SUSTAINABILITY
FROM FOREST TO FRAME

Oregon Forest Resources Institute

SOURCING FROM SUSTAINABLE FORESTS

SUSTAINABLE BUILDINGS

start with sustainable forests

Photo: Josh Partee

NATURAL BEAUTY

Wood from sustainably managed forests can create stunning architecture.

Wood is beautiful. As a natural, renewable building material that can be sourced directly from Oregon's vast forests, it's long been ubiquitous here.

More recent recognition of the material's sustainability benefits, as well as advances in technology that make it possible to construct bigger and taller buildings with wood, have helped make timber architecture even more prevalent in Oregon.

But seeing more wood used in the places where we live, work and play can bring up questions and concerns: Did this wood come from a sustainably managed forest? Was a forest destroyed and wildlife harmed to create this beautiful wood building? How can I be an environmentally conscious wood consumer?

Some of this interest in wood sourcing and whether the material is truly sustainable has been spurred by a global rise in "mass timber construction," a building type characterized by structural usage of large engineered-wood products in lieu of, or in conjunction with, steel and concrete. In the U.S., Oregon has been a pioneer of mass timber manufacturing, research and development, and building design, with many projects that have been completed or are under construction.

Ensuring these timber buildings are as sustainable as possible begins with understanding where the wood came from and whether that forest was managed according to the tenets of forest sustainability.

What is forest sustainability?

To understand what is meant by "sustainability," let's first look at its definition. Forest sustainability is commonly defined as practicing forest management that meets the needs of the present generation for environmental, social and economic benefits from our forests without compromising the ability of forests to provide these same benefits to future generations.

Forest sustainability is complex. Forests provide us and other living creatures with many different resources related to intertwining — and sometimes competing — values. This results in a range of management models that can be considered "sustainable" in different ways. For instance, some private forests are managed more like agricultural crops, prioritizing timber production while meeting federal and state environmental regulations. Conversely, many forests are managed based on third-party certifications or personal codes that trade some of the value of efficient wood harvest to focus on improving other values, such as wildlife habitat or aesthetics.

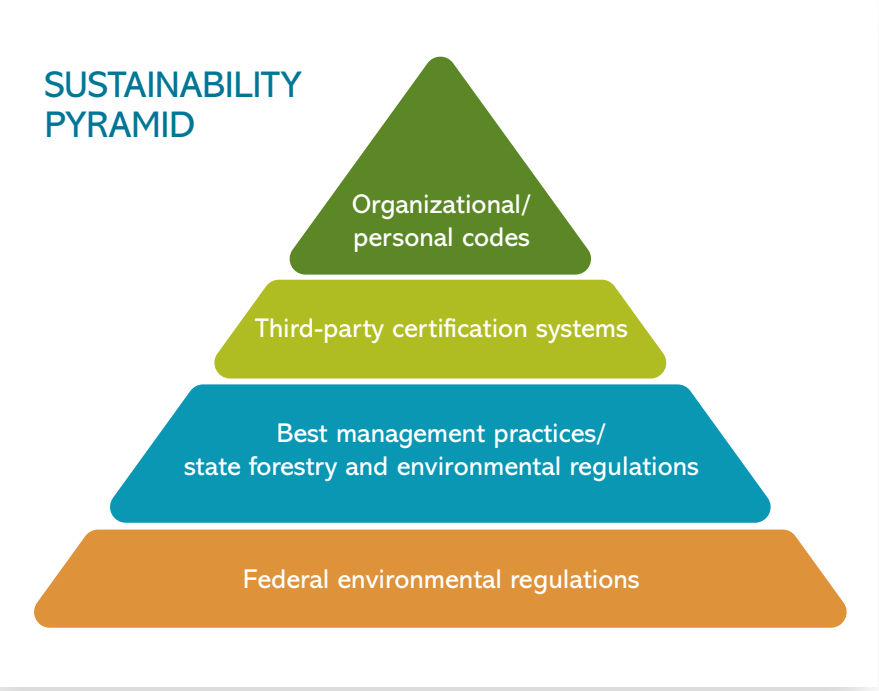
This report will examine forest sustainability and how it is regulated and encouraged at several levels, as shown in this sustainability pyramid at right.

We will look at some of the key federal and state regulations that establish a baseline for sustainable forestry practices in Oregon; discuss how voluntary practices can further promote sustainability; examine how forest certification systems document sustainability; and finally, through a series of forest landowner case studies, describe how personal and organizational codes enhance forest sustainability.

Why build with wood?

After examining forest sustainability, we will discuss the social and environmental benefits of building with wood and explore research and policies related to carbon in the built environment. Our discussion will conclude with case studies that exemplify the ways some mass timber builders are exploring sustainable wood product sourcing and utilization.

We hope this report answers your questions regarding forest sustainability, timber building sustainability, and the relationship between the two. If you have more questions, please use the additional digital resources section on page 35 to find out where you can learn more about forest sustainability, wood products and mass timber.



FOREST SUSTAINABILITY

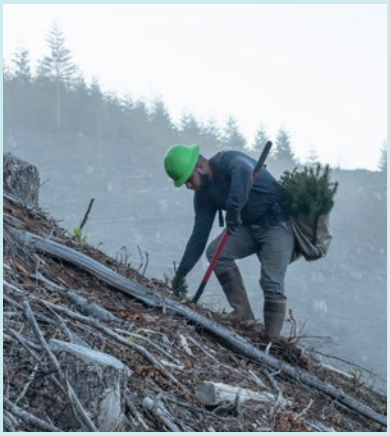
Sustaining forests for the future

Forest management has evolved over time, as have notions of forest sustainability. In the early 1900s, forestry focused primarily on timber extraction, and thus early concepts of sustainability meant making sure there was a sustainable supply of timber. One of the earliest and most foundational concepts of sustainability in forestry was to harvest less than or equal to growth. The federal government established forest reserves — the precursors to the early national forests — to ensure a sustainable timber supply, since many private lands were being overcut and not replanted.

For privately held lands, the American Tree Farm System was established in 1941 as an association of forest landowners who were interested in sustaining the nation's private forests. Initial ideas of what this would entail were based on protecting forests from human-caused wildfires and the potential federal regulation of private forests, as well as ensuring adequate reforestation. Over time, these ideas evolved into four ideals — sustaining the forest benefits of wood, water, wildlife and recreation — that now make up the four sides of the Tree Farm System's diamond-shaped signs, which are displayed

THE COMPONENTS OF FOREST SUSTAINABILITY

The following are traditional elements of managing forests sustainably:



Reforestation after timber harvest has become a central tenet of forest sustainability. Harvesting timber for wood products often leads to a need for reforestation. In western Oregon, landowners commonly use clearcutting to harvest timber, followed by planting seedlings to replace those trees as required under state law.

Timber harvest in balance with forest growth over time (called "sustained yield") is also important for maintaining a sustainable supply of timber. Any given forest property has an average annual timber growth, or yield, based on its tree stocking level and productivity. Timber harvest that exceeds yield over time will deplete the volume of trees in the forest, while harvesting less than growth will build up the standing timber volume.

Protections for water, fish, wildlife and recreation have become central components of forest sustainability as the public has recognized the diversity of benefits our forests provide in addition to timber production — sometimes referred to as "ecosystem services" — and how these impact our quality of life. Many forest-related regulations and certification standards are based on ensuring protection of these ecosystem services.

on privately owned forests certified under its forest sustainability certification program.

The environmental protection movement of the 1960s and '70s led to federal regulations requiring wildlife habitat conservation and water protection for all forest landowners. In Oregon, the state Legislature passed the Oregon Forest Practices Act, which regulates forest management practices on state and private forestland, in 1971.

Today, forest management planning on many federal forests has shifted toward objectives unrelated to timber production, including recreational opportunities and providing habitat for threatened and endangered species.

On private lands, timber management is still often a primary objective, but it is regulated and constrained by federal and state legislation.

Forest sustainability is generally interpreted as practicing forest management that is ecologically sound, socially acceptable and economically viable, meeting the needs of the present generation without compromising the ability of future generations to meet their needs.

Why are some forests selectively logged and others clearcut?

While some forests are selectively logged, clearcutting is often used in others to create optimal conditions for species such as Douglas-fir that need full sun to thrive. Clearcutting is the harvest of nearly all trees in an area that creates an open space to grow young trees in their place. This is the most common harvest method in western Oregon, where most of the state's timber is grown.

Different tree species have different growth habits and tolerances. Some shade-tolerant species, such as western hemlock, grow well in the shade of larger, older trees. These forests can be regenerated successfully with selective logging. Other species, such as Douglas-fir, are shade intolerant; as young trees, they need full sunlight to survive and grow well. Clearcutting is commonly used to harvest forests consisting of shade-intolerant species because it is an effective way to mimic these ideal growing conditions, which would otherwise be created by natural disturbances such as wildfires. After clearcutting (and, sometimes, heavy selective cutting), replanting of tree seedlings is required by Oregon law.

Forest fire protection, forest fire resiliency and forest health are obvious inclusions in modern concepts of forest sustainability. Managing forests for resiliency against wildfire is foundational to forests' health and essential to sustaining their social, economic and environmental benefits. Managing to create healthy forests that keep wood-boring or defoliating insects, tree diseases and other forest pests in balance over time is also an important part of sustainable management. This includes the use of prescribed burns to help improve the health and resilience of fire-adapted forests.

Restoration or enhancement of natural forest processes and ecological functions is one of the most advanced elements of sustainability. This involves altering plant communities and waterways to allow natural processes to perform their ecological functions. Examples include reintroducing fire to the landscape through prescribed burns and leaving a certain number of dead trees and down logs, which provide important habitat for wildlife. Stream restoration projects that improve fish habitat are another example.

FOREST REGULATIONS

mandate sustainable practices

Regulations that legally require landowners or land managers to follow certain environmental protection measures are policy tools federal and state governments use to promote forest sustainability.

Forest policies and regulations regarding management of federal forests are established by the U.S. Congress and federal agencies. Regulations that influence management of state forests and private forestlands are generally established and enforced by state governments under the framework provided by federal environmental regulations. Because state governments can adopt different approaches to meeting federal environmental regulations and may have their own state-level environmental regulations affecting forest management, the regulatory settings for state and private forests differ across the country.

What are the major rules of the Oregon Forest Practices Act?

FAQ

In 1971, Oregon became the first state to pass a comprehensive law to regulate forest practices and safeguard water, fish and wildlife habitat, soil and air. The Oregon Board of Forestry continuously reviews and updates the rules of the Oregon Forest Practices Act (OFPA) to keep pace with the most current scientific research. Most recently, the Oregon Legislature approved a major revision of the OFPA in 2022 following an agreement made between representatives from the state's timber industry and environmental groups to expand habitat protections for fish and amphibians in exchange for regulatory certainty for the forest sector.

Important rules currently include:

- **Reforestation requirements**
- **Water and stream protection**
- **Wildlife habitat protection**
- **Limits on clearcutting**
- **Restrictions for logging on steep slopes**
- **Limits on chemical use**

Early forest laws

The first attempts by states to encourage sustainability through legislation came in the form of forest laws that encouraged or required reforestation after logging. Many states passed laws in the early 1940s that required landowners to leave "seed trees" after timber harvest to promote natural forest regeneration. As seedling production and tree planting improved, many states enacted laws that required planting new trees after logging.

Water quality issues related to logging on private forestlands brought a second wave of forest regulations. After the federal Clean Water Act was passed in 1972, some states opted to enact regulations promoting "best management practices" — effective and practical means of preventing or reducing pollution in runoff from forests or agricultural land — to protect water quality.

Forest regulations evolve

As the idea of forest sustainability has evolved over time, forest regulations in some states have become more comprehensive. Laws that initially focused on maintaining a sustainable timber supply now often include protection of other ecosystem services during forest management activities, such as preserving water quality, protecting wildlife habitat, restricting pesticide and herbicide use, limiting clearcut size, requiring

timely reforestation, maintaining the aesthetic value of forests, promoting forest health, reducing forest fragmentation, and encouraging economic viability.

State forest policies differ

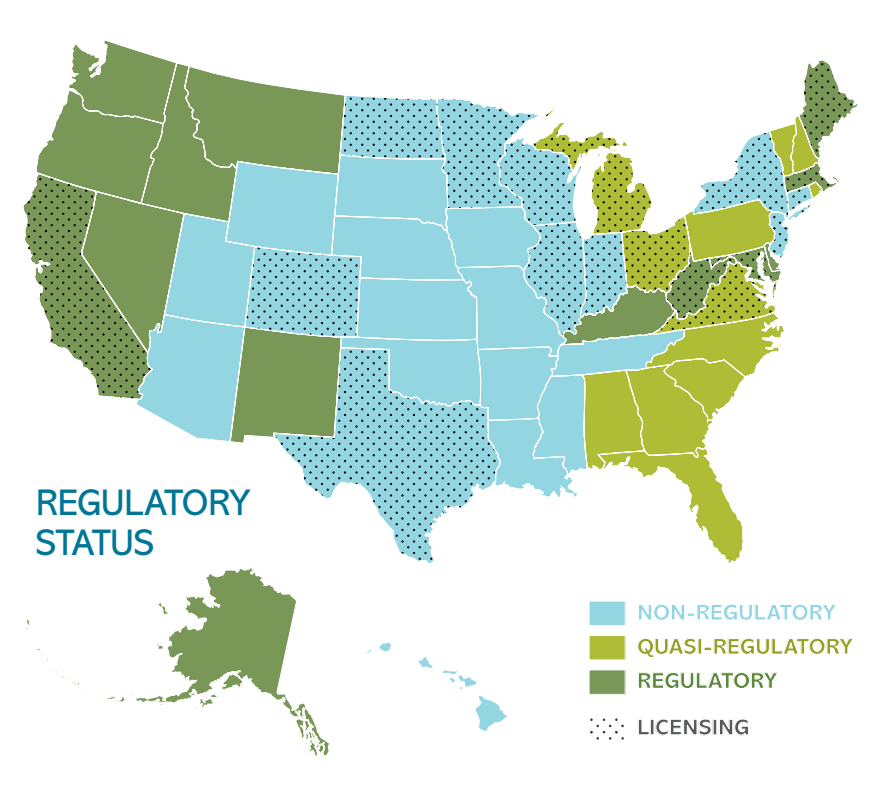
The diversity of state-level forest policy reflects different approaches to addressing environmental protection of public resources, such as clean water and wildlife habitat, while recognizing private property rights. Some states, including Oregon, have comprehensive legislation and regulations — commonly called "forest practices acts" — to encourage forest sustainability. These states are considered to be regulatory in nature.

Many states do not have comprehensive forest practices acts; they rely instead on voluntary best management practices to meet the Clean Water Act requirements and other sustainability criteria. These states are referred to as non-regulatory.

A third set of states are quasi-regulatory: while they do not require that best management practices are followed, environmental infractions can result in agency-initiated enforcement.

West Coast forest laws

Some of the most stringent forest regulations in the country are on the West Coast. Washington, Oregon and California all have comprehensive forest practices acts that govern reforestation, water, wildlife habitat and endangered species protection, as well as place limits on clearcut size and pesticide application, among other regulations. Oregon and Washington require written plans for most proposed forestry activities, such as for timber harvest and forest road construction. California requires a timber harvest plan, written by a state-licensed professional forester, that's open to public review any time timber is harvested.



This map shows which U.S. states were classified in 2022 as having regulatory, non-regulatory or quasi-regulatory systems governing forestry practices. The map also shows which states require licensing of professional foresters.

Map source: Adapted from Figure 2 in "State-level forestry policies across the US: Discourses reflecting the tension between private property rights and public trust resources," by E.C. Kelly and M.S. Crandall, 2022, *Forest Policy and Economics*, 141, p. 5 (https://doi.org/10.1016/j.forpol.2022.102757). CC BY 4.0.

Regulation and certification

We have seen that forest sustainability can be promoted by forest regulation. In the next section, we will discuss forest certification. While certification programs are typically voluntary, all forest certification systems require landowners to follow all state and federal regulations.

FOREST CERTIFICATIONS

document forest sustainability

Forest certification systems document evidence of sustainable forest management for forest products customers. To assess how well forest management meets a system's sustainability standards, periodic audits are performed by independent third-party auditors.

Wood and paper products labeling emerged in the 1990s in response to public concerns about deforestation, driven by prominent and alarming examples from the tropics. Since then, certification has evolved into a way for landowners and manufacturers to demonstrate a commitment to forest

CERTIFIED FORESTS

Some private forest landowners choose to pursue forest sustainability certifications through organizations such as the American Tree Farm System to demonstrate their commitment to using sustainable practices.

sustainability, as well as for consumers and stakeholders to identify products made by companies that agree to align with standards indicating a commitment to protection of ecosystem services, human rights, and compliance with applicable laws and regulations.

Three major certifications

The major forest certification systems in the U.S. are the Forest Stewardship Council (FSC), the Sustainable Forestry Initiative (SFI) and the American Tree Farm System (ATFS). Each certification system employs a series of standards or principles designed to demonstrate sustainable practices.

All three of these forest certification systems are nonprofit organizations. However, for-profit consulting firms provide certification auditing services for FSC and SFI. All three systems are third-party certification systems, meaning they maintain standards that are developed and endorsed by independent third-party entities. Conformance to these standards is also evaluated by independent third-party auditors.

Each certification system measures how the major components of forest sustainability are being implemented on a forest ownership, providing a level of assurance to wood product consumers and specifiers.

Advantages and disadvantages

Among the advantages of forest certification for landowners are improved access to markets and organizational image, along with pride that their sustainable

management practices are independently validated and recognized. Some landowners also enjoy the peer-review process and the learning they experience when external experts visit their land, review their management, and share insights and ideas.

The primary drawbacks of certification are the direct costs of the audit and certification process and the indirect costs of maintaining the level of records and documentation necessary for the certification audit process.

Get to know the major forest sustainability certification systems

Forest Stewardship Council (FSC)

The Forest Stewardship Council, commonly called FSC, was founded in 1993 and is an international certification system headquartered in Bonn, Germany. FSC is a membership-led organization open to all. The membership is organized into three chambers — Social, Environmental and Economic — and each chamber has equal voting power. FSC has almost 1,200 members worldwide in 89 countries. FSC is led by a voluntary international board of directors that is balanced to represent different interests in forest stewardship.

FSC has a "chain-of-custody" system, which documents forest products made with raw materials that came from FSC-certified forests or other allowed sources. FSC has a product label that is used by manufacturers, and its standards promote "natural" forests and focus on ecosystems. FSC has eight regions in the U.S., each with some different guidelines that landowners in those areas must follow to gain certification. Oregon is in the Pacific Coast region. While FSC oversees the certification rules and implementation, independent certifiers perform the forest inspections and certify compliance with the criteria necessary to gain FSC certification.

Sustainable Forestry Initiative (SFI)

The Sustainable Forestry Initiative, or SFI, was founded in 1994 by the American Forest and Paper Association but became an independent nonprofit organization in 2007. SFI-certified forests can be found across the U.S. and Canada.

SFI has a chain-of-custody system and a product label geared toward certifying "working forests" that are managed primarily for wood production. The SFI standards include promoting logger training. SFI has one set of standards for all of the U.S. and Canada. While SFI oversees the rules and implementation, independent certifiers perform forest inspections and certify compliance with the certification's criteria. SFI is recognized by the Programme for the Endorsement of Forest Certification (PEFC), an umbrella organization that endorses forest certification systems around the world. It also partners with the American Tree Farm System certification system for small woodland owners.

SFI is the most widely used forest certification system in Oregon. Eighty-one percent of Oregon's certified forestland is certified under SFI, accounting for an estimated 1.05 billion board feet of annual timber harvest.

American Tree Farm System (ATFS)

The American Tree Farm System, or ATFS, was formed in 1941 and became a third-party forest certification system in 2000. ATFS is a program of the American Forest Foundation (AFF) and is a low-cost certification alternative for family forest landowners.

ATFS is a forest management certification system only. However, since the system is recognized by the PEFC, forest products from ATFS-certified lands can enter PEFC-endorsed chains of custody, including SFI's. Landowners may be certified under ATFS in one of three ways: as participants in one of the state Tree Farm programs, through participation in an Independently Managed Group of landowners, or by holding an individual third-party certificate. AFF bears most of the costs associated with third-party monitoring on behalf of landowners participating in ATFS state programs, thus significantly reducing the burden of participation for those landowners. ATFS Independently Managed Groups and Independent Certificate Holders cover their own monitoring costs.

Fifteen percent of Oregon's certified forestland is certified under ATFS, accounting for an estimated 194 million board feet of annual timber harvest.

THE OREGON FOREST PRACTICES ACT AND FOREST CERTIFICATION SYSTEMS

Whether certified or not, all state and nontribal private forestland in Oregon is subject to the Oregon Forest Practices Act (OFPA), which requires landowners to follow a set of forest practice rules aimed to protect soil, air, water, wildlife habitat and other natural resources. All three major forest certification systems require landowners to comply with all applicable state laws and regulations in order to gain certification.

Many private forest landowners in Oregon voluntarily exceed the OFPA requirements to meet their management objectives or to gain forest certification. There are a few areas where Forest Stewardship Council (FSC) certification standards are more restrictive than the OFPA and the other two major forest certification systems, Sustainable Forestry Initiative (SFI) and American Tree Farm System (ATFS). The two main differences have to do with the maximum allowed clearcut size and the use of herbicides:

- The FSC Pacific Coast regional guidelines limit clearcuts to 6 acres, or up to 60 acres if at least 10% of the preharvest green trees are retained as individuals or groups. The OFPA allows clearcuts up to 120 acres and requires two snags or green trees per acre to be left on clearcuts of 25 acres or more.
- FSC encourages reducing or eliminating the use of herbicides — which are regulated under state and federal laws to protect human health, aquatic life and drinking water sources — for controlling vegetation that competes with newly planted tree seedlings. FSC certificate holders must use "integrated pest management" techniques that involve choosing from a variety of pest control methods, starting with the least risky, and only spraying a nonspecific pesticide over a large area as a last resort.

FAQ

Do forests need to be certified to be sustainable?

Forest certification systems were designed to document compliance with standards for forest sustainability. However, forest sustainability does not require certification.

In Oregon, forest certification is limited primarily to private lands. Public lands such as national forests are usually not certified, but they have well-developed management plans subject to public review and intended to promote forest sustainability.

On private lands, some sustainable practices — such as reforestation after timber harvest and the protection of streams and wildlife habitat — are required by the Oregon Forest Practices Act.

FOREST LANDOWNERS

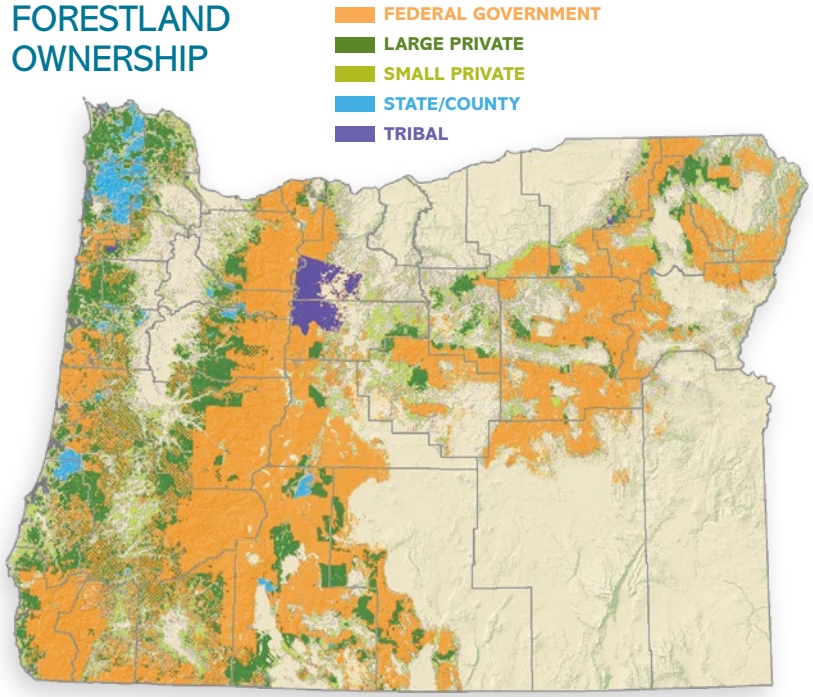
Oregon's forests are owned and managed by an array of different landowners with varying values and objectives for their forestland.

LANDOWNER PROFILES

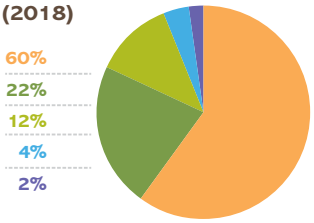
Each landowner manages differently

Oregon contains more than 29 million acres of forestland. That number has mostly held steady for nearly 100 years, even as Oregon's population has continued to grow, in large part because of how the state's land-use and forestry laws work in tandem to help keep forests as forests.

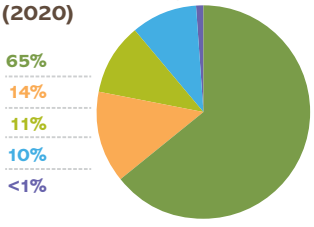
FORESTLAND OWNERSHIP



FORESTLAND ACREAGE, BY OWNER (2018)



TIMBER HARVEST, BY OWNER (2020)



FEDERAL
LARGE PRIVATE
SMALL PRIVATE
STATE/COUNTY
TRIBAL

The single biggest forest landowner in Oregon is the federal government, followed by timber companies and other private owners such as families, nonprofits and Native American tribes.

Each landowner manages their forest differently, depending on their goals and objectives. Most forest landowners try to find a balance between economic and environmental values. Federal lands are managed primarily for recreation and for ecosystem values such as threatened and endangered species habitat conservation. State lands tend to be managed for multiple uses, including recreation, water, wildlife habitat and timber. Private timber company lands are managed primarily for timber production.

The companies, families and tribes that grow the timber to manufacture Oregon wood products approach sustainable forest management differently, but they share a common goal of ensuring their forests thrive now and into the future. On the following pages, we'll hear from some of these landowners as they describe what forest sustainability looks like for them.

OREGON'S SMALL WOODLAND OWNERS

Tami Jo and Barry Braz, small woodland owners.

About 3.7 million acres of Oregon's forestland belongs to individuals and families who own 5,000 acres or less. Timber from small private forestlands makes up about 11% of Oregon's total annual timber harvest. But for many of Oregon's small woodland owners, generating timber revenue is not a top priority — and for some, it only happens once in their lifetime.

"Our number-one goal is that we want our forest and woodland to be healthy," says Tami Jo Braz, president of the Douglas Small Woodlands Association in southern Oregon's Douglas County. The association is one of 14 local chapters of the Oregon Small Woodlands Association, the state's largest small woodland owner organization.

Braz and her husband, Barry, own a 50-acre parcel in the foothills leading to the Coast Range outside the town of Oakland, Oregon, where they have lived for 37 years. Their land is diverse and includes oak savannas, madrone woodlands and conifer forests. Caring for it requires active management, including thinning trees, removing invasive weeds, sowing native plants and wildflowers, enhancing wildlife habitat, and creating recreational trails.

"Sometimes that produces wood and sometimes it benefits wildlife, it always protects water, and sometimes it creates recreation or learning opportunities," Braz says.

When she and her husband became forest landowners, they dedicated themselves to learning about sustainable forest management by contacting their local Oregon Department of Forestry stewardship forester, who helped them develop their first management plan and execute initial projects on their land. They furthered their education by becoming Master Woodland Managers through the Oregon State University Extension Service and updating their forest management plan.

They've hosted tours for other small woodland owners on their land and a wildflower event in partnership with the Native Plant Society of Oregon. They also allow college students studying forestry to use their property for hands-on learning and research.

Living on their wooded property has allowed Braz and her husband to play a very active role in how it's managed. "We have the ability to be more intensive because we live here," she says. "Taking care of the land is part of our recreation. It isn't work. It's kind of your therapy. It's a part of what we do."

Other small woodland owners feel similarly, Braz says. "They live on the land, most of them, and they love it and they're deeply connected with it."

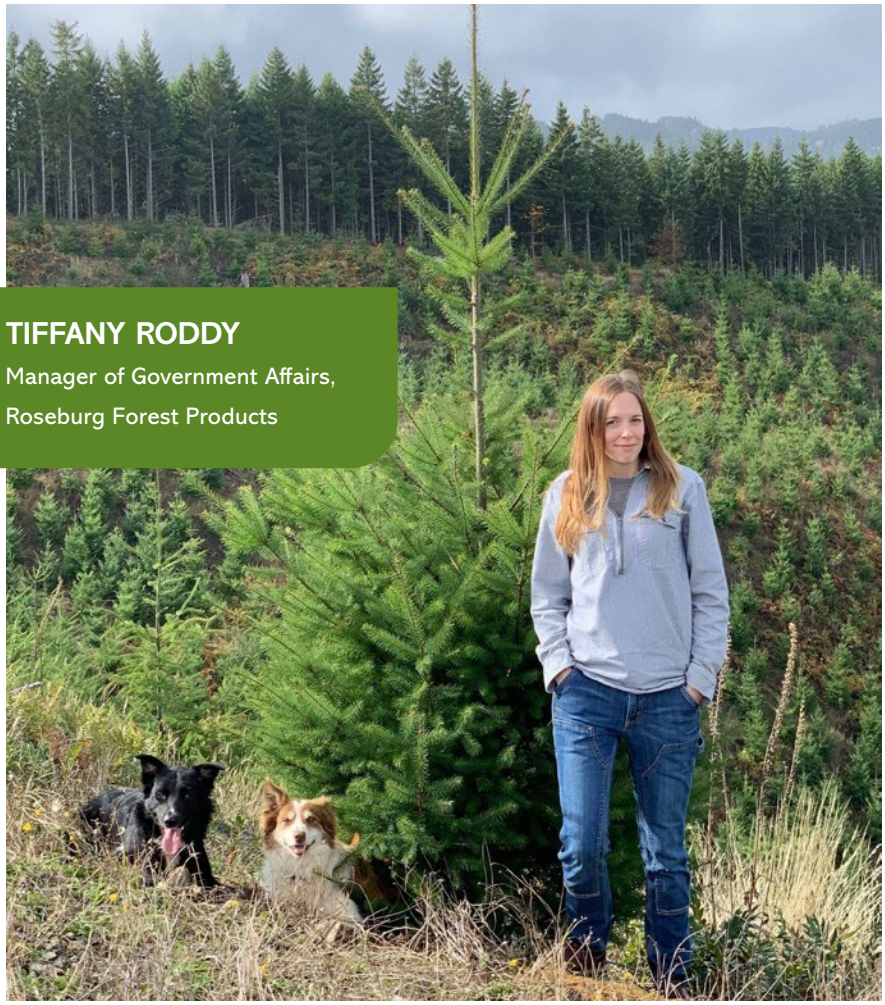
Braz knows her property so well now that she can locate exactly where each of the four native orchids are growing on her property. "But I'm still discovering new things by being at the right place at the right time. It is cool to be on land this long and you can still go out and make a discovery. That's the beauty of it."

ROSEBURG FOREST PRODUCTS

Certified responsible source lumber

Founded in 1936 in the "Timber Capital of the World," Roseburg, Oregon, Roseburg Forest Products has deep roots in the state's forest products industry.

Now known simply as Roseburg, the company owns 460,000 acres of timberland in Oregon, with an additional 140,000 acres of forest holdings in North Carolina and Virginia. The family-owned company also operates mills in Oregon, other U.S. states and Canada that make wood building products using timber grown on their forestland and other nearby forests.



TIFFANY RODDY
Manager of Government Affairs, Roseburg Forest Products

"Sustainability is the core of everything we do," says Roseburg Manager of Government Affairs Tiffany Roddy. "We are managing our forestlands to be around in perpetuity, so sustainability is vital to our business model and our company success."

Roddy, who started her career at Roseburg working as a district forester, says sustainability is integral to the way the company manages its forestland, from ensuring timber harvesting on their lands is done at a sustainable rate to carefully selecting tree species to plant to replace those harvested. On average, Roseburg harvests about 2% of its land base and plants more than 6 million seedlings every year.

"Forestry-wise, a focus on sustainability is part of every step of what we do in forest management," she says.

> "They want to be good stewards of the soil, the air, the water, the wildlife."

There's also a strong commitment among the company's forestry staff to care for the land, Roddy says. "Inherently as people, and then as foresters, they want to be good stewards of the soil, the air, the water, the wildlife. Not just while they're here, but for future generations as well."

The company's timberlands in Virginia and North Carolina are Sustainable Forestry Initiative (SFI) certified, but Roseburg's

Oregon-grown lumber products carry a different certification from the American Society for Testing and Materials (ASTM). Wood from Roseburg's Oregon timberlands is certified as responsible source lumber because these forests are managed by Roseburg and other companies in accordance with the Oregon Forest Practices Act (OFPA) regulations, which are approved by the ASTM standard.

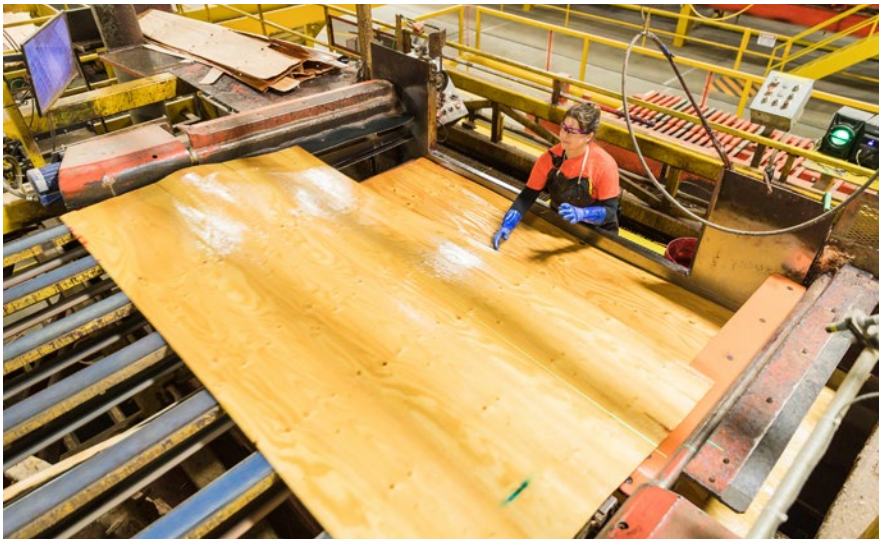
One reason Roseburg chose to pursue ASTM certification for its Oregon-produced lumber is that the company considers the OFPA to be one of the most robust forest protection laws in the country, especially

"Sustainability is the core of everything we do."

with its recent updates as a result of the Private Forest Accord agreement between timber companies — including Roseburg — and environmental groups, Roddy says. The ASTM responsible source certification provides recognition for the good work already being done on all forests managed under the OFPA, she adds.

"We have the SFI certification in Virginia and North Carolina because those are [best management practices] states, so we want to assure our customers that we're doing the right thing; whereas in Oregon, we have the OFPA laws there to enforce that," she says.

Like other forest sustainability certifications, ASTM responsible source certified lumber requires a chain of custody from forest to mill tracking the percentage of timber the company's sawmills source from private, nonfederal forestlands subject to the OFPA. Because Roseburg's Oregon mills use



only a small amount of federal timber, nearly all the logs they process come from OFPA-regulated forestlands.

Being a vertically integrated company is an advantage because it guarantees a steady flow of logs to Roseburg mills from its own timberlands, Roddy says. But some of those lands aren't located near any of their mills. In those cases, it makes better business sense to sell logs to nearby mills operated by other companies. Roseburg mills do the same, buying logs from other timber companies that own nearby forests.

"It is a very interconnected industry," she says. "While we are competitors, we do sell and buy logs from each other."

All timber that goes into Roseburg's mills comes from local sources because it's most cost-effective to transport logs a short distance from the forest to the mill, Roddy says.

"It's also something that's not just a financial incentive, but also a carbon incentive," she says. "If you look at these domestic products, even ones that we might have to truck for a distance just because there isn't a mill around, it's still a carbon win versus importing wood products."

STARKER FORESTS INC.

A fifth-generation company

RANDY HEREFORD
President and Chief Executive Officer, Starker Forests Inc.

When Thurman James "T.J." Starker started Starker Forests Inc. in the 1930s, sustainable forestry was often narrowly defined as not cutting down more trees than you were growing. Starker saw it differently.

"One of the things he always said is, 'You can't manage forestland without protecting it,'" says Starker Forests President and Chief Executive Officer Randy Hereford. "Today, we still practice that."

The fifth-generation, family-owned company based in Corvallis, Oregon, continues to take an expansive approach to what it means to sustainably manage its more than 95,000 acres of forestland in western Oregon. This includes keeping timber harvest sizes small, maintaining wildlife habitat and a diversity of both young and old trees across the landscape, replanting a variety of native tree species in areas that have been harvested, and collaborating with university researchers studying sustainable forestry practices.

For Starker Forests, practicing sustainable forestry is also about being a good neighbor, Hereford says. This includes communicating with the people who live near upcoming timber harvests to help educate them about forestry, hear their concerns, and work to reduce the impact they feel from harvest activities.

"Being a good neighbor is a core philosophy of Starker Forests. Many of our neighbors we've known for decades," Hereford says.

Starker Forests is certified through the American Tree Farm System (ATFS), the oldest third-party family forest certification program in the U.S. Although the company has long since expanded beyond being a small, family-owned forest, they're one of a handful of larger forest landowners who have been grandfathered into the certification.

"It's a symbol we are committed to doing the best for our lands, and it's always been important to us that our land be managed well," Hereford says.

To maintain ATFS certification, Starker Forests participates in third-party audits of the company's forest management plans. Auditors also inspect portions of its forestland to ensure compliance with the certification standards.

Although it's nice to have a third party confirm that Starker Forests is managing its lands sustainably, Hereford points out that ATFS and other forest certification systems don't make the company's forest management any better. Certifications serve to document

the sustainable practices the company would be doing anyway, whether certified or not, just because it's the right thing to do as stewards of the land for generations, he says.

The company is run by experienced professional foresters, Hereford says, who strive "to stay on top of the latest research because it's going to continue to improve our management over time."

That desire to be up to date on the latest forest science includes a longtime partnership between Starker Forests and the Oregon State University College of Forestry. The company is a member of multiple research cooperatives through the College of Forestry and allows research to be conducted on its lands.

Starker Forests' strategic plan outlines an array of ecosystem values that the company strives to protect and enhance on its forestland, such as soils, water quality and wildlife habitats, Hereford says. The company strives to pass on a deep appreciation for conserving these forest values into the future by allowing public access to its lands, including welcoming schoolchildren who visit on field trips to learn about forestry.

"Being a good neighbor is a core philosophy of Starker Forests. Many of our neighbors we've known for decades."

"It's important that we get them interested and get their support, because that's part of our sustainability — that we cultivate an interest in forestry and the practice of active forest management in the next generation," Hereford says.

MARK VROMAN
(right in yellow)
Timberland Manager,
Hampton Lumber

HAMPTON LUMBER

Taking a science-based approach

Although Portland-based Hampton Lumber primarily manages forestland in Oregon, Washington and Canada to provide logs for the company's nine sawmills in the Pacific Northwest and British Columbia, its approach to managing those lands goes beyond ensuring a sustainable supply of timber.

"It's a big responsibility, owning and managing timberland," says Hampton Timberland Manager Mark Vroman. "We don't want to be part of the demise of a species or the degradation of a resource of any kind out here. And so, what we're doing in the field is guided by science and best management practices from what we've learned and what we've studied. We're always trying to do the right thing."

Demonstrating that commitment, the roughly 265,000 acres of forestland the fourth-generation, family-owned company holds in western Oregon and Washington, along with about 300,000 acres of public forestland it manages in Canada, have been certified by the Sustainable Forestry Initiative (SFI) since 2005.

"Our customers wanted to have some kind of sustainable recognition for the products they were buying from us," Vroman says.

To maintain SFI certification, Hampton must undergo annual audits that examine whether the company is meeting a subset of the certification standards, plus a recertification audit every five years to assess compliance with all 17 of SFI's certification standards.

During those audits, SFI auditors look over Hampton's procedures and policies, such as documentation of their forest management plans, timber harvest management plans, wildlife protection plans, safety inspections, and compliance with forestry laws and regulations. Then they spend a day touring a selected portion of Hampton's timberlands.

"We take the documentation from the office — what we said we were going to do — and we take it out into the field and actually look at the operations in the field and compare how what we said measures up with what you see," Vroman says.

Once the audit is complete, Hampton learns whether their management practices comply with the standards necessary to maintain certification and if there are any opportunities for improvement.

"You never just get a pat on the back and, 'All right, see you next time.' They take their job very seriously, and so do we," Vroman says.

SFI auditors will also point out if a company is excelling at meeting certain certification standards. In their last audit, Hampton was proud to be recognized for superior performance in community outreach, including their active engagement in the communities where they operate mills or own land and allowing public access to their timberlands for recreation, says Hampton Director of Public Affairs Kristin Rasmussen.

"We look at the bigger picture," she says. "It's not just environmental sustainability; it's social and economic as well."

Hampton also has a strong commitment to enhancing wildlife habitat, maintaining biodiversity and promoting healthy ecosystems on their lands, she says. One example is a project to help pollinators by spreading native wildflower seed in clearcuts.

The company has worked with federal wildlife protection agencies to take voluntary measures toward conserving habitat for at-risk species, such as the fisher, a member of the weasel family, Vroman says. Hampton also participates in forestry research cooperatives and funds scientific research related to forest habitat conservation.

"What we're doing in the field is guided by science and best management practices from what we've learned and what we've studied. We're always trying to do the right thing."

"When we have scientific knowledge, we apply it in our practices," he says. "That's just good forest management. If we can do things from a scientific perspective, we know our actions are going to have benefits, and we're going to sign up for that every day."

COLLINS

First in the U.S. to be FSC-certified

GALEN SMITH
Vice President of Resources, Collins

When the Collins timberlands in Oregon, California and Pennsylvania were certified by the Forest Stewardship Council (FSC) in the 1990s, they became the first private industrial timberlands in the U.S. to gain certification. The company has maintained that certification for the past three decades.

"We felt that we were already operating at that standard," says Collins Vice President of Resources Galen Smith. "This was a way to get recognition and credit for what we were already doing that we thought was a pretty high level."

Smith is part of the fifth generation of Collins family members who own and operate the company, which was founded in 1855 in Pennsylvania and is now based in Wilsonville, Oregon. Collins still owns forestland and a hardwood mill in Pennsylvania, but today, most of its mills and timberlands are in the dry pine forests of southeastern Oregon and northern California.

In the early days of the company, Smith says, the timber industry was boom-and-bust, where mill towns would thrive until the forests that surrounded them had been cut through and the sawmills that had sustained these communities were forced to shut down. It wasn't until the 1940s, when the company started actively managing forestland it owned in northern California to supply a new mill in Chester, California, that a third-generation member of the Collins family, Truman Collins, saw a better way forward.

"It was Truman's philosophy from some of those experiences that he didn't want it to be a thing where that land was cut over quickly and then sort of moved on," Smith says. "He had this vision of it being something ongoing, sustainably managed with selection harvest, so there'd be a consistent source of lumber that could supply the mill and then support the town."

Since then, it's been the company philosophy to manage forests for the multiple benefits they provide to the economy, environment and community, and FSC certification plays into that, Smith says.

Although FSC is an international certification, the standards Collins must meet to stay certified are specific to the regions where the company's forestlands are located, including a set of standards for U.S. forests and one for the Pacific Coast. Those standards are broken down into categories such as habitat conservation, community

and tribal engagement, and compliance with forestry laws and regulations.

To maintain certification, Collins undergoes annual surveillance audits that track a subset of the certification standards, and a full audit every five years to track the company's compliance with the entire set of FSC standards. During the audits, which last several days, FSC auditors review the company's forest management plans and other documentation and go on a field tour of some of its timberland and logging operations. When the audit is complete, Collins gets a report detailing how well the company is meeting the certification standards.

"Usually, in any given audit, there's some kind of corrective actions or observations that come with requirements to correct or at least consider," Smith says. "I see it as a good opportunity to see where we may be deficient and the opportunities for improvement."

Collins' two softwood sawmills, one hardwood sawmill, and pressed wood board facilities are also FSC-certified. The company sells an "FSC Mix" of wood products that carry a certification number verifying they were made from logs that came from Collins or other certified timberlands — as well as "controlled wood" from other noncertified sources that meet basic requirements from FSC for sustainable forest management. This usually includes timber that comes from U.S. Forest Service lands and other private lands.

> "If certification can give the broader public or community faith that we care about doing things the right way, that's a good thing."

For Collins, being FSC-certified is "more for relationships than economics," Smith says. "We have not found that there is any sort of price premium to it. What we have seen is there are certain relationships we've built where it is a consideration. It allows us to maintain that sales relationship even through up-and-down markets."

Being certified for a long time also provides reassurance to consumers that Collins wood products come from sustainably managed forests, he says. "If certification can give the broader public or community faith that we care about doing things the right way, that's a good thing."

COQUILLE INDIAN TRIBE

Forestry for timber, basketry and beyond

For the Coquille Indian Tribe, owning a small portion of their ancestral forestlands is about much more than the trees that grow there.

"The tribe generally takes a longer-term approach to management, looking out seven generations and looking back seven generations."

"The tribes have been managing lands since time immemorial," says Robin Harkins, natural resources director with the Coquille Tribe. "We look at managing the land with a holistic approach."

Along with the timber, tribal members have many other uses for the Coquille Tribe's forestland, whether it be for subsistence harvesting, hunting big game or gathering basketry-making materials, she says. Sustainable management is at the core of ensuring the tribal forestlands continue to be the pharmacy, the grocery store, the hardware store and the church for members of the tribe, Harkins says.

ROBIN HARKINS
Natural Resources Director, Coquille Tribe

Forest management decisions are rooted in what the tribe's ancestors used the land for in the past, what the tribe needs from it today and what the needs will be for future generations.

"The tribe generally takes a long-term approach to management, looking out seven generations and looking back seven generations," she says. "What's going to be there for the great-grandchildren and the great-great-grandchildren of the people who are here today?"

In 1989, the Coquille Tribe had its federal recognition restored 35 years after it was terminated by the Western Oregon Termination Act of 1954. The tribe later regained from the federal government 5,400 acres of its ancestral lands in eastern Coos County on the Oregon Coast. Today, the tribe holds about 10,000 acres of land, most of it forested.

In 2011, the tribe certified its forestlands through the Forest Stewardship Council (FSC), but it didn't change much about how they manage their lands, Harkins says. "I wouldn't really say it's a whole lot different than how the tribe would manage anyway. We typically leave more buffers and more retention trees and have smaller harvest sizes."

After a 2023 certification audit, the auditors nominated the tribe for an FSC leadership award.

"Their key point in recognizing the tribe was for being a leader in innovative, responsible and sustainable stewardship of forestlands, but also managing our lands for multiple economic and cultural resource values benefitting the tribe and our communities, and taking a unique approach to how we do that," Harkins says.

This award recognized the tribe for being the first western Oregon tribe to make an agreement with the Oregon Department of Fish and Wildlife to help restore populations of Coquille River fall Chinook salmon in southern Oregon. It also praised the tribe's efforts to conserve hardwood trees that grow on their lands, some of which are used for traditional tribal basketmaking.

Each year, the tribe re-evaluates whether they'd like to continue to take on the expense of certification. They still agree it's worth it to have a third party verify that the tribe is managing their land sustainably, Harkins says. Being FSC-certified has also opened some unique markets for their timber, including for the Portland International Airport main terminal expansion, she says. (See the case study that starts on page 29 to learn more about the airport project.)

"It's going to be really neat for people to come into the airport and learn about the tribe."

About 25,000 board feet of timber from the tribe went into the new terminal's mass timber lattice ceiling. All the tribe's wood used for the project came from a single 37-acre timber sale. Within that timber harvest, the tribe left 6 acres of forested buffers along streams and preserved other trees as well, such as old "legacy trees" that survived wildfires in the late 1800s. Every load of logs was tracked from the tribal forest through the milling process to installation at the Portland airport.

It was an honor for the tribe to be a part of the project, Harkins says. "I think it's going to be really neat for people to come into the airport and learn about the tribe, learn about the tribe's history, and learn about where the wood in the airport came from."

WOOD'S ADVANTAGES

The benefits of building with wood include lower carbon emissions, compared to concrete and steel, and supporting local economies.

FOREST TO FRAME

Wood in architecture

Wood construction is gaining traction with designers and builders around the world, largely due to the many social, environmental and economic benefits associated with its use. In addition to wood's benefits as a building material, such as its relatively low carbon footprint, using wood for construction projects also provides a unique opportunity to support more localized economies and forest management practices that improve forest health.

Benefits of wood

Timber is a renewable resource. When forests are carefully managed to preserve ecosystem functions and productivity, wood can be continually generated over time. Trees can be grown, harvested and planted, again and again. Since wood is grown, not mined, it is considered one of the only structural building materials that is a truly renewable resource (unlike steel or concrete).

Wood products require less fossil energy to manufacture and have less embodied carbon than other building materials. Embodied carbon is a measure of the carbon dioxide emitted during a product's lifecycle. Embodied energy and embodied carbon are linked measures. The forestry sector, like any other major industry, consumes energy and contributes to global greenhouse gas emissions. However, it is well documented that substituting wood for steel or concrete building elements results in significantly reduced embodied energy and carbon footprints. This is both because trees sequester and store carbon from the atmosphere and because wood itself requires less energy to harvest and manufacture than other structural building materials. In fact, oftentimes much of the energy used for manufacturing wood products is generated by cleanly burning the wood residues from the manufacturing process itself, instead of relying on fossil fuels.

Forests sequester carbon. Wood stores it. As trees grow, they sequester atmospheric carbon and store it in their wood and bark. As a result, wood, when dry, is nearly 50% carbon by mass. When wood is harvested and used to construct buildings, its carbon is locked up in those buildings, and the forests it came from are replanted to continue sequestering carbon.

Wood helps "connect the dots" between our built and natural environments. The concept of "forest to frame" recognizes that our built and natural environments are inextricably linked and that solutions to climate change and other environmental challenges require creative management of both. Modern engineered wood products such as mass timber provide opportunities to use a wider array of wood types — in terms of species, size and quality — in the manufacturing process. For instance, engineered wood products provide a market for the small, low-value trees removed in forest thinning projects on public lands — the sale of which financially supports restoration work that helps make forests more resilient to fire and to insect and disease outbreaks.

Social and economic benefits. Building with wood benefits the health and resilience of our local communities, economies and landscapes. In Oregon and many parts of North America, wood is a locally grown and manufactured product that supports local landowners and jobs ranging from forestry and logging to trucking and manufacturing. Sourcing wood locally also reduces the risks and environmental impacts associated with the global supply chain. Life cycle assessments and environmental product declarations recognize the value of a local supply chain for building materials by tracking transportation of inputs and products to the final building site.

Less embodied carbon

+ more stored carbon

= lower carbon impact


Photo: LEVER Architecture

People prefer wooden buildings. "Biophilia" refers to the idea that humans have an innate affinity for natural surroundings and other forms of life. Recent studies have shown humans who are deprived of this natural connection are less content and have lower performance at work or school. Wood buildings are often described as having a "warm" quality compared to steel, concrete or drywall — an intuitive description of its biophilic effect. Wood is beautiful to look at, touch and smell, but it's also comforting; we know where it comes from, and it serves as a reminder of our connection to the natural environment.

Forestry helps keep forests as forests. The number-one cause of global deforestation is conversion of forestland for other uses, such as agriculture or urban development. While cutting down trees to save forests sounds counterintuitive, the reality is that strong markets for wood products provide an economic incentive to keep forestlands forested.

GREEN BUILDING AND FOREST CERTIFICATION SYSTEMS

Green building certifications have been developed by various organizations to provide a structured approach to quantifying and rewarding sustainable building design. The most common system in the U.S. is Leadership in Energy and Environmental Design (LEED), which was created by the U.S. Green Building Council. Other common certifications include Green Globes and the Living Building Challenge. Each of these systems certify commercial construction, but they vary in terms of governance, standards and processes. Each certification also gives credit(s) to developers for using wood from certified forests and for using locally sourced wood.

The American Society for Testing and Materials (ASTM) has developed a standard (D7612-10) to differentiate global wood sourcing based on qualities and values that have been identified as meaningful and important in the market. The ASTM framework categorizes wood as coming from three levels of sourcing: legal sources, responsible sources and certified sources. Green building certification systems such as LEED and Green Globes give the highest levels of recognition to wood building materials meeting the ASTM standard of "certified sources."

A 2014 report by the Oregon Department of Forestry (ODF) found that Oregon-grown wood that comes from forests subject to the Oregon Forest Practices Act (OFPA), including all state and non-tribal private land, meets the ASTM standard for "responsible sources."

The ODF report also concluded that since the forest certification systems have criteria that are dependent on state and local forestry regulations, in many cases uncertified wood produced under the OFPA must meet stricter criteria than certified wood grown outside of Oregon. This discrepancy is not recognized by green building certification systems.

CASE STUDY:

Wood a natural choice for affordable housing project

When the Julia West House in downtown Portland is completed in 2025, it will be the tallest mass timber building in Oregon.

Developed by the affordable housing provider Community Development Partners, the 12-story building will provide 90 units of permanent supportive housing. The decision to construct it using wood as the primary structural component had many advantages, says Mai Huynh-Carnes, senior development manager for Community Development Partners' Oregon projects.

"It meets a lot of goals and expectations of what I think ideally all buildings would want to achieve," she says.

The most important goal of the project was to deliver affordable housing units as quickly as possible, Huynh-Carnes says. To figure out the best way to achieve that goal, Community Development Partners asked the project team of Holst Architecture, Walsh Construction Co. and KPFF Consulting Engineers to compare the estimated cost, construction schedule and sustainability of a cast-in-place concrete structural system versus a mass timber structure for the Julia West building. When the analysis showed going with mass timber would shave 12 to 16 weeks off the construction schedule, it was the clear winner, she says.

Another advantage of mass timber products is they are usually prefabricated into custom building components, saving time for a construction crew working on a small, challenging site in downtown Portland, says Ed Sloop, chief estimator with Walsh Construction. "It's an erector set with wood and steel pieces, so it's well suited for this particular application."

The project's structural engineer, KPFF, also did a life cycle analysis to compare the environmental impact of concrete and mass timber structural systems, says Nici Stauffer, project architect with Holst Architecture.

"Between the two, the wood building definitely has a better outlook, especially if you consider carbon sequestration of the material," she says. "For us, that was an exciting factor that we could choose the more sustainable option."

The biophilic attributes of wood are another advantage, Stauffer says. Going with a mass timber structure allowed the building design to include exposed wooden ceilings, beams and columns in both the living spaces and common areas that add warmth to those areas and help them feel bigger, she says. "The visibility of the wood in the interior is a huge benefit."

While most affordable housing is built with wood, whether it's mass timber or stick frame, taller timber affordable housing is still rare, Sloop says. That will probably change with recent building code changes that are more accommodating of tall wood buildings, he says.

"This is the first tall wood affordable housing project that we're aware of anywhere near here, so we're learning as we go, but it's encouraging that the local jurisdictions are favorable to it."

Rendering: Holst Architecture

CASE STUDY:

Portland's "Living Building"

As an environmentally conscious engineering firm with offices along the West Coast, PAE wanted to upgrade their Portland office to better reflect their values as a business.

The firm chose to locate the new office building in Portland's historic Old Town neighborhood and committed to meeting the Living Building Challenge, a stringent green building certification with sustainability requirements for the project team to achieve in design, construction and performance.

"Our vision is a world with clean air, energy and water for all, so we said, 'We're going to build a Living Building,'" says PAE Sustainability Lead Karen Joslin. "We wanted to demonstrate that it could be economically feasible and replicable."

Completed in 2021, the 55,000-square-foot, five-story PAE Living Building generates more energy than it uses with two solar arrays, harvests rainwater, recycles wastewater with a greywater reuse system, and uses composting toilets with a nutrient recovery system to produce compost and fertilizers. The building also stores almost 2,000 tons of embodied carbon in its cross- and glue-laminated timber structural system.

The ability of wood to store carbon was a major factor in the decision to go with a mass timber structural system over concrete or steel to gain Living Building Challenge certification for the project, Joslin says. "Carbon emissions had become a much bigger part of everyone's vocabulary. The Living Building Challenge required that we track all of our embodied carbon emissions for all of the construction materials that went into the building."

Photo: Benjamin Benschneider

Steel and concrete had clear disadvantages when it came to carbon emissions because the manufacturing processes for both materials require a lot of heat, she says. "Only burning fossil fuels can make that much heat."

Using wood as the primary structural component of the building and limiting concrete and steel to the foundation and core helped reduce the carbon footprint of the structure by about 27%, Joslin says. And sourcing the timber from as close to the project as possible further reduced the project's carbon emissions, in comparison to transporting heavy materials such as steel over long distances.

Using mass timber also greatly shortened the construction time because each timber component was prefabricated and ready for assembly, she says. Each floor of the building only took construction crews a week to put up.

"That's a real advantage for mass timber structures," Joslin says.

Along with the reduction in carbon emissions, the prominent use of wood in the project helped meet some of the other Living Building Challenge requirements, which are broken down into seven "petals" — place, water, energy, health and happiness, materials, equity, and beauty.

One example is the inherent beauty of wood construction, Joslin says. Exposed wood is featured prominently in the building's interior office spaces.

"Wood is innately comfortable for humans, and providing a nature-connected, beautiful workspace contributes greatly to our health and wellness," she says.

Photo: Benjamin Benschneider

CASE STUDY:

PDX

Wood shines in airport project

Situated just across the Columbia River from Washington state, Portland International Airport serves as a gateway to Oregon and the larger Pacific Northwest. So, when it came time to plan a major terminal expansion at the airport Portlanders simply call "PDX," preserving a regional vibe was a top priority for its operator, the Port of Portland.

"For us, when you're in the Portland airport, we want you to know you're in Portland," says the Port's PDX Next Chief Projects Officer Vince Granato. "We know how much our region loves our airport. They really care about the airport, and we knew that going into the project."

Maintaining the local brand of the airport was an important goal for the look of the new terminal when the Port started working on the project with Portland-based ZGF Architects, the firm that's designed most of the major expansions to the airport over the past 30 years.

"With Oregon being this natural resource state, the architects really took that to heart and said, OK, what is it about this region that everybody truly loves, and how can we connect it? And so that's when I think the wood started to creep into the conversation," Granato says.

The lattice for the expanded terminal's 9-acre wood roof, entirely constructed with 3.5 million board feet of timber grown and manufactured in Oregon and Washington, helps support local economies and serves as a nod to the region's natural resources and cultural history, says Jacob Dunn, a project architect and principal with ZGF.

Photo: Ema Peters Photography

WOOD ROOF

Portland International Airport's new wooden lattice roof was constructed with 3.5 million board feet of timber grown and manufactured in Oregon and Washington.

"As an airport, they're really interested in protecting and stewarding natural resources — both immediately, since they're right by the Columbia River, but also our forests are arguably the region's most precious natural and cultural resource," he says.

Granato points out that PDX was among the first airports in the country to feature local concessions, and it continues to lead the industry in its representation from Portland- and Oregon-based businesses.

"That opportunity to do the same with wood sourcing just kind of was this natural connection," he says.

Wood sourcing goals

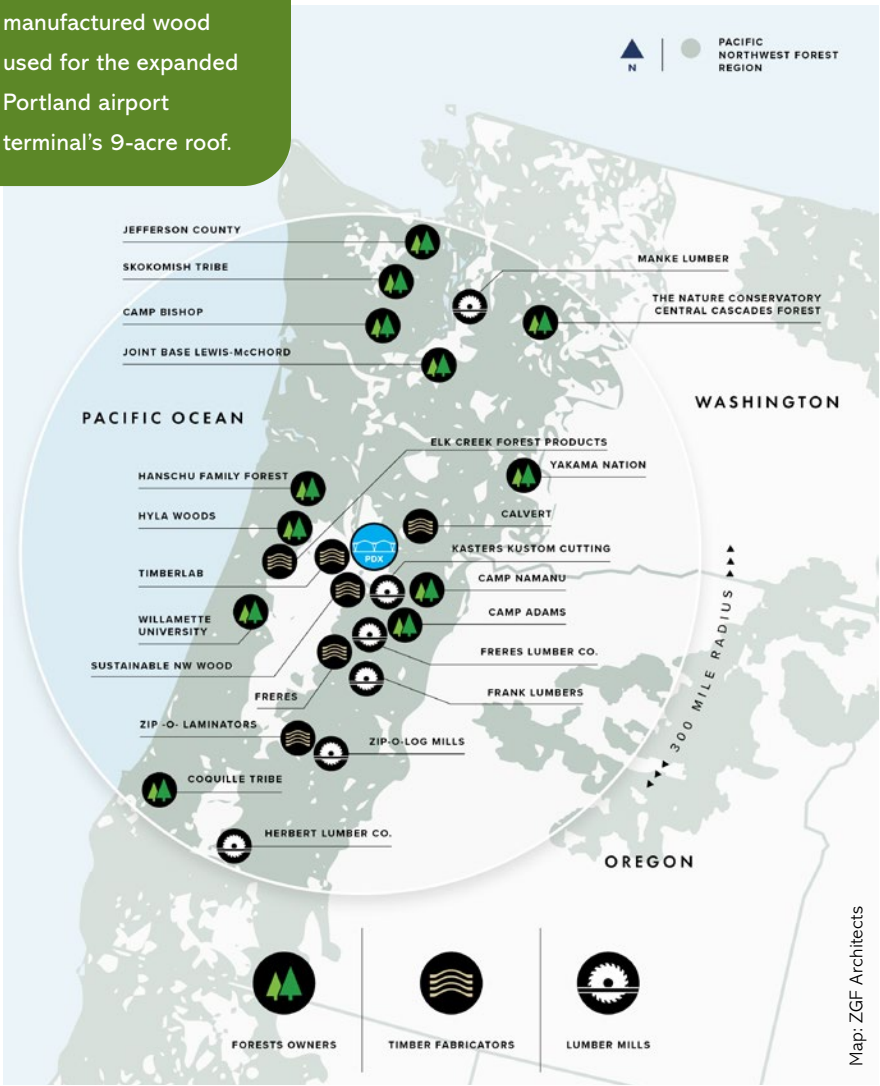
Sourcing goals included supporting the surrounding region by distributing the

project's economic impact across both western and eastern Oregon and Washington, as well as targeting small family forest landowners, tribal forests and other underrepresented parts of the mass timber supply chain.

It was also important to the Port to source wood in a way that creates better outcomes for regional forests. The project team worked together with the forest products industry, landowners, mills and fabricators to come up with a definition for sustainably managed forests that reflected the Port's goals around supporting timber harvests that went above and beyond simply meeting federal and state forestry regulations.

REGIONAL SOURCING

This map highlights Pacific Northwest forest landowners, timber fabricators and lumber mills that grew and manufactured wood used for the expanded Portland airport terminal's 9-acre roof.



Map: ZGF Architects

To achieve this, the Port partnered with the Portland-based nonprofit Sustainable Northwest to develop criteria for sustainably sourced wood for the project. That process included broadening the scope beyond wood certified by the Forest Stewardship Council (FSC) to include timber from forests that were not FSC-certified but were still being managed according to ecological forestry principles, says Paul Vanderford, senior director of wood markets with Sustainable Northwest.

"We ultimately met all of the airport's goals and got wood from places that would meet or exceed the FSC goals," he says.

With the sourcing criteria that Sustainable Northwest helped develop as a guide, the airport terminal expansion ended up directly sourcing wood from more than a dozen Pacific Northwest forests located within 300 miles of the project site that met each of the project's five sustainable timber harvesting pathways. This included harvests from FSC-certified forests, federal forests and forests managed under state-approved habitat conservation plans. The project also sourced wood from any landowner who could meet a custom set of sustainable forestry criteria that included leaving wider buffers of trees along streams, limiting herbicide use and growing a diversity of tree species.

The project team even got the chance to visit many of the forests that provided wood for the terminal expansion, which include family, tribal and community forests, and talk to the landowners to learn about how and why they steward their forests the way they do.

"To meet the people and places that wood comes from is the story of the airport," Vanderford says.

From the forest to the construction site

Once a set of criteria for regional sustainable timber sourcing was established, the project team realized that tracking the new terminal's wood products from the forest to the construction site was key to meeting their goals.

Typically, mills source timber from nearby forests and the logs are mixed into a single batch to be processed, often with no way to identify the exact location where they were sourced. But the detailed log tracking information that mills gather allowed the PDX project team to find out more about the types of landowners who sold timber to each mill.

In some cases, this was enough to verify a mill's wood sourcing met the project's sustainable forestry criteria, Dunn says. Other times, they were able to take it a step further by asking mills to buy timber sales from specific landowners, segregate the logs from those sales and process them specifically for the PDX project. An example of this is the timber sourced for the project from the Coquille Tribe on the Oregon Coast (see profile on page 22).

"These new transparency-based approaches allow projects to have a more direct forest-to-frame story, and even help influence where their wood comes from," Dunn says. "For PDX, since we know where — and helped choose where — over a million board feet in the roof came from, we can tell the local story of who harvested it, why, and how these 11 landowners met the sustainable harvesting criteria defined by the project."

Photo: Hannah Letinich

VISITING SOURCE FORESTS

Members of the terminal expansion design team and the Port of Portland's executive leaders visited six of the Pacific Northwest forests where timber was sourced for the project to learn about how those lands are managed sustainably.

Lyons-based Freres Engineered Wood manufactured a custom set of mass plywood panels, a veneer-based engineered wood product, that were used in the terminal roof diaphragm and to create skylight openings that look like giant eyelashes. The company provided the percentages of timber volumes that came from each type of landowner, all traceable back to federal and private forests located within 100 miles of their mills, says Freres Engineered Wood Vice President of Sales Tyler Freres.

"The Port, to their credit, really wanted to make it an Oregon and a Northwest story," Freres says. "Wood is one of the most sustainable products we can build with. Oregon has an opportunity to be a leader in mass timber construction if we can support local, sustainable forest management."

Connecting landowners, mills and manufacturers

The PDX project general contractor Hoffman Skanska hired Sustainable Northwest to continue as a consultant to help meet the Port's criteria for wood sourcing. They also hired the construction company Swinerton and its Portland-based subsidiary, Timberlab, to help make connections

between forest landowners, mills and mass timber manufacturers to source the wood needed for the PDX project.

"We wanted to tell the whole story, from the dirt it came from all the way down to the person's hands who are putting it into place, and be able to track it down to that level of detail," says Timberlab Director of Manufacturing Jared Revay.

This required convincing manufacturers to make extra efforts like doing a special batch run through their mill of logs specifically for the PDX project, Revay says. "That took a lot of coordination and relationship building and trust building."

Through his involvement in the PDX project, Revay says he learned a lot about the forest products industry in the Pacific Northwest, including that any wood coming from Oregon or Washington is already held to a higher standard with regards to responsible forestry because of the two states' forest practice laws.

Dunn, of ZGF Architects, says the project also gave him a much greater understanding of the range of forest management practices in the region beyond meeting the forest practice laws, and how landowners strive to balance environmental and social values with economic goals.

"I had no idea I would learn this much about the forest, but it's been a lot of fun, too. It's been sort of a new direction for me, as a sustainability lead at the office, to really engage and understand the importance of it," he says.

One of the most eye-opening experiences for him was when the design team and the Port's executive leaders visited six of the forests where the wood was sourced for the airport. The sites included the Yakama Nation, a Native American tribe from central Washington that provided 370,000 board feet for the project — the most of any single landowner.

"It was transformational going out there, and hearing landowners talk about why they harvest the way they do has still been the best educational tool that we've had," he says.

A replicable process

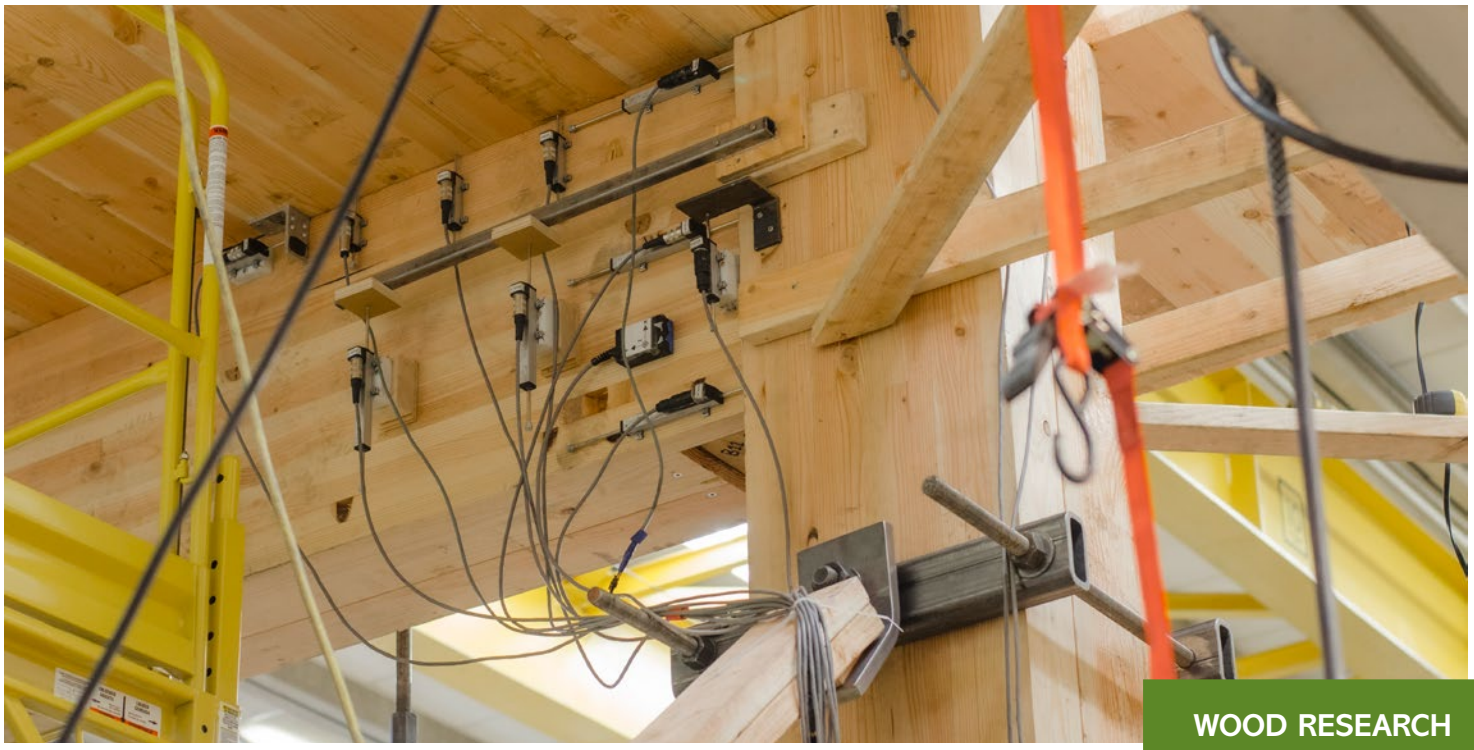
Dunn says he sees the terminal expansion as just the start. Granato, from the Port, and Vanderford, with Sustainable Northwest, agree that the PDX wood sourcing process is replicable. Sustainable Northwest has since created a wood advisor consulting arm of the nonprofit that's assisted with local timber sourcing for other building projects in the region.

ZGF is already experimenting with using a wood sourcing and transparency process similar to the airport's for other projects, and Dunn says he hopes others will be inspired by the terminal expansion and convinced of the value of making that extra effort.

"We also like the idea of making our region more competitive against other regions and countries because we have such amazing stories and diversity of landowners here," he says. "I think this will help keep sourcing local, especially around mass timber, and people will really look at the Pacific Northwest as a leader."

MASS TIMBER EVOLUTION

Research supports wood building solutions



WOOD RESEARCH

Researchers from Oregon's public universities are investigating the seismic and fire resiliency of wood buildings.

In this report, we examined the important relationship between our forests and our built environment, and what it means for forests and wood buildings to be sustainable. We illustrated how forest landowners and managers meet sustainability objectives, and we talked to architects and builders to highlight construction projects that prioritize local, sustainable wood sourcing.

We've seen that wood products from sustainably managed forests can help address some of the challenges we face as a state, nation and world, including access to affordable housing, increased wildfire risk and climate change. That begs the question: *Where do we go from here?*

Research and education in mass timber

Faculty at Oregon State University and the University of Oregon have teamed up on research and education related to mass timber through TallWood Design Institute (TDI), one of the nation's first interdisciplinary research collaboratives focused exclusively on the advancement of building solutions that use mass timber and other wood products.

The partnership between the colleges of forestry and engineering at Oregon State

Is it feasible to use small-diameter timber from federal forest restoration treatments for mass timber?

Yes. Small-diameter Douglas-fir logs thinned from western Oregon's federal forests are routinely manufactured into mass plywood products by Freres Engineered Wood in Lyons, Oregon. The commercial value for these small logs helps offset the cost of much-needed federal forest restoration projects that reduce fire fuel and improve wildlife habitat.

The picture is more challenging for eastern Oregon's federal forests, where expensive fuels reduction and forest restoration projects produce large volumes of small, low-value ponderosa pine, lodgepole pine, and grand and white fir logs that have limited markets.

Sourcing federal timber for building products and wood products manufacturing helps support these projects that improve forest landscape resiliency. It also supports local logging businesses and mills that rely heavily on federal timber. Improving markets for the timber harvested during these projects would allow many more acres of federal forests to be treated with forest restoration measures.

Cross-laminated timber (CLT) in the U.S. is typically made with two-by-six lumber, which is primarily cut from logs that are 12 inches or larger in diameter. CLT can be made from two-by-fours cut from trees as small as 6 inches in diameter, but it is much more costly. Ongoing research at TallWood Design Institute and Oregon State University's Department of Wood Science is examining the properties and use of small-diameter ponderosa pine and white fir logs in custom CLT panels with the goal of providing benchmark data and proof of concept for manufacturers and designers.

University and University of Oregon College of Design oversees a wide range of testing and applied research. TDI research topics range from seismic and fire resiliency of wood buildings to acoustics, life cycle assessments, and new ways to use previously undervalued wood products and species.

Part of TDI's core mission is to advance education, workforce development and local economies in the region. The Institute collaborates with a wide array of public and industry stakeholders to disseminate research and provide educational opportunities for students and professionals.

TDI is headquartered in Corvallis at Oregon State University's A.A. "Red" Emmerson Advanced Wood Products Laboratory, part of the College of Forestry's Oregon Forest Science Complex. The Emmerson lab is a state-of-the-art timber research facility being used to prototype wood products and structures, and to structurally test building components and full-scale buildings (up to three stories high). The facility is an integral part of a larger network of labs and collaborators focused on mass timber research and development.

Researchers continue to collaborate on several areas of study, including the fire performance of mass timber components and structures. The data collected from fire resiliency experiments are used to understand the fire performance of mass timber building systems and to update performance-based and prescriptive approaches to fire-safe design for mass timber buildings.

Pacific Northwest Mass Timber Tech Hub

In October 2023, Oregon State University became the leader of two federally designated "Tech Hubs." One is the Pacific Northwest Mass Timber Tech Hub, which aims to establish the region as a global leader in mass timber design and manufacturing to lower the construction industry's carbon footprint and increase housing affordability.

The U.S. Economic Development Administration (EDA) selected Oregon State University from nearly 400 applicants nationwide as the only university to lead two Tech Hubs. The university's other Tech Hub focuses on microfluidics technology.

The Tech Hub program is a federally funded economic development initiative designed to drive regional innovation and job creation by strengthening a region's capacity to manufacture, commercialize and deploy technology that will advance American competitiveness.

Building off the region's wood products research and development expertise and its abundance of experienced architectural, engineering and construction firms, the Pacific Northwest Mass Timber Tech Hub will invest in advanced materials science to mainstream mass timber as a viable and sustainable construction alternative.

The Mass Timber Tech Hub is led by TallWood Design Institute Director Iain Macdonald.

"This Tech Hub designation recognizes, validates and builds on the collaborative work that Oregon State University has done over the last three years with the University of Oregon and our other Oregon Mass Timber Coalition partners," he says. "We look forward to working with the EDA and the private sector to achieve our joint vision: evolving the Pacific Northwest into a globally competitive industry ecosystem for mass timber design, manufacturing and construction."

ADDITIONAL RESOURCES

To learn more about some of the topics covered in this report, and for answers to additional forest sustainability FAQs, visit **OregonForests.org**.

More information is also available on the following websites:

- American Tree Farm System
  treefarmsystem.org/certification-american-tree-farm-system
- Forest Stewardship Council
  fsc.org/en
- Oregon Forest Practices Act
  oregon.gov/odf/working/pages/fpa.aspx
- Oregon Forest Resources Institute
  oregonforests.org/sustainable-forest-management-is-key
- Oregon Mass Timber Coalition
  masstimbercoalition.org
- Oregon Small Woodlands Association
  oswa.org
- Oregon State University College of Forestry Department of Wood Science and Engineering
  wse.forestry.oregonstate.edu/wse-research
- Pacific Northwest Mass Timber Tech Hub
  pnwmasstimbertechhub.org
- PAE Living Building
  pae-engineers.com/about/pae-living-building
- Port of Portland's PDX Next terminal expansion project
  pdxnext.com
- Port of Portland and mass timber
  portofportland.com/masstimber
- Sustainable Forestry Initiative
  forests.org
- Sustainable Northwest wood advisor
  sustainablenorthwest.org/wood-advisor
- Sustainable wood sourcing for PDX project
  futureforestsnorthwest.org/pdx-next
- TallWood Design Institute
  tallwoodinstitute.org
- T2 Building Innovation Hub
  masstimbercoalition.org/projects
- University of Oregon Institute for Health in the Built Environment
  buildhealth.uoregon.edu/publications-2

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AUTHORS

Inka Bajandas,
Oregon Forest Resources Institute

Mike Cloughesy,
Oregon Forest Resources Institute (retired)

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