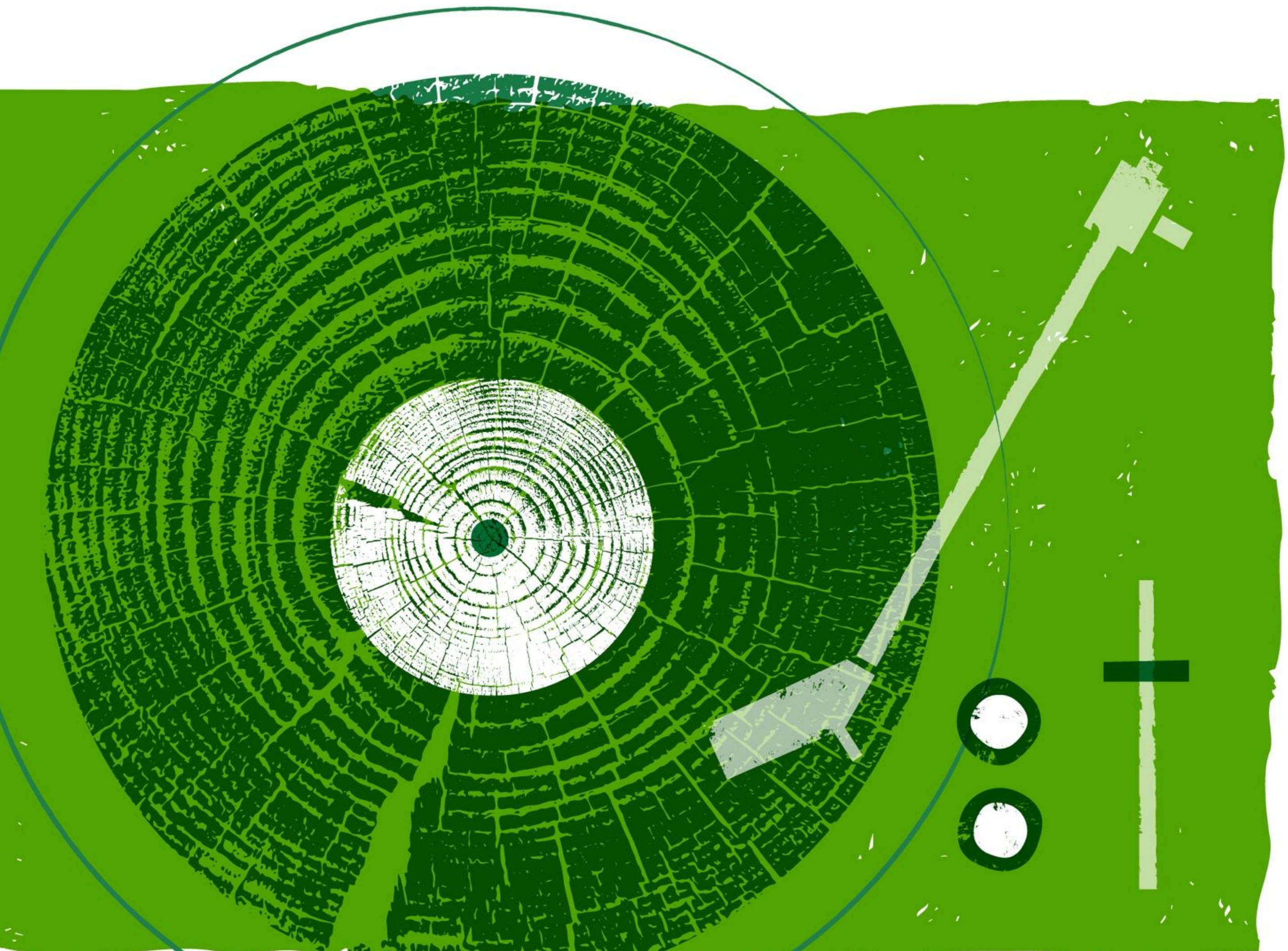
# CARBON RECORD B-SIDE

## *Methodology*

Version 3.0 | April 2023



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# 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 OUR DETAILED METHODOLOGY AND WELCOME OTHERS TO JOIN US IN BUILDING A CONSISTENT AND CREDIBLE APPROACH ACROSS THE WORLD.**

The "Emissions" track 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 third 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" tracks 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. Alongside our *Carbon Record*, we are simultaneously working with international collaborators as part of the Greenhouse Gas Protocol's Land Sector and Removals Guidance to standardize the reporting and calculation methodology for carbon removals.

**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" track describes our newly set science-based greenhouse gas emissions target, which has been approved by the Science Based Targets initiative (SBTi) as in line with the goals of the Paris Agreement and limiting global warming to 1.5 degrees Celsius. This designation is the highest level of ambition put forth by SBTi and puts us among a select group of companies leading on the path to a more sustainable future. Climate change in one of the most critical challenges of our time, and we are proud that our target and our *Carbon Record* can be a case study for the role of working forests and wood products in enabling the transition to a net-zero world.

# KEY TERMS

For the best listening experience of our *Carbon Record*, it is helpful to be grounded in a few terms.

**$mtCO_2e$:** 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.

# TRACK 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 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[1] | 2022 AMOUNT in million metric tons of carbon dioxide equivalent (million $mtCO_2e$) |
|---|---|
| Scope 1: Direct emissions * | 0.4 |
| Scope 2: Indirect emissions from purchased energy (location-based) * | 0.5 |
| Scope 2: Indirect emissions from purchased energy (market-based) * | 0.4 |
| Combined Scope 1 and Scope 2 (location-based) * | 0.9 |
| **Combined Scope 1 and Scope 2 (market-based) *** | **0.8** |
| Scope 3: Upstream and downstream products and services | 9.2 |
| **Total Scope 1, 2 and 3** | **10.1** |
| Carbon dioxide emissions from biologically sequestered carbon[2] | 2.5 |

We collect GHG emissions data from our Wood Products and Timberlands businesses. Our GHG inventory includes carbon dioxide ($CO_2$), methane ($CH_4$), nitrous oxide ($N_2O$) and hydrofluorocarbon (HFC) 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.

*In 2023, we obtained limited assurance of our 2020, 2021, and 2022 Scope 1 and Scope 2 (location-based) and Scope 2 (market-based) emissions from a third-party attestation provider.

[1] In section 2 "Removals" we show that we removed 31,000,000 $mtCO_2e$ in 2022, so our operations are significantly carbon negative.

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

# Scope 1: Direct emissions
In 2022 our Scope 1 emissions were 0.4 million mt$CO_2$e.

Scope 1 emissions are direct GHG emissions resulting from sources proportionate to the share of equity in the operation held by Weyerhaeuser. Sources of direct GHG emissions include:

- Fossil fuel combustion at our mills, distribution centers, nurseries and office buildings as well as company-owned mobile equipment at our mills and in our timberlands.
- Biomass emissions at our mills[3], to account for methane ($CH_4$) and nitrous oxide ($N_2O$) emissions from carbon neutral combustion of biomass.
- Fertilizer and controlled burn $N_2O$ and $CH_4$ emissions, respectively, in our forests.
- $CH_4$ emissions from the decomposition of manufacturing residuals in landfills at our mills.

# Scope 2: Indirect emissions from purchased energy
In 2022 our location-based Scope 2 emissions were 0.5 million mt$CO_2$e. Our market-based Scope 2 emissions were 0.4 million mt$CO_2$e.

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

- Electricity purchased from regional electrical power suppliers.
    - To calculate location-based Scope 2 emissions, we use the EPA's Emissions and Generation Resource Integrated Database (eGRID) and the Canadian National Inventory Report. We multiply the quantity of purchased electricity by the appropriate eGRID (or Canadian equivalent) emission factor.
    - To calculate market-based Scope 2 emissions, we use a combination of residual mix, balancing authority, or utility-specific emissions factors, according to the hierarchy set forth by the GHG Protocol. We do not account for Renewable Energy Credits (RECs) or Power Purchase Agreements (PPAs) in our inventory.
- Steam purchased from non-Weyerhaeuser facilities.

FIGURE 1: SCOPE 1 AND 2 ACTIVITIES

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

# Scope 3: Upstream and downstream products and services

In 2022 our Scope 3 emissions were 9.2 million $mtCO_2e$[4].

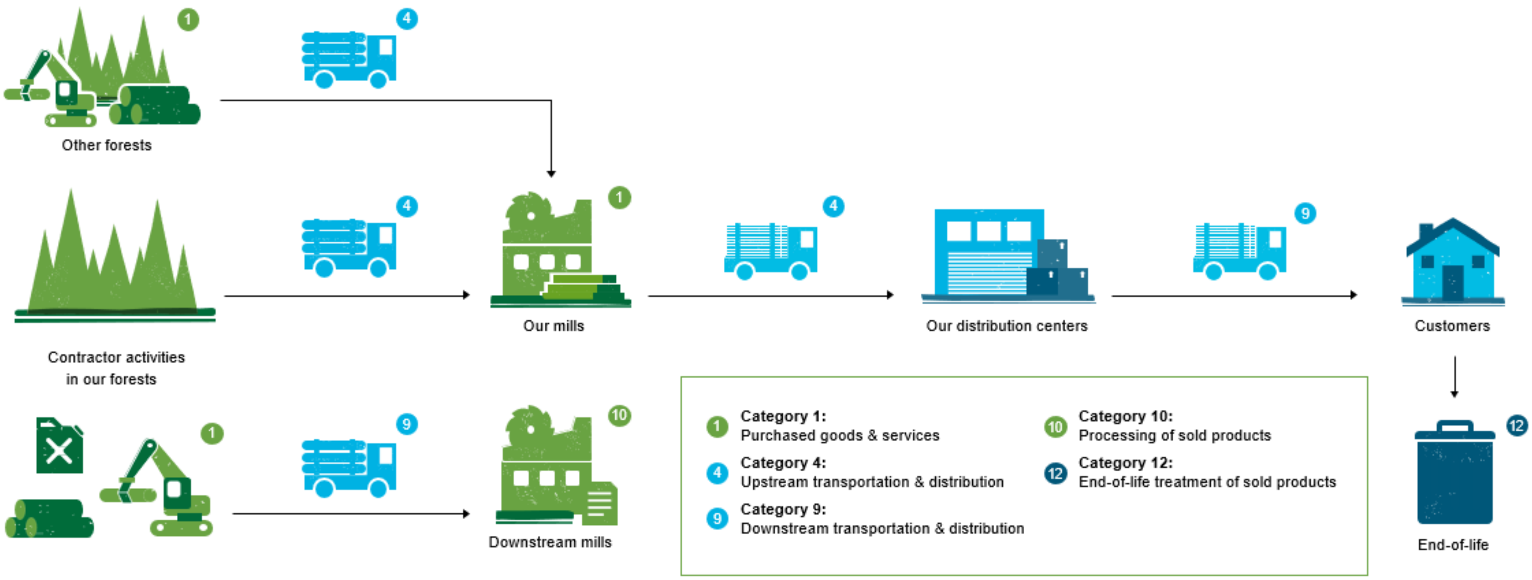
Scope 3, or value chain, emissions include all indirect emissions not included in Scope 2. Our value chain includes both upstream activities (our suppliers) and downstream activities (our customers and end-users). The GHG Protocol divides Scope 3 into 15 categories and we calculate and include 6 significant categories in our inventory:

**TABLE 2: BREAKDOWN OF SCOPE 3 EMISSIONS**

| SCOPE 3 EMISSIONS | | 2022 AMOUNT in million metric tons of carbon dioxide equivalent (million $mtCO_2e$) |
|---|---|---|
| Category 1 | Purchased goods and services | 0.6 |
| Category 3 | Fuel- and energy-related activities | 0.2 |
| Category 4 | Upstream transportation and distribution | 0.3 |
| Category 9 | Downstream transportation and distribution | 0.7 |
| Category 10 | Processing of sold products | 4.2 |
| Category 12 | End-of-life treatment of sold products | 3.3 |

## 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”.




[4] Note that the categories do not sum to the 9.2 million total due to independent rounding.

## FIGURE 3: SCOPE 3 ACTIVITIES

### Category 1: Purchased goods and services.
**0.6 million mt$CO_2$e**

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.
2. *Emissions from forestry operations conducted by third-party contractors on our land.* 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.
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.

**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

**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 3: Fuel- and energy-related activities not included in Scope 1 or 2.
**0.2 million mt$CO_2$e**

We have three primary sources of category 3 emissions:

1. *Upstream emissions of purchased fuels.* We account for the emissions associated with extracting, producing and transporting the fossil fuels we use in our operations.
2. *Upstream emissions of purchased electricity*. This includes the emissions associated with extracting, producing and transporting the sources of energy that produce the electricity we use.
3. *Transmission and distribution (T&D) losses of purchased energy*. This includes the losses of energy during the transportation and distribution of the electricity we purchase.

**Primary data:**
- Fossil fuel use, by type of fuel
- Electricity purchases, by eGRID region or Canadian province

**Secondary data:**
- Gross grid loss from transmission and distribution systems, from the EPA
- Average GHG emissions associated with acquiring and transporting fossil fuels, US LCI

**Calculation type:** Average-data method[vi]

**Data quality**: Fair

### Category 4: Upstream transportation and distribution

**0.3 million $mtCO_2e$**

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[vii]

**Calculation type:** Distance-based method[viii]

**Data quality:** Good

### Category 9: Downstream transportation and distribution

**0.7 million $mtCO_2e$**

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[ix]
- Distance traveled by logs and finished products sold to international markets, by country

**Calculation type:** Distance-based method

**Data quality:** Good

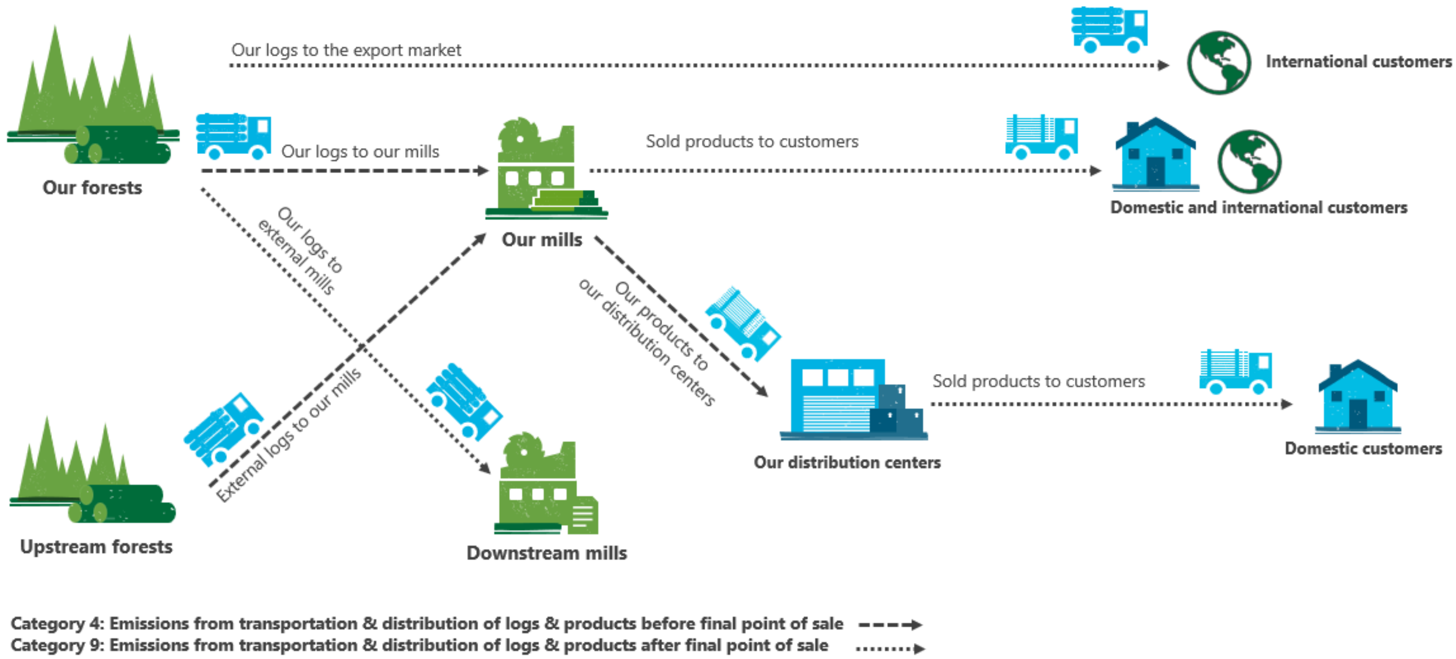



**FIGURE 4: SCOPE 3, CATEGORIES 4 AND 9 – EMISSIONS GENERATED DURING TRANSPORTATION OF PRODUCTS**

### Category 10: Processing of sold products

**4.2 million mtCO$_2$e**

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.

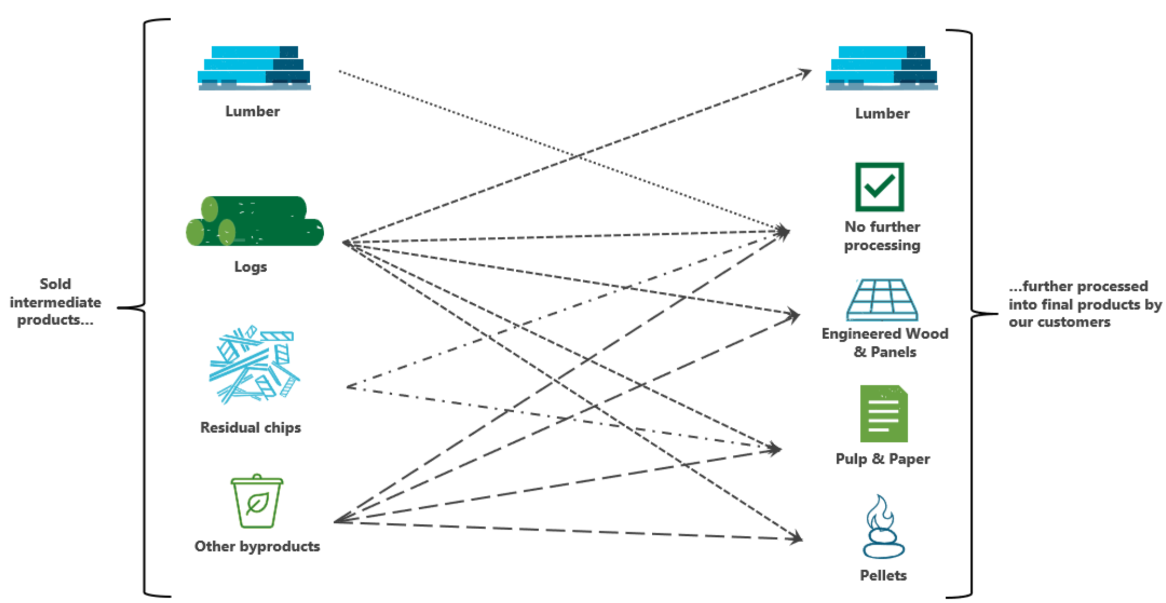



**FIGURE 5: SCOPE 3, CATEGORY 10 – EMISSIONS GENERATED IN THE FURTHER PROCESSING OF SOLD PRODUCTS**

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):***

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

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

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

**Calculation type:** Average-data method[xi]

**Data quality:** Good

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

**3.3 million mt$CO_2$e**

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[xii] (USFS) and emission factors from the EPA[xiii][xiv]. 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.

**Primary data:**

- Wood products primary production
- Logs sold to external customers

**Secondary data:**

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

**Calculation type:** Waste-type-specific method[xv]

**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[xvi] [xvii] [xviii] 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 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[xix]. 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.[xx]) for this category to approach significance. Calculations are based on EPA data for emissions from a typical passenger vehicle[xxi].

**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[xxii] (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 2022 our emissions from biomass combustion were 2.5 million mt$CO_2$e.

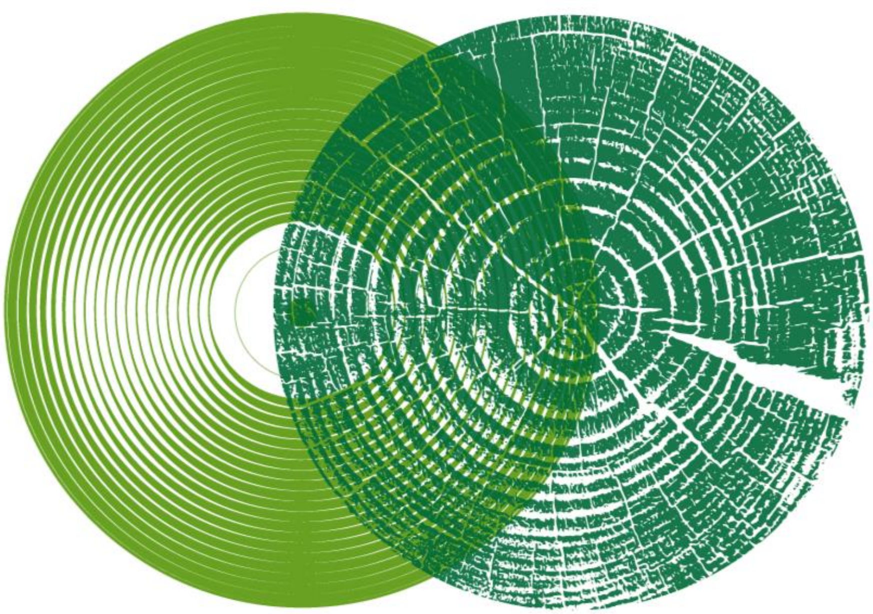
Per the current GHG Protocol[xxiii], we report direct $CO_2$ emissions associated with the combustion of biomass fuels, such as wood and wood waste, separately from the scopes. Note: the $CH_4$ and $N_2O$ emissions associated with biomass combustion *is* included in our Scope 1 GHG emissions. Our biomass fuel is a mix of mill and forest residuals sourced from sustainably managed forests in regions where carbon stocks are stable or increasing[xxiv]. 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[xxv].

**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)*



# TRACK 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 | 2022 AMOUNT in million metric tons carbon dioxide equivalent (Million mt$CO_2$e)[5] |
|---|---|
| Scope 1: Net change in our forests | 2 |
| Scope 3 | |
| Category 1: Net change in the forests of our sourcing regions | 12 |
| Category 11: Stored in our wood products | 11 |
| Category 11: Stored in downstream wood products | 7 |
| **Total Removals** | **31** |

[5] Removals are rounded to the nearest million metric tons.

**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[6] in carbon storage both in our own forests and in the forests of our sourcing regions.[7] 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 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[8] 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.

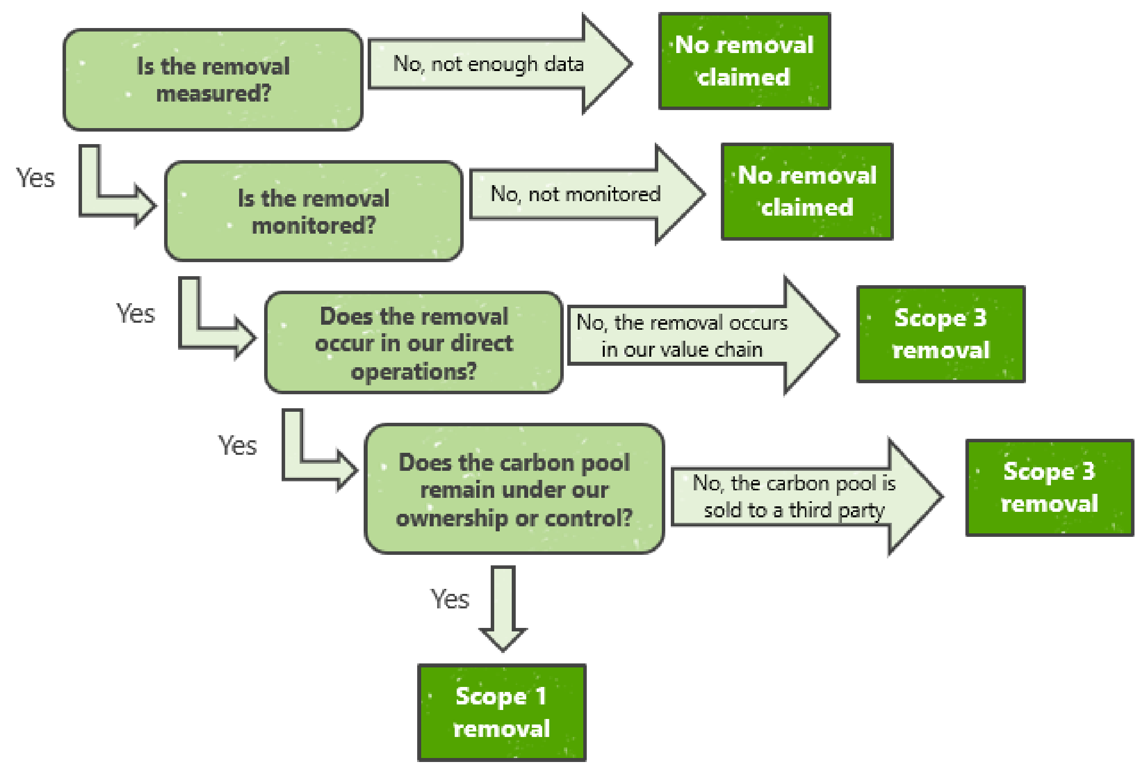



**FIGURE 6: CATEGORIZATION OF REMOVALS**

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[6] 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.

[7] 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.

[8] 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[xxvi] *not* included in our removals calculations[9]:

- **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,[xxvii] 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.[xxviii] 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.

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.

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[9] 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".

# Scope 1: Net change in our forests[10]

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 2022, the net change in carbon stored in our forests was a removal of 2 million metric tons carbon dioxide equivalent[11]. That is equivalent to taking about 500,000 cars off the road for one year.[xxix]

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:

**1. Determine consistent spatial footprint** → **2. Map spatial footprint to inventory database** → **3. Expand inventory to aboveground carbon**

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 on the next pages illustrate one example.

[10] 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.

[11] Based on approximately 10,600,000 acres of land we owned at the end of both 2021 and 2022.

**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** |

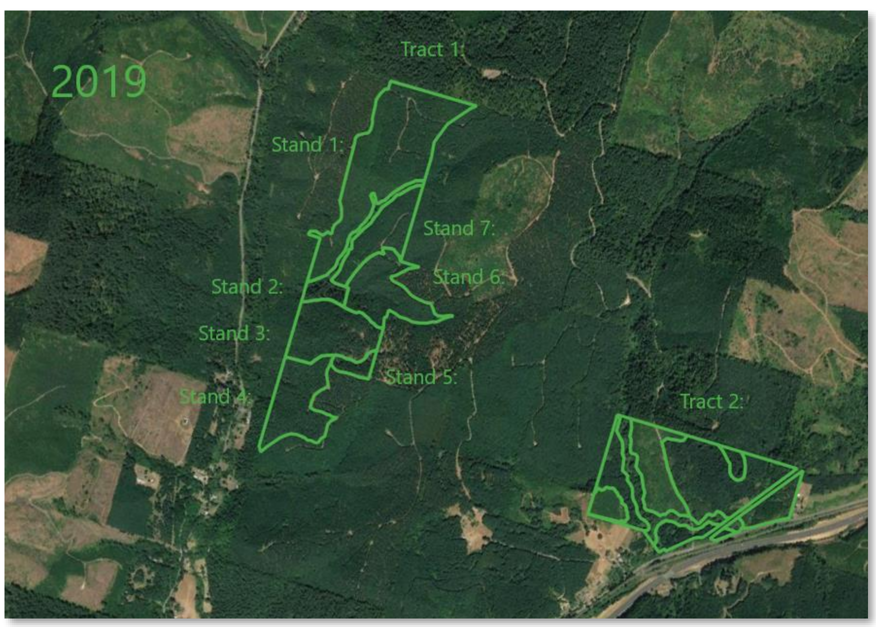



**FIGURE 6: 2019 OWNERSHIP.** THE SEVEN STANDS COMPRISING TRACT 1 ARE LABELED INDIVIDUALLY.

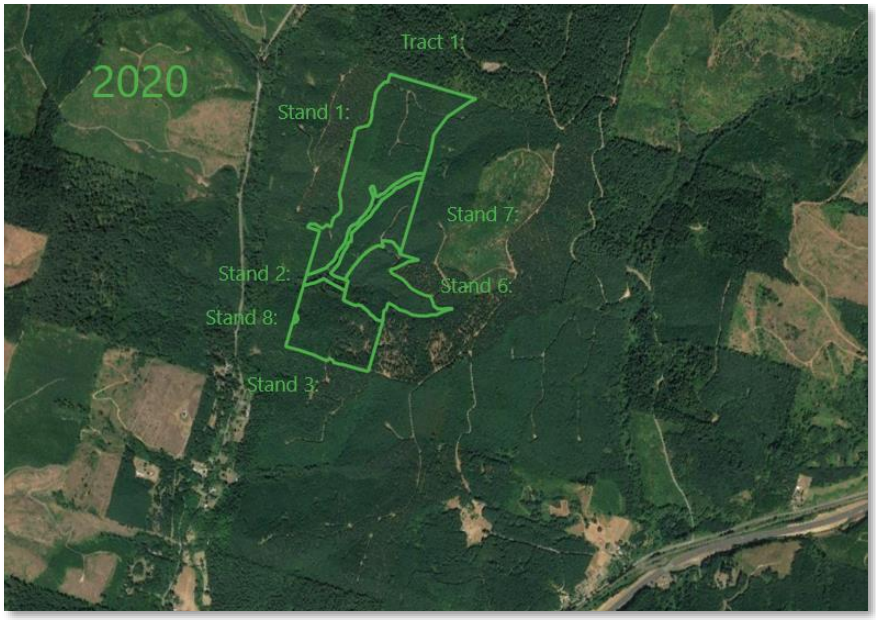



**FIGURE 7: 2020 OWNERSHIP.** IN 2020 WE SOLD TRACT 2, SO IT IS NOT INCLUDED IN THE SPATIAL FOOTPRINT. STANDS 1, 6 AND 7 ARE OWNED IN BOTH YEARS WITH THE SAME ACREAGE. THEY ARE INCLUDED IN THE SPATIAL FOOTPRINT WITHOUT CHANGE.

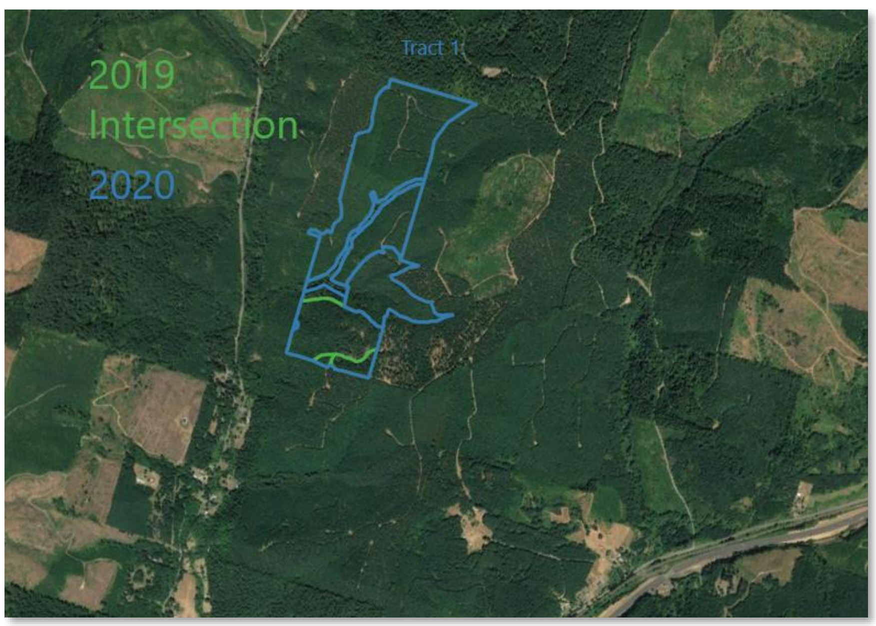



**FIGURE 8: 2019 AND 2020 OVERLAY.** IN 2020 SOME ACRES WERE COMBINED BETWEEN TRACTS. THE "NEW" STAND 3 INCLUDES ACRES FROM THE "OLD" STANDS 2, 4 AND 5. NOTE THAT ALL ACRES IN STANDS 2 AND 5 REMAIN OWNED, WHILE A PORTION OF STAND 4 WAS SOLD. THERE IS ALSO A SMALL ADDITION OF A NEW STAND 8 IN 2020 THAT 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.[xxx] 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 2022 removal of 12 million mt$CO_2$e. 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[xxxi] 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 FIA unit in the United States[xxxii] and at the national level for managed Canadian forests.[xxxiii] 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 referenced in step one. To determine total harvest at the FIA unit level in the U.S., we use Forest Inventory and Analysis data gathered by the USFS[xxxiv]. 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 on the next page.

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.

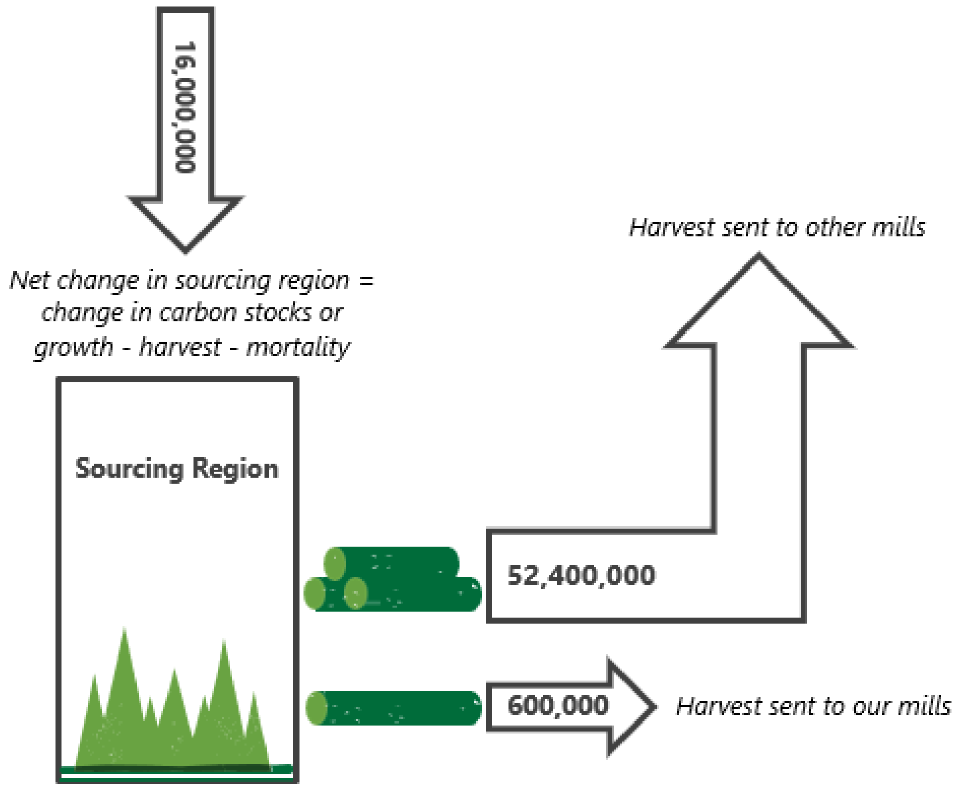



FIGURE 7: HYPOTHETICAL EXAMPLE OF CALCULATING A LAND REMOVAL FACTOR

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

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

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 $mtCO_2e$.

**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*[xxxv] [xxxvi]
- 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)[xxxvii]
- 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[xxxviii]

**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 2022, 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*[xxxix], 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.*[xl] Different conversion factors are available from separate U.S. Forest Service reports[xli] 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[xlii] and the USFS[xliii].

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.[xliv] 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."[xlv] 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)[xlvi]
- Conversion factors to convert from production units to metric tons, per product[xlvii]

**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 2022 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[xlviii] 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)[xlix]

**Calculation type**: Dynamic accounting

**Data quality**: Fair

# TRACK 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.[l]

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.[li] 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.[lii] While this difference could be explained by regional differences or varying boundaries of defining of soil carbon[12], 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 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[liii].

**TREES AND ROOTS**
1,000 million

[12] 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.

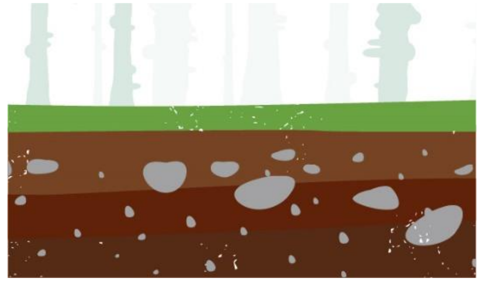
  

Forest carbon pools *estimated to a range of values* using a mix of regional and species-specific estimates from secondary data:[liv] [lv]

- **Soil:** All carbon-based material, measured to a depth of 1 meter, in both mineral (rocks) and organic (decomposed organic matter) soils.

**SOIL**

1,000–1,900 million



- **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.

**OTHER BIOMASS**

300–700 million

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[lvi] [lvii] | 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 mt$CO_2$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[13]. 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[14].

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.

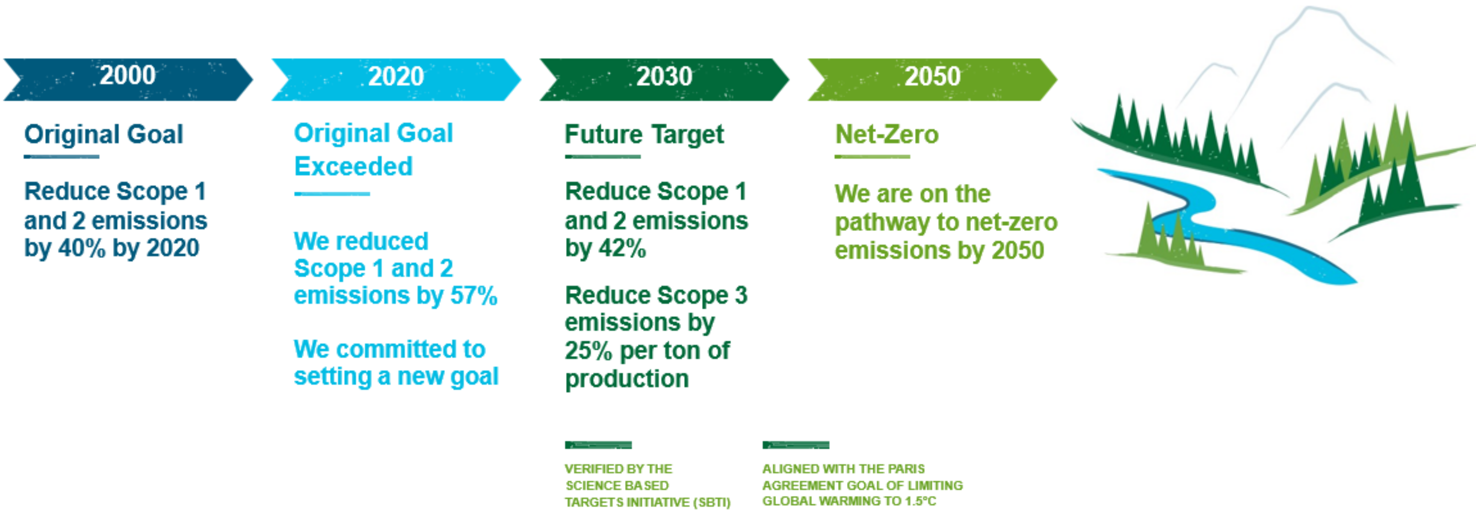
We have been managing our forests sustainably for over 120 years and are proud to be the stewards of such an amazing natural resource. Our continuous cycle of planting, growth, harvest and replanting maintains billions of tons of carbon dioxide equivalent in our forests over the long term, in addition 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.

**FIGURE 8: OUR FORESTS STORAGE CARBON IN TREES, ROOTS, SOIL, AND OTHER BIOMASS**

[13] 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 mt$CO_2$e.
[14] Based on the most recently available data from 2019.

# TRACK 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 is in line with limiting global warming to 1.5 degrees Celsius. 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.




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.

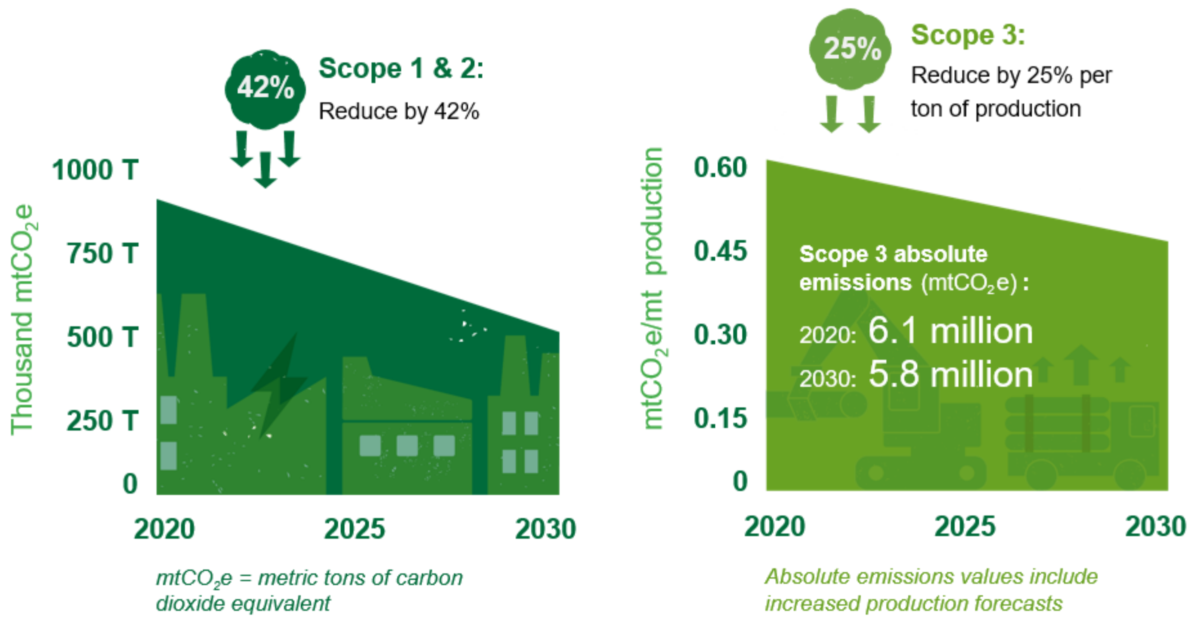



**FIGURE 9: OUR 2030 EMISSIONS REDUCTION TARGET IS IN LINE WITH LIMITING GLOBAL WARMING TO 1.5C**

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.

# REMIX: PROGRESS & ADJUSTMENTS

Since the first release of our *Carbon Record* in September 2021, we have made considerable progress towards reducing our greenhouse gas emissions and maintaining the immense amount of carbon that is stored in our forests and wood products. We have also taken great strides to improve the data quality that support all our climate-related disclosures; from receiving limited assurance of our Scope 1 and 2 emissions, to implementing process and internal control enhancements, to migrating to an industry-leading sustainability data collection and reporting platform.

This "remix" of the original *Carbon Record* shows our progress over time and transparently communicates how our baseline is adjusted as we continue to enhance greenhouse gas inventory. We follow the recommendations of the GHG Protocol to determine when and how to adjust our baseline.

## 2022 progress

### Emissions

- Combined Scope 1 and Scope 2 (market-based) emissions decreased by 5% in 2022 against a 2020 baseline.
    - Reduced fertilizer application and fossil use in our Timberlands operations
    - Reduce natural gas and biogenic energy use in our manufacturing facilities
- Scope 3 emissions decreased by 3% in 2022 against a 2020 baseline.
    - Fewer by-products sold to pulp and paper manufacturers, resulting in lower downstream emissions in categories 10 (use of sold products) and 12 (end-of-life treatment of sold products)

### Removals

- The net change in above-ground live carbon stored in our forests (our Scope 1 removals) changed from a removal of 10 million mt$CO_2$e in 2020 to a removal of 2 million mt$CO_2$e in 2022. Because we calculate our removals by comparing our timber inventory across two years, changes to our inventory that are not retroactively applied to previous years' inventories can sometimes influence our removals value. In 2022, there were three such cases which resulted in downward changes to our removals value year-over-year:
    - Additional work to update our inventory to account for the impact of 2020 Oregon wildfires
    - Updates to the hardwood inventory in our southern timberlands in 2022, which are primarily classified as riparian management zones
    - Higher amount of fee harvest in 2022 compared to 2021
- No change to Scope 3 removals categories (net change in the forests of our sourcing regions, carbon storage in our wood products, carbon storage in downstream wood products)

## 2020 baseline adjustments

### Emissions

- Scope 1 and 2
    - Expanded the boundary of Scope 1 and 2 inventory to include controlled burns in our timberlands, tree nurseries and seed orchards, distribution centers, and owned office buildings.
    - Changed our Scope 2 location-based emissions factors from the state-level to eGRID region-level.
    - Implemented a process change that enabled the calculation of Scope 2 market-based emissions separately from Scope 2 location-based emissions.
- Scope 3
    - Expanded the boundary of our Scope 3 inventory to include the end-of-life emissions of our sold logs (category 12) and the fuel- and energy-related activities not included in Scope 1 or 2 (category 3).
    - Changed the default emission factors used for the transportation of our logs and for the use of our by-products by pulp and paper manufacturers.

### TABLE 6: ADJUSTMENTS TO EMISSIONS BASELINE

| CATEGORY | 2020 (million $mtCO_2e$) | | 2021 (million $mtCO_2e$) | |
|---|---|---|---|---|
| | Original | New | Original | New |
| Scope 1 | 0.4 | 0.4 | 0.4 | 0.4 |
| Scope 2 (location-based) | 0.6 | 0.5 | 0.6 | 0.5 |
| Scope 2 (market-based) | 0.6 | 0.4 | 0.6 | 0.4 |
| Scope 3 | 6.1 | 9.5 | 6.5 | 9.4 |
| Category 1 | 1.2 | 0.6 | 1.6 | 0.6 |
| Category 3 | - | 0.2 | - | 0.2 |
| Category 4 | 0.3 | 0.3 | 0.3 | 0.3 |
| Category 9 | 1.3 | 0.7 | 1.4 | 0.7 |
| Category 10 | 2.9 | 4.3 | 2.9 | 4.2 |
| Category 12 | 0.3 | 3.4 | 0.3 | 3.4 |

**Removals**

- Scope 1
    - No changes to baseline
- Scope 3
    - Category 1 (net change in the forests of our sourcing regions)
        - Improved the spatial resolution used to calculate the net change of our sourcing regions. Originally, state-level data was used to determine our allocation of net change. We now utilize FIA unit-level data, allowing us to determine our allocation of net change with a greater degree of certainty. There are typically between 5 and 10 FIA units in each state from which we source.
    - No changes to category 11 baselines (carbon storage in our wood products, carbon storage in downstream wood products)

### TABLE 7: ADJUSTMENTS TO REMOVALS BASELINE

| CATEGORY | 2020 (million $mtCO_2e$) | | 2021 (million $mtCO_2e$) | |
|---|---|---|---|---|
| | Original | New | Original | New |
| Scope 3: Category 1 | 4 | 12 | 3 | 12 |

# 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 CARBON RECORD, OUR SUBMITTAL OF A SCIENCE-BASED GREENHOUSE GAS TARGET THAT ALIGNS WITH THE PATH TO NET ZERO, AND THE PUBLISHING OF THIS DETAILED METHODOLOGY, 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.

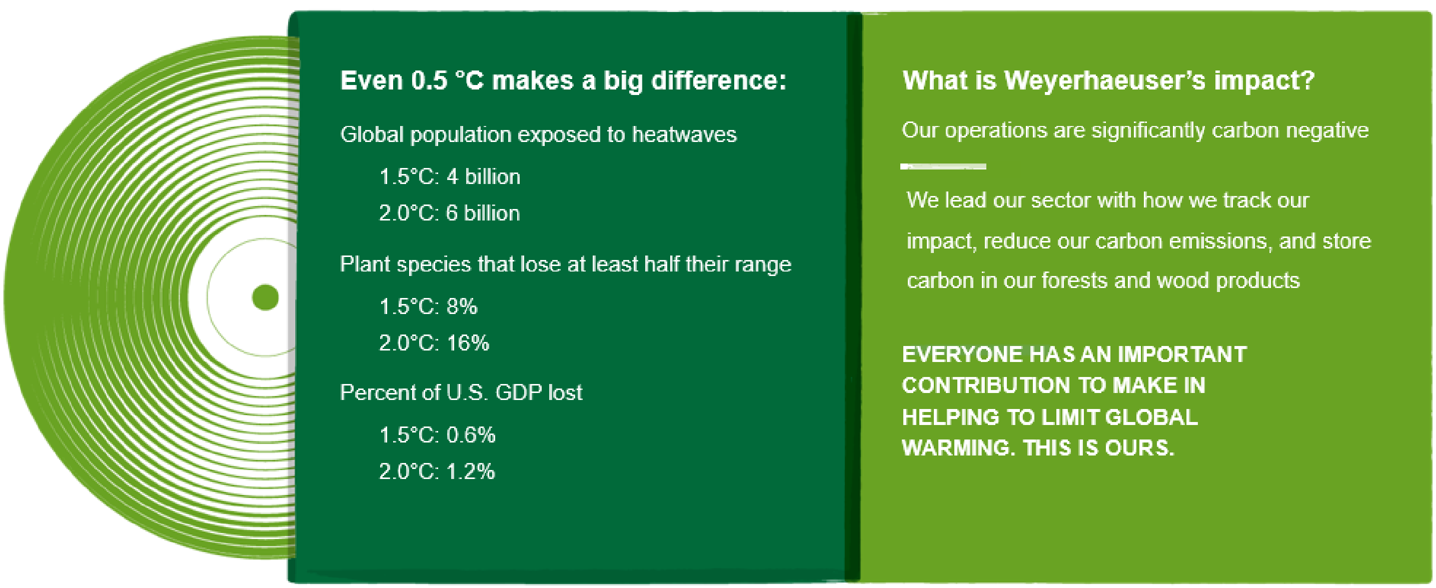



**FIGURE 10: BEHIND THE RECORD[15]**

[15] UW Climate Impacts Group (adapted from World Resources Institute)

# ALBUM CREDITS

***Singer/songwriter: Vaughan Andrews***

***Producer: Ara Erickson***

***Sound mixing: Karl Wirsing***

### TRACK 1: EMISSIONS

- Band members
    - Tracey Jochim, Johanna Wassermann, Katie Cava, Chad Leatherwood
- Featuring
    - Helen Smith, wood products mills, environmental managers, and regional environmental managers, timberlands areas, foresters, and region foresters, logging truck drivers
- Sampled
    - Diane Sepanski, National Council for Air and Stream Improvement, Inc. (NCASI), all our customers and suppliers, and all the people that helped us gather data!

### TRACKS 2 AND 3: REMOVALS AND STORAGE

- Band members
    - Fletcher Harvey, Casey Ghilardi
- Featuring
    - Greg Johnson, Alicia Robbins, Scott Holub, Olivia Jacobs, timberlands areas, foresters, and region foresters, wood products mills, environmental managers, and regional environmental managers
- Sampled
    - Diane Sepanski, National Council for Air and Stream Improvement, Inc. (NCASI), U.S. Forest Service (Forest Inventory and Analysis), Canadian Forest Service

### TRACK 4: EMISSIONS REDUCTION TARGET

- Band Members
    - Chad Leatherwood
- Featuring
    - Energy Strategy Team, Jason Minchin, Rob Laishley, Justin Nikbakhsh, Shane Wells, Mitchell Lue, wood products mills, environmental managers, and regional environmental managers

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