Department of Natural Resources

Economic & Revenue Forecast

Fiscal Year 2023, Third Quarter
February 2023

Forecast Summary

Lumber and Log Prices. Lumber prices have been exceptionally volatile throughout the past three years. In 2021, prices peaked at around $1,600/mbf in May, then plummeted to a low of $414/mbf in August (West Coast standard or better 2x4, Douglas-fir/Hemlock). Prices rebounded over the next several months to peak at $1,400/mbf in March 2022, but again fell dramatically to $640/mbf in August. Since then, prices have continued to decrease and were around $440/mbf in December 2022. Prices are expected to remain above $400/mbf — the average price for several years prior to 2019 — and are unlikely to rise again until late in the calendar year at the earliest. Obviously, there is still meaningful downside risk to prices.

High lumber prices appear to have pulled up log prices, with the price of a "typical" DNR log rising from a low of $500/mbf in April 2020 to peak at $720/mbf in April 2021. Prices then softened to a trough of $600/mbf in October 2021, before increasing again to peak at $790/mbf in July 2022. However, the decline in lumber prices hasn't pulled log prices down as much. July log prices seem to have been the peak, with prices falling to a range between $690/mbf and $730/mbf from August to December. This is still meaningfully higher than the $580/mbf average from 2015-2019.

Timber Sales Volume. DNR currently plans to offer around 530 mmbf for sale in FY 23. Building in likely no-bids and sales falling off for various reasons, our sales volume forecast is unchanged at 500 mmbf for FY 23 and outlying years.

Currently, there is no expectation that the timber sales program will be able to recoup the sales delayed in FY22. Additionally, it is possible that future forecast volumes will be reduced due to the Department's Carbon Project, which will remove 10,000 acres of forest land from the planned harvest schedule and instead generate revenue through carbon offsets. However, the current 500 mmbf forecast in outlying years is typically quite conservative, so it is also possible that the new program will have no meaningful effect on the forecast sales volumes.

Timber Sales Prices.

The forecast timber sales prices are increased to $380/mbf for FY 23. Sales prices have averaged $412/mbf through the January auction — a $380/mbf forecast is on the lower end of a reasonable middle ground, reflecting both the continued strength of prices and the likely decline in prices due to slower housing construction and some lower value timber expected in the latter half of the fiscal year. The outlying years' forecast prices are unchanged at the long-term average of $350/mbf.

Timber Removal Volume and Prices.

The removal volume forecast for FY 23 is decreased to 500 mmbf (from 510 mmbf) due to slower than expected harvests in the first half of the year. Outlying years' forecast volume removal is unchanged.

Removal prices are increased slightly in FY 23. Removal prices in outlying years are increased more substantially due to both higher sales prices to-date (leading to a higher value inventory) and the increase in the forecast sales price.

Timber Revenue. Timber revenue in FY 23 is reduced slightly due to lower timber harvests to date, while outlying years' revenue is increased due to the increase in the FY 23 forecast average sales price.

Timber revenues for the 2021-23 biennium are $358 million — around $7.0 million lower than previously forecast. Forecast revenues for the 2023-25 biennium are increased to $383 million — around $10.7 million higher than the previous forecast.

Non-Timber Revenues. In addition to revenue from timber removals on state-managed lands, DNR generates sizable revenues from managing leases on uplands and aquatic lands.

Forecast uplands revenue for FY 23 is decreased by $0.4 million due to lower irrigated agriculture revenue expectations more than offsetting an increase in minerals and hydrocarbon revenue. Forecast revenue in outlying years is unchanged.

The aquatic lease forecast for FY 23 is increased slightly, while outlying years' forecasts are decreased slightly.

The geoduck forecast revenue for FY 23 is decreased to $19.5 million. This is purely due to a decrease in the prices received for the November geoduck auction. The price forecast is typically on the lower end of the likely range of geoduck prices, due to geoducks historical volatility. There were a number of coincident issues that appear to have suppressed the November auction price to below the forecast that do not seem likely to affect upcoming forecasts. Therefore, the price forecast in the future is unchanged for now.

In addition to the normal risks that can swing geoduck revenue wildly — including paralytic shellfish poison closures, compliance vessel availability, and sewage contamination from flooding run-off — there are concerns about the ongoing strength of geoduck demand from China. In the lower revenue, but still possible, scenarios, a drop in geoduck demand will lead to a market more like FY 20 and FY 21, with revenue in the $10-$13 million range.

Additionally, geoduck are still covered by tariffs initiated during the trade war between China and the U.S. from 2018. These have been suspended during the COVID-19 pandemic, but, as far as we can tell, they are still on the books.

Total Revenues. The forecast revenue for the 2021-23 biennium is decreased to $516 million, and the forecast revenue for the 2023-25 biennium is increased to $536 million.

Other notes to the Forecast.

There are, as always, a number of sources of uncertainty around DNR revenue specifically, and the overall economy more broadly. These include:

- increasingly frequent legal challenges to timber sales;
- uncertainty about the type and quality of stumpage DNR is able to bring to market more than six months out; and
- the ongoing (but apparently dormant) trade war and political tension with China directly affecting timber, agricultural products and geoduck exports and price.

Additionally, although timber sales volume estimates are based on the best available internal planning data, they are subject to adjustments due to operational and policy decisions.

Climate change has emerged as a meaningful short- and long-term risk as opposed to an amorphous risk in the far future, as previously rare extreme weather events become more common. In 2021, drought in Washington decreased wheat production on DNR lands by about 40 percent. In September and October 2021, extraordinary rainfall in British Columbia destroyed roads and railways, essentially halting timber harvests, lumber production, and timber exports through the Port of Vancouver. More recently, in mid-June 2022, there was concurrently: massive flooding in Montana and Wyoming, thunderstorms that took out power-grids in the Great Lakes, and a record setting heat-wave that killed over 2,000 cattle in Kansas[1].

Climate change will increasingly affect Washington's fire seasons — drought and rising temperatures dry out fuels fast, leaving conditions ripe for wildfires to begin earlier in the year, burn longer, and spread more unpredictably than in the past. Although these haven't seriously affected DNR timberland revenue since 2015, they pose a significant risk to both our short-term timber revenue forecast — potentially destroying standing timber under contract — and long-term revenue by destroying younger stands that would be harvested in future decades. Research suggests that the massive fires in Oregon around Labor Day 2020 caused not only immediate damage, but will reduce future Oregon harvests by *115 to 365 mmbf per year for the next 40 years.* That, with the more immediate damage from the fires, suggests an overall economic impact of $5.9 billion on Oregon's Forest Sector[2].

[1] `https://www.washingtonpost.com/climate-environment/2022/06/16/summer-climate-disasters/`

[2] 2020 Labor Day Fires: Economic Impacts to Oregon's Forest Sector, Oregon Forest Resources Institute ''https://oregonforests.org/node/840''

Table 1: February 2023 Forecast by Source (millions of dollars)

Timber Sales		FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27
Volume (mmbf)		534	542	429	500	500	500	500	500
	Change				-	-	-	-	-
	% Change				0%	0%	0%	0%	0%
Price ($/mbf)		291	395	419	380	350	350	350	350
	Change				10	-	-	-	-
	% Change				3%	0%	0%	0%	0%
Value of Timber Sales		**155.3**	**214.2**	**179.7**	**190.0**	**175.0**	**175.0**	**175.0**	**175.0**
	Change				5	-	-	-	-
	% Change				3%	0%	0%	0%	0%
Timber Removals									
Volume (mmbf)		555	528	485	500	510	510	500	500
	Change				(10)	(0)	0	-	-
	% Change				-2%	0%	0%	0%	0%
Price ($/mbf)		333	340	355	371	388	363	350	350
	Change				1.5	15.3	5.6	-	-
	% Change				0%	4%	2%	0%	0%
Timber Revenue		**184.9**	**179.3**	**172.5**	**185.5**	**197.8**	**185.3**	**175.0**	**175.0**
	Change				(2.8)	7.8	2.9	-	-
	% Change				-1%	4%	2%	0%	0%
Upland Leases									
Irrigated Agriculture		9.0	8.8	8.9	8.4	9.0	9.0	9.0	9.0
	Change				(0.6)	-	-	-	-
	% Change				-7%	0%	0%	0%	0%
Orchard/Vineyard		8.8	9.4	8.2	8.4	8.4	8.4	8.4	8.4
	Change				-	-	-	-	-
	% Change				0%	0%	0%	0%	0%
Dryland Ag/Grazing		6.2	6.8	6.0	6.4	6.4	6.1	6.1	6.1
	Change				-	-	-	-	-
	% Change				0%	0%	0%	0%	0%
Commercial		10.3	11.3	11.2	11.2	11.2	11.2	11.2	11.2
	Change				-	-	-	-	-
	% Change				0%	0%	0%	0%	0%
Other Leases		10.0	13.7	11.9	11.6	11.5	11.8	11.8	11.8
	Change				0.2	-	-	-	-
	% Change				2%	0%	0%	0%	0%
Total Upland Leases		**44.3**	**50.0**	**46.3**	**46.0**	**46.5**	**46.5**	**46.5**	**46.5**
	Change				(0.4)	-	-	-	-
	% Change				-1%	0%	0%	0%	0%
Aquatic Lands									
Aquatic Leases		12.7	9.7	14.5	12.5	12.2	12.2	12.2	12.2
	Change				0.2	(0.1)	(0.1)	(0.1)	(0.1)
	% Change				2%	-1%	-1%	-1%	-1%
Geoduck		10.6	13.0	19.3	19.5	17.5	17.5	17.5	17.5
	Change				(0.2)	-	-	-	-
	% Change				-1%	0%	0%	0%	0%
Aquatic Lands Revenue		**23.4**	**22.6**	**33.8**	**32.0**	**29.7**	**29.7**	**29.7**	**29.7**
	Change				-	(0.1)	(0.1)	(0.1)	(0.1)
	% Change				0%	0%	0%	0%	0%
Total All Sources		**252.6**	**252.0**	**252.6**	**263.5**	**274.1**	**261.5**	**251.2**	**251.2**
	Change				(3.2)	7.7	2.8	(0.1)	(0.1)
	% Change				-1%	3%	1%	0%	0%

Table 2: February 2023 Forecast by Fund (millions of dollars)

Key DNR Operating Funds		FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27
041	RMCA - Uplands	33.5	33.5	38.1	43.9	43.2	41.4	39.8	39.8
	Change				0.9	0.7	0.3	(0.1)	(0.1)
	% Change				2%	2%	1%	0%	0%
041	RMCA - Aquatic Lands	9.9	10.2	14.8	14.1	13.0	13.0	13.0	13.0
	Change				(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
	% Change				0%	0%	0%	0%	0%
014	FDA	28.3	27.2	23.9	18.7	22.6	22.3	21.4	21.4
	Change				(0.4)	0.1	0.0	(0.0)	(0.0)
	% Change				-2%	0%	0%	0%	0%
21Q	Forest Health Revolving	11.2	12.6	8.1	16.1	16.2	12.2	10.8	10.8
					(3.4)	4.5	1.5	0.4	0.4
					-17%	39%	14%	4%	4%
Total DNR Key Operating Funds		**82.9**	**83.5**	**85.0**	**92.8**	**95.0**	**88.9**	**85.1**	**85.1**
	Change				(2.9)	5.4	1.8	0.2	0.2
	% Change				-3%	6%	2%	0%	0%
Current Funds									
113	Common School Construction	59.5	53.2	57.6	65.6	69.4	67.7	65.7	65.7
	Change				(0.6)	0.5	0.2	(0.1)	(0.1)
	% Change				-1%	1%	0%	0%	0%
999	Forest Board Counties	68.7	69.5	53.6	44.6	55.7	54.6	52.5	52.5
	Change				(1.4)	0.4	0.2	(0.1)	(0.1)
	% Change				-3%	1%	0%	0%	0%
001	General Fund	4.7	4.4	5.5	3.8	3.6	3.5	3.4	3.4
	Change				0.1	(0.1)	(0.0)	(0.0)	(0.0)
	% Change				3%	-2%	0%	0%	0%
348	University Bond Retirement	0.6	1.6	2.6	2.8	2.2	2.0	1.9	1.9
	Change				(0.1)	(0.1)	(0.0)	(0.0)	(0.0)
	% Change				-3%	-5%	-1%	0%	0%
347	WSU Bond Retirement	1.9	2.6	1.6	1.6	1.6	1.6	1.6	1.6
	Change				(0.0)	-	-	-	-
	% Change				-2%	0%	0%	0%	0%
042	CEP&RI	3.6	2.2	3.7	5.1	4.8	4.7	4.6	4.6
	Change				(0.3)	(0.2)	(0.0)	(0.0)	(0.0)
	% Change				-6%	-3%	-1%	0%	0%
036	Capitol Building Construction	4.4	7.7	6.0	11.7	9.5	8.3	7.5	7.5
	Change				2.1	1.0	0.3	(0.0)	(0.0)
	% Change				22%	11%	4%	0%	0%
061/3/5/6	Normal (CWU, EWU, WWU, TESC) School	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	Change				(0.0)	-	-	-	-
	% Change				-2%	0%	0%	0%	0%
Other Funds		1.1	0.6	0.1	0.8	0.6	0.3	0.1	0.1
	Change				(0.2)	0.1	0.1	(0.0)	(0.0)
	% Change				-17%	26%	24%	0%	0%
Total Current Funds		**144.7**	**141.9**	**130.8**	**136.1**	**147.6**	**142.9**	**137.5**	**137.5**
	Change				(0.4)	1.6	0.7	(0.2)	(0.2)
	% Change				0%	1%	0%	0%	0%

(Continued)

Table 3: February 2023 Forecast by Fund (millions of dollars), cont'd

Aquatic Lands Enhancement Account		FY 20	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	FY 27
02R		13.5	12.4	19.0	17.9	16.7	16.7	16.7	16.7
	Change				0.0	(0.1)	(0.1)	(0.1)	(0.1)
	% Change				0%	0%	0%	0%	0%
Permanent Funds									
601	Agricultural College Permanent	5.4	5.7	3.9	4.9	5.3	4.3	3.8	3.8
	Change				(1.0)	0.3	0.1	(0.0)	(0.0)
	% Change				-16%	7%	3%	0%	0%
604	Normal School Permanent	2.6	2.8	4.0	4.6	4.0	3.1	2.6	2.6
	Change				0.4	0.8	0.3	(0.0)	(0.0)
	% Change				11%	26%	9%	0%	0%
605	Common School Permanent	0.2	0.4	0.2	0.3	0.3	0.3	0.3	0.3
	Change				-	-	-	-	-
	% Change				0%	0%	0%	0%	0%
606	Scientific Permanent	3.1	4.9	9.3	5.4	4.4	4.7	4.6	4.6
	Change				0.5	(0.3)	(0.1)	(0.0)	(0.0)
	% Change				11%	-7%	-2%	0%	0%
607	University Permanent	0.1	0.3	0.5	1.5	0.7	0.6	0.5	0.5
	Change				0.1	0.0	0.0	(0.0)	(0.0)
	% Change				4%	3%	2%	0%	0%
Total Permanent Funds		**11.4**	**14.2**	**17.8**	**16.7**	**14.7**	**13.0**	**11.9**	**11.9**
	Change				0.1	0.8	0.3	(0.0)	(0.0)
	% Change				0%	6%	3%	0%	0%
Total All Funds		**252.6**	**252.0**	**252.7**	**263.5**	**274.1**	**261.5**	**251.2**	**251.2**
	Change				(3.2)	7.7	2.8	(0.1)	(0.1)
	% Change				-1%	3%	1%	0%	0%

Figure 1: Timber Forecast Charts

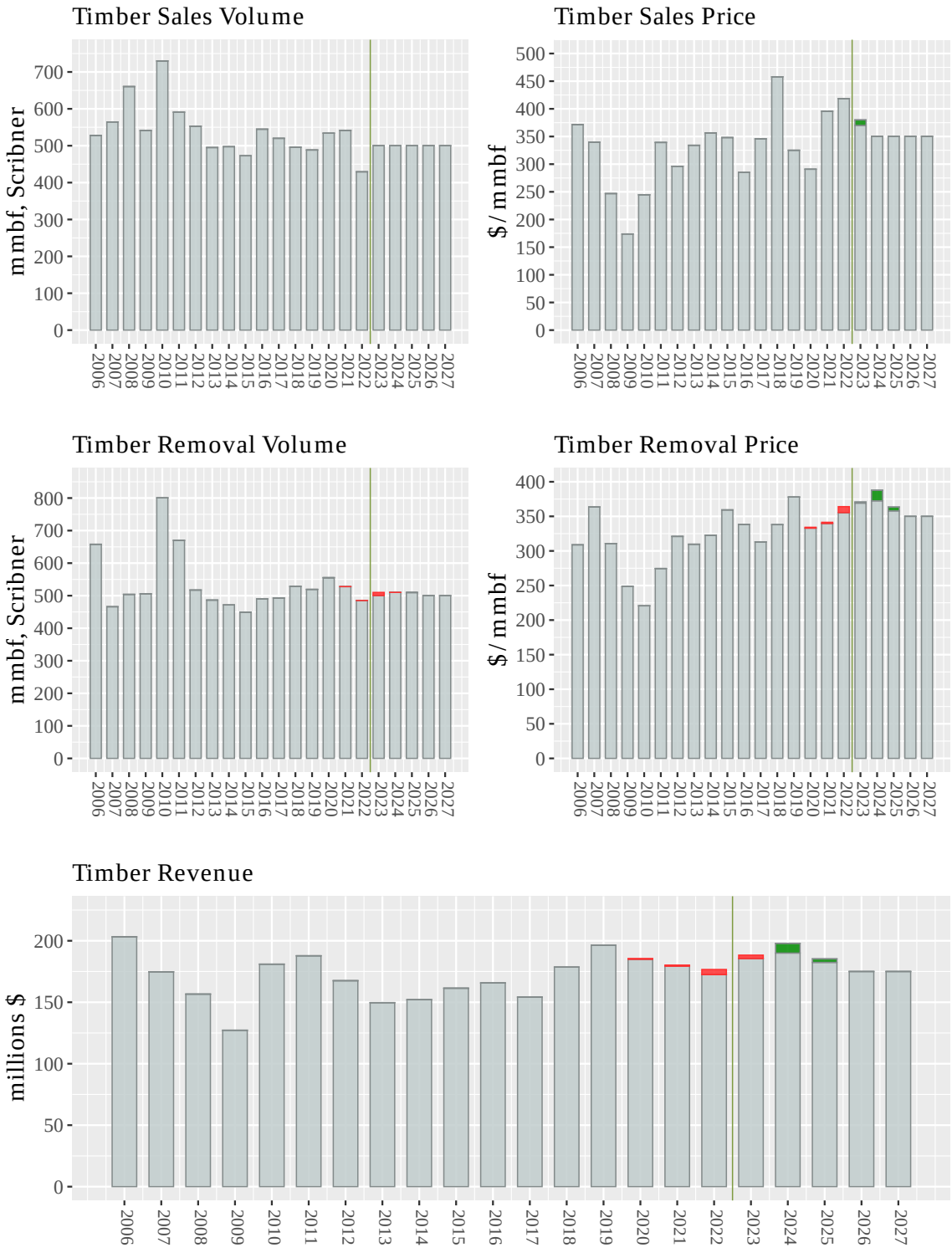


Figure 2: Other Uplands Forecast Charts

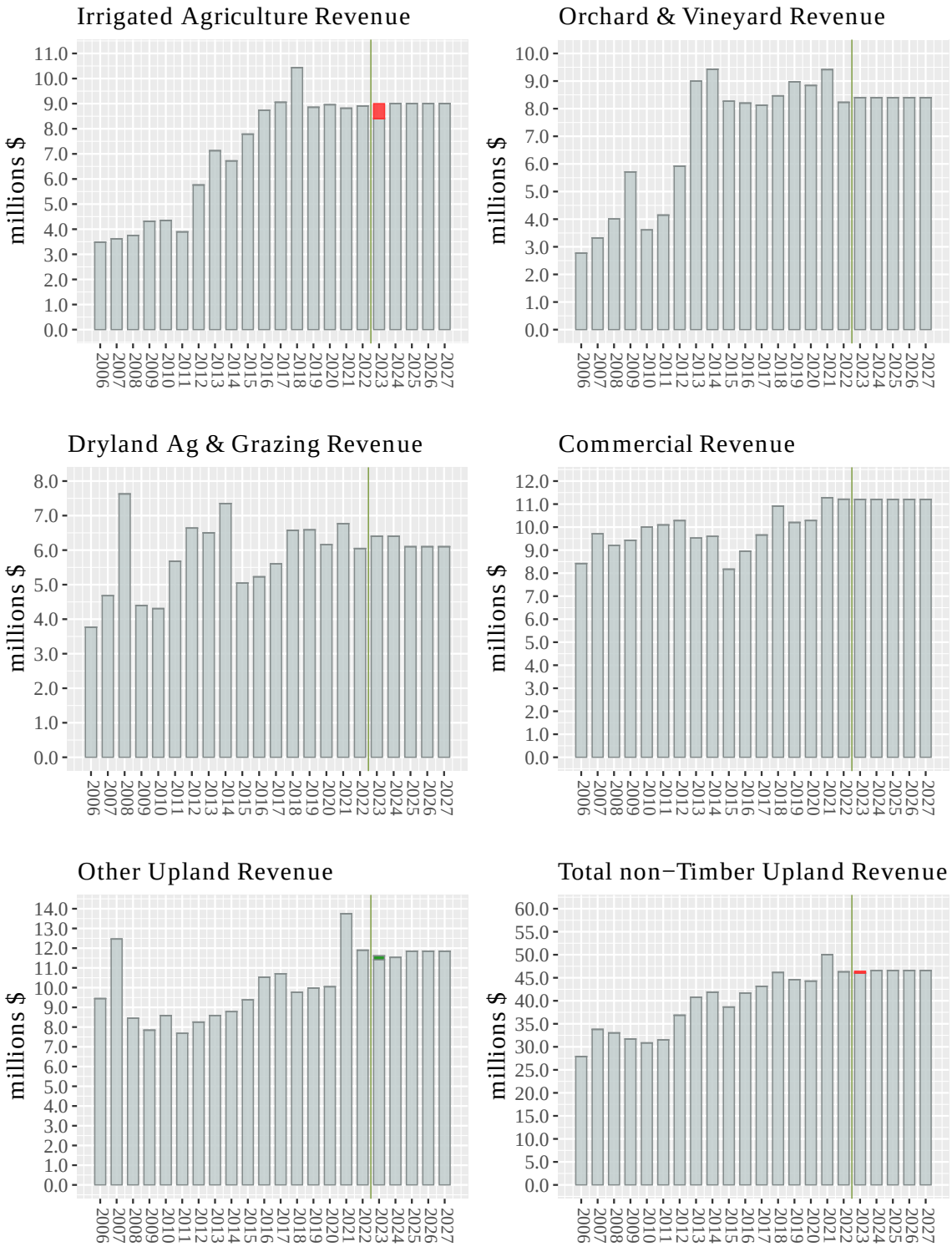
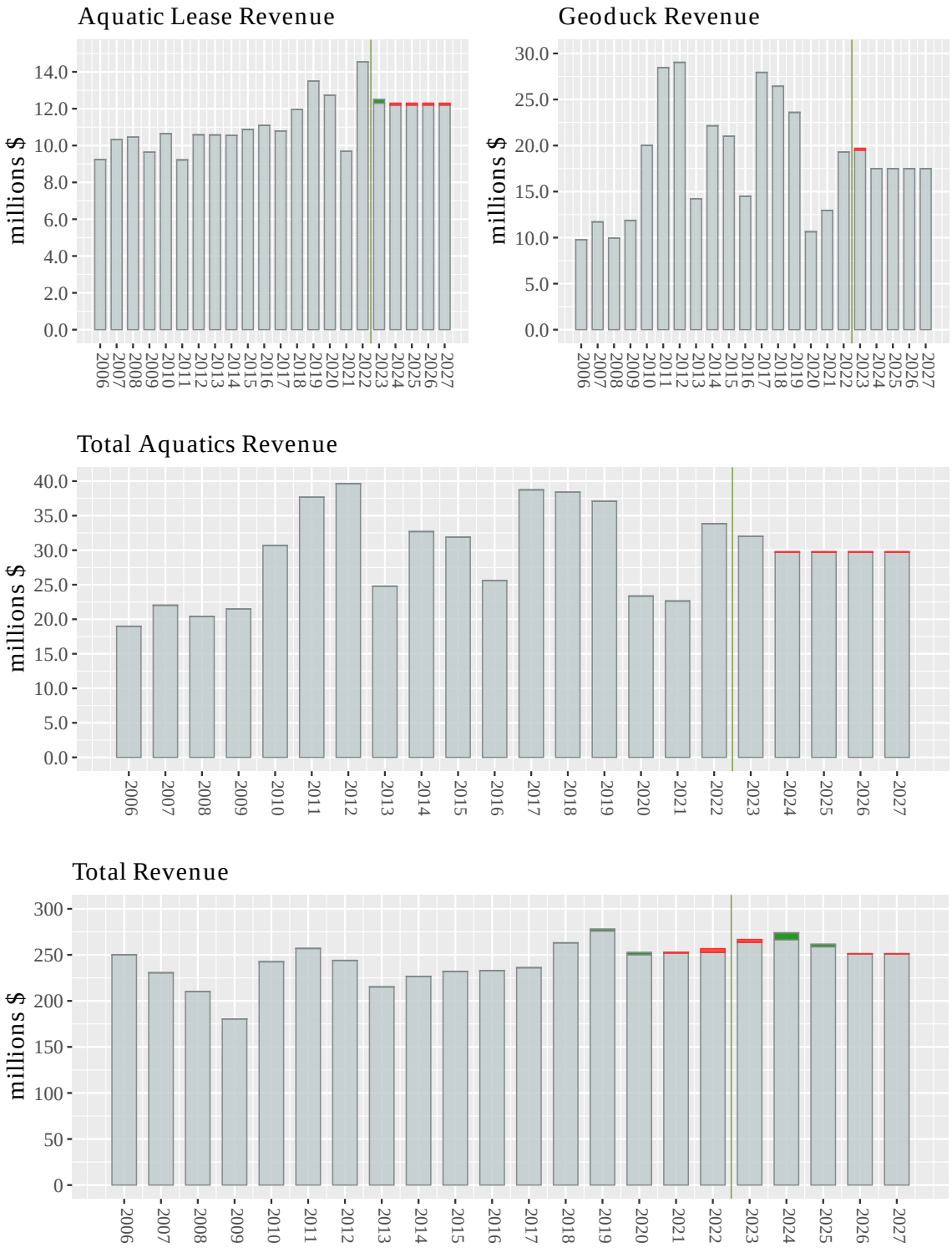


Figure 3: Aquatics and Total Forecast Charts



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Acronyms and Abbreviations

bbf	Billion board feet
BLS	U.S. Bureau of Labor Statistics
CAD	Canadian dollar
CNY	Chinese yuan (renminbi)
CPI	Consumer Price Index
CY	Calendar Year
DNR	Washington State Department of Natural Resources
ECB	European Central Bank
ERFC	Washington State Economic and Revenue Forecast Council
FDA	Forest Development Account
FEA	Forest Economic Advisors
Fed	U.S. Federal Reserve Board
FOMC	Federal Open Market Committee
FY	Fiscal Year
GDP	Gross domestic product
HMI	National Association of Home Builders/Wells Fargo Housing Market Index
IMF	International Monetary Fund
ITC	U.S. International Trade Commission
mbf	Thousand board feet
mmbf	Million board feet
PSP	Paralytic shellfish poisoning
PPI	Producer Price Index
Q1	First quarter of year (similarly, Q2, Q3, and Q4)
QE	Quantitative easing
RCW	Revised Code of Washington
RMCA	Resource Management Cost Account
SA	Seasonally adjusted
SAAR	Seasonally adjusted annual rate
SLA	Softwood Lumber Agreement
TAC	Total allowable catch
USD	U.S. dollar
WDFW	Washington Department of Fish and Wildlife
WWPA	Western Wood Products Association
WTO	World Trade Organization

Preface

This *Economic and Revenue Forecast* projects revenues from Washington state lands managed by the Washington State Department of Natural Resources (DNR). These revenues are distributed to management funds and beneficiary accounts as directed by statute.

DNR revises its Forecast quarterly to provide updated information for trust beneficiaries and state and department budgeting purposes. Each DNR Forecast builds on the previous one, emphasizing ongoing changes. Forecasts re-evaluate world and national macroeconomic conditions, and the demand and supply for forest products and other goods. Finally, each Forecast assesses the impact of these economic conditions on projected revenues from DNR-managed lands.

DNR Forecasts provide information used in the *Washington Economic and Revenue Forecast* issued by the Washington State Economic and Revenue Forecast Council. The release dates for DNR Forecasts are influenced by the state's forecast schedule as prescribed by RCW 82.33.020. The table below shows the anticipated schedule for future *Economic and Revenue Forecasts*.

This Forecast covers fiscal years 2022 through 2027. Fiscal years for Washington State government begin July 1 and end June 30. For example, the current fiscal year, Fiscal Year 2023, runs from July 1, 2022, through June 30, 2023.

The baseline date (the point that designates the transition from "actuals" to predictions) for DNR revenues in this Forecast is January 1, 2023. The forecast numbers beyond that date are predicted from the most up-to-date DNR sales and revenue data available, including DNR's timber sales results through December 2022. Macroeconomic and market outlook data and trends are the most up-to-date available as the Forecast document is being written.

Unless otherwise indicated, values are expressed in nominal terms without adjustment for inflation or seasonality. Therefore, interpreting trends in the Forecast requires attention to inflationary changes in the value of money over time, separate from changes attributable to other economic influences.

Economic Forecast Calendar

Forecast	Baseline Date	Final Data and Publication Date (approximate)
June 2023	May 1, 2023	June 15, 2023
September 2023	August 1, 2023	September 15, 2023
November 2023	October 1, 2023	November 15, 2023
February 2024	January 1, 2024	February 15, 2024

Acknowledgements

The Washington State Department of Natural Resources' (DNR) *Economic and Revenue Forecast* is a collaborative effort. It is the product of information provided by private individuals and organizations, as well as DNR staff. Their contributions greatly enhance the quality of the Forecast.

Thanks go to DNR staff who contributed to the Forecast: Joseph Koontz, Michael Sly, Tom Heller, Patrick Ferguson, Kari Fagerness, Michael Kearney, Sherry Land, Linda Farr, Michelle McLain, Michal Rechner, and Tom Gorman. They provided data and counsel, including information on markets and revenue flows in their areas of responsibility.

In the final analysis, the views expressed are our own and may not necessarily represent the views of the contributors, reviewers, or DNR.

Office of Finance, Budget, and Economics

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Macroeconomic Conditions

This section briefly reviews macroeconomic conditions in the United States and world economies because they influence DNR revenue — most notably through the bid prices for DNR timber and geoduck auctions and lease revenues from managed lands.

COVID-19 Pandemic

Although the COVID-19 pandemic is in the rearview mirror for most people and there are no more government enforced public health measures, it remains a ***potentially*** meaningful issue in the macroeconomy in both the short and long-term[3]. It is also entirely possible that COVID-19 will have negligible future effects, or that they will be outweighed by other factors.

Global supply chains appear to have largely stabilized after the problems caused by the pandemic, so the two most salient remaining potential COVID-19 issues appear to be China's reversal of it's zero-COVID policy and the effect of repeated infections on the labor force.

In December, China reversed it's zero-COVID policy, which entailed shutting down entire cities or regions for even a small number of COVID-19 cases. This reversal led to a massive surge in the number of cases, and presumably deaths, though the statistics released by the Chinese government haven't reflected this. There is some worry that this policy change will puch Chinese production and supply chains at risk due to the risk of large numbers of workers being sick concurrently, however, it seems likely that the new policy will actually help stabilize production.

Current research suggests that around 1 in 15 of those who get COVID-19 will suffer from long COVID — a poorly defined condition that currently encompasses symptoms ranges from a persistent cough to debilitating impairment to memory and attention [4].It appears that vaccination reduces long COVID risks by only 15 percent[5], so even in highly vaccinated areas, future waves or ongoing repeated infections will likely leave some amount of the workforce less productive, if not pull them from the labor force entirely[6].

It's impossible to say with certainty how the pandemic will behave in the future. There are very few precautions taken to avoid the spread of the disease within the U.S. and many countries across the globe, which may help create new immuniy-escaping variants. However, it also seems as though the US population has built enough immunity that new variants may not cause large waves. For instance, recently there were fears that a newer Omicron variant, XBB 1.5, might cause another large wave of infections. However, it appears to have caused only a modest increase in cases in November and December and a small increase in deaths.

Taken all together, the forecast is built with the expectation that the pandemic will continue indefinitely, with either waves of infections from new variants or low ongoing infections. However, it is unlikely to ***seriously*** affect DNR revenue in the short- to mid-term. DNR revenue comes predominantly from timber, with some from agriculture and other uplands leases as well. Housing construction demand largely drives timber and commodity prices largely drive agricultural revenue. These will be discussed in their respective sections of the forecast, but, in short, they will likely be largely unaffected by ongoing circulation of COVID-19.

Having written all that, the COVID-19 pandemic is still a wild card and increases the potential risks and volatility of DNR revenue. This does not affect the point forecasts provided, but it does increase

[3]We are not epidemiologists or experts on public health or pandemics. This section is written with our best understanding of the pandemic and its dynamics gathered from reputable sources with the aim of translating those into likely broader economic effects and then more direct effects on DNR revenue. In addition to the significant uncertainty still surrounding the future path of the epidemic even for experts, there is additional uncertainty due to our limited experience and understanding.

[4]https://www.nature.com/articles/s41467-021-26513-3

[5]https://www.nature.com/articles/d41586-022-01453-0

[6]https://www.brookings.edu/research/is-long COVID-worsening-the-labor-shortage/ and https://www.nber.org/system/files/working_papers/w30435/w30435.pdf

the range of potential outcomes.

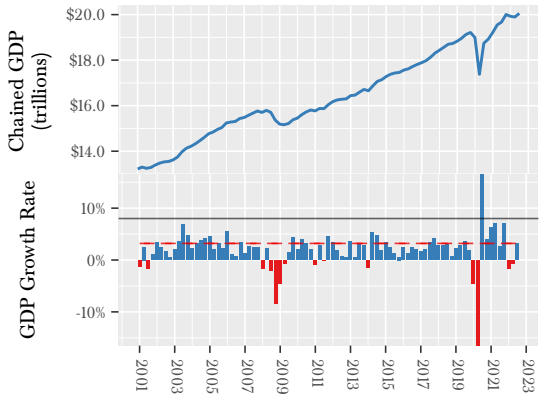
U.S. Economy

Gross Domestic Product

Typically, GDP is a useful indicator of how the U.S. economy is growing overall. When GDP is growing well, then generally there will be an increase in jobs, spending, and overall economic welfare. This often includes growth in housing spending and construction, which influences timber prices and DNR's income from timber. It is a useful indicator of how other, more directly relevant indicators may move in the future.

After falling 2.8 percent in 2020 due to the onset of the COVID-19 pandemic, GDP increased in 2021 by 5.9 percent. This was very rapid growth that was largely due to a rebound from the contraction due to the pandemic, as well as the fiscal and monetary policies enacted in response to the pandemic. GDP growth slowed to 2.1 percent in 2022.

Figure 4: U.S. Gross Domestic Product



Note that the y-axis of the bottom chart is limited to 15 percent because the Q2 and Q3 2020 GDP growth are such outliers that they distort the chart.

How GDP will grow 2023 is extremely uncertain. The high-frequency GDPNow forecast from the Atlanta Fed predicts Q1 growth of 2.8 percent, while the blue-chip consensus prediction is around -0.2 percent.

The Washington ERFC preliminary forecast is for small negative growth for Q1-Q3 2023, before eking out a 0.7 percent growth for the year.

The December FOMC meeting materials show a central tendency of forecasts between 0.4-1.0 percent for the real GDP growth from Q4 2022 to Q4 2023. This is down from the Septembers meeting materials, where the central tendency was between 0.5 and 1.5 percent growth. 0.1-0.3 percent real GDP growth in 2022. Outlying years' predictions are closer to what we saw pre-pandemic at between 1.3 and 2.0 percent from 2024.

There appears to be broad agreement that there will be a slowdown through late in 2023, before something of a rebound brings GDP into positive growth for the year.

Figure 5: Unemployment Rate and Monthly Change in Jobs

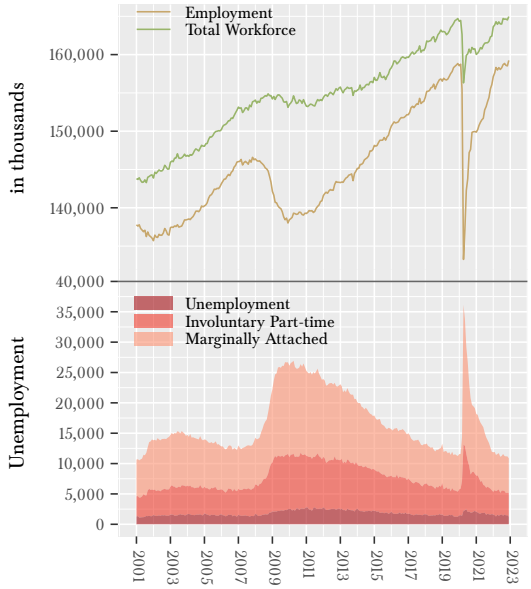
Note that the y-axes for these charts are limited because of the extreme changes in Q2 2020.

Employment and Wages

The labor market is the primary driving force behind consumption, which typically constitutes

about 70 percent of GDP and naturally extends to the demand for housing, the major driver of U.S. timber demand. The U.S. headline unemployment rate measures the number of people looking for work as a percentage of the number of people in the labor force.

Figure 6: Employment and Unemployment



With the beginning of the pandemic, the unemployment rate shot up to 14.7 percent in April 2020, the highest it has been since the Great Depression (Figure 5). At the same time, the labor force participation rate — that is, the percentage of the working-age population that is in the labor force — decreased substantially from 63.4 percent in February to 60.2 percent in April 2020. The decrease in the labor force participation rate meant that the increase in the unemployment rate was a meaningful underestimate of the actual rate of unemployed people who would have preferred employment.

Since mid-2020, both have improved considerably, with the unemployment rate at 3.4 percent in January 2023, and the labor force participation rate at 62.4 percent (Figure 6). Overall, there are around 2.7 million more jobs in January 2023 than in February 2020 and about 1.4 million more people in the labor force (that is, employed or looking for work).

The unemployment rate is likely to either remain stable or increase slowly from its current level. Given that one of the stated purposes of the Fed raising rates is too slow down job growth, it seems fairly likely that the Fed will continue raising rates until the national unemployment rate starts to increase. The FOMC expected unemployment between 4.4 and 4.7 percent in the fourth quarter of 2023.

However, decreasing the unemployment rate may be difficult given the low, and seemingly stable, labor force participation rates — the labor force participation rate was fairly stable in 2022, ranging between 62.2 and 62.4. It seems the increase in the labor force is balancing out the increase in jobs to keep the unemployment rate low.

There was some expectation that increasing wages would draw back people who lost or left their jobs during the pandemic. This would push up the labor force participation rates, increase the unemployment rate from its very low levels, and decrease wage pressures.

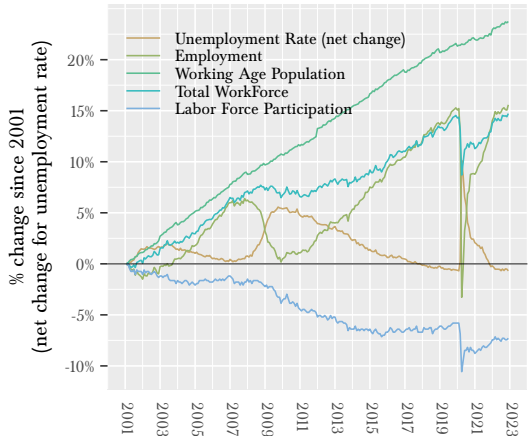
However, the employment-to-population ratio for prime age workers is back to what it was before the pandemic. It appears that the labor force participation rate will continue to have meaningful downward pressure on it from both demographic changes, largely from retiring baby-boomers, and from a significant drop in immigration that had previously supported it.

That is to say nothing about those affected by COVID-19. While it seems like the vast majority of those who died from the virus were above prime-working age, there does appear to be some cohort affected by long-covid. In August, a Brookings Institute report was updated with new Census data and estimated that around 16 million Americans had long COVID and between 2 and 4 million had left the labor force because of it[7]. A separate study estimated that long COVID had reduced the labor

[7] `https://www.brookings.edu/research/is-long COVID-worsening-the-labor-shortage/`

force by around 500,000 people[8]. Given that the headline unemployment rate only represents people who are part of the workforce, it will miss the people dropping out of the labor force due to long COVID.

Figure 7: Labor Market Indicators



Inflation

Aside from a short period in 2012, core inflation was below the FOMC's two percent target between the recession in 2008 and early 2021. During that period, inflation forecasts were consistently too high, with each year predicted to break the cycle of weak inflation, only to disappoint as the year progressed (Figure 8).

For policy purposes, the FOMC uses the core Personal Consumption Expenditures (PCE) index as the measure of inflation, which removes the more volatile fuel and food prices. In a fairly striking policy change, the FOMC announced in September 2020 that it would "aim to achieve inflation moderately above 2 percent for some time so that inflation averages 2 percent over time and longer-term inflation expectations remain well anchored at 2 percent." This was a marked departure from policy in the previous decade, when there were a number of (sometimes-contentious) interest rate increases, even though inflation was well below 2 percent.

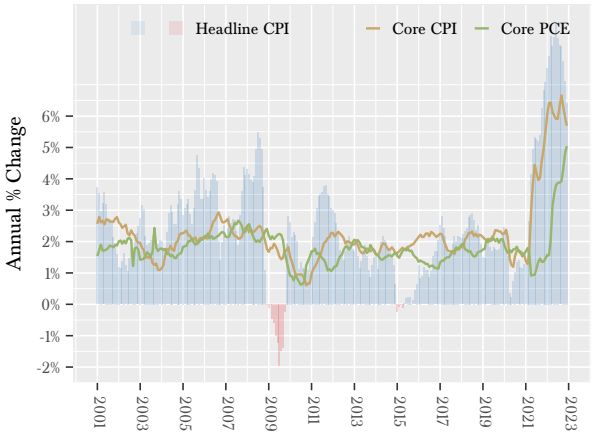
Since April 2021, core PCE inflation has been higher than the FOMC's target, and remained high on the back of supply chain issues and strong demand, as well as shocks to the market like Russia's invasion of Ukraine. In March 2022 the FOMC decided to start raising interest rates to bring inflation down.

Preliminary estimates are that core PCE inflation was 5.0 percent in 2022, substantially higher than the 2.5 to 3.0 percent the FOMC expected at their December 2021 meeting.

The outlook for inflation is unclear. Although inflation had slowed through the latter half of 2022, it jumped to an annualized rate of 6.3 percent in January, from 1.6 percent in December. This has already motivated the Chair of the FOMC, Jerome Powell, to say in a recent speech that interest rates would have to rise faster than previously expected. This is widely taken to mean that the Fed will increase the pace of interest rate rises. At some point, this will have to push inflation down.

Inflation is expected slow substantially in the coming months, mainly because of the pace of interest rate increases.

Figure 8: U.S. Inflation Indices



[8] https://www.nber.org/system/files/working_papers/w30435/w30435.pdf

Interest Rates

Interest rates are a powerful tool used by the Federal Reserve Bank to influence the U.S. economy[9]. An increase in interest rates will generally slow down economic growth — business investment slows down because borrowing money becomes more expensive, so job and wage growth slow down (constraining consumption). Similarly, it becomes more expensive for consumers to borrow, impeding demand, particularly in the housing and auto markets. The opposite of all of this is also true — decreasing or lowering interest rates can help drive economic expansion through expanded investment and consumption.

As mentioned in the previous section, the Fed began increasing interest rates in March 2022 due to continued high inflation. They increased rates by 0.25 percent in each month from March through May, and then increased rates more rapidly by 0.75 percent in June, September *and* November. As inflation has remained high, expectations for interest rates have gradually increased since mid-2022. The June FOMC meeting materials show an expected federal funds interest rate between 3.1 and 3.6 percent at the end of 2022. This increased to between 4.1 and 4.4 percent in September and 5.1-5.4 in December.

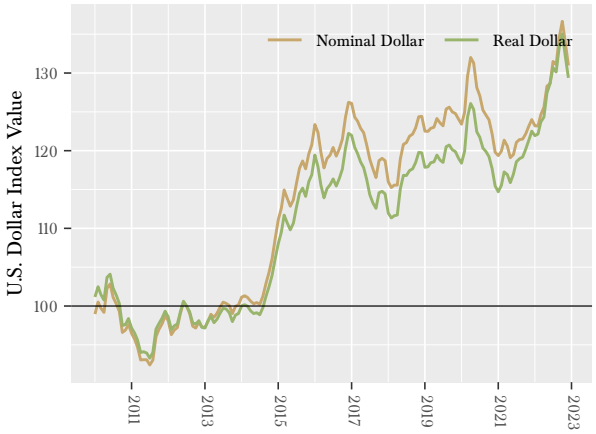
With inflation remaining relatively high and the comments of the Fed Chair, the federal funds rate will likely get even higher than the December projections. However, the Fed is expected to start dropping rates, or at least not raise them anymore, at the end of the year after inflation has fallen significantly.

The U.S. Dollar and Foreign Trade

Between February and April 2020, the U.S. dollar trade-weighted index jumped almost 6 percent, largely due to a "flight to safety" from the uncertainty caused by the pandemic (Figure 9). From April 2020 to mid-2021, the index fell, but then quickly climbed through October to its highest point since least 2006 (the earliest date for the data set we use). Since October, the US dollar has fallen back sharply, but remains extremely high compared to the last decade and a half.

A higher dollar means that timber and lumber from the Pacific Northwest become more expensive for international buyers and, conversely, timber and lumber imported into the U.S. becomes less expensive. This will tend to undermine local prices and DNR's timber and agricultural revenues. Wildstock geoduck revenue will also be negatively affected because geoduck is primarily marketed abroad.

Figure 9: Trade-Weighted U.S. Dollar Index



Foreign trade and access to export markets is normally important for DNR revenues. Chinese demand for timber and lumber was a major support for lumber prices after 2010, even though DNR timber cannot be exported directly. Additionally, much of the soft white wheat produced in Washington is exported to Asia and the vast majority of the Pacific Northwest geoduck harvest is exported to China.

Until recently, the dollar's strength hasn't been particularly concerning. Strong domestic demand supported prices for timber products, such that any price effect on stumpage would likely be small. Agricultural product prices also remained high, and geoduck auctions continued to have very

[9]We refer to interest rates broadly, but the Fed specifically governs the Federal funds rate, which heavily influences interest rates across the economy.

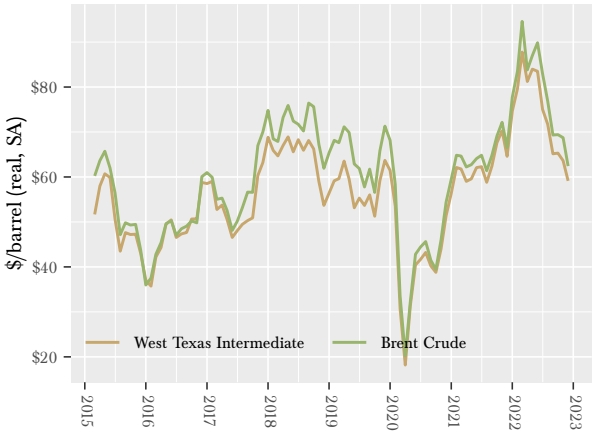
strong prices — even as economic trouble in China has become more apparent.

However, the dollar has gotten stronger while domestic demand is dropping off, likely due to high interest rates suppressing house price growth and housing demand. This means that there is not likely to be much in the way of international demand to support prices. While this is a meaningful risk to our price forecast, it does not yet appear that the drop in domestic demand for lumber has yet translated into a drop in demand for timber.

Petroleum

Crude oil and its derivatives strongly affect production, transportation, and consumption in the world and U.S. domestic economies. Broadly, an increase in oil prices acts like a tax increase for consumers and can discourage consumption. Additionally, all other things being equal, higher petroleum prices will increase diesel fuel prices and will make transportation-sensitive industries — such as Pacific Northwest logging and agriculture — less competitive in international markets.

Figure 10: Crude Oil Prices

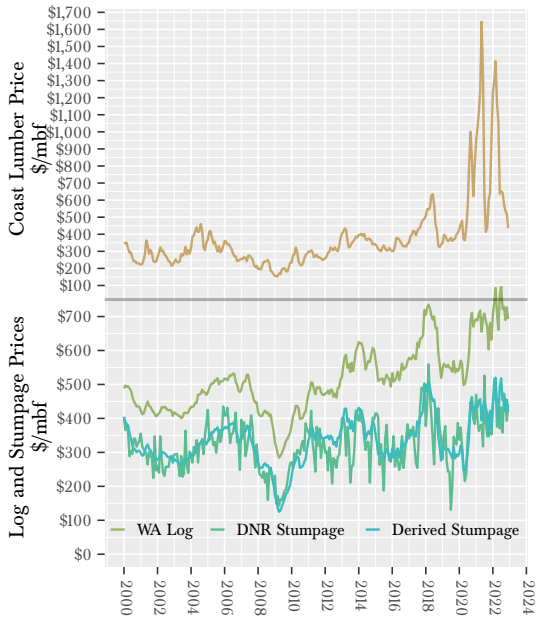


The Russian invasion of Ukraine in early 2022 initially pushed oil prices much higher, with the nominal Brent Crude spot prices jumping from $86/barrel in January to $122/barrel in June — the highest they had been since 2014 (Figure 10). These prices were high enough to create a drag on economic growth. However, they were fairly short-lived. Since peaking in June 2022, prices have dropped to $80/barrel in December.

Wood Markets

Timber stumpage revenue constitutes about 70 percent of total DNR revenues on average. Therefore, DNR is vitally concerned with understanding stumpage prices, log prices, lumber prices, and the related supply-and-demand dynamics underlying all three. This section focuses on specific market factors that affect timber stumpage prices and overall timber sales revenue generated by DNR.

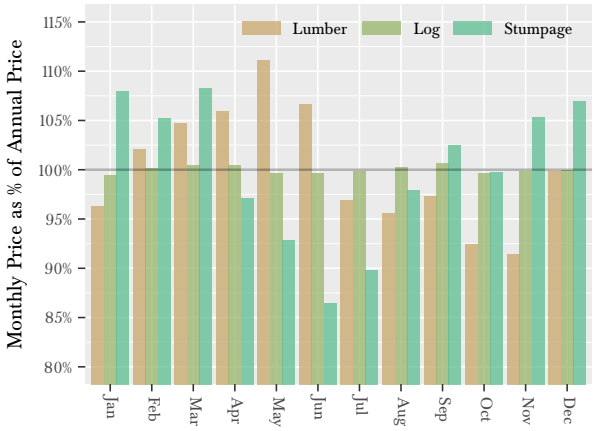
Figure 11: Lumber, Log, and Stumpage Prices in Washington



In general, timber stumpage prices reflect demand for lumber and other wood products, timber supply, and regional lumber mill capacity. There is a consistent, positive relationship between log prices and DNR's stumpage prices, despite notable volatility in stumpage prices (Figure 11). High log prices make access to logs more valuable, increasing purchasers' willingness to pay for stumpage (the right to harvest). Volatility in stumpage prices arise not only from log prices, but also from the volume of lumber and logs held in mills' inventories and from DNR-specific issues, such as the quality and type of the stumpage mix offered at auction, the region, and the road-building requirements of a particular sale.

The relationship between lumber and log prices is less consistent. Lumber prices are significantly more volatile, and both the direction and size of price movements can differ from log prices. This is due to both demand and supply-side factors. On the demand side, mills will often have an inventory of logs in their yards, as well as an inventory of "standing logs," so they do not always need to bid up log or stumpage prices to take advantage of high lumber prices. From the supply side, landowners often do not need to sell their timber, so when prices fall too far, they can withhold supply and allow their trees to grow and increase in quality.

Figure 12: Lumber, Log, and DNR Stumpage Price Seasonality



There are differences in price seasonality between lumber, logs, and stumpage, as illustrated in Figure 12. These prices are affected by a degree of seasonality that is largely the result of when each of these commodities will be used. For instance, lumber prices tend to be higher starting in February, when housing construction starts to pick up, and decline through fall as demand wanes, while stumpage prices tend to be highest in December-March, when harvesters are lining up harvestable stock for the summer. DNR stumpage price volatility is also affected by the firefighting season and the

quality of the stumpage mix, which varies throughout the year but tends to be lower from July through September.

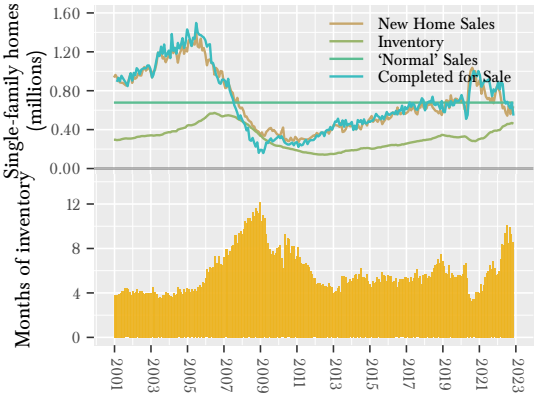
U.S. Housing Market

This section continues with a discussion of the U.S. housing market because it is particularly important to overall timber domestic demand.

New residential construction (housing starts) and residential improvements are major components of the total demand for timber in the U.S. From 2000-18, these sectors have averaged 69 percent of softwood consumption — 37 percent going to housing starts and 32 percent to improvements — with the remainder going to industrial production and other applications.

The 2007 crash in the housing market and the following recession drastically reduced demand for new housing, which undermined the total demand for lumber. Since the 2009-11 trough through to the beginning of the COVID-19 pandemic in early 2020, an increase in housing starts drove an increase in lumber demand.

Figure 13: New Single-Family Home Sales



As with almost every other part of the economy, the coronavirus pandemic created a lot of uncertainty in the housing market. After the initial collapse in activity in early 2020, both starts and new home sales increased substantially — largely driven by strong household balance sheets and record-low mortgage rates. However, since the Fed began increasing interest rates, mortgage rates more than doubled from under 3.0 percent to above 7.0 percent, though they have currently fallen back to the high-6.0 range. The increased costs of financing have significantly affected both sales and construction of homes.

New Home Sales

Unsurprisingly, new home sales plummeted during the 2008-09 recession, reaching a record low of 306,000 (SAAR) in 2011 before beginning a slow rise to average 680,000 (SAAR) in 2019 (Figure 13).

From January through April 2020, new single-family home sales fell from 708,000 to 570,000 (SAAR) as the initial effects of the pandemic took hold. However, April was the bottom. From then, new home sales quickly grew well beyond their January 2020 highs to a peak of 1,036,000 (SAAR) in August 2020, averaging 960,000 in the latter half of the year. New home sales slowed a little in 2021, averaging 769,000 (SAAR) per month. With the increased mortgage rates since March 2022, new single-family sales fell to a low of 588,000 in September 2022, basically at the level of April 2020. Sales seem to have rebounded a little since then, increasing every month to 670,000 in January 2023.

At the same time as new home sales have declined, so have new home completions. Completions were still been higher than sales through most of 2022, leading to a buildup in new home inventories. More recently, completions have fallen off as new home sales have rebounded.

There remains decent demand for housing. Households still have strong balance sheets and wages are increasing, though not quite keeping up with inflation, which will mitigate some of the effect of increased interest rates on housing demand. Additionally, the housing stock in the U.S. is quite old. New housing was underbuilt from 2008 and there are very low inventories of existing housing on the market while there is still demand, which should

help to maintain housing construction.

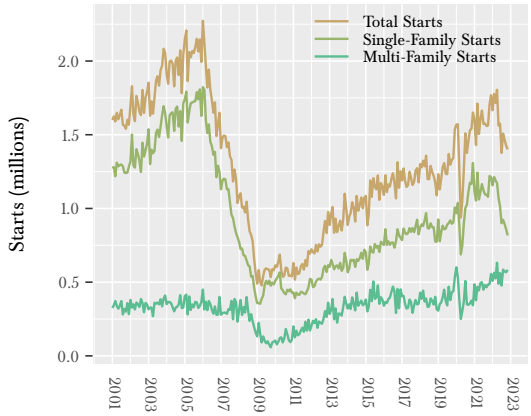
Overall, it is likely that sales will remain higher than the period between 2008 and 2015, but it would not be surprising to see them stay below the long-term average for some time.

Housing Starts

In April 2009, U.S. housing starts fell to the lowest point since the Census Bureau began tracking these data in 1959. U.S. housing starts picked up in 2011 and continued to rise, largely because of increases in multi-family starts. Single-family starts were more or less flat after the recession through 2012, but rose slowly through most of 2019 (Figure 14).

Single family starts hit 1.6 million in January and February 2020 before dropping sharply in April to 0.9 million. Again, as with sales, April 2020 was the nadir, and starts climbed back quickly to more than 1.5 million in October through January. Single family starts averaged 1.1 million in 2021, and increased slightly to an average of 1.2 million through April 2022. But, again as with sales, starts have fallen substantially since then.

Figure 14: Housing Starts

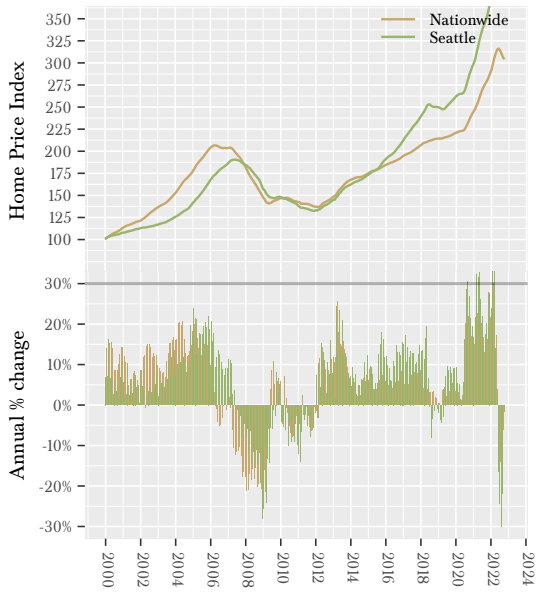


Two things are particularly notable about starts since they started falling. First, even though there has been a significant drop in starts, they are still higher than any point between 2007 and mid-2019. Second, it's primarily single-family starts that have dropped so significantly. Multi-family starts have been more stable, likely because rents are still quite high and those are typically built for the rental market, though they too have fallen in the last three months. Single-family construction uses more lumber than multi-family construction, so the drop in single-family starts has more of an impact on lumber demand and prices than a drop in multi-family.

Housing Prices

U.S. housing experienced six unprecedented years of falling or flat prices following the 2008 recession. House prices started rising again only in 2012 as economic and employment indicators continued to improve. Figure 15 charts the seasonally adjusted S&P/Case-Shiller Home Price Index for the 20-city composite, which estimates national existing home price trends, as well as the Index for Seattle.

Figure 15: Case-Shiller Existing Home Price Index

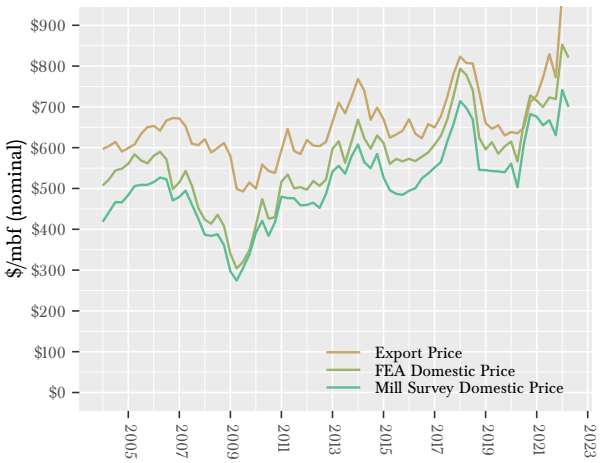


Although the pandemic initially stalled national price growth, the national Case-Shiller ended 2020 with 10 percent December-December price growth. Locally, for Seattle, price growth was 13 percent.

Since then, prices have increased even faster. In March 2022, the 12-month prices nationwide were 21 percent higher, and Seattle prices were *28* percent higher.

However, May 2022 was the peak. The Seattle Case-Shiller index fell from 414.0 in May to 351.7 in December, which is very interesting because it represents a 1.8 percent *decrease* in the December-December price. Nationally, the 12-mmonth change showed positive growth of 4.7 percent. However, the 12-month change hides the fact that house prices are already falling. If they continue on the current trajectory, then by mid-year the national house prices will be lower on 12-month change basis.

Figure 16: Log Export Prices



Export Markets

Although federal law prohibits export of logs from public lands west of the 108th meridian, log exports can still have a meaningful impact on DNR stumpage prices. Exports compete with domestic purchases for privately sourced logs and strong export competition pulls more of the supply from the domestic market, pushing up domestic prices. However, changes in export prices do not necessarily influence domestic prices in a one-to-one relationship.

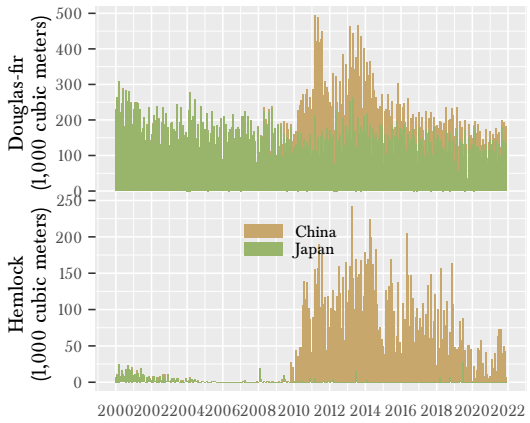
Export prices are almost always higher than domestic prices, a difference that is referred to as the "export premium" (Figure 16). The export premium is primarily due to the characteristics of the export markets, which can include a demand for higher-quality wood, a high value placed on long-term contracts, and high transaction costs.

Note that the export prices shown in Figure 16 are weighted by DNR's typical species mix, not the species mix of actual export volumes.

The primary markets for logs and lumber from Washington are China and Japan. Japan primarily imports Douglas-fir and has been relatively consistent, averaging 1.8 million m^3 per year since 2009[10]. China primarily imports hemlock, but it has been much more variable in its demand.

After entering the market meaningfully in 2010, demand from China was a major support for log and lumber prices in Washington (Figure 17). That started waning in late 2014 as China's economic health wavered, the U.S. dollar appreciated while the value of the euro and ruble dropped (making U.S. timber comparatively more costly), and a 25 percent Russian tariff on log exports was reduced.

Figure 17: Log Export Volume



Surprisingly, export volume to Japan in actually increased in 2020 and 2021 after having declined every year in the previous six, but this was still 30

[10] Trade data is from the U.S. International Trade Commission Dataweb at `https://dataweb.usitc.gov/`

percent lower than the peak exports of 2,199 m^3 2014. Exports to China also increased slightly in 2021, but were down 77 percent from their peak in 2013.

As a result of the Russian invasion of Ukraine, sanctions were placed on Russia that limit its international trade. Russia supplies around 12 percent of the world's export logs. Although much of this is sold to China, the reduction of timber on the world market appears to have pushed up export prices (Figure 16).

Price Outlook

Lumber Prices

Lumber prices have been exceptionally volatile the past two years (Figure 11). In 2021, prices peaked at around $1,600/mbf in May then plummeted to $414/mbf in August (West Coast standard or better 2x4, Douglas-fir/Hemlock). Prices rebounded over the next several months to peak at $1,400/mbf in March 2022. However, after that they plummeted, dropping from $1,056/mbf in May to $638/mbf in June. As of December, they've dropped further to $436/mbf. Prices are expected to stay around this level until near the end of the calendar year. Though, given the price behavior in recent years, as well as increasing interest rates and a stalling housing starts, it is entirely possible that prices will fall further.

Log Prices

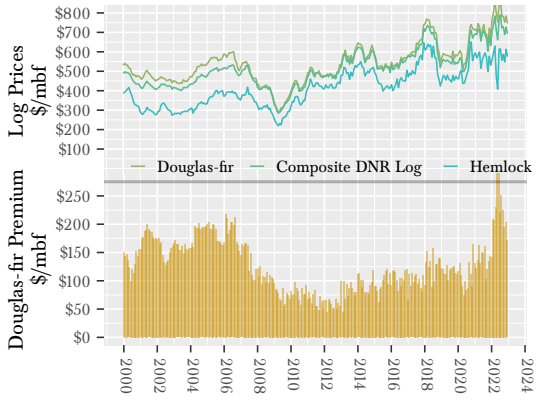
Figure 18 presents prices for Douglas-fir, hemlock, and DNR's composite log. The latter is calculated from prices for logs delivered to regional mills, weighted by the average geographic location, species, and grade composition of timber typically sold by DNR. In other words, it is the price a mill would pay for delivery of the typical log harvested from DNR-managed lands. The dark green line for the DNR composite log price on Figure 18 is the same as the light green line on Figure 11.

Log prices also bottomed in April 2020 and had recovered by August 2020, though they have obviously not reached the same extremes as lumber prices. Timber harvesters and mills often have an inventory of standing timber to draw from, so they don't always need to bid up new logs.

Stumpage Prices

Timber stumpage prices are the prices that successful bidders pay for the right to harvest timber from DNR-managed lands (Figure 19). At any time, the difference between the delivered log price and DNR's stumpage price is equivalent to the sum of logging costs, hauling costs, and harvest profit (Figure 11). Subtracting the average of these costs from the log price line gives us a derived DNR stumpage price.

Figure 18: DNR Composite Log Prices



When actual DNR stumpage prices differ significantly from the derived stumpage prices, a correction is likely to occur. Currently, stumpage prices are roughly in line with what we would expect, given log prices. Although log and lumber prices bottomed out in April 2020, DNR stumpage prices fell through May 2020, to a low average auction price of $215/mbf. However, they rebounded earlier than expected, jumping to $347/mbf in July, which typically has the lowest auction prices of a year. DNR timber auctions had very strong prices through the end of the year, so that the average stumpage for FY 21 was $396/mbf. The average price for FY 22 was $427/mbf. The average for FY 23 through January is $412/mbf.

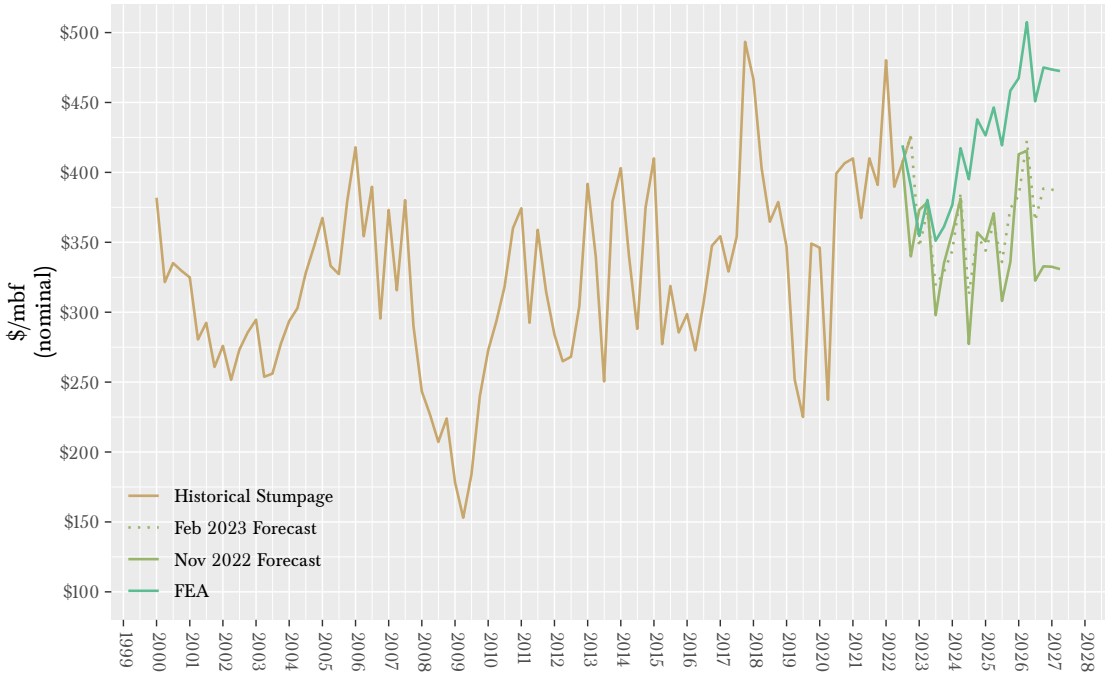
As always, these prices also depend heavily upon the characteristics of the sales, particularly the type and quality of the wood, the type of logging, and the costs associated with road-building and maintenance. Right now, sales prices may also be more heavily influenced by the ready availability of the sales — that is, whether purchasers can begin harvesting soon or whether they have to do a lot of preparatory work.

DNR Stumpage Price Outlook

DNR currently contracts with a forest economics consulting firm that provides log and timber stumpage price forecasts, as well as valuable insights into the housing, lumber, and timber markets. By modeling DNR's historical data on its price forecasts, we arrive at a stumpage price outlook (Figure 19, note that the FEA "forecast" series reflects the species and class characteristics of typical DNR timber; the original series were West Coast averages, and are not shown).

It is important to note that these are nominal price expectations.

Figure 19: DNR Timber Stumpage Price



DNR Revenue Forecast

This Revenue Forecast includes revenue generated from timber sales on trust uplands, leases on trust uplands, and leases on aquatic lands. It also forecasts revenues to individual funds, including DNR management funds, beneficiary current funds, and beneficiary permanent funds. Caveats about the uncertainty of forecasting DNR-managed revenues are summarized near the end of this section.

Timber Revenue

DNR sells timber through auctioned contracts that vary in duration. For instance, contracts for DNR timber sales sold in FY 2019 needed to be harvested between three months and three years from the date of sale, with most being about two years in length. The purchaser determines the actual timing of harvest within the terms of the contract, which is likely based on perceptions of market conditions. As a result, timber revenues to beneficiaries and DNR management funds lag behind sales.

For the purposes of this chapter, timber that is sold but not yet harvested is referred to as "inventory" or "under contract." Timber volume is added to the inventory when it is sold and placed under contract, and it is removed from the inventory when the timber is harvested.

Timber Sales Volume

The sales volume for FY 22 was 430 mmbf, a significant decrease from the 530 mmbf planned at the beginning of the fiscal year. As noted in the previous forecasts, in the middle of the fiscal year, the proposal to limit DNR timber harvests to only stands less than 120 years old stalled many planned sales and required review of many sales that had already been prepared, delaying the preparation of other sales. Additionally, severe winter weather delayed some sales planning in December 2021 and January 2022, while staffing constraints in some regions also affected sales planning.

The sales volume forecast for FY 23 and outlying years is unchanged at 500 mmbf. Currently, there is no expectation that the timber sales program will be able to recoup the delayed sales from FY 22 to add these the future years. It is also possible that future forecast volumes will be reduced due to the by the Department's Carbon Project, which will remove 10,000 acres of forest land from the planned harvest schedule and instead generate revenue through carbon offsets. However, the current 500 mmbf forecast in outlying years is typically quite conservative, so it is also possible that the new program will have no meaningful effect on the actual volume sold or harvested.

Figure 20: Forecast Timber Sales Volume

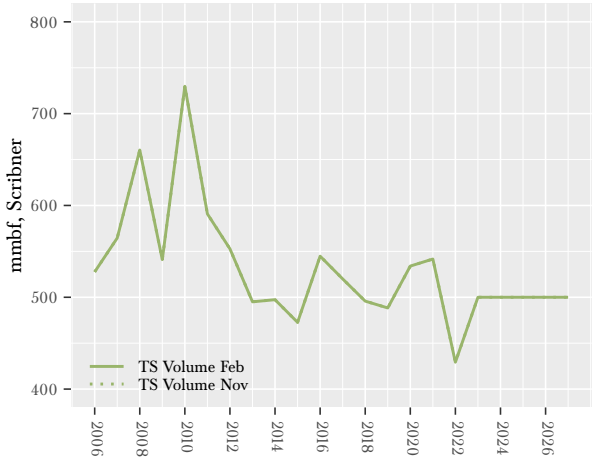
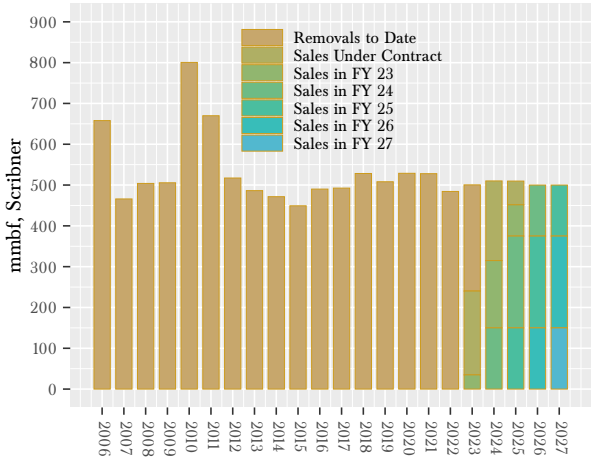


Figure 21: Forecast Timber Removal Volume



Timber Removal Volume

The removal volume for FY 23 is reduced to 500 mmbf, from 510 mmbf, due to slower-than-expected harvests in the first half of the fiscal year. Outlying years' forecasts are unchanged.

Figure 22: Forecast Timber Sales Price

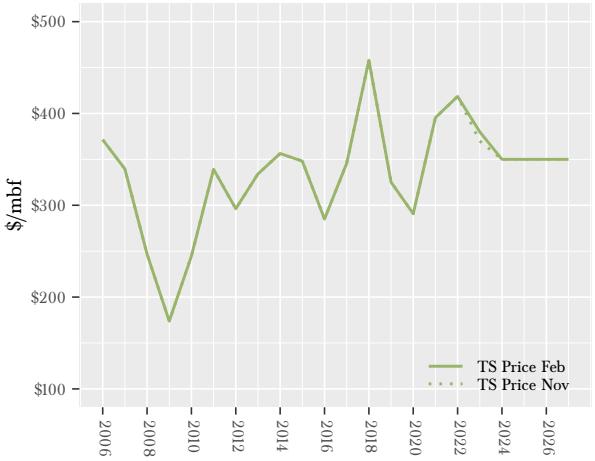
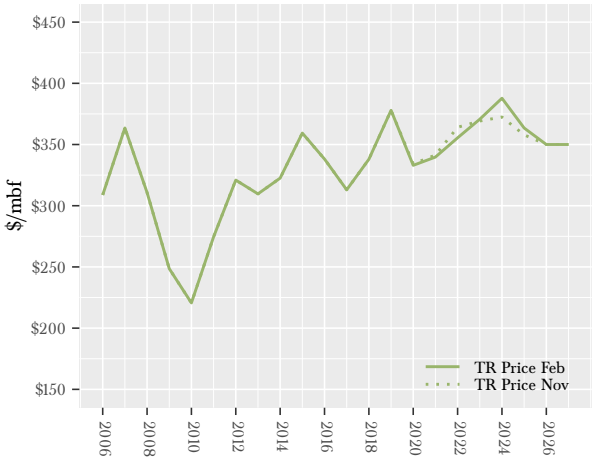


Figure 23: Forecast Timber Removal Price



Timber Sales Prices

The price results of monthly DNR timber sales can be quite volatile (Figure 11). As discussed in the stumpage price outlook, the DNR sales price (stumpage) forecast is informed by West Coast log and stumpage price estimates from a forest economics consulting firm.

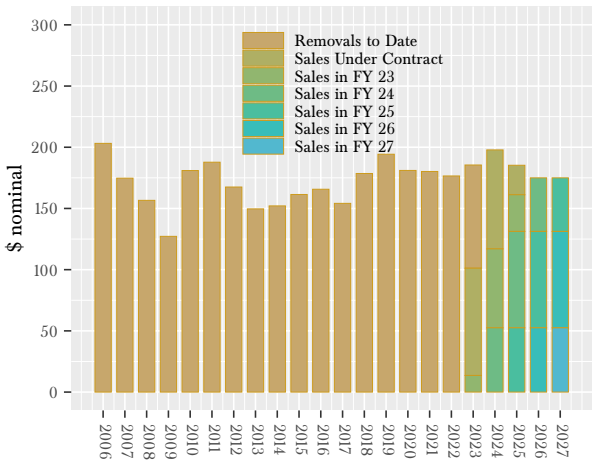
The forecast timber sales prices are increased to $380/mbf for FY 23. Given the most recent average sales prices from the January auction, this is likely on the low end of the range of possible average prices for the year. For the average price for the year to reach $380/mbf, the average price for the remaining sales volume needs to be only $330/mbf. This type of sustained drop in stumpage prices would be unusual, especially given the consistent strength in stumpage prices, but certainly not unheard of.

The outlying years' forecast prices are unchanged at $350/mbf.

Timber Removal Prices

Timber removal prices are determined by sales prices, volumes, and harvest timing. They can be thought of as a moving average of previous timber sales prices, weighted by the volume of auctioned timber removed in each time period (Figure 23). Removal prices are decreased slightly in FY 23 due to the value of timber harvested to-date. Removal prices in outlying years are increased slightly due to the increased FY 23 sales price.

Figure 24: Forecast Timber Removal Value



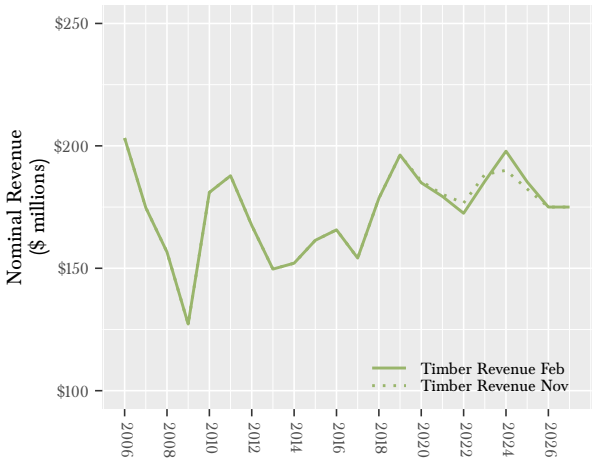
Timber Removal Revenue

Figure 24 shows projected annual timber removal revenues, broken down by the fiscal year in which the timber was sold. Revenue estimates reflect all of the changes described above.

Forecast timber revenues for the 2021-23 biennium are reduced to $358 million, due to the reduction in harvest volume forecast for FY 23, and an update to the harvest revenue for timber tied to the Forest Health Revolving fund.

Forecast revenues for the 2023-25 biennium are increased to $383 million — around 3 percent higher ($11 million) — due to increased prices from FY 23.

Figure 25: Forecast Timber Removal Revenue

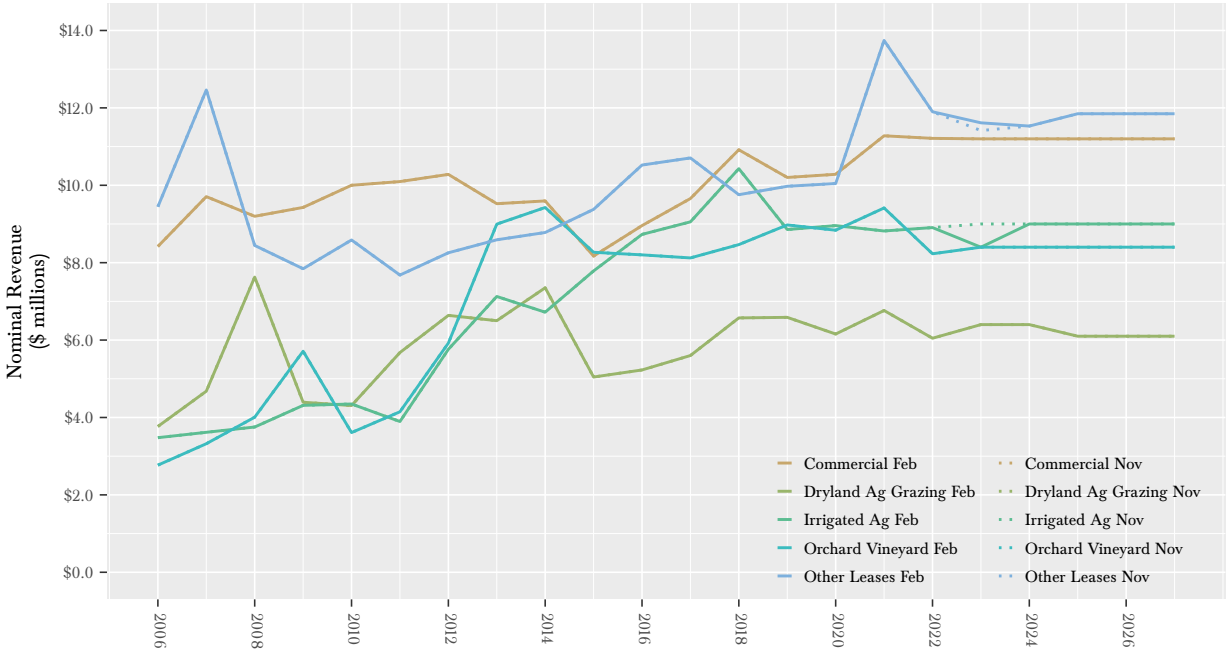


Upland Lease Revenues

Upland lease revenues are generated primarily from leases and the sale of valuable materials other than timber on state trust lands (Figure 26).

Forecast uplands revenue for FY 23 is decreased by $0.4 million to $46.0 million, due to higher than expected revenue to-date from both minerals and hydrocarbon partially offsetting lower than expected revenue from irrigated agricultural leases. Outlying years' revenue is unchanged.

Figure 26: Forecast Upland Lease Revenue

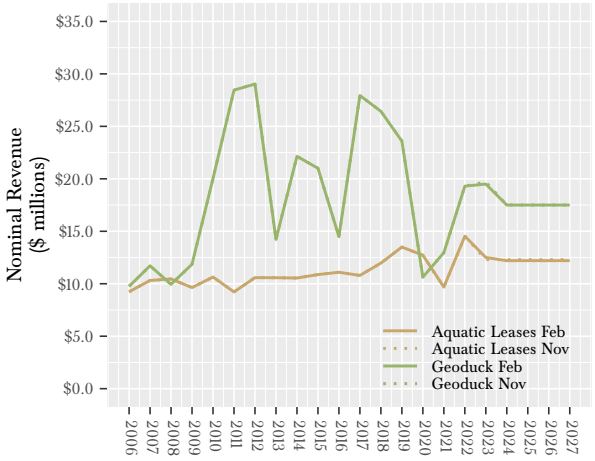


Aquatic Lands Revenues

Aquatic lands revenues are generated from leases on aquatic lands and from sales of geoduck. In the past, on average, leases have accounted for one-third of the revenue and geoduck sales accounted for the remainder. However, prices for geoduck plummeted in the beginning of FY 20, so that it accounted for less than half of the aquatic lands revenue that year. Geoduck prices have since recovered and geoduck revenue are now forecast to account for around 60 percent of aquatic revenue.

The aquatic lease forecast for FY 23 is increased due to higher than expected water-dependent rents. However, outlying years' revenues are reduced slightly due to lower expectations for easements (Figure 27). The recent announcement of net pen aquaculture closures on DNR managed lands are not expected to push aquaculture revenue down. Net pens' revenues have been decreasing for several years and now are only a very small portion of total aquaculture revenue.

Figure 27: Aquatic Lands Revenues



The geoduck price forecast is reduced for FY 23 based on the prices for the auction in November, which were about $0.80/lb lower than expected. However, there were several coincident factors that suggest the November auction prices shouldn't be used as indications of future prices. These include: relatively poor quality tracts, a new stricter refund policy and a recent change in Covid policy in China which led to both significant uncertainty and a large number of cases.

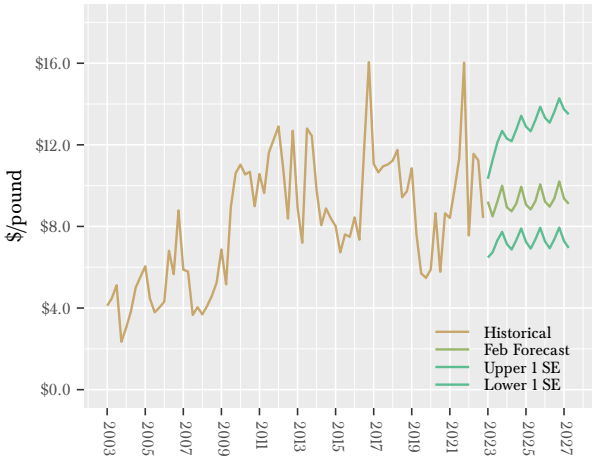
Indeed, as of this writing, the March auction averaged around $13/lb, suggesting that the current forecast revenue will meaningfully underforecast geoduck revenue.

Prices for outlying years are unchanged.

There are, as always, potentially significant downside risks to geoduck revenues, even in the near term and in addition to the pandemic, that are important to consider but difficult to forecast:

- China's zero-COVID policy and current political unrest have increased the downside risk of economic problems or political action in China reducing geoduck demand.
- Harvests (and therefore revenues) could be deferred or lost if geoduck beds are closed due to occurrence of paralytic shellfish poison.
- Harvests are slowed or delayed due to injury or death of divers.
- Early in 2021, heavy rains overwhelmed sewage treatment plants in the Puget Sound, spilling untreated sewage into the sound and closing geoduck tracts for several weeks. Although program staff were able to offer alternative harvest from different tracts, this type of risk will continue as climate change grows more severe.
- In light of recent Washington Department of Fish and Wildlife surveys of closed South Puget Sound geoduck tracts showing declining recovery rates and evidence of active poaching, future commercial harvest levels may be further reduced.

Figure 28: Geoduck Auction Prices



Total Revenues from All Sources

The forecast revenue for the 2021-23 biennium are decreased to $516 million, and the forecast revenue for the 2023-25 biennium are increased to $536 million (Figure 29).

Figure 29: Total Revenues

Distribution of Revenues

The distribution of timber revenues by trust are based on:

- The volumes and values of timber in the inventory (sales sold but not yet harvested) by trust;
- The volumes of timber in planned sales for FY 23 by trust, and relative historical timber prices by DNR region by trust; and
- The volumes of timber by trust for FYs 23-25 based on output of the sustainable harvest model and relative historical timber prices by DNR region by trust.

Because a single timber sale can be worth more than $3 million, dropping, adding, or delaying even one sale can represent a significant shift in revenues to a specific trust fund.

Distributions of upland and aquatic lease revenues by trust are assumed to be proportional to historic distributions unless otherwise specified.

Management Fee Deduction.

The Forecast assumes that the Legislature and Board of Natural Resources will continue to approve the Resource Management Cost Account management deduction at 31 percent and the Forest Development Account management deduction at 25 percent.