

# An Overview of North American Forestry and Implications for Wood Product Selection

Presented By:



## INTRODUCTION TO NORTH AMERICAN FORESTS

Architects are asked to consider sustainability when making product selections, which includes understanding how products are sourced and created. Some argue for increasing the use of wood over other structural materials such as steel, concrete, and masonry, and taking into greater account the embodied carbon intensity of each of these materials. Research suggests that creating less steel and concrete would yield real carbon savings, but what are the consequences of increasing wood product consumption?<sup>1</sup> Can our forestry practices sustain such an increase? This course examines the ways North American foresters manage growth and harvest and why it is important to specify sustainable, renewable,

and responsibly sourced softwood lumber from countries like the United States and Canada, where forestry practices are heavily regulated. While it is admittedly difficult to track wood products back to their source because of the complexity of the supply chain, the professional obligation still exists to understand this supply chain, how materials are sourced, and their impact on the environment.

The United States and Canada have approximately 15.5% of the world's total forest cover, with both countries maintaining observable standards for sustainable forestry, although the two countries differ in terms of forest ownership and laws.<sup>2</sup> The United States grows 823 million acres of forests and woodlands.<sup>3</sup> Forest management practices on these timberlands are regulated by

## LEARNING OBJECTIVES

1. Examine commonly held beliefs about forestry and how they are affecting communities in North America.
2. Review the economic and environmental importance of specifying sustainable and responsibly sourced wood products.
3. Explore the tenets of sustainable forestry management and industry standards that work to improve forestry practices.
4. Determine how durable softwood species can be a sustainable building material option.

## CONTINUING EDUCATION

This course is approved for AIA & GCBI Learning Unit Credits.



Use the learning objectives to focus your study as you read this article. For details on the learning units or credit information, and to earn credit and obtain a certificate of completion, visit <http://go.hw.net/AR12214> to view the entire CEU and complete the quiz. If you are new to Hanley Wood University, CEU courses are free of charge once you create a new learner account; returning users log in as usual.

federal law and industry standards, but forest ownership and management are complicated because they are so varied. Fifty-seven percent of the U.S. forested land base is privately owned by corporations, investment funds, and approximately 10 million family forest landowners, while the rest is owned by public entities such as national, state, and regional governments.<sup>4</sup> For example, in West Coast states such as Washington, Oregon, and California, coastal softwood forests may be owned and operated by the U.S. Forest Service; the state; or private companies such as Weyerhaeuser, International Paper, Hampton, and Sierra Pacific. However, they

are bound by extensive federal, state, and local legal requirements no matter the entity. Over the past 50 years, these strict regulations have allowed less than 2% of the U.S. standing tree inventory to be harvested every year, with a net tree growth of 3%.<sup>5</sup>

In Canada, “Ninety-three percent of the forests are publicly owned by the Provincial Government, and forest companies operate under some of the most stringent sustainability laws and regulations in the world. Less than one-half of one percent of the managed forest is harvested annually, and the law requires all areas to be promptly regenerated.”<sup>6</sup> British Columbia (B.C.) is where Canada’s softwood lumber industry is based. The province has one of the highest proportions of land covered with forests (57%) compared with China, Japan, the European Union, New Zealand, the Russian Federation, and the U.S. Within Canada, B.C. is the leading provincial forest producer by volume, producing 67.97 million cubic meters of roundwood in 2015. Roundwood is sections of tree stems, with or without bark, such as logs, bolts, posts, and pilings.<sup>7</sup> The total forest area in B.C. has remained stable at around 55 million hectares, with the lowest rate of deforestation (6,200 hectares per

year) among all jurisdictions.<sup>8</sup> Importantly, “British Columbia ranks high among other jurisdictions on several key sustainable forest management parameters with legislation and forest management regimes aiming to meet the environmental, social, and economic needs of current and future generations.”<sup>9</sup>

### THE INTERSECTION OF INDUSTRY AND COMMUNITY INTERESTS

B.C. has some of the most abundant ecologically and climatically diverse forests globally, including their prized first-growth forests. First-growth forests are not just old or big trees; they are unique ecosystems composed of trees and plants of various species and ages, whose characteristics vary based on location. First-growth forests are an ancient ecosystem and an iconic piece of B.C.’s landscape and identity valued not only for their beauty but for their importance to the provincial economy.<sup>10</sup> In B.C., trees in the coastal region 250 years and older are defined as first growth or first cut. “In the Interior, where trees have a shorter life span, and wildfires are more common [than on the coast], first growth is defined as more than 120 years for forests dominated by lodgepole pine or broadleaf species, and more than 140

years for all other forests such as Englemann spruce, white spruce, and interior Douglas-fir.”<sup>11</sup> According to *The State of British Columbia’s Forests: A Global Comparison*, “22.6 million ha (41 percent of B.C.’s forests) have been classified as first-growth forests.”



Timber from first-growth forests is a primary source of income in many communities; thousands of workers in hundreds of communities are dependent on the health and prosperity of the forestry sector, as are 120 First Nations that participate in the industry.

Timber from first-growth forests is a primary source of income in many communities. Thousands of workers in hundreds of communities are dependent on the health and prosperity of the forestry sector, as are 120 First Nations that participate in the industry.<sup>12</sup> First-growth trees are also valuable to the industry because they yield “tight-grain clear wood” without knots, favored for cladding, shingles, and decking products.<sup>13</sup> That being said, there is a move toward harvesting second-growth forests versus first-growth ones. For example, the industry is actively marketing knotty products harvested from second-growth forests (i.e., “second cuts”) to ease the pressure on the more prized first-growth forests.

The authors of *A New Future for Old Forests: A Strategic Review of How British Columbia Manages for Old Forests Within its Ancient Ecosystems* note:

In recent years, the government has been under pressure to protect older forests from degradation by industrial development. At the same time, there is pressure to maintain viable resource industries at a scale that can compete in global markets. This pressure has led to increasing tension and uncertainty about what will happen to the forest and the industry. In addition, the tremendous diversity of the province further complicates the challenge for



In Canada, ninety-three percent of the forests are publicly owned by the Provincial Government, and forest companies operate under some of the most stringent sustainability laws and regulations in the world.



the government. Not only are forest types different, but the history of development and economic dependence of communities on forestry varies vastly from one part of the province to another.

The 2020 *Strategic Review* of B.C.'s first-growth forest management indicates this pressure is growing: "Recently, there have been large-scale public demonstrations demanding an end to logging 'old growth' and others demanding the government protect jobs by protecting the 'working forest' in the face of diminishing timber supplies."<sup>14</sup> Environmental organizations have decried the loss of first-growth forests in B.C., claiming that only 1% of the province's forests are first growth when in reality, that number is 41%.<sup>15</sup> They have blockaded access roads to logging camps with boulders and timber they cut from the surrounding forest, leading to arrests. According to Reuters, "Protesters say they are trying to save the last intact watershed outside of a park or protected area on southern Vancouver Island, home to 1,000-year-old yellow cedars. The Pacheedaht First Nation, within whose territory this area lies, is divided on the issue, as the First Nation owns three sawmills and has signed a revenue-sharing agreement with the province for logging activities in its territory."<sup>16</sup>

### FINDING A BALANCE

An ideal approach to material production invites environmentalists, communities, federal



There is a move toward harvesting second-growth forests versus first-growth ones and the industry is actively marketing knotty products harvested from second-growth forests (i.e., "second cuts") to ease the pressure on the more prized first-growth forests.

governments, and the lumber industry to find a balance that considers both the ecology of forests and the livelihood of people who work and live in them. Responsibly managed forests can play an outsized role in storing carbon, addressing climate change, and providing sustainable products, which is particularly important because the global need for wood is not diminishing. "Shutting down first-growth logging in B.C. will only move the supply to unregulated, [offshore] regimes, while homes and buildings constructed of an unknown alternative do not help the world's carbon footprint."<sup>17</sup> According to the British Columbia Council of Forest Industries, "In 2019, the forestry sector contributed C\$13 billion, roughly 5 percent, to provincial GDP. Of that, only C\$3.5 billion came from first-growth logging."<sup>18</sup>

### AN INCLUSIVE APPROACH TO FIRST-GROWTH FORESTS IN B.C.<sup>19</sup>

The B.C. government is taking a new approach to first-growth forests after engaging with thousands of British Columbians, including First Nation leaders, who are respected as decision-makers regarding resources in their territories. These First Nation leaders are helping to develop policies and strategies to protect their communities' forests. In addition, to combat misinformation and demonstrate good-faith efforts to protect Canada's first-growth forests, the provincial government recently instituted the Old Growth Technical Advisory Panel and conducted the 2020 Old Growth Strategic Review, which recommended protection of critical areas that are not currently adequately represented.

In September 2020, the provincial government designated nine areas that contain almost 196,000 hectares of first growth that will be deferred from harvest. They are also working to protect some of the province's largest trees through Special Tree Protection Regulation, which is expected to protect 1,500 of the largest trees in B.C. Naturally Wood notes, "These efforts will continue to enhance high conservation old-growth forests while enabling sustainable management of natural and diverse forests in B.C."

Balanced solutions to forest protection can be reached, in part, by ensuring that forests are responsibly and sustainably managed. We will discuss *how* forests should be managed later in the course, but let's first

## GLOSSARY

**American Tree Farm System (ATFS)**—A PEFC-endorsed certification program for smaller family forests and tree farms; ATFS is the largest and oldest sustainable family woodland system in the U.S.

**Canadian Standards Association (CSA) Group Sustainable Forest Management System (SFM) Standard**—Canada's official national standard for sustainable forest management and the first in the world to be developed (1996)

**Carbon Sink**—A forest that sequesters carbon from the atmosphere through growth

**Carbon Source**—A forest that emits carbon back into the atmosphere through respiration, decay, death, or disturbance

**Forest Stewardship Council (FSC)**—A network of businesses, environmental organizations, and cultural organizations established in 1993 as a coalition effort between the World Wide Fund for Nature (WWF) and several environmental NGOs, timber producers, indigenous groups, and community forestry groups working to protect forests

**Hectares (ha)**—A metric unit of surface or land equal to 100 ares, or 10,000 square meters; equivalent to 2.471 acres

**Lacey Act**—A U.S. conservation law passed in 1900 that prohibits trade in wildlife, fish, and plants that have been illegally taken, possessed, transported, or sold; it protects both plants and wildlife by creating civil and criminal penalties for those who violate the rules and regulations

**Roundwood**—Sections of tree stems, with or without bark, such as logs, bolts, posts, and pilings

**Softwood**—One of the group of trees which have needle-like or scale-like leaves; the term has no specific reference to the softness of the wood

**Sustainable Forestry Initiative (SFI)**—An organization that works to improve forestry practices on all forestlands in North America, whether boreal forests or plantation forests, and whether they are naturally regenerated or planted



Responsibly managed forests can play an outsized role in storing carbon, addressing climate change, and providing sustainable products, which is particularly important because the global need for wood is not diminishing.

### B.C. FIRST-GROWTH FOREST FACTS<sup>20</sup>

- Sixty percent of B.C. is forested.
- An average of 200,000 hectares of forested lands are harvested every year in B.C. (based on 2014–2018 data); 0.1% of the total forest area harvested each year in the province is first-growth forest.
- Twenty-three percent (13.7 million hectares) of forest lands are considered first growth, of which over 70% (10 million hectares) is under protection or is not available for harvest.
- Not all old forests are the same, and old does not necessarily mean big trees.
- As much as 80% of old forests consist of smaller trees growing in bogs, sub-alpine elevations, and the outer coast.



This article continues on

<http://go.hw.net/AR12214>.

Go online to read the rest of the CEU course, complete the corresponding quiz for credit, and receive your certificate of completion.

### SPONSOR INFORMATION



The Western Red Cedar Lumber Association represents quality “Real Cedar” producers, distributors and retailers throughout North America. Founded in 1954 and known as “the voice of the cedar industry,” WRCLA offers extensive resources to assist with selection, specification and quality standards. For more information, visit [RealCedar.com](http://RealCedar.com).

### QUIZ

- In British Columbia, trees in the coastal region \_\_\_\_\_ years and older are defined as first growth or first cut.
  - 120
  - 140
  - 210
  - 250
- 22.6 million ha, or \_\_\_\_\_ percent of British Columbia’s forests, have been classified as first-growth forests.
  - 21
  - 31
  - 41
  - 51
- By 2030, Canada’s forest sector will remove \_\_\_\_\_ megatonnes of carbon dioxide from the atmosphere every year—representing more than 10 percent of Canada’s climate change mitigation target.
  - 10
  - 20
  - 30
  - 40
- The \_\_\_\_\_, is a U.S. conservation law that prohibits trade in wildlife, fish, and plants that have been illegally taken, possessed, transported, or sold.
  - Lacey Act
  - Special Tree Protection Regulation
  - Old Growth Strategic Review
  - Clean Air Act
- Which of the following is a tenet of sustainable forestry management?
  - Maintain sustainable yields
  - Maintain biodiversity within the forest
  - Protect wildlife habitats
  - Meet or exceed water quality laws & regulations
  - All of the above
- Which of the following forestry standards was the first in the world to be developed?
  - Canadian Standards Association (CSA) Group Sustainable Forest Management System (SFM) Standard
  - Forest Stewardship Council (FSC) U.S. Forest Management Standard
  - Sustainable Forestry Initiative (SFI) Forestry Management Standard
  - American Tree Farm System (ATFS) Standards of Sustainability for Forest Certification
- There are more than \_\_\_\_\_ million acres of third-party certified forests in the United States and Canada, representing over half of the world’s certified forests.
  - 258
  - 320
  - 480
  - 530
- Responsible forest management in North America has resulted in more than \_\_\_\_\_ consecutive years of net forest growth that exceeds annual forest removals despite increasing population and higher demand for wood products.
  - 30
  - 40
  - 50
  - 60
- Which North American softwood species is often used for reforestation due to its insect resistance and tolerance to shade, flooding, and a wide variety of soils?
  - Western red cedar
  - Yellow cedar
  - Hem-fir
  - Douglas fir
- Steel, concrete, and brick have many valuable properties and are widely used in most building projects today, but they are energy-intensive to create, accounting for around \_\_\_\_\_ percent of the entire planet’s fossil fuel production.
  - 6
  - 16
  - 8
  - 18

talk about *why* sustainably managed forests are essential for the economy, environment, and health.

**EMPLOYMENT AND ECONOMIC VALUES<sup>21</sup>**

The forest industry plays a significant role in the North American economy. The statistics here represent the value of forestry for both employment and the economy in the U.S. and B.C.

**ECOLOGICAL VALUES**

Forests are also significant players in mitigating the impacts of climate change, mainly because of their ability to reduce greenhouse gas emissions by capturing carbon. Forests remove carbon from the atmosphere and store it as below-ground (dead) and above-ground (living) organic matter. In addition, they perform other essential ecological functions, such as

burning trees] release tremendous amounts of carbon dioxide and other greenhouse gases back into the atmosphere, turning our forests from climate change assets into liabilities. Managing forests to avoid large emissions from the loss of old trees while rapidly removing carbon from the atmosphere through young forest growth can provide both storage and sequestration benefits. In addition, managed forests produce wood products that store carbon long after the trees are harvested.”<sup>30</sup>

Carbon transfers are categorized as either sinks (the forest sequesters carbon from the atmosphere through growth) or sources (the forest emits carbon back into the atmosphere through respiration, decay, death, or disturbance). The impact of these transfers (net carbon balance) means the forest is either a net sink, meaning it sequesters more carbon than it emits, or a net source, meaning more carbon is emitted than sequestered.<sup>31</sup>

As you may guess, when a first-growth tree dies in the forest, it releases a massive amount of carbon. But if that tree were felled and used in building products, for example, that carbon is stored for the lifecycle of the product. Thus, when specifying wood, architects are “doing their part to support a low-carbon future by giving a second life to trees; as **carbon captured** over a tree’s lifetime stays locked inside the wood, sustainably harvested wood products continue to represent a carbon store long after they leave the forest.”<sup>32</sup> For example, Sandy High School in Sandy, OR was completed in 2012 by Dull Olson Weekes Architects and was intentionally designed to minimize the school’s carbon footprint and have a minimum service life of 75 years. While it is steel-frame construction, the design incorporates a great deal of wood elements, including heavy timbers and cedar siding, soffits, and sun louvers for shading.<sup>33</sup> Therefore, in this particular project, the additional service life of the stored carbon is 75 years. Many buildings constructed of wood over 150 years ago are still standing.

In fact, “By 2030, Canada’s forest sector will remove 30 megatonnes (mt) of carbon dioxide from the atmosphere every year—representing more than 10 percent

UNITED STATES	BRITISH COLUMBIA <sup>22</sup>
The U.S. forest industry is defined as total employment in three sectors—forestry and logging, wood product manufacturing, and paper manufacturing. This doesn’t include forestry support personnel or those working in furniture manufacturing. <sup>23</sup>	The forest sector was responsible for \$11.5 billion of B.C.’s total exports in 2020, and it is the primary employer in several parts of the province.
The U.S. forest products industry employs approximately 1 million workers and accounts for 6% of the total U.S. manufacturing GDP; it is almost on par with the automotive and plastics industry, according to the American Forest & Paper Association. <sup>24</sup>	Forestry-related activities directly support over 6,700 businesses and employ almost 50,000 people.
The forest products industry is among the top 10 manufacturing sector employers in 48 states and generates over \$200 billion a year in sales and about \$54 billion in annual payroll. <sup>25</sup>	Forest products represent 29% of B.C.’s commodity exports.
The U.S. exported a record \$9.7 billion of forest products in 2014; only corn and soybeans had higher export values. <sup>26</sup>	Roughly 80% of B.C. forest product value is sold to international markets.
As the world’s fourth-largest exporter of forest products, the U.S. maintains a steady share of the growing global market at just over 10 percent. <sup>27</sup>	In fiscal year 2020/2021, the B.C. government reported that \$1.3 billion in government revenue was attributable to the forest sector, primarily from timber sales.
The U.S.’s top exports to China—hardwood lumber and softwood logs—accounted for nearly three-quarters of all U.S. forest product exports in fiscal year 2014. <sup>28</sup>	Forest sector companies and their employees pay income tax and commodity taxes, which generate more revenue on top of the \$1.3 billion to fund infrastructure and government services that British Columbians depend on.



An ideal approach to material production invites environmentalists, communities, federal governments, and the lumber industry to find a balance that considers both the ecology of forests and the livelihood of people who work and live in them.

regulating climate extremes and regulating water cycles by purifying water and preventing flooding.<sup>29</sup>

**Carbon Capture**

Let’s explore how carbon capture works, as described by Forestry for the Future: “As a forest grows, trees absorb and store carbon. But as trees age, the forests become more susceptible to disturbances such as fire, pest outbreaks, droughts, and storms. Although these natural disturbances are normal and frequent in the forest, [decomposing or



of Canada's climate change mitigation target."<sup>34</sup> In the United States, "forests and associated harvested wood products uptake the equivalent of more than 14 percent of economy-wide carbon dioxide emissions each year and store more than three decades of CO<sub>2</sub> emitted from fossil fuels," according to the USDA Forest Inventory and Analysis (FIA) National Program.

#### Minimizing Waste<sup>35</sup>

There is little waste associated with wood product manufacturing, as every piece of a timber is utilized, although the use varies by location. In some regions, sawdust can be burned for energy, while it is used to make engineered wood panels in others. Unlike some other building materials, no pre-consumer waste must be reintroduced to the process to have value.

#### Maintaining Soil and Water Quality<sup>36</sup>

Additionally, many jurisdictions require forest managers to leave a certain amount of debris behind after harvest. According to the American Wood Council, "Bark, tops, and stumps left in the forest after a harvest help maintain soil and water quality, and provide cover and nutrients for species."

### SPECIFYING WOOD FROM SUSTAINABLY MANAGED FORESTS

Architects and others who specify wood products have the responsibility to do so from sustainably managed forests. In fact, in the U.S., architects are legally responsible for sourcing materials from the proper channels and must comply with the Lacey Act, which is a U.S. conservation law passed in 1900 that prohibits trade in wildlife, fish, and plants that have been illegally taken, possessed, transported, or sold. It protects both plants and wildlife by creating civil and criminal penalties for those who violate the rules and regulations. "In 2008, the Lacey Act was amended to include a wider variety of prohibited plants and plant products, including products made from illegally logged woods, for import."<sup>37</sup>

### THIRD-PARTY FOREST CERTIFICATION

There are internationally recognized standards for forest certification that add a layer of verification and assurance that forest managers are maintaining healthy forests and communities. This includes harvesting at a sustainable rate, maintaining biodiversity within the forest, protecting wildlife habitats, and preserving water and soil quality.<sup>38</sup> According

to Naturally Wood, "Forest certification is a voluntary process conducted by an independent third party that assesses the sustainability and quality of a company's forest management against a set of defined standards. Certification and related product labeling inform customers and the public about wood products that come from certified forests."<sup>39</sup> Third-party certification provides documented verification that a forestry company is operating legally and sustainably, and meets internationally recognized standards for sustainable forest management.<sup>40</sup> That being said, certified lumber makes up a small percentage of available product globally. The Forest Stewardship Council compared the amount of FSC-certified wood harvested every year (300 million cubic meters) with data from the Food and Agriculture Organization of the United Nations (FAO) and found that "FSC-certified wood comprises 16.6% of the global industrial roundwood market, and 8% of the global fuelwood and industrial roundwood market."<sup>41</sup>

In the U.S. and Canada, forests are certified by one of four prominent certification programs:

- Canadian Standards Association (CSA) Group Sustainable Forest Management System (SFM) Standard
- Forest Stewardship Council (FSC) U.S. Forest Management Standard
- Sustainable Forestry Initiative (SFI) Forestry Management Standard
- American Tree Farm System (ATFS) Standards of Sustainability for Forest Certification

In North America, these certification programs are endorsed and overseen by one of two independent nonprofit organizations: the [Programme for the Endorsement of Forest Certification \(PEFC\)](#) and the Forest Stewardship Council, which oversees both endorsement and certification programs. PEFC is the world's largest international forest certification system. The PEFC recognizes both CSA and SFI.

Released in 1996, CSA is Canada's official national standard for sustainable forest management and was the first in the world to be developed. PEFC endorses the CAN/CSA Z809 SFM Standard, with more forests certified to this standard than any other national standard in the world.<sup>42</sup>



Architects and others who specify wood products have the responsibility to do so from sustainably managed forests.

"Products from forest certified to CSA Z809 are accepted by customers around the world, including the governments of France, Germany, Japan, New Zealand, and the United Kingdom."<sup>43</sup>

The FSC is a network of businesses, environmental organizations, and cultural organizations working to protect forests. The council was established in 1993 as a coalition effort between the World Wide Fund for Nature (WWF) and several environmental NGOs, timber producers, indigenous groups, and community forestry groups.<sup>44</sup>

SFI works to improve forestry practices on all forestlands in North America, whether boreal forests or plantation forests, and whether they are naturally regenerated or planted. Its philosophy is that healthy, productive forests yield immense environmental, social, and economic benefits and mitigate climate change's impacts by absorbing and storing carbon in trees, soil, and biomass. SFI-certified forest organizations must undergo independent audits by accredited certification organizations.<sup>45</sup>

There is also a program helping family forest landowners to develop effective forest management plans, which is vital because 10 million family forest landowners own approximately 50% of the timberland in the United States.<sup>46</sup> The American Tree Farm System (ATFS) is a PEFC-endorsed certification program for smaller family forests and tree farms, and is the largest and oldest sustainable family woodland system in the U.S.<sup>47</sup> "The American Tree Farm System has over 95,000 family forest owners totaling more than 25 million acres of non-industrial private forestland certified in the program in 46 states."<sup>48</sup> As part of the PEFC endorsement, the ATFS is mutually recognized by the SFI program, which helps to promote and expand sustainable forest management practices on small and large ownerships. Under this agreement, ATFS members have the potential for greater access to certified wood markets both in the United States and abroad.<sup>49</sup>

### METHODS OF FOREST PROTECTION

Forest certification assesses the sustainability and quality of a company's forest management practices against a set



Chain of custody certification starts with forest management certification but then assesses the sawmill, factory, processor, and the end retailer to ensure that the product is trademarked and labeled correctly at every step; labeling helps inform customers and the public that the wood products they purchase and specify come from certified forests.

of standards. There are two consecutive paths: forest management certification and chain of custody (CoC) certification. Forest management certification examines whether a forestry operation meets a specified set of standards (CSA, FSC, SFI, or ATFS). It follows controlled wood and the supply chain. CoC certification starts with forest management certification but then assesses the sawmill, factory, processor, and the end retailer to ensure that the product is trademarked and labeled correctly at every step. Labeling helps inform customers and the public that the wood products they purchase and specify come from certified forests. CoC certification can also track the amount of recycled or certified content in products, which is increasingly important with the proliferation of green building rating systems. CoC certification "verifies that certified material is identified or kept separate from non-certified or non-controlled material throughout production, from the forest to the end-user. To label an end-product as certified, both forest management certification and chain-of-custody certification are required."<sup>50</sup>

According to WoodWorks, "There are more than 480 million acres of third-party certified forests in the United States and Canada, representing over half of the world's certified forests." "While there are some differences between each certification program, all promote principles, criteria, and objectives based on sustainable forest management, including

reforestation, reasonable harvesting quotas, and protection of wildlife habitat, soils, water, and surrounding ecosystems."<sup>51</sup>

### TENETS OF SUSTAINABLE FORESTRY MANAGEMENT

Forest certification applies the highest standards, but all forests should be held within these basic ecological tenets of sustainable forestry management:<sup>52</sup>

- Forest managers must comply with all forestry laws that apply to them in the U.S. and Canada, and practice responsible forestry on their certified lands.
- Organizations must maintain sustainable yields, meaning the rate of forest growth must exceed harvest levels.
- Clearcuts cannot threaten the forests' ecological integrity. Instead, forest managers must enhance and maintain their long-term environmental benefits.
- Forest managers must maintain or restore the ecosystem of high conservation value forests.
- Forests should have a management plan that must be monitored and assessed, and forest managers must proactively engage and consult with local stakeholders.
- Forest organizations certified by one or more sets of sustainable forestry management standards must meet or exceed water quality laws and regulations. In addition, they must take measures to manage and protect wetlands and riparian zones on certified lands.
- They must also continually evaluate how forest activities impact biodiversity and habitats to improve the quality of habitats and protect endangered species.
- Highly hazardous chemicals are prohibited in sustainably managed forests.

There are also economic and social tenets that forest managers must follow, including community relations and workers' rights that protect them from illegal practices and ensure a safe work environment and fair labor practices.<sup>53</sup> The standards for forest management practices are reviewed regularly and evolve with changing expectations about what sustainable forest management entails. For example, the Sustainable Forestry Initiative 2015-2019 Forest Management Standard set out a



new objective to “recognize and respect Indigenous Peoples’ rights” not only on public land but also on private land. In addition, the standard has adopted the principles outlined in the United Nations Declaration for the Rights of Indigenous Peoples. “SFI-certified organizations are encouraged to communicate and collaborate with local Indigenous and Tribal groups to better understand their traditional practices with respect to forest management.”<sup>54</sup>

**IN NORTH AMERICA, GROWTH EXCEEDS REMOVALS**

The rate of deforestation in Canada and the U.S. has been virtually zero for many decades. In fact, “Responsible forest management in North America has resulted in more than 50 consecutive years of net forest growth that exceeds annual forest removals” despite increasing population and higher demand for wood products.<sup>55</sup> Compare this to other countries where deforestation is rampant and accounts for 17% of global greenhouse gas emissions. According to the *2007 State of the World’s Forests* report, “the world lost about 3 percent of its forest area from 1990 to 2005; but, in North America, total forest area remained virtually constant.”<sup>56</sup>

In 2011 the American Forest & Paper Association announced the greenhouse gas sustainability goal of reducing the industry’s emissions by 15%, which was increased to 20% when that initial goal was reached. By 2020, the industry had achieved a 23.2% reduction

in greenhouse gas emissions from the 2005 baseline. This reduction was accomplished by optimizing the industry’s manufacturing processes, which included “maximizing efficient use of resources including fiber, reusing water and pulping chemicals multiple times, utilizing manufacturing residuals and byproducts to produce carbon-neutral biomass energy, and optimizing the use of non-renewable resources.” Recycling, recovering, and repurposing wood and paper products is another critical environmental goal of the industry, as is increasing the amount of fiber sourced from certified forests and certified fiber sourcing programs.<sup>57</sup>

The fact is, “when forest owners are confident they will have a market for their wood, they are more likely to invest in practices that prevent disease and infestation and in regular maintenance that reduces the risk of wildfire and other natural disturbances, as well as to replant more trees.”<sup>58</sup> This is what consumers are increasingly demanding, and the industry is well-poised to deliver.

**MAINTAINING SPECIES DIVERSITY**

Forests that maintain a high diversity of tree species and densities, and a mix of forest habitats, increase the number of ecological niches and species that live in them. This helps preserve the biodiversity of ecosystems worldwide. Sustainable and renewable coastal softwood species in North America help to maintain diverse forests and include western red cedar, yellow cedar, western hemlock (hem-



Sustainable and renewable coastal softwood species in North America help to maintain diverse forests and include western red cedar, yellow cedar, western hemlock (hem-fir), and Douglas fir.

fir), and Douglas fir.<sup>59</sup> These species have similar performance characteristics and applications in the building industry. For example, they can be used for timbers; framing; siding; shingles; outdoor structures such as decking and pergolas; or interior applications such as ceilings, paneling, and feature walls. They are also used as laminating stock to manufacture structural glulam beams and timbers.<sup>60</sup>

By law, North American forests must be reforested immediately using a mix of native tree species, which protects vital ecosystems and biodiversity when combined with natural regeneration and proper management of indigenous flora and fauna. Softwood forests are sustainably managed according to a 250-year cycle.

**Species Characteristics and Applications**

North American softwood species come from conifer trees and have needle-shaped foliage instead of the leaves found on hardwood trees. Softwood lumber is highly versatile and beautiful, making it ideal for structural applications and exterior and interior projects where aesthetics take precedent.<sup>61</sup>

**Western red cedar**

Western red cedar does not require chemical treatment because it is naturally resistant to decay and insect damage. Its superior durability, aesthetic beauty, and dimensional stability make it an excellent choice for exterior applications in residential or commercial projects. In addition, western red cedar is often used for reforestation due to its insect resistance and tolerance to shade, flooding, and a wide variety of soils.<sup>62</sup>



When forest owners are confident they will have a market for their wood, they are more likely to invest in practices that prevent disease and infestation and in regular maintenance that reduces the risk of wildfire and other natural disturbances, as well as to replant more trees.



### Yellow cedar

Yellow cedar is one of the slowest-growing conifers, with closely packed growth rings and little distinction between earlywood and latewood rings; this results in a fine texture; dense, uniform yellow color; and lack of visible grain. Yellow cedar has exceptional longevity and is one of the world's most durable woods. Because it is considerably harder when dry than most commercial softwoods, yellow cedar is exceptionally strong.

### Hem-fir

Hem-fir, also called Pacific Coast hemlock, is a combination of **western hemlock** and the true firs such as **noble, California red, grand, Pacific silver, and white fir**. It is the most abundant tree species on the coast of B.C. Hem-fir is one of the most desirable western softwoods for those seeking wood with a very light color. It has a vast range of uses because of its good strength-to-weight ratio and even density, which gives it excellent working qualities.<sup>63</sup>

### Douglas fir

Douglas fir is a very large tree, reaching 85 meters in height on B.C.'s coast, with the oldest trees surviving more than 1,500 years.<sup>64</sup> Douglas fir has the highest modulus of elasticity (stiffness) of all North American softwoods and the highest ratings of any western softwood for strength, including fiber stress in bending, horizontal shear, tension parallel to grain, compression parallel to grain, and compression perpendicular to grain. This species is one of the finest timbers for heavy structural purposes.<sup>65</sup>

## CONSIDERING WOOD AS A REPLACEMENT MATERIAL

Steel, concrete, and brick have many valuable properties and are widely used in most building projects today, but they are energy-intensive to create, accounting for around 16% of the entire planet's fossil fuel production.<sup>66</sup> If we take into account transport and assembly, this number increases to 20–30%.<sup>67</sup> Building with wood, on the other hand, consumes much less energy than using concrete or steel. This is partly because "While the concrete and steel industries are primarily powered by fossil fuels, many lumber companies use woody



Building with wood consumes much less energy than using concrete or steel.

biomass (e.g., sawmill residues such as bark and sawdust) to fuel their operations."<sup>68</sup>

Research conducted by the *Journal of Sustainable Forestry* in 2014 estimated that "the world's forests contain about 385 billion cubic meters of wood, with an additional 17 billion cubic meters growing each year. A mere 3.4 billion cubic meters is harvested each year [globally], mostly for subsistence fuel burning; the rest rots, burns in fires, or adds to forests' density."<sup>69</sup> This 3.4 billion cubic meters accounts for only 20% of new annual growth. Additional positive environmental effects would result if the wood harvest were increased to 34% or more. Creating less steel and concrete, and building with wood instead, would avoid 14–31% of global CO<sub>2</sub> emissions because carbon is stored in the cell structure of wood products. In addition, constructing with wood, rather than concrete or steel, uses much less energy. For example, "A wooden floor beam requires 80 megajoules (mj) of energy per square meter of floor space and emits 4kg CO<sub>2</sub>. By comparison, a square metre of floor space supported by a steel beam requires 516 mj and emits 40 kg of CO<sub>2</sub>, and a concrete slab floor requires 290 mj and emits 27kg of CO<sub>2</sub>."<sup>70</sup>

The *Journal of Sustainable Forestry* study was undertaken by scientists from the Yale School of Forestry & Environmental Studies

and the University of Washington's College of the Environment. They evaluated various scenarios, including leaving forests unharvested; burning wood for energy; and using wood as a construction material rather than steel, concrete, or brick. Researchers found that "By using efficient harvesting and production techniques, more CO<sub>2</sub> is saved through the avoided emissions, materials, and wood energy than is lost from the harvested forest – yet another reason to appreciate forests and to protect them from endless deforestation for agriculture. Clearing trees for harvest is temporary, but converting forests to farmland is a permanent loss of all forest's resources and biodiversity."<sup>71</sup> Harvesting wood while intentionally preserving the biodiversity of forests reduces the chance of catastrophic wildfires and improves a forest's ability to withstand fire, saves fossil fuel and CO<sub>2</sub> emissions, and provides employment for local communities.<sup>72</sup>

## CONCLUSION

More attention is being paid than ever before to how buildings impact the environment, including the choice of materials used in construction and how those materials help conserve energy during operation. This course has examined why material choice matters when it comes to designing a sustainable built environment, which includes wood and the forests from where it's sourced. We have explored the ways North American foresters manage growth and harvest, learning that fortunately, North American forests are managed exceptionally well and can therefore handle increased consumption. This includes softwood species such as western red cedar, yellow cedar, hem-fir, and Douglas fir, which are natural, renewable, and sustainable building material options with a lighter carbon footprint than some alternative building materials. ■

## ABOUT THE WRITER

Paige Lozier is an experienced writer of digital and print publications, primarily within the design and construction industries. She received a Bachelor's degree in Interior Design and a Master's degree in Historic Preservation from the University of Georgia. She provided subject-matter expertise for the content written in this course.

## RESOURCES

- <sup>1</sup> <https://theconversation.com/swap-steel-concrete-and-brick-for-wood-wooden-buildings-are-cheaper-and-cleaner-25694>
- <sup>2</sup> <https://www.woodworks.org/wp-content/uploads/IS-Forestry.pdf>
- <sup>3</sup> <https://www.usda.gov/media/blog/2019/04/22/state-forest>
- <sup>4</sup> <https://www.woodworks.org/wp-content/uploads/IS-Forestry.pdf>
- <sup>5</sup> State of America's Forests, M. Alvarez, 2007, Society of American Foresters
- <sup>6</sup> Natural Resources Canada, <http://canadaforests.nrcan.gc.ca/article/publicownership>; Forest Products Association of Canada, [www.fpac.ca](http://www.fpac.ca)
- <sup>7</sup> <https://cfs.nrcan.gc.ca/terms/read/989>
- <sup>8</sup> Gilani, Haris R. and Innes, John L. (2020, Mar. 13). "The State of British Columbia's Forests: A Global Comparison." Retrieved from <https://www.mdpi.com/1999-4907/11/3/316>
- <sup>9</sup> Gilani, Haris R. and Innes, John L. (2020, Mar. 13). "The State of British Columbia's Forests: A Global Comparison." Retrieved from <https://www.mdpi.com/1999-4907/11/3/316>
- <sup>10</sup> <https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/stewardship/old-growth-forests/strategic-review-20200430.pdf>
- <sup>11</sup> <https://www.for.gov.bc.ca/hfd/pubs/docs/mr/mr112/page14.htm>
- <sup>12</sup> <https://www.timescolonist.com/opinion/op-ed/comment-b-c-s-forests-deserve-facts-not-fabrications-1.24351478>
- <sup>13</sup> <https://www.reuters.com/business/environment/fairy-creek-blockades-dispute-over-logging-canadas-old-growth-forests-2021-06-06/>
- <sup>14</sup> <https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/stewardship/old-growth-forests/strategic-review-20200430.pdf>
- <sup>15</sup> <https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/stewardship/old-growth-forests/strategic-review-20200430.pdf>
- <sup>16</sup> <https://www.reuters.com/business/environment/fairy-creek-blockades-dispute-over-logging-canadas-old-growth-forests-2021-06-06/>
- <sup>17</sup> <https://www.timescolonist.com/opinion/op-ed/comment-b-c-s-forests-deserve-facts-not-fabrications-1.24351478>
- <sup>18</sup> <https://www.reuters.com/business/environment/fairy-creek-blockades-dispute-over-logging-canadas-old-growth-forests-2021-06-06/>
- <sup>19</sup> [https://www.naturallywood.com/wp-content/uploads/old-growth-forests-in-bc\\_factsheet\\_naturallywood.pdf](https://www.naturallywood.com/wp-content/uploads/old-growth-forests-in-bc_factsheet_naturallywood.pdf)
- <sup>20</sup> <https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/old-growth-forests>
- <sup>21</sup> <https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/old-growth-forests/old-growth-values>
- <sup>22</sup> <https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/old-growth-forests/old-growth-values>
- <sup>23</sup> <https://forest-atlas.fs.fed.us/benefits-forest-industry.html>
- <sup>24</sup> <https://www.fs.fed.us/research/forest-products/>
- <sup>25</sup> <https://www.fs.fed.us/research/forest-products/>
- <sup>26</sup> <https://www.fas.usda.gov/data/money-does-grow-trees-us-forest-product-exports-set-record>
- <sup>27</sup> <https://www.fas.usda.gov/data/money-does-grow-trees-us-forest-product-exports-set-record>
- <sup>28</sup> <https://www.fas.usda.gov/data/money-does-grow-trees-us-forest-product-exports-set-record>
- <sup>29</sup> <https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/old-growth-forests/old-growth-values>
- <sup>30</sup> <https://www.forestryforthefuture.ca/capturing-carbon>
- <sup>31</sup> [https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/nrs-climate-change/mitigation/forest-carbon-initiative/module\\_1\\_forest\\_carbon\\_modelling\\_reporting\\_web.pdf](https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/nrs-climate-change/mitigation/forest-carbon-initiative/module_1_forest_carbon_modelling_reporting_web.pdf)
- <sup>32</sup> <https://www.forestryforthefuture.ca/getting-to-net-zero>
- <sup>33</sup> <https://www.architecturalrecord.com/articles/7277-sandy-high-school#:~:text=Trail%20School%20District-,Architect%3A,%E2%80%93IBI%20Group%20Architects%2C%20Inc.>
- <sup>34</sup> <https://www.forestryforthefuture.ca/capturing-carbon>
- <sup>35</sup> <https://www.awc.org/sustainability/facts>
- <sup>36</sup> <https://www.awc.org/sustainability/facts>
- <sup>37</sup> <https://www.fws.gov/international/laws-treaties-agreements/us-conservation-laws/lacey-act.html#:~:text=Under%20the%20Lacey%20Act%2C%20it,sold%20in%20violation%20of%20State>
- <sup>38</sup> <https://www.forestryforthefuture.ca/sustainable-forestry>
- <sup>39</sup> <https://www.naturallywood.com/topics/forest-certification-in-british-columbia/>
- <sup>40</sup> <https://www.naturallywood.com/topics/forest-certification-in-british-columbia/>
- <sup>41</sup> <https://fsc.org/en/newsfeed/the-global-volume-and-market-share-of-fsc-certified-timber>
- <sup>42</sup> <https://www.csasfmforests.ca/>
- <sup>43</sup> [https://www.csasfmforests.ca/docs/csa\\_group\\_sustainable\\_forest\\_management\\_profile\\_dec\\_2013635222722591220745.pdf](https://www.csasfmforests.ca/docs/csa_group_sustainable_forest_management_profile_dec_2013635222722591220745.pdf)
- <sup>44</sup> <https://fsc.org/en>
- <sup>45</sup> <https://www.forests.org/forestmanagementstandard/>
- <sup>46</sup> [http://www.wasfi.org/Landowner\\_Brochure\\_WA\\_Update\\_2018.pdf](http://www.wasfi.org/Landowner_Brochure_WA_Update_2018.pdf)
- <sup>47</sup> <https://www.forestfoundation.org/american-tree-farm-system>
- <sup>48</sup> [http://www.wasfi.org/Landowner\\_Brochure\\_WA\\_Update\\_2018.pdf](http://www.wasfi.org/Landowner_Brochure_WA_Update_2018.pdf)
- <sup>49</sup> [http://www.wasfi.org/Landowner\\_Brochure\\_WA\\_Update\\_2018.pdf](http://www.wasfi.org/Landowner_Brochure_WA_Update_2018.pdf)
- <sup>50</sup> <https://www.naturallywood.com/topics/forest-certification-in-british-columbia/>
- <sup>51</sup> <https://www.naturallywood.com/topics/forest-certification-in-british-columbia/>
- <sup>52</sup> <https://www.forests.org/forestmanagementstandard/>
- <sup>53</sup> <https://www.woodworks.org/wp-content/uploads/IS-Forestry.pdf>
- <sup>54</sup> <https://www.forests.org/forestmanagementstandard/>
- <sup>55</sup> Natural Resources Canada; USDA Forest Service
- <sup>56</sup> <https://www.woodworks.org/wp-content/uploads/IS-Forestry.pdf>
- <sup>57</sup> [https://www.afandpa.org/sites/default/files/2021-07/2020\\_AF-PA-Sustainability-Report.pdf](https://www.afandpa.org/sites/default/files/2021-07/2020_AF-PA-Sustainability-Report.pdf)
- <sup>58</sup> <https://nafoalliance.org/issues/working-forests/>
- <sup>59</sup> <https://www.thinkwood.com/softwood-species>
- <sup>60</sup> <https://www.thinkwood.com/softwood-species>
- <sup>61</sup> <https://www.thinkwood.com/softwood-species>
- <sup>62</sup> <https://ppo.puyallup.wsu.edu/plant-health-concerns/redcedar/>
- <sup>63</sup> <https://americansoftwoods.com/species-characteristics/hem-fir-species-group/>
- <sup>64</sup> <https://www.naturallywood.com/species/douglas-fir/>
- <sup>65</sup> <http://www.wvpa.org/western-lumber/species/douglas-fir>
- <sup>66</sup> <https://theconversation.com/swap-steel-concrete-and-brick-for-wood-wooden-buildings-are-cheaper-and-cleaner-25694>

<sup>67</sup> <https://theconversation.com/swap-steel-concrete-and-brick-for-wood-wooden-buildings-are-cheaper-and-cleaner-25694>

<sup>68</sup> <https://www.thinkwood.com/blog/made-environmental-impacts-comparison-wood-steel-concrete>

<sup>69</sup> Chadwick Dearing Oliver, Nedal T. Nassar, Bruce R. Lippke & James B. McCarter (2014) Carbon, Fossil Fuel, and Biodiversity Mitigation With Wood and Forests, *Journal of Sustainable Forestry*, 33:3, 248-275, DOI: 10.1080/10549811.2013.839386 (<https://doi.org/10.1080/10549811.2013.839386>)

<sup>70</sup> <https://theconversation.com/swap-steel-concrete-and-brick-for-wood-wooden-buildings-are-cheaper-and-cleaner-25694>

<sup>71</sup> <https://theconversation.com/swap-steel-concrete-and-brick-for-wood-wooden-buildings-are-cheaper-and-cleaner-25694>

<sup>72</sup> <https://theconversation.com/swap-steel-concrete-and-brick-for-wood-wooden-buildings-are-cheaper-and-cleaner-25694>

---