

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

Q4 Market Trends-WillSonn Advisory, LLC



Please find attached the latest edition of my Market Trends report. The fourth quarter saw continued declines in homebuilder sentiment, affordability, housing starts, product prices, and gross mill margins. Stubborn high inflation for consumers, and builders in particular, along with rising interest rates, stagnant income and a bearish stock market, are creating significant headwinds for our industry at the start of 2023. On a positive note, timberland transactions turned positive as 2022 details come into view, with a rise in both acres and values in some regions, some of which was attributable to the allure of timberland's exceptional carbon profile.

In this quarter's Deeper Dive, I present my summary of the World Resource Institutes' corporate greenhouse gas accounting and report standards, particularly how they affect our industry. I also present a summary of some proposed new guidance for land sector and carbon removal accounting and reporting, along with my views on these draft guidelines. In the "In Case You Missed It" section, I present some of the discussion materials contained in WRI's proposed Land Sector & Removal guidelines. I hope you find this material to be both informative and thought provoking, and I welcome the opportunity to engage with you to address any questions or perspectives you would like to discuss. Please feel free to contact me by phone or by email.

Best Wishes for a happy and prosperous New Year,

Will

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7 February 2023



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MARKET TRENDS

4TH QUARTER, 2022

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

Compliments of WillSonn Advisory, LLC



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Q4 2022 HIGHLIGHTS

Market Trends

- Builder sentiment continues to weaken, spending slows (page 5-6)
- Housing Affordability moves lower as mortgage rates soar, income lags (page 7-8)
- Total Housing Starts down YOY as the Multi-Family sector gains share (page 9-10)
- Inventory of Homes for Sale builds as sales slow (page 11-12)
- Product Prices notch lower again in Q4 (page 13-14)
- PNW log prices slip as Southern logs post gains (page 15-16)
- Gross sawmill margins retreat as product declines outpace log prices (page 17)
- US South Timberland Sales prices post record values in 2022 (page 18-19)

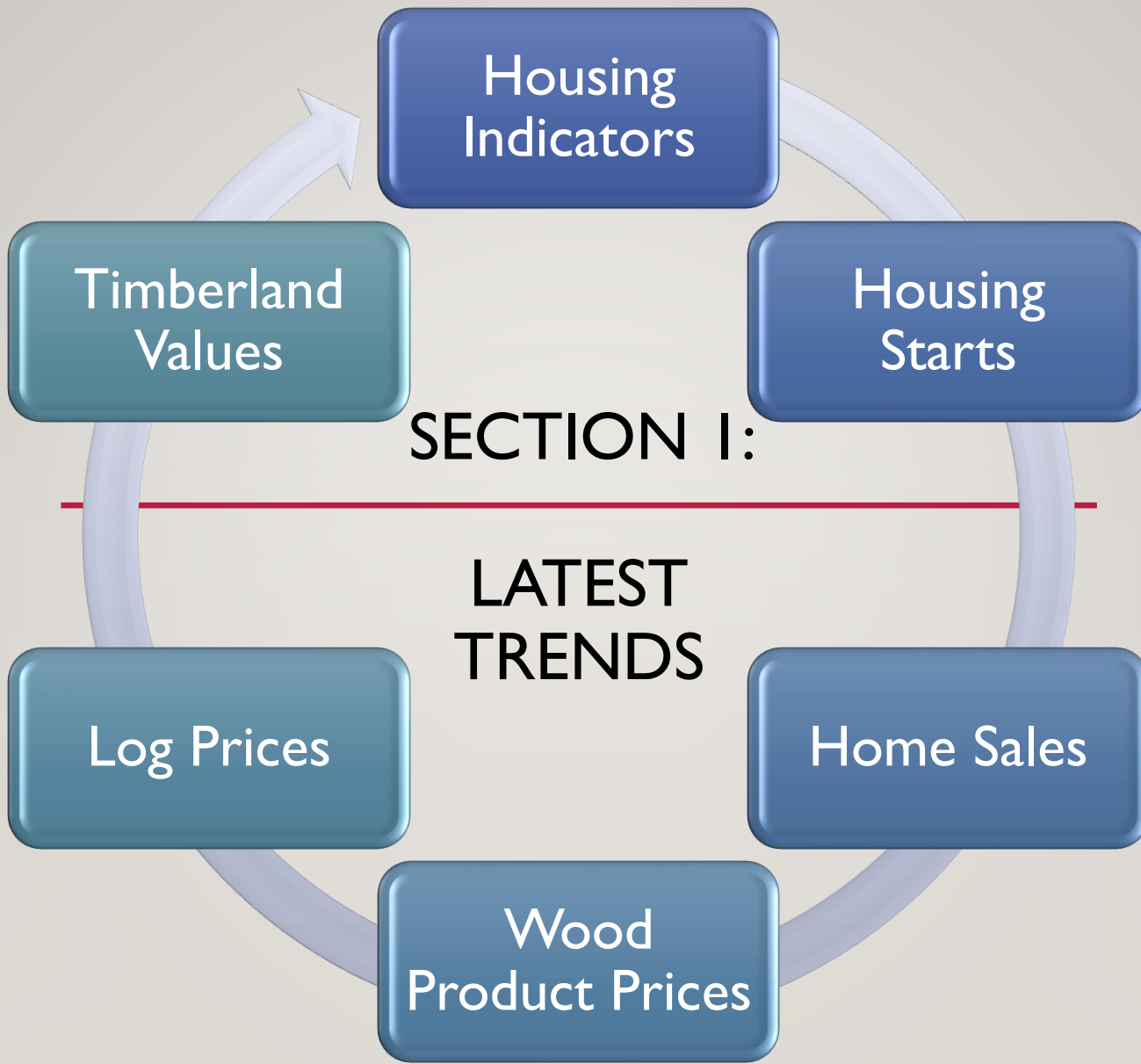
Deeper Dive

- Looking at potential changes to GHG reporting guidelines (page 20-45)

In Case You Missed It

- Excerpts from the Draft Land Sector & Removal Guidelines (page 46-53)

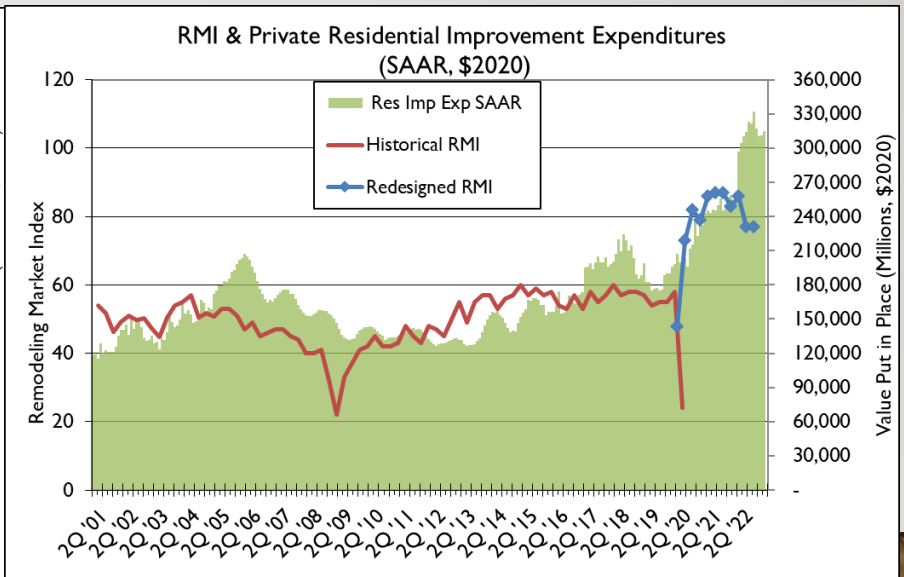
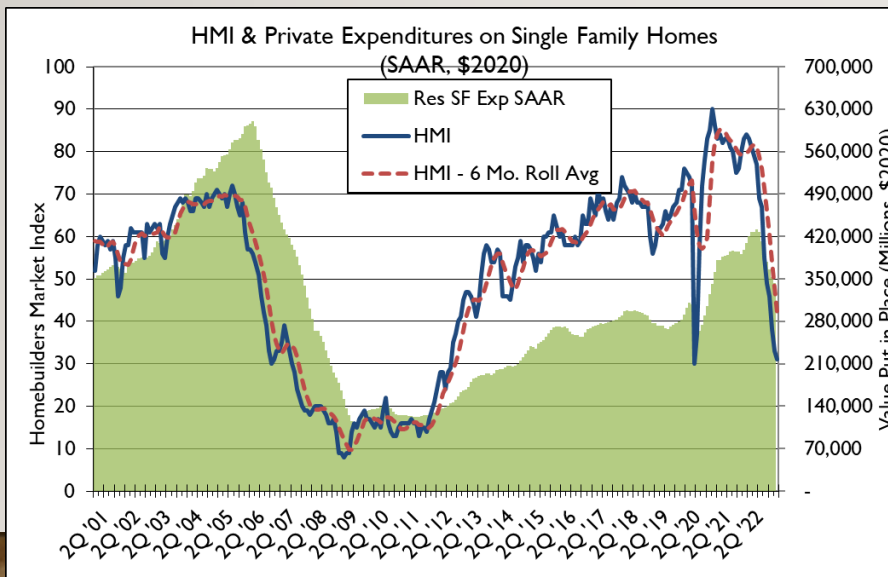
About WillSonn Advisory, LLC





BUILDER SENTIMENT & PRIVATE RESIDENTIAL EXPENDITURES

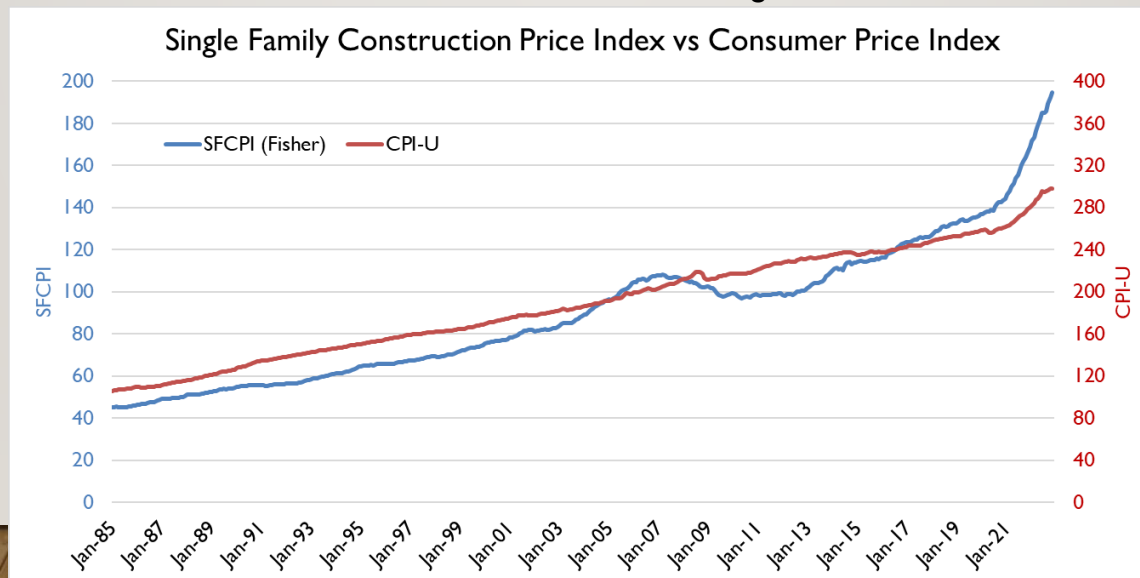
- Recent Trends:** The Homebuilder Market Index (HMI) ended Q4 2022 with a reading of 31, down 15 points from the September 2022 reading and 53 points lower than Dec 2021. The Remodeling Market Index (RMI) held steady at 77 in Q3 2022.
- YTD 2022 Real Expenditures on Single Family New Residential** exceeded 2021 levels by just 1.5%, following a 29.2% gain in 2021. YTD 2022 Real Expenditures on Private Residential Improvement increased 25.1% above 2021 levels, following 2021's 15.9% increase.
- Explanation:** Rising interest rates are dampening Homebuilder and Remodeler sentiment. Despite faltering housing starts, longer construction times plus strong remodeling activity, coupled with rising labor and material costs, continue to push expenditures higher. Higher interest rates are redirecting housing expenditures to the remodeling sector, as homeowners shun higher mortgage payments.
- Implication:** Declining builder confidence generally bodes poorly for near to intermediate-term housing starts. Higher construction costs risk limiting the pool of qualified buyers and cause delays in construction. A resumption of pre-pandemic consumer interests (e.g., travel, eating out), along with rising inflation and borrowing costs will likely undermine strength in remodeling activity in later quarters.
- Expectation:** Construction expenditures should continue to see expenditure growth slow or even contract, as lower building material prices make their way through the distribution channels. However, rising interest rates, constrained supply of existing homes, a dearth of developed lots, scarce labor and lower contractor productivity will keep residential construction and improvement expenditures elevated.





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.
 - Over the Past 10 years, it is clearly visible that the Single-Family Construction Price Index has far outpaced overall inflation, at a pace more than 3 times as fast, increasing 93%, compared to 30% for the CPI-U index.
 - Also note that the rise in CPI has slowed over the last six months, boding well for future moderation of YOY inflation figures.

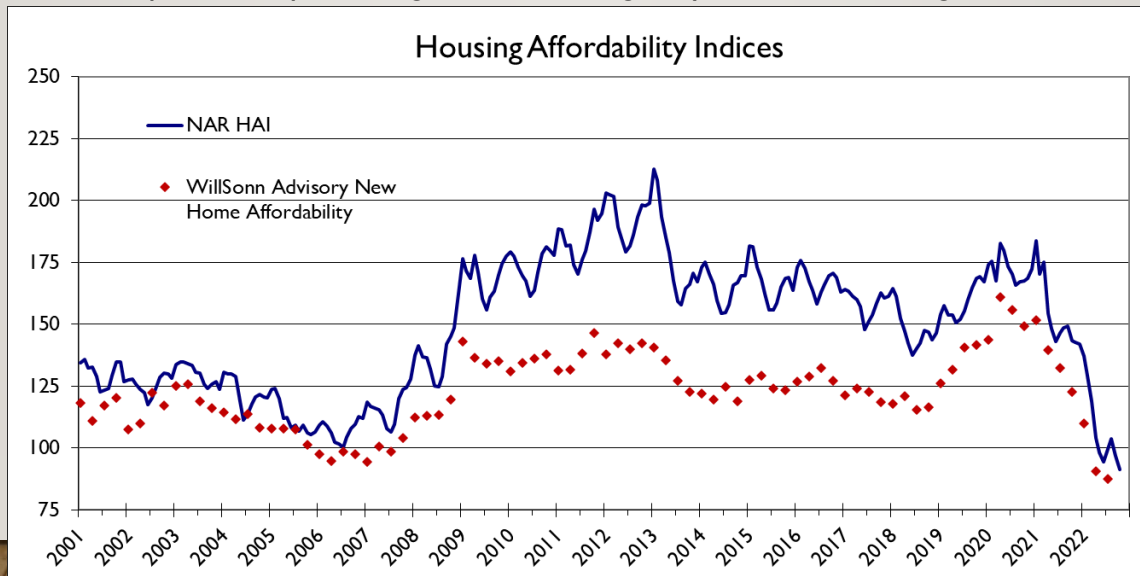


Data Sources: Census Bureau, FRED website

Charts & Analysis: WillSonn Advisory

HOUSING AFFORDABILITY

- **Recent Trends:** The Housing Affordability Index (“HAI”) (blue line) has fallen from 184 in January 2021, to 91 in October 2022, a level not seen since 1985. The New Home Affordability (red diamonds) notched lower to 88 in Q3 ’22.
- **Explanation:** In 2019 and 2020, mortgage rates eased and median family income accelerated, bolstering this measure of affordability, but soaring home prices in 2021 and 2022, and now, rising mortgage rates, are pushing affordability lower.
 - As cautioned last year, existing home affordability was overstated in late 2020/early 2021; bidding wars pushed transaction prices above listing prices in many markets and three stimulus checks artificially (and temporarily) boosted family income figures.
- **Implication:** Over the years, there is a rather weak link between affordability and housing starts (R-squared of just .19). 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 back then also helped.
- **Expectation:** The battle to temper 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 in the coming months, 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 as lumber and OSB prices ease; rising labor costs, lot prices and permitting costs are eating away at the added margin.



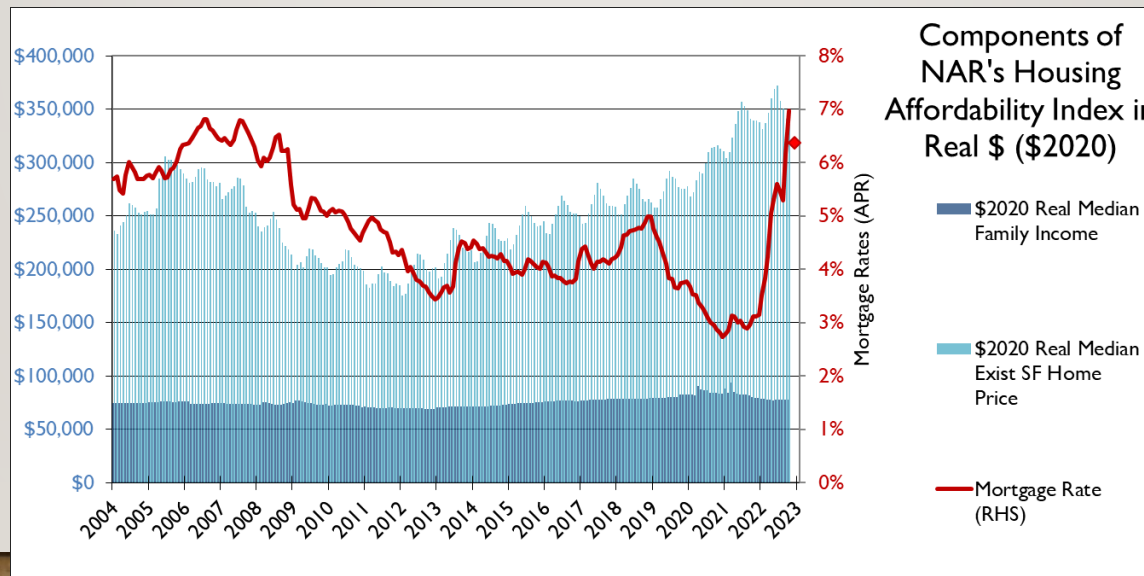
Data Sources: NAR, Census Bureau,, Dept. of Commerce

Charts & Analysis: WillSonn Advisory



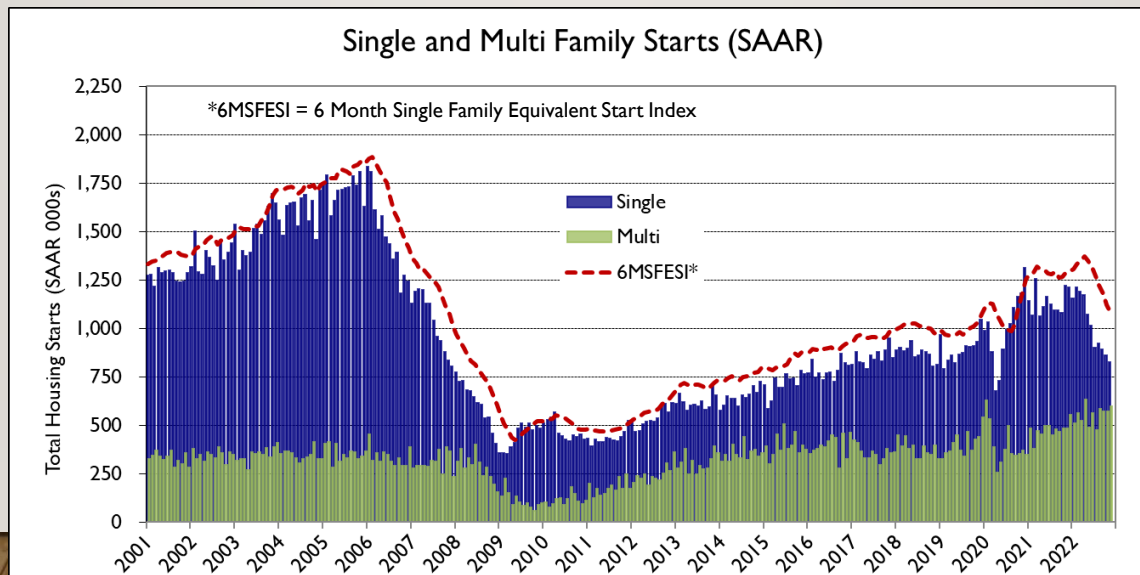
BEHIND THE NUMBERS: HOUSING AFFORDABILITY

- **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, so far in 2022 compared to 2021, median real home prices are up 4.1% while real Median Family Income has fallen -7.0%. With YTD average mortgage rates 71% higher, Mortgage Payments for the costlier median priced home are now 51% higher than 2021, eating up an increasing proportion of family income. All of this has resulted in a much lower Affordability Index.
- In October 2022, mortgage rates averaged 6.98%, 386 basis point higher than October 2021. 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 averaged 6.36% in December 2022, so a small rebound in affordability is expected in the near-term.



HOUSING STARTS

- Recent Trends:** YTD Housing Starts have registered 1.574 million units, compared to 2021's total of 1.61 million units. Single Family Starts are down -10.1% while Multi Family Starts are up 15.8%, compared to 2021. November's preliminary reading of 1.427 million units is well below the recent peak of 1.805 million units registered in April 2022.
 - 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. August's 1,088,000 unit reading represents 58% of the 2006 peak of 1.9 million SFES's.
- Explanation:** Higher home prices alone were a threat to sustained gains in Housing Starts. Now, with rising interest rates and high inflation more than offsetting Family Income gains, aspiring homeowners are being forced to remain in the rental market, shifting the market from single to multi-family construction (and pushing rents even higher).
- Implication:** Housing Starts account for 30%-40% of wood usage, so as housing goes, so goes lumber and panel demand.
- Expectation:** With the chance of a recession on the horizon, Housing starts are expected to remain under pressure over the next few quarters. In the longer-term, we can expect housing to continue to improve as the housing deficit is replenished and as existing home availability remains tight. Gains may also be tempered by limits on construction labor, developed lots, and tight lending standards.



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

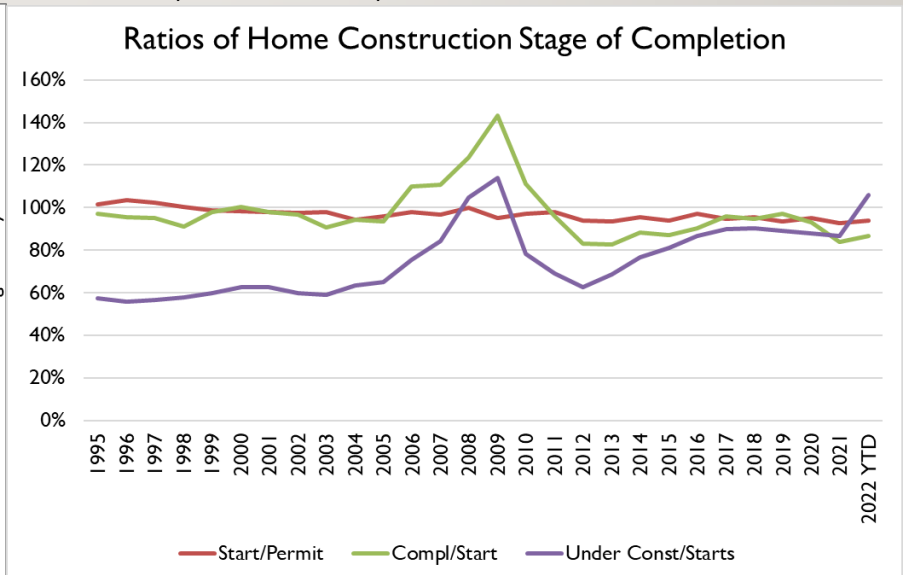
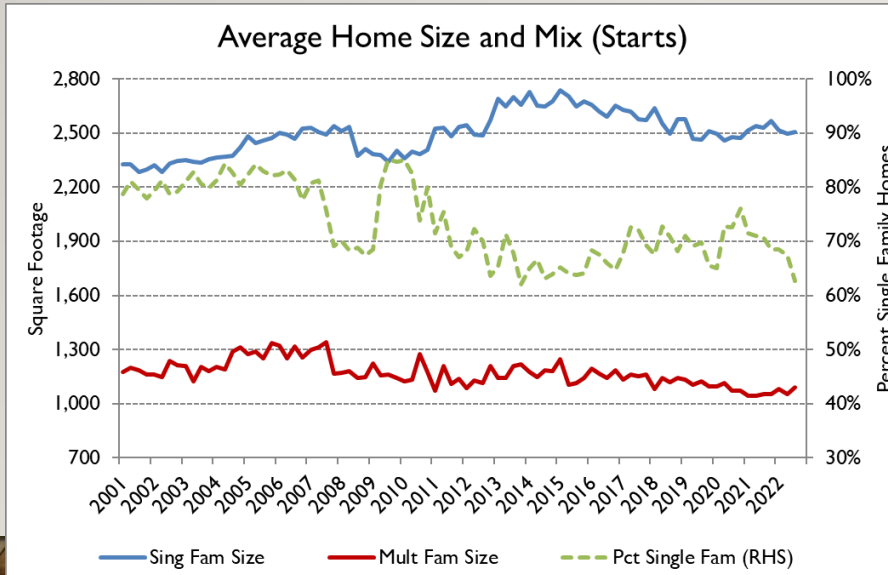


BEHIND THE NUMBERS: HOUSING STARTS

- 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 through the first three quarters of 2022 have trended smaller, averaging 2,506 sq. ft., off a modest -1.3% from 2021's average of 2,538 sq. ft. The YTD average size of Multi-Family Units started in 2022 averaged 1,075 sq. ft., up 2.5% from the 2021 average of 1,049. Single Family units made up 66% of Total Starts so far in 2022, 4 points lower than 2021 and 16 points below the pre-bust average of 82%.
- The average number of Permits fell along with Starts in 2022, with Starts averaging 94% of Permits. In the **bottom right chart**, you can see that the ratio of starts to permits has been declining over time, such that the old rule of thumb of ~97 Starts per 100 Permits should be reduced to 95 or lower. Also declining is the ratio of Completions to Starts (the green line), which has averaged 87% in 2022. As noted earlier, the run up in construction material prices, along with supply chain woes and backlogged inspections has delayed many completions in 2022. Thus, the number of homes under construction relative to starts have increased.

Data Source: U.S. Census Bureau

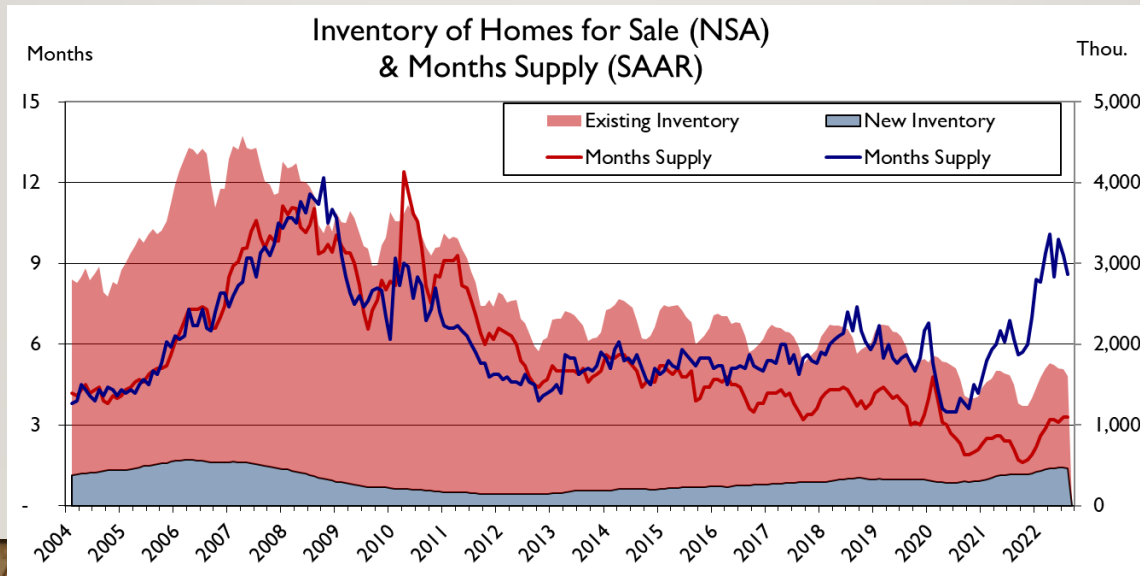
Charts & Analysis: Willsonn Advisory





PACE OF HOME SALES & INVENTORIES

- **Recent Trends:** The Inventory of Homes For Sale (Existing + New) cycled lower to 1.605 million units in November, up 334,000 units from December 2021, and up 7% (101k units) from November 2021. Separately, Existing Home Inventories are up 30k units, while New Home inventories are up 71k units, compared to November 2021. At their respective current pace of sales, there are a scant 3.3 months of sales in Existing Home inventories, and a bloated 10.2 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 nine or ten years today. Rising mortgage rate are an impediment to turnover of existing homes. New home inventories have surpassed the high end of the normal range as the lack of affordability has push 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 repair and remodel demand 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 tanked the housing sector. As expected, with rising mortgage rates, we are beginning to see Existing Home inventories and new home inventories rebuild. At a minimum, a slower pace of home price growth is expected, and possibly price declines in some markets.

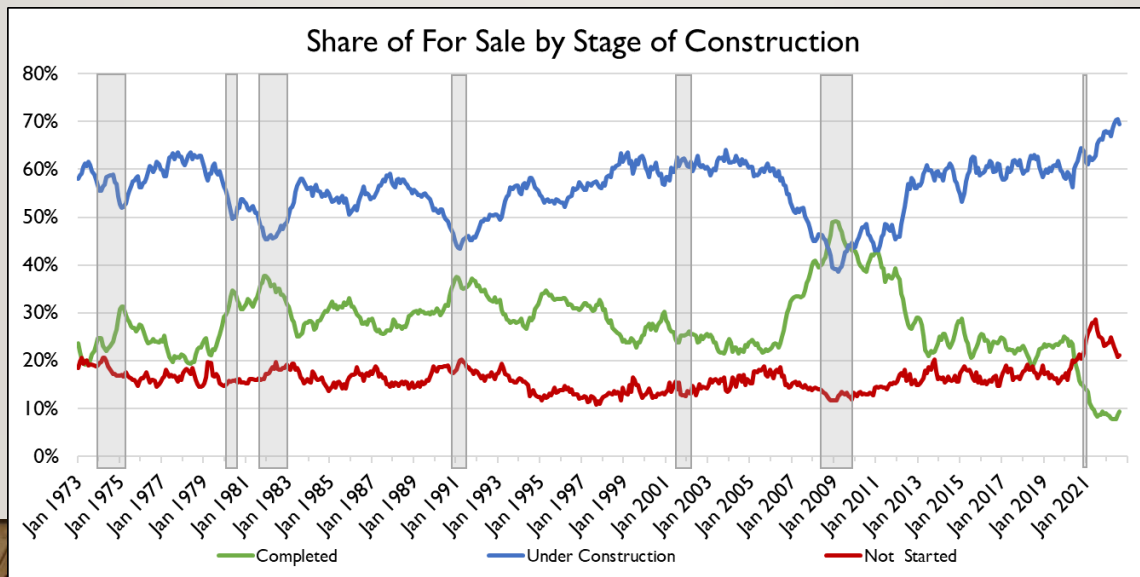


Data Source: U.S. Census Bureau, NAR

Charts & Analysis: WillSonn Advisory

BEHIND THE NUMBERS: PACE OF HOME SALES & INVENTORIES

- **On the prior page**, the 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 (as builders get stuck with more completed homes on hand). If we are soon entering a recession, it will certainly be atypical.
- Of the 465,000 New units for sale at the end of November 2022, only 9% were Completed (near the recent 47-year low), 69% were Under Construction, and 21% had Not Yet Started (down from its recent record of 29%).
- 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. High building product prices likely delayed construction as builders tried to pass off the risk of high material costs to buyers. At the same time, Completed homes got snatched up quickly.

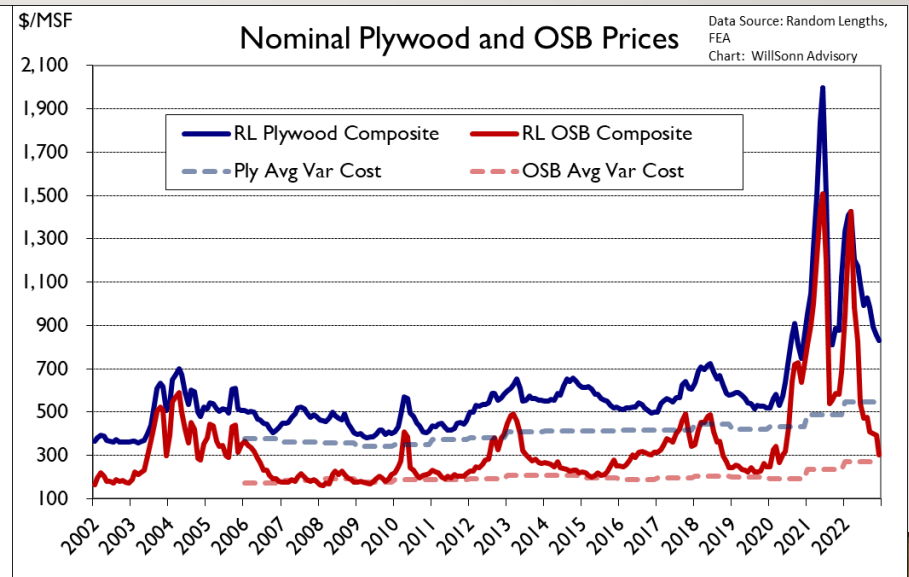
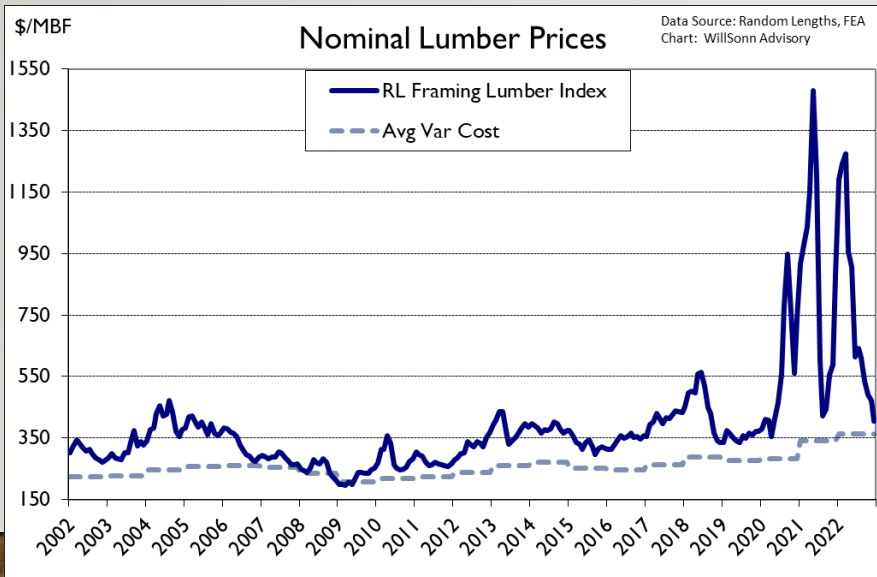


Data Source: U.S. Census Bureau, NAR
Charts & Analysis: WillSonn Advisory



WOOD PRODUCT PRICES

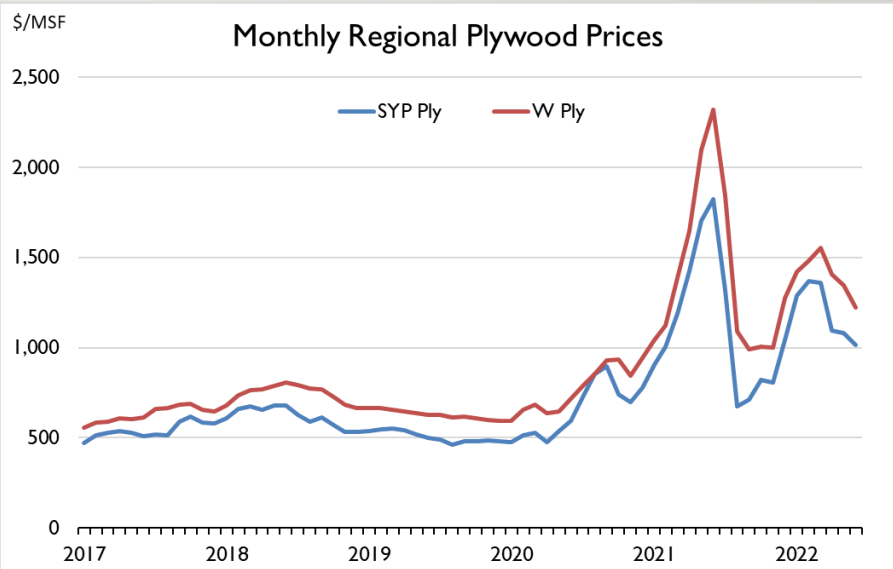
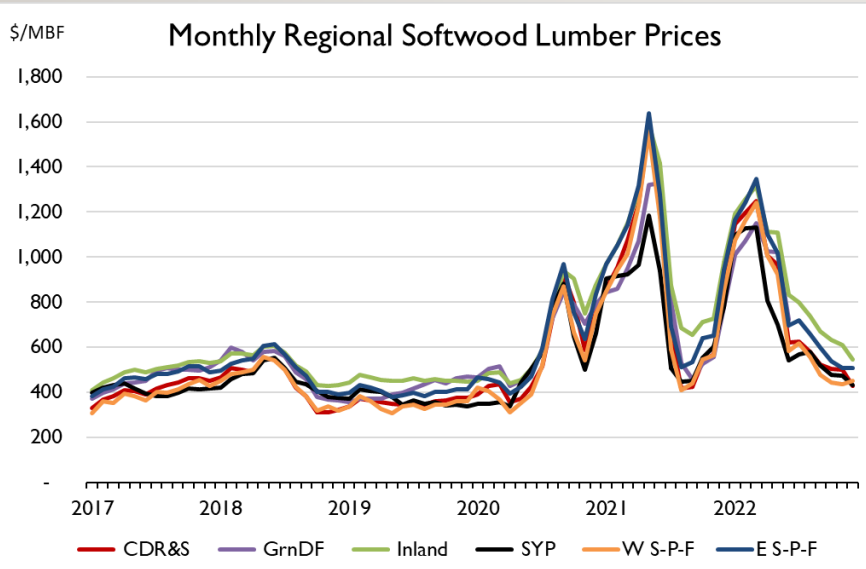
- Recent Trends:** The Random Length Framing Lumber Composite Index in Q4 2022 lost another -23% from Q3 to register -47% below Full Year 2021 prices. Panel prices reversed course as well. Plywood pricing was down another -14% in Q4 from Q3, -29% below FY 2021. OSB prices sank another -19% in Q4 below Q3 prices, down -60% from FY 2021 prices. Only softwood plywood remains at or above its historical peaks prior to the pandemic, and well above its variable cost curve.
- Explanation:** Extreme price volatility in building products have materialized as manufacturers, construction and transportation sectors have wrestled with periodic labor tightness, rising labor and volatile fuel costs, covid-related work absences and spot capacity closures for multiple quarters. As the nation navigated through new strains of the virus, changes in safety protocols, the “great resignation” and a desire to return to normalcy (including a return to the office), demand and supply for wood products has ebbed and flowed wildly.
- Implication:** As predicted, when building material prices became excessive, some buyers delayed, downsized or abandoned projects, reducing demand and thus price. Historically, high prices would spur additional mill shifts, a surge in imports and substitution from non-wood materials, each of which have been muted through the Covid-19 pandemic. Rising interest rates also had a ripple effect.
- Expectation:** As prices moderate and supply improves, builder and DIY demand should stabilize. It was hoped that vaccinations would also ease labor constraints, allowing for higher production and easing of transportation bottlenecks. But with multiple waves of covid variants, volatile fuel prices, elevated inflation and mortgage rates, and a depressed stock market, it’s hard to predict if volatility is behind us.





BEHIND THE NUMBERS: WOOD PRODUCT PRICES

- Once again, all regions shared in the pain of retreating product prices during the fourth quarter of 2022.
- Regionally in Q4 2022 relative to Q3 2022
 - West Coast lumber mills saw a -17% decline in Coastal Dry Random & Stud (“CDR&S”) prices but just a -4% decline in Green Douglas-fir prices. CDR&S is now -66% below its March 2022 peak, Green DF is off -61%.
 - Inland sawmills saw prices retreat -19%, now -59% below its March 2022 peak.
 - Southern Yellow Pine (“SYP”) sawmills saw prices sink -17% in Q4, now -48% below its more modest March 2022 peak.
 - Canadian components of the Random Lengths Framing Composite Index saw S-P-F prices lose -19% and -21% in the West and the East, respectively. Western SPF prices are off -64% in December, while Eastern SPF is off -62%, from their March 2022 peaks.
- Fourth quarter plywood prices were also lower in both regions, keeping pace with lumber and OSB. Southern Plywood prices were down -15% and Western Plywood was off -13% in the fourth quarter relative to the third. The South is off -45% from its February peak, while western plywood is off -37% from its March 2022 peak.

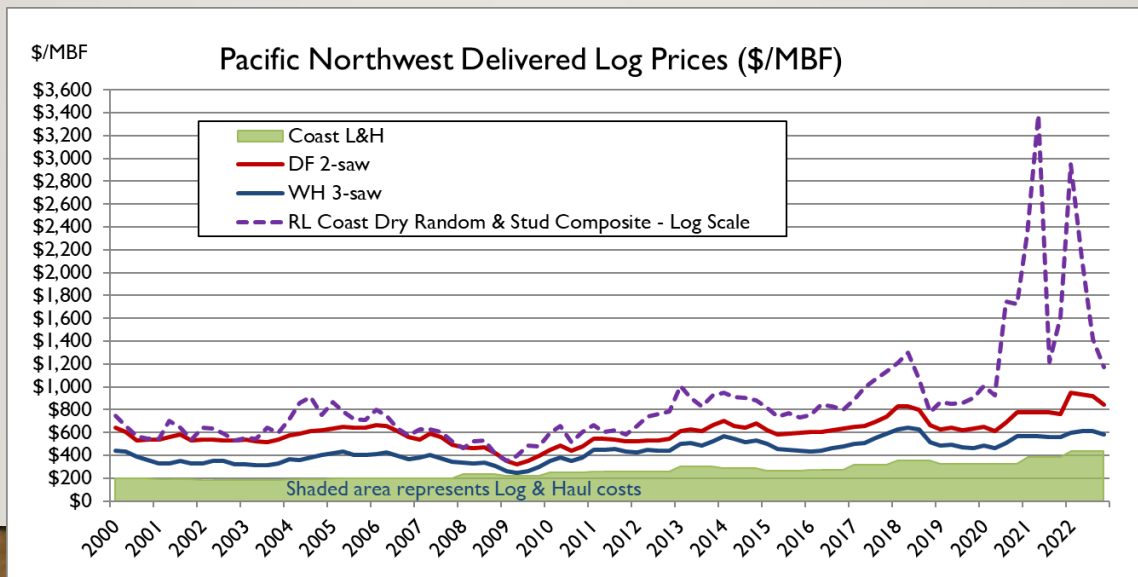




PNW LOG PRICES

- **Recent Trends:** Delivered log prices moved lower again in the fourth quarter with Douglas-fir 2saw prices off -8% (sitting 9% above 2021 levels) while western hemlock 3saw log prices were off -4% (4% above 2021 levels). Over the past 10 years, 4th quarter DF log prices have typically gained 2% while WH prices remained flat, so this quarter's movement underperformed.
- After adjustments for changes in lumber recovery, the Random Lengths Coast Dry Random & Stud Composite price (on a log scale) lost another \$239/MBF (17%) during the third quarter.
- **Explanation:** With demand outpacing production for much of the year, western mill log throughput was only modestly higher. Extensive fires throughout the West in 2020 and 2021 resulted in extensive salvage operations in 2021 and 2022. Robust lumber prices (at times) combined with constrained logging capacity continued to provide log sellers considerable pricing leverage in 2022.
- **Implication:** As a result, mills were forced to pay higher log prices in order to capture record lumber prices in 2022.
- **Expectation:** First quarter prices usually move higher, with DF 2saw gaining \$33/MBF and WH 3saw gaining \$17/MBF, over the past 10 years. Supply chains are improving. Log & Haul costs are expected to moderate in 2023 due to reduced salvage and lower diesel prices. With three quarters of moderating lumber prices behind us, continued weakness in home construction anticipated, and a relatively mild fire season in 2022, a retreat in western log price is expected.

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.



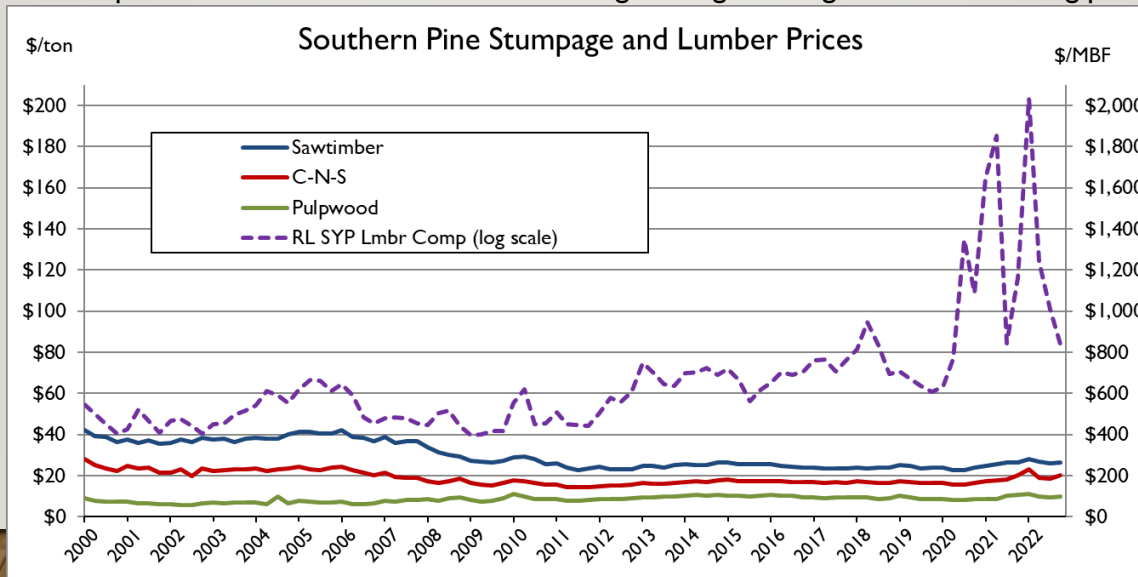
Data Source: Oregon DOF, WA DNR, Random Lengths, FEA, Log Lines

Charts & Analysis: WillSonn Advisory



SOUTHERN PINE LOG PRICES

- Recent Trends:** Third quarter Southern Yellow Pine stumpage prices moved higher in each grade, with the biggest movement again in Chip-n-Saw. SYP Sawtimber prices edged up \$0.41/ton in Q3 (+2%), Chip-n-saw stumpage prices gained \$1.91/ton (+10%) and pine pulpwood added \$0.25/ton (+3%). Relative to full year 2021, Q3 PST and PPW prices are up 4%, while CNS is up 10%.
- The Random Lengths SYP Lumber Composite, adjusted for lumber mill recovery, lost another \$173/MBF, or 17% in Q4 '22 compared to Q3 '22, now registering 40% below full year 2021's extraordinary prices (2021 was 44% above 2020 prices and more than double 2019).
- Explanation:** Q4 prices typically see prices move up \$0.20 to +\$0.50 per ton as wet Fall weather limits logging access, so 2022's Q4 upward movement was a bit better for all grades. Continued declines in lumber prices, falling lumber demand and still-high diesel prices worked against stumpage values. Despite record growth in lumber production, sawlogs remain plentiful in the US South.
- Implication:** Moving in tandem, Sawtimber to Pulpwood price ratios remained at 2.7:1 in Q4, on par with the 2.5:1 ratio of the last few years. With ratios below 4:1, landowners are less incented to grow sawtimber.
- Expectation:** Q1 prices typically see prices move up a quarter to three quarters of a dollar per ton as Winter weather limits logging access. Even though Q1 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



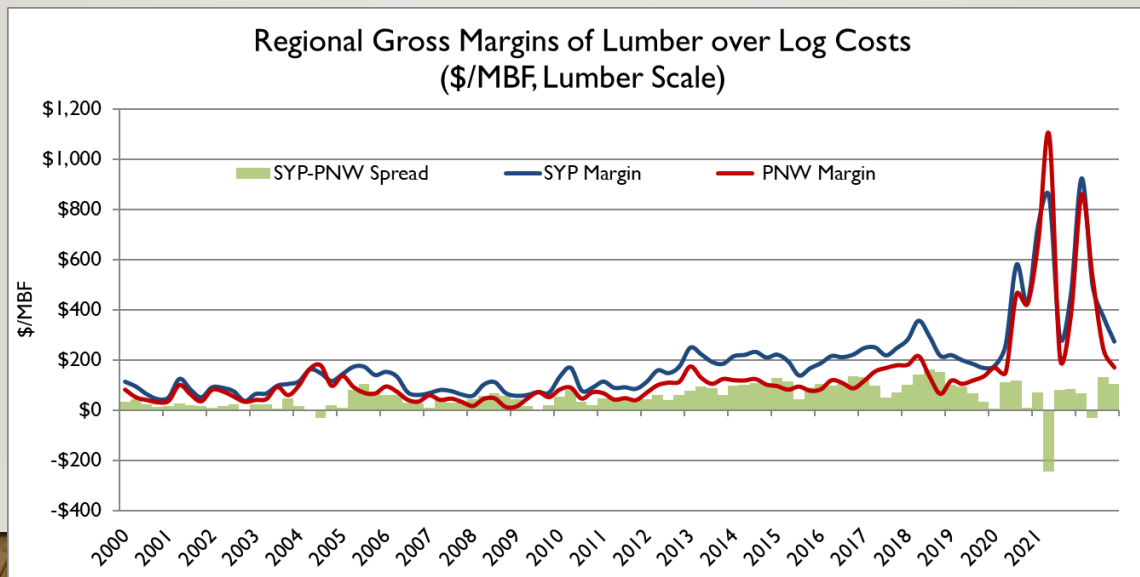
REGIONAL GROSS MARGINS

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 normal levels in Q4 at \$104/MBF in favor of the South, off slightly from \$128/MBF in Q3. The \$104/MBF spread compares to an average spread in 2020 of \$60/MBF enjoyed by southern mills. Margins in volatile 2021 were at parity (on average). Gross margins contracted again this quarter, from \$242/MBF to \$170/MBF in the PNW, and from \$371/MBF to \$273/MBF in the South. Over the past 10 years, Southern sawmills have enjoyed gross margins over \$200/MBF in 75% of the quarters, while PNW mill gross margins hit that mark only 25% 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 log prices, even as lumber prices improved. Both regions saw gross margins expand (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 to \$100/MBF range when lumber markets settle down, 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 lumber prices down.

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

Chart & Analysis: Willsonn Advisory



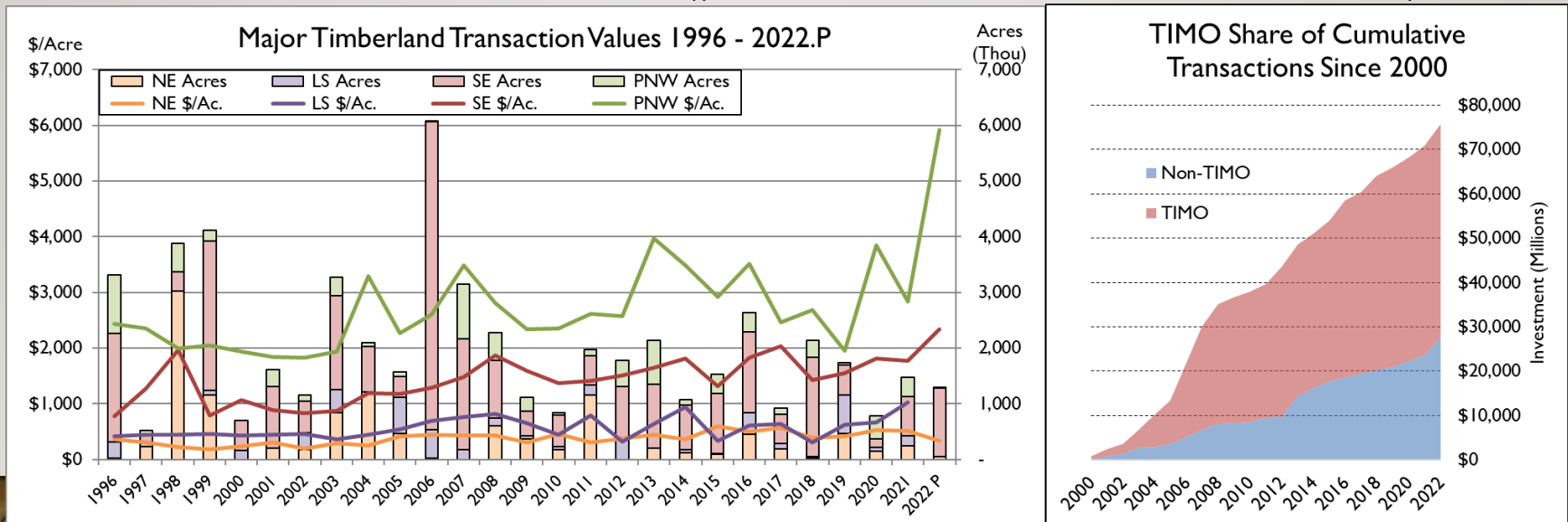
Assumptions: 67/33 weight of DF2saw and WH3saw in the PNW, and a 75/25 weight for S/T and CNS in the South (using 7.5 tons/MBF, along with FEA's estimates of Cut & Haul cost for S/T and CNS). All figures are lumber scale, and regional differences in lumber recovery factors are incorporated.



REGIONAL TIMBERLAND TRANSACTION VALUES

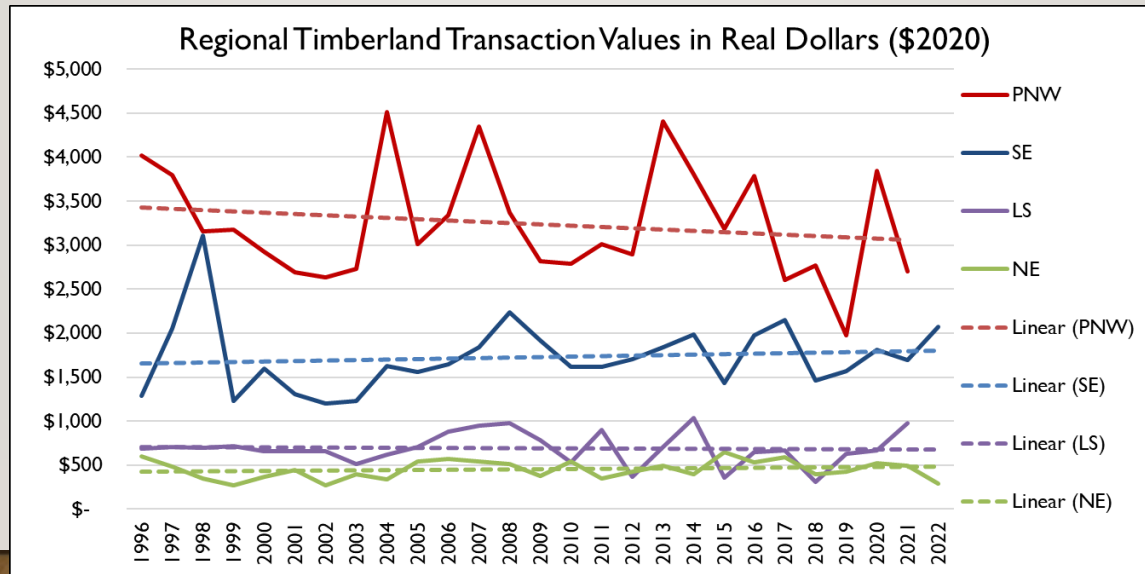
- **Recent Trends:** Timberland sales in 2022 have so far totaled \$4.8 billion on 3.1 million acres, with another +/- 310,000 acres sold at undisclosed values. In 2021, 1.5 million acres sold for a total of \$2.7 billion. Southern timberland values hit a new \$/acre value record (in nominal dollars) while transactions in Appalachia (not shown) totaled 1.8 million acres, its highest ever, outpacing all other regions.
- By investment sector, Timberland Investment Management Organizations (“TIMOs”) funded just 17% of the acquisitions in 2022, its second lowest share in 23 years. Since 2016, TIMO’s have funded 67% 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. Blue Source, a new entrant focused on carbon values, funded most of the Appalachia and NE transactions along with its co-investors.
- **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 more risky than holding government bonds, there must be some other value component forcing valuations higher, such as Carbon plays or higher price expectations.
- **Expectation:** REITs may continue to reinvest outsized profits in timberlands if prices rebound again, but that seems unlikely in the near-term as housing languishes. Longer-term, higher borrowing costs may be offset by buyers pricing in Carbon sales to support 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 lower (~\$350/acre) over the past 25 years, equivalent to a negative compound annual growth rate (“CAGR”) of -0.45%
 - 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.
 - The 2022 value shown on the previous page reflected just a single, small transaction, and was thus removed from this analysis.
- In the South, the real dollar trendline value has increased ~\$140/acre over the past 26 years, a positive CAGR of 0.32%
 - 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 lost ~\$30/acre (CAGR of -0.19%) while the value trend in the Northeast gained ~\$60/acre (a CAGR of 0.5%).
 - Both of these regions saw significant pulp mill contractions and modest gains in standing inventory, yet took a different trajectory.
 - Conservation easements have been prolific in the Lake States, a possible factor as encumbered lands are subsequently sold.





SECTION 2: DEEPER DIVE:

CARBON ACCOUNTING & REPORTING STANDARDS AND THE POTENTIAL CHANGES COMING

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 \(ghgprotocol.org\)](https://www.ghgprotocol.org/) revised and published in 2004.
 - [Corporate Value Chain \(Scope 3\) Standard | Greenhouse Gas Protocol \(ghgprotocol.org\)](https://www.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 \(ghgprotocol.org\)](https://www.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.

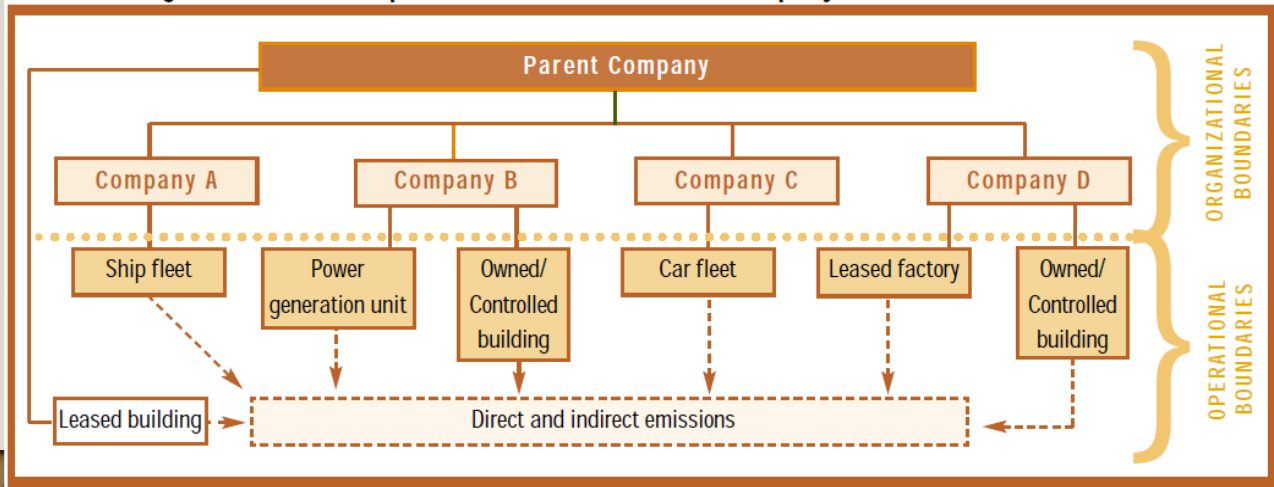
Principles

- **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

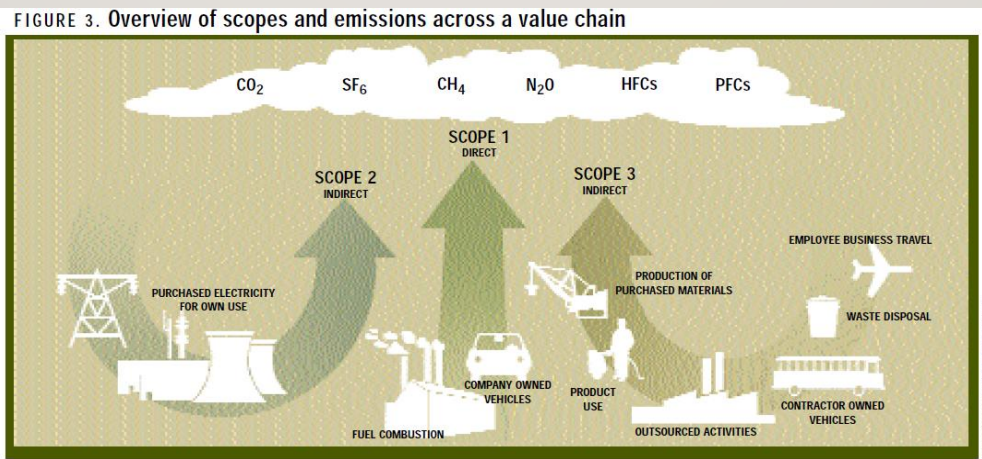
- The first step is to establish the company’s Organizational Boundary - there are two distinct approaches:
 - **Equity Share:** Under the equity share approach, a company accounts for the GHG emissions from operations according to its share of equity in the operation. This method is consistent with 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 p28 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.

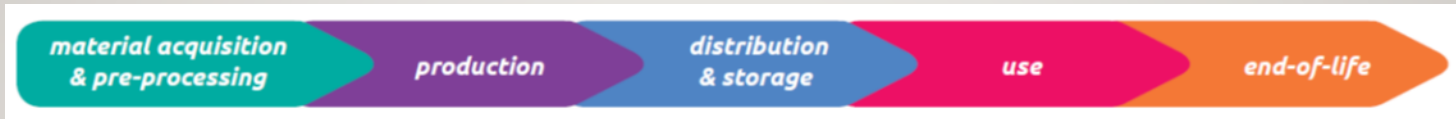


OTHER GUIDANCE IN THE CORPORATE STANDARD

- 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...

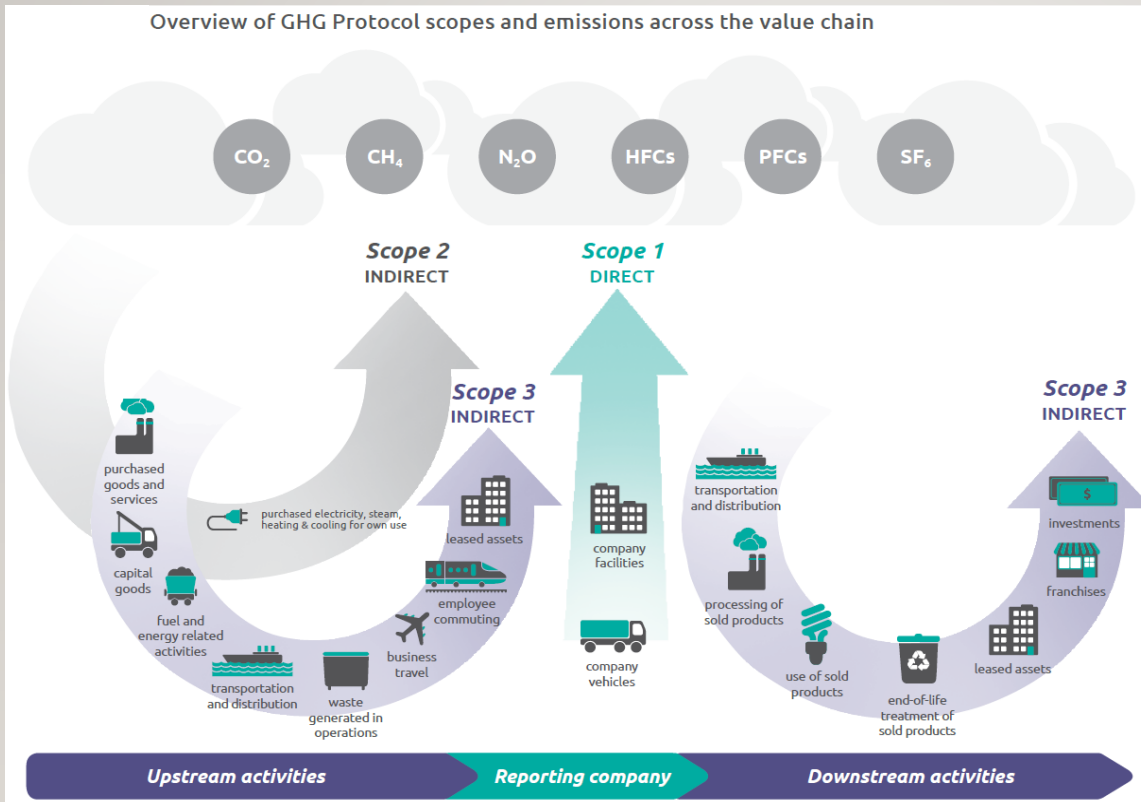
SCOPE 3 STANDARD

- 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 29.
- 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

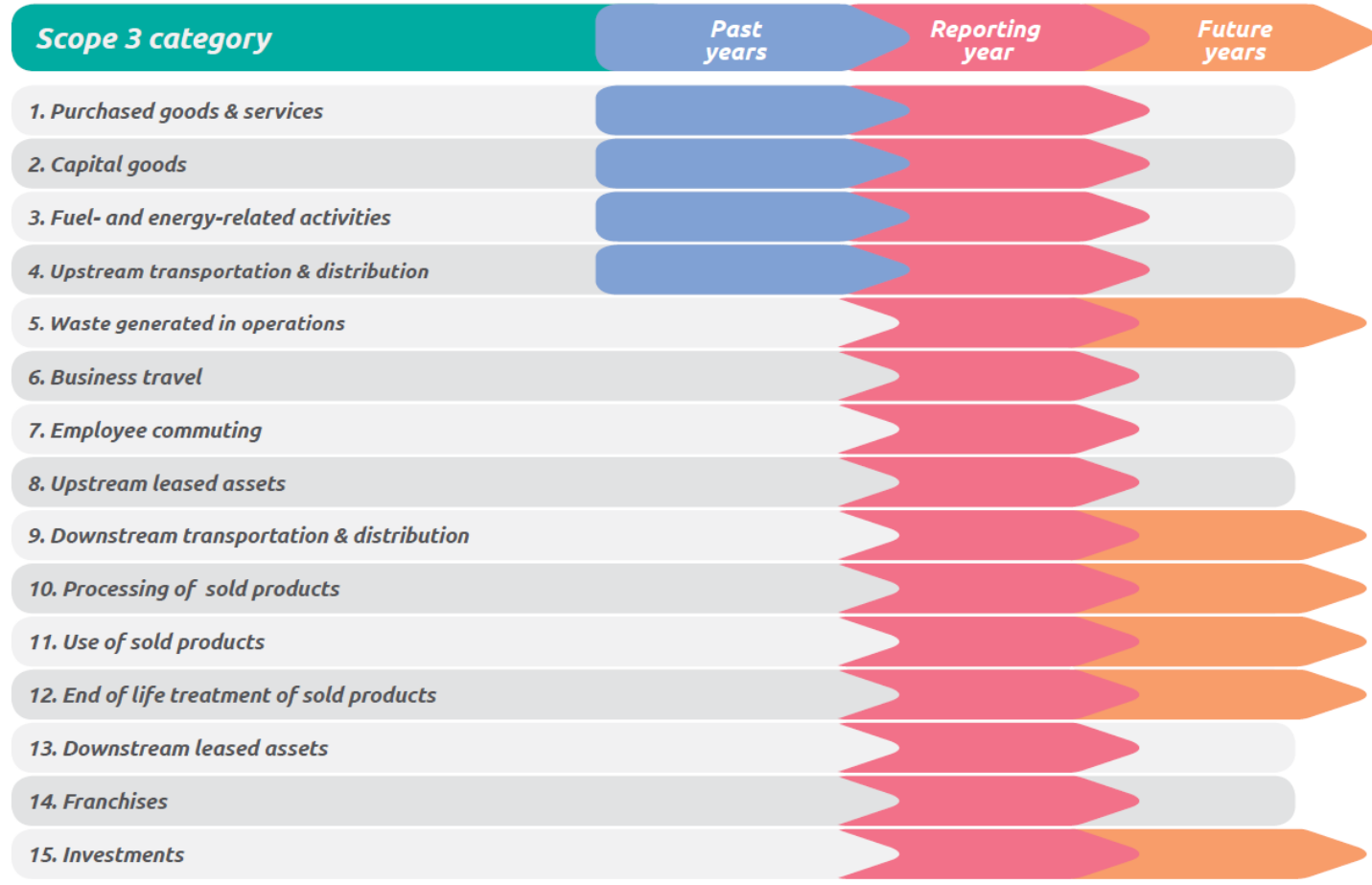


Scope 3 category

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

Time boundary of 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 CO₂ emissions (e.g., CO₂ 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 CO₂ 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 CO₂ 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 CO₂ removals from biological carbon sequestration that occurs in trees in scope 3, but instead may report CO₂ removals separately.** The company also does not account for downstream biogenic CO₂ 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.
 - Totalling 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 required principles, **Conservativeness** and **Permanence**, and another recommended 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 (CO₂e), 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 CO₂ emissions from the carbon in biogenic products as:
 - scope 1 *Land management net CO₂ 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 CO₂ 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 CO₂ 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: <ol style="list-style-type: none"> 1) the removal value, 2) the uncertainty range for the removal estimate based on a specified confidence level, and 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 <ul style="list-style-type: none"> • Net CO₂ emissions, if carbon pools are part of the GHG inventory boundary in the reporting year, or • Reversals, if carbon pools are no longer in the GHG inventory boundary in the reporting year. 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 CO₂, companies must also account for methane (CH₄) and nitrous oxide (N₂O) emissions.
- In addition to direct land use changes, reporting companies must also account for indirect 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

		Post-Conversion Land Use Category					
		Forest Land	Grassland	Cropland	Wetland	Settlement	Other Land
Pre-Conversion Land Use Category	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

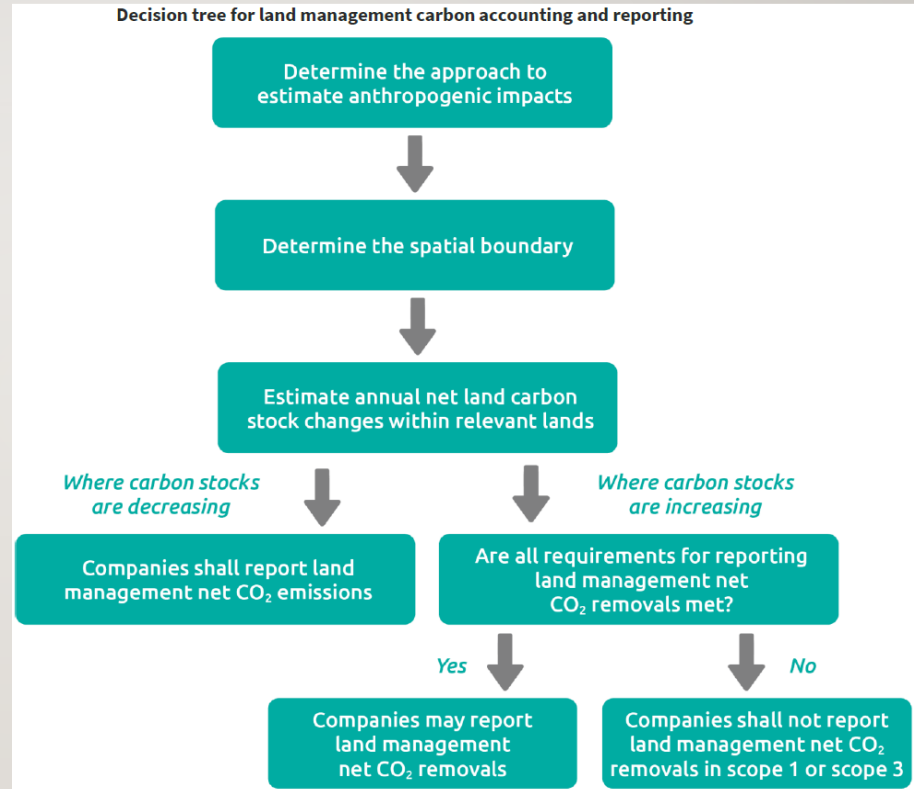
Forest Subcategories	Natural Forest	Planted Forest	Grassland & Wetland Subcategories	Natural Ecosystem	Intensively Managed Land
	Natural Forest	NF > NF		NF > PF	Natural Ecosystem
Planted Forest	PF > NF	PF > PF	Intensively Managed Land	IML > NE	IML > IML

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 stored is 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 CO₂ emissions and removals (if applicable) using one of the following two approaches:

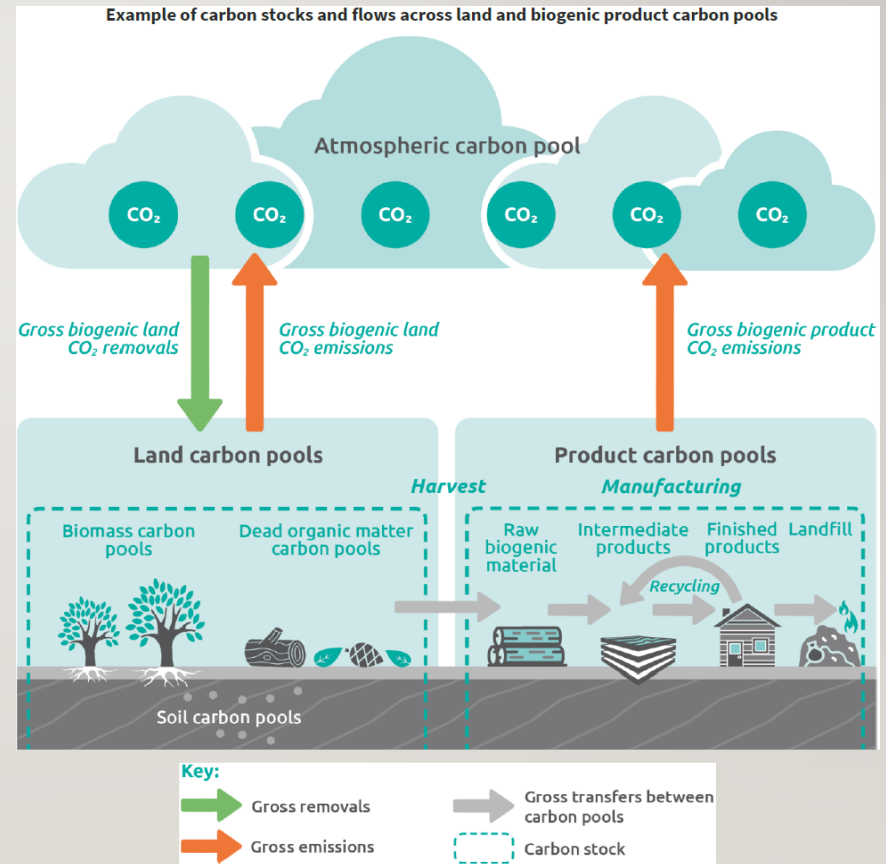
- Classify all land as managed land:** Assume all land carbon stock changes are anthropogenic and apply the managed land proxy to all lands
- Develop and consistently apply an approach to classify lands as managed or unmanaged:** Develop and consistently apply criteria to distinguish between managed 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 25) 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 effect 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 CO₂ 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 a 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, which enforces 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 13 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.

CLOSING THOUGHTS

- In general, I don't believe that reporting companies should be able to claim carbon removals or carbon storage in assets they neither own nor control (upstream timberlands, downstream wood products).
 - While the concept of allowing companies to report scope 3 removals and product storage may indeed motivate some reporting companies to source products from upstream suppliers who emit less and/or remove more carbon, or sell products to customers who waste/emit less, even the GHG Protocols admit that they make little attempt to account for leakage (as competitors and other suppliers and customers fill the market voids they create).
 - This myopic view could render the exercise nothing more than green washing.
 - The real purpose behind Carbon Reporting is to shed a light on the climate impact of corporate operations and to provide an incentive for companies to reduce emissions. Instead, it appears to have devolved into an exercise of creative accounting and taking credit for someone else's actions.
 - Timber owning companies should be proud that their assets and sound timberland management are playing a significant role in reducing and storing atmospheric GHG's. That should be enough.
- While WRI appears to be an independent, science-based organization, the influence of WBCSD on the development of the guidelines is quite apparent.
 - The objective, "simplify and reduce the cost of compiling a GHG inventory" corrodes the more meaningful objectives.
 - Involving a wide array of emission-heavy companies and financial investors in the development of GHG Protocols presents a profound perception risk that the guidelines have been compromised with an outsized emphasis on lowering costs and to make it easier for companies to minimize reported emissions and/or inflate removals. [Members - World Business Council for Sustainable Development \(WBCSD\)](#)
- Allowing investors to claim scope 3 removals will only lead to more redundancy in reporting removals.
 - The term "double counting" is an understatement, as scope 3 removals may be fully duplicated at each level of the supply chain.
 - One has to wonder how far companies will be willing to go in order to claim scope 3 removals on their carbon balance sheets. Will it lead to financial investors acquiring TIMOs so they can "control" timberlands? Will it lead to hedge funds claiming removals as they provide the funding for carbon project developers to acquire timberlands and implement so-called Improved Forest Management carbon offset programs?

OPEN QUESTIONS POSED BY WRI/WBCSD: QUESTION #1

- **Context:** The draft Guidance is based on a stock-change accounting approach for biogenic carbon and technologically removed CO₂, where net CO₂ emissions and net CO₂ removals (based on stock-change accounting) are included in the scopes, while gross CO₂ emissions and gross CO₂ removals (based on flow accounting) are separately reported (and required to be reported where noted). For biogenic products, the stock-change accounting approach for biogenic value chains used in this Guidance accounts for gross CO₂ emissions from the carbon in biogenic products as (a) scope 1 land management net CO₂ emissions or removals by land management companies, through a reduction in the land carbon stock due to harvest (when carbon is transferred from land carbon pools into product carbon pools), and (b) scope 3 (upstream) land management net CO₂ emissions or removals by consumers of biogenic products, through a reduction in the land carbon stock on sourcing lands due to harvest. As an alternative approach, flow-based accounting would report biogenic carbon flows (emissions and removals) at the point when they are transferred to or from the atmosphere, as is the approach used in nonland sectors. A flow-based approach puts an emphasis on the entities that own or control the sources and sinks that transfer CO₂ to and from the atmosphere.
- **Question:** How should biogenic CO₂ emissions and removals be reported?
 - Option 1. Current approach (stock-change accounting in scopes, flow-based accounting outside scopes): Companies shall account for net biogenic emissions and removals in the scopes through stock-change accounting of annual net land carbon stock changes (including all attributable managed lands within the value chain), with separate reporting of gross biogenic CO₂ emissions and removals (at the source and sink where they occur) using flow-based accounting.
 - Option 2. Scope 1 if not scope 3: Under this approach, companies have two options: companies shall either follow the current approach (stated above), or, if companies do not have data available to account for annual net land carbon stock changes within scope 3 associated with biogenic products they purchase or consume, then companies shall report direct gross biogenic product CO₂ emissions as scope 1 emissions and indirect gross biogenic product CO₂ emissions as scope 2 or scope 3 emissions.
 - Option 3. Dual reporting: Companies shall separately account for and report both of the following types of information in the scopes:
 - Net land management emissions and removals based on annual net land carbon stock changes (using stock-change accounting) in scope 1, scope 2 or scope 3 as relevant, and All gross emissions and removals including gross biogenic land CO₂ removals, gross biogenic land CO₂ emissions, and gross biogenic product CO₂ emissions (using flow-based accounting) in scope 1, scope 2, or scope 3 as relevant.
 - Option 4. Other option?
- **My Response:** *For land sector and removal accounting, stock-change accounting makes the most sense, and is less theoretical, for reporting in scope 1. All emissions and removals are accounted for by comparing beginning and ending inventory levels. Scope 2 and 3 reporting should not be permitted. Emissions and removals should be reported for the sources and sinks where they occur (trees, soil, down and dead material). Furthermore, removals and emissions should only be reported for anthropogenic removals and emissions - what would have occurred naturally doesn't count since it isn't a consequence of management. This reflects the concept of additionality (a core tenet of carbon offset trading). GHG accounting is supposed to be used to effect changes in behavior (management, sourcing, selling) that aid in reducing GHG.*

OPEN QUESTIONS POSED BY WRI/WBCSD: QUESTION #2

- **Context:** As explained in chapters 4 and 6, the draft Guidance is based on a stock-change accounting approach, applied through a storage monitoring framework to implement the permanence principle for all carbon pools (land carbon pools, geologic carbon pools, and biogenic and TCDR-based product carbon pools). Under this approach, net emissions and net removals (based on stock-change accounting and subject to meeting the requirements for reporting removals) are included in the scopes. Alternatively, companies may use storage discounting frameworks (e.g., dynamic methods such as tonne-year methods) which quantify the radiative forcing impact of delaying CO₂ emissions until the end of storage period and report them under a separate reporting category “temporary product carbon storage” outside the scopes.
- **Question:** Should net product carbon stock changes, accounted for using a storage monitoring framework, be reported in scope 3 or outside the scopes in a separate reporting category? In this case, net increases in product carbon stocks are reported as removals with biogenic or TCDR-based product storage, and net decreases in product carbon stocks are reported as net CO₂ emissions from biogenic or TCDR-based product storage.
- **My Response:** *Carbon stock changes on land not owned by the reporting company should be reported outside scope 3. It is impractical that sufficient knowledge (to allow monitoring and traceability, using primary data, and uncertainty assessments) of the upstream and downstream emissions and removals will ever exist (even assuming the idealistic clearing house concept) that will make reliable land sector data available to all parties (from sawmills, builders, paper mills, packaging producers, consumer-goods manufacturers, building product distribution yards, to homeowners and consumers, and eventually, landfill operators). As a result, reporting companies (from any sector) should not be allowed to include scope 3 land sector removals and storage. In my view, if you don't own it, you can't claim to store or remove GHG associated with it.*
- **Question:** Should removals with product storage, accounted for using a storage discounting framework, be reported outside the scopes in a separate reporting category (as temporary product carbon storage)? Or should other metrics be used to report on product storage and longevity?
- **My Response:** *Removals with product storage (where the reporting company no longer owns the product, and has lost its ability to trace and monitor the product in use or in landfills, i.e., primary data) should also be reported outside of scopes 1,2,3. Generalized sourcing area, regional or national data is fine for informational purposes, educating the public, good public relations, promoting the product, etc., but is ineffectual for causing changes in behavior of the reporting company, because it is simply too generalized. Simply changing suppliers or customers will have no effect on GHG emissions, due to leakage. Assuming that buyers and sellers are using the most efficient suppliers and selling to the most efficient distributors, disruption to normal supply chains may result in greater emissions, not fewer, all to peg a notch on theoretical GHG benefits. Seems like chasing one's tail. Secondly, a "storage discounting framework" suggests tonne-year accounting, which has been rejected by Verra as an acceptable framework for issuing credits. If it isn't good enough to be adopted as a voluntary credit protocol (a painfully low bar, unfortunately), then it should not be adopted by WRI for GHG accounting.*



OPEN QUESTIONS POSED BY WRI/WBCSD: QUESTION #3

- **Question:** Given the barriers to traceability in agriculture and forestry value chains, what level of physical traceability is appropriate to account for Land management net CO₂ removals?
 - Land management unit or more precise traceability: Companies shall account for and report scope 3 Land management net CO₂ removals only if they have physical traceability to the land management unit(s) where the carbon is stored. Net carbon stock changes can be accounted for at the land management unit-level or harvested area-level based on the physical traceability of products to relevant spatial scales.
 - Sourcing region with safeguards: Companies shall account for and report scope 3 Land management net CO₂ removals where they have physical traceability to either of the following: (a) Land management unit(s) where the carbon is stored. With such traceability net carbon stock changes can be accounted for at the land management unit-level or harvested area-level based on the physical traceability of products to relevant spatial scales, or (b) First point of collection or processing facility. With such traceability net carbon stock changes can be accounted for at the sourcing region-level subject to appropriate safeguards (i.e., attributable working lands, capturing heterogeneity, conservative assumptions, consistent allocation, avoiding double counting and reversal accounting).
- **My Response:** *This is an easy choice; Option 1: Land management unit or more precise traceability is preferable. As you pointed out (box 8.2, page 145), allowing sourcing region-level reporting carries many risks (including gaming) and is less likely to illicit change in behavior. If sourcing region is allowed, reporting companies will fail to meet the criteria (tracing and monitoring, primary data, account for uncertainty and reversals) of chapter 6 for reporting removals (section 6.2 on page 85). The two "safeguard" options listed are interesting. The first option (LMUs) just sounds like option 1. The second option "first point of collection" is more like a sourcing region, but requires the mill or the grain elevator to keep track (in perpetuity) of all sources of its goods at the FMU level. I guess this is okay, so long as the "first point of collection" data is audited by an independent third-party, to avoid number fudging. Frankly, I find this impractical and unlikely to occur, as it would create an increasingly complex accounting ledger. And what would happen if the mill shuts down or the grain elevator is destroyed? Who takes over monitoring? If it is abandoned, are all users of the data then required to report reversals (no ongoing data, then it would seem so), by no fault of their own.*

And then there is the issue of more than one point of collection. It is not uncommon for there to be more than a single mill in a wood basket (competing sawmills, complimentary but separately owned sawmill and pulp mill), etc.). Who polices which point of collection gets to claim which removals? And what happens if a new mill is built (as is occurring throughout the US South)? Does the pre-existing mill (and all of its customers that are relying on its removal data) then have to share its removals with the new mill and its customers? Will the pre-existing mill have to issue reversals? Issues and potential problems are unlimited.

I think WRI should stick to existing Accounting and Reporting standards and disallow scope 3 removals.

Note: page, section and box references in my response are to the source document, not this Deeper Dive.



SECTION 3:

IN CASE YOU MISSED IT



DISCUSSION EXCERPTS FROM THE DRAFT LS&R GUIDELINES

- The draft Land Sector and Removals Guidelines included some thoughtful discussions presented in blue boxes throughout the document, with the purpose of providing some background and justification for their proposed guidelines.
 - As a byproduct, the discussions tend to highlight the complexity of accounting and reporting emissions and removals.
 - They also do a decent job of presenting different sides to the debates surrounding each of the discussion topics.
- In this quarter’s “In Case You Missed It,” I decided to cut-and-paste a few of the discussion boxes, for your consideration.
 - You will see some highlighting, which I overlayed on the boxes. I hope you don’t find them too distracting.
 - Some of the discussion points relate back to points I’ve made in Deeper Dives in this and prior Market Trends, such as issues surrounding tonne-year accounting.
 - I hope you find this additional material helpful in forming your own perspectives on the efficacy of carbon emission and removal accounting and reporting related to the timber and wood products industry.

CLIMATE IMPACTS OF REMOVING AND STORING CARBON (CH 6, P 90)

Overview and need for storage monitoring framework

The human-induced increase in global average temperature is caused by cumulative greenhouse gas emissions in the atmosphere. Once CO₂ is emitted to the atmosphere, a proportion of the emission leaves the atmosphere through natural processes such as plant growth or absorption by the oceans. However, a proportion stays in the atmosphere for millennia. The resulting accumulation of greenhouse gases causes long-term warming.

Cumulative CO₂ emissions, and therefore long-term temperature change, is largely independent of when emissions occur. Whether an emission happens now or in 500 years' time, it will contribute the same amount to cumulative emissions and long-term warming. This fact underpins the idea of a global 'carbon budget', that there is a fixed amount of carbon or 'budget' that can be emitted before a given temperature change limit is exceeded (such as the 1.5°C and well below 2°C targets of the Paris Agreement).

The fact that CO₂ can persist in the atmosphere for thousands of years, and that long-term temperature change is caused by cumulative CO₂ emissions, has important implications for understanding the relevant timescales for the storage of CO₂ removed from the atmosphere.

If the removed carbon is stored in non-atmospheric carbon pools for less than millennial timescales (e.g., 100 years) and there are no additional CO₂ removals to maintain the net carbon stocks in that pool, it will not contribute to lowering cumulative CO₂ emissions. 1 t CO₂ removal + 1 t CO₂ release of stored carbon = 0 t CO₂ contribution to lowering cumulative emissions.

A storage monitoring framework, which ensures ongoing monitoring of stored carbon and reporting of emissions or reversals where carbon losses occur, can accurately reflect the impact of CO₂ removals on cumulative CO₂ emissions and thus long-term temperature change.

CLIMATE IMPACTS OF REMOVING AND STORING CARBON (CONTINUED)

Dynamic carbon accounting methods and temporary carbon storage

Dynamic carbon accounting methods aim to measure the climate impact of removing CO₂ from the atmosphere and temporarily storing carbon, or delaying the emission of CO₂, by estimating the impacts to atmospheric radiative forcing within a selected time horizon.

A 100-year time horizon is generally used to calculate global warming potential (GWP) values that compare non-CO₂ GHG emissions to CO₂ emissions in terms of CO₂ equivalent. This same time horizon is sometimes applied to dynamic carbon accounting methods to justify that after 100 years, emissions of stored carbon associated with removals no longer need to be accounted for. However, if a GHG inventory is to accurately represent an entity's contribution to cumulative CO₂ emissions and long-term temperature change, then all CO₂ emissions and removals must be counted equally, regardless of when they occur. For example, if a removal is reported in 2025 but the subsequent emissions are discounted or omitted because they occur in 2125, the accounts will understate the reporting entity's contribution to cumulative CO₂ emissions. When calculating GWP values, the use of a selected time horizon is necessary to compare the radiative forcing effects of non-CO₂ gases to CO₂. However, to quantify the effect of CO₂ emissions and removals on cumulative CO₂ emissions, it would be inaccurate to apply a limited time horizon or discount CO₂ emissions or removals based on when they occur.

Temporarily storing removed CO₂ still has important benefits as it delays the accumulation of emissions in the atmosphere. It can also reduce the rate of warming that occurs, and cumulative radiative forcing, which is important for limiting impacts such as sea level rise.⁴¹ This 'buys time' for the development and deployment of other climate change mitigation options, including options for permanent storage. It also gives more time for society and natural ecosystems to adapt to climate change, because both the absolute temperature increase and the speed of change matter. It is therefore important that GHG inventories provide information on the timing of removals and subsequent emissions, which can be achieved through a storage monitoring framework of annual net carbon stock changes through an annual GHG inventory.

THE IMPORTANCE OF REDUCING GLOBAL LAND DEMAND FOR ACHIEVING CLIMATE AND ECOSYSTEM PRODUCTION/RESTORATION GOALS (CH 7, P 116)

As the global population grows, and consumption patterns change, demand for food and other land-based products increases—and is projected to continue rising in coming decades.⁵³ Researchers have noted that increases in demand for land-based products and adequate protection and restoration of natural ecosystems (for climate, biodiversity, or other goals) can only occur in tandem if productivity of land (i.e., yields) outpaces demand growth.⁵⁴ These studies advocate “land sparing” where agricultural yields are increased to conserve remaining natural ecosystems and free up some lands for ecosystem restoration.

An alternative perspective seeks to maximize carbon stocks and biodiversity, rather than yields, on farms and other productive lands—so-called “land sharing”.⁵⁵ High-yield farming critics state that merely boosting productivity does not in itself lead to ecosystem protection, and that efficiency gains can create a “rebound effect” (Jevons paradox) in which increased profitability of farming leads to more land clearing and carbon losses.⁵⁶ In addition, intensive, high-yielding production practices can involve excessive use of fertilizer, other chemical inputs, and irrigation—and potentially degrade soil and water resources and undermine long-term productivity and resilience.⁵⁷ However, lower-yielding production systems could increase overall land requirements, creating additional pressure on natural ecosystems, limiting potential for ecosystem protection and restoration, and potentially accelerating ecosystem conversion and related GHG emissions.

Observations from multiple continents—along with modelling studies—suggest that combining high-yield agriculture with ecosystem protection has the highest potential for maximizing land-based carbon stocks while meeting future demand for land-based products.⁵⁸ Negative environmental impacts must be minimized by improving soil and water management, avoiding fertilizer overuse, reducing livestock and energy emissions, and/or implementing strategies to reduce demand.⁵⁹ In addition, both “technological” and “agroecological” approaches have potential to increase productivity while building resilience to climate change.⁶⁰

Finally, while GHG emissions, ecosystem conversion, and land use/productivity are important indicators to measure the environmental sustainability of production of land-based products, other important impact areas include freshwater, soil health, air quality, biodiversity, and ocean health. Companies should seek to monitor and minimize trade-offs among these impact areas to ensure that progress in one area does not undermine progress in another. To help facilitate management across multiple impact areas, the Science Based Targets Network is developing corporate targets and accounting approaches for these other natural systems.⁶¹

CHALLENGES IN SEPARATING OUT ANTHROPOGENIC EMISSIONS AND REMOVALS ON THE LAND (CH 8, P 136)

There have been long-running discussions on the separation of natural and anthropogenic emissions in national greenhouse gas inventories.⁸⁴ These typically focus on 1) definitions of natural and anthropogenic events, and 2) methods for separating these effects.

Defining natural and anthropogenic events

The results of these discussions culminated in the interannual variability guidance for the managed land proxy in revised IPCC national GHG inventory guidance.⁸⁵ The intention with these guidelines is to separate the human-induced from natural effects by disaggregating the impacts of natural disturbances on carbon stock changes from the total carbon stock changes on managed lands. For the purposes of this Guidance, natural disturbances are defined as those that are not the direct result of management actions taken by the company, land managers or other actors in their value chain and that are beyond the control of, and not materially influenced by a company, land management practices or other human interventions in their value chain.

Methods for separating natural and anthropogenic impacts

Key methodological challenges for attempting to separate out anthropogenic from natural impacts on the land (e.g., reference level accounting) include:

- Natural disturbances lead to a relatively rapid loss of carbon stocks, which is then followed by a slower re-accumulation of carbon as the land recovers.
- Using a plot-based stock-difference method to estimate carbon stock changes using periodic measurements (i.e., multi-year sampling) cannot separate out what factors (i.e., anthropogenic vs. natural) influence land carbon stock changes.
- Legacy effects of carbon stocks based on past management or natural disturbances can influence the potential for emissions or removals (i.e., lands with historically low carbon stocks during a base period have more potential for removals).

CONSIDERATIONS OF SPATIAL SCALE WHEN ACCOUNTING FOR SCOPE 3 LAND MANAGEMENT NET CO₂ EMISSIONS AND REMOVALS RELATED TO FOREST PRODUCTS (CH 8, P 144)

Typically, the spatial scale selected to account for emissions and removals aims to capture the effects of a certain management regime. In the case of forest products there is considerable debate regarding the most appropriate spatial scale of analysis.⁸⁷ For some forest managers, management decisions are often made based on forest management plans specific to individual forest management units (FMUs) and the forest stands within those FMUs. However, at broader spatial scales that include small private forest owners, such as at the level of a sourcing region or jurisdiction, individual forest management decisions may be impacted by broader factors, such as economic factors that can influence a forest owner's decisions to harvest.

Accounting for forest carbon stock changes at a sourcing region-level or jurisdictional-level poses a risk of including forest lands that are not attributable to the forest products coming from that region. For example, if conservation land (which will never be harvested) is included within the spatial boundary of a jurisdiction, then wood products from that jurisdiction would be associated with removals from forest lands that are not attributable to the company's supply chain. Additionally, allowing a company to use a broad spatial scale, such as a sourcing region, to account for removals, may disincentivize companies from improving their traceability over time.

There are also drawbacks to using a FMU or forest stand spatial scale to account for *Land management net CO₂ emissions and removals* associated with forest products. Building information sharing systems to ensure physical traceability of all forest products to individual FMUs or forest stands can be difficult for downstream forest product consumers in many supply chains. Even where such traceability exists as companies purchase additional forest products, new forest lands would continually need to be added to an inventory boundary over time as wood is harvested from new FMUs or stands.⁸⁸

CONSIDERATIONS OF SPATIAL SCALE... (CONTINUED)

While accounting at a FMU-level may be more reflective of some forest managers' decision-making, it raises issues surrounding the causality between a company's decision to purchase wood and the removals attributed to that wood. For example, consider two FMUs that are both managed to increase forest carbon stocks but one FMU is larger in size and managed by a large forest management company while the other is smaller and managed by a small private forest owner. If accounting at a FMU-level, a company that purchases 10 tons of wood from the small FMU will have less removals associated with the wood it purchases than a purchase of 10 tons of wood from the larger FMU (as the larger FMU has a larger area thus more forest growth and greater net carbon stock increases), even though the activity of purchasing 10 tons of wood is the same. Additionally, if removals accounted for at a FMU-level are attributed to harvested wood products, and companies purchasing those products claim those removals, then companies would be incentivized to buy more wood and would receive a climate benefit for doing so as opposed to sourcing recycled wood fiber with no associated CO₂ removals. Thus, the incentive to recycle would be reduced.

Taken together, there are **multiple causality issues** with attributing the growth of unharvested trees to harvested wood products because, at scale, incentivizing companies to buy more wood products will contribute to land use change to meet human demand for land-based products. In general, using a smaller spatial scale (e.g., FMU instead of sourcing region; harvested area instead of FMU) reduces the risk of accounting for lands that are not attributable to the forest products.



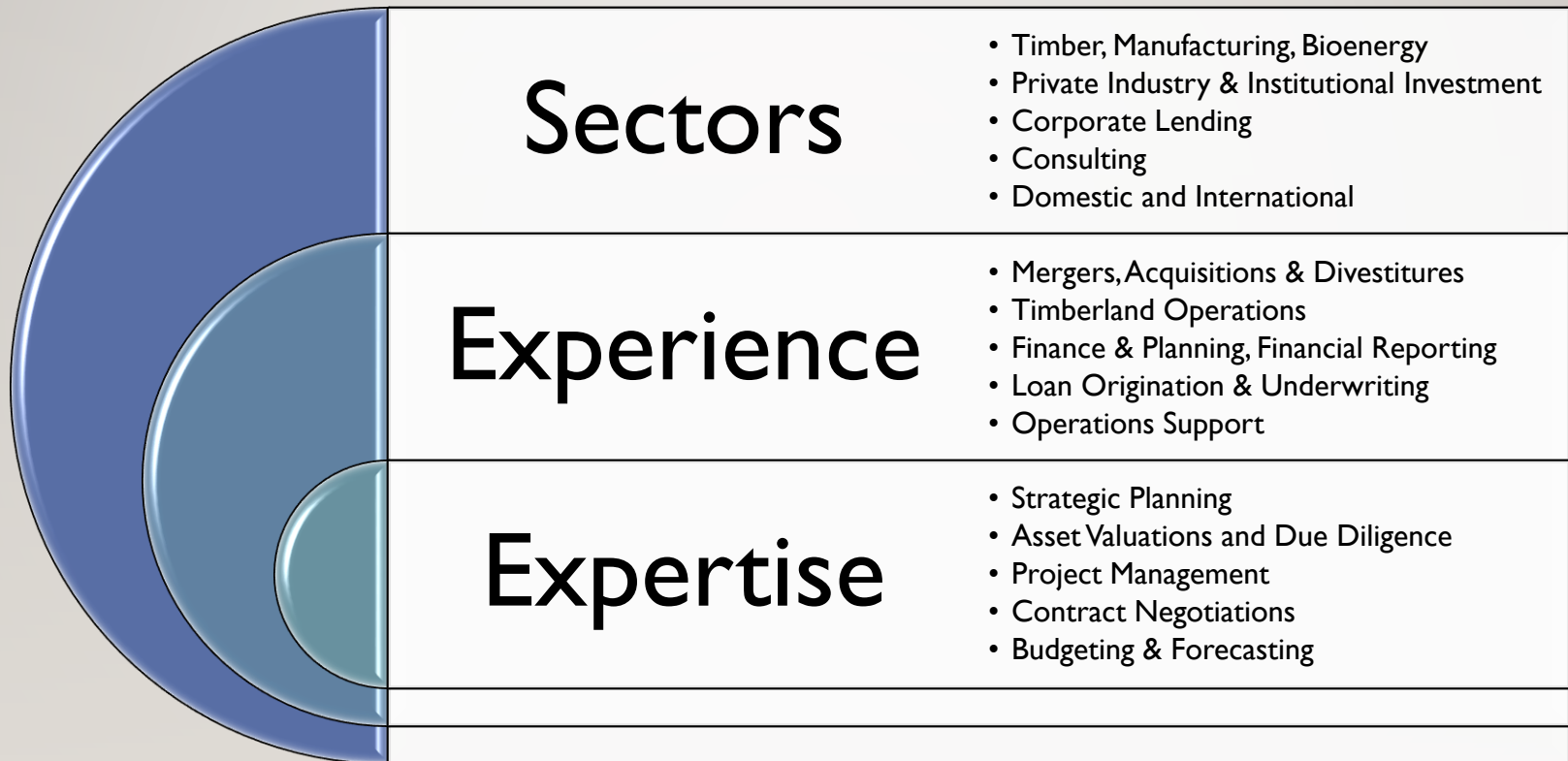
SECTION 4:

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



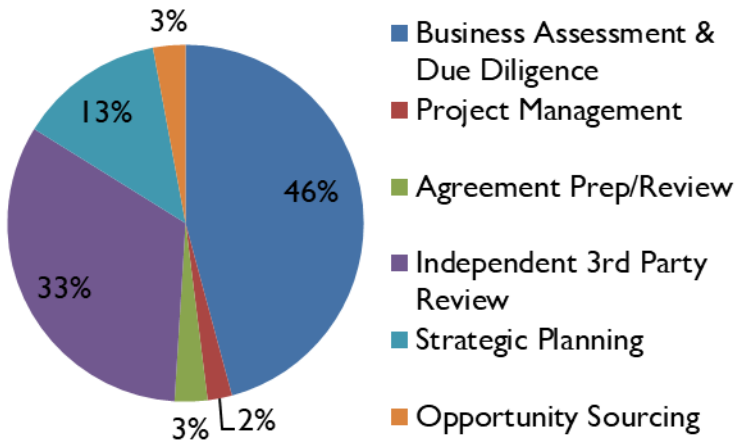
- Validate Acquisition Valuations & Due Diligence Procedures
- Evaluate Existing or Proposed Agreements or Easements
- Interpret Annual Management Plans & Appraisals
- Examine Proposed Transfers of Ownership
- Review Divestiture Timing & Strategies
- Track Investment Performance

Institutional Investor Services

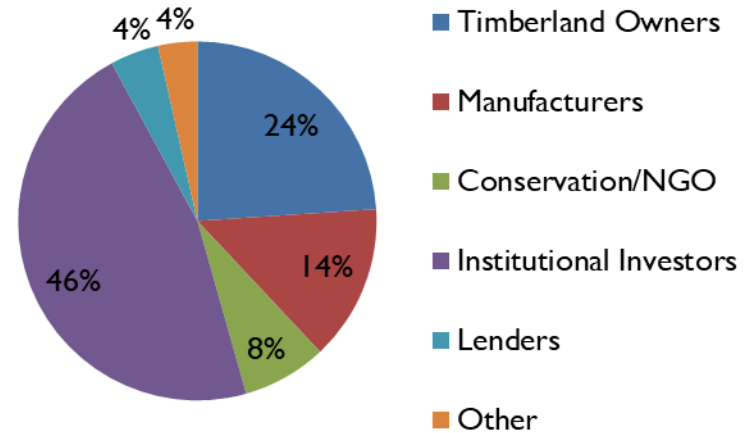


ENGAGEMENT PROFILES

Services Provided 2009-22

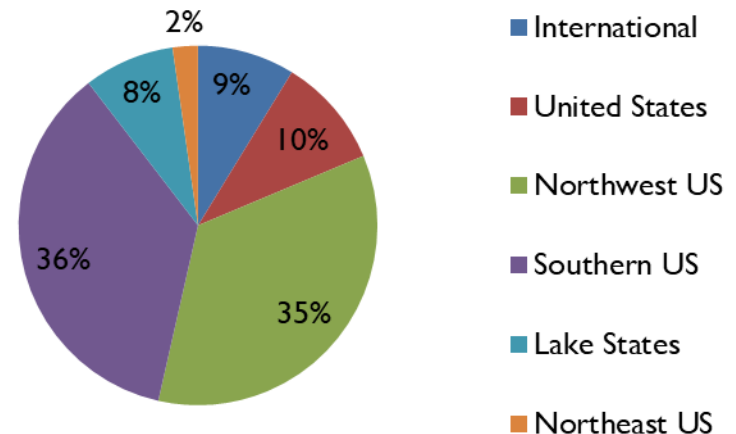


Customers Served 2009-22



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.

Regions Covered 2009-22





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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