

Oregon Forests and Climate Change

By Dave Hedberg

How climate change affects Oregon forests and how those forests affect climate change are complex, multilayered, and urgent topics. According to a 2013 report by the National Oceanic and Atmospheric Administration, climate change has driven an average temperature increase of .013°F in the Pacific Northwest in every decade since 1920. Depending on future greenhouse gas emissions, summer temperatures could increase by as much as 9.4°F by 2050. Extreme temperature is also measured by the increase in the frequency (number of days) and duration (number of days in a row) of hotter temperatures throughout a year.

Climate change has contributed to longer and more intense fire seasons, an increase in plant and animal die-offs from droughts and extreme heat waves, and a greater susceptibility of forests to insects and disease. Scientists have documented reduced snowpacks and stream flows and higher stream and surface water temperatures, which endanger fish and contribute to toxic algae blooms. At the same time, there is evidence that if humans can reduce CO₂ emissions globally, then forests can help mitigate the effects of greenhouse gas emissions from industrialization.

All plants convert carbon dioxide, sunlight, and water into oxygen and energy. During that process of photosynthesis, trees store carbon in their woody tissues. Because of the long lifespan of many Oregon tree species and the decaying tree debris that fosters a dense understory of shrubs, ferns, and lichens, western Oregon forests are some of the greatest carbon stores on the planet. The Forest Service has estimated that “in one year, a mature live tree can absorb more than 48 pounds of carbon dioxide” and has determined that western Oregon forests are significantly below their full carbon storage potential. This suggests that the reforestation and preservation of previously logged public and private forests could help mitigate CO₂ emissions.

Oregon Forests The effects of climate change on forestland and timberland are not uniform. In Oregon, each forest ecosystem has adapted to a particular climate, geography, and culture. Coast redwood (*Sequoia sempervirens*) and Sitka spruce (*Picea sitchensis*), for example, are especially adapted to a cool maritime climate where moisture is present year-round. Ponderosa pine (*Pinus ponderosa*) and lodgepole pine (*Pinus contorta*), which grow in the southern, central, and eastern Oregon mountains, have adapted to dry summer conditions. Douglas-fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*), and western red-cedar (*Thuja plicata*) grow in environments that average from 15 to 262 inches of annual precipitation and at an elevation as high as 8,000 feet.

Climate change poses different types of threats to each forest. Studies by the U.S. Forest Service and the Oregon Department of Forestry suggest that the greatest threat is to western Oregon’s wetter, temperate forests, which will experience dramatic reductions in precipitation, particularly in the summer. Species in those forests are generally less tolerant to prolonged heat and summer drought. Eastern Oregon forests are also threatened by invasive pests and diseases and by reduced snowpacks in higher-elevation forests. Researchers at Oregon State University, the Oregon Department of Forestry, and the USDA Forest Service documented millions of trees that died in southern Oregon because of hotter, drier summers as well as increases in invasive pests and pathogens.

Much of the public concern about forests and climate change has centered on increased fire risk. Fire is not *inherently* risky. It has long been a critical part of forest ecology, and many tree and understory plant species have adapted to and thrived with fire. Oral tradition and ethnographic and archaeological evidence document that Indigenous people in Oregon used fire for thousands of years as a stewardship tool that cleared forest understory, eliminated pests and pathogens, and promoted the growth of plants that people found useful. Following that precedent, the forestry programs of the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of Warm Springs, the Confederated Tribes of Grand Ronde, and the Confederated Tribes of Siletz Indians have used controlled burns to manage their timberlands and have collaborated with state and federal landowners to reintroduce controlled burns in some forests.

During the early twentieth century, practitioners of western silviculture misunderstood and oversimplified the role fire plays in forests, leading to a prohibition on seasonal burning and a

buildup of forest fuels. Oregon's federal forest reserves were established in the 1890s, and after the Great Fire of 1910 burned more than three million acres of Idaho, Washington, and Montana, the U.S. Forest Service set a policy of total fire suppression to protect commercial timber harvest. In Oregon, the state Department of Forestry was established the next year to regulate timber practices on state, county, and private lands, including fire prevention and protection. By 1935, the Forest Service had enough firefighting labor to establish the so-called 10 a.m. policy, which directed crews to extinguish a fire by ten o'clock on the morning of the day after it was first reported. By extinguishing fires quickly, the 10 a.m. policy led to a massive buildup of understory fuels in Oregon forests that, combined with the effects of climate change, has led to hotter fires that are increasingly difficult to contain.

In response to research demonstrating the benefits of fire in forest ecosystems, the Forest Service shifted its approach in the 1970s to a let-it-burn policy in wilderness areas. Because of the complexity of forest ownership and jurisdiction, however, fire suppression and containment often prevailed in order to protect lives and property. That was especially true when fires spread across state, federal, county, and private lands. With a proliferation of suburban communities near forests, current fire policy prioritizes containment and suppression to protect lives and property, but there are efforts to allow fires to burn in remote areas and to reintroduce controlled burns and fuel reduction work in some areas.

Public, Private, and Industrial Forests The ownership and regulatory control of Oregon's 30 million acres of forestland and timberland—roughly half the state's land area—is also complex. About 80 percent of Oregon's forestland is also timberland, which is forestland that can grow commercial grade timber. Timberland excludes areas where logging is restricted, such as wilderness areas and national parks, and areas where tree species are not commercially favorable, such as high alpine forests, desert steppe, and grasslands.

Public forests, which account for 64 percent of forestland in Oregon, are managed by the Forest Service, the Bureau of Land Management, the Oregon Department of Forestry, and county governments. Private timberland accounts for 34 percent of Oregon's total forest area, which ranges in ownership from small family-owned forests to industrial tree plantations. The remaining 2 percent of forests is owned by tribal governments with a mix defined as forestland and timberland.

While all forests in Oregon are regulated to protect species and watersheds according to policies defined in the Wilderness Act, the Oregon Forest Practices Act, the National Forest Management Policy Act, the Clean Water Act, and the Endangered Species Act, the type of regulation and the intensity of allowable timber harvests vary based on whether the land is federal, state, or private. Typically, managers of public forests have a management plan established through public comment and a legislative process that sets policies and the regulation of forest practices. In general, for example, federal and state timberland have a greater diversity of tree and understory species than private industrial timberland does, so a proposed harvest on public land must account for potential impacts to threatened or endangered species. Forests such as those in federal wilderness areas are protected from timber harvests. Except for wilderness and primitive areas, many publicly managed forests in Oregon allow timber harvests through competitive timber sales, following policies set by the Oregon Board of Forestry and county commissions.

Many timberlands that are owned by private landowners are managed as industrial tree plantations, which means the trees are harvested all at once and the land is replanted, with rotations occurring as frequently as twenty to sixty years. The principal aim is to grow trees for harvest, and it is the most intensive form of forestry. Herbicides are used to curtail the growth of forest understory to maximize tree growth, for example, and industrial timberland is often composed of a single species; genetic variety is selected for rapid growth and its resistance to herbicide. Industrial tree plantations are mainly regulated by the Oregon Board of Forestry, and federal laws such as the Endangered Species Act and the Clean Water Act sometimes affect how they are managed.

Significantly, both trade and conservation groups supported the 2022 Oregon Private Forest Accords, bipartisan legislation that closely aligned private forest management in Oregon with laws in Washington and California that require wider stream buffers near clearcuts, design standards for forest roads and culverts, and the removal of barriers for spawning fish. Environmental and industry groups found common ground in the Private Forest Accords' focus on mitigation strategies to lower

stream temperatures for endangered aquatic species. The Accords do not address carbon capture, sequestration, or climate change mitigation on private forests because industry, labor, and environmental groups have been unable to reach agreement on those issues.

Advocacy by Nonprofits and Industries Many nongovernmental organizations, nonprofits, and trade and industry groups have agreed that climate change puts forests at risk, but they have not agreed on what those risks are or what the solutions might be, especially when it comes to harvesting timber. Researchers at the College of Forestry at Oregon State University showed that both conservation and trade groups have at times simplified scientific studies about forests and climate change to fit their own policy goals.

In 2018, for example, the Oregon Global Warming Commission's Forestry Task Force reported preliminary studies indicating that processing logs into lumber releases 62 percent of the CO₂ stored in the harvested logs (38 percent of the carbon is retained in the lumber). Advocates for continued timber harvests have argued that these findings suggest there is an opportunity for mills to use new technologies to further reduce CO₂ emissions and make timber an efficient carbon sequestration strategy. While trade groups such as the Oregon Forests Industries Council and the Oregon Forest Resources Institute have acknowledged the threat of climate change, they argued that innovations like mass timber—which can use smaller and less desirable trees glued together to manufacture large structures, such as the new terminal at the Portland International Airport—are effective ways to sequester carbon in lumber and maintain harvest and milling jobs. While mass timber may reduce wood waste, harvesting timber releases some of the stored carbon. This position is a mitigated approach to maintaining forest products industries in light of climate change.

Conservation groups like Oregon Wild viewed the Oregon Global Warming Commission's Forestry Task Force report differently, arguing that "logging is always worse than not logging from a carbon standpoint." Oregon Wild recommended curbing logging on public lands to permanently protect old-growth and mature stands and increasing rotations and curbing clearcutting on private industrial tree plantations. Their position focuses on the potential for carbon storage. Older studies, they reported, indicate that logging, including the emissions generated by equipment and mills, releases more carbon than the trees can store.

Both groups use similar numbers and studies to advocate for their position, but neither properly contextualizes the studies they reference. The Oregon Global Warming Commission recommended that more research is necessary to understand the amount of carbon stored in forests, in wood products, and in the emissions generated during logging and milling. "Reductions in carbon stored in forests is an undisputable consequence of harvest," the Commission acknowledged; "trees are cut and removed."

Regardless of efficiencies or new technologies, harvesting timber reduces the carbon sequestration potential of Oregon forests. The debate over the future of timber harvests, the forest products industry, forest policy, and climate change is central to Oregon's climate change mitigation strategy.

Advocating for Recreation Reduced snowpack and shorter, less predictable winters have worried recreational groups. The National Ski Areas Association, for example, began issuing climate change action reports in 2012. A 2017 study of Pacific Northwest ski resorts and snowmobile areas predicted an 80 percent reduction in the ski season by 2090, as snowpack decreases in the Cascade Range. The alarms sounded in that study helped create action groups such as Protect Our Winters, which has connected climate scientists, athletes, and retail and marketing companies in efforts to create policies and public communications that help reduce CO₂ emissions and move the United States to carbon neutral energy by 2050.

In 2017, Trout Unlimited warned that fish populations in forest streams have been adversely affected by climate change. The Mazamas, the Oregon Mountain Biking Coalition, the Sierra Club, and the Nature Conservancy advised their members to make consumer choices based on climate change and pushed government leaders to put policies in place that will reduce greenhouse gas emissions and invest in research on climate change. While it has been difficult to measure the effectiveness of each organization, it is clear that these messages have reached Oregon's political leaders. In March 2020, for example, Governor Kate Brown signed Executive Order 20-04, which directed state agencies to take action that reduces greenhouse gas emissions and avoids the worst

effects of climate change.

Studies by the U.S. Forest Service, the Oregon Department of Forestry, and Oregon State Parks have predicted longer and more intense fire seasons that pose threats to summer recreation areas, trails, and campgrounds. It is likely that people will face precautionary seasonal closures of forests and shorter seasons for some outdoor activities. In 2014, over two hundred retailers and recreational industries in Oregon, including Nike, Adidas, and Intel, signed a climate change declaration, warning that lives “are threatened by a changing climate that most scientists agree is being caused by air pollution. We cannot risk our kids’ futures on the false hope that the vast majority of scientists are wrong.” Keen, a Portland-based shoe company, established climate change marketing and advocacy programs in 2017 to make customers aware of the personal consequences of climate change.

Urban Forestry As early as 1995, Portland's Urban Forestry Management Plan recognized that household energy savings and the cooling effects of trees helped prevent heat islands and lower the temperature of rivers and streams in the city. Since 2003, City of Portland Urban Forestry plans have included planting species that better tolerate a changing climate, especially in neighborhoods and communities with fewer trees. Urban Forestry began an annual tree giveaway in 2017 in neighborhoods with fewer trees and shade coverage. For decades, Friends of Trees, a nonprofit group, has planted trees in neighborhoods throughout the metropolitan area, and Trees for Life has organized volunteer watering events during the summer and advocated for larger planting spaces in new developments.

Statewide urban forestry groups such as Oregon Community Trees have collaborated with private and public institutions on grants that support the mitigation of the effects of climate change in many Oregon cities. Vivek Shandas at Portland State University’s School of Urban Studies and Planning found that on the hottest summer days urban neighborhoods with mature tree canopy are as much as twenty degrees cooler than neighborhoods with little to no tree canopy. Another PSU study connected neighborhoods with low canopy to those that had experienced redlining. “Black, Indigenous, and People of Color (BIPOC), natural resource dependent communities, and those growing up in intergenerational poverty have been and continue to be some of the most climate-impacted communities,” the 2021 Climate Change and Carbon Plan of the Oregon Department of Forestry reported. Eugene, Corvallis, Ashland, and Gresham also have urban forestry plans that consider climate change.

Climate Change Studies The devastating Labor Day fires of 2020, five large fires fueled by east winds with low humidity that burned 850,000 acres of forests in western Oregon, and the die-offs and scalding of forests from the 2021 Pacific Northwest heatwave are evidence of what Oregon forests are likely to experience in the future. Scientists at the U.S. Forest Service’s Pacific Northwest Research Station, the Center for Urban Forest Research, the Oregon Climate Change Research Institute, the University of Washington, and Oregon State University have collaborated on studying the effects of climate change on Oregon forests and forest practices that will mitigate rising carbon dioxide emissions.

The Oregon Task Force on Global Warming, created by Governor Neil Goldschmidt in 1988, identified Oregon forests as an opportunity to establish a carbon offset and stewardship incentive program for private and state forests. Comprised of twelve state agencies, the task force established policies for all state agencies to reduce greenhouse gas emissions. It recommended that the legislature create a permanent Global Warming Management Group. The Oregon Global Warming Commission was created in 2007, with twenty-five members from industry, nonprofits, and local governments. The commission tracks trends in greenhouse gas emissions and recommends state and local efforts, including forest management policies, to reduce emissions in Oregon.

Also in 2007, the legislature created the Oregon Climate Change Research Institute, a network of researchers and professionals at Oregon State University, Portland State University, the University of Oregon, and other universities, agencies, and organizations. The institute has issued a biannual assessment of the state of climate change science, which has included developments in the science of carbon sequestration in Oregon forests and the effects of climate change on the composition of forest species.

In 2010, the Forest Service established the National Roadmap for Responding to Climate Change, which directs national forests managers, including those at the USDA Pacific Northwest Research Station, to evaluate their plans and practices for climate change. As of 2022, reports suggested that some of the most vulnerable plant and animal communities are in alpine and subalpine forests. Researchers anticipate that competing plant species from lower elevations will move to higher elevations, and they have been collecting seeds from threatened species and experimenting with planting some species in alternative areas—for example, ponderosa pine in forests on the west side of the Cascades and Pacific silver fir at higher elevations. Tribal forestry programs have been identifying culturally significant plants threatened by climate change and have developed programs and partnerships so that important cultural plants such as huckleberries can be relocated to higher elevations.

The Oregon Global Warming Commission announced in 2022 that “Oregon is on track to meet the state’s goal to reduce emissions to at least 45 percent below 1990 levels by 2035.” Furthermore, the Commission found that “Oregon forests hold globally significant carbon stores, in forests that, notwithstanding two centuries of harvest and other landscape changes, rival tropical rain forests for carbon density and quantity of stores.” Its recommendations included increasing reforestation (planting harvested areas) and afforestation (planting areas not currently forested) and adding “longer harvest rotation periods (to 80 years) on private forestland and an additional 50 percent reduction in harvest on public (federal and state) lands.” The Commission concluded that Oregon forests have the potential to capture and store an additional 890 million tons CO₂ by 2050.

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