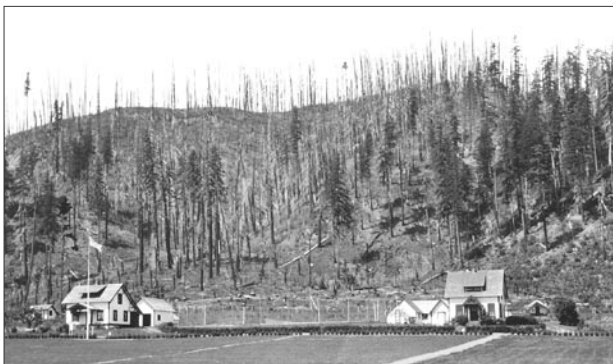


Wind River Experimental Forest



On left, Wind River housing compound in early 1900s. Slope behind houses had burned in wildfire. Early research focused on reforestation and silviculture. On right, part of Wind River housing compound in 2003. Silvicultural research continues on the forest, along with more recent wildlife and ecosystem studies.

Introduction

The Wind River Experimental Forest, known as the cradle of forest research in the Pacific Northwest, is a major center for ecological and silvicultural research in west-side Pacific Northwest forests. In the state of Washington, Wind River Experimental Forest is in the south-central area of the Gifford Pinchot National Forest, north of the Columbia River Gorge National Scenic Area. The experimental forest is about a 1.5-hour drive east of Vancouver, Washington, on the Mount Adams Ranger District. It is administered cooperatively by the U.S. Forest Service Pacific Northwest Research Station and Gifford Pinchot National Forest.

The Wind River Experimental Forest is 1 of 10 experimental areas associated with the Station. These experimental areas—forests, a watershed, and a range—represent important forest and range types and provide opportunities for short- and long-term field studies and demonstrations. Some forest management activities may occur; most of these activities are carried out as part of scientific studies and are sources of data. Research is the primary purpose.

Many studies continue for decades, and the data accumulated on changes in trees and forests over

time make experimental forests extremely valuable. Long-term stability and a continuing commitment to research have resulted in important findings about forest ecology and management that would not have been possible with short-term studies.

The experimental forest has two administrative units: the Trout Creek and Panther Creek divisions. The Trout Creek division has old-growth forests, stands that originated after large wildfires in the first third of the 20th century, and young stands regenerated after clearcuts in the last half of the 20th century. The Panther Creek division has mature stands that grew after a fire in the early 1840s and young stands from more recent clearcuts.

Environment

Wind River originates in McClellan Meadows, about 15 miles north of the experimental forest, and flows south into the Columbia River, east of the small town of Carson, Washington. The Trout Creek division is west of Wind River, and the Panther Creek division east of the river. The two units are about 4 miles apart. Elevations range from 1,100 feet on the valley floor in the Trout Creek division to over 4,200 feet on Big Huckleberry Mountain, which is on the east edge of the Panther Creek division.



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Topography varies, including both gentle and steep slopes, as well as intermittent and perennial streams, some ponds, and wetland marshes.

The nearby Columbia River Gorge affects the valley's climate, contributing to strong winds in any season and cool, wet weather in the winter. Average precipitation at Wind River is about 100 inches annually, occurring as rain or snow during fall, winter, and spring. Summers are generally warm and dry.

Volcanoes ancient and young, such as Mount Rainier and Mount St. Helens, dominate the Cascade Range. Wind River valley bedrock is composed of volcanic flows and some basalts. Soils are primarily volcanic in origin with some colluvial till and are generally free of stones.

Forest Types

Wind River Experimental Forest is best known for its old-growth forests of Douglas-fir and western hemlock, which cover about one-third of the forest. Many of the old-growth stands are more than 450 years old. In the oldest stands, western hemlock and Pacific silver fir are becoming the dominant tree species as large Douglas-fir gradually die out.

Other conifer species include western redcedar, Pacific silver fir, grand fir, noble fir, and Pacific yew. Most large, old western white pines were killed by the white pine blister rust, but some young white pines, developed from rust-resistant stock, are now thriving on the forest. Hardwood trees include Pacific dogwood, red alder, bigleaf maple, and black cottonwood.

Plant and Animal Species

Many shrubs grow in the forest understory, including vine maple, salal, Oregongrape, red huckleberry, big huckleberry, and Pacific rhododendron. Dozens of plant species grow on the forest floor, including queencup beadlily, vanilla leaf, swordfern, brackenfern, twinflower, trillium, and western prince's pine. Huckleberries and beargrass grow in



Oregongrape.

Wind River Canopy Crane Research Facility

places at higher elevations.

Visitors to the forest are most likely to see the Douglas squirrel, a small squirrel with an orange underside and tufted ears, that makes its opinions of visitors loudly known

throughout the forest. The forest has many other small mammal species that the visitor is less likely to see, including nine species of bats, three species of shrews, three species of voles, one species of flying squirrel, and Townsend's chipmunks. Large mammals include elk and black-tailed deer. All these animals are a feast for predators, and there are many of those also, including weasels, martens, bobcats, coyotes, black bears, and cougars.

Northern spotted owls, listed as a threatened species, live in parts of the forest. Other large birds in the forest are goshawks and pileated woodpeckers. Winter wrens, brown creepers, dark-eyed juncos, red-breasted nuthatches, and hairy woodpeckers are just a few of the forest's many other bird species.

Summer and winter steelhead use Trout and Panther Creeks and are the only anadromous fish known to use these streams. Rainbow trout are year-round residents in both streams. Eastern brook trout live in Trout Creek but have not been found in Panther Creek.

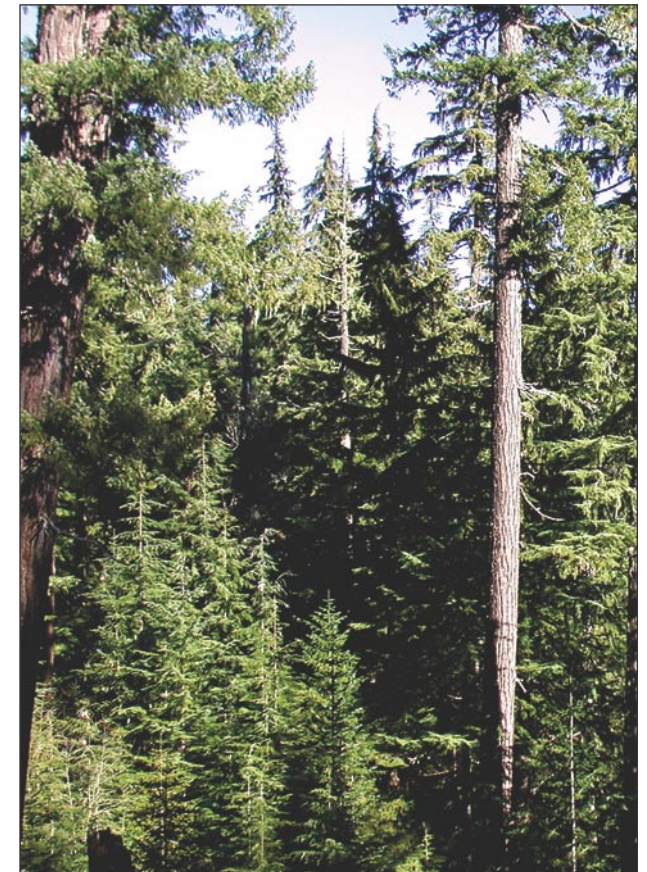
Water

Trout Creek and Panther Creek are perennial streams that are tributaries to Wind River. The experimental forest has other small streams, both permanent and ephemeral. The Trout Creek division has some wetlands and open water at the base of Bunker Hill's west slope. Bunker Hill itself is outside the experimental forest, east of the Trout Creek division.

Geology

In general, Cascade Range geology is volcanic. The underlying bedrock in the Wind River area is basalt, often covered by volcanic ejecta, andesites, and volcanic mudflows. Trout Creek Hill is an extinct shield volcano.

The most recent lava flow occurred more than 35,000 years ago. Lava poured south down Wind River and blocked the Columbia River, which rose in a lake until the river topped the lava dam and cut through it. Volcanic eruptions have deposited ash layers on the forest over the millennia. The two most famous depositions are from the Mount Mazama eruption nearly 7,000 years ago and the more recent Mount St. Helens eruption in 1980.





Research at Wind River extends from tree canopies to underground. Researchers use instruments (left) to observe root growth and install soil moisture sensors (right).

Past Research

Forest research began in the Wind River valley in 1909. Wind River Forest Experiment Station was established formally in 1913 as a base for the nursery work, the arboretum, and silvicultural studies. The surrounding area had old-growth forests,



Much of today's common knowledge about silviculture of Pacific Northwest conifers came from research at Wind River, such as this Douglas-fir spacing study. Photo taken 1932.

USDA Forest Service

burned forests from the 1902 Yacolt burn, second-growth forests, and cutover forests on private land, providing a wide range of forest age classes and challenges in forest development. The Wind River Experimental Forest was officially established in 1932, divided between the Trout Creek and Panther Creek divisions.

Forest nursery. The first experiments began in 1909 when a 5-acre plot in the Wind River valley was cleared for a nursery. Seedlings were raised to reforest the recently burned-over Bull Run watershed east of Portland, Oregon. The nursery operation pio-

neered many practices that are still used today in forest nurseries.

By 1915, the nursery was producing 1 million seedlings annually. Many seedlings were used to reforest the big burns of the time, including the nearby Yacolt burn of 1902. The original 5 acres eventually grew into a 180-acre nursery that produced 21 million conifer seedlings annually. The nursery closed in 1997 because of the decline in timber sales, which reduced the reforestation need for seedlings.

Arboretum. The Wind River Arboretum was initiated in 1912 by Thornton T. Munger, head of the silviculture research section in the Forest Service district office in Portland over several decades. Foresters planted tree species from many temperate and subtropical zones in the world to compare their performance with Pacific Northwest native tree species. Many tree species, including most hardwoods, were unable to survive the long, dry summers. Other species

thrived at first, but died during cold snaps or heavy, wet snowstorms. Conifers from arid climates, such as Siberian larch, survived drought and storms but slowly died from needle diseases, probably because these species were not adapted to a climate more humid than their native regions.

After more than 90 years and 165 species tested, no exotic tree species grew as well as native Pacific Northwest Douglas-fir, hemlocks, true firs, and cedars. Many nonnative trees at the arboretum have died. The arboretum's research helped to establish the importance of using locally adapted tree species in forestry.

Silviculture. Silviculture research for the Pacific Northwest Douglas-fir region began at Wind River. In 1909, the same year the nursery was started, Thornton T. Munger began a study on the growth of Douglas-fir in natural stands in the Wind River valley. Today's common knowledge about Douglas-fir was **not** known in the early 20th century. Long-term studies provided scientific data about the growth, yield, and mortality of Douglas-fir and other tree species. Many ecological studies focused on Douglas-fir, including observation of natural seedfall, seed storage in the forest floor, seed germination under old-growth timber, and timing of bud



Scientists are studying ecological processes in Wind River's old-growth forests, from canopy growth and gas exchange with the atmosphere to root growth and carbon storage.

break. These early studies developed successful techniques for planting, thinning, and growing Douglas-fir. Studies also established the importance of seed provenance, showing that seed origins, including locality and elevation, were critical to trees' long-term survival and growth.

By midcentury, the research emphasis was on the replacement of old-growth stands with Douglas-fir plantations. Scientists aimed to improve tree growth in plantations. To this end, they studied genetics, tree planting, natural regeneration, initial spacing, rodent control, fertilizing, thinning, and mixed-species plantings. Other studies focused on timber harvest methods, slash burning, and management of second-growth stands started after fires. Research at Wind River has provided significant contributions to silvicultural knowledge in the Pacific Northwest.

Early studies on plantation spacing started near Wind River are yielding long-term results today. Wide spacings, which were thought "bound to fail" when planted in 1925, are proving more than 50 years later to be the most successful for Douglas-fir growth—trees grown at wider spacings are both taller and larger in diameter than trees grown at closer spacings.

Current Research

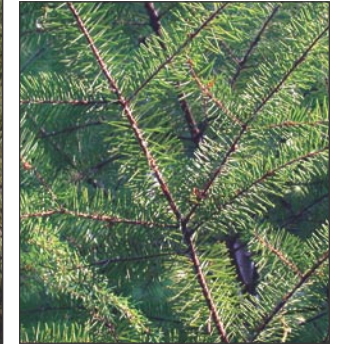
Silviculture. Silvicultural studies started decades ago are being continued. In addition, many new studies focus on the silviculture of species other than Douglas-fir and on mixed-species plantations. Research continues on fertilizing, pruning, and spacing.

Old-growth forests. Since the early 1970s, many scientists have been studying the compositions, structures, and functions of mature and old-growth forests. The Wind River Experimental Forest is one of many sites where scientists are studying the habitat needs and biology of the northern spot-

Wind River Canopy Crane Research Facility



Some blister rust-resistant white pines (right) are thriving in experimental plantations. Scientists are studying the silviculture of other conifers and mixed-species plantations, as well as Douglas-fir.



ted owl and the characteristics of old-growth forests. Scientists also are studying other wildlife in old-growth forests, such as bats and various bird species. The canopy crane, discussed below, is a valuable tool in many of the old-growth forest studies.



The 250-foot-tall canopy crane gives scientists access to nearly 6 acres of old-growth canopy, making a whole new view of the forest possible. The crane and area around it are closed to the general public owing to safety concerns.

Canopy crane research. In 1994, the Wind River Canopy Crane Research Facility was established in the experimental forest's Trout Creek division. The canopy crane is a standard construction crane, permanently installed in the old-growth forest of the Thornton T. Munger Research Natural Area. The crane is 250 feet (about 25 stories) tall and has a gondola attached to the 279-foot-long load jib. Scientists in the gondola can gather samples and conduct experiments in tree crowns as high as 220 feet. The gondola can be turned in a 550-foot-diameter circle, giving researchers access to nearly 6 acres of old-growth canopy.

The canopy crane is operated by three partners: the University of Washington, the USDA Forest Service



Scientist in crane gondola.

Pacific Northwest Research Station, and the Gifford Pinchot National Forest. The crane and area around it are closed to the general public because of safety concerns. Also, visitor traffic would compromise measurements made by



Mistletoe.

scientific instruments located on and near the forest floor around the crane.

Scientists are using the canopy crane facility for research on a wide range of topics including forest carbon, water, and nutrient cycles; forest health and pro-

tection; tree physiology and growth; the relationships between biological diversity and ecosystem functioning; monitoring of climate and climate variability; and ground validation and testing of new remote-sensing technology. Specific studies include canopy-atmosphere gas exchanges, light and photosynthesis relationships in canopies, physiology of old and young trees, canopy microclimates, water use by trees and understory vegetation, and hydraulic lift by tree roots. Some of the carbon cycle research includes studies of carbon storage and root growth underground, done in conjunction with the aboveground studies.

Other canopy aboveground studies focus on dwarf mistletoe biology, epiphyte biology, lichen and fungi ecology, and use of forest canopies by bats, birds, and insects.

Related canopy studies are now taking place in two young forests, one at the base of Trout Creek Hill and the other on the district outside the experimental forest. Scientists are using towers to access the forest canopy at these locations.

Research Natural Areas

Research natural areas (RNAs) are designated on national forest lands to represent different types of naturally occurring terrestrial and aquatic ecosystems on these lands. Natural conditions are maintained as much as possible. RNAs preserve examples of terrestrial or aquatic ecosystems for

comparison with similar areas influenced by people and provide research and educational areas for ecological and environmental studies. These areas also function as gene pool preserves for both common and rare or endangered species, and provide long-term situations for monitoring and research.

Thornton T. Munger RNA (1,180 acres). This RNA is in the Trout Creek division and has old-growth Douglas-fir and western hemlock forests. The east corner of the RNA has a swamp that supports a rich diversity of wildlife, including wood ducks and teals, and downy and hairy woodpeckers.

Sister Rocks RNA (215 acres). This RNA, located near the experimental forest, has Pacific silver fir forests on mountain slopes and ridgetops in older volcanic portions of the Cascade Range. Elevations range from 3,600 to 4,200 feet.

Steamboat Mountain RNA (1,362 acres). This RNA, also located near the experimental forest, includes excellent examples of subalpine fir forest and Pacific silver fir-mountain hemlock forests. It has three wet meadows or mountain mires, a small lake, and rock outcrops and talus. Elevations range from 3,904 to 5,426 feet.

Travel

The Wind River Experimental Forest is located about a 1.5-hour drive east of Vancouver, Washington, and Portland, Oregon. From Vancouver, drive east on Washington State Highway 14 to Stevenson. (From Portland, drive east on Interstate 84 to the town of Cascade Locks, cross the Columbia River on the Bridge of the Gods, turn east on Highway 14, and drive east to Stevenson.) From Stevenson, continue east on Highway 14 to Highway 30 (Wind River Road) and drive north to Carson. At Carson, drive northwest on Highway 30 about 8 miles to Stabler Junction. Turn west on forest road 43 and drive about 1.5 miles to the Wind River Information Center. Get detailed directions there. The Trout Creek division is accessed by forest road 43, and the Panther Creek division by forest road 65.

Facilities

Overnight facilities at the Wind River Experimental Forest are available only to researchers. Other visitors are welcome to visit the forest

on day trips. During the summer, visitors can camp at the Panther Creek or Beaver campgrounds, on the Gifford Pinchot National Forest near the experimental forest. These campgrounds are popular, and reservations are recommended. See visitor information in "For Further Information" below. Visitors can find motels and restaurants in the nearby towns of Carson and Stevenson, or in Cascade Locks on the Oregon side of the Columbia River.

Hiking Trails

Pacific Crest National Scenic Trail #2000. The Pacific Crest Trail crosses the Trout Creek division of the experimental forest and the boundary of the Panther Creek division. Consult Pacific Crest Trail guidebooks for more information.

Whistle Punk Trail #59. This 1.5-mile trail is a barrier-free interpretive trail that runs through young forest, past historical logging equipment, and a short distance through old-growth forest. The trailhead is at the junction of forest roads 4300417 and 4300434, about 1 mile west of Wind River Information Center. The trail is near, although not in, the experimental forest.

For Further Reading

Duncan, S.; Miner, C. 2000. Closer to the truth: 75 years of discovery in forest and range research. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 76 p.



Bunchberry.

Wind River Canopy Crane Research Facility



Resources on the Web

Wind River Experimental Forest: <http://www.fs.fed.us/pnw/expforests/windriver>. This site has current information about the forest. (June 2003).

PNW Research Station: <http://www.fs.fed.us/pnw>. This site lists all publications by Station scientists, including those based on research at Wind River Experimental Forest. (24 March 2003).

Wind River Canopy Crane Research Facility: <http://epts.washington.edu/wrccrf>. This site includes a bibliography of publications about research involving the canopy crane. (24 March 2003).

For Further Information

Contact the Wind River Information Center or the Nature of the Northwest Information Center to get more visitor information or to purchase maps.

Wind River Information Center

1262 Hemlock Road
Carson, WA 98610
Phone: 509-427-3200

Nature of the Northwest Information Center

800 NE Oregon Street, Room 177
(near Lloyd Center)
Portland, OR 97232
Phone: 503-872-2750; fax: 503-731-4066
Web site: <http://www.naturenw.org>

Contact the Pacific Northwest Research Station for more information about scientific research on Wind River Experimental Forest, and contact the Gifford Pinchot National Forest for more information about the national forest.



Pacific Northwest Research Station

333 SW First Avenue
P.O. Box 3890
Portland, OR 97208
Phone: 503-808-2592
Web site: <http://www.fs.fed.us/pnw>



Gifford Pinchot National Forest

10600 NE 51st Circle
Vancouver, WA 98682
Phone: 360-891-5000; TTY: 360-891-5003
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