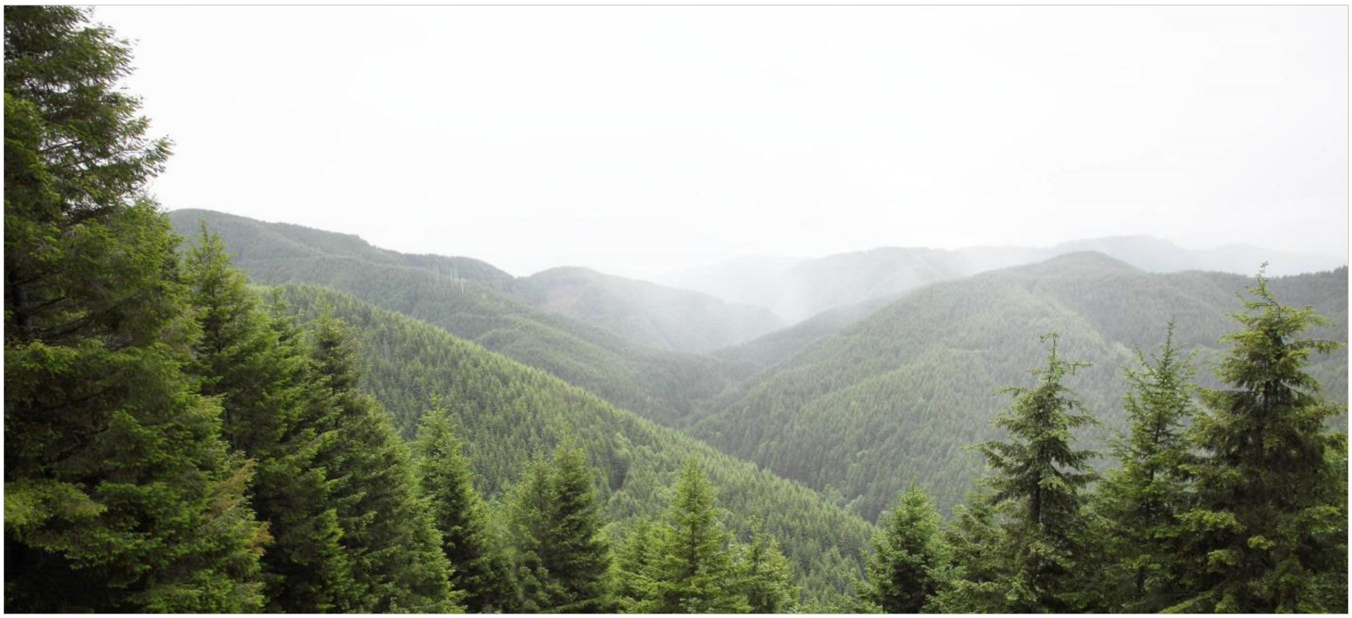
Weyerhaeuser's Carbon Record
METHODOLOGY

Version 1 | September 2021



KEY POINTS

Our net impact is signficantly "carbon negative"

Our forests store billions of tons of carbon dioxide equivalents

We have a science-based greenhouse gas emission reduction target in line with limiting global warming to 1.5˚ C

We are on the pathway to net-zero emissions by 2050

Our *Carbon Record* is leading our sector in disclosure and methodology

We welcome others to join us in building a consistent and credible approach across the world

CONTENTS

INTRODUCTION

The world is facing enormous disruptions from climate change, which is affecting everything from how we do business to our own well-being and the health of ecosystems around the planet. With the recent publication of the IPCC's sixth assessment report on the physical science of climate change, it is crystal clear that immediate decarbonization is necessary to achieve net-zero emissions by 2050, and to limit warming to 1.5 degrees Celsius above pre-industrial levels[i]. We produced our *Carbon Record* to improve global understanding of the role working forests play in helping to achieve these critical and ambitious goals.

We help mitigate climate change by sequestering and storing carbon in our forests and wood products. Both of these innate technologies are essential natural climate solutions that can help the world achieve net-zero emissions. Guidance for accounting and reporting the impact of these solutions — and how to measure all the ways carbon moves through our business and supply chain — is under development[ii]. Our *Carbon Record* is a step forward in the ongoing endeavor to measure the climate impact of working forests and the products these forests provide. ***We are excited to share the first version of our methodology and welcome others to join us in building a consistent and credible approach across the world.***

The "Emissions" section contains calculations and results that are comparable and consistent with a typical corporate greenhouse gas (GHG) inventory disclosure. We have high confidence in our data and methodology for Scopes 1 and 2, since we have been disclosing these values for more than 20 years; therefore, we are only including limited content in this document related to these Scopes. However, since this is the first year we are reporting on Scope 3 emissions, we are dedicating more content to these emissions in order to provide transparency in our calculations, assumptions and methodology. We will update our methodology as we improve the completeness, accuracy and reliability of our Scope 3 inventory. ***We invite our supply- and value-chain partners to help us drive sector-wide engagement and progress on reducing GHG emissions.***

The "Removals" and "Storage" sections are new reporting areas for our company, as well as emerging areas of focus for our sector and the global conversation around GHG accounting and natural climate solutions. Our *Carbon Record* is both evidence of our significantly carbon negative net impact and our viewpoint and rationale for how we can accurately account for the carbon dioxide removal and storage potential of forests and wood products. As we publish this, we are simultaneously working with international collaborators as part of the Greenhouse Gas Protocol's Guidance on Carbon Removals and Land Use to standardize the reporting and calculation methodology of carbon removals. We will pilot the guidance when it is made available in 2022 and update our calculations and reporting to align with the final protocol guidance. ***We invite our industry and global colleagues to read through our*** **Carbon Record** ***and work collaboratively with us to improve and maximize the potential for natural climate solutions to help mitigate climate change.***

The "Target" section describes our newly set science-based greenhouse gas emissions target, in line with limiting global warming to 1.5 degrees Celsius, the highest level of ambition put forth by the Science-Based Targets initiative (SBTi). We submitted our target to SBTi for approval and we expect to receive formal approval later this year, when we will release an expanded edition of our *Carbon Record*.

KEY TERMS

Here are a few important terms we reference in our *Carbon Record*:

$mtCO_2e$: Metric tons of carbon dioxide equivalent. The atmospheric impact of a greenhouse gas standardized to one unit of CO_2, based on the global warming potential of the gas.

Carbon negative: A state in which the value chain of a company removes more carbon dioxide each year than is emitted.

Net-zero emissions: A state in which the value chain of a company results in no net accumulation of carbon dioxide in the atmosphere. Over the long-term, a net-zero goal implies that emissions reductions are consistent with limiting warming to 1.5 degrees C and that any remaining emissions that are unfeasible to be eliminated are neutralized by removing an equivalent amount of carbon dioxide from the atmosphere[iii].

Radiative forcing: The influence a given greenhouse gas has on the amount of downward-directed energy warming the Earth's surface. The relative forcing effect of different greenhouse gases is compared to CO_2 as a reference, which can be combined into a single unit of CO_2 equivalent, or CO_2e.

Carbon pool: A reservoir or medium where carbon is stored. Carbon pools include geologic carbon pools; land-based carbon pools, such as our forests; and product carbon pools, such as our harvested wood products.

Carbon storage: The maintenance of a greenhouse gas or its constituent elements in a carbon pool.

Emission: The release of a greenhouse gas into the atmosphere. This includes the transfer of a greenhouse gas from a carbon pool, such as harvested wood products, into the atmosphere.

Carbon removal: The transfer of a greenhouse gas from the atmosphere to storage within a carbon pool.

Sequestration: The active process of removing CO_2 from the atmosphere through photosynthesis. After CO_2 is sequestered, it is stored in trees and plants as carbon.

Static accounting: Measuring carbon removal annually and reporting any future reversal when it occurs.

Dynamic accounting: Measuring carbon removal based on the longevity of carbon storage.

Value chain: The full range of activities involved with producing goods and services, starting with raw materials and ending with a delivered and useful product.

1. EMISSIONS

We follow the Greenhouse Gas Protocol's Corporate Accounting and Reporting Standard and Corporate Value Chain (Scope 3) Accounting and Reporting Standard, co-published by the World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD), to calculate our annual greenhouse gas emission inventory. We account for and report GHG emissions — direct emissions (Scope 1), emissions from purchased energy (Scope 2) and, new this year, value-chain emissions (Scope 3) — according to the equity-share approach, meaning we account for emissions in accordance with our equity in any operation.

Table 1: Annual Scope 1, 2 and 3 Emissions

Absolute emissions	**2020 Amount** in metric tons of carbon dioxide equivalent ($mtCO_2e$)
Scope 1: Direct emissions	380,000
Scope 2: Indirect emissions from purchased energy	640,000
Total Scope 1 and 2	1,020,000
Scope 3: Upstream and downstream products and services	6,100,000
Total Scope 1, 2 and 3	7,120,000
Carbon dioxide emissions from biologically sequestered carbon[1]	2,460,000

Spoiler alert: In section 2 "Removals" we show that we removed 32,000,000 $mtCO_2e$ in 2020, so our operations are significantly carbon negative.

We collect and summarize GHG emissions data annually from our Wood Products business at the mill level and our Timberlands business at the area (sub-regional) level. Data collected from our wood products mills include fuel use, energy use and production data. Data collected from our Timberlands areas include fuel used in company-owned or -controlled machines and fertilizer application within our operations. This information is primarily measured data (e.g., read from a natural gas meter or utility bill), with some portion of the data calculated (e.g., converted from short tons to metric tons), and some portion estimated (e.g., utilizing standard forest product conversion factors, such as the conversion from air dry to bone dry). We have stringent quality-assurance and quality-control procedures to maintain highly accurate and dependable environmental data.

We utilize a 2 percent de minimis threshold for individual sources of greenhouse gases. We apply this threshold separately for Scopes 1 and 2 combined versus Scope 3. For Scopes 1 and 2, this equates to sources of emissions less than or equal to 20,000 $mtCO_2e$; for Scope 3, any single category less than 120,000 $mtCO_2e$ is considered de minimis.

Our GHG inventory includes carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) emissions. We do not include perfluorocarbons (PFCs) or sulfur hexafluoride (SF_6) in our GHG inventory because our operations do not result in the release of these GHGs. We do not include hydrofluorocarbons (HFCs) because although we own and operate facilities with air conditioning units, they release an insignificant amount of HFCs that are much less than the 2 percent de minimis threshold for our Scope 1 and 2 inventory.

[1] See "Emissions from biologically sequestered carbon" at the end of this section for details about how we account for renewable biomass energy generation at our mills, and why we reported these carbon dioxide emissions separately from the Scopes.

Scope 1: Direct emissions

In 2020 our Scope 1 emissions were 380,000 mtCO_2e.

Scope 1 emissions are direct GHG emissions resulting from sources that we own or control, including:

- Fossil fuel combustion from stationary sources at our mills and company-owned mobile equipment at our mills and in our timberlands.
- Biomass combustion processes at our mills. Although CO_2 emissions from biomass combustion are considered carbon neutral per the GHG Protocol and are reported separately for transparency purposes only[2], we measure our mills' biomass combustion to account for CH_4 (methane) and N_2O (nitrous oxide) emissions.
- Fertilizer application. We follow IPCC guidelines to calculate the CO_2 equivalent of the N_2O emissions associated with the use of fertilizer in our forests.
- We do not include emissions from our distribution centers since they are de minimis for Scope 1 emissions. See description of Scope 3 emissions for relevance to upstream and downstream transportation.

Figure 1: Scope 1 Activities

Scope 2: Indirect emissions from purchased energy

In 2020 our Scope 2 emissions were 640,000 mtCO_2e.

Scope 2 emissions are indirect GHG emissions that are a consequence of our operations but occur at sources owned or controlled by another energy producer. Our Scope 2 emissions include:

- Electricity purchased from regional electrical power suppliers. We use the EPA's Emissions and Generation Resource Integrated Database (eGRID) to determine both market-based and location-based indirect emissions. We do not currently account for Renewable Energy Credits (RECs) or Power Purchase Agreements (PPAs) in our inventory and so both methods of calculating Scope 2 emissions result in the same number of emissions. We multiply the quantity of purchased electricity by the appropriate eGRID (or Canadian equivalent) emission factor to yield annual Scope 2 emissions.
- Steam purchased from a non-Weyerhaeuser facility.

[2] See the section "Emissions from biologically sequestered carbon" for more details.

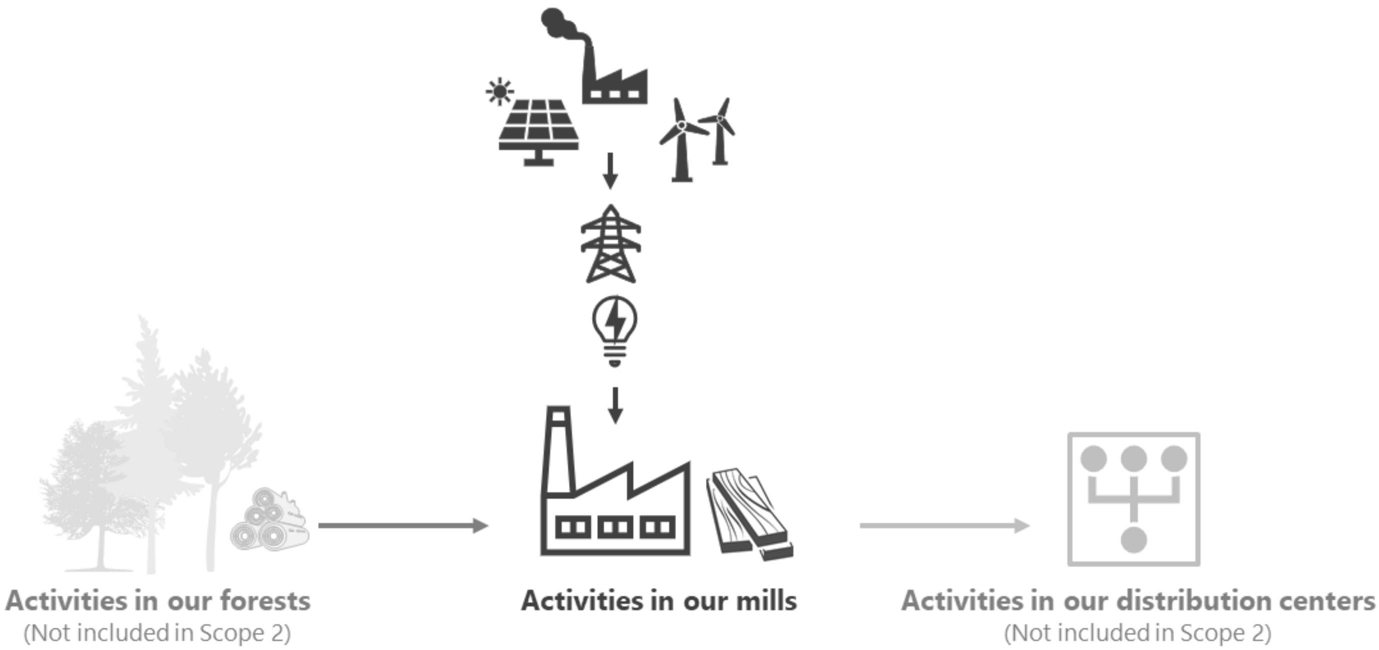


Figure 2: Scope 2 Activities

Scope 3: Upstream and downstream products and services

In 2020 our Scope 3 emissions were 6.1 million mtCO_2e[3].

Scope 3, or value chain, emissions include all indirect emissions not included in Scope 2. Our value chain includes both upstream activities (our suppliers) and downstream activities (our customers and end-users). The GHG Protocol breaks Scope 3 into 15 categories and we calculate and include 5 significant categories in our inventory[4]:

Table 2: Breakdown of Scope 3 Emissions

Scope 3 emissions		**2020 Amount** in metric tons of carbon dioxide equivalent (mtCO_2e)	**Percent of Scope 3**
Category 1	Purchased goods and services	1,200,000	20%
Category 4	Upstream transportation and distribution	300,000	5%
Category 9	Downstream transportation and distribution	1,300,000	22%
Category 10	Processing of sold products	2,900,000	48%
Category 12	End-of-life treatment of sold products	300,000	5%

[3] Note that the categories do not sum to the 6.1 million total due to independent rounding.
[4] See the "Scope 3 screening" section for rationale behind the exclusion of insignificant or not applicable categories of Scope 3 emissions.

Scope 3 Inventory

We calculate our Scope 3 emissions using a mix of primary and secondary data. For each category, we indicate the calculation method we use (as defined by the GHG Protocol Scope 3 Standard), list the primary and secondary data sources we rely upon, and provide an indicator of the data quality. As defined by the Scope 3 Standard, we classify our data as "poor," "fair," "good," or "very good," with the goal of working with our value-chain partners to increase the amount of very good, supplier-based data we utilize in our calculations.

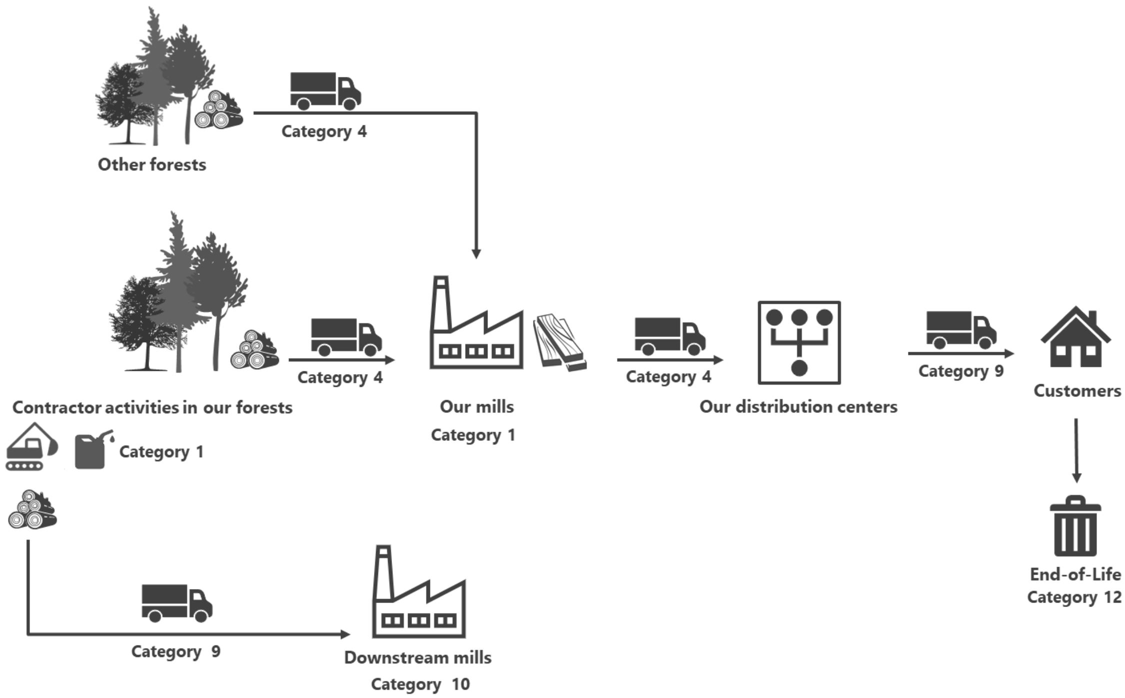


Figure 3: Scope 3 Activities

Category 1: Purchased goods and services.

1,200,000 mtCO_2e (20% of Scope 3)

We have three primary sources of category 1 emissions:

1. *Emissions associated with the wood raw material purchased by our mills from external landowners.* We purchase approximately 60 percent of the wood raw materials in our mills from third-party landowners, including a mix of small-forest landowners and other large timber companies, and lots in between. We estimate the emissions associated with forestry operations on these forestlands, such as the operation of heavy machinery, using life-cycle-assessment (LCA) data from the Forest Industry Carbon Assessment Tool (FICAT) developed by the National Council for Air and Stream Improvement (NCASI) and include them in our Scope 3 inventory.
2. *Emissions from forestry operations conducted by third-party contractors on our land.*[5] Forestry operations on our land are primarily conducted by third-party contractors. We estimate the emissions associated with these activities by applying emissions factors based on the weight of logs sold.

[5] Where our own logging and harvesting crews operate on our lands, the emissions associated with those operations are included in our Scope 1 inventory.

3. *Emissions associated with additional non-fiber, non-fuel raw materials used during the manufacturing of wood products at our mills.* The production of some of our wood products involves the addition of materials such as resins, waxes and glues. We include the upstream emissions associated with these materials in our inventory by applying emissions factors based on the amount of wood products we manufacture.

Primary data:

- Weight of logs purchased from external landowners, by region
- Weight of intersegment logs (logs from our forests that are sent to our mills) procured, by region
- Wood products production quantities, by product type

Secondary data:

- Emission factors from the Forest Industry Carbon Assessment Tool (FICAT)[iv] developed by NCASI for forestry operations based on region, species and product
- Emission factors from FICAT for additional non-fiber, non-fuel raw materials used in manufacturing

Calculation type: Average-data method[v]

Data quality: Fair

Category 4: Upstream transportation and distribution

300,000 mtCO_2e (5% of Scope 3)

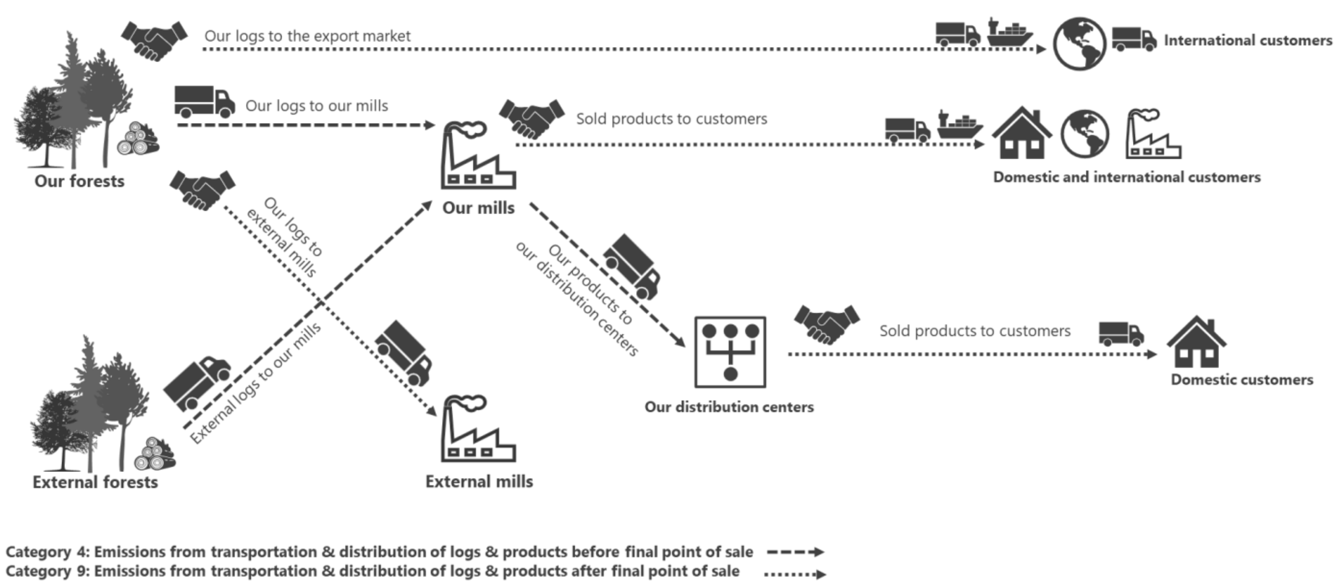


Figure 4: Scope 3, Categories 4 and 9 – Emissions Generated during the Transportation of Products

The emissions from the transportation of our logs *before* the final point of sale are included in our category 4 emissions. These include the emissions associated with the transportation of all logs (both logs from our forestlands and those sources externally) by our mills, as well as emissions from the transportation of products sent from our mills to our distribution centers (DCs). The method of transportation is via heavy-duty truck.

Primary data:

- Weight of logs procured by our mills, by region
- Distance traveled between forest and mill, by region
- Wood product production quantities
- Distance traveled between our mills and distribution centers

Secondary data:

- EPA emission factors for operation of heavy-duty trucks[vi]

Calculation type: Distance-based method[vii]

Data quality: Good

Category 9: Downstream transportation and distribution

1,300,000 mtCO_2e (22% of Scope 3)

The emissions from the transportation of our logs *after* the final point of sale are included in our category 9 emissions. These include transportation of the logs sent from our forests to external mills, byproducts sold by our mills for further use by others, products sent from our distribution centers to external customers, and the logs and finished wood products we export to international customers. We apply average distances at different scales for different product types, based on data we collect from our businesses and from publicly available estimates. For the logs we sell to external mills, we apply regional distances specific to our own operations. For byproducts and distribution sales, we apply a national distance specific to our own operations. For international markets, we apply a country-specific distance gathered from publicly available data.

Primary data:

- Weight of logs sold to external mills, by region
- Weight of byproducts sold by our mills
- Wood product production quantities
- Logs sold to international markets, by country
- Finished products sold to international markets, by country
- Distance traveled by logs sold to external mills, by region
- Distance traveled by byproducts sold from our mills
- Distance traveled between our distribution centers and end customers
- Method of transportation, by logs and finished products sold to international markets

Secondary data:

- EPA emission factors for operation of heavy-duty trucks and waterborne craft[viii]
- Distance traveled by logs and finished products sold to international markets, by country

Calculation type: Distance-based method

Data quality: Good

Category 10: Processing of sold products

2,900,000 mtCO_2e (48% of Scope 3)

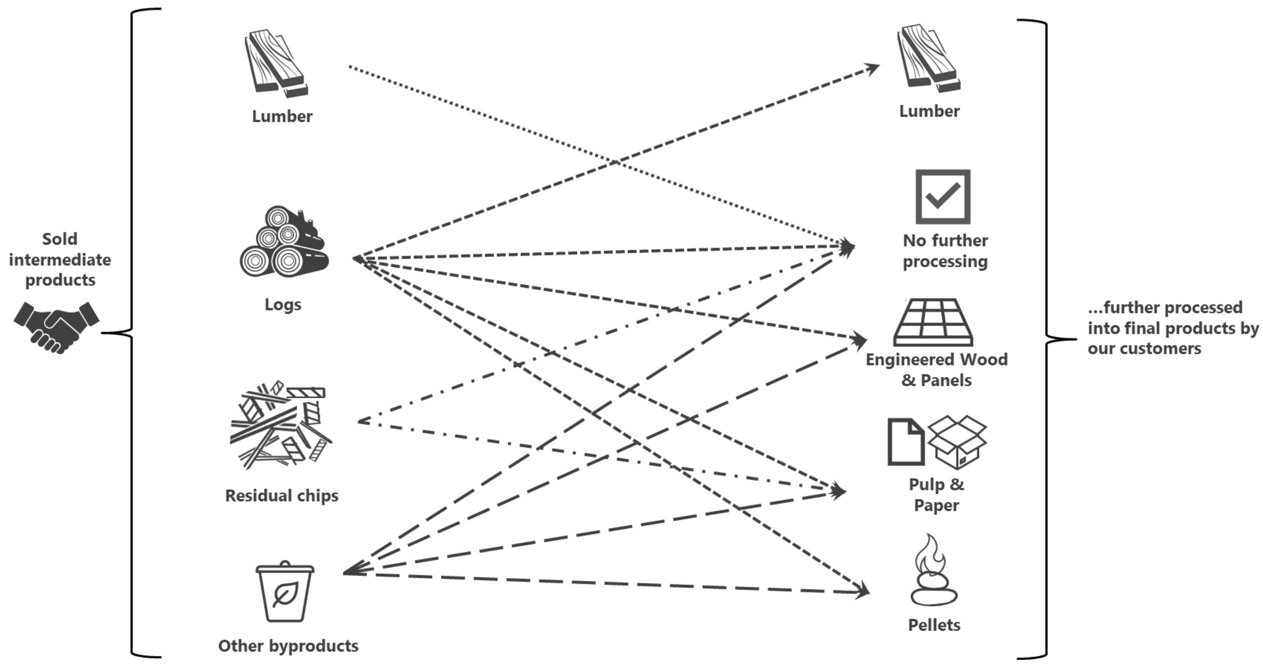


Figure 5: Scope 3, Category 10 – Emissions Generated in the Further Processing of Sold Products

Our largest category of Scope 3 are the emissions produced by the processing of our products, including lumber, logs, residual chips and other byproducts. To calculate category 10 emissions, we group our customers into five categories: (1) sawmills that produce untreated sawn timber (lumber), (2) mills that produce panels, including oriented strand board (OSB), medium-density fiberboard (MDF) or another engineered wood product (EWP), (3) pulp, paper and containerboard mills, (4) pellet mills and (5) mills or other customers that do not further process our products or whose processing of our products does not emit a GHG.

We determine the approximate proportion of each product we sell that goes to each customer category. We then calculate the category-specific emissions by applying yield factors (the material efficiency at which a mill turns raw material into a finished product) and emissions factors (the GHG emissions per unit of product) specific to each customer type.

Example calculation for emissions from logs sold to a paper mill (not actual data):

$$1. \, Logs\ sold\ (15{,}000{,}000\ metric\ tons)\ x\ Percent\ sold\ to\ paper\ mills\ (40\%) = 6{,}000{,}000\ mt$$

$$2. \, 6{,}000{,}000\ mt * dry\ weight\ of\ logs\ (50\%) * paper\ mill\ yield\ (50\%) * emissions\ factor\ \left(0.75 \frac{mt\ CO_2e}{mt\ production}\right) = 1{,}125{,}000\ mt\ CO_2e$$

More than 90 percent of our category 10 emissions come from processing the fiber we sell to pulp and paper mills. This category will be a primary focus for us moving forward as we look to reduce our Scope 3 emissions.

Primary data:

- Weight of logs sold to external mills, by region
- Weight of byproducts (including residual chips) sold by our mills
- Customer breakdown for log sales, by region
- Customer breakdown for byproducts sales, company-wide average

Secondary data:

- Yield rate for each category of customer[ix]
- Emissions factor for each category of customer (mix of internal and NCASI factors)

Calculation type: Average-data method[x]

Data quality: Good

Category 12: End-of-life treatment of sold products

300,000 mtCO_2e (5% of Scope 3)

We calculate the emissions associated with the end-of-life treatment of our products, category 12, using a combination of end-use statistics from the U.S. Forest Service[xi] (USFS) and emission factors from the EPA[xii]. For each type of product (lumber, OSB, MDF, etc.), data is available about the average fraction of each product that remains in use or is transferred to a landfill over 100 years. While a wood product remains in use, it retains the carbon stored in the original wood. In a landfill under anaerobic conditions, though the carbon continues to remain stored, there are methane emissions associated with the residence in the landfill, and these emissions are accounted for in category 12.

We also include the emissions associated with the fraction of products that are recycled or combusted within a 100-year timeframe. We use this timeframe to remain consistent with our storage calculations and because of the lack of reliable data beyond 100 years.

Primary data:

- Wood product production quantities

Secondary data:

- USFS end-use statistics of wood products
- EPA emissions factors for end-of-life treatment of sold products

Calculation type: Waste-type-specific method[xiii]

Data quality: Fair

Scope 3 Screening

We conducted a Scope 3 screening of our operations to determine the categories that should be included in our inventory. All emissions categories not included in our inventory are either insignificant (less than 120,000 mtCO_2e) or not applicable to our business. We provide a rationale for each excluded category below.

Category 2: Capital goods. In our wood products mills, we purchase new machines and/or upgrade equipment to increase production and safety, or to replace old equipment. However, based on independent LCA studies[xiv] [xv] [xvi] of wood products mills, capital goods are not a significant source of emissions. This conclusion is supported by an internal industry review of similar forestry and manufacturing companies (that is, companies that report Scope 3 emissions but do not report a significant number of category 2 emissions). As this exclusion is not based on primary data, we intend to revisit our assumptions in the future.

In addition, we do not own or operate most of the machinery used in our forests and so do not include those emissions in our category 2 calculations. If we were to increase the amount of company-owned or -operated machines, we would reevaluate this exclusion.

Category 3: Fuel- and energy-related activities not included in Scope 1 or 2. We determine these emissions based on the amount of fuel we consume in our operations, which is primarily natural gas with a small amount of gasoline and diesel as well. Using well-to-tank and transmission and distribution emissions factors from the EPA,[xvii] we calculate that these emissions total about 60,000 $mtCO_2e$, which is less than our Scope 3 inclusion threshold of 120,000 $mtCO_2e$.

Category 5: Waste generated in operations. The vast majority (99 percent) of the materials that have the potential to become waste in our operations are either recovered (burned for energy) or reused (shipped off-site for use in other products). In the case of recovery, we account for these emissions from biologically sequestered carbon separately from the scopes (see section 1's "Emissions from biologically sequestered carbon" below). In the case of reused products, these emissions are captured in category 10, which is included in our Scope 3 inventory. In total, we send less than 150,000 metric tons to landfills and recycling combined, which does not account for a significant source of emissions[xviii]. We do not have other significant sources of waste and so do not include this category in our Scope 3 inventory.

Category 6: Business travel. In 2017 we estimated the emissions associated with our business travel using purchase data from our travel department. Including air travel, mileage reimbursement (for miles driven in employee-owned vehicles for a business purpose) and rental car mileage, these emissions accounted for less than 10,000 $mtCO_2e$. We assumed that business travel did not significantly change in 2018 or 2019 and so did not collect data for these years. For this reason, and because business travel was severely restricted in 2020, this category was deemed insignificant and not included.

Category 7: Employee commuting. The first year we considered data for this calculation was 2020, and we have had difficulty gathering accurate data for this category during the COVID-19 pandemic. However, we estimate that even during normal business operations, this category would be insignificant: if all of our approximately 10,000 employees return to a regular daily commute to and from our offices, manufacturing sites and timberlands operations, each employee would have to drive more than 100 miles each day (more than six times the average commuting distance in the U.S.[xix]) for this category to approach significance. Calculations are based on EPA data for emissions from a typical passenger vehicle[xx].

Category 8: Upstream leased assets. This category is not relevant as we do not operate leased assets that are a significant source of emissions.

Category 11: Use of sold products. This category, as currently defined, is also not relevant to our company, as the wood products we sell do not generate additional emissions through their use or operation. However, we do include the carbon removals of our wood products within this category (for further discussion, see "carbon stored in our wood products" in section 2).

Category 13: Downstream leased assets. We lease our land for uses such as recreation, renewable energy development and a small amount of oil and gas operations. Emissions associated with the operation of the asset[xxi] (in this case, the land itself) are included in the calculation of net change of carbon in our forests (see "Scope 1:

Net change in our forests" on section 2 for more details) and so are not applicable to our Scope 3 emissions inventory. Additionally, the activities on the land we lease, such as recreation or the installation and operation of machinery, are not the asset that is leased and thus not included within our Scope 3 boundary.

Category 14: Franchises. This category is not relevant, as we do not operate franchises.

Category 15: Investments. This category is primarily designed for investors and financial services companies, thus it is not relevant to us.

Emissions from biologically sequestered carbon

In 2020 our emissions from biomass combustion were 2,460,000 mtCO_2e

Per the current GHG Protocol[xxii], we report direct CO_2 emissions associated with the combustion of biomass fuels, such as wood and wood waste, separately from the scopes. Note: the CH_4 and N_2O emissions associated with biomass combustion *is* included in our Scope 1 GHG emissions. Our biomass fuel is a mix of mill and forest residuals sourced from sustainably managed forests in regions where carbon stocks are stable or increasing[xxiii]. This means it is considered carbon-neutral, meaning the growth of trees in the region is more than harvest and mortality. See "Net change in the forests of our sourcing regions" on section 2 for details on the assertion of stable or increasing carbon stocks and how including removals in GHG reporting addresses how the carbon in the biomass originated from the atmosphere was sequestered in growing forests, and how the biomass is regrown after a harvest. This process is unique to the biogenic carbon cycle and thus warrants a different approach than other fuels. We use factors from the EPA to calculate emissions from biomass combustion[xxiv].

Primary Data:

- Energy generated from biomass combustion

Secondary Data:

- Emissions factors for stationary combustion of wood and wood residuals, *GHG Emission Factors Hub (April 2021)*

2. REMOVALS

Removals are the transfer (or flux) of carbon dioxide from the atmosphere to storage within a pool (i.e., negative emissions). The atmosphere experiences the same climate cooling effect whether there is a reduction in an emission or an increase in a removal, meaning that removals can be considered a counter to emissions. Removals are thus one piece of the complex set of solutions necessary to limit the catastrophic impacts of climate change.

At the time of this *Carbon Record*'s publication, there is no agreed-upon approach to calculating and reporting on removals. Our approach provides a scientifically supported basis for greenhouse gas management and enables transparent inventory accounting and reporting that gives stakeholders clarity regarding our overall GHG management, targets and performance. We offer our methodology as a case study for how an integrated forest and wood products company could include removals within a GHG inventory.

We start with the basic assertion that removals and emissions should both be reported by Scope. And to ensure removals are reported on an equal basis with emissions, it is important for removals reporting to accurately account for the time carbon or carbon dioxide is stored in the non-atmospheric carbon pool.

Since this is new and emerging methodology, we expect our removals values may change or need to be restated as the science and accounting criteria evolve.

Table 3: Annual Scope 1 and 3 Removals

Absolute Removals	**2020 Amount** in metric tons carbon dioxide equivalent (mtCO_2e)[6]
Land-based	
Scope 1: Net change in our forests	10,000,000
Scope 3 (category 1): Net change in the forests of our sourcing regions	4,000,000
Product-based	
Scope 3 (category 11): Stored in our wood products	11,000,000
Scope 3 (category 11): Stored in downstream wood products	7,000,000
Total Removals	**32,000,000**

There are two key carbon pools included in our removals reporting: land-based and product-based.

Land-based carbon: As forests grow, they remove carbon dioxide from the atmosphere through photosynthesis and store solid carbon in a variety of land-based carbon pools. We account for the net change[7] in carbon storage both in our own forests and in the forests of our sourcing regions.[8] We report the net change, rather than individual or gross changes, in forest carbon because this is an accurate representation of our overall impact on the concentration of atmospheric carbon dioxide. For land-based carbon pools, if the net change is a negative

[6] Removals are rounded to the nearest million metric tons.
[7] Net change includes carbon removals (additions to forest carbon stock) from tree growth as well as carbon emissions (reductions in forest carbon stock) from harvest and tree mortality.
[8] We report only *our allocation* of net change in our sourcing regions' forests, based on the wood and wood fiber we purchase from external lands. See section 2's "Net change in the forests of our sourcing regions" for more information on how we allocate net change.

number (meaning more carbon is released to the atmosphere than taken in), we would report it as an emission. As this is not the case for our forests or our sourcing regions' forests, we have included this value in section 2, "Removals."

Product-based carbon: When trees are harvested, carbon can be transferred from forests into the carbon pools of wood products, including primary products such as logs, and then converted into structural wood products, and pulp and paper products. We account for the removal associated with these wood products based on the duration of carbon storage in the product, using conservative, science-based estimates[9] of how long wood products retain carbon over 100 years to determine the radiative forcing (impact on global warming) of wood products. We calculate and report the carbon stored in the wood products we make, as well as those made by our log customers.

We only claim removals that can be both accurately measured and monitored for the reversal of removals over time. Reversals are the release of stored carbon dioxide from previously removed carbon, such as when a wood product decomposes, and releases stored carbon back into the atmosphere. Reversals can be monitored through measurement of carbon pools over time or through established decay rates for specific harvested wood products. When removals both occur in our direct operations *and* the pool of carbon remains under our ownership or control, we account for them in Scope 1. We account for removals that occur in our value chain *or* when the pool of carbon is sold to a third party in Scope 3. We use the decision chart below to categorize our reporting of removals.

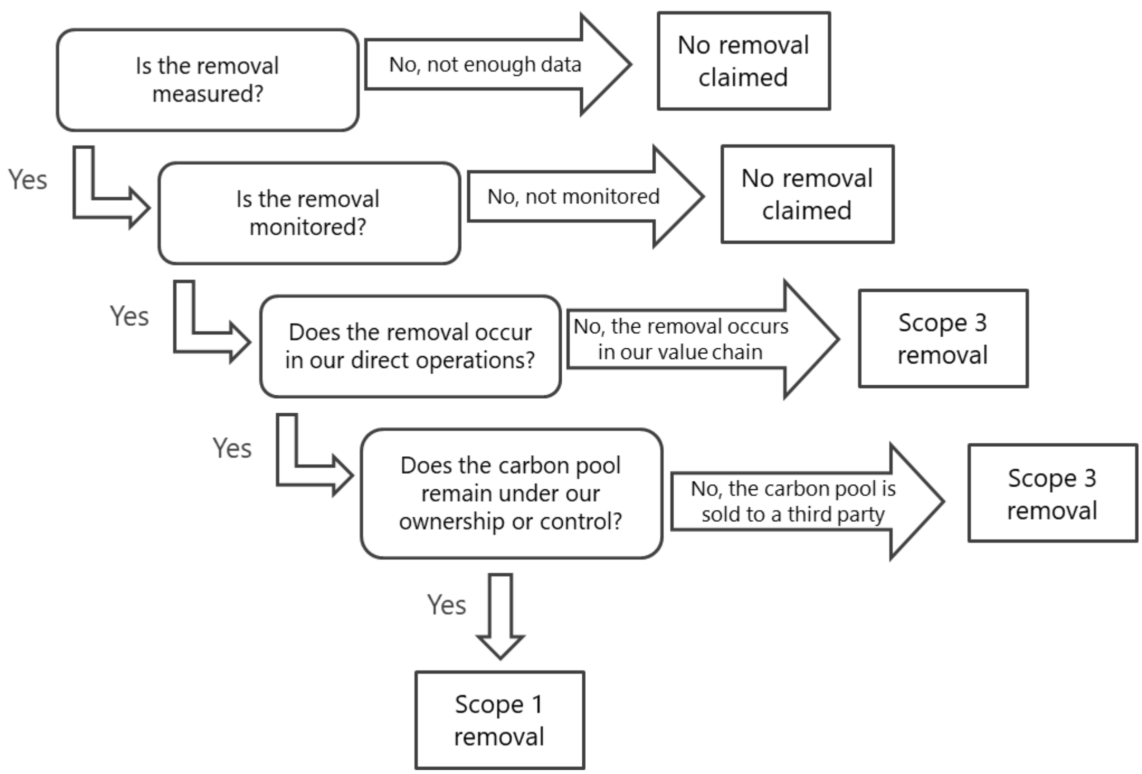


Figure 6: Categorization of Removals

[9] See section 2's "Stored in our wood products" for specifics.

Relevant carbon pools included in our removals calculations:

- **Aboveground biomass:** All living biomass above the soil, including stems, stumps, branches and foliage above 2.5 centimeters in diameter, as well as bark and seeds.
- **Harvested wood products:** Products made from harvested wood that are currently in use or reside in solid-waste-disposal sites.

Carbon pools[xxv] *not* included in our removals calculations[10]:

- **Understory biomass:** Shrubs and trees below 2.5 centimeters in diameter.
- **Belowground biomass:** All living root biomass of trees or understory plants that are thicker than 2 millimeters in diameter.
- **Dead wood:** Standing dead, down dead (lying on the forest floor) or dead wood in the soil.
- **Litter:** Leaves, needles, twigs and other dead biomass with a diameter less than 7.5 centimeters that are on the forest floor.
- **Soil**: All carbon-based material, measured to a depth of 1 meter, in both mineral (rocks) and organic (decomposed organic matter) soils

Rationale for the exclusion of certain land-based pools of carbon. We prioritize the most relevant carbon pools and highest-quality data sources to determine the net change in land-based carbon. We also employ a conservative approach to our selection of carbon pools: If the inclusion of a carbon pool with little flux or low data quality would skew our overall net change, we choose not to include that pool to avoid artificially inflating our results.

1. Much of the net change in forest carbon pools comes from changes in aboveground biomass: On average, based on 2018 data from the U.S. Forest Service,[xxvi] aboveground biomass accounts for about 70 percent of overall forest ecosystem flux, while 30 percent comes from the belowground biomass and dead wood. The remaining pools (litter and soil) contribute to less than 1 percent of the overall flux. While these amounts can vary based on tree species, age, location and management, accounting for the primary source of flux is our top consideration.
2. Including the other carbon pools, particularly soil carbon, would significantly increase the overall storage but would not significantly impact the overall flux. Based on the same 2018 USFS data, soil carbon represents about 40 to 55 percent of the total carbon storage in a forest. Aboveground biomass represents about 30 to 40 percent of total carbon storage, while the remaining pools comprise the final 10 to 20 percent. While it would be possible to include an estimate of these large pools of carbon in our removals calculations, we prioritize the pools most relevant to the *net* change in forest carbon.
3. Finally, compared to data for aboveground biomass, the reliability of data for the excluded pools is much lower. We have highly sophisticated inventory systems, measurement techniques and growth models that calculate the amount of standing timber (the stem, or bole, of a tree) on our land. We have teams and processes dedicated to accurately determining the amount of timber we own and manage at any given time. There are also well-developed species-specific relationships between the amount of standing timber in a forest and the amount of other aboveground vegetation, which includes branches, foliage and bark.[xxvii] While estimated relationships have been determined by external researchers between aboveground carbon pools and other pools, this is an evolving science that does not necessarily reflect the real-world conditions of a working forest. Incorporating these estimates into our calculations would significantly lower the overall confidence in our results.

[10] Although these pools are not included in our removals calculation, we do provide estimates of the carbon stored in these pools. See section 3 "Storage".

In summary, the combination of a lack of relevance (due to lower relative flux) and lower data quality (due to a reliance on estimation) for the belowground biomass, dead wood, litter and soil carbon pools are the key reasons why we include only the aboveground biomass carbon pool in our calculation of net change. We will reevaluate these exclusions annually and as the data and science expand in these areas.

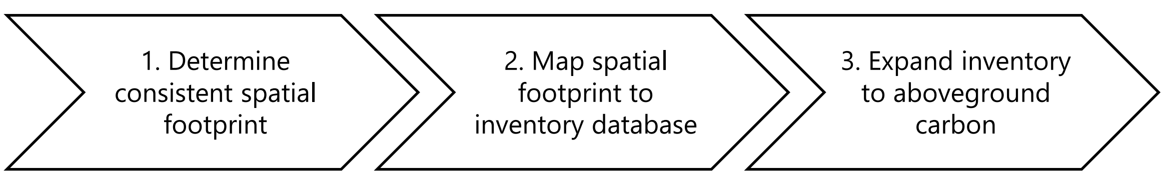
For each category of removals, we provide the same details as required by the Scope 3 Standard on emissions: our calculation methodology, assumptions, our primary and secondary data sources, and a classification of our data quality ("poor," "fair," "good" or "very good")

While there are alternative approaches for reporting removals, we believe that our approach provides the most accurate account of our GHG impact based on our activities each year.

Scope 1: Net change in our forests[11]

We report a Scope 1 removal for the flux in aboveground carbon in our forests using a consistent spatial boundary to compare year-over-year change. In 2020, the net change in carbon stored in our forests was a removal of 10 million metric tons carbon dioxide equivalent[12]. That is equivalent to taking more than 2 million cars off the road for one year.[xxviii] For reference, there are about 3 million registered vehicles in Washington state, the location of our company headquarters.

To calculate the carbon flux across our entire forest land base, we developed a rigorous — and novel — analysis that combines a technical understanding of tree growth, harvest activity, and fire and disease impacts with the ability to account for our shifting land base each year. The foundation of our analysis is our industry-leading inventory measurements, which rely on decades of experience combined with the latest scientific developments in remote sensing and LiDAR technology. Our expertise is our ability to determine, with a high degree of certainty, how much biomass is in our timberlands. Because our result is based on our inventory database — the same data we use for our harvest planning and inventory disclosure — our analysis is detailed and accurate, and we believe it exceeds the analytical rigor of our industry competitors. Our process can be described in three steps:



First, we determine a consistent spatial footprint to account for any land acquisitions and divestures that have taken place during the year, as well as any boundary adjustments in our spatial database. These can range from large transactions of more than 100,000 acres to smaller transactions of less than 10 acres. Regardless of size, our process compares land across a consistent spatial boundary so that the resulting flux is not influenced by the addition or subtraction of carbon due to land ownership change. We compare land ownership at the stand level at the end of each calendar year to determine a consistent spatial footprint. The table and images below illustrate one example.

[11] We use the existing Scope framework to account for our carbon removals. However, the wording of each Scope (i.e., net change in our forests) is our own.

[12] Based on approximately 10,600,000 acres of land we owned at the end of both 2019 and 2020.

Table 4: Spatial Footprint Logic

	Owned at 2019 year-end	Owned at 2020 year-end	Included in 2020 year-end spatial footprint?
Tract 2	Yes	No	**No**
Tract 1, stand 1	Yes	Yes	**Yes**
Tract 1, stand 2	Yes	Yes, with some area moved to 2020's stand 3	**Yes**
Tract 1, stand 3	Yes	Yes, with additional area from 2019's stands 2, 4 and 5	**Yes**
Tract 1, stand 4	Yes	Partially, with some area moved to 2020's stand 3	**Yes**, but only the portion owned in both years
Tract 1, stand 5	Yes	Yes, but included in 2020's stand 3	**Yes**
Tract 1, stand 6	Yes	Yes	**Yes**
Tract 1, stand 7	Yes	Yes	**Yes**
Tract 1, stand 8	Yes, but included in 2019's stand 3	Yes	**Yes**

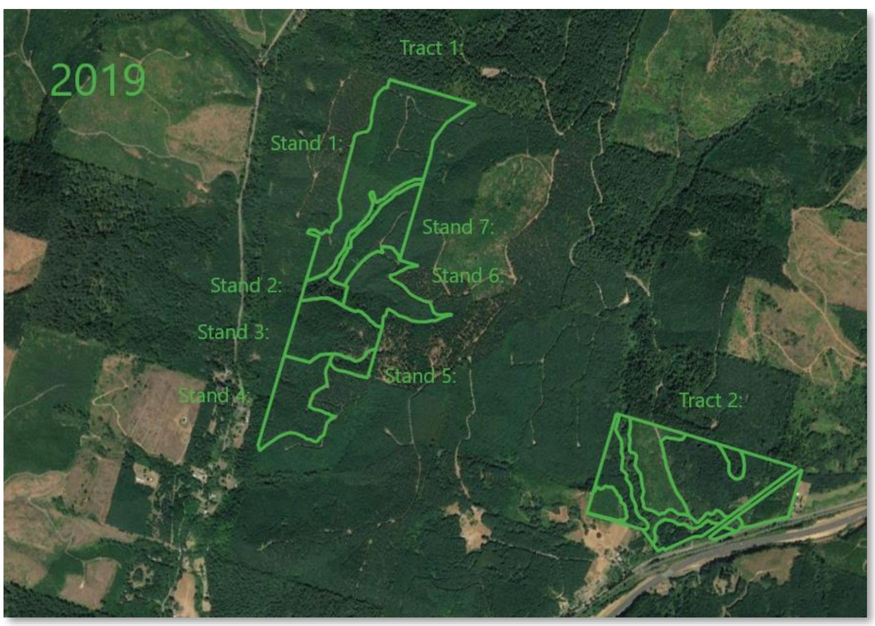


Figure 6: 2019 ownership. The seven stands comprising tract 1 are labeled individually.

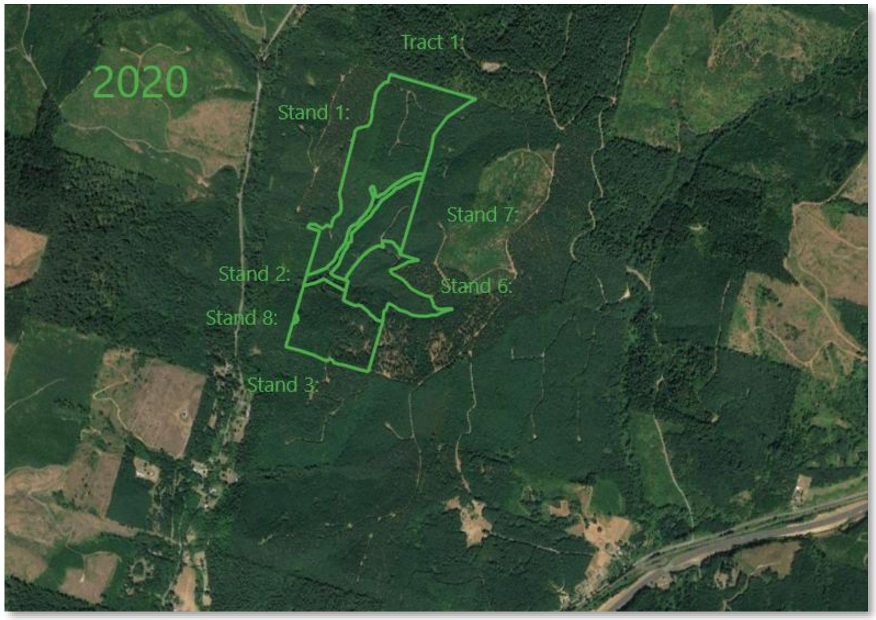


Figure 7: 2020 ownership. In 2020 we sold tract 2, so it is not included in the spatial footprint. Stands 1, 6 and 7 are owned in both years with the same acreage. They are included in the spatial footprint without change.

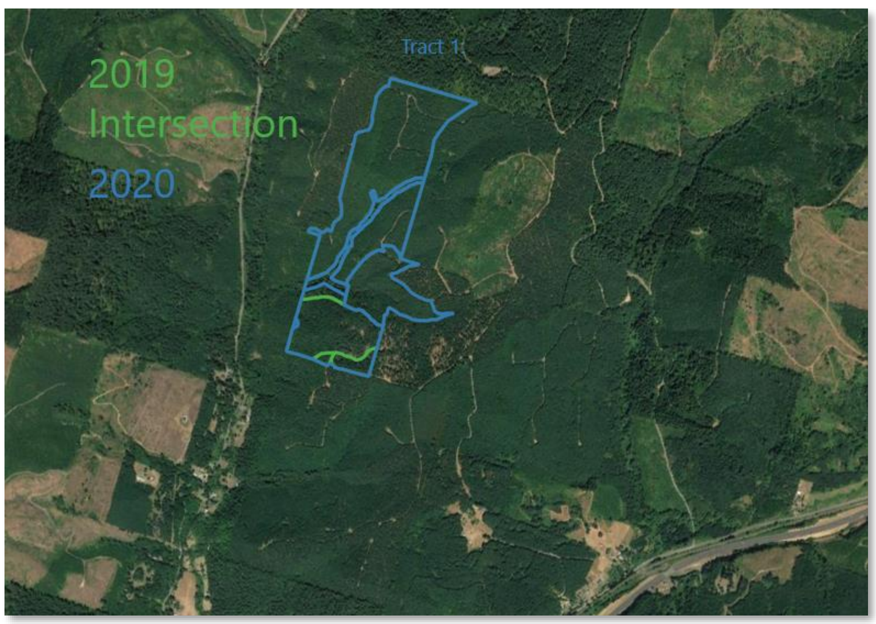


Figure 8: 2019 and 2020 overlay. In 2020 some acres were combined between tracts. The "new" stand 3 includes acres from the "old" stands 2, 4 and 5. Note that all acres in stands 2 and 5 remain owned, while a portion of stand 4 was sold. There is also a small addition of a new stand 8 in 2020 that was included within 2019's stand 3. All acres that we owned for both years are included in the spatial footprint (everything included in the blue lines).

Once we determine a consistent spatial footprint, we then quantify the amount of standing inventory on those acres. Our standing inventory is a measurement of the amount of biomass included in the stems of trees above a certain diameter threshold. This is what we call the amount of merchantable timber — the timber that is large enough to be harvested and sold in our forest. We have spent decades perfecting the science of measuring merchantable timber and believe our approach leverages this understanding and is a best-in-class method to translate our standing timber into one of the key pools of carbon in our forests.

In the final step, we expand our inventory measurements to include all aboveground carbon pools. This includes estimates of the amount of biomass carbon stored in branches, foliage, bark, stems below a merchantable size and seeds, derived from well-developed species-specific relationships between the amount of standing timber in a forest and the amount of other aboveground vegetation. We use a widely accepted 2003 USFS meta-analysis by Jenkins et. al to estimate these additional pools of carbon.[xxix] We then convert the result to metric tons of carbon dioxide.

We will repeat this process each year to keep a record of annual net change in our forest carbon. Our inventory processes, including updated tree measurements, growth calculations and quality assurance protocols inherently monitor this pool of carbon for any reversals of carbon storage. If our forests were to become a net *source* of carbon dioxide, we would account for those emissions in the year in which they occurred. These forests are our operations, so just as we report emissions from our mills in Scope 1, the net change in carbon stored in our forests is the direct – Scope 1 – removal benefit of our forests.

Primary data:

- A consistent spatial footprint of our land ownership, generated with custom SQL queries against year-end databases
- Standing inventory, mapped to consecutive-year pairs across a consistent spatial footprint

Secondary data:

- Species-specific relationships between standing inventory and aboveground carbon pools (the “Jenkins” equations)

Calculation type: Static accounting

Data quality: Very good

Comparability: There are a variety of methodologies being used to calculate the carbon impact of forests, mostly because there are no set rules for how to report this information. We are following four guiding principles to report the carbon impact of our forests.

1. First, we report the *net change* of carbon stored in our forests. Net change incorporates sequestration and growth, harvest, and mortality and is a direct reflection of how our forests impact the amount of carbon dioxide in the atmosphere.
2. Second, we derive our values from the same primary data used to calculate our publicly reported timber inventory, as opposed to generic modeling based on the age class and species of our forests.
3. Third, we apply a consistent spatial footprint to ensure we are comparing against equivalent acreages when calculating net change. This enables us to accurately and appropriately account for acquisitions and divestitures.
4. Fourth, we only report removals of carbon for which we have high quality data, such as standing trees, as opposed to including data points that rely on rough estimation or are too difficult to measure, such as down wood or understory vegetation.

As a member of the technical working group helping to develop the GHG Protocol on Carbon Removals and Land Use, we are actively engaged with bringing consistency to this space. While we wait for the draft guidance to be released and final guidance to be published late next year, we encourage others to join us in sharing their methodology and approaches.

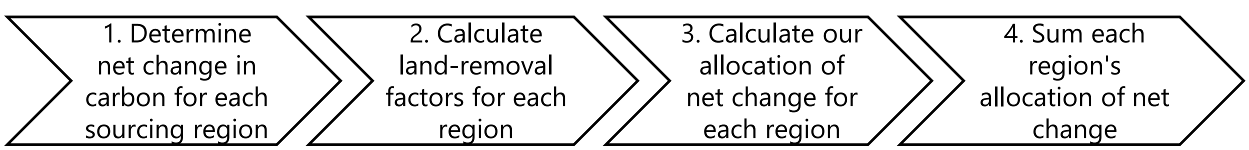
Scope 3: Net change in the forests of our sourcing regions

We report a Scope 3 (category 1: purchased goods and services) removal based on our portion (or allocation) of the flux in aboveground carbon in the forests of our sourcing regions. Using publicly available data from these wood supply regions, we determined a 2020 removal of 4 million mtCO_2e. Just as with Scope 1 removals (net change in our forests), if there was a net emission from the forests in our sourcing regions, we would report it as a Scope 3 category 1 emission.

We employ landscape-level accounting to track changes in carbon stock across our sourcing regions. Landscape-level accounting allows for accurate representation of the *annual* net flux between land and atmosphere, as opposed to stand-level accounting, which requires accounting over a longer period and would not be appropriate for the annual nature of GHG reporting. Landscape-level accounting is approved by the IPCC[xxx] and is generally accepted as the best, most accurate way to describe the relationship between forest and atmosphere. This approach integrates the net effect of all the activities on the landscape (e.g., growth, harvest, fire, drought, economic investment), providing an aggregate sense of the activities each year. To remain consistent, our landscape-level accounting of our sourcing regions incorporates the same aboveground pool of carbon that we include in the analysis of our owned and managed forests.

By using landscape-level accounting, it is possible to apply a proportional "land factor" to harvested wood products, meaning that the removal (or emission, if the net change is negative) associated with upstream (owned or managed by other entities) land changes is brought into our Scope 3 (category 1) inventory. The inclusion of a land factor enables mid- and downstream companies in the value chain to report upstream emissions and removals in a practical manner that considers the true activities happening on the land.

We use a four-step process to calculate this category of removals.



In step one, we determine the net change in aboveground carbon for each sourcing region using publicly available data. We collect this data at the state level in the United States[xxxi] and at the national level for managed Canadian forests.[xxxii] In future releases of our *Carbon Record*, we intend to improve the specificity of our Canadian data by incorporating provincial breakdowns.

Next, we calculate individual land removal factors and determine our allocation of net change in each of our sourcing regions. Doing this requires three pieces of data for each region: net change in aboveground carbon, total harvest, and the amount of harvest sent to our mills. We use the net change values from the sources reference in step one. To determine total harvest at the state level in the U.S., we use Forest Inventory and Analysis data gathered by the USFS[xxxiii]. For Canadian harvest levels we use the Canadian National Inventory Report, the same source used in step one to calculate net change. For the final piece of data, we use internal data that traces our externally sourced raw material to the state or provincial level. See an example of how we calculate individual land removal factors and allocate net change for each sourcing region in the figure below.

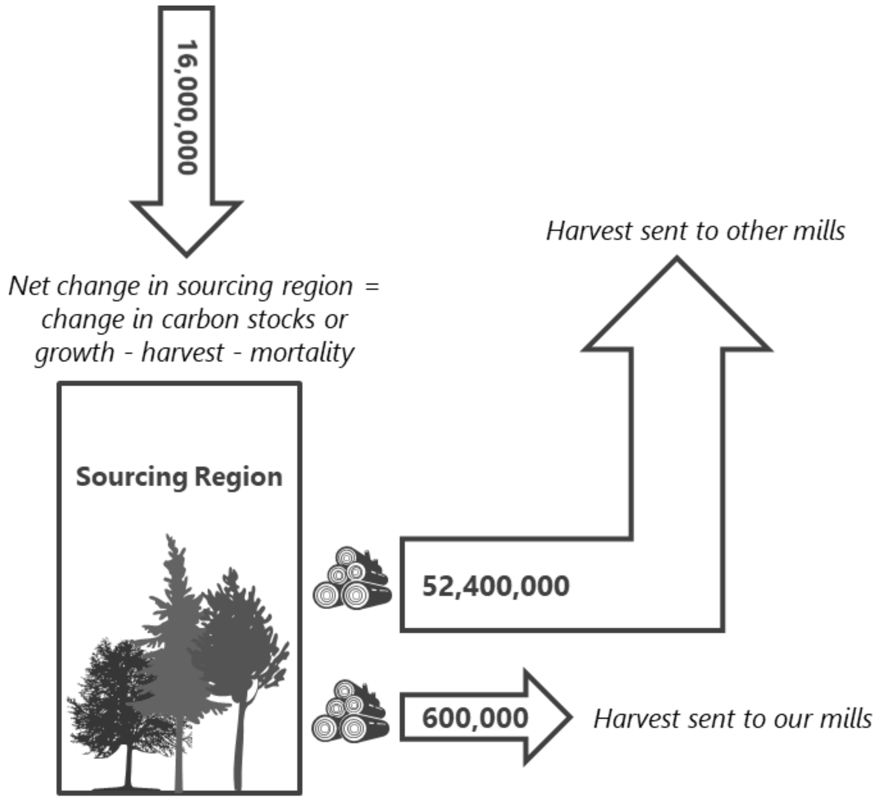


Figure 7: Hypothetical Example of Calculating a Land Removal Factor

$$Land\ removal\ factor = \frac{Net\ change\ (16{,}000{,}000)}{Total\ harvest\ (53{,}000{,}000)} = 0.302$$

$$Our\ allocation\ of\ net\ change = harvest\ sent\ to\ our\ mills\ (600{,}000) * land\ removal\ factor\ (0.302) = 181{,}132\ mtCO_2e$$

In the above hypothetical example, our harvest of 600 thousand $mtCO_2e$ resulted in a removal credit from that sourcing region of approximately 181 thousand $mtCO_2e$. In the final step of the calculation, we combine our allocation of net change from each region to calculate our overall Scope 3 (category 1) removal. In 2020, this value was 4 million $mtCO_2e$.

Each year, the USFS and Canadian Forest Service update their calculations and reporting of the net change in carbon stored on forestlands. We will use the most recent year for which data is available to continue reporting this category of removals (or emissions, if the net change is negative). In addition, our mix of sourcing regions may change over time, which could cause our land removal factors to change. Given these and other factors, we expect our Scope 3 (category 1) values to vary from year to year.

Primary data:

- Wood procured from external landowners, by state (U.S.) and nationally (Canada)

Secondary data:

- Net change in aboveground carbon for the U.S. states we source wood from, using data from the USFS report *Greenhouse Gas Emissions and Removals from Forest Land, Woodlands, and Urban Trees in the United States 1990-2018*[xxxiv] [xxxv]
- Net change in carbon in managed Canadian forests, using data from the Canadian *National Inventory Report 1990-2018* in: Chapter 6 (Land Use, Land-Use Change and Forestry) and Annex 9 (Canada's Greenhouse Gas Emission Tables by IPCC Sector)[xxxvi]
- Harvested wood for the U.S. states we source from, using data from the USFS Forest Inventory and Analysis One-Click Factsheet and supporting documentation[xxxvii]

Calculation type: Static accounting

Data quality: Fair

Scope 3: Stored in our wood products

We report a Scope 3 (category 11: use of sold products) removal based on the climate impact of the wood products we make. In 2020, our wood products stored 11 million mtCO_2e.

Harvested wood products contain an enormous amount of carbon. In fact, about half the oven-dried weight of our wood products comes from the carbon molecules stored inside them! The mass of a piece of wood is a result of photosynthesis, the incredible process by which plants (trees, in this case) absorb carbon dioxide through their leaves or needles and converts the greenhouse gas into carbon, sugars and oxygen. The tree releases some of the oxygen, which humans and animals breathe; uses the sugars to grow; and retains carbon as physical mass.

Carbon Dioxide Gas + Water + Sunlight → Sugars (Solid Carbon) + Oxygen

As long as a wood product stays in use — as framing in a house, say, or a dining room table, the floors in a building — or is kept from decomposing, decaying or burning, carbon stays in the wood product and, importantly, out of the atmosphere. Over time, some of that carbon is released back into the atmosphere as wood products decompose or burn. As simple as it would be to claim that our wood products store all the carbon they start out with, we need to account for reversals over time by using an accounting method that adjusts for this impermanence. The method, sometimes called dynamic accounting, applies a removal credit for only the portion of carbon that remains stored over time. Just as the static accounting we use for our reporting of both emissions and the carbon stored in our forests allows us to measure our climate impact in one year (which is the basis of Scope 1 and Scope 2 reporting), dynamic accounting allows us to measure the full climate impact of our activities that take place in one year but have future implications (one of the goals of Scope 3 reporting).

We use a 2014 USFS report, *Quantifying Greenhouse Gas Fluxes in Agriculture and Forestry: Methods for Entity-Scale Inventory*[xxxviii], to ensure the duration of carbon storage is translated accurately into a removal. The report establishes decay curves for specific wood products to determine the amount of carbon released back into the atmosphere in the 100 years following production. These decay curves, which can also be thought of as a schedule of reversals, represent how quickly a wood product decomposes and releases stored carbon back into the atmosphere. The data has been adapted into a user-friendly Excel tool that is owned by the National Council for Air and Stream Improvement, Inc. (NCASI) and available to NCASI members.

Also included within the NCASI tool are factors to convert from production units to reporting units. While wood products are generally measured in units of thousand board feet (MBF) or thousand square feet at three-eighths inch or three-quarters inch thick (MSF 3/8" or MSF 3/4"), we report our emissions and removals in units of metric tons of carbon dioxide equivalent ($mtCO_2e$). The tools converts from production units to carbon using data from a 2013 USFS report entitled *U.S. Timber Production, Trade, Consumption and Price Statistics 1965-2011.*[xxxix] Different conversion factors are available from separate U.S. Forest Service reports[xl] and from our own internal data. We plan to evaluate the accuracy of these conversion factors and assumptions and improve our methods, if necessary, in future releases of our *Carbon Record*. Finally, we assume that all products are 50 percent carbon by weight, an assumption supported by the IPCC[xli] and the USFS[xlii].

Included within our calculation is an assumption that wood products residing in landfills do not release carbon, because the anaerobic conditions there do not allow for the chemical decomposition of wood. Therefore, we include the carbon that remains in-use and the carbon that is stored in landfills in our overall removal value. However, landfills are a source of methane emissions, and we account for the methane emissions within our Scope 3 category 12 (end-of-life) inventory.

To calculate our removal we apply the average fraction of carbon stored over 100 years, which has been shown in a peer-reviewed study to be a conservative approximation of the radiative forcing benefit of keeping carbon out of the atmosphere, even temporarily.[xliii] This 100-year-average method is recommended by the USFS report, which states that "we recommend the measure of average carbon stored as an adequate proxy for the effect of wood products produced in the current year and stored over 100 years."[xliv] It is also endorsed by the Climate Action Reserve 2010 Forest Protocol and the California Air Resources Board.

Example calculation for carbon removed during our production of softwood lumber (not actual data):

$$2{,}000{,}000\ thousand\ board\ feet\ (MBF)\ of\ softwood\ lumber * 0.88\frac{metric\ tons}{MBF} = 1{,}760{,}000\ mt$$

$$1{,}760{,}000\ mt\ softwood\ lumber * 0.5\frac{mt\ carbon}{mt\ softwood\ lumber} = 880{,}000\ mt\ carbon$$

$$880{,}000\ mt\ carbon * \frac{44}{12}\frac{carbon\ dioxide\ (CO_2)}{carbon\ (C)} = 3{,}226{,}667\ mtCO_2\ (carbon\ stored\ at\ the\ time\ of\ production)$$

$$3{,}226{,}667\ mtCO_2 * (average\ fraction\ of\ lumber\ remaining\ in\ use\ over\ 100\ years + average\ fraction\ of\ lumber\ in\ landfill\ over\ 100\ years) = 3{,}226{,}667 * (0.466 + 0.297) = 2{,}461{,}947\ mtCO_2$$

There are two other methods that we could use to calculate the climate impact of our wood products, but they all use the same input data and decay rates. One alternate method applies the fraction of product that remains in-use or in-landfill *after* 100 years, rather than averaged over the entire timeframe. The other method differentiates between in-use and landfill storage, calculating the in-use storage using the 100-year method described above but calculating landfill storage over a longer timeframe, because this carbon is stored in landfill permanently. Until this year, we used the after 100-year method, rather than an average over 100 years. The GHG Protocol is currently evaluating all three methods, and we welcome feedback on which method is most appropriate for the goals of corporate accounting.

Primary data:

- Wood product production quantities, by product type

Secondary data:

- NCASI tool to calculate carbon stored in forest products
- Data from the USFS publication *Quantifying Greenhouse Gas Fluxes in Agriculture and Forestry: Methods for Entity-Scale Inventory*: Tables 6-A-2 (Fraction of Carbon in Primary Wood Products Remaining in End

Uses up to 100 Years After Production) and 6-A-3 (Fraction of Carbon in Primary Wood Products Remaining in Landfill up to 100 Years after Production)[xlv]

- Conversion factors to convert from production units to metric tons, per product[xlvi]

Calculation type: Dynamic accounting

Data quality: Good

Scope 3: Stored in downstream wood products

In addition to the wood products we make directly, we report an additional Scope 3 removal (category 11: use of sold products) based on the climate impact of the products our customers make from our logs. We estimate the logs we sold in 2020 store 7 million $mtCO_2e$ in products made by downstream customers.

Why do we include this storage in our *Carbon Record*? Just as we need to account for any emissions associated with the use of our downstream products in our Scope 3 accounting, we should be able to account for any climate benefits, or removals, associated with the use of our products. In this case, our products are the logs we sell to other wood products manufacturers. Those manufacturers create lumber and other engineered wood products, just like we do, and those products end up in homes, buildings and furniture, where the carbon is stored for decades — or even, in some cases, permanently.

Our methodology for this category is nearly identical to how we calculate the carbon stored in our own products, but with two key distinctions:

- First, our calculations are based on the logs we sell, rather than the products that are made from them. Without full insight into our customers' manufacturing processes, we are unable to know how much of which type of product is made. We do know the grade (type) of logs we sell, and whether they are destined for solid or engineered wood products, or fiber- and pulp-based products.
- Second, we use decay curves specific to logs, rather than individual products as in the previous section, "Scope 3: Stored in our wood products." The same USFS report[xlvii] provides decay curves for both products and logs, so our source remains consistent. The report lists decay curves based on wood type (softwood versus hardwood) and type of log (sawlog versus pulpwood) for each forest region in the U.S.

For a description of our approach to calculating this removal, refer to the previous section for a discussion of methods, including dynamic accounting and 100-year-average, and the rational for determining the climate impact of carbon stored in wood products. The example below is intended to show the adjustments that are made to our approach when calculating a downstream removal.

Example calculation for carbon removed during downstream production of a softwood sawlog from the south-central region (not actual data):

$$5{,}000{,}000\ short\ tons\ * 0.907\frac{metric\ tons}{short\ tons} = 4{,}535{,}000\ mt$$

$$4{,}535{,}000\ mt * 0.5\frac{mt\ carbon}{mt\ sawlog} = 2{,}267{,}500\ mt\ carbon$$

$$2{,}267{,}500\ mt\ carbon * \frac{44}{12}\frac{carbon\ dioxide\ (CO_2)}{carbon\ (C)} = 8{,}314{,}167\ mtCO_2\ (carbon\ stored\ at\ the\ time\ of\ harvest)$$

$$8{,}314{,}167\ mtCO_2 * (average\ fraction\ remaining\ in\ use\ over\ 100\ years + average\ fraction\ in\ landfill\ over\ 100\ years) = 8{,}314{,}167 * (0.239 + 0.176) = 3{,}450{,}379\ mtCO_2$$

Primary data:

- Log sales to third-party customers, by region and grade

Secondary data:

- Data from the USFS publication *Quantifying Greenhouse Gas Fluxes in Agriculture and Forestry: Methods for Entity-Scale Inventory*: Table 6-A-5 (Average disposition patterns of carbon as fractions in roundwood by region and roundwood category)[xlviii]

Calculation type: Dynamic accounting

Data quality: Fair

3. STORAGE

While the first two sections of our *Carbon Record* are focused on our annual carbon emissions and removals, there is another important, and impressive, section: storage. There is an enormous amount of carbon stored in our forests that remains in place, year after year, decade after decade. And when we say enormous, we are talking about *billions* of metric tons of carbon dioxide equivalents.

Before we get into the results, here is a quick refresher about the different places, or pools, where carbon is stored in a forest (see the full discussion in the introduction to section 2, "Removals"). We calculate net change based only on aboveground carbon, both because this is the largest impact on the net change of carbon and because of the higher data quality compared to other pools. On the other hand, when we, or any forest owner or manager, estimate the carbon contained in those other pools, we rely on data that is not necessarily representative of our forest. Generally, these data come from studies that are conducted on forests that are managed differently than ours, have inconsistent methods, or, in some cases, rely on data that are almost 40 years old.[xlix]

We'll provide a specific example that illustrates this point. We recently collaborated with researchers at Oregon State University to determine if harvest activities caused a short-term loss in soil carbon.[l] The study found that the change in soil carbon following harvest was negligible — validation of our assumption that soil carbon should not be included in our net change calculations. But beyond that primary finding, an interesting artifact of the study was that the amount of soil carbon at the coastal Douglas-fir research sites was nearly twice as high as the amount predicted by a leading U.S. Forest Service report for the same species and region.[li] While this difference could be explained by regional differences or varying boundaries of defining of soil carbon[13], it is a major reason why we are hesitant to report the amount of carbon stored in certain pools, including in the soil, down to a single number — at least until the science and estimation methods become more consistent.

While we aren't comfortable estimating the total carbon stored in our forests down to a single number, we believe that information is important — both to provide scale for the net change we report and because our *Carbon*

[13] The relative proportion of where carbon is stored can vary by region, and different regional boundaries exist between reports. In addition, soil carbon can refer to mineral soil (rocks) and/or organic (decomposed organic matter) soil. Different data sets include one or both types of soil, sometimes inconsistently.

Record would be incomplete without it. That is why, using a combination of primary and secondary data sources, we provide an estimated *range* of our total stored carbon. The pools of carbon we include, along with an indication of our calculation specificity, are listed below.

Forest carbon pools *calculated to a single value* using primary data:

- **Above- and belowground biomass:** All living biomass above the soil, including stems, stumps, branches and foliage above 2.5 centimeters in diameter, as well as bark and seeds, and all living root biomass of trees that are thicker than 2 millimeters in diameter. The value from stem biomass is derived from the same primary data used to calculate publicly reported timber inventory and rely on a mix of field measurements and proprietary growth models. The additional pools included in this category are calculated by converting stem biomass to all other pools of live-tree biomass using established allometric relationships[lii].

Forest carbon pools *estimated to a range of values* using a mix of regional and species-specific estimates from secondary data:[liii] [liv]

- **Soil:** All carbon-based material, measured to a depth of 1 meter, in both mineral (rocks) and organic (decomposed organic matter) soils.
- **Other pools of carbon:**
    - **Understory biomass:** Shrubs and trees below 2.5 centimeters in diameter.
    - **Dead wood:** Standing dead, down dead (lying on the forest floor) or dead wood in the soil.
    - **Litter:** Leaves, needles, twigs and other dead biomass with a diameter less than 7.5 centimeters that are on the forest floor.

The foundation of our total carbon storage calculation is the total live above- and below-ground pools of carbon that we calculate. We then rely on public data from the USFS to estimate proportions of additional carbon pools within our forests. As the proportions of forest carbon pools can vary based on species, age, region and management, we use a range reflective of the estimates available from public sources and in scientific literature. Based on this analysis, live carbon constitutes 30 to 40 percent of total forest carbon, with soil carbon representing 40 to 55 percent and all other pools containing the remaining 10 to 20 percent. This is summarized in the table below, along with numerical estimates of the carbon dioxide equivalent stored in each group of pools in our forests.

Table 5: Carbon storage

Category	Pools included	Range of estimated proportion of total forest carbon[lv] [lvi]	Calculated to a single value (mtCO_2e)	Estimated to a range of values (mtCO_2e)
Live carbon	Aboveground and belowground living biomass	30-40%	1,000 million	
Soil carbon	Soil (mineral and organic)	40-55%		1,000 – 1,900 million
All other pools of carbon	Understory, dead wood and litter	10-20%		300 – 700 million

In total, our forests store between 2.3 billion and 3.6 billion mtCO$_2$e. To put that into context, that is the same number of emissions generated by providing every home in the United States with electricity for between about three and five years[14]. Another way to appreciate the scale of this numbers is that our forests contain roughly a third to a half of the Unites States' annual GHG emissions[15].

To be clear, this carbon is not necessarily eligible for monetization in an offset or credit market. Selling a carbon credit involves more stringent data requirements, including verification of additionality beyond a baseline.

We have been managing our forests sustainably for over 120 years and are proud to be the stewards of such an amazing natural resource. Our continuous cycle of planting, growth, harvest and replanting maintains billions of tons of carbon dioxide equivalent in our forests over the long term, in addition to the myriad other benefits forests provide. This is why we believe that keeping forests as forests is one of the most valuable and important things we can do to combat climate change.

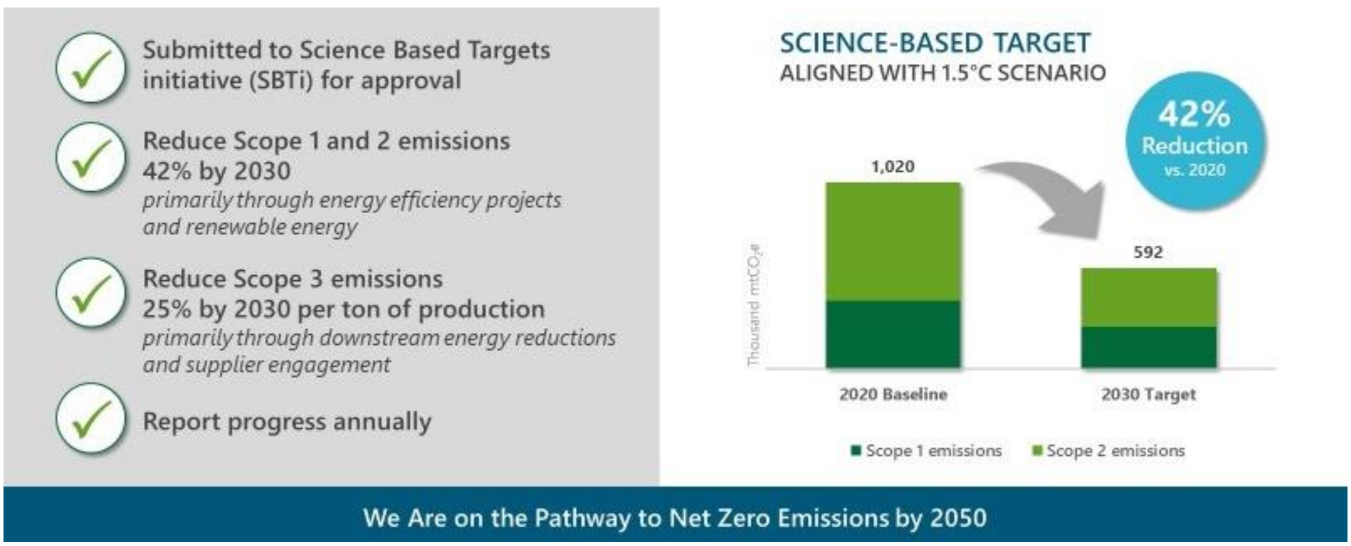
[14] Based on U.S. Energy Information Administration data that there were 121 million homes in 2020 and EPA data that the average annual electricity use per home generated 5.5 mtCO$_2$e.
[15] Based on the most recently available data from 2019.

4. EMISSION REDUCTION TARGET

In 2020, we closed the book on our original greenhouse gas (GHG) emission reduction target to reduce our scope 1 and 2 emissions by 40 percent against a 2000 baseline. We exceeded our target and achieved a 57 percent reduction by 2020.

Our *Carbon Record* includes our new GHG target, which we set and submitted to the Science-Based Targets initiative (SBTi) for approval. We set a target that we believe is in line with limiting global warming to 1.5 degrees Celsius and expect to receive formal approval of our target later this year. This is the highest level of ambition put forth by the SBTi, and we are honored to join a select group of climate leaders who are on a path to net zero emissions.

We have set a target to reduce absolute Scope 1 and 2 GHG emissions by 42 percent by 2030 from a 2020 base year, and to reduce Scope 3 GHG emissions by 25 percent per metric ton of production by 2030 from a 2020 base year.



Our goal of reducing Scope 1 and 2 emissions by 42 percent will be made possible by our own internal energy choices and from progress made by electricity providers to increase the share of renewable energy included in our purchased electricity. Our internal emissions reduction strategy will prioritize using carbon-neutral biomass energy wherever feasible. We will implement energy efficiency products, electrify as many activities as possible, and look for opportunities to reduce our remaining fossil fuel consumption closer to zero. Further down the road, additional emissions reductions projects will be enabled by energy off-take from renewable energy projects on our land or at our mills, as well as the use of renewable biofuels.

Our Scope 3 target will require encouraging and enabling sector-wide emissions reductions. Our strategy to reduce value chain emissions will begin by focusing on the sources of GHG emissions that we can influence and that have a large impact on our overall emissions. We will support innovations to reduce fuel use or switch to biofuels during in-forest harvesting and transportation. We will ensure the efficient use of additional materials used in our manufacturing or tree growing operations. Our supply chain decisions can prioritize low-carbon methods of transportation and work to reduce the distance between forests, mills and end-users. And, finally, we will continue to encourage our customers to reduce GHG emissions through coalitions and industry groups. As this is our first year of establishing our Scope 3 inventory, a big part of our early Scope 3 journey will be engaging with our suppliers and customers to improve our data quality. As we work to quantify and communicate the importance of value chain emissions reductions, we aim to use our size and influence to enable emissions reductions far beyond the reach of our direct operations.

To set both our Scope 1 and 2 and our Scope 3 targets we conducted a robust assessment of our current emissions inventory to determine the likely range of reductions achievable by 2030. We began by baselining our current emissions, analyzing data for each of our 35 wood products mills. We scoured our production forecasts and capital plans and worked with our businesses to imagine every possible lever we could pull to reduce GHG emissions. This extensive legwork allowed us to forecast future emissions based on (1) what we have planned, (2) what we can control, and (3) what external factors will impact us.

For each lever, we factored in a certain amount of uncertainty to reflect the different possible outcomes by 2030. For example, our Scope 2 emissions constitute nearly two-thirds of our total Scope 1 and 2 emissions, and the rate of "grid greening" will have a substantial impact on our ability to achieve the ambitious GHG reduction target we have set. When we forecast our GHG emissions, we build in a rate of "grid greening" that is in line with the latest forecasts from the Energy Information Administration (EIA), but we include a large range of uncertainty in this lever to reflect the fact that this is largely outside our control. After incorporating an appropriate amount of uncertainty for each of our emissions levers, we built a Monte Carlo simulation and ran 2,000 iterations to determine our likely emissions inventory in 2030.

We have set an emissions reduction target that meets the urgency of the moment. According to the latest climate science, we have a very small window in which to prevent the worst impacts of climate change. These deep reductions will not be easy, but we are well positioned to leverage our core values of innovation and sustainability to achieve our ambitious target. We have a plan in place to achieve the emissions reductions necessary, and we know where we need to focus our efforts to maximize our ability to do so. We will track progress against this plan annually and update our strategy as new technologies become available.

Finally, following the current guidance from the GHG Protocol and SBTi, our GHG target only includes emissions and does not consider removals or offsets within the target boundary. We are actively involved in drafting and piloting sector-specific guidance from both the GHG Protocol and SBTi that will inform our future target setting and removals methodology. It is likely that we will need to reassess the validity of our targets when new guidance becomes available, and we stand ready to engage with our sector peers to ensure forests and wood products can provide carbon removal benefits that far outweigh our emissions.

CONCLUSION

We recognize that people expect businesses to reach beyond providing jobs, paying taxes, operating ethically and minimizing environmental impact. Communities are looking to businesses to help solve some of the world's toughest and most pressing challenges. We agree, and we have identified three positive impact areas where we believe we have a unique role in helping make a difference over the next decade.

First, we know our forests and wood products have a critical role to play in mitigating climate change by absorbing and keeping carbon dioxide out of the atmosphere.

Second, our sustainable wood products can help meet the growing need for affordable, quality housing in communities all over the world.

Third, because of the nature of where we operate, we have a powerful opportunity to help rural communities across North America become and remain thriving places to live and work.

These are our 3 by 30 Sustainability Ambitions — three big challenges facing the world that our company can help solve — and our commitment is to make tangible progress in each area by 2030. We know we can't solve these challenges alone, and we also know our vast forests and the essential products we manufacture put us in a unique position to make a real difference.

With the release of our inaugural* Carbon Record*, our submittal of a science-based greenhouse gas reduction target that aligns with the path to net zero, and the publishing of this detailed methodology, we believe we are helping improve the understanding of working forests as a climate solution.

We expect to evolve our approach to reporting on carbon removals as the guidance for the GHG protocols is developed and finalized. In the meantime, we welcome and encourage feedback and invite partners to join us in demonstrating how working forests can and should be part of a sustainable, biodiverse and climate-resilient solution – today and long into the future.

SOURCES

[i] IPCC 6th Assessment Report 2021, The Physical Science Basis, Summary for Policy Makers: https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM.pdf
[ii] Greenhouse Gas Protocol, Update on Greenhouse Gas Protocol Carbon Removals and Land Sector Initiative: https://ghgprotocol.org/blog/update-greenhouse-gas-protocol-carbon-removals-and-land-sector-initiative
[iii] Science-Based Targets initiative, Foundations for science-based net-zero target setting in the corporate sector: https://sciencebasedtargets.org/resources/files/foundations-for-net-zero-full-paper.pdf
[iv] NCASI, Forest Industry Carbon Assessment Tool: https://www.ncasi.org/resource/forest-industry-carbon-assessment-tool/
[v] Greenhouse Gas Protocol, Technical Guidance for Calculating Scope 3 (category 1) emissions: https://ghgprotocol.org/sites/default/files/standards_supporting/Chapter1.pdf
[vi] EPA, Greenhouse Gas Emission Factors Hub (April 2021): https://www.epa.gov/sites/default/files/2021-04/documents/emission-factors_apr2021.pdf
[vii] Greenhouse Gas Protocol, Technical Guidance for Calculating Scope 3 (category 4) emissions: https://ghgprotocol.org/sites/default/files/standards_supporting/Chapter4.pdf
[viii] EPA, Greenhouse Gas Emission Factors Hub (April 2021): https://www.epa.gov/sites/default/files/2021-04/documents/emission-factors_apr2021.pdf
[ix] Personal communication with NCASI
[x] Greenhouse Gas Protocol, Technical Guidance for Calculating Scope 3 (category 10) emissions: https://ghgprotocol.org/sites/default/files/standards_supporting/Chapter10.pdf
[xi] USDA, Quantifying Greenhouse Gas Fluxes in Agriculture and Forestry: Methods for Entity-Scale Inventory: https://www.usda.gov/sites/default/files/documents/USDATB1939_07072014.pdf
[xii] EPA, Greenhouse Gas Emission Factors Hub (April 2021): https://www.epa.gov/sites/default/files/2021-04/documents/emission-factors_apr2021.pdf
[xiii] Greenhouse Gas Protocol, Technical Guidance for Calculating Scope 3 (category 12) emissions: https://ghgprotocol.org/sites/default/files/standards_supporting/Chapter12.pdf
[xiv] CORRIM, Life Cycle assessment for the production of southeastern softwood lumber: https://corrim.org/wp-content/uploads/Module-C-SE-Lumber.pdf
[xv] Forest Products Journal, Life-Cycle Assessment for the Cradle-to-Gate Production of Softwood Lumber in the Pacific Northwest and Southeast Regions: https://corrim.org/wp-content/uploads/2018/03/lca-cradle-to-gate-softwood-lumber-pnw-se.pdf
[xvi] CORRIM, Life Cycle assessment for the production of Pacific Northwest softwood lumber: https://corrim.org/wp-content/uploads/2020/06/CORRIM-AWC-PNW-Lumber.pdf
[xvii] EPA, Greenhouse Gas Inventory Guidance, Direct Emissions from Stationary Combustion Sources: https://www.epa.gov/sites/default/files/2016-03/documents/stationaryemissions_3_2016.pdf
[xviii] EPA, Greenhouse Gas Emission Factors Hub (April 2021): https://www.epa.gov/sites/default/files/2021-04/documents/emission-factors_apr2021.pdf
[xix] U.S. Census Bureau, Commuting by Public Transportation in the Unites States: 2019: https://www.census.gov/content/dam/Census/library/publications/2021/acs/acs-48.pdf
[xx] EPA, Greenhouse Gas Emissions from a Typical Passenger Vehicle: https://www.epa.gov/greenvehicles/greenhouse-gas-emissions-typical-passenger-vehicle
[xxi] Greenhouse Gas Protocol, Technical Guidance for Calculating Scope 3 (category 13) emissions: https://ghgprotocol.org/sites/default/files/standards_supporting/Chapter13.pdf
[xxii] Greenhouse Gas Protocol, Corporate Standard: https://ghgprotocol.org/corporate-standard

[xxiii] USDA, Greenhouse Gas Emissions and Removals from Forest Land, Woodlands, and Urban Trees in the United States, 1990-2018: https://www.fs.fed.us/nrs/pubs/ru/ru_fs227.pdf
[xxiv] EPA, Greenhouse Gas Emission Factors Hub (April 2021): https://www.epa.gov/sites/default/files/2021-04/documents/emission-factors_apr2021.pdf
[xxv] Congressional Research Service, Forest Carbon Primer: https://fas.org/sgp/crs/misc/R46312.pdf
[xxvi] USDA, Greenhouse Gas Emissions and Removals from Forest Land, Woodlands, and Urban Trees in the United States, 1990-2018: https://www.fs.fed.us/nrs/pubs/ru/ru_fs227.pdf
[xxvii] Forest Science, National-Scale Biomass Estimators for Unites States Tree Species: https://www.fs.fed.us/ne/newtown_square/publications/other_publishers/OCR/ne_2003jenkins01.pdf
[xxviii] EPA, Greenhouse Gas Equivalencies Calculator: https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator
[xxix] Forest Science, National-Scale Biomass Estimators for Unites States Tree Species: https://www.fs.fed.us/ne/newtown_square/publications/other_publishers/OCR/ne_2003jenkins01.pdf
[xxx] IPCC, Good Practice Guidance for Land Use, Land-Use Change and Forestry: https://www.ipcc.ch/site/assets/uploads/2018/03/GPG_LULUCF_FULLEN.pdf
[xxxi] USDA, Greenhouse Gas Emissions and Removals from Forest Land, Woodlands, and Urban Trees in the United States, 1990-2018: https://www.fs.fed.us/nrs/pubs/ru/ru_fs227.pdf
[xxxii] UNFCCC, Canadian 2020 National Inventory Report: https://unfccc.int/documents/224829
[xxxiii] USDA Forest Service. 2020 to 2021. Forests of All, 2012 to 2020. Resource Update FS-All. All, All: U.S. Department of Agriculture, Forest Service. 2p. https://public.tableau.com/views/FIA_OneClick_V1_2/StateSelection?%3AshowVizHome=no
[xxxiv] USDA, Greenhouse Gas Emissions and Removals from Forest Land, Woodlands, and Urban Trees in the United States, 1990-2018: https://www.fs.fed.us/nrs/pubs/ru/ru_fs227.pdf
[xxxv] USDA, Greenhouse Gas Emissions and Removals from Forest Land, Woodlands, and Urban Trees in the United States, 1990-2018, Appendix 1: https://www.fs.fed.us/nrs/pubs/download/RU-FS-227_Appendix_1.pdf
[xxxvi] UNFCCC, Canadian 2020 National Inventory Report: https://unfccc.int/documents/224829
[xxxvii] USDA, Forest Inventory & Analysis One-Click Factsheet: https://public.tableau.com/views/FIA_OneClick_V1_2/StateSelection?%3AshowVizHome=no
[xxxviii] USDA, Quantifying Greenhouse Gas Fluxes in Agriculture and Forestry: Methods for Entity-Scale Inventory: https://www.usda.gov/sites/default/files/documents/USDATB1939_07072014.pdf
[xxxix] USDA, U.S. Timber Production, Trade, Consumption and Price Statistics 1965-2011: https://www.fpl.fs.fed.us/documnts/fplrp/fpl_rp676.pdf
[xl] USDA, Quantifying Greenhouse Gas Fluxes in Agriculture and Forestry: Methods for Entity-Scale Inventory: https://www.usda.gov/sites/default/files/documents/USDATB1939_07072014.pdf
[xli] IPCC, Guidelines for National Greenhouse Gas Inventories, Agriculture, Forestry and Other Land Use: https://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html
[xlii] Forest Science, National-Scale Biomass Estimators for Unites States Tree Species: https://www.fs.fed.us/ne/newtown_square/publications/other_publishers/OCR/ne_2003jenkins01.pdf
[xliii] Forests, Global Warming Mitigating Role of Wood Products from Washington State's Private Forests: https://amforest.org/wp-content/uploads/2020/03/forests-11-00194.pdf
[xliv] USDA, Quantifying Greenhouse Gas Fluxes in Agriculture and Forestry: Methods for Entity-Scale Inventory: https://www.usda.gov/sites/default/files/documents/USDATB1939_07072014.pdf
[xlv] USDA, Quantifying Greenhouse Gas Fluxes in Agriculture and Forestry: Methods for Entity-Scale Inventory: https://www.usda.gov/sites/default/files/documents/USDATB1939_07072014.pdf
[xlvi] USDA, U.S. Timber Production, Trade, Consumption and Price Statistics 1965-2011: https://www.fpl.fs.fed.us/documnts/fplrp/fpl_rp676.pdf

[xlvii] USDA, Quantifying Greenhouse Gas Fluxes in Agriculture and Forestry: Methods for Entity-Scale Inventory: https://www.usda.gov/sites/default/files/documents/USDATB1939_07072014.pdf

[xlviii] USDA, Quantifying Greenhouse Gas Fluxes in Agriculture and Forestry: Methods for Entity-Scale Inventory: https://www.usda.gov/sites/default/files/documents/USDATB1939_07072014.pdf

[xlix] Nature, Soil carbon pools and world life zones: https://www.nature.com/articles/298156a0

[l] Soil Science Society of America Journal, Soil Carbon Storage in Douglas-Fir Forests of Western Oregon and Washington Before and After Modern Timber Harvesting Practices: https://acsess.onlinelibrary.wiley.com/doi/abs/10.2136/sssaj2018.09.0354

[li] USDA, Methods for Calculating Forest Ecosystem and Harvested Carbon with Standard Estimated for Forest Types of the Unites States: https://www.nrs.fs.fed.us/pubs/gtr/ne_gtr343.pdf

[lii] Forest Science, National-Scale Biomass Estimators for Unites States Tree Species: https://www.fs.fed.us/ne/newtown_square/publications/other_publishers/OCR/ne_2003jenkins01.pdf

[liii] USDA, Methods for Calculating Forest Ecosystem and Harvested Carbon with Standard Estimated for Forest Types of the Unites States: https://www.nrs.fs.fed.us/pubs/gtr/ne_gtr343.pdf

[liv] USDA, Greenhouse Gas Emissions and Removals from Forest Land, Woodlands, and Urban Trees in the United States, 1990-2018: https://www.fs.fed.us/nrs/pubs/ru/ru_fs227.pdf

[lv] USDA, Greenhouse Gas Emissions and Removals from Forest Land, Woodlands, and Urban Trees in the United States, 1990-2018: https://www.fs.fed.us/nrs/pubs/ru/ru_fs227.pdf

[lvi] USDA, Methods for Calculating Forest Ecosystem and Harvested Carbon with Standard Estimated for Forest Types of the Unites States: https://www.nrs.fs.fed.us/pubs/gtr/ne_gtr343.pdf