18 April 2024

**SENT TO LSU AGCENTER/LOUISIANA FOREST PRODUCTS DEVELOPMENT CENTER - FOREST SECTOR / FORESTY PRODUCTS INTEREST GROUP**

# Q1 2024 Market Trends-WillSonn Advisory

Please find attached your complimentary copy of WillSonn Advisory's Market Trends Report for the 1st Quarter of 2024. Towards the end of the first quarter, many of the housing indicators appear stalled as the prospect of near-term interest rate cuts has dissipated, though the quarter as a whole showed some modest improvements from Q4. Affordability broke above 100, Builder sentiment improved, home inventories for sale ticked up, all mildly positive. On the downside, improvement spending and multi-family building slipped. Housing starts improved as buyers may be resigned to the higher interest rates, though home size continues to shrink. Log prices were mixed in both regions, resulting in a slight improvement in Gross Mill Margins. The final tally of timberland transactions showed 2024 registered about a fourth of 2022's volume.

In this quarter's Deeper Dive, I present a case study for reporting Carbon, along with a qualitative review of the Timber REITs' 2022 Carbon Reports. Last year's review of Carbon Reporting standards have been put in the "In Case You Missed It" section for your convenience. Reporting our industry's performance in a consistently rigorous, science-based manner, with full disclosure, transparency and accountability, will serve our industry best in the long run, especially as the SEC develops the protocols for its upcoming Carbon disclosure requirements. I hope you find this analysis informative and look forward to hearing your impressions, concerns, and ideas for finding a way forward.

Best Regards,

Will

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# MARKET TRENDS

## 1ST QUARTER, 2024

The latest market trends and indices impacting the Timber and Wood Products sectors.

Compliments of WillSonn Advisory, LLC

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# Q1 2024 HIGHLIGHTS

## Market Trends

- New Home Builder Sentiment improves, while remodeling spending trends lower (page 5-6)
- Housing Affordability ends its sub-100 stretch (page 7-8)
- Total Housing Starts remain sluggish. Single-Family improves, gains share (page 9-10)
- Inventory of Homes for Sale ticks up YOY (page 11-12)
- Wood Product prices register small gains in Q1, remain below 2023 (page 13-14)
- Log price movements were mixed, lag product prices (page 15-16)
- Gross sawmill margins improve, South:PNW spread narrows (page 17)
- Final tally of 2023 US Timberland Sales was 25% of 2022's volume (page 18-19)

## Deeper Dive

- A Case Study in Carbon Reporting, Qualitative review of 2022 REIT Carbon Reports (pages 20-35)

## In Case You Missed It

- Q4 2022 Deeper Dive: Carbon Reporting Standards & Potential Changes (pages 36-57)

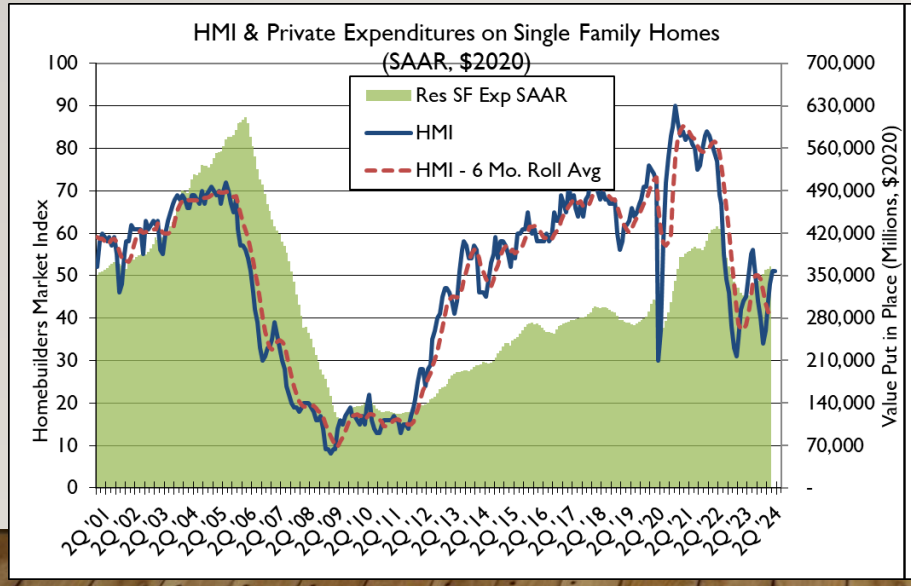
## About WillSonn Advisory, LLC

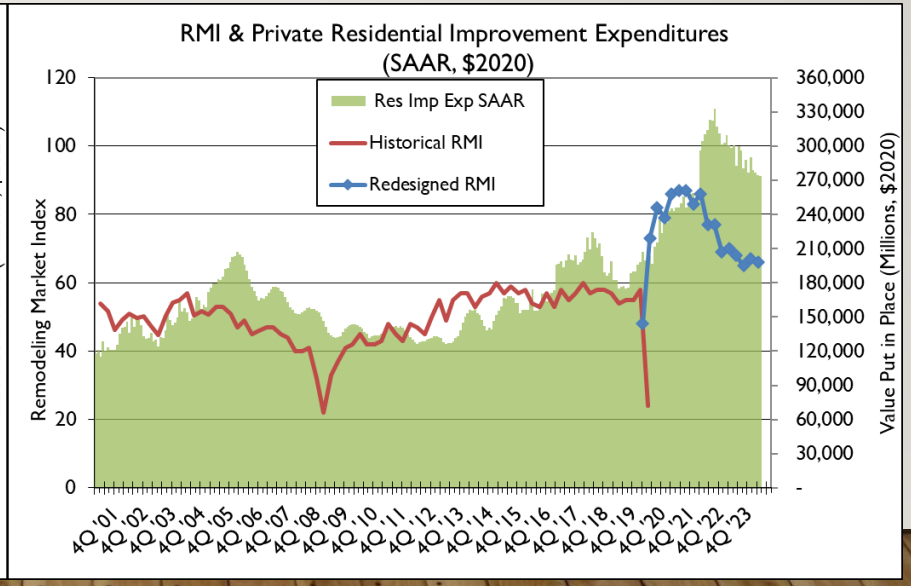

# SECTION 1:

# LATEST TRENDS

# BUILDER SENTIMENT & PRIVATE RESIDENTIAL EXPENDITURES

- **Recent Trends**: The Homebuilder Market Index (HMI) ended Q1 2024 with a reading of 51, 14 points higher than December 2023 and 20 points higher than December 2022. The Remodeling Market Index (RMI) ticked down to 66 in Q1 2024.
- Full year 2023 Real Expenditures on Single Family New Residential were -15.2% below full-year 2022 expenditure levels, following flat expenditures in 2022. 2023 Real Expenditures on Private Residential Improvement slid -7.4% below 2022 levels, following 2022's 24.3% increase. Through February, Real SF expenditures are up 9.3% while MF expenditures are down -5.1%, versus 2023 levels.
- **Explanation**: Homebuilder sentiment moved lower as mortgage rates moved higher. Higher interest rates and weak housing starts have dampened construction expenditures.
- **Implication**: Improving builder confidence generally bodes well for near to intermediate-term housing starts. Higher mortgage costs risk limiting the pool of qualified buyers and cooling housing turnover. Competition from pre-pandemic consumer interests (e.g., travel, eating out, a.k.a. "revenge spending"), along with elevated borrowing costs may moderate remodeling activity for a few more quarters.
- **Expectation**: Eventually, builder sentiment and construction expenditures should begin to improve when housing recovers, and with it, improving building material prices and stable to declining mortgage rates. However, constrained supply of existing homes for sale, a dearth of developed lots, scarce labor and lower contractor productivity will keep residential expenditures in check in the near-term.

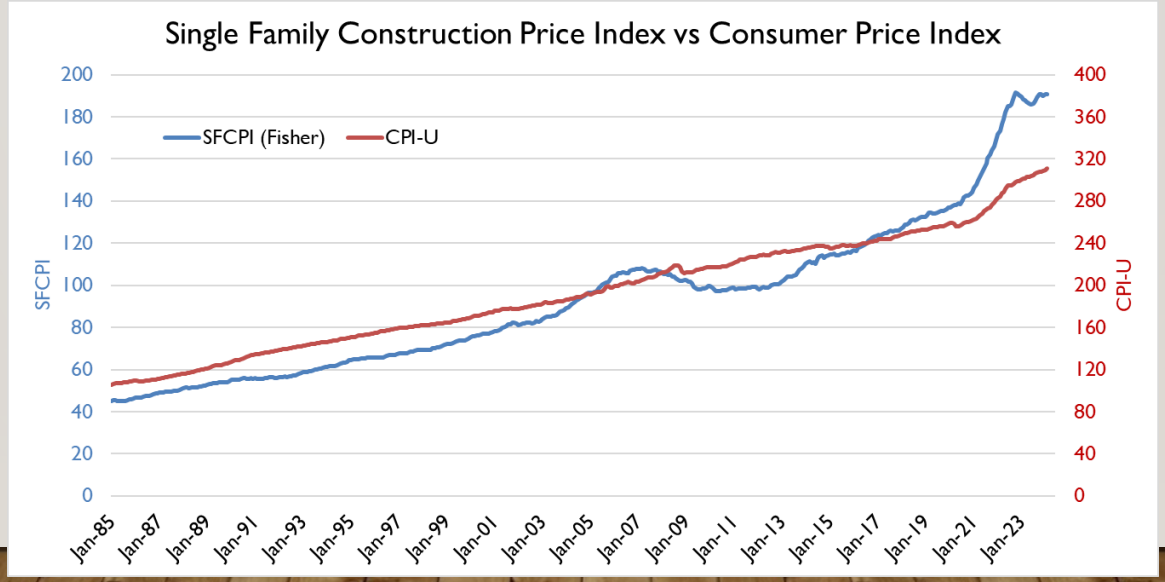



Data Sources: Census Bureau, NAHB, Dept. of Commerce Charts & Analysis: WillSonn Advisory

# *BEHIND THE NUMBERS*: BUILDER SENTIMENT & PRIVATE RESIDENTIAL EXPENDITURES

- **On the previous page**, NAHB's Homebuilder Market Index (HMI) and Remodeling Market Index (RMI) are measures of home builder and remodeling contractor sentiment.
- The monthly HMI and quarterly RMI are dispersion indices, measuring the proportion of respondents who have a positive versus negative view (neutral responses are ignored in the calculation). A reading over 50 indicates a prevailing positive view of conditions.
  - Note that the NAHB instituted a new RMI survey beginning in Q1 2020, such that comparisons to prior years are meaningless.
- Private Construction Expenditures depicted on Single Family Housing and Remodeling are in constant 2020 dollars, (i.e., inflation adjusted) using the Consumer Price Index – All Urban Consumers.
- **In this chart**, I show the Single Family Construction Price Index (SFCPI), produced by the Census Bureau, which reflects the cost of construction, including labor, materials, and permitting, but excludes the cost of land and other non-construction costs. This index also holds the characteristics of homes under construction constant, so it does not reflect cost changes due to increasing or decreasing house size or amenities.
  - Since 2012, it is clearly visible that the Single-Family Construction Price Index has far outpaced overall inflation, at a pace almost 3 times as fast, increasing 90%, compared to 33% for the CPI-U index.

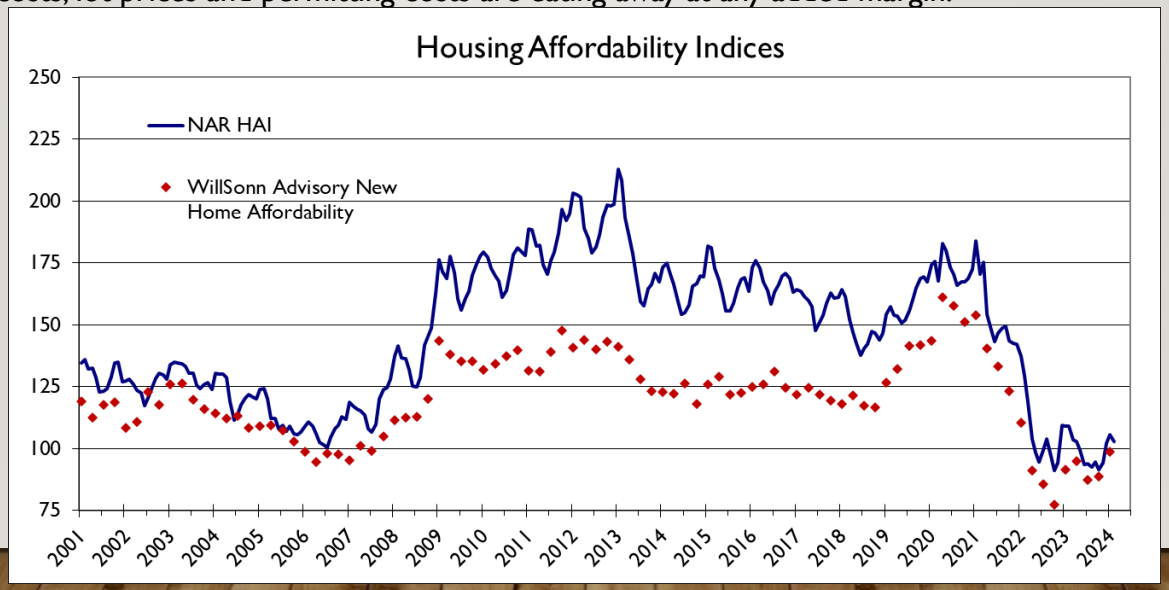



Data Sources: Census Bureau, FRED website

Charts & Analysis: WillSonn Advisory

# HOUSING AFFORDABILITY

- **Recent Trends**: The Housing Affordability Index ("HAI") (blue line) breached 100 in December 2023, registering 103 in February. The New Home Affordability (red diamonds) rebounded to a reading of 99 in Q1 '24, 21 points above the record low of Q4 2022.
  - 2023's seven consecutive months below 100 had not been seen since the mid-1980's.
- **Explanation**: In 2019 and 2020, mortgage rates eased and median family income accelerated (with the help of federal stimulus payments), bolstering this measure of affordability. Over much of the past three years, home prices continued to march higher in the face of strong demand, while rising mortgage rates and lagging income gains pushed affordability lower.
- **Implication:** Over the years, there is a rather weak link between affordability and housing starts (R-squared of just .17). In fact, the highest levels of housing starts occurred when affordability was in a trough (~2006). Thus, a "fear of missing out" may have spurred some home buyers to buy sooner than later, before home ownership was forever out of reach. Easy credit early 2000's also helped.
- **Expectation**: The efforts to keep a lid on inflation will continue to keep mortgage rates higher while thin existing home inventories will keep home values elevated. Expect affordability to continue to remain under pressure for awhile longer, but don't worry too much about its direct impact on housing starts. Also don't expect builders to pass along lower building material costs to buyers if lumber and OSB prices ease; rising labor costs, lot prices and permitting costs are eating away at any added margin.

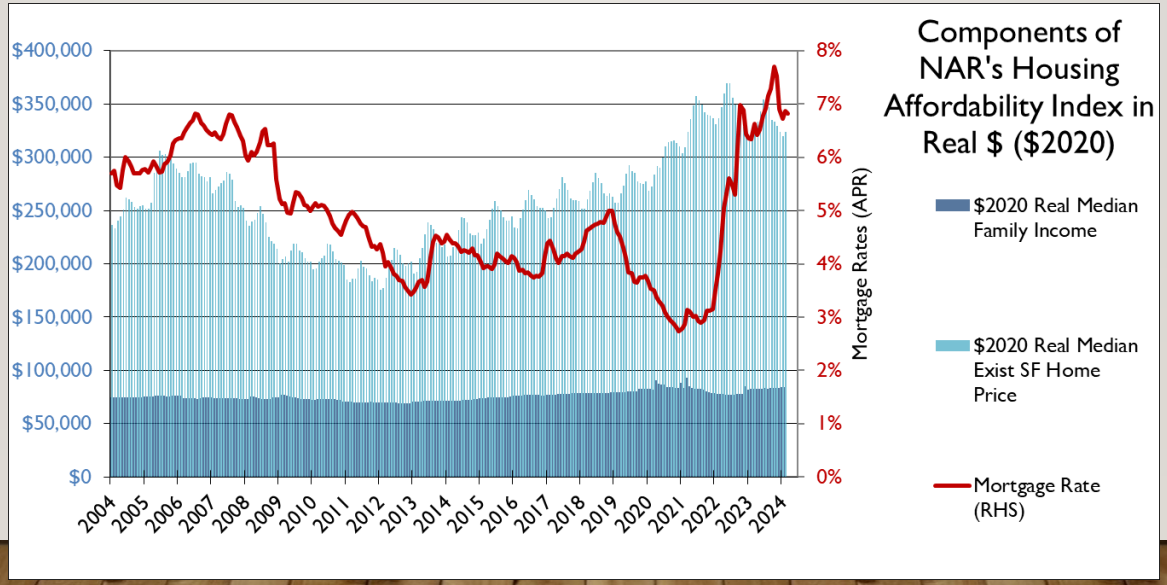



Data Sources: NAR, Census Bureau,, Dept. of Commerce

Charts & Analysis: WillSonn Advisory

# *BEHIND THE NUMBERS:* HOUSING AFFORDABILITY

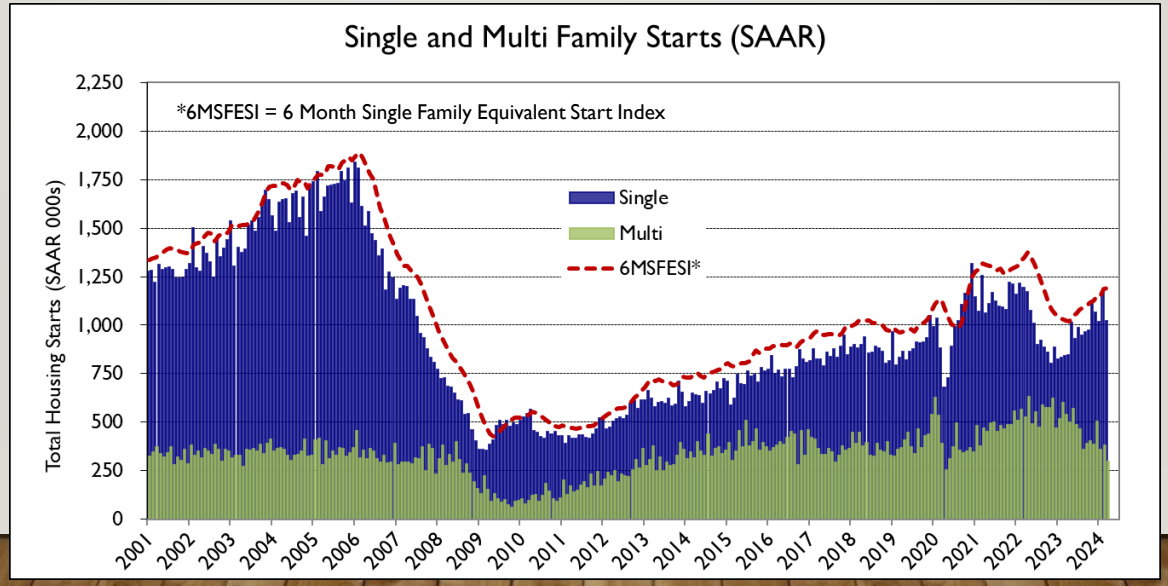
- **On the previous page**, the National Association of Realtors' Housing Affordability Index ("HAI") is based on three inputs: list prices of existing homes for sale, 30-year fixed mortgage rates and median family income. WillSonn Advisory's New Home Affordability uses the actual sales price of new homes, with the same income and mortgage rate figures as the HAI.
  - A reading of 100 means that a family with median income would need to spend fully 25% of its monthly income on a mortgage to purchase the median priced existing home. A reading of 140 means that 25% of the median family income is 1.4 times the mortgage payment for the median priced existing home.
- **The chart below** displays the movement in the three components of the NAR Affordability Index – home prices, mortgage rates and family income – in Real dollar ($2020) terms. Adjusted for inflation, 2023 compared to 2022, median real home prices declined -3.4% while real Median Family Income gained 6.0% (*Note: new Census Bureau estimates of Median Family Income were recently adjusted upward, retroactive to 1/1/2023*). But with average mortgage rates 27% higher, Mortgage Payments for the median priced home were 22% higher than 2022, eating up an increasing proportion of family income. All of this resulted in a declining Affordability Index.
- In February 2024, mortgage rates averaged 6.9%, 50 basis point higher than January 2023. Holding home price and income steady, a 50-basis point increase in mortgage rates drives the Affordability Index down about 10 points. 30-year Fixed Rate Mortgages have retreated since January, averaging 6.8% in March, so expect affordability to remain just above the 100-level in the near-term.




Data Sources: NAR, FRED website
Charts & Analysis: WillSonn Advisory

# HOUSING STARTS

- **Recent Trends:** Through March 2024, Housing Starts registered 1.415 million units, compared to 2023's total of 1.423 million units. Single Family Starts for 2023 were down -6% while Multi Family Starts were down -13%, compared to 2022. March's preliminary reading of 1.321 million units is still below the recent peak of 1.805 million units registered in April 2022, but certainly improved.
    - The WillSonn Advisory "6 Month Single Family Equivalent Start Index," recasts a multi-family unit into a single-family unit based on relative wood use, so a better measure of Housing Start's demand for wood. March's 1,190,000 unit reading moved higher from its recent low of 1,019,000 in April 2023, now at 63% of the 2006 peak of 1.89 million SFES's.
- **Explanation**: Accelerating home prices alone were a threat to sustained gains in Housing Starts. Coupled with elevated interest rates, Family Income gains have been more than offset, keeping aspiring homeowners in the rental market and shifting the market from single to multi-family construction (and pushing rents higher). Two years of declining Multi-family starts will keep pressure on rental prices.
- **Implication**: Housing Starts typically account for 30%-40% of wood usage, so as housing goes, so goes lumber and panel demand.
- **Expectation**: With a recession looking less likely and/or severe, Housing starts are expected to slowly improve over the next few quarters. In the longer-term, we can expect housing to continue to gain steam as the housing deficit is replenished and as existing home availability remains tight. Gains may be tempered by limits on construction labor and developed lots, and tight lending standards.

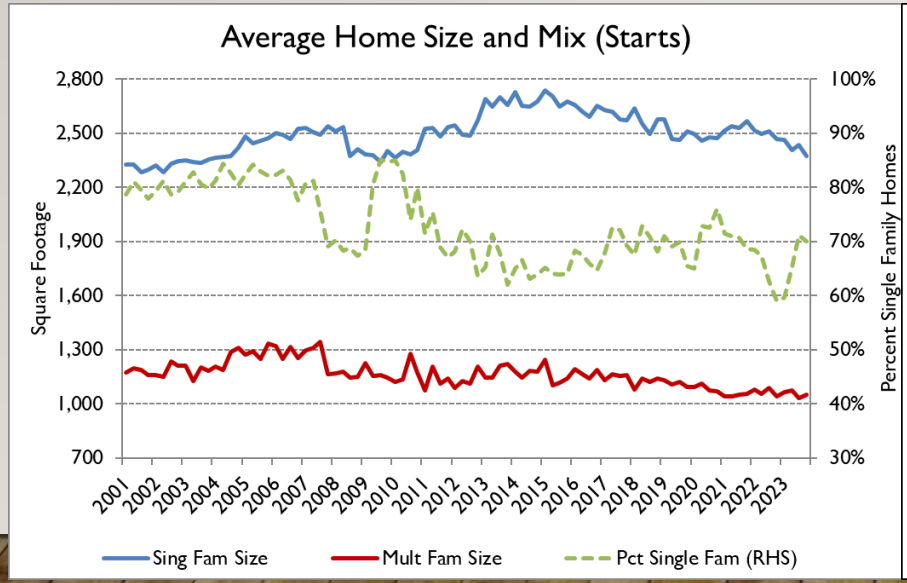


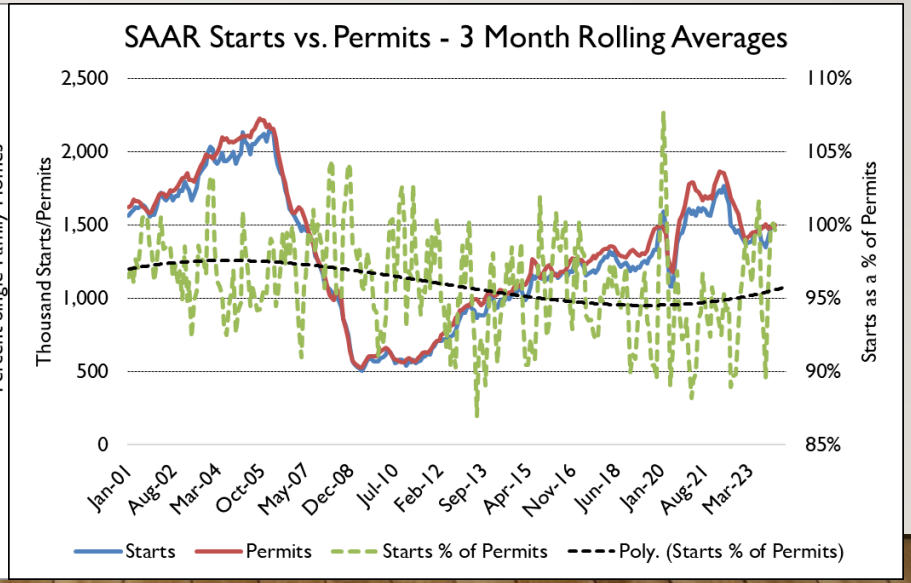

Data Source: U.S. Census Bureau
Charts & Analysis: WillSonn Advisory

# *BEHIND THE NUMBERS:* HOUSING STARTS

- For the **Single-Family Equivalent Start Index** on the previous page, Multi-family units use approximately 2/3 as much wood per square foot of construction compared to a Single-Family Unit, and since Multi-Family Units are about half the size of Single-Family homes, I count them as a 1/3 single-family-equivalent.
- On the **bottom left chart**, you can see that the size of Single-Family Home Starts trended smaller in 2023, averaging just 2,417 sq. ft., -3.3% smaller than 2022's average of 2,500 sq. ft. The average size of Multi-Family Units started in 2023 averaged 1,057 sq. ft., down slightly from the 2022 average of 1,066 sq. ft. The share of Single Family starts has inched higher to the 70% range during the last two quarters of 2023, six points above 2022 and 12 points below the pre-bust average of 82%.
- The ratio of Starts:Permits in 2023 improved, averaging 97%, compared to 93% in 2021 and 2022. It sits at 95% in Q1 2024. In the **bottom right chart**, you can see that the ratio had been declining over time, such that the old rule of thumb of ~97 Starts per 100 Permits came into question. Ongoing monitoring is warranted. Tightening builder credit since the housing-led Great Recession of 2008-09, along with volatile building material prices, were likely contributing factors. As housing starts regain momentum, and when (or if) the market shifts towards more single family starts, I expect the ratio to steady itself in the mid to upper-90's range.

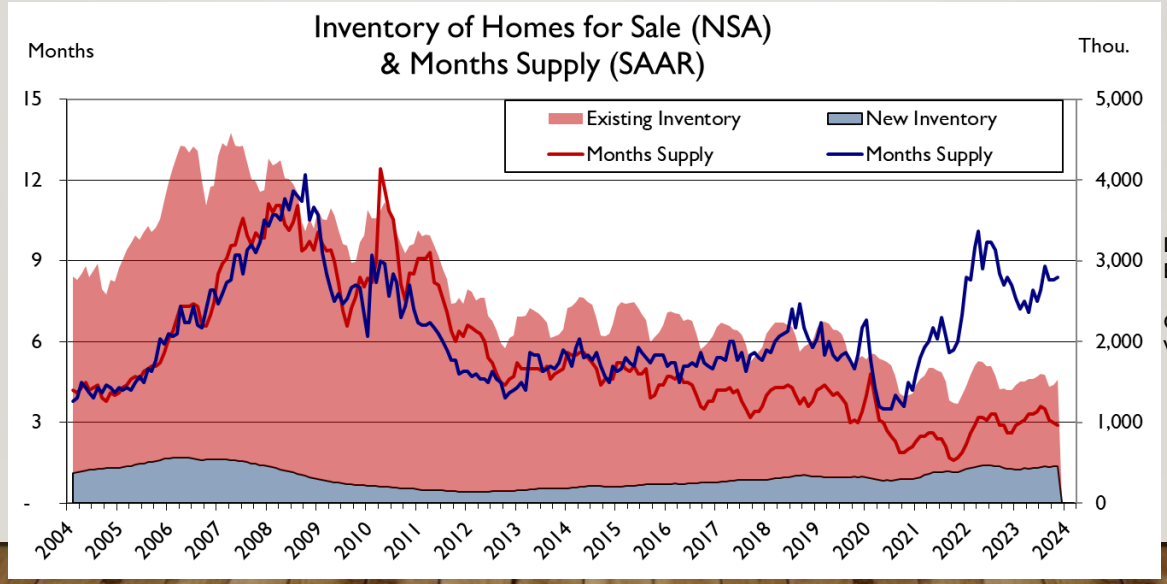
Data Source: U.S. Census Bureau  Charts & Analysis: WillSonn Advisory



# PACE OF HOME SALES & INVENTORIES

- **Recent Trends**: The Inventory of Homes For Sale (Existing + New) moved higher to 1.526 million units in February, up 84,000 units from December 2023, and up 128,000 units from February 2023. Separately, Existing Home Inventories are up 100k units, while New Home inventories are up 28k units, compared to February 2023. At their respective current pace of sales, there are a scant 2.9 months of sales in Existing Home inventories, and an excessive 8.4 months of sales in New Home inventories. Five or six months is normal.
- **Explanation**: The inventory of existing homes has been suppressed as homeowners have stayed put, increasing tenure from six or seven years a generation ago, to thirteen years today. Elevated mortgage rate and higher home prices are impediments to turnover of existing homes. New home inventories have surpassed the high end of the normal range as poor affordability has pushed buyers to the sidelines.
- **Implication**: Tighter inventories are contributing to higher home prices, which in turn limits existing homeowners' options to purchase replacement homes, a vicious cycle. While New homes are a major user of building materials, many R&R projects occur within the first couple years of ownership, so lower Existing home turnover can have a negative effect on the repair and remodel sector as well.
- **Expectation**: It is unlikely that the US housing starts will return to basement levels of the late 2000's when lax mortgage standards in the early 2000's torpedoed the housing sector. As predicted, with elevated mortgage rates, we are beginning to see lower levels of existing home sales and new home inventories rebuilding, along with a slower pace of home price growth.

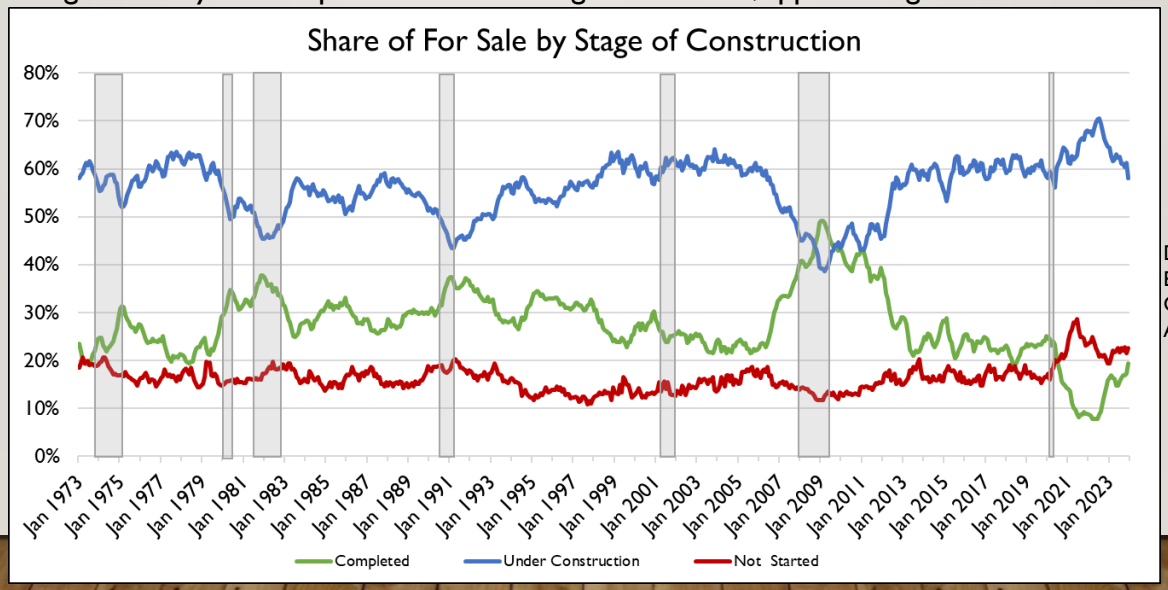



Data Source: U.S. Census Bureau, NAR

Charts & Analysis: WillSonn Advisory

# *BEHIND THE NUMBERS:* PACE OF HOME SALES & INVENTORIES

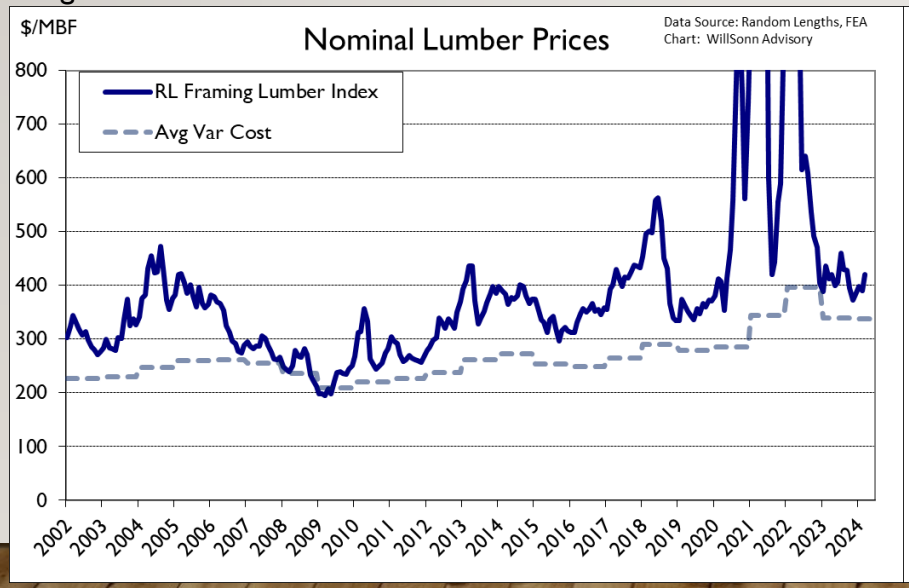
- **On the prior page, t**he inventory of New and Existing homes combines data from the National Association of Realtors ("NAR") which provides data for Existing home sales (both single and multi-family homes), and the U.S. Census Bureau, which provides data for New home sales (single family only). Inventory figures are not seasonally adjusted ("NSA"). Months Supply is derived from inventories and monthly sales volume, which are seasonally adjusted (Seasonally Adjusted Annual Rate, or "SAAR").
- **In the chart below**, I've plotted the share of New Homes for sale, by stage of construction. Also shown on the chart are the US recessions, in grey bars. What I notice in this chart is that a US recession is typically accompanied by a buildup (up to 30%+) in the share of Completed Homes for Sale and the longer the recession, the more pronounced the buildup of Completed Homes becomes. These patterns are typically mirrored by a decline in the share of homes Under Construction (below 50%).
- Of the 453,000 New units for sale at the end of 2023, only 19% were Completed (well above the recent 47-year low of 8%), 58% were Under Construction, and 23% had Not Yet Started (down from its recent record of 29%, but still elevated). If a typical recession is coming, there is a lot of change needed for the Completed and Under Construction shares.
- With the onset of the pandemic, and its impact on construction activity (slowed) and demand (heightened) we saw the inventory of homes Completed plummet, while the share of homes Not Yet Started climbed. Higher mortgage rates, beginning in 2022, drove demand for new homes lower, allowing inventory of Completed homes to begin to recover, approaching the low end of the normal range.

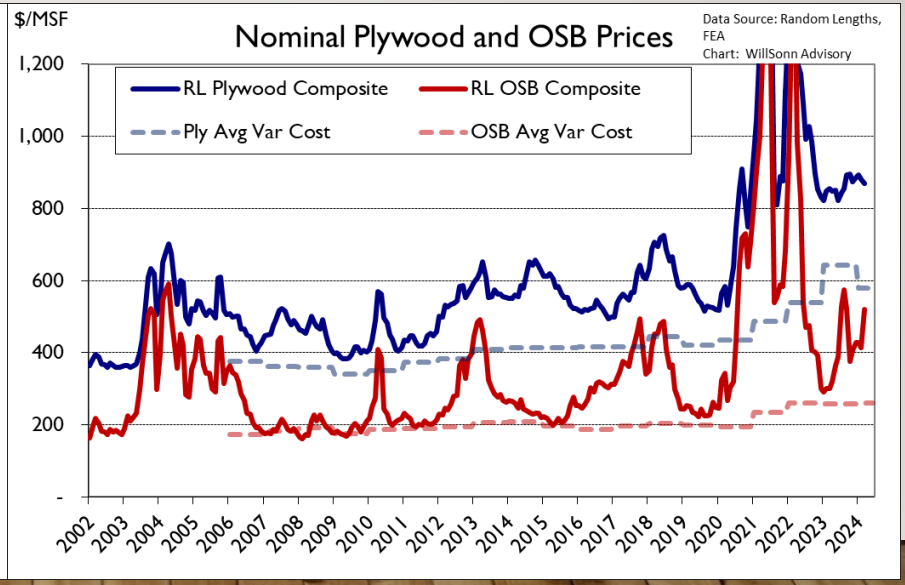



Data Source: U.S. Census Bureau, NAR
Charts & Analysis: WillSonn Advisory

# WOOD PRODUCT PRICES

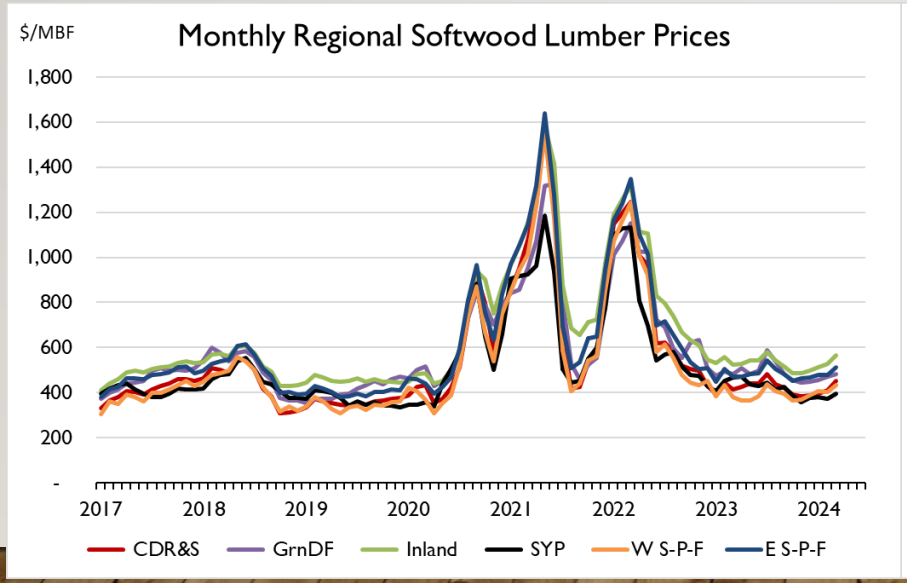
- **Recent Trends**: The Random Length Framing Lumber Composite Index in Q1 2024 moved higher, gaining 5% from Q4, though still -2% below Full Year 2023 prices. OSB prices recovered, gaining 13% in Q1 from Q4, now perched 14% above FY 2023 prices. In contrast, Plywood pricing were flat from Q4 and up a modest 3% above FY 2023. Only softwood plywood remains at or above its historical peaks prior to the pandemic.
- **Explanation**: A pause in the housing sector helped moderate and stabilize product prices relative to the pandemic years when manufacturing, construction and transportation sectors wrestled with periodic labor shortages, rising labor costs and volatile fuel costs for multiple quarters. Plywood has held up better than OSB due to lower exposure to the housing sector and reduced supply (down -3% since 2019 vs. +1% for OSB).
- **Implication**: As predicted, when building material prices became excessive, some buyers delayed, downsized or abandoned projects, reducing demand and thus price. Normally, high prices would spur additional mill shifts, a surge in imports and substitution from non-wood materials, each of which were muted during the Covid-19 pandemic. Elevated interest rates are now having a ripple effect.
- **Expectation**: As production and interest rates stabilize, and demand from housing improves, product prices should see gains. However, labor remains tight (both in the mills and on construction sites) and elevated interest rates will suppress demand and margins for a while longer.

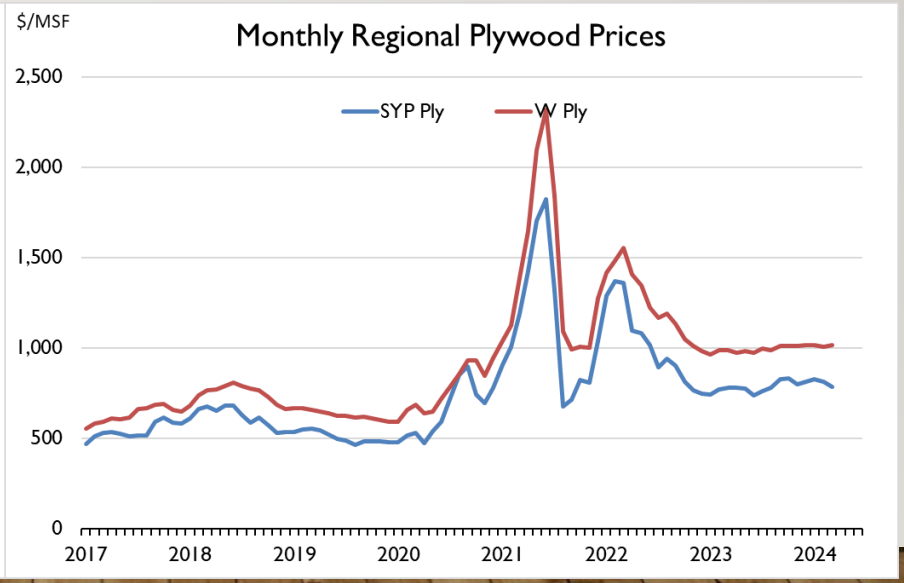


# *BEHIND THE NUMBERS*: WOOD PRODUCT PRICES

- All North American regions saw some gains in product prices during the first quarter of 2024.
- Regionally in Q1 2024 relative to Q4 2023
  - West Coast lumber mills saw an 8% gain in Coastal Dry Random & Stud ("CDR&S") prices and a 4% tick in Green Douglas-fir prices.
  - Inland sawmills saw prices move up 9% in Q1.
  - Southern Yellow Pine ("SYP") sawmills saw prices improve only modestly, just 3% in Q1 as regional capacity continues to expand, outstripping demand.
  - Canadian components of the Random Lengths Framing Composite Index saw S-P-F prices rebound 11% in the West and 6% in the East. Capacity in British Columbia continues to wane, now -32% below 2018 levels.
- Fourth quarter plywood prices were generally flat in both regions, in contrast to Lumber and OSB prices. Southern Plywood prices were down -1% while Western Plywood was flat in the first quarter relative to the prior quarter.
  - The Housing sector makes up 50-60% of Plywood consumption, versus 80%+ of OSB consumption.

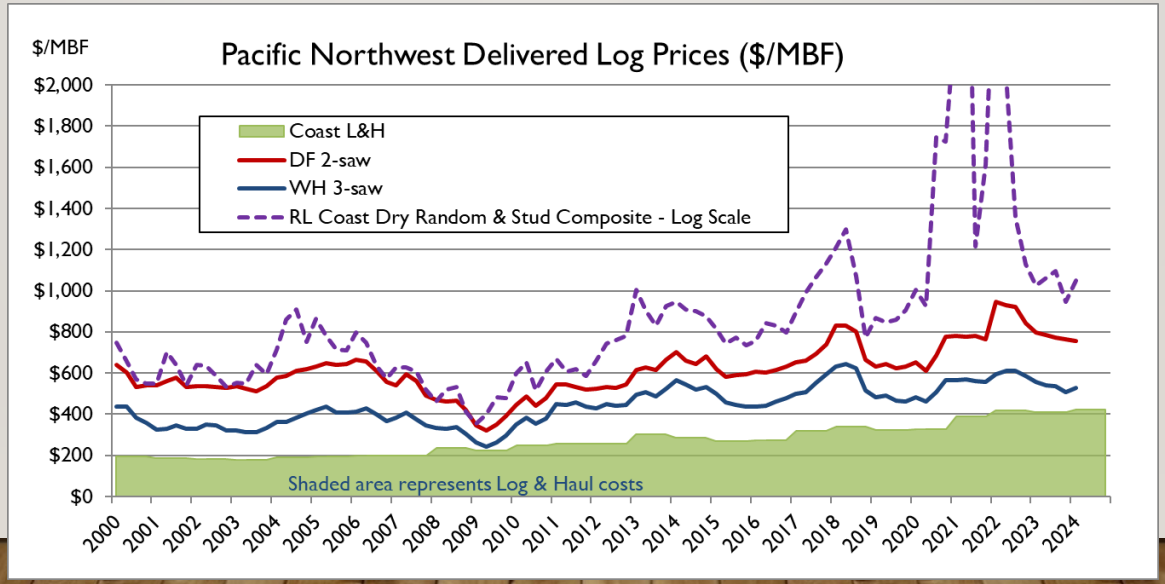


# PNW LOG PRICES

- **Recent Trends**: Delivered log prices were mixed in the first quarter with Douglas-fir 2saw log prices drifting -1% while western hemlock 3saw log prices moved 4% higher, compared to the prior quarter. Both species are down -5% from the first quarter of 2023. Over the past 10 years, 1st quarter prices usually go up, DF by 3% and WW by 1%, so DF underperformed.
- After adjustments for changes in lumber recovery over time, the Random Lengths Coast Dry Random & Stud Composite price (on a log scale) gained $100/MBF (11%) during the first quarter.
- **Explanation**: With lower demand from housing and the R&R markets, western mill output has declined, and with it, log consumption. Weaker lumber prices and more normal logging conditions are now undercutting log sellers' pricing power, though log prices remain elevated.
- **Implication**: As a result, mills were able to keep a lid on log prices through 2023 and into the first quarter of 2024.
- **Expectation**: Over the past 10 years, second quarter DF 2saw log prices usually retreat -$13/MBF (-2%) while WH 3saw typically see prices gain $9/MBF (+2%). With eight quarters of moderating lumber prices behind us, home construction still underperforming, delivered western log price are expected to remain under pressure until fundamentals change. The wildcard for 2024 is the PNW fire season outlook, with a lower-than-average snow-pack in Washington, but a switch from warmer El Nino to cooler La Nina anticipated at some point in 2024.

*Historically, with about a one-quarter lag, western lumber prices have been the primary driver in West Coast domestic log pricing, though changes in supply and export log prices do exert some influence.*

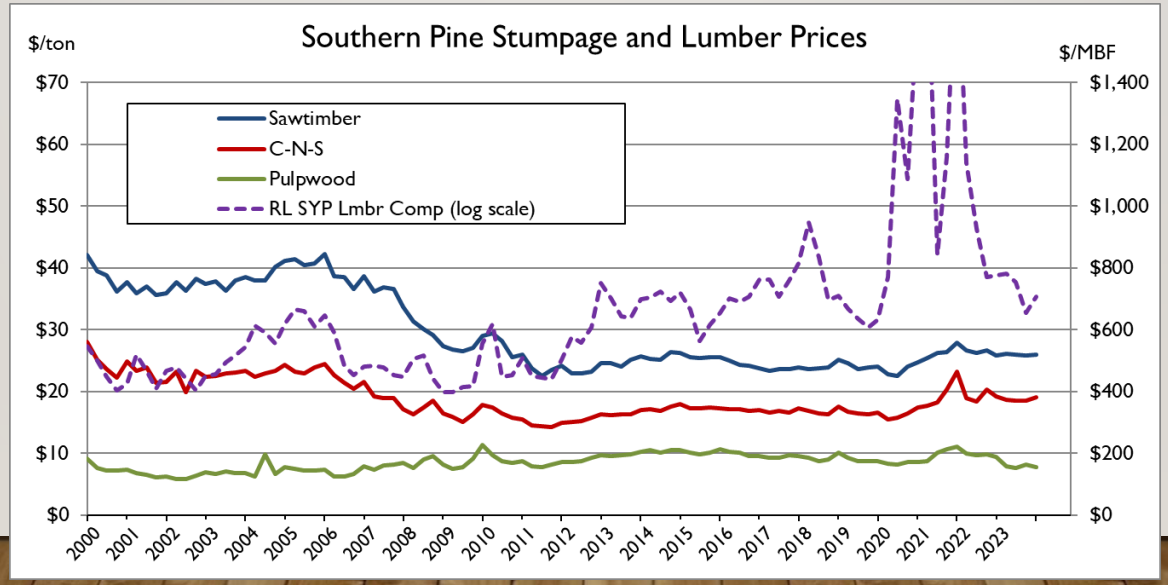



Data Source: Oregon DOF, WA DNR, Random Lengths, FEA, Log Lines

Charts & Analysis: WillSonn Advisory

# SOUTHERN PINE LOG PRICES

- **Recent Trends:** Southern Yellow Pine Sawtimber prices drifted higher $0.13/ton in Q1 (1%), Chip-n-saw stumpage prices ticked up $0.46/ton (2%) while pine pulpwood slipped $0.37/ton (-5%). Relative to full year 2023, first-quarter 2023 PST was flat, CNS was up 2%, and PPW -6% lower.
- The Random Lengths SYP Lumber Composite, adjusted for higher lumber mill recovery, ticked up $51/MBF, or 8% in Q1 '24 compared to Q4 '23, now registering -5% below full year 2023's prices.
- **Explanation**: SYP Stumpage prices typically move higher as Winter logging conditions restrict logging access. The big story in 2023 was the dramatic drop in pulpwood prices (-19%), as mounting pulp mill closures, growing sawmill residual output and declining market pulp prices converged to undercut pulpwood prices. Despite growth in southern lumber capacity, sawlogs remain plentiful in the region.
- **Implication**: Sawtimber to Pulpwood price ratios were 3.3:1 in Q1, close to its highest ratio since 2009, though still weak. Ratios below 4:1 undercut landowner incentives to grow sawtimber.
- **Expectation**: Q2 markets typically see prices move lower, $0.45 to $0.80 per ton, as Spring weather restores logging access. Even though 2022 Sawlog prices hit a 12-year high (and CNS a 15-year high), my longer-term view has not changed; SYP sawtimber prices will remain under pressure for an extended period as plentiful inventory on the stump, modest gains in housing starts, increased plantation productivity, and incremental improvements in mill recoveries all work against significant gains in southern log prices.



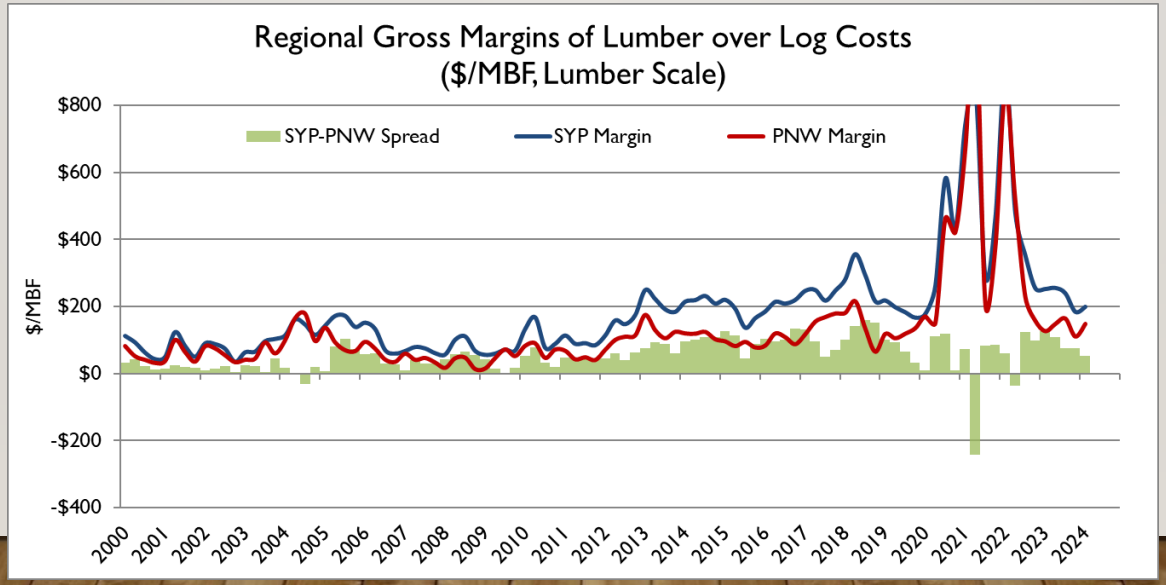

Data Source: Timber Mart South, Random Lengths, FEA

Charts & Analysis: WillSonn Advisory

# REGIONAL GROSS MARGINS

Sawmill Gross Margins (lumber price minus delivered raw material costs) in the Northwest and South were derived from the figures on the previous two pages. The difference in margins between the two regions is the "spread."

- **Recent Trend:** The gross margin spread between Southern and PNW sawmills remained at new-normal levels in Q1 at $52/MBF in favor of the South, down a third from $75/MBF in Q4. The $52/MBF spread compares to an average spread in 2023 of $97/MBF enjoyed by southern mills. Gross margins in the PNW expanded this quarter, from $110/MBF to $148/MBF in the PNW, and in the South, from $185/MBF to $200/MBF. Over the past 10 years, Southern sawmills have enjoyed gross margins over $200/MBF more than 75% of the time, while PNW mill gross margins hit that mark just 24% of the time.
- **Explanation**: Since 2012, log export markets and declining Interior BC lumber production pushed PNW log prices to historical highs. In the South, persistent excess inventories of mature sawtimber on the stump have kept downward pressure on sawtimber prices, even as lumber prices improved. Both regions saw gross margins balloon (twice!) during the pandemic-fueled run-ups in lumber prices.
- **Implication**: Manufacturing capital investments will continue to favor the US South as its margin advantage persists.
- **Expectation**: I expect the spread between the PNW and South to settle in the $50-100/MBF range as lumber markets stabilize, in favor of the South. These spreads will persist until standing sawtimber inventories are worked down in the South over the next several years, or until expanded SYP lumber production pulls SYP lumber prices down (which may take hold sooner than later).




Data Sources: Timber-Mart South, Random Lengths, FEA, Oregon DOF, WA DNR

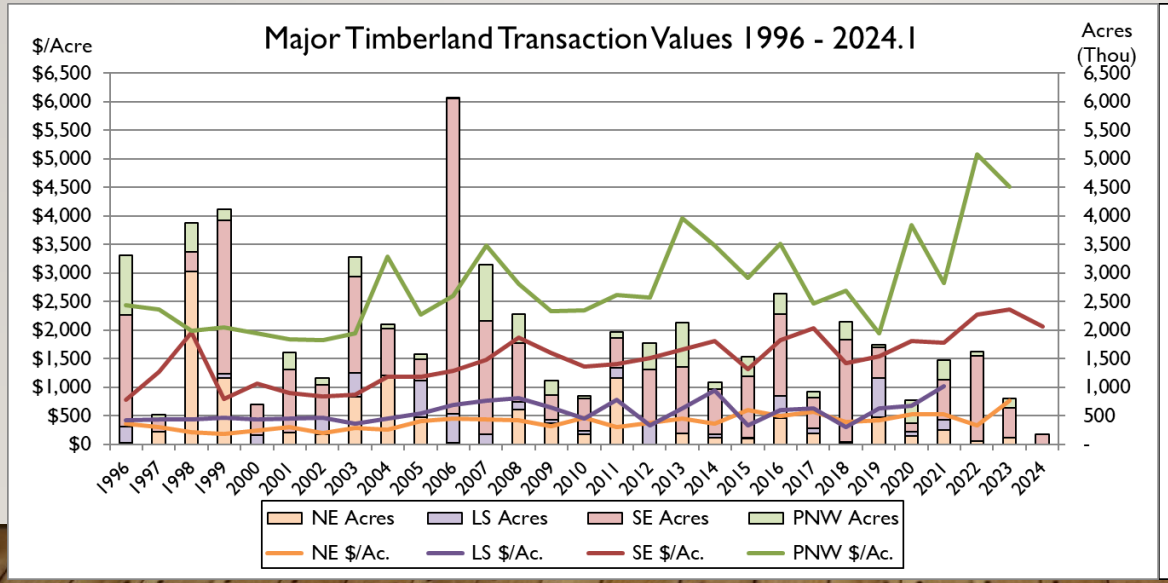
Chart & Analysis: WillSonn Advisory

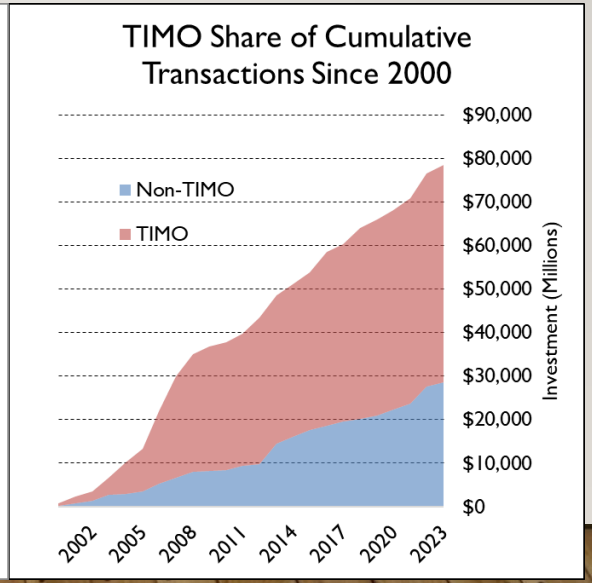
*Assumptions: 67/33 weight of DF2saw and WH3saw in the PNW, and a 75/25 weight for S/T and CNS in the South (using 7.5 tons/MBF, along with FEA's estimates of Cut & Haul cost for S/T and CNS). All figures are lumber scale, and regional differences in lumber recovery factors are incorporated.*

# REGIONAL TIMBERLAND TRANSACTION VALUES

- **Recent Trends**: Final 2023 timberland sales totaled $2.08 billion on 833,000 acres. 63% of the acres sold were in the US South. In 2022, 3.4 million acres sold (4x 2023) for a total of $5.7 billion (2.7x 2023). Only a handful of sales have closed in Q1, all in the South.
- By investment sector, Timberland Investment Management Organizations ("TIMOs") funded 55% of the acquisitions in 2023, up from 2022. Since 2016, TIMO's have funded 56% of all transactions (by value). From 2013-15, TIMO buyers acquired 25% of US timberlands sold (by dollar), compared to 78% in the previous 13 years (2000-2012).
- **Explanation**: The REITs took advantage of record lumber prices and/or record PNW log revenues to fund acquisitions in the South in 2013-15 and again in 2020-22. With narrower mill margins, the TIMO's have been more competitive.
- **Implication**: Rising asset values during periods of rising interest rates narrow the implied equity risk premium being paid for timberlands. Since owning timberlands is obviously riskier than holding government bonds, there must be some other value component forcing valuations higher, such as Carbon plays or rosy price expectations. **See Q3 2023 Deeper Dive**.
- **Expectation**: REITs may continue to reinvest outsized profits in timberlands if prices rebound again, but that seems unlikely in the near-term as housing remains subdued. More likely, higher borrowing costs will more than offset Carbon sales, leading to more modest valuations.

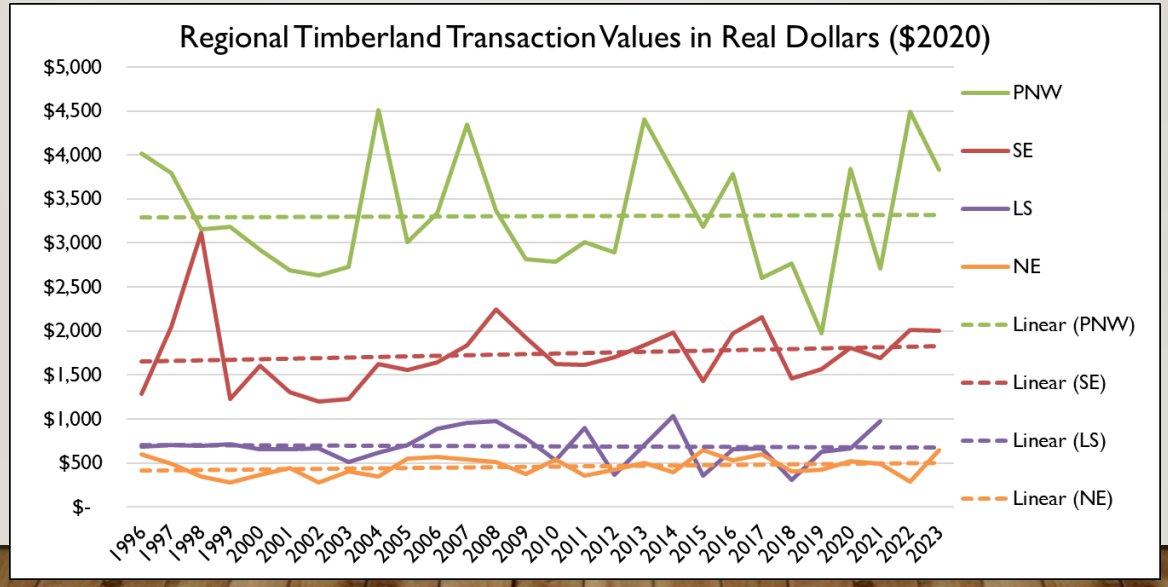
NE: Northeast LS: Lake States SE: Southeast PNW: Pacific Northwest Not Shown: Appalachia and Inland Northwest Data Source: TMS, TMR, Press Releases Charts & Analysis: WillSonn Advisory



# *BEHIND THE NUMBERS:* TRANSACTION VALUES IN REAL $'S

- In real dollar terms, the PNW trendline has drifted sideways (~$30/acre) over the past 27 years, equivalent to a compound annual growth rate ("CAGR") of just 0.03% (i.e., essentially flat real)
  - Some transactions in recent years have included lands in lower-value subregions. In addition, modest gains in productivity were likely offset by increased regulation limiting harvestable acres and/or volume, or concerns about forest fires.
  - There is a particularly high amount of variability in timberlands values in the PNW from one property to another, and some years have very few transactions (small sample size).
- In the South, the real dollar trendline value has increased ~$175/acre over the past 27 years, a CAGR of 0.38%
  - Private softwood growing stock volumes are 32% higher (USFS: 2017 vs 1997), accounting for much of the increase in value. In addition, assumed near-term recoveries in stumpage prices have typified underwriting for years, despite evidence to the contrary.
- The Lake States real dollar timberland value trend through 2021 lost ~$30/acre (CAGR of -0.19%) while the value trend in the Northeast through 2023 gained ~$80/acre (a CAGR of 0.66%).
  - Both of these regions saw significant pulp mill contractions and modest gains in standing inventory, yet took different trajectories.
  - Conservation easements have been prolific in the Lake States, a possible factor as encumbered lands are subsequently sold.



# SECTION 2: DEEPER DIVE

## A CASE STUDY IN CARBON REPORTING, AND A QUALITATIVE REVIEW OF THE THREE TIMBER REITS' CARBON REPORTS

# INTRODUCTION

- In the Deeper Dive section of my Q4 2021 Market Report, I reviewed the 2020 Carbon Reports of the four publicly traded timber REITs.
  - My earlier review included a line-by-line analysis of the REITs' reported carbon stocks, emissions and removals, with my own estimates based on the limited disclosures found in each company's Annual Reports, Carbon Report and Investor Presentations.
- In preparation for this quarter's Deeper Dive, I started an analysis of the 2022 Carbon Reports for the three remaining REITs; Weyerhaeuser, PotlatchDeltic and Rayonier.
  - Over the past couple years, the Carbon Reports of the three remaining timber REITs has evolved, as has my understanding of Greenhouse Gas ("GHG") accounting.
  - Looking back, I can see where additional refinements to my estimates could be made, and where my analysis needed to be expanded, particularly around emissions related to harvesting and wood products production and use.
  - Unfortunately, the companies are inconsistent and fail to provide sufficient detail needed to independently verify their estimates. A lot of work and educated guessing is required to fill in disclosure gaps, and I want to give it more thought before I publish my estimates in a future Deeper Dive.
- This quarter's Deeper Dive will focus on two themes, rather than replicating 2021's analysis.
  - The first theme is to discuss a case study I prepared for a hypothetical timberland and sawmill operation, presenting alternative reporting formats that mirror current and proposed GHG protocols, and what reporting companies are choosing to do instead.
    - This case study is based heavily on USFS publication GTR NE-343 data, as previously referenced and discussed.
  - The second theme is a higher-level qualitative review of the REITs' Carbon Reports – what they've included, what they didn't, and what the impacts might be. Developing this case study was informative.
- The 2022 Carbon Reports of the three REITs can be found using these links.
  - Weyerhaeuser: https://www.weyerhaeuser.com/application/files/3617/0793/4508/CarbonRecord_Bside_methodology_1.pdf This report (version 3.3) includes 2023 results for Scope 1 and 2 emissions, side by side with full reporting for 2022.
  - PotlatchDeltic: https://investors.potlatchdeltic.com/news-and-events/presentations/presentation-details/2022/Carbon-and-Climate-Report/default.aspx.
  - Rayonier: https://www.rayonier.com/sustainability/responsible-stewardship/environmental/ Scroll down and look for the bar "Download Our Carbon Report"

# CASE STUDY OVERVIEW

- Hypothetical Timber Company located in US Southeast.
  - Timber Company harvests 1,000,000 tons of logs each year.
    - Log species and grade mix, stocking levels according to GTR NE-343.
    - 25% of pine sawlogs logs are sold on the open market.
    - All other log products are sold to other wood product manufacturers.
  - Timber Company has a pine sawmill which produces 200 MMBF of lumber.
    - 75% of fee sawlogs used are sourced internally.
    - Remainder of log furnish (just over half) is purchased from Third-party Landowners.
    - Residual chips are sold to a paper mill while hog fuel is used internally for biogenic power/heat.
  - Timber Company harvests logs from its plantations only, leaves other lands untouched.
    - 75% of land base is High Productivity Loblolly Pine Plantations.
    - 25% of its land base is non-plantation (20% Oak-Gum-Cypress, 5% non-stocked roads, gravel pits, landings, etc.)
  - Third-party landowners also harvest from High Productivity Pine Plantations.
    - Assumes a Sourcing Region approach, where the Growth:Drain Ratio of Third-party Landowners is assumed to be 2:1 (i.e., growth is 2x harvest). If a Land Management Unit approach were assumed, a 1:1 ratio would be more appropriate.
  - All pine plantations are assumed to be on second rotations, so no required reporting of emissions related to Land Use Change.
- Scenarios analyzed:
  - Current Carbon Reporting Protocols – no reporting of Scope 3 Removals or Carbon storage in wood products.
  - Common Practice Carbon Reporting – report both Scope 1 and 3 Removals, carbon storage treated as a Removal.
  - Proposed Carbon Reporting with Managed Land Proxy – treats all lands as managed land, allows all Removals (anthropogenic and non-anthropogenic, scope 1 and 3) to be reported within the scopes. Carbon storage in wood products can only be reported outside the scopes.
  - Proposed Carbon Reporting limited to Anthropogenic Removals – only anthropogenic Removals are included. Carbon storage in wood products and non-anthropogenic Removals can only be reported outside the scopes.

# CASE STUDY MODELING APPROACH

- Rule #1: Every metric tonne of Carbon Dioxide equivalents (MT CO2e) must be accounted for.
  - Where growth equals harvest, Removals should equal the sum of Emissions and Storage.
    - Just like in accounting; Revenues should equal the sum of Expenses and Profit, and Assets should equal the sum of Liabilities and Shareholder Equity.
    - With a hypothetical Case Study, I have the luxury of knowing all the details of the inputs and outputs.
  - Emissions and storage related to harvesting include not only the carbon in the logs that are sold, but also include the rest of the tree. Same goes with Removals (Live Tree rather than just industrial roundwood).
- While I have my opinions, I've tried to set them aside for this Case Study.
  - I have provided last year's review of GHG Reporting protocols in this quarter's "In Case You Missed It" section, for your (and my) easy reference.
  - The protocols offer specific examples of what can or cannot be done. I tried to apply the protocols as I understood them.
    - It is clear that Scope 3 Removals are not permitted (see pages 42 and 46).
    - It is also clear that assuming zero emissions associated with Biogenic Energy is only allowed if the Reporting Company does not report any associated Removals (see page 46).
- I used the 2022 Carbon Reports issued by Weyerhaeuser, PotlatchDeltic and Rayonier, to guide my development of the "Common Practice" reporting scenario.
- You will note that I included a number of non-timberland related emission items (e.g., transportation emissions), just to provide a more fulsome picture.
  - In the scenarios presented, these items totaled 68 thousand MT of CO2e, or roughly 2.5% of total Live Tree CO2e harvested (Fee plus Non-fee).
- Anthropogenic Removals from managed lands are calculated as the difference between Removals on Average and High Productivity Loblolly Plantations.
  - CO2e Removals from Non-plantations forests that remain unharvested and unmanaged are considered non-anthropogenic.

# CASE STUDY RESULTS: CURRENT PROTOCOLS vs. COMMON PRACTICE

- The first two columns represent reporting under the Current Protocols.
  - Current Protocols (1) is the clearest, I think, as it best displays the full amount of Removals, and the full impact of harvesting timber and manufacturing wood products for each category of Emissions.
    - Line 11 includes all of the Emissions related to fee harvests, plus wood waste emissions that occur during manufacturing (fee and non-fee logs).
    - Line 14 captures the Emissions related to non-fee harvests.
  - Current Protocols (2) gives a nod to practitioners who report Net Removals.
    - The lower figure in Line 11 reflects the Emissions from burning mill waste from purchased (i.e., non-fee) logs only.
    - Lines 19 and 20 are also lower, reflecting only processing and end of life Emissions related to non-fee logs.
- The third column represents Common Practice.
  - It won't mirror any one company – they all do things a bit differently, so it's my best attempt at presenting a consensus methodology. Please see page 26 to see how it aligns with the figures reported by the REITs.
  - The most obvious difference is the inclusion of Scope 3 Removals (Lines 4-6) and treating CO2e storage in wood products as a Removal (Lines 7-9).
  - On Line 24, there is one item REITs commonly report outside the scope – Biogenic Energy Emissions.
  - Notice the "Reconciling Items" at the bottom (Lines 23-29), which are needed to balance Emissions and Removals (Rule #1).

| | Case Study: A Hypothetical Southeast Timber Company | Current | Current | Common |
|---|---|---|---|---|
| | **$MTCO_2e$ Sequestered in Forests** | **Proto's (1)** | **Proto's (2)** | **Practice** |
| 1 | CO2e Removals in Live Trees (growth-mortality & decay) | 1,495 | 1,495 | 1,495 |
| 2 | CO2e Harvested Wood Products (Live Tree) Emissions | | (1,136) | (920) |
| 3 | **Net Change in REIT Forest $CO_2e$ Stocks (Scope 1)** | **1,495** | **359** | **575** |
| | | | | |
| 4 | CO2e Removals in Live Trees (growth-mortality & decay) | | | 1,048 |
| 5 | CO2e Harvested Wood Products (Live Tree) | | | (356) |
| 6 | **CO2e Stock Change in Log Supplier's Forests (Scope 3)** | | | **691** |
| | | | | |
| | **MTCO2e Stored in Wood Products (Scope 3 Cat 11)** | | | |
| 7 | CO2e Stored in REIT Wood Products | | | 267 |
| 8 | CO2e Stored in Customer Wood Products | | | 380 |
| 9 | **Total CO2e Stored in Wood Products Claimed** | | | **647** |
| | | | | |
| | **Total Net $MTCO_2e$ Removals** | **1,495** | **359** | **1,912** |
| | | | | |
| | **$MTCO_2e$ Carbon Emissions** | | | |
| 10 | Scope 1 - Direct (company vehicles & equip) | 7 | 7 | 7 |
| 11 | Scope 1 - Direct (Fee Harvest and/or non-fee WP Emissions) | 659 | 104 | |
| 12 | Scope 2 - Indirect (e.g., electricity & steam generation) | 10 | 10 | 10 |
| 13 | Scope 3, Cat 1 - Purchased Goods & Services | 17 | 17 | 17 |
| 14 | Scope 3, Cat 1 - Purch G&S (Non-Fee Harvest Emissions) | 165 | 165 | |
| 15 | Scope 3, Cat 3 - Fuel & Energy-Related | 5 | 5 | 5 |
| 16 | Scope 3, Cat 4 - Usptream Transp. & Dist. | 10 | 10 | 10 |
| 17 | Scope 3, Cat 6 - Business Travel | | | |
| 18 | Scope 3, Cat 9 - Downstream Trans & Dist. | 20 | 20 | 20 |
| 19 | Scope 3, Cat 10 - Processing of Products Sold | 400 | 49 | 400 |
| 20 | Scope 3, Cat 12 - End of life, Products Sold | 301 | 71 | 301 |
| 21 | **Total Carbon Emissions Accounted For** | **1,594** | **458** | **769** |
| | | | | |
| 22 | **Net Carbon Removals/(Emissions)** | **(99)** | **(99)** | **1,143** |
| | ========== | | | |
| 23 | ***Items Reported Outside the Scopes*** | | | |
| 24 | *Biogenic Energy Emissions Not Included in the Scopes* | | | *(194)* |
| 25 | *Storage in Products Sold (100-year average)* | *346* | *346* | |
| 26 | *Other Upstream Removals (non-fee and/or non-anthro)* | *1,048* | *1,048* | |
| 27 | ***Reconciling Items*** | | | |
| 28 | *Double Counting Wood Products Storage, treating it as a Removal* | | | *346* |
| 29 | *Reconciliation:* | *0* | *0* | *0* |

# CASE STUDY RESULTS: COMMON PRACTICE vs. DRAFT LSR GUIDELINES

- The first column represents Common Practice (same as p 24).
- The last two columns represent reporting under the Draft Land Sector and Removals ("LSR") Guidelines.
  - As I have previously pointed out, the ability to apply the "Managed Land Proxy" (the second column) would be hugely beneficial to a reporting company as it would greatly increase reportable Removals (versus only Anthropogenic Removals, as is depicted in the third column).
  - Note that I list CO2e Storage in Product Sold (line 25) outside the scopes.
- Case Study Summary:
  - The range of results are striking, from 949,000 Metric Tonnes of Net CO2e Removals in the LSR Managed Land Proxy case, to 877,000 MT Net CO2e Emissions, when Removals are limited to Anthropogenic causes (human caused), as depicted in the LSR only Anthro case.
  - Current Protocols suggest timberland owners are ~carbon neutral.
  - Common Practice exceeds the LSR Managed Land Proxy case.
  - It is important to note that the results are greatly dependent on my assumption that non-fee log sourcing comes from lands where Growth to Harvest ratios are 2:1. This is reflective of a "Sourcing Region" approach to determining Scope 3 Removals.
  - If Reporting Companies were required to use the "Land Management Unit" approach, one would expect the Growth:Harvest ratio to be closer to 1:1 (as was assumed for fee plantations). Scope 3 Removals would be much lower for the Common Practice and LSR MLP cases.

| | Case Study: A Hypothetical Southeast Timber Company | Common | LSR Mngd | LSR only |
|---|---|---|---|---|
| | **$MTCO_2e$ Sequestered in Forests** | **Practice** | **Lnd Prxy** | **Anthro** |
| 1 | CO2e Removals in Live Trees (growth-mortality & decay) | 1,495 | 1,495 | 405 |
| 2 | CO2e Harvested Wood Products (Live Tree) Emissions | (920) | | |
| 3 | **Net Change in REIT Forest $CO_2e$ Stocks (Scope 1)** | **575** | **1,495** | **405** |
| | | | | |
| 4 | CO2e Removals in Live Trees (growth-mortality & decay) | 1,048 | 1,048 | 311 |
| 5 | CO2e Harvested Wood Products (Live Tree) | (356) | | |
| 6 | **CO2e Stock Change in Log Supplier's Forests (Scope 3)** | **691** | **1,048** | **311** |
| | | | | |
| | **MTCO2e Stored in Wood Products (Scope 3 Cat 11)** | | | |
| 7 | CO2e Stored in REIT Wood Products | 267 | | |
| 8 | CO2e Stored in Customer Wood Products | 380 | | |
| 9 | **Total CO2e Stored in Wood Products Claimed** | **647** | | |
| | | | | |
| | **Total Net $MTCO_2e$ Removals** | **1,912** | **2,542** | **716** |
| | | | | |
| | **$MTCO_2e$ Carbon Emissions** | | | |
| 10 | Scope 1 - Direct (company vehicles & equip) | 7 | 7 | 7 |
| 11 | Scope 1 - Direct (Fee Harvest and/or non-fee WP Emissions) | | 659 | 659 |
| 12 | Scope 2 - Indirect (e.g., electricity & steam generation) | 10 | 10 | 10 |
| 13 | Scope 3, Cat 1 - Purchased Goods & Services | 17 | 17 | 17 |
| 14 | Scope 3, Cat 1 - Purch G&S (Non-Fee Harvest Emissions) | | 165 | 165 |
| 15 | Scope 3, Cat 3 - Fuel & Energy-Related | 5 | 5 | 5 |
| 16 | Scope 3, Cat 4 - Usptream Transp. & Dist. | 10 | 10 | 10 |
| 17 | Scope 3, Cat 6 - Business Travel | | | |
| 18 | Scope 3, Cat 9 - Downstream Trans & Dist. | 20 | 20 | 20 |
| 19 | Scope 3, Cat 10 - Processing of Products Sold | 400 | 400 | 400 |
| 20 | Scope 3, Cat 12 - End of life, Products Sold | 301 | 301 | 301 |
| 21 | **Total Carbon Emissions Accounted For** | **769** | **1,594** | **1,594** |
| | | | | |
| 22 | **Net Carbon Removals/(Emissions)** | **1,143** | **949** | **(877)** |
| | ========== | | | |
| 23 | ***Items Reported Outside the Scopes*** | | | |
| 24 | *Biogenic Energy Emissions Not Included in the Scopes* | *(194)* | | |
| 25 | *Storage in Products Sold (100-year average)* | | *346* | *346* |
| 26 | *Other Upstream Removals (non-fee and/or non-anthro)* | | | *1,826* |
| 27 | ***Reconciling Items*** | | | |
| 28 | *Double Counting Wood Products Storage, treating it as a Removal* | *346* | | |
| 29 | *Reconciliation:* | *0* | *0* | *0* |

# HOW THE "COMMON PRACTICE" CASE COMPARES TO THE TIMBER REITS' REPORTS

- I focused more on format, rather than trying to replicate figures.
  - Weyerhaeuser is ~30-40 times larger than the Case study presented while PotlatchDeltic and Rayonier are ~8-10 times larger, based on acres owned, fee harvest, and wood products production.
- All three REITs have operations in the Northwest in addition to the US South.
  - Weyco also has timberlands in the NE and mill operations in Canada.
  - Rayonier's New Zealand operations are excluded from my analysis.
  - The Case Study is limited to just the US South.
  - Replicating each REIT's regional ownership and wood products production is the next step for me…another day.
- Finally, it is interesting to see that none of the REITs actually sum up their stated Removals and Emissions Totals.
  - Maybe it's a tacit acknowledgment that the Emissions and Removals are not really additive without making some adjustments.

| | Case Study: A Hypothetical Southeast Timber Company | Figures in Thousands | | | | | | | Common |
|---|---|---|---|---|---|---|---|---|---|
| | **$MTCO_2e$ Sequestered in Forests** | **WY** | | **PCH** | | **RYN - US** | | | **Practice** |
| 1 | CO2e Removals in Live Trees (growth-mortality & decay) | | | 5,800 | 0.05 | 11,839 | 0.12 | 0.09 | 1,495 |
| 2 | CO2e Harvested Wood Products (Live Tree) Emissions | | | (7,000) | (1.07) | (7,651) | (0.97) | (0.92) | (920) |
| 3 | **Net Change in REIT Forest $CO_2e$ Stocks (Scope 1)** | **1,750** | | **(1,200)** | | **4,188** | | | **575** |
| | | | | | | | | | |
| 4 | CO2e Removals in Live Trees (growth-mortality & decay) | | | | | | | | 1,048 |
| 5 | CO2e Harvested Wood Products (Live Tree) | | | | | | | | (356) |
| 6 | **CO2e Stock Change in Log Supplier's Forests (Scope 3)** | **11,750** | | **1,700** | | | | | **691** |
| | | | | | | | | | |
| | **MTCO2e Stored in Wood Products (Scope 3 Cat 11)** | | | | | | | | |
| 7 | CO2e Stored in REIT Wood Products | 10,750 | 0.027 | 1,500 | 0.023 | | | 0.024 | 267 |
| 8 | CO2e Stored in Customer Wood Products | 6,750 | | 1,200 | | 4,644 | | | 380 |
| 9 | **Total CO2e Stored in Wood Products Claimed** | **17,500** | | **2,700** | | **4,644** | | | **647** |
| | | | | | | | | | |
| | **Total Net $MTCO_2e$ Removals** | **31,000** | | **3,200** | | | | | **1,912** |
| | | | | | | | | | |
| | **$MTCO_2e$ Carbon Emissions** | | | | | | | | |
| 10 | Scope 1 - Direct (company vehicles & equip) | 400 | | 37 | | 0 | | | 7 |
| 11 | Scope 1 - Direct (Fee Harvest and/or non-fee WP Emissions) | | | | | | | | |
| 12 | Scope 2 - Indirect (e.g., electricity & steam generation) | 400 | | 43 | | 1 | | | 10 |
| 13 | Scope 3, Cat 1 - Purchased Goods & Services | 600 | | 200 | | 114 | | | 17 |
| 14 | Scope 3, Cat 1 - Purch G&S (Non-Fee Harvest Emissions) | | | | | | | | |
| 15 | Scope 3, Cat 3 - Fuel & Energy-Related | 200 | | 25 | | | | | 5 |
| 16 | Scope 3, Cat 4 - Usptream Transp. & Dist. | 300 | | 75 | | 53 | | | 10 |
| 17 | Scope 3, Cat 6 - Business Travel | | | | | 1 | | | |
| 18 | Scope 3, Cat 9 - Downstream Trans & Dist. | 700 | | 125 | | 23 | | | 20 |
| 19 | Scope 3, Cat 10 - Processing of Products Sold | 4,200 | | 1,000 | | | | | 400 |
| 20 | Scope 3, Cat 12 - End of life, Products Sold | 3,300 | | 1,075 | | 2,757 | | | 301 |
| 21 | **Total Carbon Emissions Accounted For** | **10,100** | | **2,580** | | **2,949** | | | **769** |
| | | | | | | | | | |
| 22 | **Net Carbon Removals/(Emissions)** | | | | | | | | **1,143** |
| | ========== | | | | | | | | |
| 23 | ***Items Reported Outside the Scopes*** | | | | | | | | |
| 24 | *Biogenic Energy Emissions Not Included in the Scopes* | *(2,500)* | | *(500)* | | | | | *(194)* |
| 25 | *Storage in Products Sold (100-year average)* | | | | | | | | |
| 26 | *Other Upstream Removals (non-fee and/or non-anthro)* | | | | | | | | |
| 27 | ***Reconciling Items*** | | | | | | | | |
| 28 | *Double Counting Wood Products Storage, treating it as a Removal* | | | | | | | | *346* |
| 29 | *Reconciliation:* | | | | | | | | *0* |

# SOME QUALITATIVE COMMENTS

- As I've stated in the past, Scope 3 Removals are not permitted under current GHG Protocols.
  - The REITs are jumping the gun on future (and as yet undetermined) GHG reporting protocols.
    - Weyerhaeuser says it is doing so as "a case study." PotlatchDeltic says they are following their peers….
    - So, in this Deeper Dive I present more alternative cases, including those that adhere to the reporting protocols, not just the one that casts someone in the best light.
- Characterizing $CO_2e$ Storage in Wood Products as a Removal, as Weyerhaeuser has done, is patently wrong.
  - Storage is an avoided emission, not a Removal, just like Profit is not Revenue, it's what's left over after Expenses (akin to Emissions) are subtracted from Revenues (akin to Removals). You don't add Profit to Revenue and then call it all Revenue!
  - Treating Storage as a Removal is effectively double counting these Removals.
  - Weyco includes its ~17.5 million MT $CO_2e$ storage in its "Removals" total. PotlatchDeltic includes their 2.5 million MT $CO_2e$ of storage in its total of "Removals & Storage." Rayonier presents its Removals and Storage together in a single table, though it doesn't explicitly add the two together. You can see snap shots from each REIT's summaries in the Appendix, pages 30-32.
- Biogenic Energy Emissions should not be a "below the line" item, reported outside the scopes.
  - The idea behind emission monitoring bodies allowing emissions related to the use of bio-fuels (e.g., bio diesel, wood pellets, etc.) to be counted as zero, goes hand-in-hand with the directive that reporting companies are not allowed to report Removals related to the origins of these biogenic fuels (remember, no Scope 3 Removals allowed). See pages 42 and 46.
  - Both Weyerhaeuser (2.5 million MT $CO_2e$) and PotlatchDeltic (500,000 MT $CO_2e$) have misapplied this guidance while claiming $CO_2e$ Removals.
  - Ignoring an Emission is also effectively double counting a Removal.
- Removals related to Carbon offsets that have been sold, or are held for sale, shall not be included in the tally of Removals, and should be disclosed in the Carbon Report.
  - PotlatchDeltic has failed to do this. I will be interested to see if Weyerhaeuser and Rayonier (newer participants in this arena) follow this guideline, or not.

# MORE QUALITATIVE COMMENTS

- There is still a lot of room for improvement in disclosure and consistency.
  - Between its Annual Report and its detailed Carbon Report (B side Methodology), Weyerhaeuser provides a fair amount of detail, including example (but not actual) calculations. Unfortunately, its results are very summarized. There is still a lot of missing data.
  - PotlatchDeltic provides the most detail in its tables and illustrates where goods are flowing in its Carbon Report, though it takes some work to piece it all together. But the Annual Report continues to provide little detail about its inventory.
  - Rayonier provides the least amount of detail in its carbon report – no sample calculations, no informative flow charts, just some summary data. But it does have the best disclosure in its Annual Report, and it is a simpler business.
- In 2020 and 2021 Weyerhaeuser reported Scope 3 Removals of 3-4 million MT CO2e. In 2022, it revised those estimates (retrospectively) to 12 million MT.
  - It took some digging, but this is 8-9 million MT increase in Scope 3 Removals was a result of adding Removals related to its Canadian operations. Weyco based its Removals, not on the net removals on the 14 million acres of Tree Farm Licenses it controls, but rather the entire country of Canada. Why do you think that is? Was it to boost reported Scope 3 Removals?
  - According to my estimation, Weyco's share of Canadian forest CO2e Removals (3.5%) amounts to 4.7 million MT, about half of the 8-9 million MT Weyco is claiming. More refinements and discussion when I complete my individual REIT reviews…
- Other items that stood out to me
  - All of the REITs had much lower Scope 1 and 3 Emissions than I expected to see, largely because they net harvests against growth in the Removals section. There has to be a better way to report Removals and Emissions.
    - In my view, this distorts the presentation, and understates each company's emissions. One of the goals of GHG Reporting is to set a baseline against which companies can improve. Including Harvest Emissions in Net Removals creates a cloak behind which opportunity for improvement can hide.
  - Weyerhaeuser had some very dramatic changes in their Removals in 2022, compared to 2020, mentioned above. Likewise on Emissions, though at a smaller scale.
    - I'm not suggesting that reporting companies shouldn't fix mistakes and refine estimates. I am suggesting that they don't publish reports before they have figured out their processes, and provide better explanations when revisions are made.
  - Rayonier, who has no mill operations, surprisingly reported no Scope 3 Emissions related to Processing of Products Sold (Line 19). Do they think their log customers have zero Emissions when processing all those logs? Both WY and PCH reported some.
- I hope this Deeper Dive was informative and helps drive change in our industry. I welcome your feedback.

# DEEPER DIVE APPENDIX

Excerpts from the REIT's Carbon Reports

Details from WillSonn Advisory's Case Study Model

# WEYERHAEUSER'S CARBON REPORT SUMMARIES

| 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 |

| ABSOLUTE REMOVALS | 2022 AMOUNT in million metric tons carbon dioxide equivalent (Million $mtCO_2e$)[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** |

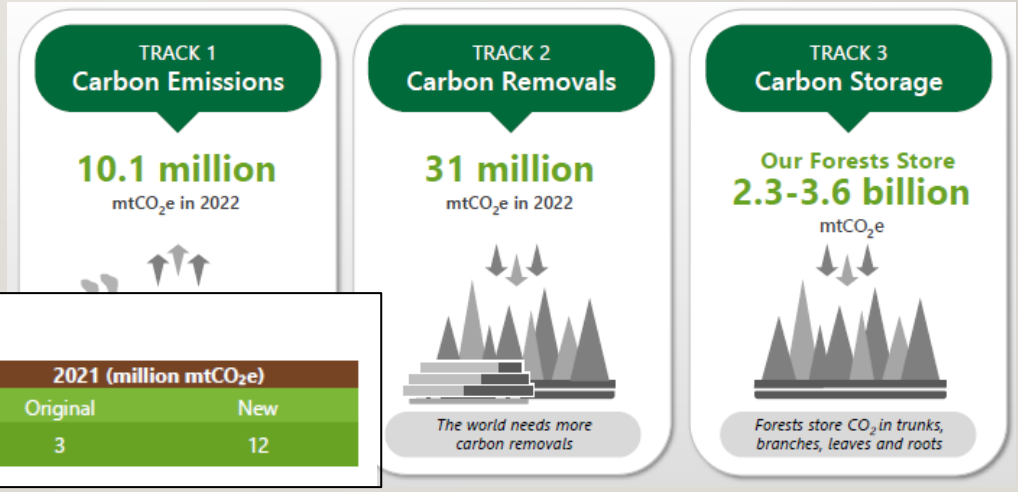
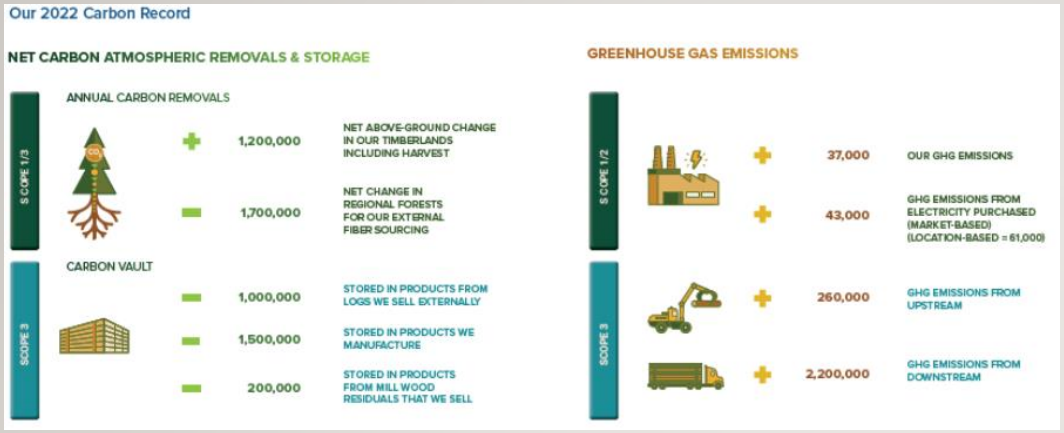
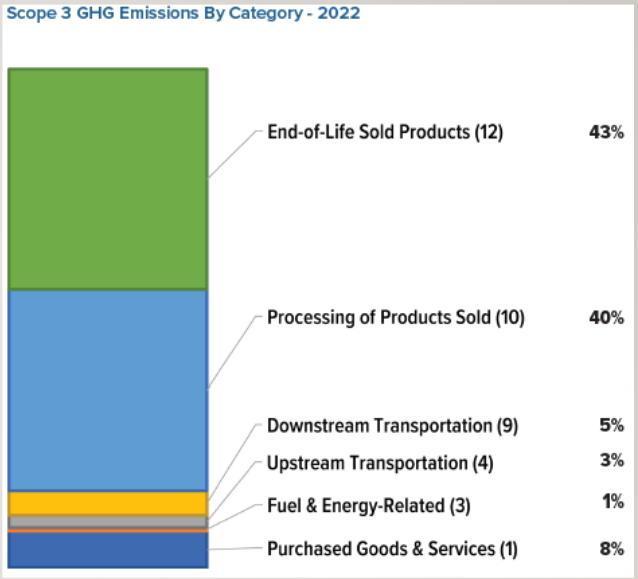



TABLE 7: ADJUSTMENTS TO REMOVALS BASELINE

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

# POTLATCHDELTIC'S CARBON REPORT SUMMARIES




# RAYONIER'S CARBON REPORT DETAILS

**CARBON SEQUESTERED[1] BY RAYONIER'S FORESTS DURING 2022** »

11,839,301 (U.S.)[3]
2,778,008 (N.Z.)[4]

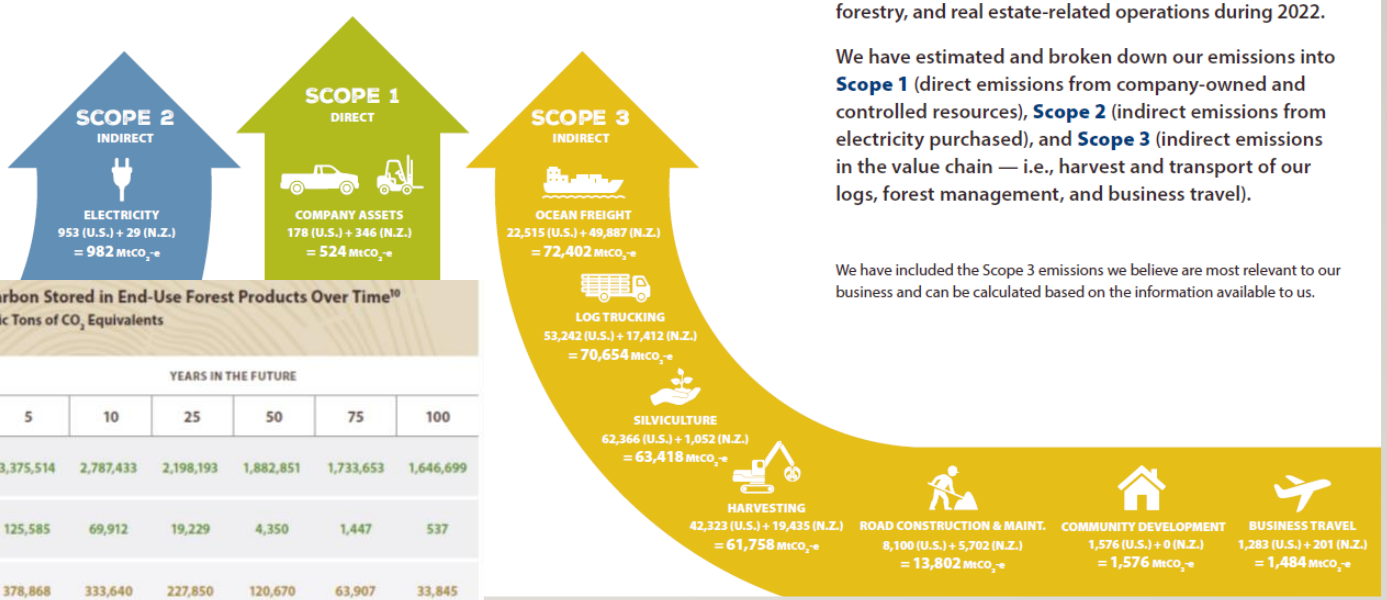
**14,617,309 $MtCO_2$-e**

**CARBON REMOVED[7] THROUGH RAYONIER'S 2022 HARVEST ACTIVITY** »

7,650,990 (U.S.)[8]
1,738,302 (N.Z.)[9]

**9,389,292 $MtCO_2$-e**

**CARBON EMITTED[6] BY RAYONIER IN 2022** » 192,536 (U.S.) 94,064 (N.Z.) **= 286,600 $MtCO_2$-e**




We have measured our impact on the environment by calculating the **emissions** associated with our corporate, forestry, and real estate-related operations during 2022.

We have estimated and broken down our emissions into **Scope 1** (direct emissions from company-owned and controlled resources), **Scope 2** (indirect emissions from electricity purchased), and **Scope 3** (indirect emissions in the value chain — i.e., harvest and transport of our logs, forest management, and business travel).

We have included the Scope 3 emissions we believe are most relevant to our business and can be calculated based on the information available to us.

**2022 Harvest Activity: Projected Carbon Stored in End-Use Forest Products Over Time[10]**
Metric Tons of $CO_2$ Equivalents

| REGION | PRODUCT DESTINATION | CARBON REMOVED IN HARVEST | HARVEST CONVERTED TO PRODUCT[11] | YEARS IN THE FUTURE | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 5 | 10 | 25 | 50 | 75 | 100 |
| U.S. | DOMESTIC[12] | 7,386,343 | 4,400,640 | 3,375,514 | 2,787,433 | 2,198,193 | 1,882,851 | 1,733,653 | 1,646,699 |
| U.S. | EXPORT[13] | 264,646 | 243,475 | 125,585 | 69,912 | 19,229 | 4,350 | 1,447 | 537 |
| N.Z. | DOMESTIC[14] | 717,046 | 430,228 | 378,868 | 333,640 | 227,850 | 120,670 | 63,907 | 33,845 |
| N.Z. | EXPORT[15] | 1,021,256 | 931,538 | 644,858 | 407,187 | 102,514 | 10,290 | 1,033 | 104 |
| TOTAL | | 9,389,291 | 6,005,881 | 4,524,825 | 3,598,172 | 2,547,786 | 2,018,161 | 1,800,040 | 1,681,185 |

# EXAMPLE REFERENCE DATA

**Source: Anthro Decision Tree WS v1d**
**Tab: Bridge Summary**

| | | | | Green Tons of Timber Harvested (Merch, Delivered) | Species Moisture Content, Carbon content, and Bark Content | Industrial Roundwood to Live Tree Conversion Ratio | Green tons to Metric Tonnes C to CO2e | Metric Tonnes of CO2e in Timber Harvested (Total Live Tree) | Near-term Emissions at Harvest | Near-term Emissions in Wood Processing (fuel or waste) | Near-term Emissions - Bark | Near-term Emissions - Firewood | Storage in Wood Products @ Time$_0$ | Temporary additions to Non-Soil Storage, excluding Live Trees | Long-term Emissions from Wood Products (100-year avg) | Eventual Emissions of Non-Soil Carbon (early in next rotation) | Metric Tonnes of CO2e Stored in WP (100-year avg) | SE Loblolly | Rows 111-114 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| R 39-54 | SE Loblolly (Hi Prod) | Rgn Avg | SWST | 1.00 | 0.23 | 1.76 | 3.33 | 1.32 | 22.1% | 20.8% | 10.4% | 1.2% | 36.3% | 9.2% | 13.0% | 9.2% | 23.4% | | 45.0% |
| R 57-72 | SE Loblolly (Hi Prod) | Rgn Avg | SWPW | 1.00 | 0.23 | 1.76 | 3.33 | 1.32 | 22.1% | 25.5% | 10.6% | 1.0% | 31.7% | 9.2% | 20.7% | 9.2% | 11.0% | | 45.2% |
| R 75-90 | SE Loblolly (Hi Prod) | Rgn Avg | HWST | 1.00 | 0.24 | 2.29 | 3.33 | 1.81 | 21.0% | 16.4% | 8.3% | 20.1% | 25.5% | 8.7% | 10.0% | 8.7% | 15.5% | | 2.5% |
| R 93-108 | SE Loblolly (Hi Prod) | Rgn Avg | HWPW | 1.00 | 0.23 | 2.17 | 3.33 | 1.69 | 21.4% | 18.3% | 9.8% | 15.1% | 26.5% | 8.9% | 15.5% | 8.9% | 11.0% | | 7.3% |
| | | | | | | | | | percentages of Live Tree Carbon | | | | | | | | | | Industrial Roundwood Share |
| R 39-54 | SE Loblolly (Avg Prod) | Rgn Avg | SWST | 1.00 | 0.23 | 1.94 | 3.33 | 1.46 | 28.8% | 18.8% | 9.4% | 1.1% | 32.9% | 9.1% | 11.7% | 9.1% | 21.1% | | 45.0% |
| R 57-72 | SE Loblolly (Avg Prod) | Rgn Avg | SWPW | 1.00 | 0.23 | 1.95 | 3.33 | 1.46 | 28.8% | 23.0% | 9.6% | 0.9% | 28.6% | 9.1% | 18.7% | 9.1% | 9.9% | | 45.2% |
| R 75-90 | SE Loblolly (Avg Prod) | Rgn Avg | HWST | 1.00 | 0.24 | 2.51 | 3.33 | 1.99 | 27.4% | 14.9% | 7.5% | 18.3% | 23.2% | 8.7% | 9.1% | 8.7% | 14.1% | | 2.5% |
| R 93-108 | SE Loblolly (Avg Prod) | Rgn Avg | HWPW | 1.00 | 0.23 | 2.39 | 3.33 | 1.86 | 27.9% | 16.7% | 8.9% | 13.7% | 24.1% | 8.8% | 14.1% | 8.8% | 10.0% | | 7.3% |
| | | | | | | | | | percentages of Live Tree Carbon | | | | | | | | | | |
| R 39-54 | SE Oak Gum Cypress | Rgn Avg | SWST | 1.00 | 0.23 | 3.08 | 3.33 | 2.40 | 60.9% | 12.1% | 6.0% | 0.7% | 21.1% | -0.9% | 7.5% | -0.9% | 13.6% | | 15.0% |
| R 57-72 | SE Oak Gum Cypress | Rgn Avg | SWPW | 1.00 | 0.23 | 3.09 | 3.33 | 2.41 | 61.0% | 14.8% | 6.1% | 0.6% | 18.4% | -0.9% | 12.0% | -0.9% | 6.4% | | 5.1% |
| R 75-90 | SE Oak Gum Cypress | Rgn Avg | HWST | 1.00 | 0.24 | 3.93 | 3.33 | 3.18 | 58.7% | 9.8% | 5.0% | 12.1% | 15.3% | -0.8% | 6.0% | -0.8% | 9.3% | | 32.9% |
| R 93-108 | SE Oak Gum Cypress | Rgn Avg | HWPW | 1.00 | 0.24 | 3.79 | 3.33 | 3.01 | 59.7% | 10.8% | 5.8% | 8.9% | 15.6% | -0.8% | 9.2% | -0.8% | 6.5% | | 47.1% |
| | | | | | | | | | percentages of Live Tree Carbon | | | | | | | | | | |
| R 39-54 | SE Oak Pine | Rgn Avg | SWST | 1.00 | 0.23 | 2.45 | 3.33 | 1.91 | 47.1% | 15.1% | 7.5% | 0.9% | 26.3% | 3.1% | 9.4% | 3.1% | 16.9% | | 36.9% |
| R 57-72 | SE Oak Pine | Rgn Avg | SWPW | 1.00 | 0.23 | 2.46 | 3.33 | 1.91 | 47.2% | 18.4% | 7.6% | 0.7% | 22.9% | 3.1% | 15.0% | 3.1% | 7.9% | | 15.8% |
| R 75-90 | SE Oak Pine | Rgn Avg | HWST | 1.00 | 0.24 | 3.18 | 3.33 | 2.57 | 45.4% | 12.0% | 6.1% | 14.8% | 18.7% | 3.0% | 7.4% | 3.0% | 11.4% | | 16.1% |
| R 93-108 | SE Oak Pine | Rgn Avg | HWPW | 1.00 | 0.24 | 3.04 | 3.33 | 2.42 | 46.2% | 13.4% | 7.1% | 11.0% | 19.3% | 3.0% | 11.3% | 3.0% | 8.0% | | 31.2% |

**Source: Anthro Decision Tree WS v1d**
**Tab: Inventory Bridges**

| | | | | Softwood lumber | Hardwood lumber | Softwood plywood | Hardwood plywood | Oriented strandboard | Nonstructural panels | Other industrial products | Wood pulp | Fuel and other emissions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| R 349-358 | | Rgn Avg | SWST | 35.00% | 0.00% | 7.60% | 0.00% | 0.00% | 2.70% | 5.40% | 12.90% | 36.40% |
| R 540-560 | As used | Lumber | SWST | 48.87% | | | | | | | 16.87% | 34.27% |
| | separate | Lumber | SWST | 48.87% | | | | | | | 33.73% | 17.40% |
| | separate | Resid Chips | SWST | | | | | | | | 16.87% | 16.87% |
| | | | | Percentages of Industrial Roundwood (no bark, cu ft) *Source: Fonseca, The Measurement of Roundwood* | | | | | | | | |

Rows 417-424

| | | |
|---|---|---|
| 76.13% | SW Lumber | |
| 23.55% | Wood Pulp | |
| 100-yr Avg in Use & Landfill | | |

Rows 200-04

| | Acres (Rotation age + 1) | Live Tree C Growth rate/year | Mean Annual Increment (mt C/Acre/yr) |
|---|---|---|---|
| SE Loblolly (Hi Prod) | 26 | 7.38% | 1.93 |
| SE Loblolly (Avg Prod) | 26 | 7.08% | 1.36 |
| SE Oak Gum Cypress | 51 | 3.58% | 0.71 |
| SE Oak Pine | 51 | 3.52% | 0.71 |
| | Growth Rates | | |

**Source: Anthro Decision Tree WS v1d.xlsx**
**Tab: Inventory Bridges**

| | | Timberlands | Harvest | Inventory | | Green tons of Merch Inventory | Species Moisture Content, Carboncontent, and Bark Content | Industrial RoundwoodGS to Live Tree Conversion Ratio | Live Tree to Total NonSoil Conversion Ratio | Green tons to Metric Tonnes C to CO2e | MT of CO2e's Total Non-Soil |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Row 182 | SE Loblolly (Hi Prod) | | 135.39 | 64.70 | Rows 3-27 | 1 | 0.23 | 1.97 | 1.40 | 3.33 | 2.08 |
| Row 182 | SE Loblolly (Avg Prod) | | 86.06 | 41.00 | Rows 3-27 | 1 | 0.23 | 2.27 | 1.48 | 3.33 | 2.55 |
| Row 182 | SE Oak Gum Cypress | | 44.81 | 24.77 | Rows 3-27 | 1 | 0.24 | 3.66 | 1.29 | 3.33 | 3.75 |
| Row 182 | SE Oak Pine | | 60.65 | 32.70 | Rows 3-27 | 1 | 0.24 | 2.85 | 1.41 | 3.33 | 3.18 |
| | | | Average GT/Acre | | | Inventory Conversion Ratios | | | | | |

| | Green tons of Harvest | Species Moisture Content, Carboncontent, and Bark Content | Industrial RoundwoodGS to Live Tree Conversion Ratio | Green tons to Metric Tonnes C to CO2e | MT of CO2e's Total Live Tree |
|---|---|---|---|---|---|
| Rows 3-27 | 1 | 0.23 | 1.80 | 3.33 | 1.36 |
| Rows 3-27 | 1 | 0.23 | 1.99 | 3.33 | 1.51 |
| Rows 3-27 | 1 | 0.24 | 3.70 | 3.33 | 2.95 |
| Rows 3-27 | 1 | 0.24 | 2.76 | 3.33 | 2.18 |
| | Harvest Conversion Ratios | | | | |

**Source: Carbon Emissions & Sequestration Lifecycle v3c.xlsx**

| | Forest type | Merch Volume Growth (ft3/ac) | Stand age (years) | Merch Volume (ft3/ac) | Live tree (t/ac) | Standing dead (t/ac) | Understory (t/ac) | Down dead wood (t/ac) | Forest floor (t/ac) | Soil (t/ac) | Total nonsoil (t/ac) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Row 22 | SE Loblolly (Hi Prod) | 8.05% | 26.00 | 2,072.69 | 26.23 | 0.67 | 1.55 | 5.01 | 3.21 | 29.50 | 36.67 |
| Row 22 | SE Loblolly (Avg Prod) | 1.59% | 26.00 | 1,313.56 | 19.20 | 0.64 | 1.48 | 3.98 | 3.21 | 29.50 | 28.51 |
| Row 22 | SE Oak Gum Cypress | | 51.00 | 798.92 | 19.71 | 1.23 | 0.67 | 1.86 | 1.86 | 63.90 | 25.33 |
| Row 22 | SE Oak Pine | | 51.00 | 1,017.94 | 20.08 | 0.81 | 1.37 | 2.67 | 3.47 | 24.90 | 28.40 |
| | | | Merch Vol, no bark | | Average Stocking, Carbon: Metric tonnes/Acre | | | | | | |

# EXAMPLE MODELING DATA

| | | | | | Green Tons of Timber Harvested (Merch, Delivered) | | Region-Timber Type | Metric Tonnes of CO2e in Timber Harvested (Total Live Tree) | Near-term Emissions at Harvest | Near-term Emissions in Wood Processing (fuel or waste) | Near-term Emissions - Bark | Near-term Emissions - Firewood | Storage in Wood Products @ Time$_0$ | Temporary additions to Non-Soil Storage, excluding Live Trees | Long-term Emissions from Wood Products (100-year avg) | Eventual Emissions of Non-Soil Carbon (early in next rotation) | Metric Tonnes of CO2e Stored in WP (100-year avg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Company Harvest** | 1,000,000 | | **External Log Sales** | | | | | | | | | | | | | | |
| | SW Saw | 45% | 25% | 112,530 | | | SE Loblolly (Hi Prod) | 148,966 | 32,869 | 30,980 | 15,490 | 1,833 | 54,130 | 13,663 | 19,321 | 13,663 | 34,810 |
| | SW Pulp | 45% | 100% | 452,397 | | | SE Loblolly (Hi Prod) | 598,858 | 132,474 | 152,605 | 63,300 | 5,856 | 189,558 | 55,065 | 123,833 | 55,065 | 65,725 |
| | HW Saw | 2% | 100% | 24,619 | | | SE Loblolly (Hi Prod) | 44,528 | 9,368 | 7,281 | 3,687 | 8,958 | 11,340 | 3,894 | 4,459 | 3,894 | 6,881 |
| | HW Pulp | 7% | 100% | 72,863 | | | SE Loblolly (Hi Prod) | 122,842 | 26,277 | 22,539 | 12,014 | 18,521 | 32,569 | 10,922 | 19,099 | 10,922 | 13,470 |
| | | | | | | | | | | | | | | | | | **120,886** |
| **Log usage GT/MBF (with Bark)** | | | | | | | | | | | | | | | | | |
| Lumber Production | 200,000 | | | | | | | | | | | | | | | | |
| tons/MBF | 3.6104986 | | | | GT Logs w/bark | | | Ind Rdwd CO2e | Live Tree CO2e | | | | | | | | |
| GT Logs Needed | 722,100 | | Fee Logs | 337,590 | SE Loblolly (Hi Prod) | | 255,331 | 446,897 | 98,608 | *44,426* | 46,470 | 5,500 | *124,776* | 40,988 | *29,784* | 40,988 | 94,992 |
| | | | Non-Fee Logs | 384,509 | SE Loblolly (Hi Prod) | | 290,817 | 509,008 | 112,313 | *50,600* | 52,929 | 6,264 | *142,117* | 46,685 | *33,923* | 46,685 | 108,194 |
| | | | Total Log Use for Lumber | | | | 546,148 | 955,905 | 210,921 | 95,026 | 99,399 | 11,764 | 266,893 | 87,673 | 63,707 | 87,673 | **203,186** |
| | | | | | | | | | | | | | | | | | |
| | | | Residual Chips | | | | | | | 92,114 | | | 92,114 | | 70,421 | | **21,693** |

- In the analysis above, the distribution of forest carbon is allocated to either emissions or storage categories.
- In the analysis below, anthropogenic and non-anthropogenic Removals are calculated.

| | | | | | | | | MT of CO2e's | | | | | | | | MT of Co2e | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Scope 1 - Fee Harvest** | | 192,040 | acres | | | | | | | | | | | | | | |
| | Growth:Drain Ratio | | 1.0 | Inventory | MT of | | | Live Tree | Stand Dead | Understory | Down Dead | Forest Floor | Soil | Total Non Soil | | Growth | Harvest | Variance |
| | | | Acres | Green Tons | CO2e's, Total | Variance | | | | | | | | | | | | |
| | SE Loblolly (Hi Prod) | 75% | 192,040 | 12,425,440 | 25,820,522 | - | | 18,470,313 | 473,945 | 1,088,719 | 3,528,859 | 2,258,686 | 20,772,331 | 25,820,522 | | 1,362,253 | 1,362,253 | - |
| | SE Oak Gum Cypress | 20% | 51,211 | 1,268,710 | 4,755,798 | - | | 3,700,223 | 230,113 | 125,918 | 350,140 | 349,404 | 11,998,662 | 4,755,798 | | 132,545 | | |
| | Non-Stocked | 5% | 12,803 | - | - | | | - | - | - | - | - | 1,734,548 | - | | | | |
| | | | 256,053 | 13,694,150 | 30,576,321 | - | | 22,170,535 | 704,058 | 1,214,637 | 3,878,999 | 2,608,090 | 34,505,541 | 30,576,321 | | 1,494,799 | | |
| | Counterfactual | | | | | | | | | | | | | | | | | |
| | SE Loblolly (Avg Prod) | | 192,040 | 7,874,556 | 20,074,955 | - | | 13,520,973 | 453,633 | 1,041,325 | 2,800,338 | 2,258,686 | 20,772,331 | 20,074,955 | | 957,369 | | 404,884 |
| | | | | | | | | | | | | | | | | **non-anthropogenic** | | **anthropogenic** |
| | **Scope 3 - Non-Fee Harvest** | | 164,048 | acres | | | | MT of CO2e's | | | | | | | | Growth | Harvest | |
| | Growth:Drain Ratio | | 2.0 | | | | | Live Tree | Stand Dead | Understory | Down Dead | Forest Floor | Soil | Total Non Soil | PST % of Harvest | | | |
| | SE Loblolly (Hi Prod) | | 328,095 | 21,228,516 | 44,113,639 | - | | 31,556,012 | 809,722 | 1,860,046 | 6,028,957 | 3,858,902 | 35,488,946 | 44,113,639 | 45% | 1,047,598 | 509,008 | 538,590 |
| Counter | SE Loblolly (Avg Prod) | | 328,095 | 13,453,459 | 34,297,499 | - | | 23,100,204 | 775,019 | 1,779,074 | 4,784,299 | 3,858,902 | 35,488,946 | 34,297,499 | 45% | 736,234 | | 311,364 |
| | | | Acres | GT Inv. | MT CO2e Non-soil | | | | | | | | | | | **non-anthropogenic** | | **anthropogenic** |

# EXAMPLE MODEL OUTPUT (CURRENT PROTOCOLS)

| Within the Scopes | | | | | Emissions | | subtotals | Removals | | | Key Assumptions | | Timberlands | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Fee Logs | Non-Fee Logs | | | | | | | | | | | |
| Scope 1 | | Harvest Related Emissions | Harvest | | 299,597 | | | 404,884 | Fee | Anthropogenic | Company Plantation Quality | | SE Loblolly (Hi Prod) | | | | |
| | | | Wood Waste | | 44,426 | | | 957,369 | Fee Uplands | Non-Anthro | Company Hardwood Type | | SE Oak Gum Cypress | | | | |
| | | | Bark | | 46,470 | | | 132,545 | Fee Hardwood | Non-Anthro | Supplier Plantation Quality | | SE Loblolly (Hi Prod) | | | | |
| | | | Firewood | | 40,668 | | | | | | Counterfactual To Plantation | | SE Loblolly (Avg Prod) | | | | |
| | | | Other Nonsoil | | 124,532 | | 555,693 | | | | Company Growth:Drain Ratio | | 1.0 | | | | |
| | | Vehicles & Equipment | | | 7,000 | | | | | | Supplier Growth:Drain Ratio | | 2.0 | | | | |
| | | Land Use Change | | | - | | | | | | | | | | | | |
| Scope 2 | | Indirect Energy | | | 9,639 | | | | | | | | Operations | | | | |
| Scope 3 | Cat 1 | Purch Goods & Services | | | 16,643 | | | | | | Annual Harvest | Green Tons | 1,000,000 | | | | |
| | | | Harvest | | | 112,313 | | | Non-Fee | Anthro | Lumber Production | MBF | 200,000 | | | | |
| | | | Wood Waste | | | 50,600 | | | Non-Fee | Non-Anthro | External Pine Sawlog Sales | | 25% | | | | |
| | | | Bark | | | 52,929 | | | | | | | | | | | |
| | | | Firewood | | | 6,264 | | | | | | | | | | | |
| | | | Other Nonsoil | | | 46,685 | 268,791 | | | | | | | | | | |
| | Cat 3 | Fuel & Energy-Related | | | 5,000 | | | | | | Error Checks | Residual Chips | - | | | | |
| | Cat 4 | Upstream Transp. & Dist. | | | 10,000 | | | | | | | Fee Growth | - | | | | |
| | Cat 6 | Business Travel | | | | | | | | | | Non-Fee Growth | 538,590 | GDR @1:1 | | | |
| | Cat 9 | Downstream Trans & Dist. | | | 20,000 | | | | | | | Non-Soil CO2e - Fee | - | | | | |
| | Cat 10 | Processing of Prod Sold | Log Processing | | 213,405 | | | | | | | Non-Soil CO2e - Non-Fee | - | | | | |
| | | | Bark | | 94,491 | | | | Fee Logs Sold | | | Total Emissions | - | | | | |
| | | | Resid Chips | | 43,064 | 49,050 | 400,010 | | Lumber - Fee | | | Total Removals | - | | | | |
| | Cat 11 | Use of Sold Products | | | | | | | Resid Chips - Fee | | | Total Fee | - | | | | |
| | | | | | | | | | Lumber - Non-fee | | | Total Non-fee | - | | | | |
| | | | | | | | | | Resid Chips - Non-fee | | | Biogenic Remvls:Emits | - | | | | |
| | Cat 12 | End of life, Products Sold | Logs Sold | | 166,711 | | | | | | | | | | | | |
| | | | Lumber | | 29,784 | 33,923 | | | | | | Reconciliation to REIT Reports | | | | | |
| | | | Resid Chips | | 32,923 | 37,498 | 300,840 | | | | | This tab | REIT Reports | | 939,106 | 939,106 | - Removals |
| | | **Total Emissions** | | | **1,593,616** | MT Co2e | MT Co2e | **1,494,799** | **Total Anthropogenic Removals** | | | (98,817) | (98,817) | (0) | 1,037,923 | 1,037,923 | - Emits |
| ========== | | | | | | | | | | | | Reconciliation to REIT Reports (Recast) | | | | | | |
| **Outside the Scopes** | | | | | | | | | | | | This tab | REIT Reports | | 1,494,799 | 1,494,799 | - Removals |
| | | **CO2e Storage in Product Sold (avoided emissions)** | | | | | | **Inventory** | | | | (98,817) | (98,817) | (0) | 1,593,616 | 1,593,616 | - Emits |
| | | | Fee Logs Sold | | 120,886 | 100-yr avg. | | MT Co2e | | | | | | | | | |
| | | | Lumber - Fee | | 94,992 | 100-yr avg. | | 18,470,313 | Plantations | | | Growth Rates | Anthro | Non-Anthro | | | |
| | | | Resid Chips - Fee | | 10,142 | 100-yr avg. | | 3,700,223 | Natural | | | Plantations | 2.19% | 5.18% | | | |
| | | | Lumber - Non-fee | | 108,194 | 100-yr avg. | | 8,405,785 | Other Non-soil | | | Natural | | 3.58% | | | |
| | | | Resid Chips - Non-fee | | 11,551 | 100-yr avg. | | 34,505,541 | Soils | | | | | | | | |
| | | | **MT CO2e Storage** | | **345,765** | | | **65,081,862** | **Total Forest CO2e Inventory** | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | **Removals** | | | **Scope 1 Biogenic Fuels** | | | | | | | | | |
| | | | Fee Uplands Non-Anthro | | | | | | Wood waste - Fee | | | | | | | | |
| | | | Fee Hardwoods | | | | | | Bark - Fee | | | | | | | | |
| | | | Non-fee Uplands Anthro | | 311,364 | | | | Wood Waste Non-fee | | | | | | | | |
| | | | Non-fee Uplands Non-Anthro | | 736,234 | | | | Bark - Non-fee | | | | | | | | |
| | | | **MT CO2e Removals** | | **1,047,598** | | | **-** | **MT CO2e Emissions** | | | | | | | | |

# SECTION 3: IN CASE YOU MISSED IT

## CARBON ACCOUNTING & REPORTING STANDARDS AND THE POTENTIAL CHANGES COMING

FROM WILLSONN ADVISORY LLC'S DEEPER DIVE, Q4 2022

# INTRODUCTION

- You may recall that in the Q4 2021 Market Trends Deeper Dive, I reviewed Carbon Reports published by each of the (then) four publicly traded Timber REITs.
  - In that review, I highlighted the different reporting formats of each REIT, and compared their figures to ones I estimated from their timber inventory found in their Annual Reports.
  - I also pointed out some issues I had with Carbon Accounting and Reporting, in general, and graded the Carbon reports against Financial Accounting and Reporting standards.
- Since then, I have studied the Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard along with its companion document, Corporate Value Chain (Scope 3) Accounting and Reporting Standard.
  - These two standards (together, the "GHG Protocols") were developed by the World Resource Institute ("WRI") and the World Business Council for Sustainable Development ("WBCSD"), along with other NGO's and governments.
    - WRI was established 40 years ago as "a science- and evidence-based institution that would carry out rigorous policy research of global environmental and development issues," according to its website. It has approximately 1,700 employees, spread out across the globe, including 159 individuals listed on the Forests team.
    - WBCSD bills itself as "the premier global, CEO-led community of over 200 of the world's leading sustainable businesses working collectively to accelerate the system transformations needed for a net-zero, nature positive, and more equitable future." Among its diverse members in the banking, accounting, oil, automotive and chemical industries, I also found companies in the Timber and Wood Products industry, including International Paper, Weyerhaeuser, Masisa, CMPC, Greif, Ikea, New Forests, Smurfit Kappa, Sumitomo Forestry, Manulife, and Timberland Investment Group.
  - If you are interested in reading these standards for yourself, you can find them on the links below.
    - Corporate Standard | Greenhouse Gas Protocol (ghgprotocol.org) revised and published in 2004.
    - Corporate Value Chain (Scope 3) Standard | Greenhouse Gas Protocol (ghgprotocol.org) published in 2011.
- More recently, I volunteered to review and provide comments on the proposed Land Sector and Removals Guidance, a supplement to the Corporate Standard and Scope 3 Standard.
  - You can find the draft Land Sector guidance here: Land Sector and Removals Guidance | Greenhouse Gas Protocol (ghgprotocol.org)
- In this Deeper Dive, I will first provide a foundational overview of the existing GHG Protocols, followed by some highlights of the proposed Land Sector and Removal Guidance.
  - Statements in quotations come directly from the text of the reviewed documents.

# THE EXISTING GHG PROTOCOLS

# CORPORATE STANDARD OVERVIEW: OBJECTIVES & PRINCIPLES

- These Objectives and Principles, offered by the Greenhouse Gas Protocol Corporate Accounting and Reporting Standard (the "Corporate Standard"), are foundational for the protocols, and for this discussion.
  - "What gets measured gets managed. Accounting for emissions can help identify the most effective reduction opportunities."
  - "Conducting a rigorous GHG inventory is also a prerequisite for setting an internal or public GHG target and for subsequently measuring and reporting progress."
  - The principles were "derived in part from generally accepted financial accounting and reporting principles."

## Objectives

- To help companies prepare a GHG inventory that represents a true and fair account of their emissions, through the use of standardized approaches and principles.
- To simplify and reduce the costs of compiling a GHG inventory.
- To provide businesses with information that can be used to build an effective strategy to manage and reduce GHG emissions.
- To provide information that facilitates participation in voluntary and mandatory GHG programs.
- To increase consistency and transparency in GHG accounting and reporting among various companies and GHG programs.

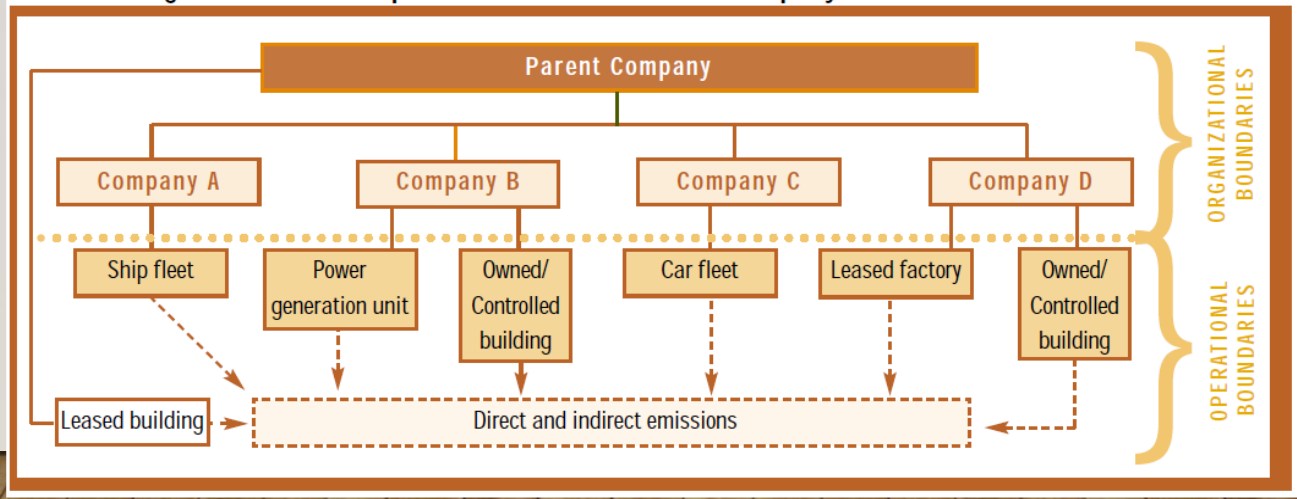
## Principles

- **Relevance**: Ensure the GHG inventory appropriately reflects the GHG emissions of the company and serves the decision-making needs of users – both internal and external to the company.
- **Completeness**: Account for and report on all GHG emission sources and activities within the chosen inventory boundary. Disclose and justify any specific exclusions.
- **Consistency**: Use Consistent methodologies to allow for meaningful comparisons of emissions over time. Transparently document any changes to the data, inventory boundary, methods, or any other relevant factors in the time series.
- **Transparency**: Address all relevant issues in a factual and coherent manner, based on a clear audit trail. Disclose any relevant assumptions and make appropriate references to the accounting and calculation methodologies and data sources used.
- **Accuracy**: Ensure that the quantification of GHG emissions is systematically neither over nor under actual emissions, as far as can be judged, and that uncertainties are reduced as far as practicable. Achieve sufficient accuracy to enable users to make decisions with reasonable assurance as to the integrity of the reported information.

# ORGANIZATIONAL AND OPERATIONAL BOUNDARIES

- The first step is to establish the company's Organizational Boundary - there are two distinct approaches:
  - **Equity Share**: Under the equity share approach, a company accounts for the GHG emissions from operations according to its share of equity in the operation. This method is consistent with financial reporting standards.
  - **Control**: Under the Control approach, a company accounts for 100% of the GHG emissions from operations over which it has control and 0% of the GHG emissions from operations in which it may own an interest but has no control.
    - Control can be defined in either financial or operational terms (but not both).
  - Double Counting: When two or more companies hold an interest in the same joint operation and use different consolidation approaches, emissions from that joint operation could be double counted.
    - The Corporate Standard states "this may not matter for voluntary corporate public reporting as long as there is adequate disclosure from the company on its consolidation approach."
- Operational Boundaries – involves identifying emissions associated with its operations, categorizing them as direct or indirect emissions, and choosing the scope of accounting and reporting for indirect emissions.
  - The established organizational and operational boundaries together constitute the company's **inventory boundary**.

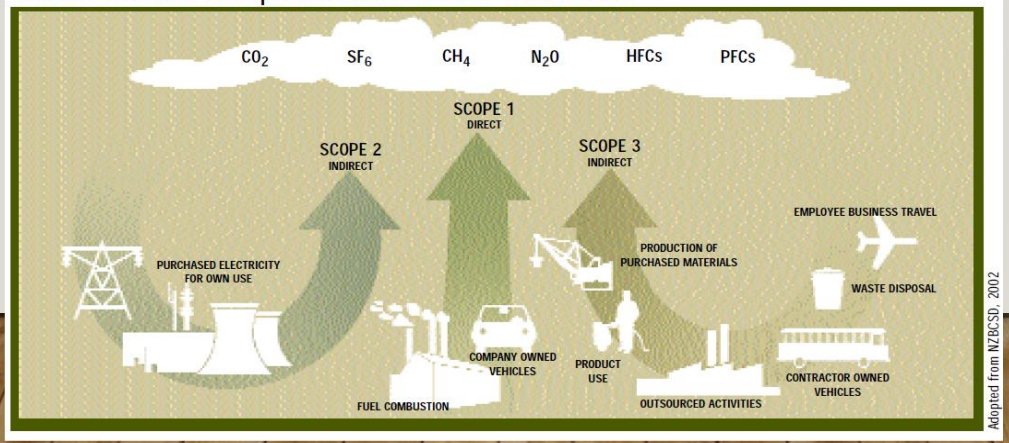
FIGURE 2. Organizational and operational boundaries of a company



# THE THREE "SCOPES"

- Scope 1: Direct GHG emissions - from sources that are owned or controlled by the reporting company.
  - Examples include emissions from chemical production, or combustion in owned or controlled boilers, furnaces, vehicles, etc.
  - Interestingly, the Corporate Standard specify that direct emissions from the combustion of biomass shall not be included in scope 1 but reported separately from the scopes.
- Scope 2: Electricity indirect GHG emissions - from the generation of purchased electricity consumed by the company (where emissions physically occur at a third-party facility where electricity is generated).
- Scope 3: Other indirect GHG emissions – an optional category (as of 2004) to capture the other indirect emissions.
  - Scope 3 emissions are a consequence of the activities of the company but occur from sources not owned or controlled by the company. Indirect emissions include both up-stream and down-stream activities of the company.
  - Examples include emissions from the extraction and production of upstream purchased materials, transportation of purchased fuels, transportation of products sold, and the use of sold products and services. See p44 for more detail.
  - Not only is reporting Scope 3 emissions optional, the choice of which scope 3 emission to report is also optional.
    - The Corporate Standard concedes that optionality creates an issue, at odds with the fifth objective declared earlier.
    - "Since companies have discretion over which categories they choose to report, scope 3 may not lend itself well to comparisons across companies."
- The Corporate Standard is designed to prevent double counting, but only within Scopes 1 and 2.
  - Thus, one company's Scope 1 emission may be counted as a scope 2 or scope 3 emission by another company.

FIGURE 3. Overview of scopes and emissions across a value chain



# OTHER GUIDANCE IN THE CORPORATE STANDARD

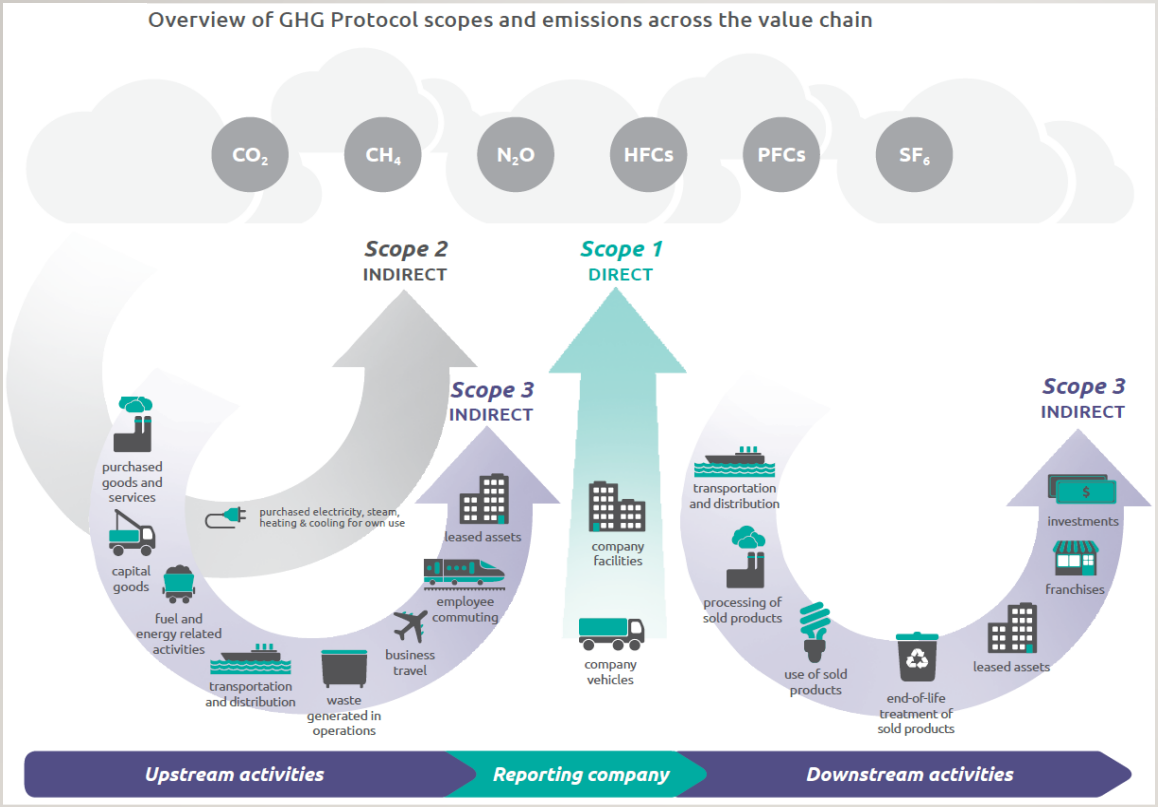
- Tracking emissions over time, relative to a base year, and subject to recalculations when warranted.
  - Recalculations can be triggered by structural changes such as mergers, divestitures, or outsourcing or insourcing activities, by changes in calculation methodologies, or by the discovery of significant errors.
  - Base year emissions and any historical data are not recalculated for organic business growth or decline, such as increases or decreases in manufacturing productivity, product mixes, or the opening and/or closing of owned/controlled facilities.
- Implementation of an Inventory Quality Management System to manage GHG emission inventory quality.
- Distinguishing between accounting for reductions in GHG emissions that occur over time, and accounting for offsets or credits that result from GHG reduction projects.
  - Reductions that occur over time are calculated by comparing a company's emission inventory over time relative to a base year.
    - This is the focus of the Corporate Standard and can include reductions in both direct and indirect emissions.
  - Offsets are calculated relative to a baseline that represents a hypothetical scenario for what emissions would have been in the absence of the project. Improved Forest Management projects would fall into this category.
  - "It is important for companies to report their physical inventory emissions for their chosen inventory boundary separately and independently of any GHG trades they undertake."
    - These reductions need to be reported separately if they are sold, traded externally, or used as an offset or credit.
    - "GHG trades should be reported in its public GHG report … and information addressing the credibility of purchased or sold offsets or credits should be included."
- The Corporate Standard recommends that a public GHG report be based on the best data available at the time of publication, while being transparent about its limitations, with any material discrepancies identified in previous years communicated.
- Additional Guidance is provided for Verification and Setting a GHG Target (both are optional).
- Finally, in the Corporate Standard Appendix, Accounting for Sequestered Atmospheric Carbon (aka, "Removals") is addressed.
  - At the time of publication (2004), consensus methods had yet to be developed, and thus reporting scope 3 removals were explicitly not permitted. Scope 3 removals are still not permitted under the GHG Protocols…

# SCOPE 3 STANDARD

- The Corporate Value Chain (Scope 3) Accounting and Reporting Standard (the "Scope 3 Standard") was published in 2011 as a supplement to the Corporate Standard, to account for value chain emissions at the corporate level.
  - A sister document, the Product Life Cycle Accounting and Reporting Standard (the "Product Standard," also published in 2011) provides guidance for life cycle emissions at the individual product level.
  - The Scope 3 Standard and the Product Standard both take a "life cycle" approach to GHG accounting.

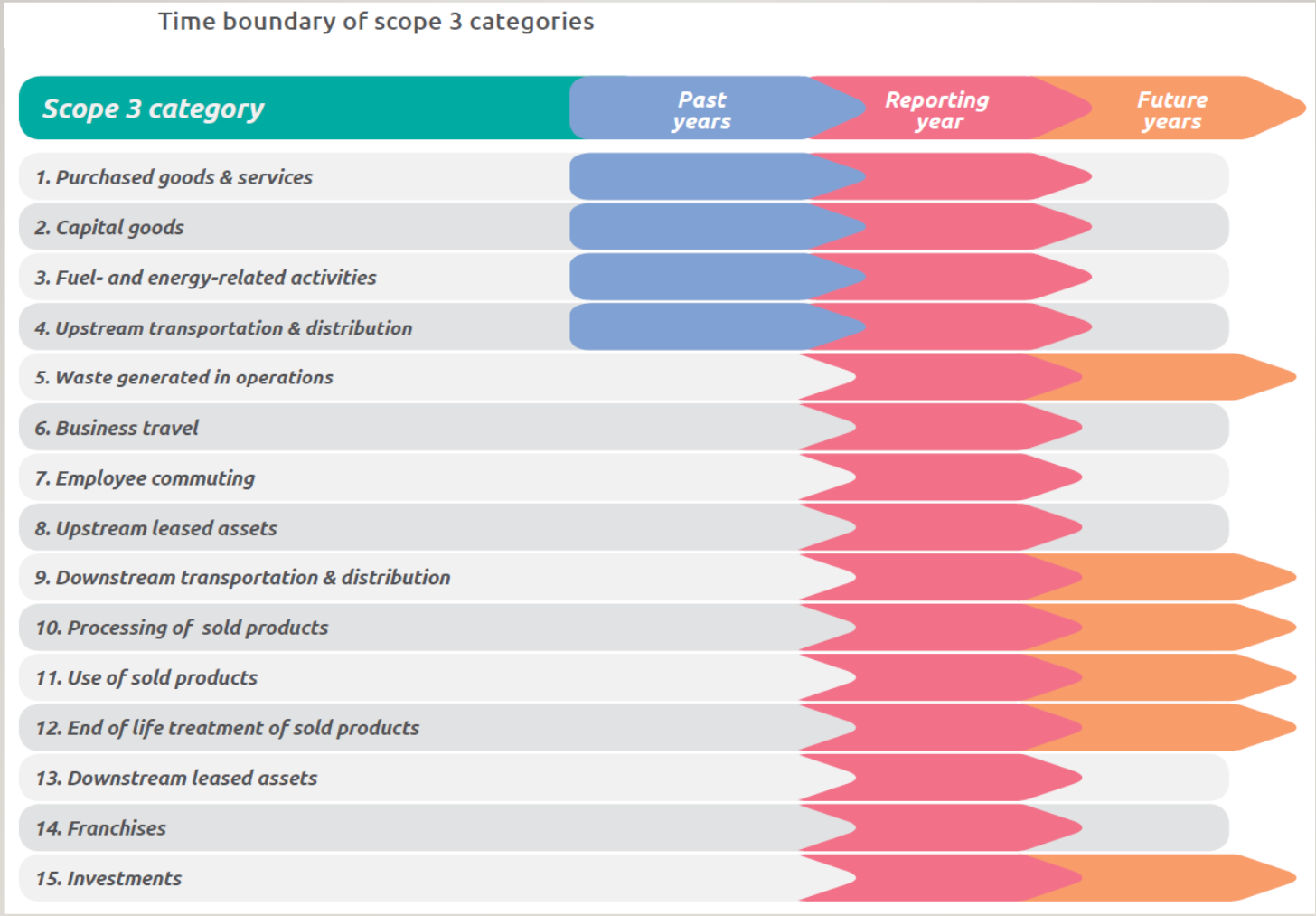

- There are eight upstream categories and seven downstream categories (see the next page), each of which are described in a great amount of detail in the Scope 3 Standard.
  - Some upstream emissions (e.g., purchased goods & services) can occur prior to the reporting period of the reporting company, while some downstream emissions (e.g., waste generated in operations, use of sold products) can occur in the future.
  - Regardless of actual timing, each are included in the upstream or downstream activities of the reporting company in the year of the report. See the chart on page 45.
- To avoid double counting for emissions related to Recycling processes:
  - Companies should account for upstream emissions from recycling processes in Purchased Goods & Services and Capital Goods when the company purchases goods or materials with recycled content.
  - Companies should account for emissions from recovering materials at the end of their life for recycling but should not account for the emissions from recycling processes themselves (as they are counted by whoever purchases the recycled goods).
  - Companies should not report negative or avoided emissions associated with recycling in Scope 3 but can report avoided emissions outside of scopes 1, 2 or 3 (i.e., outside of the scopes).
- Category 15: Investments is quite broad, and includes equity, debt, and/or project financing investments, applicable to both investors and companies that provide financial services.

# GHG PROTOCOL SCOPES AND EMISSIONS ACROSS THE VALUE CHAIN




| Scope 3 category |
|---|
| 1. Purchased goods and services |
| 2. Capital goods |
| 3. Fuel- and energy-related activities (not included in scope 1 or scope 2) |
| 4. Upstream transportation and distribution |
| 5. Waste generated in operations |
| 6. Business travel |
| 7. Employee commuting |
| 8. Upstream leased assets |
| 9. Downstream transportation and distribution |
| 10. Processing of sold products |
| 11. Use of sold products |
| 12. End-of-life treatment of sold products |
| 13. Downstream leased assets |
| 14. Franchises |
| 15. Investments |

# TIME BOUNDARY FOR SCOPE 3 CATEGORIES



# SETTING THE SCOPE 3 BOUNDARY

- As noted earlier, the Corporate Standard allowed companies flexibility in choosing which, if any, scope 3 activities to include. The Scope 3 Standard was designed to create **additional completeness and consistency** by defining (and expanding) scope 3 boundary requirements.
  - "**Companies shall account for all scope 3 emissions…and disclose and justify any exclusions**."
- The Scope 3 Standard provides some very specific guidance relevant to the forest products industry:
  - "Biogenic $CO_2$ emissions (e.g., $CO_2$ from the combustion of biomass) that occur in the reporting company's value chain shall not be included in the scopes, but shall be included and separately reported in the public report."
    - Note that this is the same guidance provided in the Corporate Standard for Scope 1 Biogenic $CO_2$ emissions.
  - "Any GHG removals (e.g., biological GHG sequestration) **shall not be included in scope 3**, but may be reported separately."
  - A couple examples are also provided in the Scope 3 Standard, presented below (with my highlights).
  - In Weyerhaeuser's 2020 and 2021 Carbon Reports and PotlatchDeltic's 2021 Carbon Report, removals related to upstream suppliers of logs processed in their mills were included in scope 3 of their Carbon Report (so, not reported separately), an issue I pointed out in my Deeper Dive a year ago.

**Accounting for biogenic emissions**

A manufacturing company contracts with a third-party transportation provider that uses both diesel and biodiesel in its vehicle fleet. The manufacturer accounts for upstream GHG emissions from the combustion of diesel fuel in scope 3, category 4 (Upstream transportation and distribution), since emissions from diesel fuel are of fossil origin. The manufacturer reports biogenic $CO_2$ emissions from the combustion of biodiesel separately. The manufacturer does not report any removals associated with the production of biodiesel in scope 3.

**Accounting for biogenic emissions and removals**

A paper manufacturer purchases wood pulp from suppliers and sells finished paper products to consumers. The company accounts for GHG emissions from the production of wood pulp in scope 3, category 1 (Purchased goods and services). The company does not account for upstream $CO_2$ removals from biological carbon sequestration that occurs in trees in scope 3, but instead may report $CO_2$ removals separately. The company also does not account for downstream biogenic $CO_2$ emissions from the incineration of sold paper products at the end of their life in scope 3, but instead reports those emissions separately.

# THE LAND SECTOR AND REMOVAL GUIDELINES (DRAFT)

# DRAFT LAND SECTOR & REMOVAL GUIDANCE

- The Land Sector and Removal Guidance (the "LS&R Guidance") was distributed for review and pilot testing on September 29, 2022, with feedback due in early December.
  - Totaling more than 400 pages in two volumes and 21 chapters, the guidance (in whatever form is adopted) is intended to be a supplement to the Corporate Standard and Scope 3 Standard already discussed.
  - "Due to a lack of agreed upon guidance, several important activities and associated GHG impacts have often been excluded from companies' GHG inventories."
  - The authors state (in a footnote) that they "plan to update the Corporate Standard and Scope 3 Standard to ensure alignment with the [Land Sector & Removal Guidance] where any differences exist."
- In addition to the five principles of the Corporate Standard, the LS&R Guidance added two more <u>required</u> principles, **Conservativeness** and **Permanence**, and another <u>recommended</u> principle, **Comparability**.
  - The Conservativeness principle requires the reporting company to use conservative assumptions, values, and procedures when uncertainty is high, such that emissions are more likely to be overestimated and removals are more likely to be underestimated.
    - This is in contrast to the Accuracy principle that requires that quantification of GHG emissions and removals be neither over nor under actual emissions or removals.
  - The Permanence principle requires reporting companies to ensure that mechanisms are in place to monitor the continued storage of reported removals, account for reversals, and report emissions from associated carbon pools.
  - The Comparability principle recommends that reporting companies apply common methodologies, data sources, assumptions and reporting formats such that the reported GHG inventories from multiple companies can be compared.
    - This is nearly identical to the recommendations I expressed in my Deeper Dive a year ago…
- On the following pages, I will focus on those chapters that I view are most relevant to companies in the timber and wood products industries, along with companies up and down the value chain, who may choose to adhere to the final version of the LS&R Guidelines in their future carbon reports.
  - Following my Closing Thoughts, I have also shared the responses I provided in answering the three Open Questions posed by the authors of the guidelines.
  - This is just a small subset of the feedback I provided during my review of the draft LS&R Guidelines. More of my comments submitted to WRI/WBSCD are available on request.

# DRAFT LAND SECTOR & REMOVAL GUIDANCE – SCOPE 3 REMOVALS

- In the tables below, the Draft LS&R Guidance opens the door to scope 3 removals. Reporting Scope 3 emissions is required by the Scope 3 Standard. Reporting Scope 3 removals would become optional.
- In the box below (my highlights), the LS&R Guidance provides a rationale for why scope 3 removals may be permitted in GHG accounting; "to provide a means of incentivizing improved land management practices to reduce emissions and increase removals" across the value chain.
  - The stock-change accounting approach refers to comparing the beginning and ending stock of carbon – a net increase in carbon stocks indicates a removal in atmospheric carbon ($CO_2e$), while a decrease in carbon stocks indicates an emission.
  - It is not enough, however, that the reporting company simply calculate the change in the carbon stocks. It must also account for emissions due to all forest management activities attributable to operating upstream (third-party) forests, including the effects of the use of fertilizer, prescribed burning, and other emissions that occur over the course of a rotation (the life cycle).

**Importance of scope 3 accounting and reporting for the land sector and for removals**

- Scope 3 accounting enables land management GHG impacts to be accounted for by companies in land-based value chains that do not own or control land, to provide a means of incentivizing improved land management practices to reduce emissions and increase removals. For many companies, land impacts are located in scope 3.
- Scope 3 accounting is needed for companies that consume biogenic products, since the stock-change accounting approach used in this Guidance accounts for $CO_2$ emissions from the carbon in biogenic products as:
  - scope 1 *Land management net $CO_2$ emissions* by land management companies, through a reduction in the land carbon stock due to harvest (when carbon is transferred from land into products), and
  - scope 3 (upstream) *Land management net $CO_2$ emissions* by consumers of biogenic products, through a reduction in the land carbon stock on sourcing lands due to harvest.

- This Guidance introduces removals accounting within GHG inventory. If a company reports removals within the scopes, the company needs to report all life cycle emissions related to those activities, in line with the principles of completeness and conservativeness. For example, if a company in a direct air capture and utilization value chain reports removals, the company needs to report all life cycle emissions (e.g., energy required to remove $CO_2$ from the atmosphere) to determine the total GHG impact looking across all processes. If a company in a biomass value chain reports removals, the company needs to report all life cycle emissions (e.g., land use change emissions, land management emissions, land tracking category) to determine the total GHG impact looking across all processes in the value chain. These impacts are most often located in scope 3.

# REMOVAL ACCOUNTING OVERVIEW: CHAPTER 6

- The requirements for removal accounting appears demanding and unequivocal.
- All of these requirements **shall** (i.e., must) be met, not just some of them.
  - Companies must use primary data to monitor the storage of only traceable carbon pools, both upstream and downstream, while accounting for any uncertainty in their estimates.
  - If monitoring ceases, for whatever reason, the reporting company must reverse its removals that it reported in prior years' reports.
  - The application of the new principles, Conservativeness and Permanence, is apparent.
- Regarding the use of primary data, Chapter 6 guidelines provide only qualified and limited wiggle room.
  - For example, remote sensing-based approaches to inventory estimates are okay, so long as they are calibrated using direct measurement, with remeasurement no less frequent than every five years.
  - Limited use of secondary data for such things as wood densities, root to shoot ratios and carbon content is permissible, so long as the secondary data is "technologically, temporally and geographically representative," and comes from reputable sources.

**$CO_2$ removal requirements**

| Criteria | Requirement |
|---|---|
| **Ongoing storage monitoring** | Companies **shall** account for and report removals only if there is ongoing storage monitoring of the relevant carbon pool(s), as specified through a monitoring plan, to demonstrate that the carbon remains stored or to detect losses of the stored carbon. |
| **Traceability** | Companies **shall** account for and report removals only if the reporting company has traceability throughout the full $CO_2$ removals pathway, including to the sink (where $CO_2$ is transferred from the atmosphere to non-atmospheric pools, e.g., forest where trees are growing or direct air capture facility removing atmospheric $CO_2$), to the carbon pools where carbon is stored (e.g., farms where increased soil carbon storage occurs, markets where long-lived products are used and their end-of-life treatment occurs, or geologic reservoirs), and to any intermediate processes, if relevant. |
| **Primary data** | Companies **shall** account for and report removals only if the net carbon stock changes are accounted for using empirical data specific to the sinks and pools where carbon is stored in the reporting company's operations or value chain. |
| **Uncertainty** | Companies **shall** only account for and report statistically significant removals and provide quantitative uncertainty estimates for removals including:<br>1) the removal value,<br>2) the uncertainty range for the removal estimate based on a specified confidence level, and<br>3) justification for how the selected value does not overestimate removals. |
| **Reversals accounting** | Companies **shall** account for and report net carbon stock losses of previously reported removals in the year they occur, as either<br>• Net $CO_2$ emissions, if carbon pools are part of the GHG inventory boundary in the reporting year, or<br>• Reversals, if carbon pools are no longer in the GHG inventory boundary in the reporting year.<br>If companies lose the ability to monitor carbon stocks associated with previously reported removals, companies **shall** assume previously reported removals are emitted and report reversals. |

# LAND USE CHANGE AND LAND TRACKING: CHAPTER 7

- "Land use change accounting captures carbon stock losses occurring in the conversion or transition from one land use category to another."
- In addition to conversion of forestlands to other uses (all of which are viewed as causing a net carbon emission), reporting companies must account for changes in carbon stocks within the Forest Land Category.
  - Note that conversions of natural forests to plantation forests are viewed as causing a loss in carbon stocks.
  - Direct land use change accounting must look back 20 years or more (and at least a full rotation if more than 20 years), according to the proposed LS&R Guidance.
  - In addition to $CO_2$, companies must also account for methane ($CH_4$) and nitrous oxide ($N_2O$) emissions.
- In addition to <u>direct</u> land use changes, reporting companies must also account for <u>indirect</u> land use changes that take place outside the sourcing landscape (i.e., leakage) that result from an overall increase in demand for the land-based product.

**Land Use Categories and Subcategories, and Relationship to Accounting Approaches**

| Pre-Conversion Land Use Category | Post-Conversion: Forest Land | Grassland | Cropland | Wetland | Settlement | Other Land |
|---|---|---|---|---|---|---|
| Forest Land | F > F | F > G | F > C | F > W | F > S | F > O |
| Grassland | G > F | G > G | G > C | G > W | G > S | G > O |
| Cropland | C > F | C > G | C > C | C > W | C > S | C > O |
| Wetland | W > F | W > G | W > C | W > W | W > S | W > O |
| Settlement | S > F | S > G | S > C | S > W | S > S | S > O |
| Other Land | O > F | O > G | O > C | O > W | O > S | O > O |

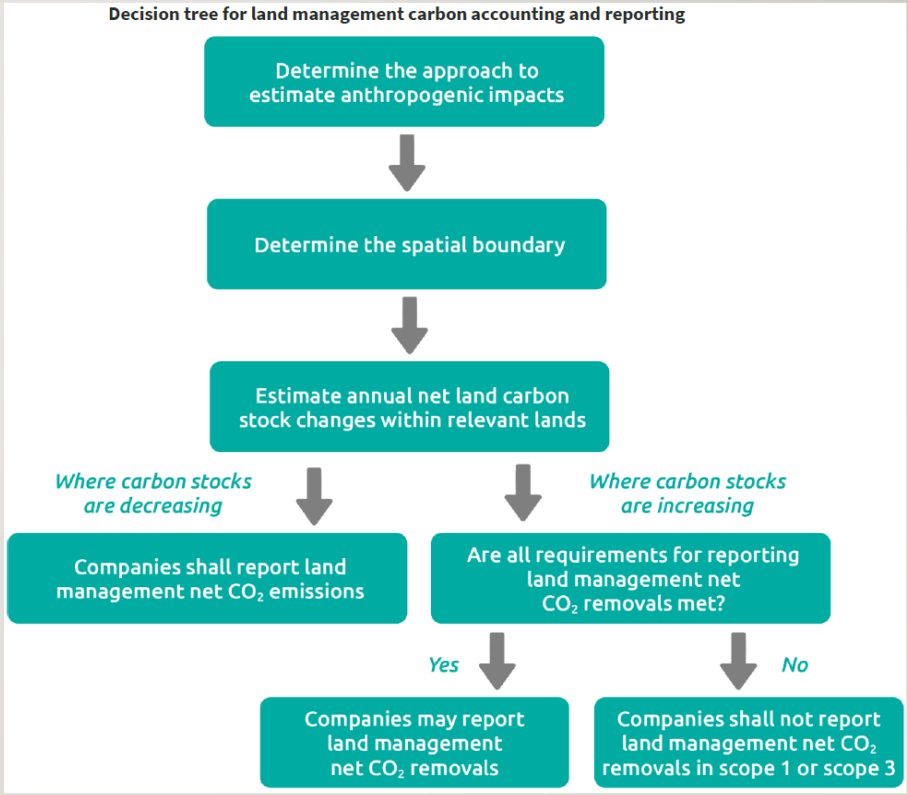
| Forest Subcategories | Natural Forest | Planted Forest |
|---|---|---|
| Natural Forest | NF > NF | NF > PF |
| Planted Forest | PF > NF | PF > PF |

| Grassland & Wetland Subcategories | Natural Ecosystem | Intensively Managed Land |
|---|---|---|
| Natural Ecosystem | NE > NE | NE > IML |
| Intensively Managed Land | IML > NE | IML > IML |

Key:
- Land use change with carbon stock losses (Chapter 7)
- Land management and/or land use change with carbon stock gain (Chapter 8)
- Forest Subcategories
- Grassland & Wetland Subcategories

# LAND MANAGEMENT ACCOUNTING: CHAPTER 8

- Chapter 8 starts off strong: In order to report Land Management Removals, all chapter 6 requirements (monitoring, traceability, primary data, uncertainty and reversals) must be met.
- Land-based carbon pools include biomass, dead organic matter and soil, each of which can be impacted by land management.
  - Each pool should be reported separately.
- "Companies that own or control land, or purchase products from lands owned and managed by others in their value chain, have only partial control of land carbon stock changes. In addition to anthropogenic* management decisions (e.g., harvesting, replanting, and prescribed burning), land carbon stocks also change due to natural factors (i.e., natural unassisted growth and disturbances)."
- "GHG inventories are designed to capture anthropogenic emissions and removals due to land management."
  - "If certain lands are considered unmanaged then companies cannot account for emissions or removals associated with such lands."




*Anthropogenic: resulting from the influence of human beings on nature.

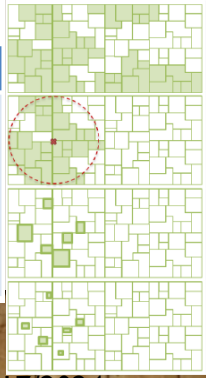
# SIMPLIFYING ASSUMPTIONS FOR LAND MANAGEMENT ACCOUNTING

- For the first 134 pages of the draft LS&R Guidelines, the guidelines appear rather stringent for reporting scope 3 removals from timberlands (meeting all chapter 6 requirements, distinguishing between managed and unmanaged lands, capturing only human caused atmospheric carbon removals, etc.).
- The draft LS&R Guidance then does an about-face mid-way through chapter 8, allowing reporting companies to apply a number of simplifying assumptions.
  - Reporting companies can assume that all of the lands they are evaluating are managed lands under the managed land proxy and further, reporting companies can assume that all carbon stock changes are anthropogenic. See the lower left box.
  - A few pages later, the LS&R Guidelines propose an exception for the spatial boundary requirements for reporting Scope 3 Removals (see lower right box). Reporting companies would be permitted to estimate carbon stock changes using "secondary data representative of average management for lands within the sourcing region."
- By assuming that all lands are managed, that all carbon inventories and removals are anthropogenic, that all lands in a sourcing region are the reporting company's "source" of raw materials, and that secondary data can be used to calculate carbon stock changes, the proposed LS&R guidelines significantly lower the bar for additional scope 3 removal accounting, for a greater number of companies.
  - Scope 1 removals would still require the landowner to meet all the chapter 6 requirements, though a reporting company would certainly benefit from the managed land proxy assumption and from assuming that all removals are anthropogenic.

*Applying the Managed Land Proxy*

| Accounting requirement |
|---|
| Companies **shall** account for anthropogenic land management net $CO_2$ emissions and removals (if applicable) using one of the following two approaches:<br>• **Classify all land as managed land:** Assume all land carbon stock changes are anthropogenic and apply the managed land proxy to all lands<br>• **Develop and consistently apply an approach to classify lands as managed or unmanaged:** Develop and consistently apply criteria to distinguish between managed and unmanaged lands, then apply the managed land proxy to all managed lands |

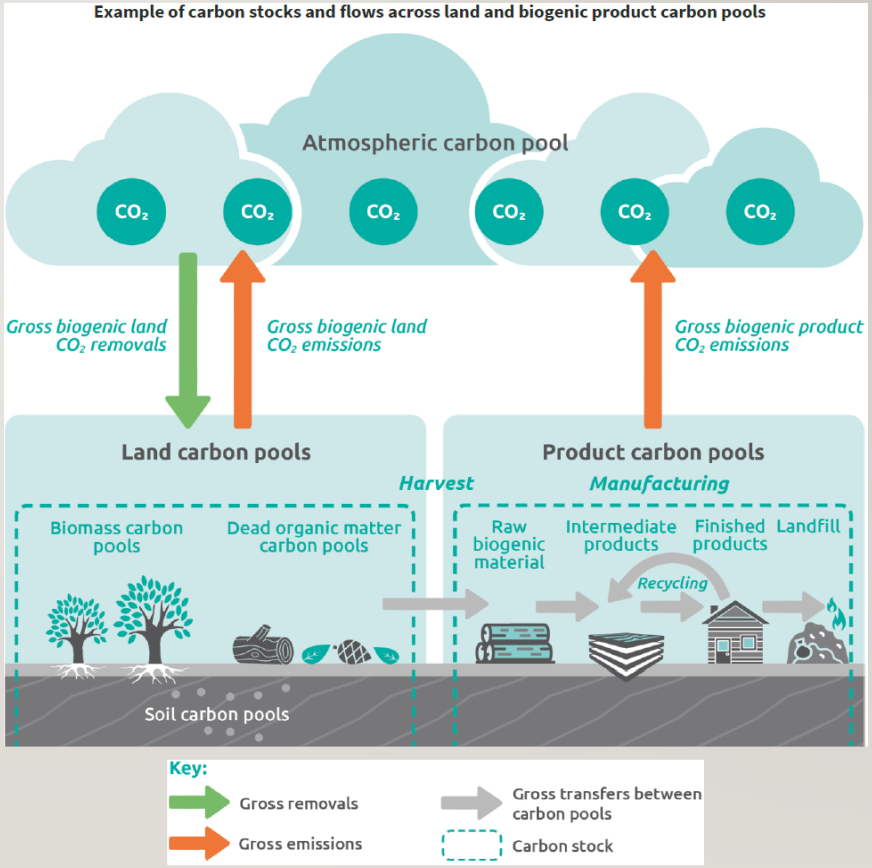
**Illustration of relevant spatial boundary based on traceability for scope 3 accounting**



| Spatial Boundary | Traceability | Data Specificity | Emissions Reporting | Removals Reporting |
|---|---|---|---|---|
| **Jurisdiction** | Known subnational jurisdiction, country or political region (e.g. EU) of origin | Average national or regional secondary data for attributable managed lands in the jurisdiction | Least precise | No, requires more precise traceability and primary data |
| **Sourcing Region** | Known first collection point or processing facility | Primary data on attributable managed lands in the sourcing region(s) or secondary data representative of average management for lands within the sourcing region(s) | | Subject to pilot testing question #3 |
| **Land Management Unit** | Known land management units of origin (e.g. forest management unit, ranch or farm) | Primary data from producers for the specific land management unit(s) | | Yes, if the company meets other removals requirements |
| **Harvested area** | Known field or forest stand of origin | Primary data from producers for the specific harvested area(s) | Most precise | Yes, if the company meets other removals requirements |

# ACCOUNTING FOR PRODUCT CARBON POOLS: CHAPTER 9

- Product Carbon Pools affect accounting for Scope 3, category 11 (use of sold product) and category 12 (end-of-life treatment of sold products).
- Product Carbon Pool Emissions are accounted for on a life-cycle basis, as described in the Scope 3 Standard (p 41) and look into the future. Reporting is required.
- Product Carbon Pool Removals are accounted for annually (do not look into the future), based on stock-change accounting. Reporting is optional, employing one of two approaches.
  - Simplified approach: Assume there are no changes in the carbon stock of products sold and report no net emissions or removals.
  - Stock-change approach: Chapter 6 requirements apply (monitor, trace, primary data, uncertainty, reversal), with a decrease in carbon stocks reported as an emission and an increase in carbon stocks reported as a removal.
- The draft LS&R Guidelines stipulate that Scope 3 life-cycle emissions and annual removals reported under the LS&R Guidelines must not be combined in reporting, and that category 11 removals must be reported separately from category 12 removals.
  - Unlike chapter 8, the LS&R Guidelines do not offer any simplifying assumptions to grease the skids for adoption.



# OTHER GUIDANCE OF THE LS&R GUIDELINES

- Chapter 11 provides requirements and guidance on evaluating GHG impacts of "significant actions" using "intervention accounting" methods.
  - Intervention accounting estimates the systemwide net GHG impacts of actions compared to a counterfactual baseline scenario (i.e., compared to the conditions most likely to occur in the absence of the action).
    - "Actions" include projects, strategies, investments, purchases and sales, that may affect GHG emissions or removals, land use, land use change, land carbon stocks, production of products, etc.
  - This would include global impacts not captured in the scopes such as:
    - Avoided emissions and avoided removals.
    - Leakage and market mediated effects such as substitution or displacement.
    - Indirect land use changes that occur outside a company's value chain.
    - Carbon opportunity costs which assess the difference between the current carbon stocks of managed lands and the native vegetation carbon stocks of that land, showing the potential for $CO_2$ removal if the land were reforested or otherwise reverted to native vegetation.
  - While the Accounting Requirements appear to be demanding, the guidance allows for some discretion by the reporting company to deem an action as "insignificant" or to focus evaluation efforts on actions with net positive effects.
    - "Companies do not need to evaluate all actions. Instead, companies should identify and assess the actions expected to have the most significant potential impacts on emissions and removals." *Notice it reads "should" rather than "shall."*
    - "Intervention accounting methods can be used to estimate impacts of actions in the future or to evaluate impacts in the past. Companies should decide if they want to evaluate the impacts of actions that have already been implemented and/or potential actions that are being considered or planned."
- Chapter 13 addresses accounting for credited emission reductions and removals, applicable to companies that purchase or sell credits or where credits have been generated in the company's value chain.
  - Among a number of requirements: "Companies **shall** not double count a ton of GHG reduction or removal that has been credited and sold if the credit is used (or could potentially be used) as an offset or for compensation."
  - This applies to both offsets (activities occurring outside a company's value chain) and insets (activities occurring within a company's value chain).

# SUMMARY OF THE PROPOSED LS&R GUIDELINE CHANGES

- What could get stricter:
  - Adding the principles of permanence and conservativeness to the GHG protocols for Land Sector & Removal Guidelines.
  - Imposing all of the requirements of chapter 6 (traceability, monitoring, primary data, uncertainty, reversals) to Scope 1 removals and Scope 3 carbon storage in products.
    - Effectively, the emissions associated with harvesting trees would no longer be allowed to be partially offset with carbon storage in products.
  - Required accounting for land use change, both direct and indirect, looking back a minimum of 20 years.
  - Evaluating GHG impacts of "significant actions" through the chapter 11 guidelines, though with substantial discretion.
  - Required separate disclosure of carbon credits, offsets and insets in carbon reporting.
  - Mandatory reporting of all scope 3 categories, by category and by carbon pool, with emissions and removals disclosed separately.
- What could get easier (and/or more generous):
  - Scope 3 removals associated with upstream value-chain timberlands would be permissible.
  - Significantly lower standards for estimating scope 3 removals, when defining the operational boundary of the reporting company and accounting for anthropogenic emissions and removals.
  - Scope 3 removals available to investors, with "investors" defined broadly.
  - Double counting of GHG removals between reporting companies if Scope 3 Removals are allowed (as proposed).
- What isn't changing
  - Any requirements for independent third-party verification when companies issue a carbon report to the public.
  - Imposition of reporting standards to ensure comparability between reporting companies (recommended, but not required).
  - The influence of the WBCSD in shaping the guidelines.
  - Continued double counting of emissions between reporting companies, of scope 1 and scope 3 GHG emissions.

# CLOSING THOUGHTS

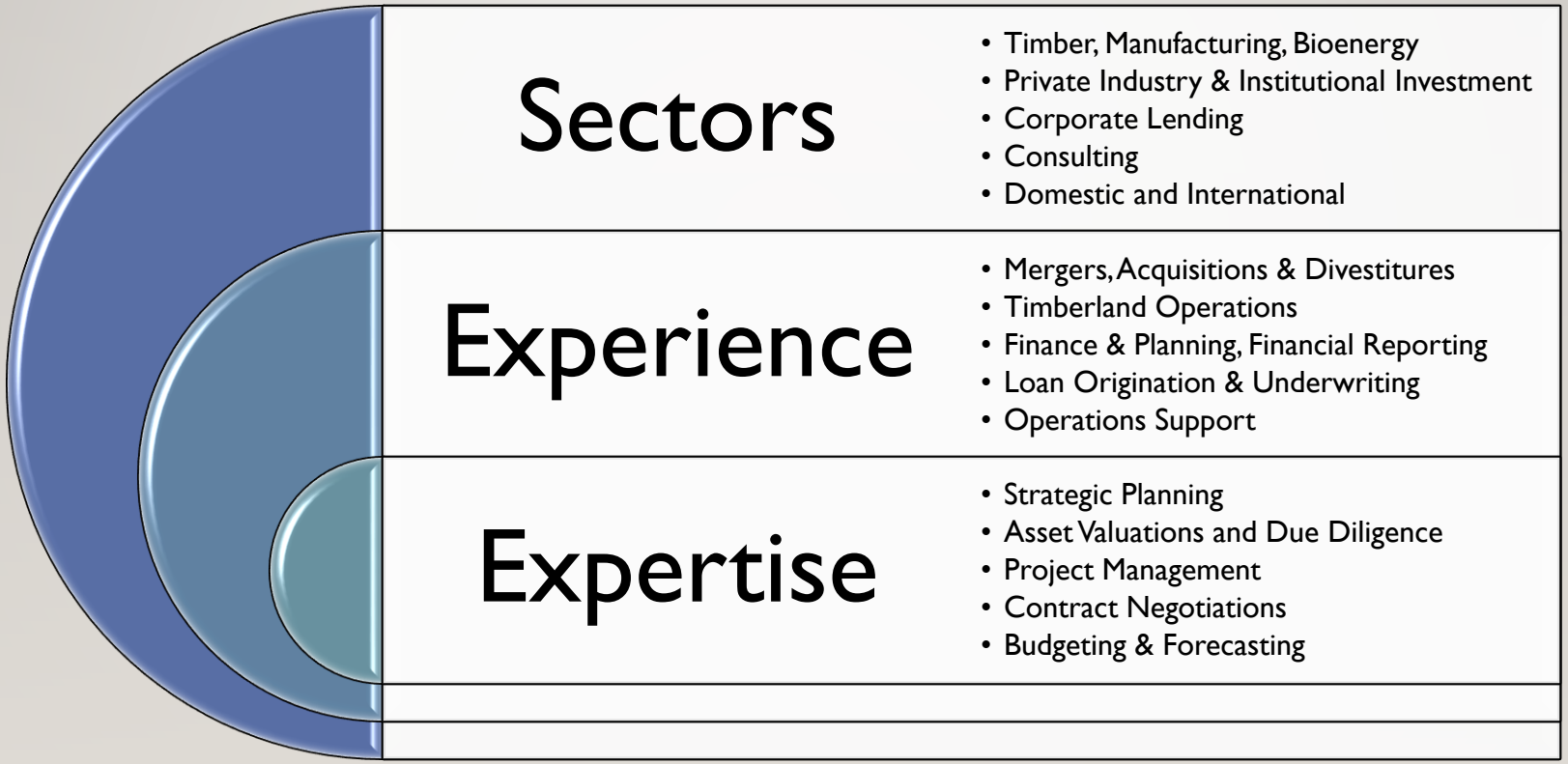
- Any company has the right to issue a Carbon Report, whether it's compliant with a set of protocols or not.
  - Simply using the terms and structures embedded in the GHG Protocols lends an air of legitimacy to a company's carbon report, whether all of the requirements are followed or not.
  - In this case, perception is not reality.
- Adherence to the GHG Protocols is voluntary.
  - If publicly traded firms aim to be included in "sustainable" investment lists and index funds, their bona fides must be measured against a single standard (akin to GAAP), certified by an independent and regulated verification body (akin to accredited CPA firms), and subject to oversight by regulatory bodies (e.g., the SEC and FTC). Investors and consumers deserve no less.
  - Unfortunately, there are no independent oversight entities in the USA, not even WRI itself. No entity is enforcing compliance for reporting companies claiming to adhere to the GHG Protocols.
  - Requiring third-party verification when claiming to follow GHG Protocols appears to be the only solution to this problem.
- Parts of the LS&R guidelines could actually go a long way towards improving the completeness and veracity of carbon reporting, helping to accurately inform the public on the climate impact of a company's operations and possibly incentivizing global reductions of net GHG emissions.
  - Expanded accounting requirements for scope 1 removals and for carbon storage in products, and the introduction of accounting for land use changes, are significant enhancements to the GHG Protocols.
  - The requirements of Chapter 11 governing Significant Actions could also have the potential for substantial impacts.
  - **Seemingly, reporting companies are only limited by their imaginations and willful discretion when deciding how to account for emissions and removals, and which requirements to follow and which to ignore.**
- The simplifying assumptions are a deal-killer, as they are unlikely to elicit an actual (not just accounting) positive change in emissions and removals in a company's value-chain, and possibly result in outright abuse.
  - Ironically, buying more logs would enable a reporting company to claim more removals, as the authors of the LS&R Guidance describe, though they call them "causality issues" instead of abuses.
  - If the egregious simplifying assumptions introduced in chapter 8 were eliminated, adherence to the scope 3 removal standards would be so complex and expensive that only the largest companies would be able to afford to do so, making it inequitable.

# SECTION 4:

# ABOUT WILLSONN ADVISORY, LLC

# CRITICAL EXPERIENCE FOR CRITICAL ENDEAVORS

WillSonn Advisory brings senior management experience, across multiple sectors of the wood products industry, with expertise in leading an array of strategic initiatives.



# WILLSONN ADVISORY SERVICES

- Timberland & Mill Valuations
- Acquisition "Post-Mortem" Audits
- Conversion of Acquisition Pro Forma to Lender Financial Projections
- Acquisition and Operational Due Diligence
- Development of Company Enterprise Valuations
- Incorporating Economic Forecasts into Business Plans

**Business Assessments & Due Diligence Services**

- Acquisition and Divestiture Process Management
- Conduct Regional or Global Market Studies
- Plan and Oversee Inventory & GIS Projects and/or Audits
- Independent Review of Harvest Flow Projections and Processes
- Prepare Offering Memorandums and Prospectuses

**Project Management Services**

- Fiber/Log Supply Agreements
- Purchase & Sale Agreements
- Timber Deeds and Leases
- Conservation Easements & Carbon Projects
- Service and Offtake Agreements
- Joint Ventures & Partnerships
- Contract Negotiating Strategies

**Contract Structuring and Negotiation Services**

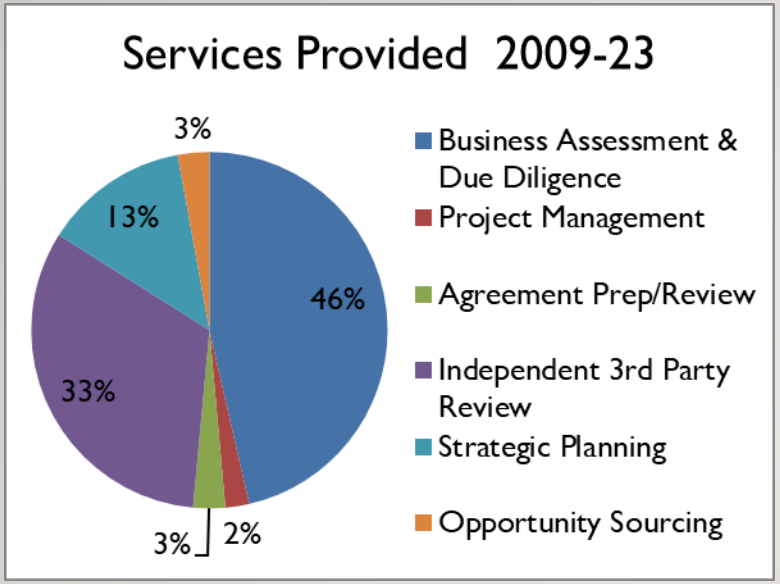
- Strategic Plan Process Design, Facilitation and Documentation
- Company Specific Price, Supply and/or Demand Forecast Development
- Contingency Plan Development and Monitoring
- Financial Planning and Capital Restructuring
- Work-out Strategy Development
- Capital Investment Assessments

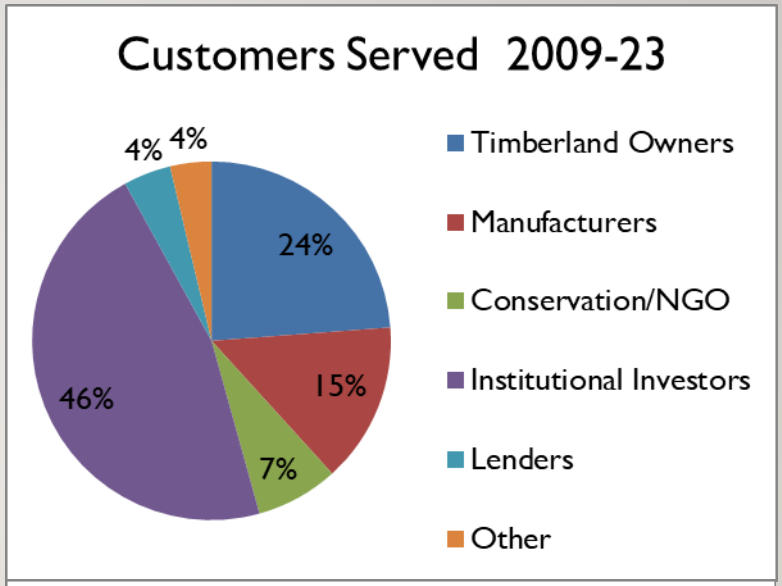
**Strategic Planning & Business Restructuring Services**

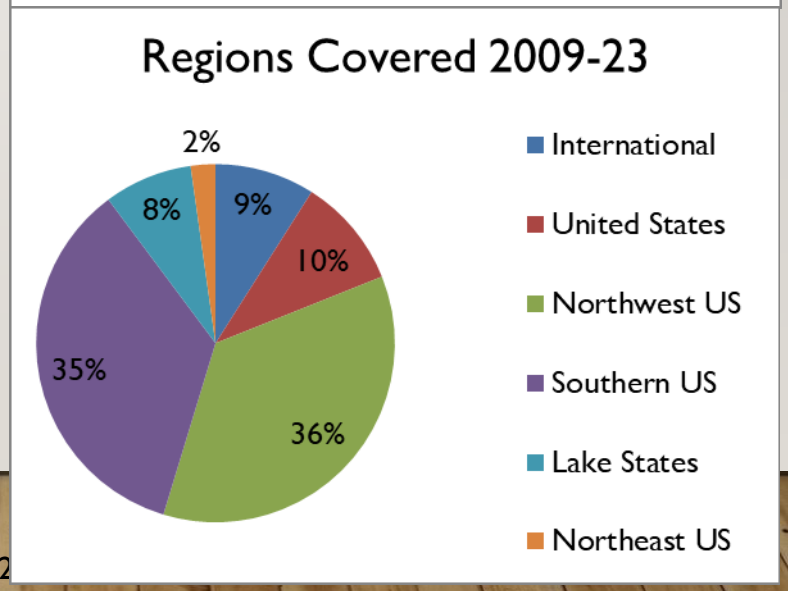
- Validate Acquisition Valuations & Due Diligence Procedures
- Evaluate Existing or Proposed Agreements or Easements
- Interpret Annual Management Plans & Appraisals
- Examine Proposed Transfers of Ownership
- Review Divestiture Timing & Strategies
- Track Investment Performance

**Institutional Investor Services**

# ENGAGEMENT PROFILES




Since 2009, Will Sonnenfeld has provided a broad range of consulting services to dozens of clients across the full spectrum of industry sectors, in all regions of the US and abroad.

I look forward to receiving any comments or questions you may have and would welcome the opportunity to serve your consulting needs.

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