14 April 2022

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

I hope all is well. Please find attached this quarter's review of the timber and wood products Market Trends. Our markets are reflecting the wild times we are all going through, with inflation running high, unemployment running low and the stock market swooning, with management of Covid-19 shifting from pandemic to endemic responses, and with the tragic war in Ukraine and climate change impacting industries and economies across the globe. All of this disruption is creating opportunities for some and challenges for others. In this quarter's Market Trends, you will see that housing markets are mixed with builder sentiment still optimistic, but affordability moving lower. Housing starts remain strong, while existing home inventories for sale are at historical lows. Product prices tested the historic levels of 2021, while log prices notched only partial gains – the South still has a long way to go. All of this has led to remarkable mill margins.

In this quarter's Deeper Dive, I reprint CarbonPlan's submission to Verra, offering their perspectives on ton-year accounting. If you are unfamiliar with ton-year carbon accounting, there is a useful link to their "explainer" on the subject. In the last section, ICYMI, I reprint the recent Bloomberg article on forest carbon projects, with some post-publication commentary by Jim Hourdequin that serves as an introduction. All very interesting to me, and I hope to you as well.

Best wishes for the next few months as the country and world navigate these unsettled times.

Will

William Sonnenfeld
WillSonn Advisory, LLC
P.O. Box 4706
Rollingbay, WA 98061-0706

Cell: 206 445-2980
Attention: My email address has changed! Please update my contact information in your records.
Email: WillSonnAdv@outlook.com

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Richard P. Vlosky, Ph.D.
Crosby Land & Resources Professor of Forest Sector Business Development
Director, Louisiana Forest Products Development Center
Room 227, School of Renewable Natural Resources
Louisiana State University
Baton Rouge, LA 70803
Phone: (225) 578-4527; Mobile: (225) 223-1931
vlosky@lsu.edu

MARKET TRENDS

1ST QUARTER, 2022

Perspectives on the latest market trends and indices impacting the Timber and Wood Products sectors, compliments of WillSonn Advisory, LLC

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Q1 2022 HIGHLIGHTS

Market Trends

- Builder sentiment retreats while spending remains robust (page 5-6)
- Housing Affordability dives as home prices and mortgage rates soar (page 7-8)
- Housing Starts continue to increase, up 7% from 2021 (page 9-10)
- Inventory of Existing Homes for sale drop below 1 million units (page 11-12)
- Product Prices soar in Q1 as buyers prepare for the Spring (page 13-14)
- PNW and Southern Log prices move higher (page 15-16)
- Gross sawmill jump again in Q1, South remains on top (page 17)
- US Timberland Sales end the year strong, valuations drift lower in 2021 (page 18-19)
- Public Timber REIT 2021 land sales drop, harvests drift lower (page 20-21)

Deeper Dive

- CarbonPlan's comments on Ton-Year Accounting for Forest Carbon Projects (page 22-33)

In Case You Missed It

- Jim Hourdequin's Bloomberg Interview re Forest Carbon Offsets (page 34-41)

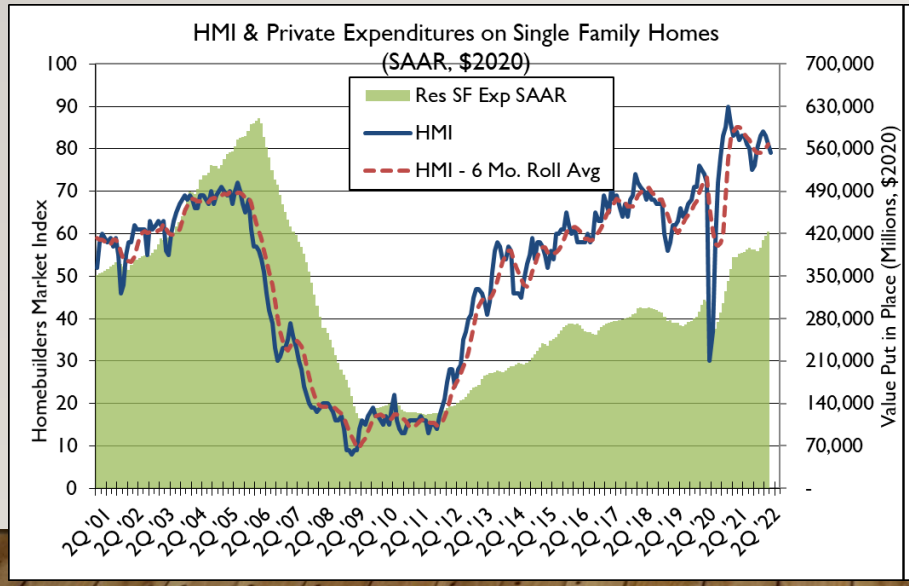
About WillSonn Advisory, LLC

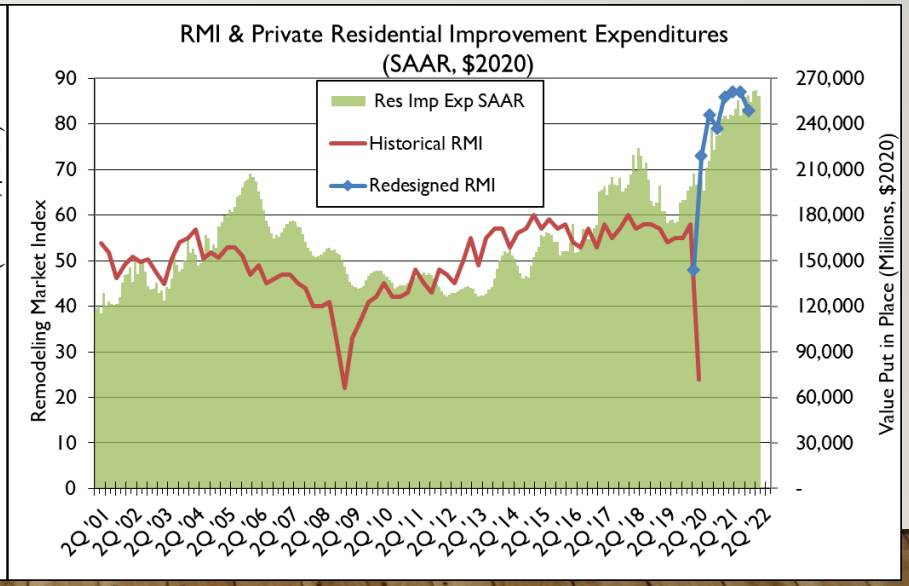
SECTION 1:

LATEST TRENDS

BUILDER SENTIMENT & PRIVATE RESIDENTIAL EXPENDITURES

- **Recent Trends**: The Homebuilder Market Index (HMI) ended Q1 2022 with a reading of 79, down from its all-time high of 90 in November 2020. Likewise, the quarterly Remodeling Market Index (RMI) slipped to 83 in Q4 2021, down 4 points from Q3.
- 2021 Real Expenditures on Single Family New Residential exceeded 2020 levels 29.2 %, following a 10.0% gain in 2020. 2021 Real Expenditures on Private Residential Improvement increased 15.9% above 2020 levels, following 2020's 17.8% increase.
- **Explanation**: Gains in home construction starts and remodeling, along with rising labor and material costs, pushed residential expenditures higher during the pandemic when demand for new housing soared and supply chains were strained. Higher construction expenditures were only partially offset by longer construction times and somewhat smaller home sizes.
- **Implication**: Higher builder confidence generally bodes well for near to intermediate-term housing starts and therefore continued demand for building products for both construction and remodeling. Higher construction costs risk limiting the pool of qualified buyers and delays in construction. A resumption of pre-pandemic interests (e.g., travel) may undermine strength in remodeling activity.
- **Expectation**: In the longer-term, construction expenditures should see slower growth or even contraction as lower building material prices make their way through the distribution channels. Constrained supply of existing homes, developed lots, scarce labor and lower contractor productivity will keep residential construction and improvement expenditures elevated.

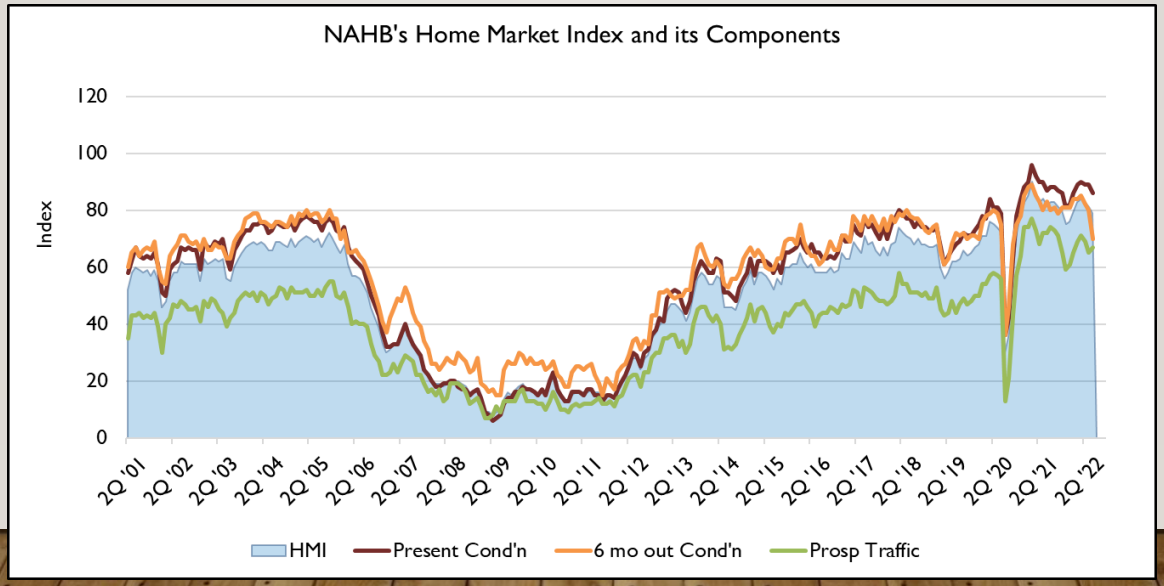




Data Sources: Census Bureau, NAHB, Dept. of Commerce Charts & Analysis: WillSonn Advisory

BEHIND THE NUMBERS: BUILDER SENTIMENT & PRIVATE RESIDENTIAL EXPENDITURES

- NAHB's Homebuilder Market Index (HMI) and Remodeling Market Index (RMI) are measures of home builder and remodeling contractor sentiment.
  - In the chart below, you see the three components of the HMI – Present Condition, Condition 6 months out, and Prospective Buyer Traffic.
  - During the pandemic, Prospective Buyer Traffic has been much stronger than in prior good markets, both in terms of the absolute number, but also relative to the other two measures.
  - Also note that the "6 month out" component remains weaker than "Present" which is unusual, historically, no doubt impacted by impending rises in interest rates.
- 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). While a reading over 50 indicates a prevailing positive view of current and future conditions, it says nothing about the proportion in the neutral camp.
  - Note that the NAHB instituted a new RMI survey beginning in Q1 2020, such that comparisons to prior years are meaningless.

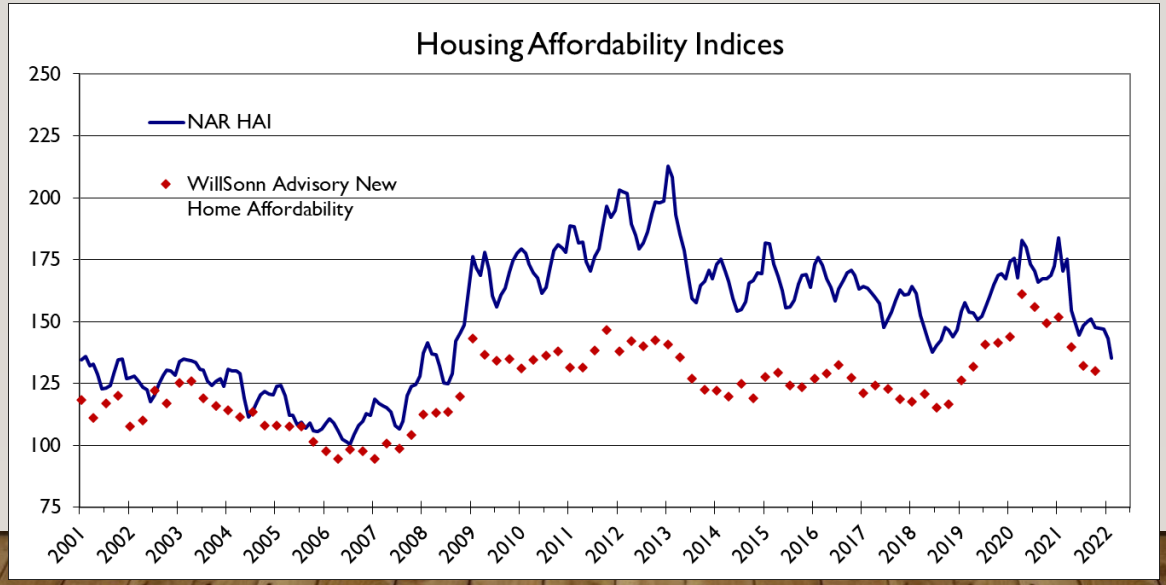


Data Sources: Census Bureau, FRED website

Charts & Analysis: WillSonn Advisory

HOUSING AFFORDABILITY

- **Recent Trends**: The Housing Affordability Index ("HAI") (blue line) has fallen from 186 in January 2021, to 135 in February 2022, a 14-year low. The New Home Affordability (red diamonds), increased in 2020, from which it has retreated to 130 in Q4 '21.
- **Explanation**: The HAI drifted lower in 2012-18 as home price increases outpaced income growth. In 2019 and 2020, mortgage rates eased and median family income accelerated, bolstering this measure of affordability, but soaring home prices in 2021, 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 push mortgage rates higher while thin existing home inventories will keep home values elevated. Expect affordability to continue to drift lower in the coming months, but don't worry too much about its impact on housing starts. Also don't expect builders to pass along lower construction costs to buyers when material costs ease; they like the wider margins.

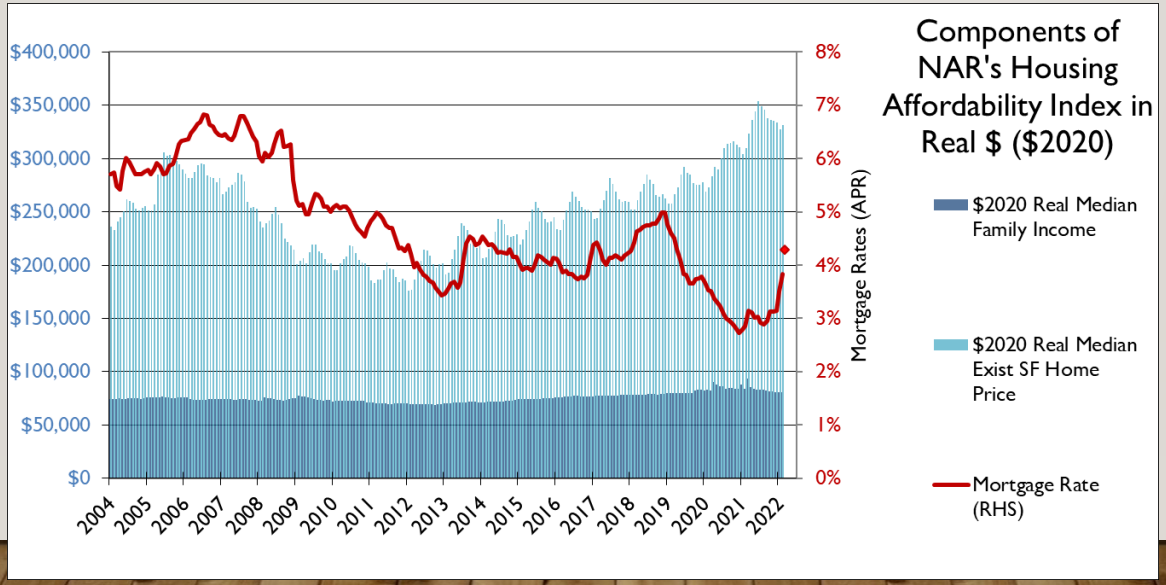


Data Sources: NAR, Census Bureau,, Dept. of Commerce

Charts & Analysis: WillSonn Advisory

BEHIND THE NUMBERS: HOUSING AFFORDABILITY

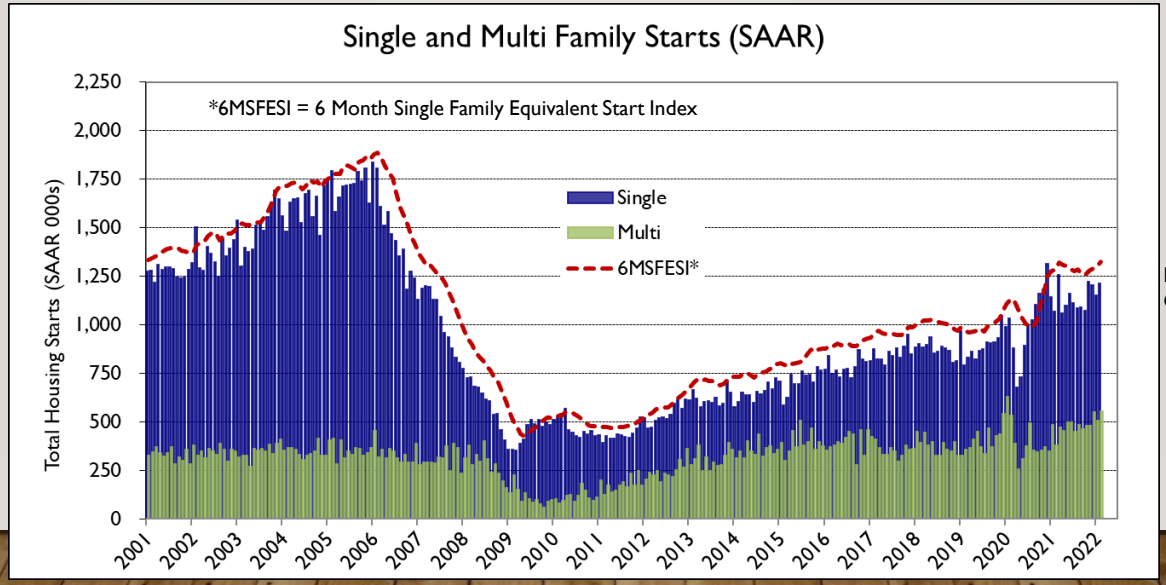
- The National Association of Realtors' Housing Affordability Index ("HAI") is based on three inputs: list prices of existing homes for sale, 30-year fixed mortgage rates and median family income. WillSonn Advisory's New Home Affordability uses the actual sales price of new homes, with the same income 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.
- This chart displays the movement in the three components of the NAR Affordability Index – home prices, mortgage rates and family income – in Real dollar terms. In 2021, compared to 2020, median home prices were up 17.1% and Median Family Income was up 3.6% (with the help of stimulus payments), while Mortgage rates declined -5.2%. As a result, Mortgage Payments, as a percent of Income increased 11.1%, resulting in the lower average 2021 HAI, down -9.5% from 2020's average.
- In March 2022, mortgage rates averaged 4.28%, 114 basis point higher than March 2021 and 127 bps above the average 2021 rate. Holding home price and income steady, a 50-basis point increase in mortgage rates drives the Affordability Index down about 10 points.



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

HOUSING STARTS

- **Recent Trends:** Total Housing Starts totaled 1.601 million units in 2021, 16% above 2020's pace of 1.380 million units. 2021 Single Family Starts were up 13.8%, while Multi Family Starts were up 22.6%, compared to 2020. In early 2022, Total Housing Starts (SAAR) averaged 1.713 million units, an improvement of 6.8% versus 2021.
    - 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. February's 1,326,000 unit reading represents 70% of the 2006 peak of 1.9 million SFES's.
- **Explanation**: Housing has led the economic recovery in the US since the short-lived, pandemic-induced recession. Near-term demographics are supportive of a resurgence in demand for homes, both new and existing, with limited turnover of existing homes favoring new home construction. Memories of the 2008-09 housing-induced Great Recession have been fading over time.
- **Implication**: Housing Starts account for 30%-40% of wood usage, so rising starts are directly tied to higher lumber and panel demand.
- **Expectation**: Housing starts are expected to continue to improve over the coming months and years, as the 2008-2018 deficit of homes built is replenished and as existing home availability remains tight. Gains will be tempered by limits on construction labor, a scarcity of developed lots, long construction times, tight construction financing standards, and by the occasional recession.

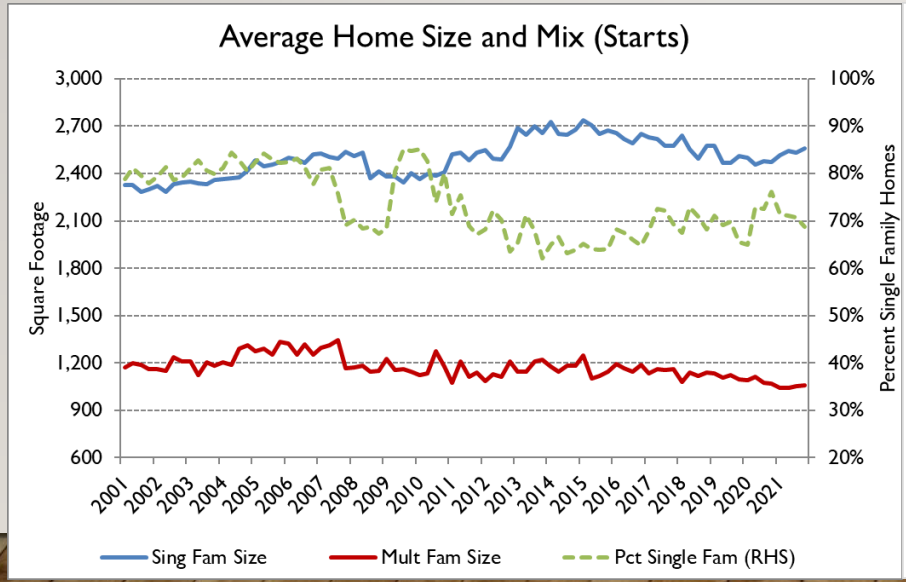


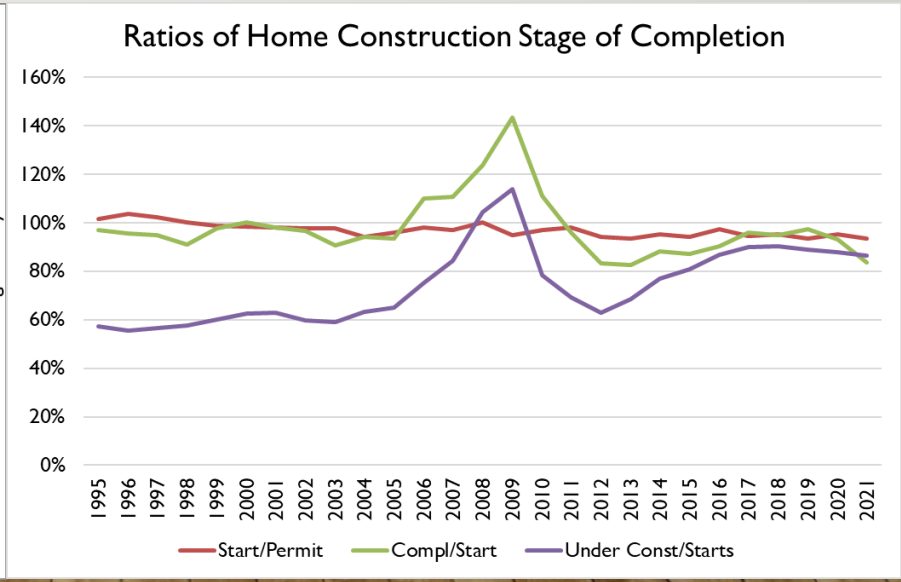
Data Source: U.S. Census Bureau
Charts & Analysis: WillSonn Advisory

BEHIND THE NUMBERS: HOUSING STARTS

- The size of Single-Family Home Starts through the four quarters of 2021 trended higher, averaging 2,537 sq. ft., up modestly 2.4% from 2020's average of 2,476 sq. ft. The average size of Multi-Family Units started in 2021 averaged 1,049 sq. ft., down -3.5% from the 2020 average of 1,087. Single Family units made up 70% of Total Starts in 2021, 2 points lower than 2020 and 12 points below the pre-bust average of 82%.
- 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.
- The average number of Permits increased along with Starts in 2021, 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 averaged just 84% in 2021. As noted earlier, the run up in construction material pricess, along with supply chain woes and backlogged inspections delayed many completions in 2021. Thus, the number of homes under construction relative to starts remain elevated.

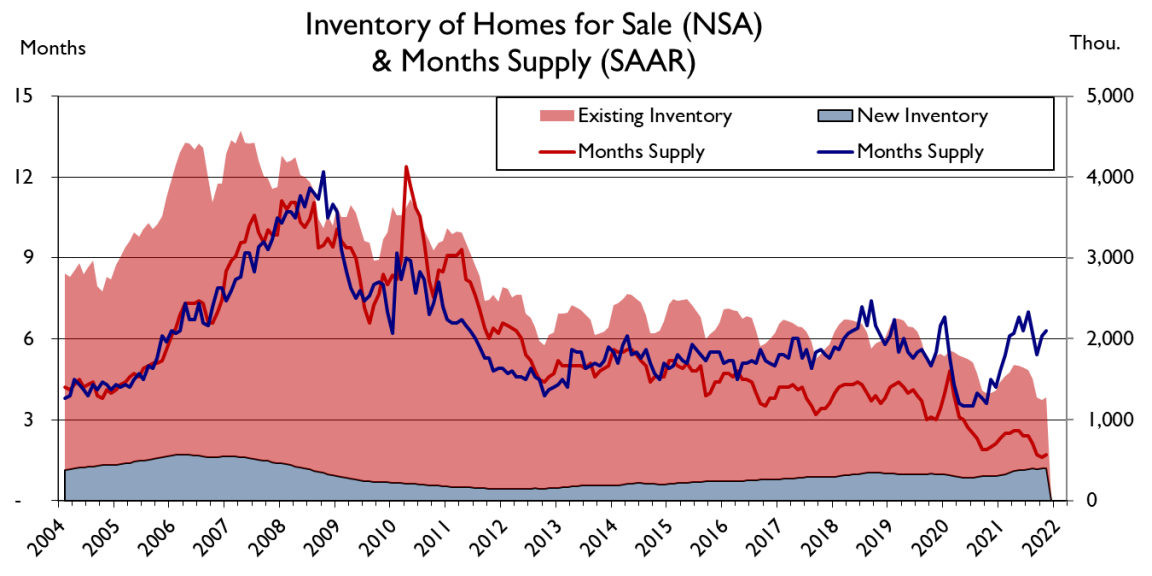
Data Source: U.S. Census Bureau Charts & Analysis: WillSonn Advisory





PACE OF HOME SALES & INVENTORIES

- **Recent Trends**: The Inventory of Homes For Sale (Existing + New) cycled lower to 1.271 million units in February, even with December 2021, but down -5% (62k units) from February 2021. Separately, Existing Home Inventories are down 160k units, while New Home inventories are up 98k units, compared to February 2021. At their respective current pace of sales, there are a scant 1.7 months of sales in Existing Home inventories, and 6.1 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. New home inventories have recently recovered to the high end of the normal range as higher home prices and rising interest rates may be driving buyers to the sidelines or looking at existing homes.
- **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 building products demand as well.
- **Expectation**: It is unlikely (and unwise) that the US housing market would return to frothy levels of the early 2000's when mortgage standards were lax. With the expectation of rising mortgage rates in the months to come, home price growth may slow and Existing Home inventories may recover as the pace of sales tapers off.

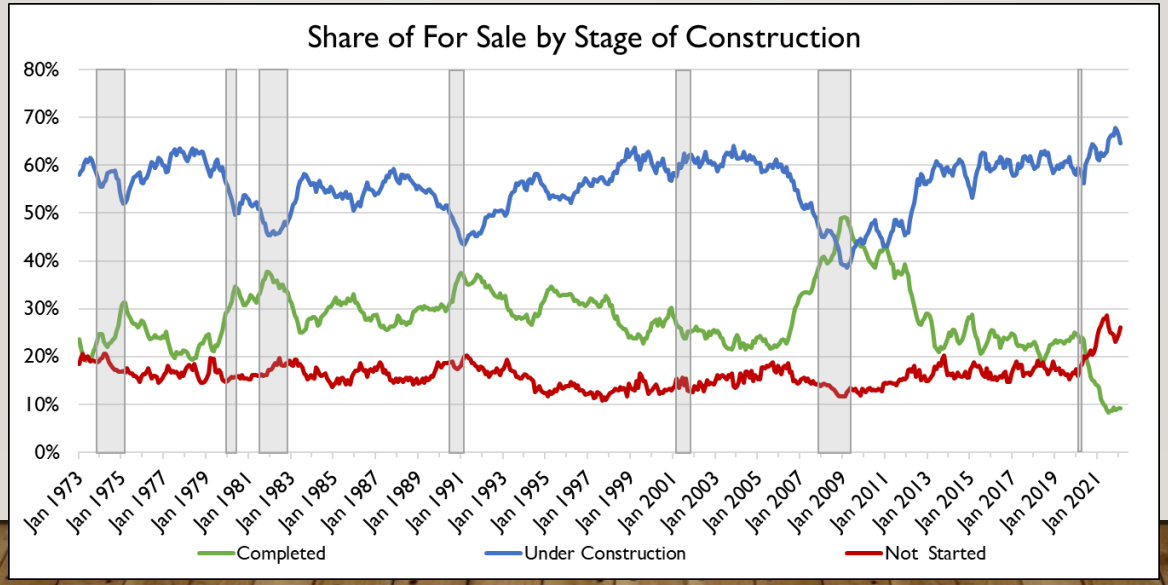


Data Source: U.S. Census Bureau, NAR

Charts & Analysis: WillSonn Advisory

BEHIND THE NUMBERS: PACE OF HOME SALES & INVENTORIES

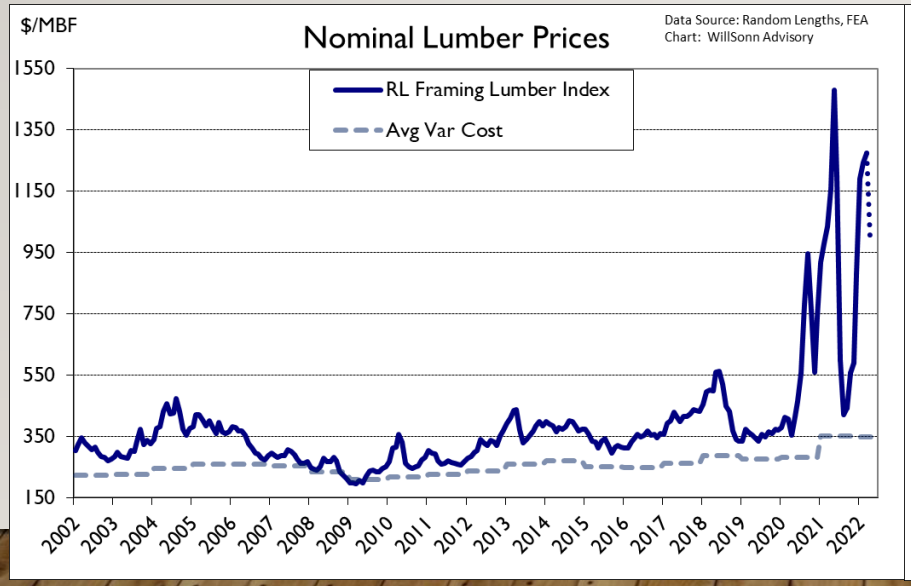
- The inventory of New and Existing homes combines data from the National Association of Realtors ("NAR") which provides data for Existing home sales (both single and multi-family homes), and the U.S. Census Bureau, which provides data for New home sales (single family only). Inventory figures are not seasonally adjusted. ("NSA"). Months Supply is derived from inventories and monthly sales volume and are seasonally adjusted (Seasonally Adjusted Annual Rate, or "SAAR").
- In the chart below, I've plotted the share of 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 got stuck with more completed homes on hand).
- Of the 401,000 New units for sale at the end of February 2022, only 9% were Completed (a 47-year low), 65% were Under Construction, and 26% had Not Yet Started (just off its recent record of 29%).
- With the onset of the pandemic, and its impact on construction activity (slowed) and demand (heightened) we saw the for-sale inventory of homes Completed plummet, while the share of for-sale homes Not Yet Started climb. High Building product prices appear to be delaying the start of construction as builders try to pass off the risk of high material costs to buyers, and as buyers chose to let lumber and panel prices come down. Completed homes are getting snatched up quickly.

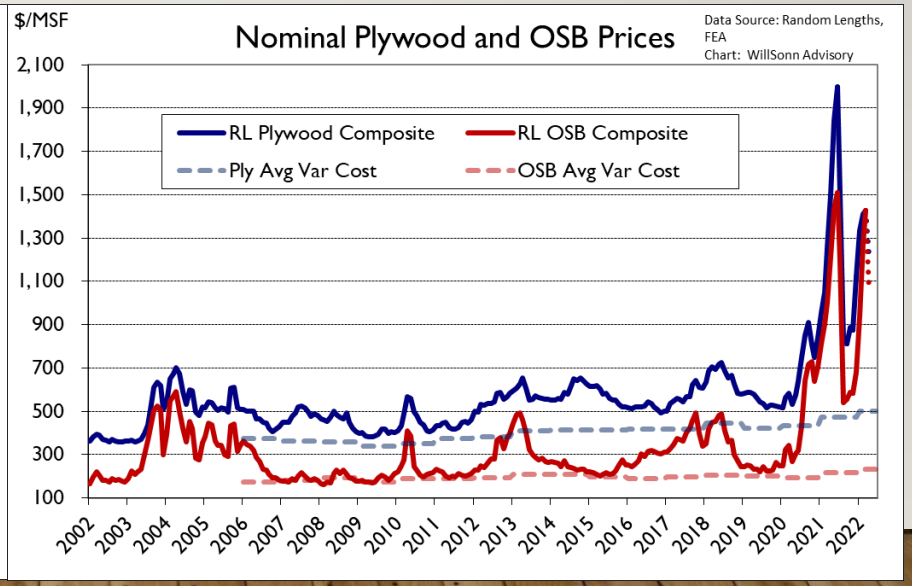


Data Source: U.S. Census Bureau, NAR
Charts & Analysis: WillSonn Advisory

WOOD PRODUCT PRICES

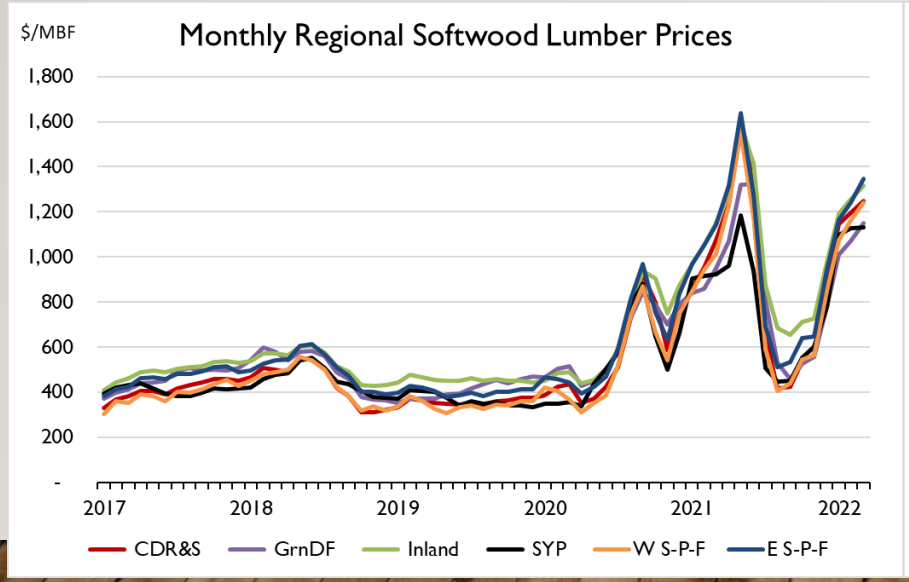
- **Recent Trends**: The Random Length Framing Lumber Composite Index in Q1 2022 gained 83% from Q4 to register 45% above Full Year 2021 prices. Panel prices have caught up to lumber. Plywood pricing was up 45% in Q1 from Q4, 14% above FY 2021. OSB prices soared 97% in Q1 above Q4 prices, up 32% from FY 2021 prices. In February, the OSB index price exceeded SYP Plywood index prices, for the first time ever, talk about mixed up markets! Mid-April prices (dotted line) have come down from the March peak.
- **Explanation**: Extreme price volatility in building products have materialized as manufacturers, construction and transportation sectors have wrestled with periodic labor tightness, rising labor and 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 cost for home builders and remodelers become excessive, some buyers delay, downsize or abandon projects, reducing demand and thus price. Historically, high prices spur additional mill shifts, a surge in imports and substitution from non-wood materials, each of which have been muted during the Covid-19 pandemic. Supply-chain woes are also adding to price volatility.
- **Expectation**: As prices moderate and supply improves, builders and DIY demand should improve. Vaccinations should also ease labor constraints, allowing for higher production and easing of transportation bottlenecks. But with multiple waves of covid variants, and now high fuel prices and a declining stock market, it's hard to know when volatility will moderate.

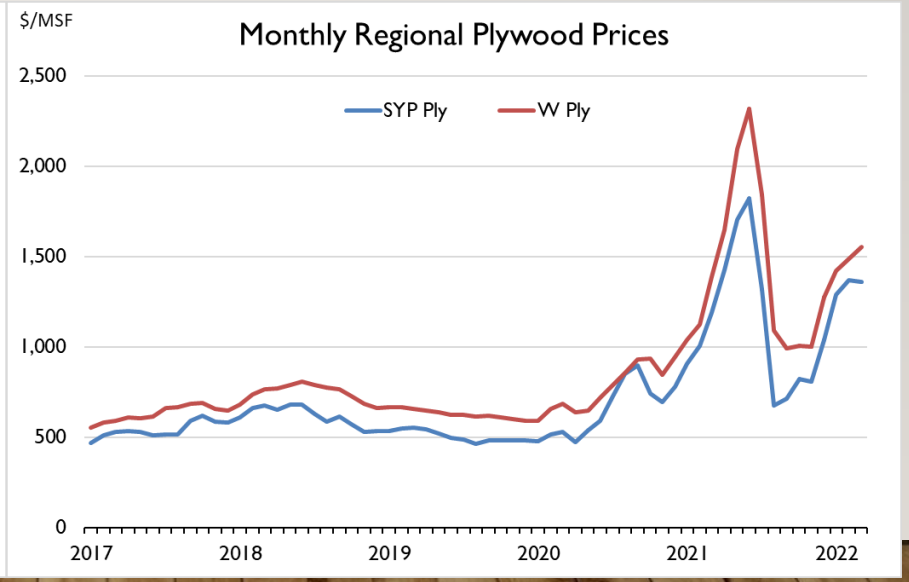




BEHIND THE NUMBERS: WOOD PRODUCT PRICES

- Record prices were enjoyed by all regions in all product segments during the first quarter of 2022.
- Regionally in Q1 2022 relative to Q4 2021
  - West Coast lumber mills saw an 81% increase in Coastal Dry Random & Stud ("CDR&S") prices and a 74% increase in Green DF prices
  - Inland sawmills saw prices improve 56%.
  - Southern Yellow Pine ("SYP") sawmills saw prices rebound 74%.
  - Canadian components of the Random Lengths Framing Composite Index saw S-P-F prices gain 78% and 68% in the West and the East, respectively.
- First quarter plywood prices were also higher in both regions, with Southern Plywood prices up 50% and Western Plywood up 36% during the quarter. Panel price movements were more in lock-step with lumber prices during the first quarter.

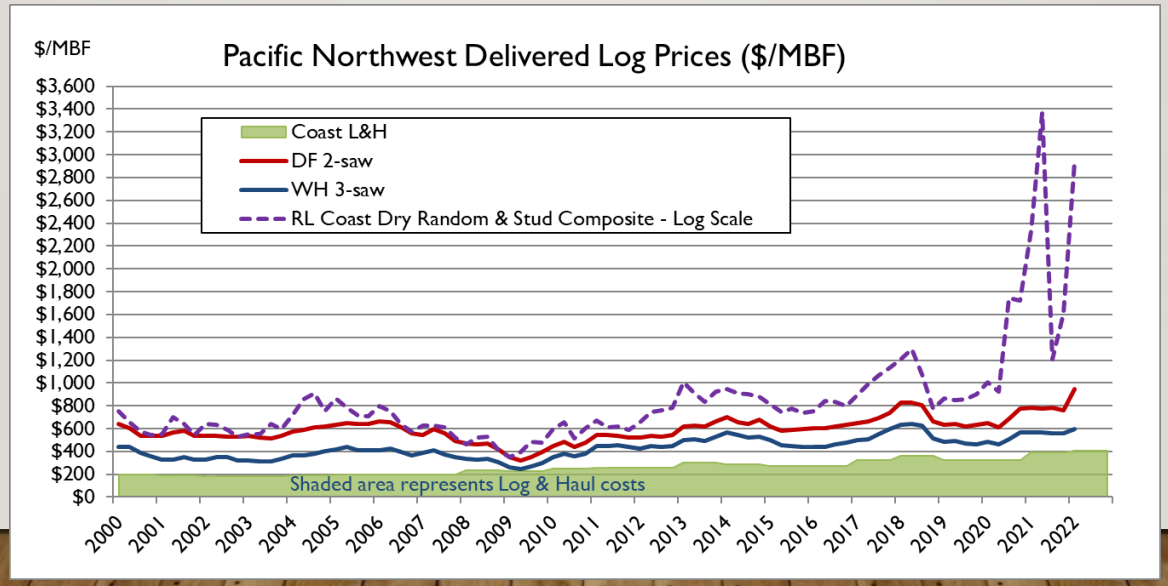




PNW LOG PRICES

- **Recent Trends**: Delivered log price movements were uneven in the first quarter with record Douglas-fir 2saw prices up 24% (sitting 22% above 2021 levels) while western hemlock 3saw log prices moved just 7% higher (6% above 2021 levels). Over the past 10 years, 4th quarter DF log prices have typically gained 2% while WH prices gain 3%, so this quarter's movement in DF prices was atypical.
- After adjustments for changes in lumber recovery, the Random Lengths Coast Dry Random & Stud Composite price (on a log scale) gained over $1,300/MBF (82%) during the fourth quarter.
- **Explanation**: With high end-use demand in the midst of constrained production, western mill throughput of logs has been only modestly higher. Extensive fires throughout the West in 2020 and 2021 resulted in extensive salvage operations in 2021. Robust lumber prices combined with constrained logging capacity has provided log sellers some measure of pricing leverage in 2022.
- **Implication**: Simply put, mills were forced to pay higher log prices in order to capture record lumber prices entering the 2022 building season.
- **Expectation**: Second quarter price movement is usually mixed, with DF 2saw dropping $8/MBF and WH 3saw gaining $7/MBF over the past 10 years. Supply chains will likely remain choppy as access in the forest is limited in the short-term. Log & Haul costs are expected to remain elevated in 2022 due to tight labor and high diesel prices.

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.

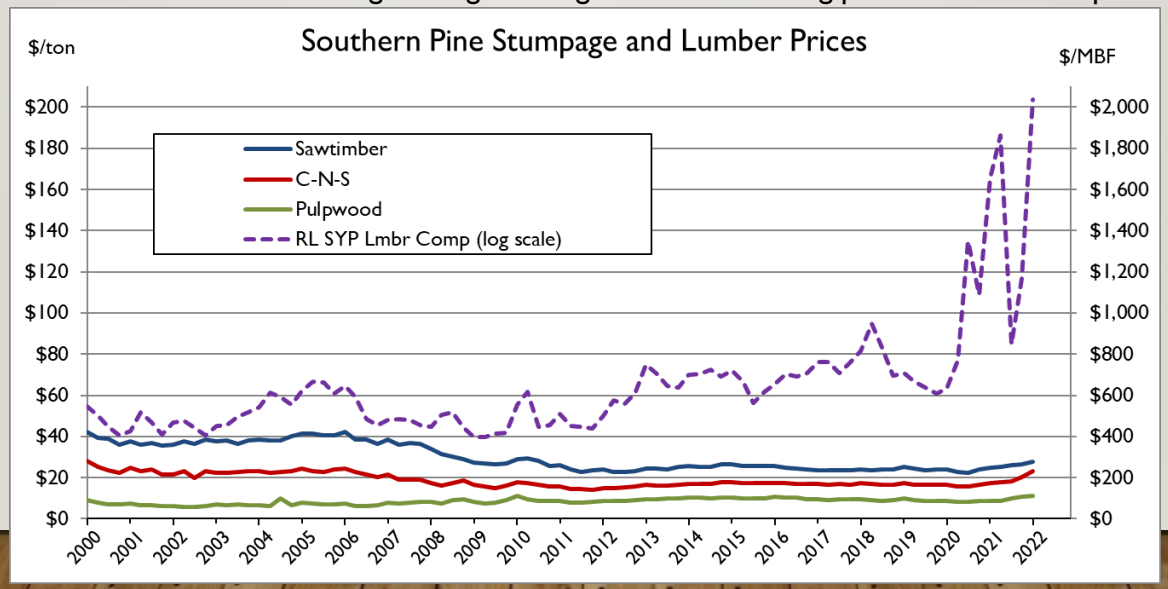


Data Source: Oregon DOF, WA DNR, Random Lengths, FEA, Log Lines

Charts & Analysis: WillSonn Advisory

SOUTHERN PINE LOG PRICES

- **Recent Trends:** First quarter Southern Yellow Pine stumpage prices made material gains across the spectrum, with the biggest movement in Chip-n-Saw. SYP Sawtimber prices gained $1.47/ton in the Q1 (+6%), Chip-n-saw stumpage prices were up $3.01/ton (+15%) and pine pulpwood was up $0.45/ton (+4%). Relative to full year 2021, Q1 PST price is up 13%, CNS is up 34% and PPW is up 29%.
- The Random Lengths SYP Lumber Composite, adjusted for lumber mill recovery, shot up $870/MBF, or 75% in Q1 '22 compared to Q4 '21, and registering 47% above full year 2021 prices (2021 was 44% above 2020 prices and more than double 2019).
- **Explanation**: Q1 prices typically see prices gain of $0.42-$0.52 per ton as wet Winter weather sets in, so 2022's upward movement was certainly exaggerated for Sawtimber and CNS. Improved manufacturing demand and continued supply chain constraints supported the continued uptick in price. Despite record lumber prices and increased production, sawlogs remain plentiful in the US South.
- **Implication**: Moving in tandem, Sawtimber to Pulpwood price ratios remained at 2.5:1 in Q1, on par with the 2.5:1 ratio of the last few years. With ratios below 4:1, landowners are less inclined to grow sawtimber.
- **Expectation**: Q2 prices typically see prices retreat $0.31-$0.47 per ton price as drier Spring weather improves logging access. While 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. SYP lumber prices are unsustainable.



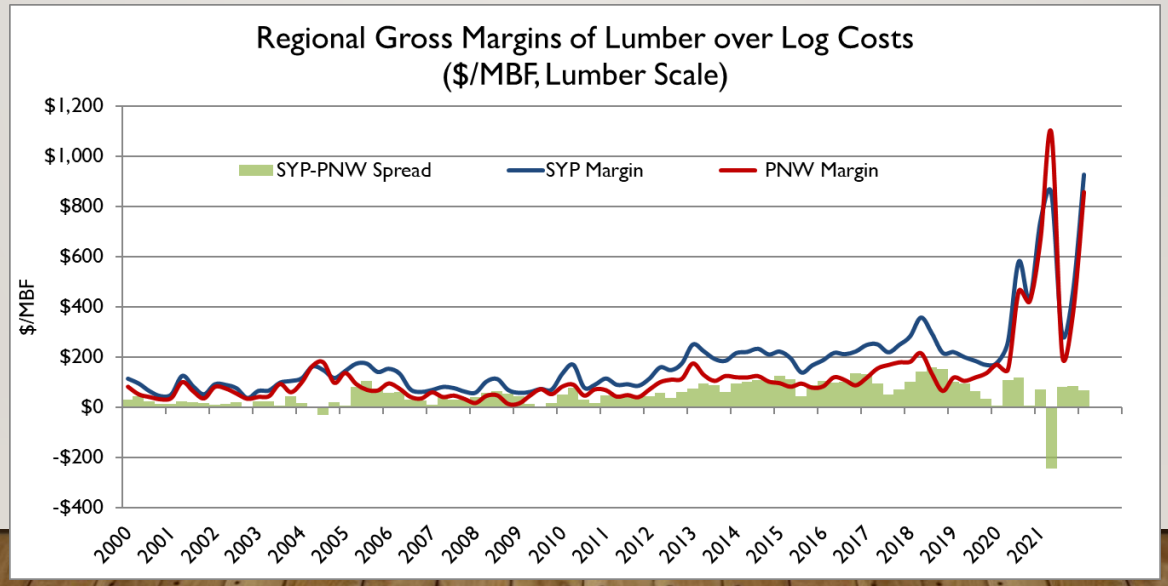
Data Source: Timber Mart South, Random Lengths, FEA

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 narrowed a bit in Q1 to $68/MBF in favor of the South, down from $86/MBF in Q4. The $68/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 expanded again this quarter, from $376/MBF to $858/MBF in the PNW, and from $462/MBF to $926/MBF in the South. Since 2013, Southern sawmills have enjoyed gross margins over $200/MBF in 27 of the last 37 quarters, while PNW mill gross margins hit that mark only eight times.
- **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 during the pandemic-fueled run-up 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

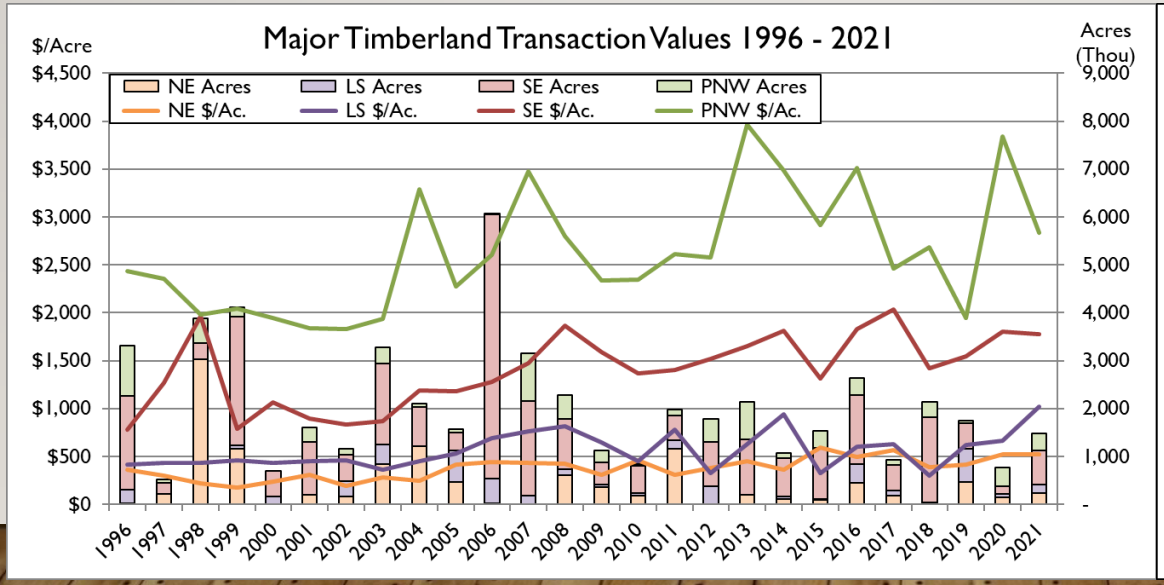
Chart & Analysis: WillSonn Advisory

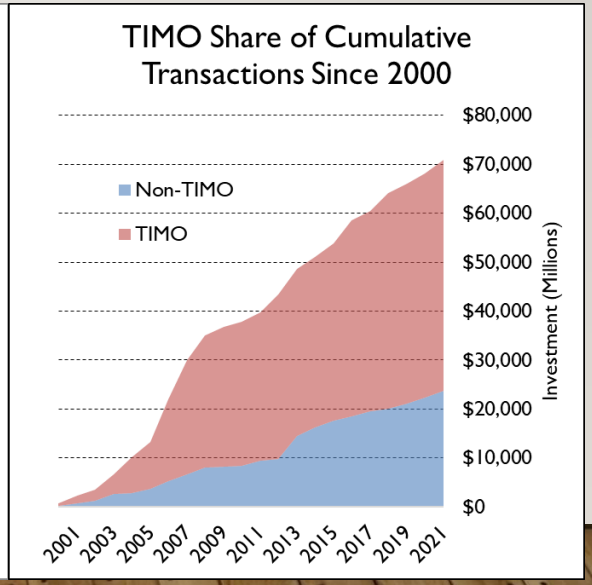
Assumptions: 67/33 weight of DF2saw and WH3saw in the PNW, and a 75/25 weight for S/T and CNS in the South (using 7.5 tons/MBF, along with FEA's estimates of Cut & Haul cost for S/T and CNS). All figures are lumber scale, and regional differences in lumber recovery factors are incorporated.

REGIONAL TRANSACTION VALUES

- **Recent Trends**: Timberland sales in 2021 totaled $2.7 B on 1,549,000 acres, with another +/- 870,000 acres sold at undisclosed values. For the year, 50% (by dollar) of disclosed transactions were made by TIMO's, with the other half made by integrated lumber producers, conservation organizations, and private timberland owners.
- By investment sector, Timberland Investment Management Organizations ("TIMOs") have funded 67% of the acquisitions from 2016 to 2021, well above the 25% captured in the 2013-2015 period. By comparison, TIMO buyers acquired 78% of US timberlands sold (by dollar) in the previous 13 years (2000-2012).
- **Explanation**: Prices in the Pacific Northwest turned lower as PNW sales were dominated by a couple large non-strategic (i.e., lower value) sale by Weyco, Hampton and Roseburg. Long-term upward price movement in the South and PNW during the 1996-2006 period reflected increased deal competition, discount rate compression and increasing use of "optimization" models in timberland valuations.
- **Implication**: As discount rates used to calculate timberland values decline, expected cash-on-cash returns also decline, all other things being equal. Optimization models used to schedule harvests and merchandize logs are "best-case scenarios," less likely to be realized.
- **Expectation**: In the near-term, integrated producers may continue to reinvest outsized lumber profits in timberlands. Longer-term, rising borrowing costs may erode value, but could be more than offset by buyers pricing in Carbon sales to bolster valuations.

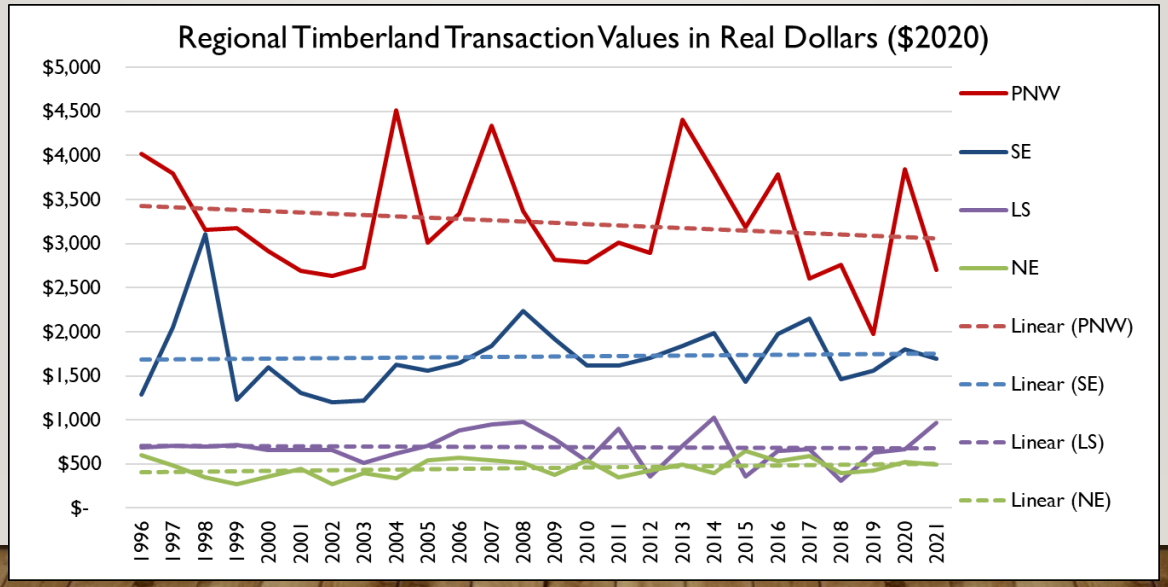
NE: Northeast LS: Lake States SE: Southeast PNW: Pacific Northwest Not Shown: Appalachia and Inland Northwest Data Source: TMS, TMR, Press Releases Charts & Analysis: WillSonn Advisory





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 -0.44%
  - 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.
- In the South, the real dollar trendline value has increased ~$85/acre over the past 25 years, a positive CAGR of 0.20%
  - 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 ~$60/acre (CAGR of -0.3%) while the value trend in the Northeast gained ~$100/acre (a CAGR of 0.9%).
  - Both of these regions saw significant pulp mill contractions and modest gains in standing inventory, yet took a different trajectory.
- The number of acres sold, and the stocking levels on those properties, can vary significantly from year to year, leading to apparent volatility.

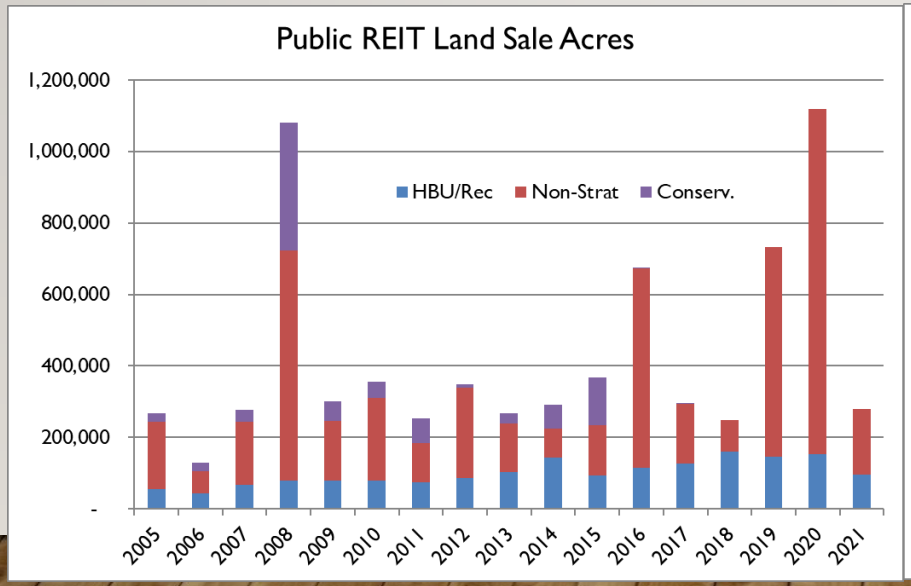


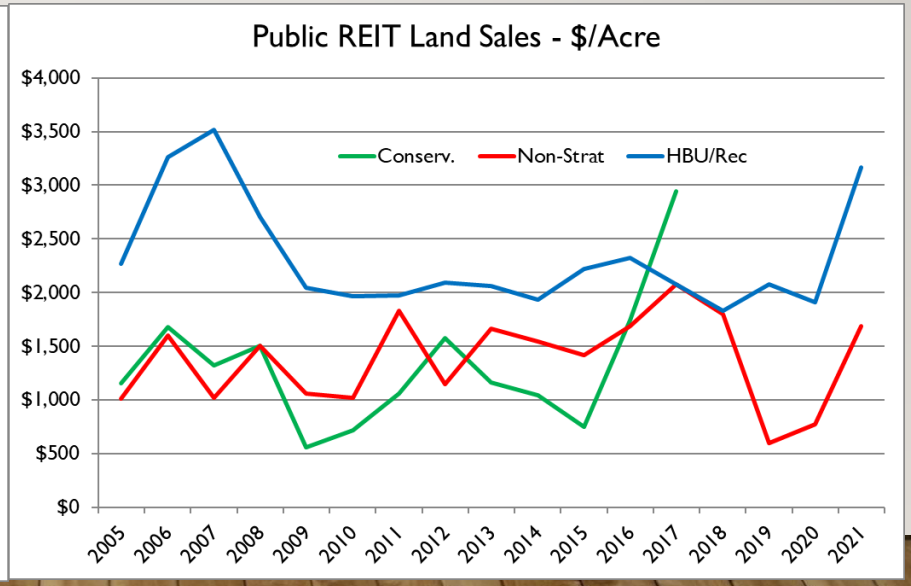
PUBLIC REIT LAND SALES

- **Recent Trends**: Land Sales among the four remaining REITs declined in 2021with 281,000 acres sold generating $710 Million in revenue. 96,000 acres of HBU/Rec land sales were reported, at an average price of $3,166/acre, up about $1,254/acre from 2020, with only Weyco showing material improvement. Non-strategic land sales totaled 185,000 acres in 2021, well off the pace of the last two years.
- **Explanation**: As Landowners initiate HBU programs, they first sell the properties with the least upside potential for value growth, which typically are the higher valued lands, thus the generally flat to lower prices (prior to 2021).
  - Some may attribute 2021's higher prices for HBU/Recreational land to heightened interest during the pandemic. It may also be due to be geographic or subsector mix. Weyco provided no explanation for the increased value per acre.
- **Implication**: Landowners will have to sell more HBU/Rec lands to generate the same amount of Land Sale revenues, in the face of flat to declining values. With more HBU acres being offered, values may get suppressed, certainly in Real Dollar terms.
- **Expectation**: I expect to see more acres sold as HBU as the REITS have become reliant on this income stream.
  - With Weyco's 2019-20 sales of MI, MT, SW OR and NW WA complete, their pool of non-strategic lands is dwindling.
  - As Covid-19 becomes endemic and offices reopen, the increase in interest from city slickers wanting to move to the country may wane.

Data Source : Company SEC Filings (PCL, WY, PCH, RYN, DEL, POPE, CTT)

Charts & Analysis: WillSonn Advisory

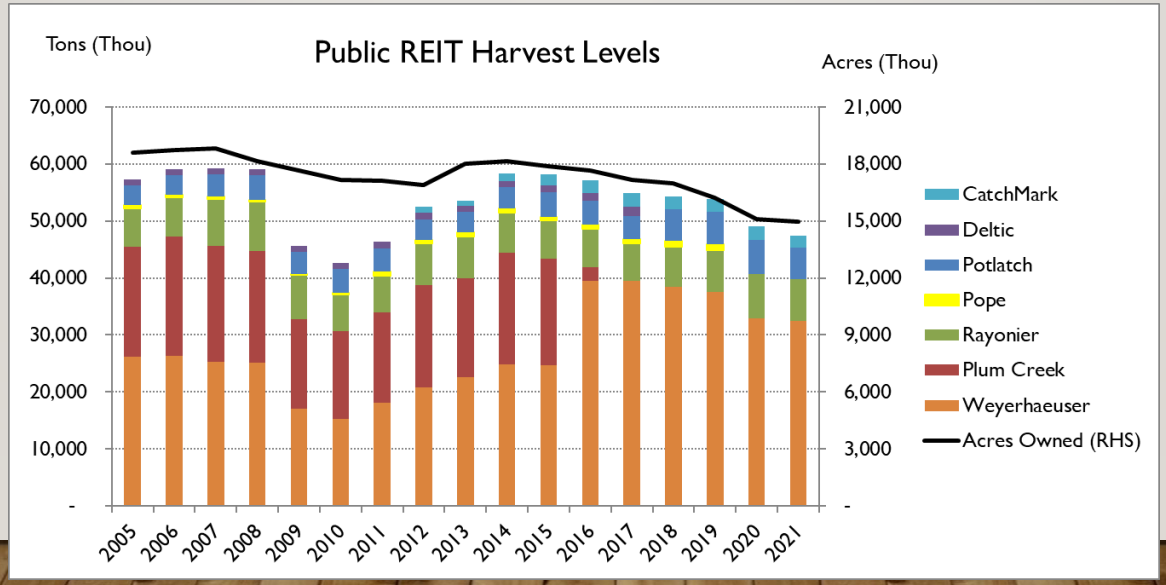




PUBLIC REIT HARVEST LEVELS

- **Recent Trends**: Harvest levels by the four remaining publicly traded timber REITs in the United States stepped 3% lower in 2021 while ownership shrank just 1% year over year. Comparing 2021 to the average for the 2005-07 period, industry ownership has declined 20% (3.8 million acres) while industry harvests have declined 19%.
  - The combined Weyco/Plum Creek ownership has dropped 27% (4.0 million acres) over this period, the largest decliner.
- **Explanation**: A combination of HBU/Development land sales and non-strategic sales have reduced both harvest and ownership. Approximately 46% of the acreage reduction has been in the form of HBU/Development sales.
- **Implication**: As ownership declines, investors should expect harvest levels to decline as well. Gains in productivity may help mitigate a drop in harvests, but that can take years to realize and are often oversold; we certainly have seen little gains in the last 15 years.
  - From the manufacturing view, as HBU (and some non-strategic) lands are sold, a portion is taken out of active management while other timber is held on longer rotations, thereby reducing the pool of timber available to the wood products industry.
- **Expectation**: The rate of decline in harvest is expected to continue, though at a slower pace than 2015-21 period, as the pool of non-strategic lands held by the public timber REITs dwindles and as sales are focused on the least productive regions and lands.

Note: Harvests and Ownership in Funds or JVs managed by a company have not been included.



Data Source: Company SEC Filings and Investor Presentations

Chart & Analysis: WillSonn Advisory

SECTION 2:

DEEPER DIVE

CARBONPLAN'S COMMENTS TO VERRA ON TON-YEAR ACCOUNTING

- In my Q3 2021 Deeper Dive, I presented some of the arguments for and against forest-based carbon offset credits.
  - In that piece, I mentioned one-year harvest deferrals as one proposed program, which is based on the concept of ton-year carbon accounting.
- CarbonPlan is a California based non-profit "that analyzes climate solutions based on the best available science and data." https://carbonplan.org/
  - In January 2022, CarbonPlan posted a couple very informative articles on its website that explained ton-year accounting (Unpacking ton-year accounting – CarbonPlan), and a related post that reviewed a one-year harvest deferral program developed by NCX (A critique of NCX's carbon accounting methods – CarbonPlan).
- VCS (Verified Carbon Standard) is run by Verra, who touts the VCS Program as "the world's leading voluntary program for the certification of GHG emission reduction projects." https://verra.org/
  - Verra is in the process of updating its VCS Program standards to accept ton-year accounting.
  - In addition, Verra is taking comments from the public regarding NCX's program, to which anyone may make a submission. Methodology for Improved Forest Management through Targeted, Short-Term Harvest Deferral – Verra
- In this quarter's Deeper Dive, I present CarbonPlan's submission to Verra addressing their update to the VCS program, specifically, their plan to include ton-year accounting.
  - It is critical, as you will read in the "In Case You Missed It" section, that the industry gets the math right, and that after it is all said and done, any forest-based carbon offsets that are sold are real, verifiable, permanent, and additional, even those that are sold in the voluntary market.
  - I believe that CarbonPlan's analysis is well reasoned and well supported, and while I think there are additional issues with one-year harvest deferrals that were not addressed (such as ignoring leakage), I hope that the recommendations and concerns expressed in their comment submissions to Verra are heeded.
  - So, now you have the opinions of some real PhD's to consider, not just mine. I hope you find the material informative.

CARBONPLAN'S COMMENTS TO VERRA ON TON-YEAR ACCOUNTING

Verra Secretariat (by email) APR 08 2022

RE: Proposed updates to the VCS Program (February 2022)

Dear Verra Secretariat staff,

Thank you for the opportunity to comment on the Proposed Updates to the VCS Program.[1] Our comments focus on the proposed use of ton-year accounting, and are informed by recent research projects reviewing ton-year accounting and related permanence issues.[2]

For context, CarbonPlan is a non-profit research organization with expertise in climate science and carbon offsets. We actively publish our work in scientific journals and are engaged in the development and evolution of public and private standards for carbon markets. We are interested in ensuring the scientific integrity of market standards, including the validity of technical decisions that affect the permanence and additionality of credited carbon.

As explained further below, we are concerned about the potential adoption of ton-year accounting across Verra's VCS Program. Fundamentally, ton-year accounting is physically inconsistent with net-zero climate goals that seek to stabilize planetary temperatures. We urge Verra to reconsider the proposed adoption of ton-year accounting methods, as this approach opens the door for carbon offsetting practices that significantly increase long-term temperatures and are incompatible with net-zero climate goals.

If Verra decides to proceed with ton-year accounting, then Verra should (1) develop safeguards on a methodology-by-methodology basis to address novel additionality risks introduced by the ton-year accounting option, and (2) retain the proposed conversion rate to translate temporary carbon storage into carbon credits and ensure that no methodologies or projects deviate from this fixed parameter. Verra should also (3) clearly indicate that credits issued to short-duration projects are not consistent with canceling out the effects of ongoing CO_2 pollution.

1 Verra, Proposed Updates to the VCS Program (Feb. 7, 2022) (hereinafter "Proposed Updates") (proposing to modify Verra's VCS Standard v4.2 (Jan. 20, 2022) (hereinafter "VCS Standard")); see also Verra, Additional Background Information on Tonne-Year Accounting (Apr. 1, 2022) (hereinafter "Additional Background").

2 Freya Chay et al., Unpacking ton-year accounting, CarbonPlan (Jan. 31, 2022); Bodie Cabiyo & Alex Dolginow, Accounting for Short-Term Durability in Carbon Offsetting, Carbon Direct (Feb. 28, 2022).

CARBONPLAN'S COMMENTS TO VERRA ON TON-YEAR ACCOUNTING

Section 4.3, Question 1. What concerns do you have about the introduction of tonne-year accounting as an alternative approach to non-permanence risk within the VCS Program?

We have two significant concerns with the proposed adoption of ton-year accounting.

Issue 1: Ton-year accounting is inconsistent with net-zero climate goals and global temperature stabilization. Issuing offset credits based on ton-year accounting is inconsistent with the physical climate outcomes required for net-zero climate goals and global temperature stabilization. Ton-year accounting asserts that temporary carbon storage is equivalent to the permanent effects of CO_2 emissions based on a peculiar physical criterion: when the cumulative radiative forcing of CO_2 emissions is balanced out by an equal reduction in radiative forcing brought about by temporary CO_2 storage.

Critically, this equivalence concept ignores temperature and is thus inconsistent with climate-stabilization outcomes. Global temperatures are highly responsive to the amount of CO2 in the atmosphere.[3] If temporary carbon storage is used to offset emissions, post-storage temperatures reflect both the offset emission and the carbon emitted at the end of its temporary storage period — as well as a reduced rate of uptake in natural sinks during the temporary storage period. As a result, the system stabilizes at a higher temperature and leads to larger long-term climate impacts. These impacts must be taken into account to properly measure the value of temporary carbon storage, but they aren't included in ton-year accounting methods.

To illustrate the problem, we modeled the temperature outcomes of carbon offsetting based on Verra's proposed ton-year methods. Specifically, Verra's proposal would award partial credits for each year a ton of CO_2 is stored outside the atmosphere based on a "conversion rate" of 100:1.[4] In other words, Verra calculates that over a 100-year time period, 100 tons of CO_2 stored for 1 year is equivalent to 1 ton of CO_2 emissions. Figure 1 shows the temperature outcome of offsetting 1 $GtCO_2$ of emissions with a 10-year carbon storage project credited under Verra's proposed ton-year accounting method (green line).

4 Proposed Updates at § 4.2 (proposing to add ton-year accounting with a conversion rate of 100:1 to VCS Standard at § 3.14.4). For convenience, we note that CarbonPlan has elsewhere referred to what Verra calls a "conversion rate" as an "equivalence ratio." Freya Chay et al., supra note 2.

3 M.U.F. Kirchbaum, Temporary carbon sequestration cannot prevent climate change, Mitigation and Adaptation Strategies for Global Change 11: 1151–64 (2006).

CARBONPLAN'S COMMENTS TO VERRA ON TON-YEAR ACCOUNTING

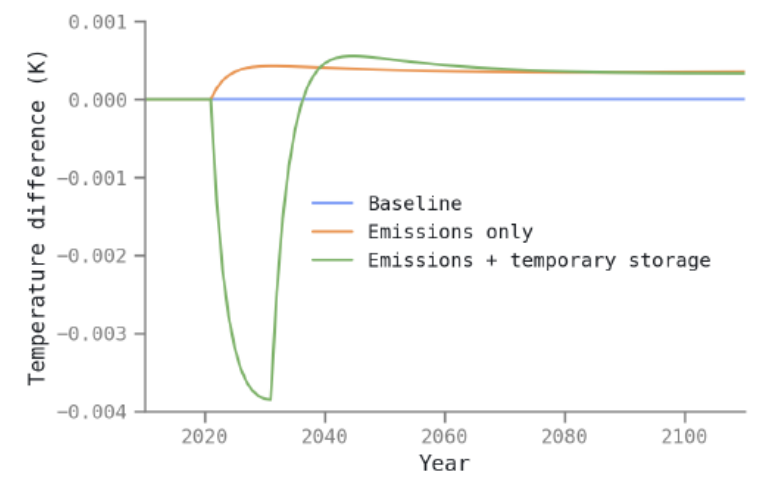


Figure 1: Temperature impacts of CO_2 emissions and temporary CO_2 storage.5 Carbon offsetting based on Verra's proposed ton-year accounting method (green line) can produce initial temperature benefits, but leads to higher emissions relative to a baseline scenario (blue line). The long-term temperature impacts resemble those of an emissions scenario where no offsetting occurs (orange line).

Because Verra's proposed 100:1 conversion rate requires a 10-year project to store 10 times the CO_2 emitted, the offsetting scenario (green line) initially leads to a significant but temporary reduction in temperature. When the temporarily stored CO_2 is released after 10 years, however, temperature increases and briefly exceeds the emissions-only scenario (orange line). Although Verra's methods suggest that ton-year offsetting neutralizes warming, the long-term effect is essentially identical to the effect of initial emissions (orange line) and substantially higher than the baseline scenario (blue line). If Verra's assertion about physical equivalence were consistent with temperature stabilization, we would instead expect the green and blue lines to be similar.

5 We implemented these scenarios using the FaIR climate model. See Christopher J. Smith et al., FAIR v1.3: A simple emissions-based impulse response and carbon cycle model, Geoscientific Model Development 11: 2273-97 (2018); Richard J. Millar et al., A modified impulse-response representation of the global near-surface air temperature and atmospheric concentration response to carbon dioxide emissions, Atmospheric Chemistry and Physics 17: 7213-28 (2017). We used the SSP2-4.5 emissions scenario as the baseline scenario for our calculations (blue line). The emissions-only scenario assumes 1 $GtCO_2$ emitted in 2020 and no further changes (orange line). The 10-year temporary storage project scenario assumes 1 $GtCO_2$ emitted in 2020 and 10 $GtCO_2$ stored from 2020 through 2029 and emitted in 2030 (green line).

CARBONPLAN'S COMMENTS TO VERRA ON TON-YEAR ACCOUNTING

We are mindful that these concerns have ramifications for other temporary carbon storage projects. We also appreciate that temporary carbon storage provides some benefits to the climate. Climate researchers have identified scenarios where temporary carbon storage can help reduce peak warming and delay climate impacts, for example, but those scenarios depend on temporary carbon storage augmenting climate mitigation and not being used as a justification for additional emissions via offset credits.[6]

We are concerned that ton-year accounting is being considered for offset crediting despite never having been stress-tested for net-zero climate targets. Ton-year accounting was developed in the late 1990s and early 2000s as a way to estimate the benefits of temporary carbon storage in forests and other natural ecosystems,[7] about a decade before the scientific literature began to recognize that net-zero greenhouse gas emissions are required to stabilize temperatures.[8] The method's history is relevant because ton-year accounting has only rarely been used in practice and has largely remained an academic abstraction. Its recent revival — including Québec's cap-and-trade program regulator,[9] the Climate Action Reserve's Mexico Forest Protocol[10] and Soil Enhancement Protocol,[11] and now NCX's proposal to use ton-year methods in Verra's program[12] — has come without any discussion of whether an old method is relevant in a world aiming for global net-zero emissions.

The value of temporary carbon storage ultimately depends on a number of critical factors that must be analyzed comprehensively[13] — notably the global emissions scenario, the extent and pace of future climate impacts, and highly normative decisions around economic discounting and distributional impacts. Ton-year accounting does not account for any of these complexities and is based, instead, on an oversimplification of physical climate science dynamics. Issuing offset credits based on conversion ratios derived from ton-year

6 H. Damon Matthews et al., Temporary nature-based carbon removal can lower peak warming in a well-below 2 °C scenario, Nature Communications Earth & Environment 3: 65 (2022).

7 IPCC Special Report on Land Use, Land Use Change, and Forestry (2000) at § 2.3.6.3 (reviewing the history of academic papers that developed ton-year methods in the mid-to-late 1990s).

8 See, e.g., H. Damon Matthews & Ken Caldeira, Stabilizing climate requires near-zero emissions, Geophysical Research Letters 35: L04705 (2008).

9 See Québec MELCC, Offset Credits. Québec has also proposed a new protocol that would use ton-year accounting.Québec MELCC, Draft offset credit regulation on afforestation and reforestation projects on private lands (Sept. 2020).

10 Climate Action Reserve, Mexico Forest Protocol Version 2.0 (Mar. 30, 2020).

11 Climate Action Reserve, Soil Enrichment Protocol Version 1.0 (Sept. 30, 2020) at 3.5.5. As of this writing, Indigo Ag, which sponsored CAR's protocol, has a very large project (CAR1459) that is in the initial process of crediting and has opted out of the ton-year accounting option.

12 Verra, Methodology for Improved Forest Management through Targeted, Short-Term Harvest Deferral (Mar. 17, 2021) (developed by NCX).

13 See, e.g., Ben Groom & Frank Venmans, The social value of offsets, working paper (Dec. 16, 2021).

CARBONPLAN'S COMMENTS TO VERRA ON TON-YEAR ACCOUNTING

accounting does not indicate progress toward net-zero goals and may even lead to counterproductive outcomes that increase global temperatures.

Issue 2: Ton-year accounting introduces novel additionality concerns that require methodology-specific mitigation standards.

The additionality standard requires projects to demonstrate that their credited climate benefits occur in addition to business-as-usual expectations, i.e. that credited emission reductions would not occur in the absence of the credit's financial incentive. According to VCS program rules, additionality must be "demonstrated and assessed in accordance with the requirements set out in the [crediting] methodology applied to the project."[14]

We strongly recommend Verra foreclose the option to use ton-year accounting with crediting methodologies that were not explicitly designed to address the novel additionality risks created by ton-year accounting. These risks are significant enough in their own right when it comes to methodologies that are designed primarily around ton-year accounting. What Verra is proposing, however, goes far beyond that. Verra's proposal includes the option for any project to petition Verra to use ton-year accounting under any methodology.[15] This is a problem because additionality risks vary depending on offset methodologies' crediting periods. As a result, protections designed for an existing methodology with a crediting period of 40 years might be wholly inadequate for a ton-year methodology based on 1-year crediting periods.

As proposed, ton-year accounting creates unique additionality risks because it gives projects the option to exit their carbon commitments on an annual basis. Specifically, projects could be issued credits on an as-you-go basis with a renewable crediting period of one or more years.[16] Projects electing ton-year accounting can choose to end the crediting period at any time with no penalty and do not have to make contributions to buffer pools.[17] Giving projects the ongoing option to exit their carbon commitments creates multiple, novel additionality risks. Additionality depends on complex real-time market dynamics and can be gamed when projects can opt in or out of crediting. For example, imagine a forest project with mature timber that has decided to defer harvest until market prices recover from an unexpected crash. With ton-year accounting, this project could receive

14 VCS Standard at § 3.13.1.

15 Proposed Updates at § 4.2 (proposing to add VCS Standard § 3.14.4).

16 Proposed Updates at § 4.2 (proposing to update the crediting period in VCS Standard § 3.8.7). Crediting periods can be renewed up to 100 years. Id.

17 Proposed Updates at § 4.2 (proposing to add VCS Standard § 3.2.20).

CARBONPLAN'S COMMENTS TO VERRA ON TON-YEAR ACCOUNTING

non-additional credits over a flexible time horizon while it waits for more favorable market conditions to conduct its business-as-usual harvest plans. Alternatively, consider a forest project with a 40-year harvest cycle. Using ton-year accounting, this project could claim credits during its natural regrowth cycle without having to make any changes to long-term carbon stocks or change business-as-usual harvesting intentions. Because today's crediting methodologies are based around a minimum 20-year crediting period,[18] the possibility that projects would opt in and opt out of crediting on much shorter time horizons is not addressed — but would become an explicit additionality risk under ton-year accounting.

Additionality risks also depend on interactions between program rules and crediting methodologies. Although the Proposed Update includes potential changes to program rules that have direct ramifications for the additionality of ton-year accounting projects, the Proposed Update does not appear to contemplate how these changes might encourage non-additional crediting under ton-year methods. For instance, the VCS Standard contains a requirement that individual projects increase the total size of the terrestrial carbon sink by crediting the project in the context of its long-term harvest dynamics.[19] If ton-year projects were exempted from this requirement — as Verra appears to be contemplating[20] — then the additionality risk currently addressed by this requirement would need to be resolved by another, as-of-yet-unspecified mechanism.

Similarly, additionality risks depend on the rules governing when landowners can cycle in and out of credited projects. Under Section 5 of the Proposed Updates, landowners who were previously credited with ton-year accounting are allowed to move between projects and have gaps between leaving one project and starting in another. This could exacerbate the additionality concerns outlined above by allowing cyclical, non-additional crediting patterns that take advantage of business-as-usual harvesting and timber market dynamics.[21]

Because ton-year accounting offers projects the flexible option to exit carbon commitments on an annual basis, it creates new opportunities for projects to earn credit for business-as-usual behaviors. These risks must be addressed with methodology-specific additionality standards. Projects using methodologies that were not explicitly designed to address the additionality risks of ton-year accounting should not be allowed to use ton-year accounting.

18 VCS Standard at § 3.8.3.

19 VCS Standard at § 3.2.

20 See our comments below on Section 4.3, Question 2 for details.

21 See our comments below on Section 5.3, Question 1 for details.

CARBONPLAN'S COMMENTS TO VERRA ON TON-YEAR ACCOUNTING

Section 4.3, Question 2. What concerns do you have with the proposed conversion rate of 100 tonne-years to one tonne? What do you think would be a more appropriate conversion rate, and why would this be more appropriate than 100 to 1?

The proposed 100:1 conversion rate should not be reduced. The current rate is appropriate for asserting a balance in cumulative radiative forcing over 100 years. A lower conversion rate would be inconsistent with the stated goal of balancing cumulative radiative forcing over 100 years, and a higher conversion rate is required to balance cumulative radiative forcing over a period longer than 100 years.

We believe the choice of conversion rate should be based on climate modeling that substantiates a ton-year method's claim of balancing cumulative radiative forcing. Using the FaIR climate model to balance cumulative radiative forcing, we calculate a conversion rate of about 104:1.[22] The correspondence between Verra's proposed conversion rate (100:1) and our climate-model-based calculation (about 104:1) suggests that Verra's proposal is reasonably well aligned with the goal of balancing cumulative radiative forcing over 100 years. We note, however, that the modeled conversion rate depends on the choice of global emission scenarios and can range from 82:1 to 121:1.[23]

Again, however, we stress that ton-year accounting is not consistent with net-zero climate goals or global temperature stabilization. It is also important to observe that Verra's choice of a 100-year time horizon excludes consideration of all subsequent warming impacts. A higher conversion rate is needed to justify physical equivalency claims that extend beyond 100 years.

We also want to address two alternative methods for choosing a conversion rate that should not be adopted, either in the present consultation or as an option for future methodologies.

First, some stakeholders have proposed introducing economic discounting concepts into the calculation of a conversion rate. NCX's recent white paper, for example, introduces a discount rate that reduces the reported ton-year impacts of emission scenarios over time. As a result of discounting, NCX calculates a conversion rate of 30.1:1 for a 100-year time horizon and only

22 Specifically, we calculated a conversion rate by equalizing the cumulative radiative forcing over a 100-year period between an initial emissions pulse and a 1-year delay in emissions. As in Figure 1, we used the SSP2-4.5 emissions trajectory. We note that conversion rates derived from the FaIR climate model are sensitive to different emission scenarios. See Christopher J. Smith et al., supra note 5; Richard J. Millar et al., supra note 5.

23 The modeled conversion ratio for a 1-year delay in emissions with a 100-year time horizon is 82:1 for SSP1-1.9 (a deep emissions scenario) and 121:1 for SSP5-8.5 (a high emissions scenario).

CARBONPLAN'S COMMENTS TO VERRA ON TON-YEAR ACCOUNTING

30.8:1 for an infinite time horizon.[24] This approach is inappropriate because discounting radiative forcing calculations invalidates any claim to physical equivalency, including the claimed equivalency under Verra's proposal.[25] Decisions about discounting and time horizons should be made separately from physical equivalency assertions,[26] not co-mingled in ways that are all but certain to confuse market participants.

Second, in addition to the "Lashof" method on which Verra's proposal is based, a distinct approach known as the "Moura Costa" method exists and should not be used.[27] The Moura Costa method does not address the atmospheric impacts of emitting CO_2 after temporary storage. As a result, the Moura Costa method can produce the obviously absurd result that temporarily storing 1 tCO_2 justifies the emission of more than 1 tCO_2.[28]

Section 4.3, Question 3. Should [Afforestation, Reforestation and Revegetation] ARR and [Improved Forest Management] IFM projects using tonne-year accounting be exempt from the long-term average requirements outlined in Section 3.2 of the VCS Standard?

No. Section 3.2 of the VCS Standard is designed to ensure that individual projects increase the total size of the terrestrial carbon sink by crediting the project in the context of long-term harvest dynamics. Absent these safeguards, ton-year accounting could allow significant non-additional crediting of business-as-usual forest regrowth.

In many ways, Section 3.2 of the Verra Standard anticipates the additionality concerns surrounding ton-year accounting that we raise above. Like ARR and IFM projects that include timber harvesting, ton-year accounting can only be successful if it takes into account harvest dynamics to ensure the additionality of credited carbon. In the absence of these protections, projects could enroll business-as-usual land management activities in ton-year accounting and earn credit for non-additional carbon storage leading up to planned harvest activities.

24 Zack Parisa et al., The Time Value of Carbon Storage, Research Square preprint (Mar. 16, 2022).

25 Danny Cullenward et al., A critique of NCX's accounting methods, CarbonPlan (Jan. 31, 2022).

26 Liz Marshall, Biofuels and the Time Value of Carbon: Recommendations for GHG Accounting Protocols, World Resources Institute (2009); Kenneth R. Richards, The time value of carbon in bottom-up studies, Critical Reviews in Environmental Science and Technology 27: 279-92; Ben Groom & Frank Vehnman, supra note 13.

27 Verra, Additional Background, supra note 1.

28 Freya Chay et al., supra note 2 (see Table 1).

CARBONPLAN'S COMMENTS TO VERRA ON TON-YEAR ACCOUNTING

To reduce the risk of these outcomes, Verra should retain the long-term average requirements in its current Standard, including the calculation and reporting of historical harvest/cutting cycle lengths in Section 3.2.3.21. Section 3.2 should also be expanded to prohibit the use of ton-year accounting to credit carbon stored in ARR and IFM projects when the trees are younger than the historic harvest/cut cycle. This would have the effect of prohibiting business-as-usual timber regrowth cycles from earning offset credits that are highly likely to be non-additional.

Section 4.3, Question 4. How should situations where partial credits are generated be handled? Should Verra allow projects to carry over excess tonne-years to the next verification period?

We have no objection to carrying partial credits forward, so long as the total number of credits issued never exceeds verified historical quantities.

Section 4.3, Question 5. What further clarifications on using tonne-year accounting do you think are needed?

The Proposed Updates define a ton-year as "[a] metric tonne (MT) of CO_2 stored for one year that approximates the radiative forcing that the tonne of CO_2 would have had in the atmosphere over a single year."[29] We believe this definition should be clarified to avoid potential misunderstandings.

In our view, a ton-year is an arbitrary but potentially useful way to refer to a combination of mass and time. Technically, ton-year accounting methods balance impacts denominated in ton-years — not cumulative radiative forcing. When a ton-year accounting method uses an impulse response function to calculate ton-years (as the Lashof method[30] does), it is true that ton-year calculations approximate radiative forcing calculations.[31] However, there is nothing about ton-year units that necessarily approximates radiative forcing. This is clearly demonstrated by the Moura Costa method, which balances impacts denominated in ton-years but produces physically inconsistent claims from the standpoint of radiative forcing.

Because ton-year units may have separate utility in climate accounting, we suggest defining a ton-year in the VCS Program Definitions simply as "[a] metric tonne (MT) of CO_2 stored for one year," as Verra has elsewhere in its explanatory materials.[32]

29 Program Updates at § 4.2 (proposing to expand the VCS Program Definitions).

30 Philip M. Fearnside et al., Accounting for time in mitigating global warming through land-use change and forestry, Mitigation and Adaptation Strategies for Global Change 5: 239-70 (2000).

31 Freya Chay et al., supra note 2.

32 Verra, Additional Background, supra note 1.

CARBONPLAN'S COMMENTS TO VERRA ON TON-YEAR ACCOUNTING

Section 5.3, Question 1. What concerns do you have with the proposed clarifications?

The revisions proposed under Section 5 of this consultation clarify that landowners would be allowed to move between offset projects and, if credited with ton-year accounting, to have gaps between leaving one project and joining another.[33] Without safeguards — such as those we recommend strengthening in Section 3.2 of the VCS Standard, in response to Question 3 in Section 4.3 of this consultation — this optionality could pose significant risks to the additionality criteria of the Verra Standard.

For example, imagine a landowner with industrial timberlands scattered throughout the American South, all in various age classes and managed on rotation lengths of about 30 years. The ability to indiscriminately enroll and un-enroll segments of that acreage could invite significant arbitrage opportunities, whereby the owner could enroll soon-to-be harvested parcels that they technically could harvest, but would not typically harvest until the trees were slightly older. To continue our example, the landowner might enroll trees in year 20 or 25 of their rotation. After collecting ton-year-based payments for a few years, they could un-enroll their land, execute their planned business-as-usual timber harvests, and, during the course of the next harvest cycle, re-enroll the land for additional carbon payments. Such a scenario could continue in perpetuity and would result in no additional carbon storage, but could nevertheless generate credits under a ton-year accounting approach.

It is unreasonable, if not impossible, to fully grasp how flexible enrollment and ton-year accounting might interact across all of Verra's methodologies. Because ton-year accounting presents significant and novel additionality risks, including as a result of landowners (or "instances") moving in and out of projects, ton-year accounting should only be allowed — if at all — under methodologies that were explicitly designed to address these risks.

Thank you for the opportunity to submit comments.

Danny Cullenward, JD, PhD, Policy Director, danny@carbonplan.org

Freya Chay, Program Associate, freya@carbonplan.org

Grayson Badgley, PhD, Research Scientist, grayson@carbonplan.org

33 Proposed Updates at § 5.2 (proposing to add explicit flexibility for "instances" using ton-year accounting to leave and join different offset projects in VCS Program §§ 3.5.5 and 3.5.16).

SECTION 3:

IN CASE YOU MISSED IT

JIM HOURDEQUIN'S BLOOMBERG INTERVIEW

Jim Hourdequin's post on LinkedIn following the publication of the Bloomberg article on Forest Carbon:

Many are reacting to the recent profile of me and Lyme Timber in Bloomberg. I am pleased that Bloomberg is reporting on the challenges and opportunities facing the market for forest carbon offsets. While the sensationalist headline did not accurately reflect the substance of the article, my views on evolving carbon markets were generally represented. However, I was disappointed that the reporter did not describe the many ways in which the carbon protocols have evolved over the years as feedbacks from early forest offset projects were studied and evaluated. One important example is that the current protocol requires the terms of any conservation easement to be factored into project baselines, and additionality can only be claimed with respect to increases in carbon stocks "beyond what has already been agreed to through a working forest conservation easement." This means that the example from the article of our first carbon project in Tennessee would no longer be permissible under the protocol.

One of my objectives in agreeing to be interviewed was to point out that progress has been made since 2011 and to support the further evolution of forest carbon offset markets.

I should also note that the 200,000+ acres that Lyme has enrolled in carbon sequestration projects are subject to strict, enforceable limitations on timber harvesting for over 100 years and are binding on future owners. These forests will remain conserved and carbon stocks must be maintained even if strong log markets make it financially advantageous to increase harvest levels and thereby reduce carbon stocks. The buyers of offsets from these compliance projects are purchasing credits that meet all the requirements of the protocols, and they are doing so in good faith as part of their compliance and/ or internal commitments. They have contributed meaningfully to the long-term conservation of sustainably managed forestlands and helped to ensure that current, above baseline standing carbon stocks are maintained for 100 years.

While I believe there is room for improvement in the regulatory mechanisms for forest carbon, I applaud the registries, regulators, and offset buyers who are working to sharpen the tools by which carbon markets create meaningful and durable climate benefits. We are all served by ensuring that carbon markets deliver meaningful, additional climate benefits to society.

JIM HOURDEQUIN'S BLOOMBERG INTERVIEW

This Timber Company Sold Millions of Dollars of Useless Carbon Offsets

Ben Elgin 17 Mar 2022

(Bloomberg) -- Jim Hourdequin is one of the planet's biggest sellers of carbon offsets—the widely used instruments that are supposed to act as a balm for the rapidly overheating climate. His company earned $53 million from these environmental transactions over the past two years.

But now the 47-year-old timber executive is calling out the entire system, including some of his own projects, as broken and shortchanging the climate. Although critics for years have revealed how carbon markets fail to deliver their intended climate benefits, Hourdequin is likely the first major industry participant to admonish the market from the inside. By speaking out, he says, he hopes he can help repair the flawed system: "We don't think that forest carbon markets can survive and grow if they do not deliver real climate value."

As the chief executive officer of privately held Lyme Timber Co., a $1.2 billion investment company in Hanover, N.H., Hourdequin manages 1.5 million acres of U.S. forests (roughly the size of Delaware). Even before the recent boom in timber prices, Lyme generated most of its revenue from chopping down trees. But over the past decade, it began selling credits for the planet-warming carbon that some of its forests soaked up. Today, Lyme sells carbon credits on about 220,000 acres, or 15% of its land.

Forest owners can't sign up all their trees for carbon payments. Each credit is supposed to represent 1 ton of carbon dioxide that's been absorbed because of a change in behavior triggered by the promise of carbon payments. So a forest owner might scale back planned timber harvests or plant seedlings on otherwise barren lands. Buyers of the credits (usually large corporations) then subtract those carbon savings from their emissions ledgers, because, in theory, their payments caused this carbon reduction to happen.

On a gray December afternoon, sitting in a café in Berkeley, Calif., where he's traveled after checking in on some of Lyme's West Coast operations, Hourdequin inhales a sandwich before expounding on carbon credits. With a thin, wiry build, deep-set blue eyes, and a baseball cap atop his receding, closely cropped brown hair, he looks as if he'd be comfortable trekking for miles through backcountry forests. He perks up when talking about financial models and occasionally slips into the vernacular from his days at Harvard Business School. ("I'm a real stickler for structured analysis," he likes to explain.)

The problem with carbon markets, he says, is that weak rules have created strong incentives for landowners to develop offset projects that don't actually change the way forests are managed, and therefore do little to help the climate. Most forest carbon projects, including some from Lyme, fall into this category, Hourdequin says. "I believe in being intellectually honest about it," he says.

JIM HOURDEQUIN'S BLOOMBERG INTERVIEW

Take Lyme's first carbon project, which it developed a decade ago in mountains east of Nashville. When the company acquired a huge swath of land there in 2007, it agreed to sell a restrictive easement to the state of Tennessee on almost 5,000 acres. This restriction barred Lyme from doing any timber harvesting, and it protected the habitat of several vulnerable species, including the cerulean warbler, a sky-blue songbird.

When a carbon project developer informed Lyme several years later that it could sell carbon credits on the already protected land, Hourdequin could scarcely believe it. After all, the company had already been compensated to safeguard the forest. It was legally prohibited from cutting any of the trees. Any carbon revenue it received would have zero impact on the atmosphere. "We kind of scratched our heads and said, 'Really? You can do this?' " Hourdequin says.

In fact, they could. And it was quite common. The project was enrolled in California's carbon market, which requires polluters in the state to shrink their emissions and allows them to purchase offsets—including from out-of-state projects, such as Lyme's in Tennessee—to achieve some of their reductions. Chevron Corp., which operates several oil fields and refineries in California, purchased more than 20,000 of Lyme's Tennessee credits to meet its requirements. This means some of Chevron's pollution cuts are, in fact, fictitious. (Chevron declined to comment.)

The brisk sales of meaningless offsets is leading to widespread claims of climate progress that isn't actually happening. As Bloomberg Green previously reported, environmental groups such as the Nature Conservancy and the National Audubon Society have sold credits for protecting trees that weren't in danger of being harvested, leading to misleading claims of emissions reductions by Walt Disney Co., JPMorgan Chase & Co., and other companies. Meanwhile, North America's largest carbon reforestation project, GreenTrees, has sold credits for trees that were already planted through government programs, sometimes more than a decade earlier, resulting in inflated carbon reduction claims by Bank of America Corp. and many others. (The Nature Conservancy, Audubon, and GreenTrees all said their projects followed the market's rules, while Disney, JPMorgan, and Bank of America each declined to comment.) "There's a distinct possibility that a great deal of existing carbon offsets are effectively fake," says Robert Mendelsohn, professor of forest policy and economics at Yale.

Hourdequin isn't the only one who sees that the market is at a crucial inflection point. Kyle Harrison, who closely tracks carbon offsets as the head of sustainability research for BloombergNEF, a clean energy research group, published a report in January that offered wildly divergent scenarios for offsets. If the market undergoes substantial improvements, delivers higher-quality projects, and fetches higher prices, it could soar to $190 billion in value by 2030. But the offsets industry could also wither away and die without substantial changes. "The current design of the voluntary carbon market is doomed to fail," Harrison wrote.

JIM HOURDEQUIN'S BLOOMBERG INTERVIEW

Hourdequin is fully aware that there are downsides to speaking out. By essentially admitting the company has abetted corporate greenwashing and undermined efforts to tackle climate change, he exposes Lyme to criticism and risks losing business from offset buyers, who may prefer to purchase credits from forest owners who stubbornly insist their projects are exemplary.

"The spouting whale gets the harpoon," Hourdequin acknowledges. But he says a transformation can't happen without an honest self-appraisal. His hope is that the market will tighten its rules and force landowners to change their behavior so they can deliver true carbon savings. If this happens, he expects carbon prices to soar and companies such as Lyme to start managing forests for the value of carbon as much as they do for timber.

"I want carbon offsets to be respected as a solution," Hourdequin says. "The future of this market is going to be about behavior change. We're all going to have to design projects that are going to actually change practices and remove CO_2 from the air."

As an undergrad at Dartmouth College, Hourdequin spent a lot of time beneath the canopies of forests. He studied ecology and evolutionary biology and spent several summers building trails in New Hampshire's White Mountains. When it came time to write his senior thesis, he examined how young stands of northern spruce fir regenerate. After college he started a logging company with two partners. "Cutting up trees with chainsaws and actually managing forests was a much more exciting endeavor than research," he says.

Hourdequin joined Lyme after finishing business school in 2005, and he took over as CEO in 2016. When the company began exploring its first carbon deal in Tennessee a decade ago, the market was in its infancy. And in some ways, the requirements seemed daunting. For the next century, Lyme would need to pay tens of thousands of dollars every six years to have foresters come and measure a sampling of its trees to quantify how much carbon was being locked away. If Lyme ever sold the property, the requirements of the offsets deal would transfer to the new owner.

Hourdequin had no clue if these added obligations would torpedo the land's value. "We were basically scared out of our minds," he says.

He rationalized the project's lack of climate benefits as a necessary first step. "People thought these were the things that were needed to get this market started," Hourdequin says. "You've got to make it an easy win for the landowner to sign up for a 100-year obligation. Nobody really knew what they were getting into."

Lyme began developing a string of carbon projects. But Hourdequin was struck by how often they received large volumes of lucrative credits for creating few additional climate benefits.

One deal netted Lyme about $20 million for minor changes to a forest in West Virginia. After purchasing a huge hardwood forest there in 2017, it put together a carbon project on 47,000 acres of forbidding terrain. Some of the land is so rugged and steep, Hourdequin says, the trees can be extracted only by helicopter, which is prohibitively expensive.

JIM HOURDEQUIN'S BLOOMBERG INTERVIEW

Nonetheless, California's carbon market would pay Lyme handsomely to preserve these little-threatened trees. To entice landowners with richly stocked forests, California gives valuable upfront credits for these bigger-than-average trees. The landowner must then preserve this larger volume for a century—seemingly a win for the climate.

For Lyme, though, $20 million wasn't necessary to maintain this higher volume of trees, because it didn't make economic sense to cut them. "Society probably didn't need to pay us for that," Hourdequin says.

Lyme has since scaled back some of its harvests in West Virginia to collect higher annual carbon payments, which could help the atmosphere. But in total, the company has received credits for the property that vastly exceed the climate benefits.

Pacific Gas & Electric, Chevron, and PBF Energy, a petroleum refiner, have all purchased hundreds of thousands of credits from this West Virginia project to meet California's emission requirements. (PG&E and PBF also both declined to comment.)

Although the project has been a dud for the climate, Hourdequin strongly denies that Lyme is a profiteer. Even carbon projects with scant climate benefits can be expensive, he says. It costs money to measure the trees, and the carbon rules limit a company's ability to sell off or develop parts of the land. Landowners must also apply some of California's more stringent forestry rules to their carbon acreage, which can mean less fertilizer and smaller clear-cuts. These rules stick with the land for a century and lower its value. With carbon prices hovering around $10 to $13 per ton, Hourdequin says, the payments are far too low to cover both this lost value and any changes to how Lyme would manage its forests.

To get around these challenges, a budding industry of carbon project developers has worked shoulder to shoulder with landowners, including Lyme, to pinpoint the tracts of land that can generate the largest quantities of carbon credits for the smallest changes to the forest. This tactic deprives the atmosphere—and the public—by finding the biggest payout for the tiniest climate benefit.

Unfortunately the market is now awash in these types of projects, according to Grayson Badgley, who examines offset projects as a research scientist for the nonprofit CarbonPlan. "The way the market is currently constructed, it just does not promote quality," he says. "The atmosphere gets left holding the bag."

Last year, Hourdequin began tinkering with a simple idea to fix the market: Instead of looking for forests that can generate lots of offsets with few changes, what if this whole approach was flipped on its head? Start with honest-to-goodness carbon savings by planning to cut fewer trees and see how much it would cost to implement.

Hourdequin and his staff set to work, looking at a half-million acres of Michigan forestland it began acquiring in 2019. The previous owners had aggressively harvested the land. And Lyme was planning on a similar model.

JIM HOURDEQUIN'S BLOOMBERG INTERVIEW

Hourdequin asked: What if Lyme reduced the planned harvest by about 15% per year? His team spent days digging into their forest models and spreadsheets. They calculated that simply implementing the offset project—such as paying for measurement of the trees and restricting their ability to sell small parcels of the land—would cost about $30 per ton. Then the carbon benefits from cutting fewer trees would cost another $30 per ton. All told, it would require $60 per ton to set up an offset project that could have real climate benefits. Could they actually sell credits for that much?

Price signals from the $1 billion trade in offsets aren't promising. Ecosystem Marketplace, which tracks the industry, reported an average price last year of $3.37 per ton. Some buyers are willing to pay more—Microsoft Corp. says it averages $20 per ton, and Bill Gates spends $600 per ton to neutralize emissions from his private jet—but many others are paying less. Delta Air Lines Inc. declared itself carbon neutral last year after purchasing 13 million offsets at a cost of $30 million, or about $2.31 per ton.

Undaunted, Hourdequin pitched his idea to a forest industry conference in October, with a speech titled "You Get What You Pay For." He immediately got to the point, telling his audience of fellow forest managers that offsets weren't delivering on their promise. "It can be argued," he said, "that carbon markets have paid the landowner to not do what they were not going to do." He conceded that $60 per ton was "substantially out of market," but, in effect, he was challenging the industry to raise its standards.

The speech didn't make waves. A recording on YouTube has garnered only about 100 views. A handful of attendees sent Hourdequin polite messages afterward, expressing agreement.

But carbon market observers hold out hope that a major seller of carbon credits such as Hourdequin could help push the market toward improvement. "Our belief is that transparency is good," says Matthew Potts, chief science officer at Carbon Direct, which advises companies on carbon reduction strategies. "It's nice that producers of projects are speaking out."

Big offset buyers haven't exactly jumped at Lyme's new $60 credits. The company pitched its project to a major bank, which Hourdequin won't identify. The bank declined. Hourdequin then discussed the idea with a couple of large tech companies. One praised his speech and expressed an interest in future collaboration, but both companies have thus far demurred.

Even if Hourdequin were to find buyers at $60 per ton, it's not clear that Lyme's new approach to offsets would be good enough. Reducing harvests on working timberlands could cause another landowner somewhere else to cut more trees to fill the demand for lumber, a phenomenon known as "leakage." Various carbon market rules try to address this by docking the number of credits granted to certain forest projects by anywhere from 10% to 40%. But many experts say the actual leakage rate is much higher.

JIM HOURDEQUIN'S BLOOMBERG INTERVIEW

"If somebody in Topeka wants to build a deck, they're buying those two-by-fours from somewhere," says Michael Raynor, a managing director at Deloitte Services LP. (Hourdequin agrees that leakage is a major issue that hasn't been adequately sorted out, but he says harvest reductions can still have a positive climate impact.)

Lyme isn't the only outfit exploring different ideas to improve carbon offsets. The Science-Based Targets initiative, considered the gold standard of carbon reduction efforts, published guidance in October that urged companies to limit offsets to projects that actually remove heat-trapping gases from the atmosphere. This kind of project would include new tree plantings and machines that pull CO_2 out of the air. While the initiative is seeking to tighten the pool of credible offsets, it hasn't yet defined whether projects such as Lyme's would make the cut. Meanwhile, the Taskforce on Scaling Voluntary Carbon Markets, an initiative launched in 2020 by United Nations climate envoy Mark Carney, recently spun out an integrity council, which says it will produce tools to help assess the credibility of offset projects later this year.

Pachama Inc., a carbon technology company, has been working for two years to write a new carbon protocol, which it says will use satellite data and machine learning to better quantify a project's true climate benefits. The startup claims this protocol will more accurately compare different types of landowners, closing loopholes used by projects today to inflate the number of credits they receive. Deloitte, meanwhile, is developing types of offset transactions that it says could funnel large sums of money to quality reforestation projects.

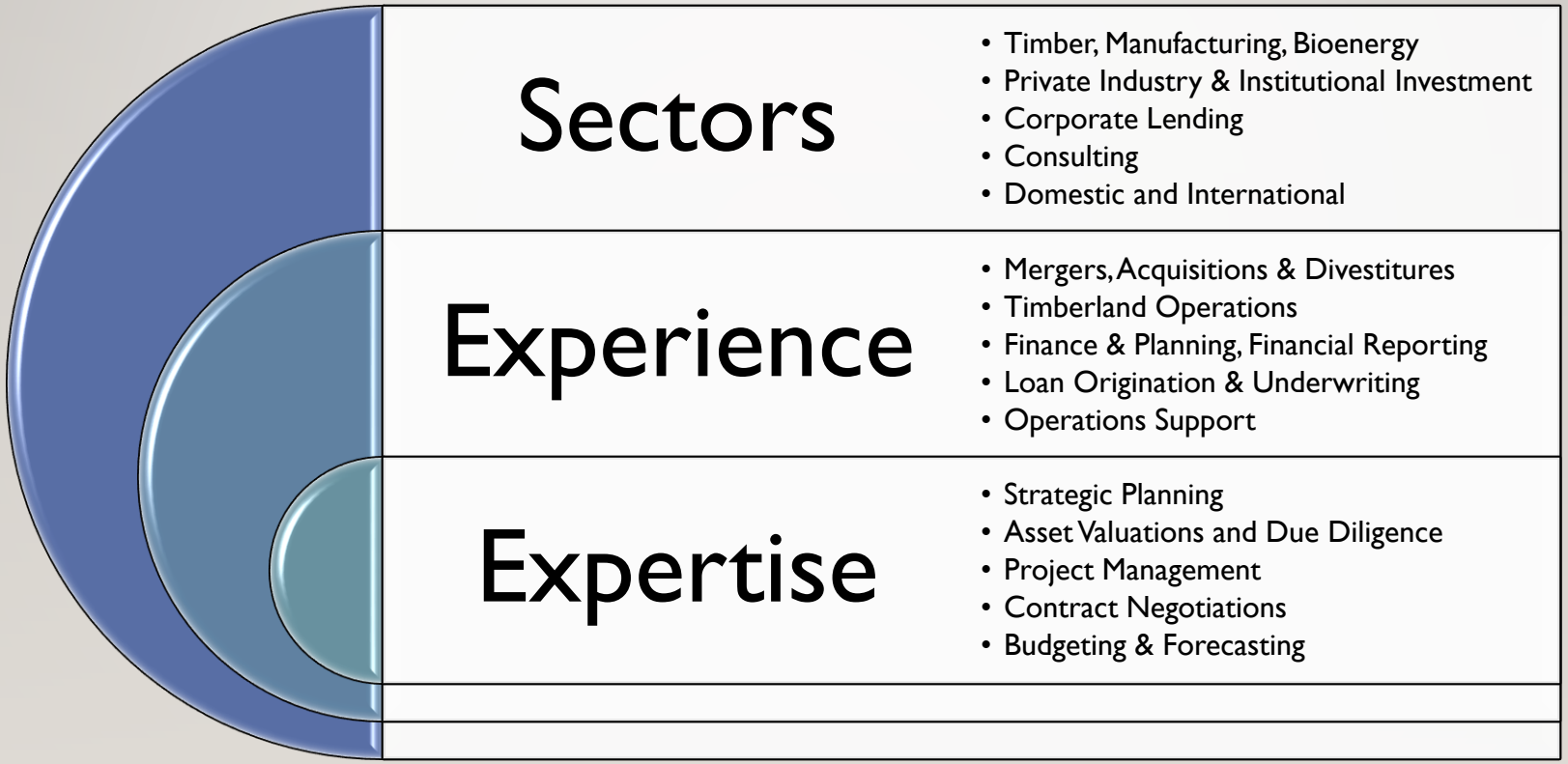
It's too soon to tell whether any of these new initiatives will improve the market. But a key first step, Hourdequin says, is honestly taking stock of how carbon projects have performed. "Ten years into this market, I think it's fair to be asking whether these projects are delivering climate mitigation," he says. "If they're not, it's fair to begin demanding that they do."

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

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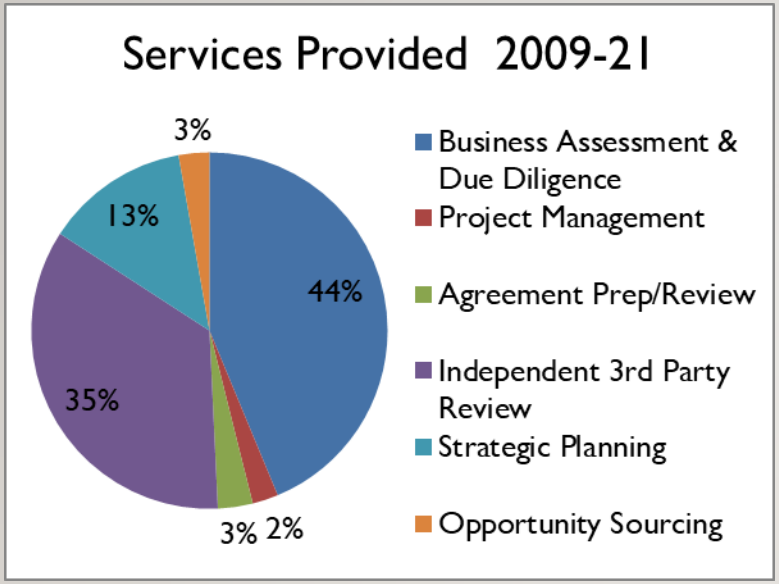
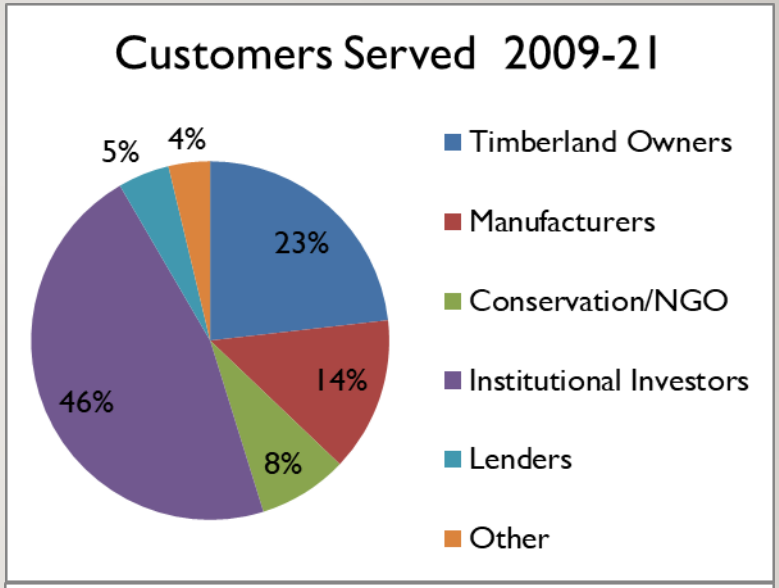
- Evaluate Existing or Proposed Agreements or Easements
- Interpret Annual Management Plans & Appraisals
- Examine Proposed Transfers of Ownership
- Review Divestiture Timing & Strategies
- Track Investment Performance

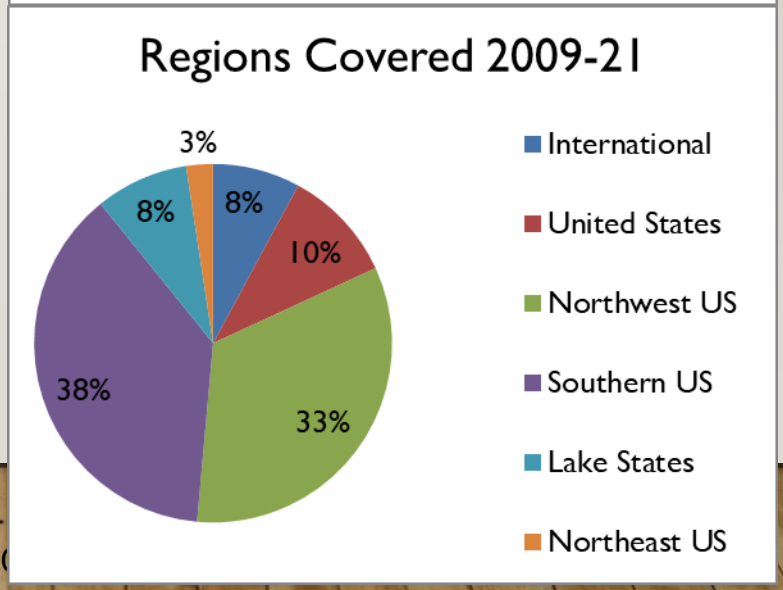
Institutional Investor Services

ENGAGEMENT PROFILES





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



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

William E. Sonnenfeld, Principal

WillSonnAdv@outlook.com
Cell: (206) 445-2980

PO Box 4706
Rollingbay, WA 98061-0706