H.J. Andrews Experimental Forest

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Forest Service
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Pacific Northwest Research Station

Horace Justin Andrews

H.J. Andrews (1892-1951).
Originally named the Blue River Experimental Forest, the Andrews Experimental Forest was renamed in 1953 to honor Horace Justin Andrews, Regional Forester for Oregon and Washington from 1943 to 1951, when he died in an automobile accident. Born October 31, 1892 in Sidnaw, Michigan, H.J. Andrews obtained a BS (1915) and MS (1916) in forestry from the University of Michigan; served as an air cadet in World War I; taught forestry at New York State College of Forestry in Syracuse, and Iowa State; was appointed Michigan's state forest fire warden; became a forest economist with the USDA Forest Service's Pacific Northwest Research Station; and was promoted to Assistant Regional Forester in 1939. Widely recognized as a leading authority on the problems of Northwest forestry, he was a driving force in the selection and establishment of the Experimental Forest to address regional problems.

INTRODUCTION

The H.J. Andrews Experimental Forest is a world renowned center for research and education about the ecology and management of forests and streams. Located about 50 miles (80 km) east of Eugene, Oregon, the Andrews Experimental Forest lies in the Blue River Ranger District of the Willamette National Forest. Established in 1948, the Experimental Forest is administered cooperatively by the USDA Forest Service's Pacific Northwest Research Station, Oregon State University, and the Willamette National Forest.

Funding for the research and education programs comes from the National Science Foundation (NSF), USDA Forest Service, NASA, Oregon State University, U.S. Geological Survey, and other sources. In 1976, the Experimental Forest was designated a Biosphere Reserve as part of the United Nations' Man and the Biosphere Program, and in 1980, the Experimental Forest became a charter member of the NSF's Long-Term Ecological Research (LTER) Program, which by 2003 had grown to 22 sites around the nation and 2 in Antarctica.

ENVIRONMENT

The Experimental Forest is on the western slope of the Cascade Range of Oregon, and occupies the 15,800-acre (6400-ha) drainage basin of Lookout Creek, a tributary of Blue River and the McKenzie River. Elevation ranges from about 1,350 feet (410 m) to 5,340 feet (1630 m). Broadly representative of the rugged, mountainous landscape of the Pacific Northwest, it features excellent examples of west-slope conifer forests and steep, fast-flowing streams.

The Experimental Forest's maritime climate has wet, mild winters and dry, cool summers. At the primary meteorological station near the headquarters at 1,400 feet (430 m) elevation, the mean monthly temperature ranges from a low of about 34 °F (1 °C) in January to 64 °F (18 °C) in July. Precipitation is concentrated from November through March and increases with elevation, averaging about 90 inches (230 cm) per year at lower elevations to over 140 inches (355 cm) at upper elevations. Rain predominates at low elevations, whereas snow is common at high elevations with deep snowpacks lasting late into spring. Highest streamflows generally occur from November through February when the occasional warm rainstorm melts the deep snowpacks.

FOREST TYPES

Before timber cutting began in 1950, about 65 percent of the Experimental Forest was cloaked in old-growth forests with towering, 400-plus year-old Douglas-firs. The rest of the Experimental Forest was largely in stands that regenerated following wildfires in the mid-1800s. Lower elevation forests are dominated by Douglas-fir, western hemlock, and western redcedar. Upper elevation forests contain noble fir, Pacific silver fir, Douglas-fir, and western hemlock. Clearcutting and shelterwood cuttings over about 30 percent of the Experimental Forest have created young plantation forests varying in composition, stocking level, and age. Wildfire was the primary disturbance type in the natural forest; windthrow, landslides, root rot infections, and lateral stream channel erosion were secondary disturbance agents.

SPECIES

The wide range of habitats supports a diverse flora and fauna. About 500 vascular plant species are found on the Experimental Forest. Vertebrate species include northern spotted owl, pileated woodpecker, osprey, black bear, bobcat, mountain lion, coyote, black-tailed deer, and Roosevelt elk. Invertebrate species total more than 3,000. Species lists for the Experimental Forest are available through the Internet (See back panel).

STREAMS AND RIPARIAN ZONES

The clear, fast-flowing streams of the Experimental Forest contain cutthroat and rainbow trout, Pacific giant salamanders and other vertebrate species, as well as various invertebrate species. Streamside vegetation, which includes deciduous and coniferous forests and herbaceous vegetation, strongly influences stream ecosystems by shading and contributing large woody debris and litter to streams.

GEOLOGY

Lower elevations of the Experimental Forest are made up of Oligocene-lower Miocene volcanic rocks composed of mudflow, ash flow, and stream deposits. In higher areas, bedrock is composed of andesite lava flows of Miocene age and of younger High Cascade rocks. Stream erosion, landslides, and glaciation have created a deeply dissected and steep landscape. Soils developed from these parent materials are mainly Inceptisols with local areas of Alfisols and Spodosols.

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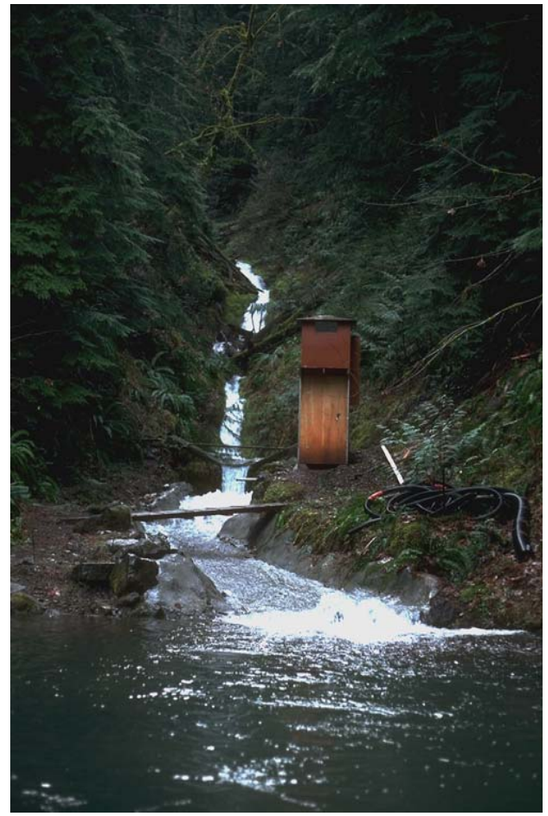


Watershed 2 gauging station, Andrews Experimental Forest.

Seining hole on Lookout Creek, Andrews Experimental Forest, 1955.

KEN HAMMOND

Stream team strings restraining net across Lookout Creek, Andrews Experimental Forest, 1991.

PAST RESEARCH

The Experimental Forest has a rich and diverse research history with the dominant themes changing through time. Research in the 1950s centered on road engineering, logging methods for old-growth forests, and rapid forest regeneration. In the 1960s, research focused on effects of logging on water yield, sediment loads, and nutrient losses from small watersheds. During the International Biological Program (IBP) of the 1970s, basic ecological studies examined how forest and stream ecosystems function (e.g., nutrient cycling, energy flow, and community organization) in old-growth and managed forests. These basic ecological studies continued in the 1980s, which also saw the beginning of research on ecosystem management. The 1990s research program has been characterized by landscape-scale studies and testing of ecosystem management methods.

During the 1950s and 1960s, the research was conducted by a few Forest Service scientists. The size and scope of the research changed dramatically in 1970 with the start of IBP and the use of the Experimental Forest by university scientists and graduate students. The program has grown to include scientists and graduate students from around the country and the world.

Many of the past research projects established permanent study areas (i.e., watersheds, forest plots, stream reaches, and weather stations), where periodic measurements are needed to examine natural changes as well as the effects of logging and other management activities. The data from these long-term studies have made the Experimental Forest an important monitoring site to detect regional changes in climate. This information also provides excellent opportunities to examine the effects of catastrophic or episodic events such as major floods, windstorms, or insect outbreaks. The Experimental Forest has become a world leader in development of data management and archiving methods to ensure high quality and easy access to long-term data.

Since 1980, the Experimental Forest has been one of the 230-plus stations in the National Atmospheric Deposition Program, which monitors the chemistry of the Nation's precipitation. It has the purest precipitation in the network.

CURRENT RESEARCH

More than 100 research projects are underway at the Andrews Experimental Forest each year. Selected examples are:

Long-Term Ecological Research (LTER): The centerpiece of Andrews Experimental Forest research, which holds as its central question: How do forest management, natural disturbances, and climate changes affect key ecosystem properties such as biodiversity, carbon dynamics, and hydrology? Results from LTER studies are being tested at large landscape and regional scales.

Watershed Studies: Several sets of watersheds provide information on the effects of different logging systems and road construction on yields of water, sediment, and nutrients; development of vegetation; and biological diversity. Integrated studies examine the roles of topography, geology, vegetation age and composition, snow depth and condition, road density and placement, and storm intensity on timing and height of peak flows. The effects of vegetation composition on summer low flows also are being studied.

Stream and Riparian Zone Ecology and Restoration: This diverse research area includes studies that examine links among different types of forests and stream food resources and habitat structure; response of riparian zones and streams to floods and logging; effects of landforms and geomorphology on stream ecosystems; sources and effects of large woody debris in streams; and effect of nutrient enrichment on food web organization. Stream-restoration experiments have installed different levels of coarse woody debris to determine the effects on channel complexity, aquatic habitat, and stream productivity.

Forest Development, and Growth and Yield: A large network of permanent vegetation plots has been established in a wide range of vegetation ages and types. This network is periodically resampled to study the changes of forest structure and composition through time; the patterns of biological diversity; and changes in wildlife habitat. Particular attention is paid to growth and yield of various forest types.

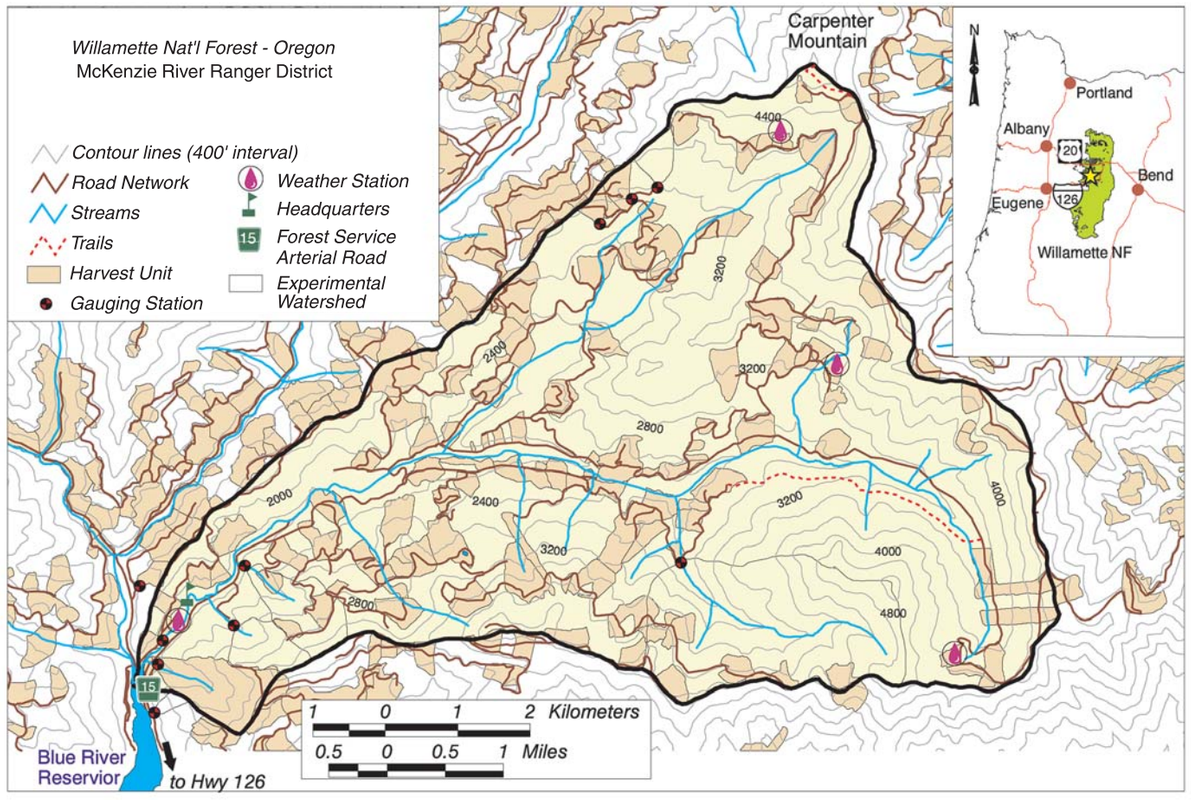
Young-Forest Structure and Wildlife Use: To better understand the relations between forest structure and composition of young stands and wildlife use, several areas are being precommercially and commercially thinned to create different patterns and densities. The growth and yield of the different stands also are being followed.

Invertebrates: Insects, spiders, mites, and their relatives play many roles, which are poorly understood, as is their response to different management treatments. Several studies address the habitat requirements and distribution of these species as well as their roles in decomposition, nutrient cycling, pollination, defoliation, pest control, and other ecological processes.

Carbon Dynamics: The concern over "greenhouse gases" has made this a prominent topic. The basic processes controlling carbon flux in our systems are being studied at the Experimental Forest and then extrapolated over larger areas by using models and remote sensing. Pacific Northwest forests play a disproportionately large role in carbon dynamics because of their high productivity, the extremely old ages they can attain, and the slow rate of decomposition of many tree species.

Remote Sensing: Sites like the Andrews Experimental Forest provide excellent information about how forest and stream ecosystems work, but that knowledge needs to be tested over large areas to be truly useful. Several studies are examining the application of remote-sensing imagery to inventory, monitoring, and modeling questions at large, regional scales. Methods are being developed that offer the promise of rapidly measuring ecosystem variables such as aboveground biomass, carbon stores, leaf area, and certain aspects of wildlife habitat.

Landscape Ecology: Several studies are underway that examine the effects of vegetation pattern on biological diversity, carbon dynamics, and hydrology. Landscape-scale models are used to compare presettlement forest disturbance patterns (particularly wildfire) with current forest management practices in determining forest landscape patterns and the effects of those patterns on such things as severity of rain-on-snow flooding, or how disturbances like wildfire or an insect outbreak might move through the landscape.



EDUCATION

The educational program includes college classes, formal and informal short courses, symposia, field trips, and nature talks at local campgrounds. Participants include high school classes, college undergraduate and graduate students, scientists, natural resource managers and other professionals, elected officials, media representatives, and the general public.

PHILOSOPHY

The Experimental Forest is dedicated to research and to communication of research results to land managers, policymakers, scientists, students, and the general public. The educational program is a highly valued component. It is firmly believed that management of forests and streams will be improved with better understanding of how they work. The Experimental Forest is open to all basic and applied research that does not conflict with existing programs or detract from the quality of the site. Experimental manipulations, including logging, are permitted in specific areas and are broadly advertised to the scientific community with the intent of fostering collaborative research. In addition to these experiments, an array of young stands has been created with known initial conditions and mixtures of species, stocking densities, and genetic makeup, which offer many research opportunities.

The Experimental Forest, with its long history of experiments and extensive data sets, is committed to sustaining long-term, interdisciplinary research programs, which are critical to addressing present and future problems in natural resource management. Long-term observations are maintained for basic meteorological and hydrological factors, vegetation development, stream habitat conditions, and other variables. Many of these data sets are available through the Internet (See back panel for address).

AL LEVNO

Spotted owl

MATT HUNTER

Red-legged frog

AL LEVNO

Morel

JOHN CISSEL

Bunchberry

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NEARBY RESEARCH NATURAL AREAS

Several Research Natural Areas (RNAs) have been established close to the Experimental Forest which provide examples of forest and meadow communities and aquatic habitats not found within the Experimental Forest. Local RNAs include:

Wildcat RNA (1,415 acres, 573 ha) High-elevation true fir (*Abies*) and mountain hemlock forests as well as wet and dry subalpine meadows.

Ollalie Ridge RNA (655 acres, 265 ha) High-elevation true fir (*Abies*) forests, moist and dry subalpine meadows, and several endemic plant species.

McKenzie Pass RNA (1,187 acres, 480 ha) Small, shallow lakes and high-elevation meadows and forests surrounded by lava flows.

Hagan RNA (1,127 acres, 456 ha) Dense, mature Douglas-fir forests at mid to low elevation which established following wildfires in the 1840s and 1880s.

Three Creek RNA (711 acres, 288 ha) High-elevation 800-year old-growth forests and associated streams, and avalanche track communities.

Several other RNAs are within a 1- to 2-hour drive of Andrews Experimental Forest.

TRAVEL

The Experimental Forest is about a 1-hour drive east of Eugene, Oregon. About 3 miles east of the town of Blue River on Oregon Highway 126, turn left/north onto USFS road 15, drive about 4.5 miles (7.25 km) on road 15 and turn right/east onto USDA FS road 130, bear right at Y (about 0.5 mi.[0.8 km]) onto USDA FS road 132.

A few restaurants and motels are available within a 15-mile (24.1 km) drive of the Experimental Forest. Many are available in Eugene (1 hour away).

FACILITIES

Housing facilities are limited to people involved in on-site research or educational activities. There are overnight accommodations for about 80 people, a small cafeteria (capacity 32), open air pavilion, mechanical/wood shop, and a 10,000 square-foot (929 m^2) laboratory-office complex with classrooms and conference and meeting rooms.

BIBLIOGRAPHY

A bibliography of over 2,500 publications from research at the Experimental Forest is available from the Pacific Northwest Research Station, the Andrews Experimental Forest office, or through the Internet. (See back panel.)

OTHER MAPS

Willamette National Forest maps are available from the McKenzie River Ranger District, McKenzie Bridge, Oregon or the Willamette Supervisor's Office, Eugene, Oregon.

Field tour on the Andrews Experimental Forest.

The H.J. Andrews Experimental Forest is part of a system of research properties including other experimental forests, watersheds, rangelands, and RNAs.

HIKING TRAILS

Two public-use trails provide excellent introductions to the Andrews Experimental Forest. The Lookout Creek Old-Growth Trail travels about 3.5 miles (5.6 km) through unbroken old-growth forest along the lower slopes of Lookout Mountain. A short (about 1 mile [1.61 km] long) trail climbs to the top of Carpenter Mountain, site of a restored fire lookout with far-ranging views of the Cascade Range.

FOR FURTHER INFORMATION CONTACT:

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