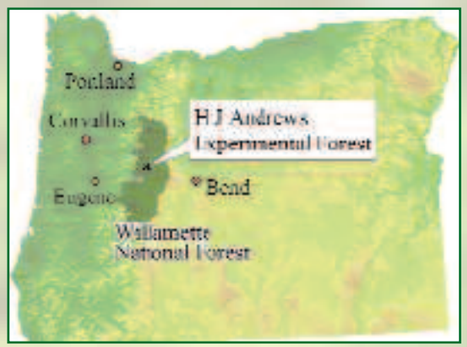
H. J. Andrews Experimental Forest
Long Term Ecological Research



The Andrews Forest is a major node in a series of research networks at regional, national (e.g., LTER), and global (e.g., MAB Program) scales, and the hub of many regional studies of forest cover change, carbon sequestration in forests, forest hydrology, decomposition processes, historic fire regimes, and other phenomena.

Since its establishment in 1948, the H.J. Andrews Experimental Forest has grown to be a major center for research and education about the ecology and management of forests and streams. The Andrews Forest is dedicated to research and to communication of research results to land managers, policy makers, scientists, students, and the general public.

Spotted Owl. Photo by Al Levno

Located about 80 km east of Eugene, Oregon, the Andrews Forest is centrally located in the coniferous forest biome of the Pacific Northwest. The Andrews Forest Program is administered cooperatively by Oregon State University and the USDA Forest Service's PNW Research Station and Willamette National Forest.

The Ecosystem

The Andrews Forest is on the west slope of the Cascade Range of Oregon, and encompasses the 6400-ha watershed of Lookout Creek, a tributary of Blue River and the McKenzie River. Elevation ranges from about 410 to 1630 meters above sea level. Broadly representative of the rugged, mountainous landscape of the Pacific Northwest, the Andrews Forest features excellent examples of the vast towering conifer forests and rapidly plunging mountain streams. Annual average precipitation exceeds 2500 mm, falling mainly in the autumn and winter as rain at low elevations and as snow at areas above 1000 meters above sea level. Before heavy timber cutting began in the Pacific Northwest in the 1950s, 65 percent of the Andrews Forest was cloaked in Douglas-fir/western hemlock stands that originated

The Andrews Forest headquarters includes labs, offices, conference facilities, and lodging to support the field-oriented research program.

about 450 years previously, after massive fires. The remainder was largely stands that regenerated following wildfires in the mid- and late 1800s. Since 1950, clearcutting and farming of conifers have created plantations over about 25 percent of the Andrews Forest. The wide range of habitats—from canopy to soil to stream—supports diverse fauna and flora. Especially important for habitat diversity in these massive forests is the vertical variation in canopy structure as well as dead and dying trees and dead wood on land and in streams. About 500 species of vascular plants are found in the Forest. Vertebrate species include cutthroat trout, Pacific giant salamander, black bear, coyote, mountain lion, osprey, Roosevelt elk, and bobcat. More than 4000 species of invertebrates have been identified and their ecological characteristics described.

Large cover photo: Upper Lookout Creek, HJ Andrews Experimental Forest, Photo by Al Levno. Insets: Yellow violet. Photo by Al Levno. Rough-skinned newt. Photo by Jay Sexton.

H.J. Andrews Experimental Forest

LTER Long Term Ecological Research

http://www.fsl.orst.edu/lter/

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For more information on the LTER Network, see: http://www.lternet.edu

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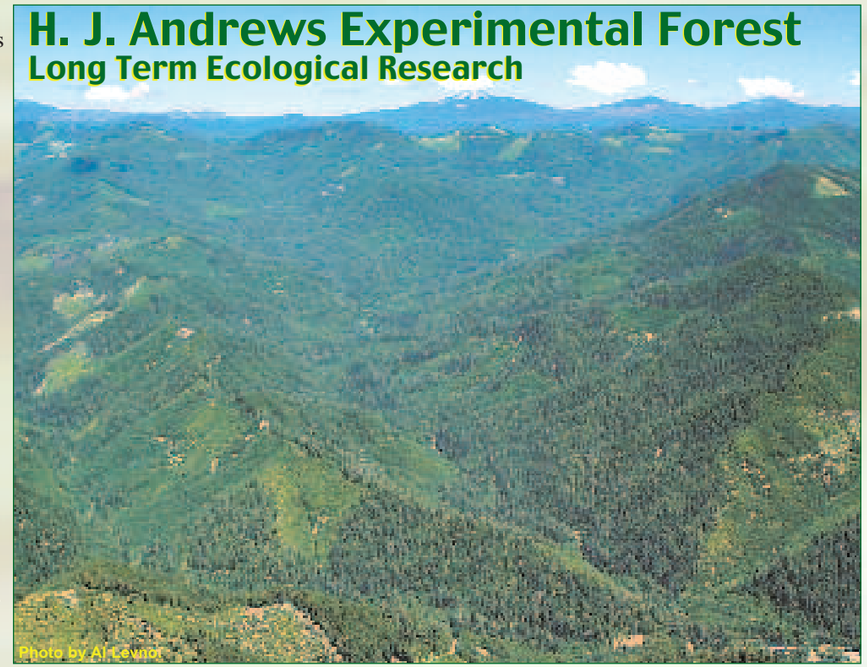


Photo by Al Levno

The H.J. Andrews Experimental Forest in Oregon's Cascade Range was established in 1948 to examine the effects of logging and road-building in steep mountainous terrain; since 1970, ecosystem research has dominated the work there. Now, the research program's greatest contribution is the increased understanding of forest and stream ecosystems and the training of scientists and natural resource managers for the future. After more than 50 years of intense, long-term ecological study from a relationship between the USDA Forest Service and Oregon State University, the central question guiding scientists is: *How do land use, natural disturbance processes, and climate variability affect biodiversity, carbon dynamics, and hydrology?*


The bright green caterpillar of the Polyphemus moth *(Antheraea polyphemus)* is one of the many species of insects studied at the Andrews Forest. Photo by Jeff Miller.

Biodiversity
Andrews Forest researchers seek to characterize patterns of biological diversity in forested landscapes; they are working to identify the mechanisms that control these patterns and to understand how various aspects of biological diversity influence ecosystem function. Early biodiversity research at the Andrews Forest focused on species inventories of terrestrial and aquatic invertebrates. More recent research has expanded to include work on the functional diversity of microorganisms, relationships between moth species abundance and habitat conditions, and the spatial and temporal dynamics of forest and meadow plant communities.

Carbon Dynamics
The productive Douglas-fir/western hemlock forests at the Andrews Forest store massive amounts of carbon in the form of dead wood, large and long-lived trees, and carbon-rich soils. Researchers at the Andrews Forest study carbon dynamics of forest and stream ecosystems at multiple temporal and spatial scales. They use remote sensing, simulation modeling, and long-term permanent plots distributed throughout the Pacific Northwest to study carbon sequestration at the long-term and regional scales. Manipulative experiments, isotopes, and observational studies allow researchers to answer questions about carbon storage and carbon dioxide exchange, including carbon assimilation, respiration, and decomposition, at the stand and watershed scales. Andrews Forest researchers are also involved in international cross-site studies on decomposition and soil organic matter processes.


Right:This log is part of a 200-year log decomposition study. Photo by Jay Sexton. Below: A researcher samples air from soil for isotope analysis of CO_2. Photo by Cheryl Hatch/OSU.

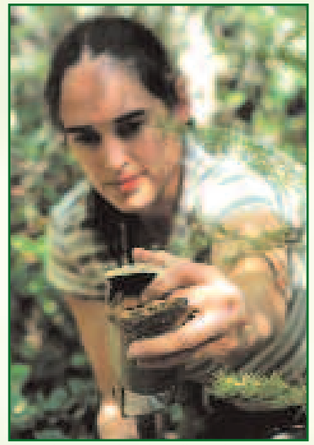
Hydrology and Watershed Studies
For over 50 years, Andrews Forest researchers have studied the effects of forest harvest on water, sediment, and nutrient losses from small watersheds. New ecological tools and integration of knowledge across disciplines allow examination of complex processes such as patterns of carbon dioxide exchange at a small watershed scale, movements of water and nutrients within watersheds, and the transport and fate of nitrogen in stream networks.

Forest Change
Andrews Forest researchers study forest change on multiple timescales, from gradual changes occurring as vegetation succession to abrupt changes such as fire, flood, wind, and landslides. Permanent forest plots across a wide range of stand ages, habitats, and management histories in Oregon and Washington provide direct observations of the relatively slow dynamics of Pacific Northwest forests. Fire history studies encompass the Pacific Northwest region and local fire history data are being used in landscape management plans. Major flood events have provided opportunities for scientists to study the climatic, hydrologic, geomorphic (e.g., channel change, landslides, road-related erosion), and biotic effects of floods.

Linking Research to Land Management
The Andrews Forest has a long history of important contributions to forest management and policy on themes as diverse as old-growth forests, dead wood in forests and streams, ecology of the northern spotted owl, and management of plantations. Sustained, direct interaction between scientists and land managers through a partnership between the Andrews Forest, the National Forest System, and the Bureau of Land Management facilitates quick delivery of science information into practice and opportunities to develop research projects that address current management issues. Important features of the partnership are long-term, applied, operational-scale experiments on forest landscape management and young plantation forest management.


Installing a 2-dimensional anemometer to measure airflow patterns in the airshed of Watershed 1. Photo by Thomas Iraci

Education and Training
The Andrews Forest provides educational opportunities in the realms of ecosystem science and natural resource management for all ages through NSF-funded graduate, undergraduate, and teacher training programs; partnerships with nearby school districts and a science enrichment program at OSU; undergraduate classes from throughout the U.S.; as well as tours for K-12 students and teachers, graduate students, land managers, and college faculty.


A graduate student installs an instrument as part of a telemetry observatory project. Photo by Cheryl Hatch/OSU.

Information Management
Intensive forest ecosystem research, conducted on the Andrews Forest since the 1950s, has resulted in many diverse, long-term ecological databases and a strong commitment to information management. The Forest Science Data Bank (FSDB) is managed through an information management system that supports the collection, quality control, archival and long-term accessibility of collected data and associated metadata. Most of these data resources are available through the Andrews website at no charge to anyone who is interested.

Links to the Humanities
The Long-Term Ecological Reflections program brings together creative writers, humanists, and scientists to produce a living record of how Andrews Forest researchers understand the forest and how the relation of people to the forest changes over time. As a collaboration between the USDA Forest Service, and the Spring Creek Project for Ideas, Nature and the Written Word, this project will gather reflections for generations, assembling a long-term record of changing creative responses to an ever-changing landscape.