through the USGS Portland Oregon Water Science Center to digitize, enter, and otherwise reconstruct an hourly record starting in 1949 through 1986 when the USGS high temporal resolution record begins. This long-term data set (HF004) is unique among Pacific Northwest streams in its extent and availability. Over the 70-year period, Lookout Creek has ranged from a trickle of 5 cubic feet per second in mid-September of 1981 to an estimated 8,000 cfs in the famous flood on February 7th, 1996.



Over 70 years, the highest recorded streamflow record in Lookout Creek occurred during the 1996 flood.

Fond Farewells: Don Henshaw and Rob Pabst

The cornerstone of long-term ecological research is the collection and management of long-term data. Two of our long-term data gatherers and managers are about to retire, leaving us a vast wealth of information resources—and big shoes to fill.

Don Henshaw was originally hired as a statistician with the Forest Service in 1978, and has been a steady, diligent force in the growth of our information management system locally and across the entire LTER Network. His innovative development of data harvester systems has facilitated widespread use of climate, hydrology, and other environmental data globally. Don's leadership has been critical to the success of the Andrews Forest, and the larger LTER endeavor.

Rob Pabst has anchored the Permanent Sample Plot program since 2009, tracking ~140 plots containing more than 50,000 trees in the Pacific Northwest, including the Andrews Forest. Rob has shepherded field crews and has herded data into the Forest Science Databank, in close collaboration with Don Henshaw and Suzanne Remillard. Rob has also been a lead or contributing author on many publications, including two recent papers that challenge conventional wisdom in forest ecology.

Don's and Rob's attentiveness, helpfulness, friendly temperaments, and skills will be sorely missed. Thank you, Don and Rob!



Don Henshaw (top) and Rob Pabst (bottom), two important long-term staff members, will retire in 2019.

In Print

The Andrews Forest has made important appearances in three new books. Elizabeth Rush's *Rising: Dispatches from the New American Shore* (2018, Milkweed) addresses sea-level rise and describes its far reach in the chapter "Connecting the Dots," based on her 2016 residency at the Andrews Forest. The long-distance migration of rufous hummingbirds between coastal habitats and their mountain breeding grounds makes the connection—loss of critical habitat in one part of their migratory path endangers the species' essential ecological role, such as pollination, in another location. Rush's field experience was immersive, as she recounts tumbling down steep slopes through vine maple thickets on an hour-long trek to reach a bird observation station.

Religious studies professor Gretel Van Wieren's *Listening at Lookout Creek: Nature in Spiritual Practice* (2019, OSU Press) is more inward looking, seeking to balance family, professional, and spiritual lives. The opening line, "There is spirit in these woods, if you take the time to listen" is a compliment, coming from such a deeply spiritual person. Van Wieren, too, had an immersive experience—skinny-dipping in Lookout Creek.

Richard Powers' monumental, Pulitzer-winning *The Overstory: A Novel* (2018, Norton) taps forests and forest science, some of it from the Andrews Forest, in an epic tale of the connectedness of all things in ways that give hope for the future.

Making History

In 1996-1998 Historian Max Geier conducted 32 individual and 5 group oral history interviews as foundation for his book *Necessary Work: Discovering Old Forests, New Outlooks, and Community on the H.J. Andrews Experimental Forest, 1948-2000*. Now, more than 20 years later, Geier's history interviews are proving to be valuable resources in preparation of two new books—one on the Andrews Forest and the other the Northwest Forest Plan. Audio and transcript formats of the oral histories are now accessible online in the OSU Special Collections Oral History Program. Oregon State University, PNW Forest Service, and National Forest staff recount a stunning variety of career paths to converge in the upper McKenzie River and to work in intense and close collaboration as central players in the reshaping of Federal forest lands practices and policy during the 1980s and early 1990s.

Mike Kerrick, for example, describes his career-long engagement with Andrews Forest, beginning in 1953 as a forestry student from Minnesota helping construct the stone monument for the plaque renaming the forest to honor H.J.

Andrews. Later Kerrick served as District Ranger and he ultimately retired as Willamette Forest Supervisor in 1990. Along the way, he supported collaboration with the research community, including hiring two rangers, Steve Eubanks and Lynn Burditt, in part because of their strong interest in working with the science community.

Link to the oral histories: <http://scarc.library.oregonstate.edu/omeka/exhibits/show/forestryvoices/main/>



(from left) Martha Brookes, Roy Silen, Max Geier, Art McKee, Ted Dyrness at the entrance to the headquarters, in 1997, at the start of a group interview conducted as part of the oral history project commissioned to commemorate the 50th anniversary of the establishment of the Experimental Forest.



Supporting the Andrews Forest

Did you know that charitable gifts support research, educational programs, and facilities at the Andrews Forest? We hope you will consider supporting the program. Some people have specific ideas for support, like a long-term monitoring project, or training for K-12 school teachers, or arts and humanities efforts. Others give to support a broad range of activities at the Andrews Forest. 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 programs at the Andrews Forest that aren't otherwise covered by our federal funding.

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.