

Department of Natural Resources
Economic & Revenue Forecast

Fiscal Year 2022, Fourth Quarter
June 2022



Forecast Summary

Lumber and Log Prices. Lumber prices have been exceptionally volatile the past two years. 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. Since then, the prices have fallen dramatically. The CME cash price for lumber shows it dropping from \$1,300/mbf in February and to \$600/mbf as of writing in early June. Demand remains high and prices are expected to remain higher than they have historically been through 2022, even if they fall further.

The high lumber prices 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. These are very high historically, but interestingly, still below the highs of early 2018. Since then, log prices have softened to a trough of \$600/mbf in October 2021, before increasing again to peak at \$780/mbf in March 2022. Prices have softened to \$720/mbf in April 2022. Log prices are expected to increase in Q3 2022, before softening in Q4.

Timber Sales Volume. DNR currently plans to offer around 430 mmbf for sale in FY 22. This is a significant decrease from the 530 mmbf of sales planned in January. As noted in the previous forecast, some of that planned volume was at risk. 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 and January, while staffing constraints in some regions also affected sales planning.

The sales volume forecasts for future years are unchanged in this forecast. Currently, there is no expectation that the timber sales program will be able to recoup the delayed sales to add these the future years. It is 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 forecast.

Timber Sales Prices. The increase in forecast sales price to \$380/mbf in February appears to have been too conservative, with the average sales price actually *increasing* since the January auction, from an average of \$407/mbf to \$427/mbf. The forecast timber sales prices are increased to \$410/mbf for FY 22. Given the most recent average sales prices from the May auction, this new forecast price may still be too conservative. The outlying years' forecast prices are held at \$350/mbf due to the downside price risks from increasing mortgage interest rates potentially undermining housing demand.

Timber Removal Volume and Prices.

The removal volume forecast is reduced in FYs 22 and 23. Harvests to date have been somewhat slower than expected, forcing a reconsideration of our FY 22 expectations, while the potential for slower demand may undermine harvests in FY 23.

Removal prices are increased primarily due to the increased sales price in FY 22, but also because smaller than expected harvests in FY 22 leave higher valued timber to be harvested in later years.

Timber Revenue. Timber revenue in all years is increased due to the adjustments in removal prices.

Timber revenues for the 2021-23 biennium are \$375 million — around 1 percent higher (\$4 million) than previously forecast. Forecast revenues for the 2023-25 biennium are increased to \$361 million — around 2 percent higher (\$8 million).

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 22 is decreased

by \$0.2 million to \$46 million, due to higher dry-land agricultural revenue being offset by lower revenue from irrigated agriculture and communication leases. Outlying years' revenue is reduced due to rebasing built-in annual percentage increases in communication leases to the current fiscal year.

The aquatic lease forecast for FY 22 is increased slightly due to higher-than-expected revenue from water-dependent rents offsetting lower revenues from aquaculture and non-water-dependent rents.

The geoduck forecast revenue for FY 22 is unchanged at \$18 million, increased in FY 23 by \$0.7 million to \$17 million, and decreased slightly in outlying years. The price forecast has been adjusted based on consistently high auction prices. The revenue expectations for geoduck would be higher if harvests did not face significant risks in all years. Paralytic shellfish poison harvesting closures are a major risk. Additionally, there remain serious issues with compliance vessel availability. Finally, a slew of other risks remain, including labor shortage risks from a small pool of licensed divers, the potential for China to ban geoduck imports for a variety of reasons, and tract closures due to sewage contamination from flooding run-off. 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 they are still on the books.

Total Revenues. The forecast revenue for the 2021-23 biennium are increased to \$528 million, and the forecast revenue for the 2023-2025 biennium are increased to \$512 million.

Coronavirus pandemic¹

The COVID-19 pandemic has significantly altered the economic landscape. It, and government and

business reactions to it, has affected almost every aspect of economic life, from consumer behavior and purchasing decisions to production and supply chain operations. And although the threat of large-scale COVID-19 lock-downs seems to be gone, at least for the moment, it is clear both that the disease can still cause widespread disruption and it will take some time for economies to work through the chaos that it has wrought.

Additionally, the pandemic is ongoing. Currently, transmission levels are rated as high for the vast majority of the country, despite significantly fewer tests being tracked by the Centers for Disease Control and Prevention. This, and future waves, are unlikely to appear in the data due to the availability of at-home testing undermining centralized surveillance - epidemiologists estimate that the true number of COVID-19 infections are somewhere between 3 and 31 times the official reports. The current levels are largely due to the BA.2 Omicron sub-variant, but with the potentially more dangerous BA.4 and BA.5 subvariants growing rapidly as they apparently escape immunity to previous infection and vaccination. Although it's impossible to say with certainty how the pandemic will behave in the future, with very few precautions taken to avoid the spread of the disease within the U.S. and many countries across the globe, waning immunity from current vaccines, and repeated evolution of immunity escaping variants thus far, it seems likely that COVID-19 will continue to cause waves of disease and disruption for quite some time.

Assuming that this is the course that the pandemic takes, these waves would likely cause some short term economic disruption by periodically debilitating some portion of the labor force for one to three weeks at a time. This sort of labor disruption could undermine output, constraining supply and keeping upward pressure on inflation.

¹As a reminder, 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, uncertainty arises from our limited experience and understanding. Additionally, all of the assertions here are linked to references in the main paper. Most references have been omitted here for space.

²Although 'long COVID' does not seem to have been well defined yet, a good general definition is in <https://www.nature.com/articles/s41598-021-95565-8>: "Symptoms, signs, or abnormal clinical parameters persisting two or more weeks after

Additionally, each wave will likely cause be longer term effects through 'long-COVID'². In addition to the widely known long-term damage COVID-19 can cause to the lungs, even mild cases can potentially damage the brain, increase risks of heart problems (such as myocarditis, clots, inflammation, and arrhythmias), and damage kidneys, the liver, and other organs.

Current research suggest that around 1 in 15 of those who get COVID-19 will suffer from long COVID, and at least one pre-print suggests that repeated infections increase the risks of both death post-acute COVID and long-COVID.

It appears that vaccination reduces long- risks by only 15 percent, so even in highly vaccinated areas, future waves will likely leave some amount of the workforce less productive at least, if not pull them from the labor force entirely.

In January, a Brookings Institute report estimated that long COVID could be responsible for about 1.1 million not working at any given time, and 2.1 million people reducing their working hours. In the United Kingdom, a wide survey of businesses showed that long COVID was a top reason for around a quarter of long-term employee absences. Additionally, it appears that recent data suggest that since the start of the pandemic, there has been a large increase in those working with a disability, and those who are not working because of a disability.

Having written all of that, the direction of the pandemic will still be affected by society's response to it. Although, the Omicron subvariants appear to be very good at avoiding immunity thus far, whether through vaccination or previous infection, Moderna has just released an updated version of its COVID-19 booster that appears to work against the BA.4 and BA.5.

A meaningful part of the COVID-19's ongoing effects will depend on how other countries react to outbreaks. China, in particular, is still following a zero-COVID policy. The effect of this is that even a few cases can shut down large parts of cities. If those cities happen to be a port cities, like Shen-

zhen or Ningbo-Shoushan, then even small outbreaks can disrupt international shipping, cause more supply-chain issues, putting upward pressures on costs and inflation. Fortunately, it appears that at least some of the congestion in U.S. ports has eased, alleviating at least one part of the supply-chain problem.

Unfortunately, even if there are no more economic shutdowns, widespread disruptions, or long-term labor market issues from long COVID, many of the pandemic's larger economic effects are still working their way through the economy. After spending most of 2021 with low inventories and constrained supply chains, many businesses are now flush with excess inventory, after finally getting old orders filled, at the same time that demand is dropping off.

Taken all together, the forecast is built with the expectation that the pandemic will continue indefinitely, with waves of infections from new variants every 3-6 months. However, these waves themselves are 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 market demand largely drives timber prices and commodity prices largely drive agricultural revenue. These will be discussed in their respective sections of the forecast, but, in short, the demand for these are largely independent of the pandemic.

Even without clear effects such as stay-at-home orders, the ongoing pandemic will almost certainly have some effects on the economy, though some will likely be more insidious and difficult to quantify, and occur over a longer time horizon. The repercussions could include things such as:

- Reduced demand for services or fluctuations in demand for different types of goods and services as people change behavior depending on whether there is a wave in cases.
- Disruptions to shipping, both international and domestic, because of overrun ports or outbreaks in port cities, as happened in mid-August 2021 at Ningbo-Zhoushan, the world's

COVID-19 onset that do not return to a healthy baseline can potentially be considered long-term effects of the disease"

third-largest container port³.

- Reduced economic output across the global economy due to outbreaks among labor in other sectors, further disrupting supply chains.
- Reduced labor availability due to school and child-care closures or availability - for instance classes being canceled due to a lack of teachers.
- Impaired productivity growth due to long COVID.

To summarize, the assumptions underlying this forecast are:

- There will be no more stay-at-home orders or significant limitations on economic activity by governments in the U.S.
- Successive waves of COVID-19 will not cause major disruptions to DNR revenue streams, which are relatively insulated from the direct effects of COVID-19.
- Even if new COVID-19 infections drop substantially, it will not create a meaningful boost in economic activity that will affect DNR revenues.

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

Other notes to the Forecast. Aside from COVID-19, the other major issue affecting markets currently is the Russian invasion of Ukraine. The invasion drove sanctions on Russian exports, dramatically increasing prices and volatility for oil, timber and grains. The increase in oil prices has pushed up already-high inflation via transport and energy costs, while the constraint on grain supplies has both increased prices and raised the possibility of food shortages. Russia, Belarus and Ukraine account for around 25 percent of world exports, so

the sanctions, plus lower production from Ukraine has seriously constrained supply in international markets⁴.

Right now, it is extremely uncertain how long the invasion will last. Russia has been pushed out of large portions of Ukraine, but are holding large portions of its east. It does not appear that either side will be able to make a decisive victory soon and it also does not appear that either side will be willing to negotiate an end anytime soon. That means that oil, grain and timber supply constraints will likely continue for the foreseeable future.

In addition to the above, a number of sources of uncertainty may affect DNR revenue specifically, and the overall economic activity more broadly. These include: legal challenges to the sustainable harvest volume and marbled murrelet conservation strategy; 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 the timber sales volume estimates are based on the best available internal planning data, they are subject to adjustments due to operational and policy decisions.

From the beginning of 2018 until just before the COVID-19 pandemic, the U.S. and China engaged in an escalating trade dispute. Prior to the pandemic, the tariffs on geoduck were 25 percent and were a significant driver of the drop in geoduck prices in late 2019. The log tariffs and a slowdown in housing starts were the major contributors to the lower domestic price of logs through late 2019. With the pandemic, tariffs were reduced to 5 percent tariff on geoduck, wheat, and softwood logs. There is no indication that tariffs between the countries will be reduced further or removed soon.

Finally, climate change has emerged as a meaningful immediate risk as opposed to an amorphous risk in the far future, as previously rare extreme

³<https://www.ft.com/content/e1263950-1173-4832-a011-ada04df1e93c>

⁴<https://www.ft.com/content/d6388b32-757b-4484-95ff-720b4b2319f3>

weather events become more common. In 2021 drought in Washington decreased wheat production on DNR lands by about 40 percent. In September and October of 2021, extraordinary rainfall in British Columbia destroyed roads and railways, essentially halting timber harvests and lumber production and timber exports through the Port of Vancouver. More recently, in mid-June, there was concurrently: massive flooding wrecking havoc in Montana and Wyoming, thunderstorms that took out power-grids throughout the Great Lakes, and a record setting heat-wave killed at least 2,000 cattle in Kansas⁵.

Climate change continues to impact Washington state'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 do not appear to have seriously affected revenue from DNR timberlands since 2015, they pose a significant risk to both our short-term timber revenue forecast, potentially destroying standing timber under contract, as well as 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 of the fires, suggests an overall economic impact of \$5.9 billion⁶.

⁵<https://www.washingtonpost.com/climate-environment/2022/06/16/summer-climate-disasters/>

⁶2020 Labor Day Fires: Economic Impacts to Oregon's Forest Sector, Oregon Forest Resources Institute ' ' https://oregonforests.org/sites/default/files/2021-09/OFRI-LaborDayFiresEconomicReport_Final_2021.pdf ' '

Table 1: June 2022 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	430	500	500	500	500	500
	Change			(70)	-	-	-	-	-
	% Change			-14%	0%	0%	0%	0%	0%
Price (\$/mbf)		291	395	410	350	350	350	350	350
	Change			\$ 30	\$ -	\$ 10	\$ 10	\$ 10	\$ 10
	% Change			8%	0%	3%	3%	3%	3%
Value of Timber Sales		155.3	214.2	176.3	175.0	175.0	175.0	175.0	175.0
	Change			\$ (13.7)	\$ -	\$ 5.0	\$ 5.0	\$ 5.0	\$ 5.0
	% Change			-7%	0%	3%	3%	3%	3%
Timber Removals									
Volume (mmbf)		529	528	500	510	510	510	500	500
	Change			(20)	(10)	(0)	0	-	-
	% Change			-4%	-2%	0%	0%	0%	0%
Price (\$/mbf)		345	341	368	374	358	351	350	350
	Change			12.2	16.1	7.5	7.7	10.0	10.0
	% Change			3%	5%	2%	2%	3%	3%
Timber Revenue		182.5	180.2	184.1	190.6	182.5	179.0	175.0	175.0
	Change			(1.1)	4.6	3.8	3.9	5.0	5.0
	% Change			-1%	2%	2%	2%	3%	3%
Upland Leases									
Irrigated Agriculture		9.0	8.8	9.0	9.0	9.0	9.0	9.0	9.0
	Change			(0.4)	-	-	-	-	-
	% Change			-4%	0%	0%	0%	0%	0%
Orchard/Vineyard		8.8	9.4	8.6	9.0	9.0	9.0	9.0	9.0
	Change			-	-	-	-	-	-
	% Change			0%	0%	0%	0%	0%	0%
Dryland Ag/Grazing		6.2	6.8	5.7	6.0	6.0	6.0	6.0	6.0
	Change			0.7	-	-	-	-	-
	% Change			14%	0%	0%	0%	0%	0%
Commercial		10.3	11.3	10.8	10.8	10.8	10.8	10.8	10.8
	Change			-	-	-	-	-	-
	% Change			0%	0%	0%	0%	0%	0%
Other Leases		10.0	13.7	11.4	11.8	11.9	12.0	12.1	12.3
	Change			(0.5)	(0.3)	(0.3)	(0.3)	(0.2)	-
	% Change			-4%	-3%	-3%	-3%	-2%	0%
Total Upland Leases		44.3	50.0	45.5	46.6	46.7	46.8	46.9	47.1
	Change			(0.2)	(0.3)	(0.3)	(0.3)	(0.2)	-
	% Change			0%	-1%	-1%	-1%	0%	0%
Aquatic Lands									
Aquatic Leases		12.7	9.7	12.6	12.4	12.4	12.4	12.4	12.4
	Change			0.2	-	-	-	-	-
	% Change			1%	0%	0%	0%	0%	0%
Geoduck		10.6	13.0	18.0	17.7	16.5	16.2	16.2	16.2
	Change			-	0.7	(0.2)	(0.1)	(0.1)	(0.1)
	% Change			0%	4%	-1%	-1%	-1%	-1%
Aquatic Lands Revenue		23.4	22.6	30.6	30.1	28.9	28.6	28.6	28.6
	Change			0.1	0.7	(0.2)	(0.1)	(0.1)	(0.1)
	% Change			0%	2%	-1%	0%	0%	0%
Total All Sources									
		250.1	252.9	260.1	267.2	258.0	254.4	250.5	250.7
	Change			(1.1)	5.0	3.3	3.5	4.7	4.9
	% Change			0%	2%	1%	1%	2%	2%

Table 2: June 2022 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	39.1	42.5	41.4	41.0	40.4	40.4
	Change			(1.0)	0.8	0.6	0.6	0.7	0.8
	% Change			-3%	2%	1%	1%	2%	2%
041	RMCA - Aquatic Lands	9.9	10.2	13.4	13.2	12.6	12.4	12.4	12.4
	Change			0.1	0.4	(0.1)	(0.1)	(0.1)	(0.1)
	% Change			0%	3%	-1%	0%	0%	0%
014	FDA	28.3	27.2	23.5	22.0	22.1	22.2	21.8	21.8
	Change			0.8	(0.6)	0.1	0.5	0.6	0.7
	% Change			4%	-2%	0%	2%	3%	3%
21Q	Forest Health Revolving	8.7	13.5	13.9	13.7	10.0	8.3	8.2	8.2
	Change			(1.4)	1.9	0.7	(0.0)	-	-
	% Change			-9%	16%	7%	0%	0%	0%
Total DNR Key Operating Funds		80.5	84.4	90.0	91.5	86.2	83.9	82.8	82.8
	Change			(1.5)	2.5	1.2	1.0	1.3	1.4
	% Change			-2%	3%	1%	1%	2%	2%
Current Funds									
113	Common School Construction	59.5	53.2	59.1	67.9	67.6	67.5	66.6	66.6
	Change			(2.7)	(0.0)	0.2	0.6	0.9	1.0
	% Change			-4%	0%	0%	1%	1%	1%
999	Forest Board Counties	68.7	69.5	54.0	52.4	53.7	54.4	53.3	53.4
	Change			2.2	(1.5)	0.1	1.1	1.6	1.6
	% Change			4%	-3%	0%	2%	3%	3%
001	General Fund	4.7	4.4	4.8	4.3	3.8	3.6	3.5	3.5
	Change			0.3	0.5	0.2	0.1	0.1	0.1
	% Change			6%	12%	6%	3%	3%	3%
348	University Bond Retirement	0.6	1.6	3.0	2.9	2.3	2.0	1.9	1.9
	Change			(0.0)	0.7	0.3	0.1	0.0	0.0
	% Change			-1%	34%	14%	3%	2%	2%
347	WSU Bond Retirement	1.9	2.6	1.6	1.6	1.6	1.6	1.7	1.7
	Change			0.1	0.1	0.1	0.1	0.1	0.1
	% Change			6%	5%	5%	5%	6%	7%
042	CEP&RI	3.6	2.2	3.8	4.3	4.6	4.7	4.6	4.6
	Change			0.3	(0.3)	0.0	0.1	0.2	0.2
	% Change			10%	-6%	0%	3%	4%	4%
036	Capitol Building Construction	4.4	7.7	7.1	9.6	8.4	7.9	7.6	7.6
	Change			(0.3)	1.2	0.5	0.2	0.2	0.2
	% Change			-4%	15%	7%	3%	3%	3%
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)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
	% Change			-11%	-10%	-10%	-10%	-10%	-10%
Other Funds		1.1	0.6	1.5	0.9	0.4	0.2	0.1	0.1
	Change			0.0	0.1	0.1	0.0	0.0	0.0
	% Change			0%	14%	29%	20%	3%	3%
Total Current Funds		144.7	141.9	135.0	144.2	142.5	141.8	139.5	139.6
	Change			(0.1)	0.9	1.5	2.2	3.1	3.2
	% Change			0%	1%	1%	2%	2%	2%

(Continued)

Table 3: June 2022 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	17.2	16.9	16.3	16.1	16.1	16.1
	Change				0.1	0.4	(0.1)	(0.1)	(0.1)	(0.1)
	% Change				1%	2%	-1%	0%	0%	0%
Permanent Funds										
	601	Agricultural College Permanent	5.4	5.7	4.3	5.4	4.4	4.0	3.9	3.9
		Change			(0.0)	1.2	0.4	0.1	0.1	0.1
		% Change			-1%	27%	11%	3%	3%	3%
	604	Normal School Permanent	2.6	2.8	3.9	2.7	2.7	2.7	2.7	2.7
		Change			0.4	(0.4)	(0.1)	0.1	0.1	0.1
		% Change			10%	-12%	-2%	2%	3%	3%
	605	Common School Permanent	0.2	0.4	0.3	0.3	0.3	0.3	0.3	0.3
		Change			-	-	-	-	-	-
		% Change			0%	0%	0%	0%	0%	0%
	606	Scientific Permanent	3.1	4.9	8.6	5.0	4.9	4.8	4.7	4.7
		Change			(0.1)	(0.2)	0.0	0.1	0.1	0.1
		% Change			-2%	-5%	0%	2%	3%	3%
	607	University Permanent	0.1	0.3	0.7	1.2	0.8	0.6	0.5	0.5
		Change			0.2	0.8	0.3	0.0	0.0	0.0
		% Change			41%	173%	50%	7%	3%	3%
Total Permanent Funds			11.4	14.2	17.9	14.6	13.1	12.5	12.1	12.1
		Change			0.4	1.3	0.6	0.3	0.4	0.4
		% Change			2%	10%	5%	3%	3%	3%
Total All Funds			250.1	252.9	260.1	267.2	258.0	254.4	250.5	250.7
		Change			(1.1)	5.0	3.3	3.5	4.7	4.9
		% Change			0%	2%	1%	1%	2%	2%

Figure 1: Timber Forecast Charts

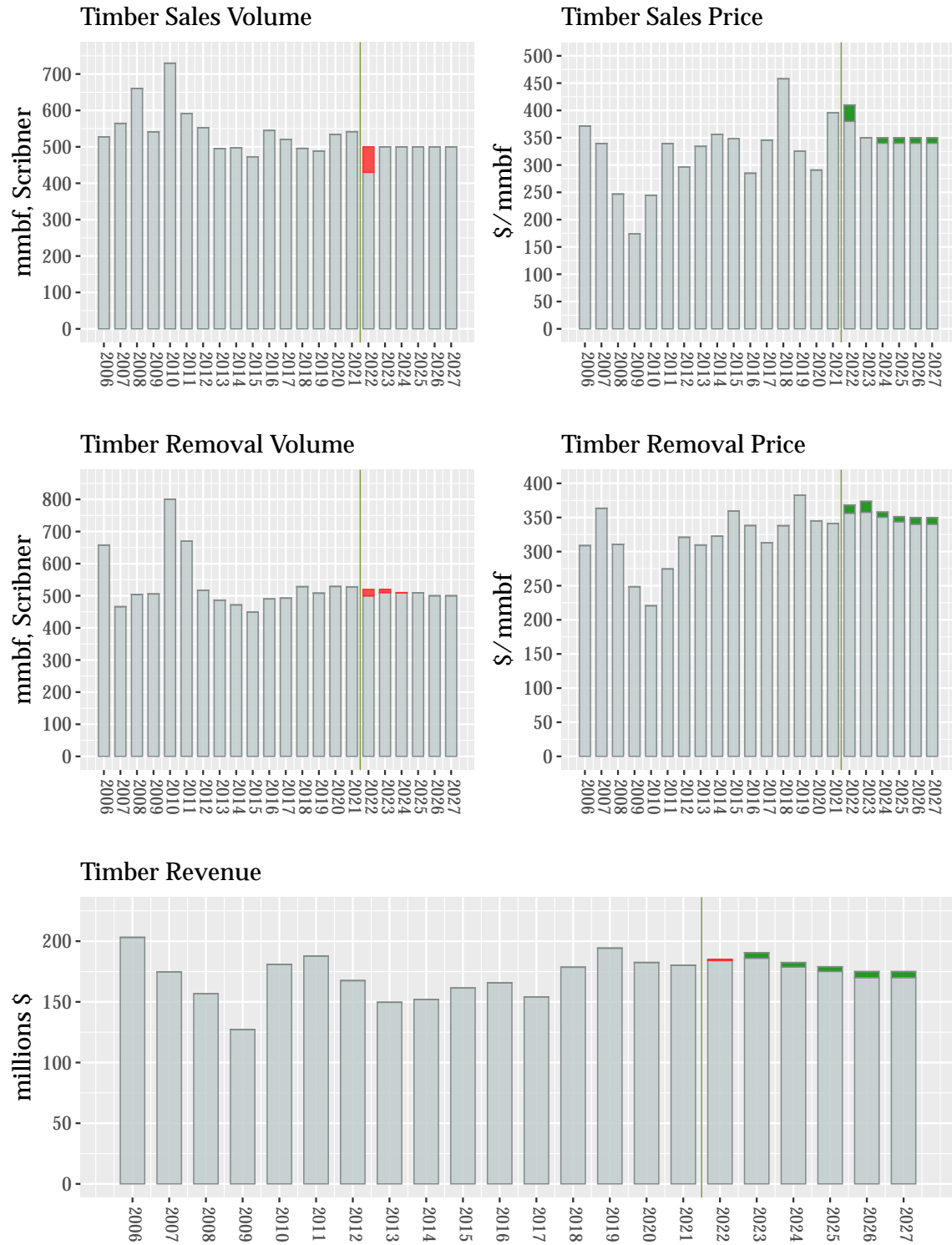


Figure 2: Other Uplands Forecast Charts

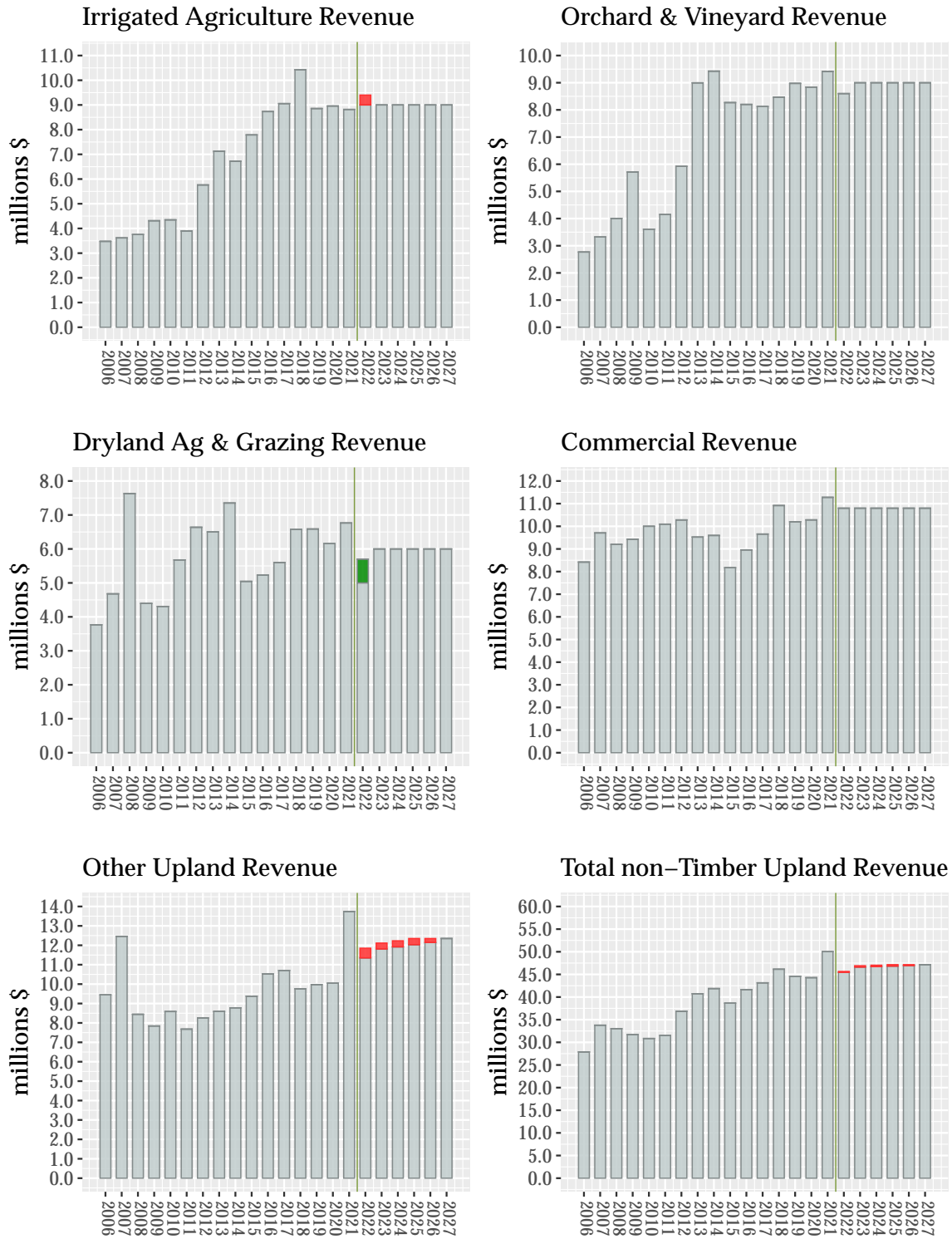
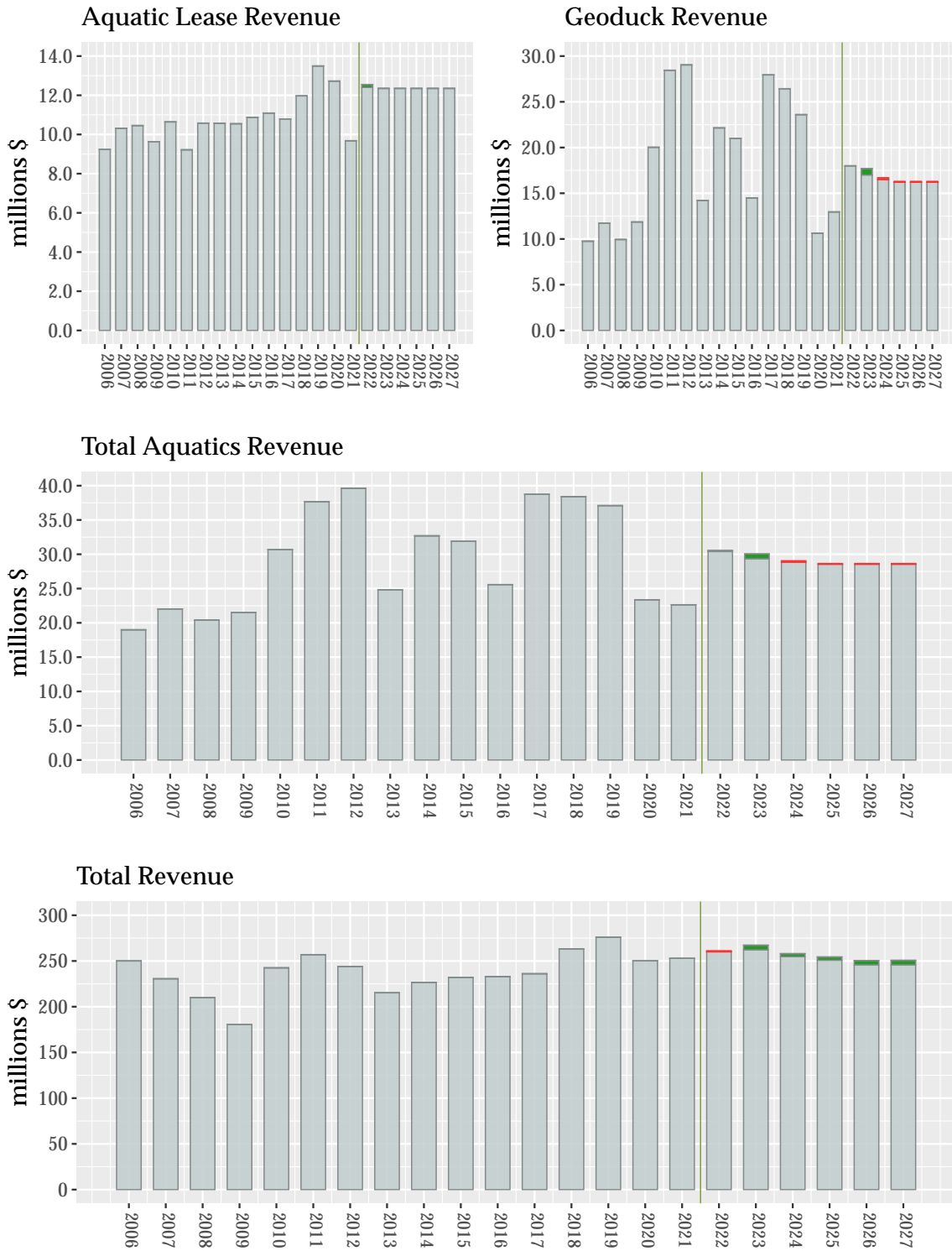


Figure 3: Aquatics and Total Forecast Charts



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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 2022, runs from July 1, 2021, through June 30, 2022.

The baseline date (the point that designates the transition from “actuals” to predictions) for DNR revenues in this Forecast is May 1, 2022. 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 May 2021. 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)
September 2022	August 1, 2022	September 15, 2022
November 2022	October 1, 2022	November 15, 2022
February 2023	January 1, 2023	February 15, 2023
June 2023	May 1, 2023	June 15, 2023

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: Tom Heller, Patrick Ferguson, Kari Fagerness, Kathryn Mink, Michael Kearney, Sherry Land, Linda Farr, Michelle McLain, 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

Kristoffer Larson, Economist

David Chertudi, Lead Economist

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

The COVID-19 pandemic has significantly altered the economic landscape⁷. It, and government and business reactions to it, has affected almost every aspect of economic life, from consumer behavior and purchasing decisions to production and supply chain operations. And although the threat of large-scale COVID-19 lock-downs seems to be gone, at least for the moment, it is clear both that the disease can still cause widespread disruption and it will take some time for economies to work through the chaos that it has wrought.

Additionally, the pandemic is ongoing. Currently, transmission levels are rated as high for the vast majority of the country, despite significantly fewer tests being tracked by the Centers for Disease Control and Prevention⁸. This, and future waves, are unlikely to appear in the data due to the availability of at-home testing undermining centralized surveillance - epidemiologists estimate that the true number of COVID-19 infections are somewhere between

3 and 31 times the official reports⁹. The current levels are largely due to the BA.2 Omicron subvariant, but the potentially more dangerous BA.4 and BA.5 subvariants growing rapidly as they apparently escape immunity to previous infection and vaccination¹⁰. Although it's impossible to say with certainty how the pandemic will behave in the future, with very few precautions taken to avoid the spread of the disease within the U.S. and many countries across the globe, waning immunity from current vaccines¹¹, and repeated evolution of immunity escaping variants thus far, it seems likely that COVID-19 will continue to cause waves of disease and disruption for quite some time¹².

Assuming that this is the course that the pandemic takes, these waves would likely cause some short term economic disruption by periodically debilitating some portion of the labor force for one to three weeks at a time. This sort of labor disruption could undermine output, constraining supply and keeping upward pressure on inflation.

Additionally, each wave will likely cause longer-term effects through 'long COVID'¹³. In addition to the widely known long-term damage COVID-19 can cause to the lungs, even mild cases can potentially damage the brain¹⁴, increase risks of heart problems¹⁵ (such as myocarditis, clots, inflammation and arrhythmias), and damage kidneys¹⁶, the liver and other organs¹⁷.

⁷As a reminder, 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, uncertainty arises from our limited experience and understanding.

⁸<https://COVID.cdc.gov/COVID-data-tracker/>

⁹<https://www.medrxiv.org/content/10.1101/2022.05.25.22275603v1.full.pdf+html> and <https://www.bloomberg.com/news/newsletters/2022-06-04/coronavirus-daily-just-how-wildly-are-covid-cases-undercounted>

¹⁰<https://www.cnn.com/2022/06/22/health/ba4-ba5-escape-antibodies-covid-vaccine/index.html> and <https://COVID.cdc.gov/COVID-data-tracker/>

¹¹<https://www.nature.com/articles/s41467-022-30884-6>

¹²<https://www.nature.com/articles/s41598-022-13137-w>

¹³Although 'long COVID' does not seem to have been well defined yet, a good general definition is in <https://www.nature.com/articles/s41598-021-95565-8>: "Symptoms, signs, or abnormal clinical parameters persisting two or more weeks after COVID-19 onset that do not return to a healthy baseline can potentially be considered long-term effects of the disease"

¹⁴<https://www.nature.com/articles/s41586-022-04569-5> and <https://www.nature.com/articles/s41467-022-30932-1>

¹⁵<https://publichealth.jhu.edu/2022/COVID-and-the-heart-it-spare-no-one> and [https://www.thelancet.com/journals/lanres/article/PIIS2213-2600\(21\)00085-0/fulltext](https://www.thelancet.com/journals/lanres/article/PIIS2213-2600(21)00085-0/fulltext)

¹⁶<https://www.nature.com/articles/s41581-021-00487-3>

¹⁷<https://www.nature.com/articles/s41598-021-95565-8>

Current research suggest that around 1 in 15 of those who get COVID-19 will suffer from long COVID¹⁸, and at least one pre-print suggests that repeated infections increase the risks of both death post-acute COVID and long COVID¹⁹.

It appears that vaccination reduces long COVID risks by only 15 percent²⁰, so even in highly vaccinated areas, future waves will likely leave some amount of the workforce less productive at least, if not pull them from the labor force entirely.

In January, a Brookings Institute report estimated that long COVID could be responsible for about 1.1 million not working at any given time, and 2.1 million people reducing their working hours²¹. In the United Kingdom, a wide survey of businesses showed that long COVID was a top reason for around a quarter of long term employee absences²². Additionally, recent data appear to suggest that since the start of the pandemic, there has been a large increase in those working with a disability, and those who are not working because of a disability²³.

Having written all of that, the direction of the pandemic will still be affected by society's response to it. Although, the Omicron subvariants appear to be very good at avoiding immunity thus far²⁴, whether through vaccination or previous infection, Moderna has just released an updated version of it's COVID-19 booster that appears to work against the BA.4 and BA.5 subvariants²⁵.

A meaningful part of COVID-19's ongoing effects will depend on how other countries react to outbreaks. China, in particular, is still following a zero-COVID policy. The effect of this is that even a few cases can shut down large parts of cities. If those cities happen to be a port cities, like Shenzhen or Ningbo-Shoushan, then even small outbreaks can disrupt international shipping, and cause more supply-chain issues, putting upward pressures on costs and inflation. Fortunately, it appears that at least some of the congestion in U.S. ports has eased, alleviating at least one part of the supply-chain problem²⁶.

Unfortunately, even if there are no more economic shutdowns, widespread disruptions, or long-term labor market issues from long COVID, many of the pandemic's larger economic effects are still working their way through the economy. After spending most of 2021 with low inventories and constrained supply chains, many businesses are now flush with excess inventory, after finally getting old orders filled, at the same time that demand is dropping off.

Taken all together, the forecast is built with the expectation that the pandemic will continue indefinitely, with waves of infections from new variants every three to six months²⁷, but 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

¹⁸<https://www.nature.com/articles/s41467-021-26513-3>

¹⁹<https://www.researchsquare.com/article/rs-1749502/v1>

²⁰<https://www.nature.com/articles/d41586-022-01453-0>

²¹<https://www.brookings.edu/research/is-long-COVID-worsening-the-labor-shortage/>

²²<https://www.ft.com/content/33444f29-bab1-4655-85b5-c0b1f68d9653>

²³<https://www.bloomberg.com/opinion/articles/2022-06-15/long-COVID-is-showing-up-in-the-employment-data>

²⁴https://www.washingtonpost.com/business/omicron-is-turning-out-to-be-a-weak-vaccine/2022/05/16/8777e9b6-d510-11ec-be17-286164974c54_story.html

²⁵<https://www.nbcnews.com/health/health-news/moderna-bivalent-COVID-vaccine-appears-work-omicron-subvariants-ba4>

²⁶<https://www.wsj.com/livecoverage/stock-market-news-inflation-consumer-price-index-may-2022/card/southern-california-port-congestion-falls-PuSRA17k13DzD JuzkVjF>

²⁷Though these waves are unlikely to appear in the data. With the availability of at-home testing undermining centralized surveillance, epidemiologists estimate that true COVID infections are somewhere between 3 and 31 times official reports - <https://www.medrxiv.org/content/10.1101/2022.05.25.22275603v1.full.pdf+html> and <https://www.bloomberg.com/news/newsletters/2022-06-04/coronavirus-daily-just-how-wildly-are-COVID-cases-undercounted>. Additionally, it appears that a new wave of subvariants are increasing currently, with BA.4 and BA.5 supplanting BA.2 <https://www.msn.com/en-us/health/medical/stealth-omicron-was-just-overtaken-in-the-us-by-a-new-subvariant-that-evades-immunity/ar-AAHYJEM>

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 the ongoing pandemic.

Even without clear effects such as stay-at-home orders, the ongoing pandemic, with waves of variants like Delta and Omicron, will probably still have some effects on the economy, though some will likely be more insidious and difficult to quantify, and occur over a longer time horizon. The repercussions could include things such as:

- Reduced demand for services or fluctuations in demand for different types of goods and services as people change behavior dependent on whether there is a spike in cases.
- Disruptions to shipping, both international and domestic, because of overrun ports and outbreaks in port cities, as happened in mid-August 2021 at Ningbo-Zhoushan, the world's third-largest container port²⁸.
- Reduced economic output across the global economy due to outbreaks among labor in other sectors, further disrupting supply chains.
- Reduced labor availability due to school and child-care closures or availability.
- Impaired productivity growth due to long COVID.

To summarize, the assumptions underlying this forecast are:

- There will be no more stay-at-home orders or significant limitations on economic activity by governments in the U.S.
- Successive waves of COVID-19 will not cause major disruptions to DNR revenue streams, which are relatively insulated from the direct effects of COVID-19.
- Even if new COVID-19 infections drop substantially, it will not create a meaningful

boost in economic activity that will affect DNR revenues.

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

In addition to the real health and economic problems caused by the pandemic, the upheaval of the economic systems and the ongoing pandemic impacts have dramatically increased the difficulty of economic modeling. Broadly, economic models rely on historical data to try to forecast or understand how the future will look. Initially, the suddenness and severity of the coronavirus impacts meant that economic models were operating well outside of their historical bounds. Additionally, models typically rely on consistent relationships between economic variables, but COVID-19 has also distorted some of those relationships for instance by changing underlying consumer behavior or by undermining parts of the economy, such as manufacturing supply chains.

This causes "out of sample" or "generalization" errors — the current data or relationships between variables are far enough outside of the normal bounds that the models become ever more inaccurate. These issues have even caused some models to be pulled offline — for instance the New York Fed's Nowcast model's publication was suspended on September 3, 2021 due to uncertainty and volatility caused by the pandemic²⁹.

Altogether, this means that the path of the economy is inordinately unclear, even in the short term. The massive multiple fiscal stimulus packages and monetary policy response of the U.S. mitigated the worst of the possible outcomes and even drove a strong rebound, with both GDP and wages climbing higher than historical averages.

Additionally, the relatively high savings rate and fiscal stimulus packages sharply increased demand for goods (at the same time that demand for ser-

²⁸<https://www.ft.com/content/e1263950-1173-4832-a011-ada04df1e93c>

²⁹<https://www.newyorkfed.org/research/policy/nowcast>

vices plummeted) while supply chain issues and labor constraints across the world limited the supply response, causing large price spikes from everything from cars to lumber to aluminum. Its uncertain when this price volatility will settle down — for instance, the lumber price spike from mid-2021 to \$1,600/mbf seemed to resolve with prices falling to the \$400/mbf range, only to dramatically increase again in early 2022 ... and then fall again to now. Supply chain issues have settled somewhat, but given that the pandemic is ongoing, it is unclear when many of these industries will reach new price equilibria.

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.

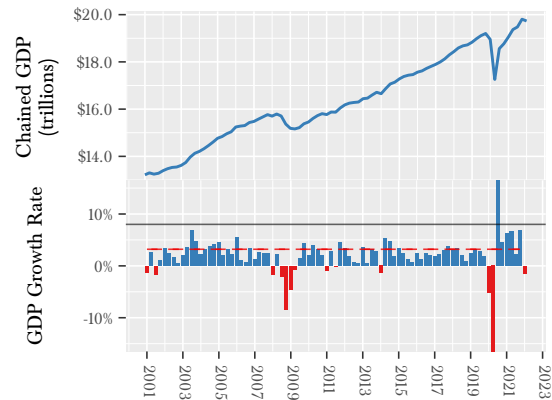
The onset of the COVID-19 pandemic caused the sharpest quarterly GDP decline in history: first -0.86 percent in Q1 and then a staggering -9.62 percent in Q2 (-31.4 percent SAAR). However, it rebounded with growth of 33.4 (SAAR) percent in Q3 and 4.0 percent (SAAR) in Q4. This meant that the average annualized GDP was -3.5 percent for 2020, and left chained GDP at roughly what it was in Q3 2018 (Figure 4).

Generally, GDP growth rebounds after a recession, spiking to well above the historical average. This did not happen with the Great Recession in 2008-09, but with the fiscal stimulus packages and monetary stimulus, the U.S. economy grew very well in 2021, with annual growth of 5.5 percent.

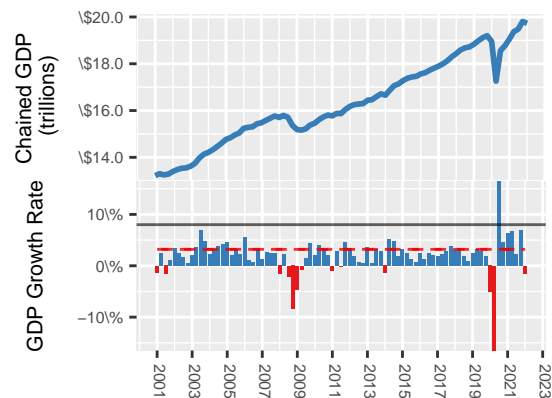
However, that is extremely unlikely to continue at this point. First-quarter 2022 GDP growth was undermined by government spending and inventory changes, and shrank by 1.4 percent (SAAR). Additionally, core inflation was already climbing, but

with the Russian invasion of Ukraine, inflation has been pushed much higher and the Federal Reserve has started raising interest rates. The rate rises, plus the increased prices of oil and agricultural commodities due to the war, will likely reduce GDP growth substantially.

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.



The Atlanta Fed’s GDPNow high-frequency forecast predicts Q1 2022 GDP at 0 percent. As noted in the summary section, the New York Fed’s Nowcast, the other major high-frequency forecast we typically look at, suspended publication on September 3, 2021, because of uncertainty and volatility

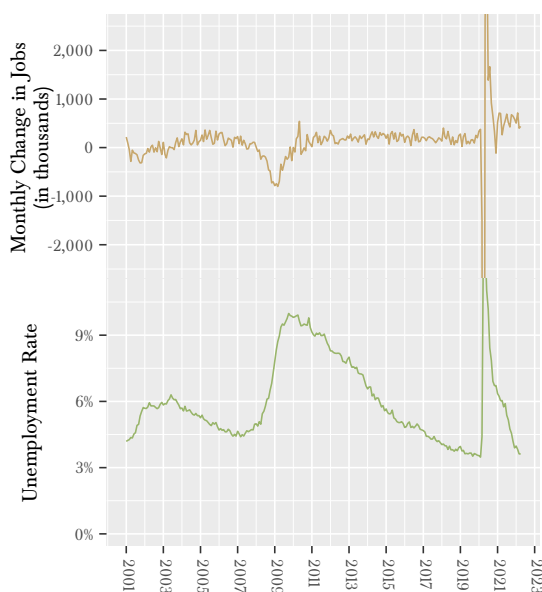
caused by the pandemic.

The June FOMC meeting materials shows forecasts between 1.5 and 1.9 percent real GDP growth in 2022. This is well down from 3.6 and 4.5 percent growth expectations in the December materials. Expectations for outlying years are closer to what we saw before the pre-pandemic, at between 1.3 and 2.5 percent.

There is a non-zero probability of a recession this year due to increased interest rates and the Russian war on Ukraine. Macro-economists from multiple banks predict a between 30 and 50 percent chance of a recession this year.

A lot of uncertainty remains around all of these forecasts because, as noted previously, economic models are typically based on historical relationships — which the pandemic has upended. The global economy still is not operating anything like how it normally would be.

Figure 5: Unemployment Rate and Monthly Change in Jobs

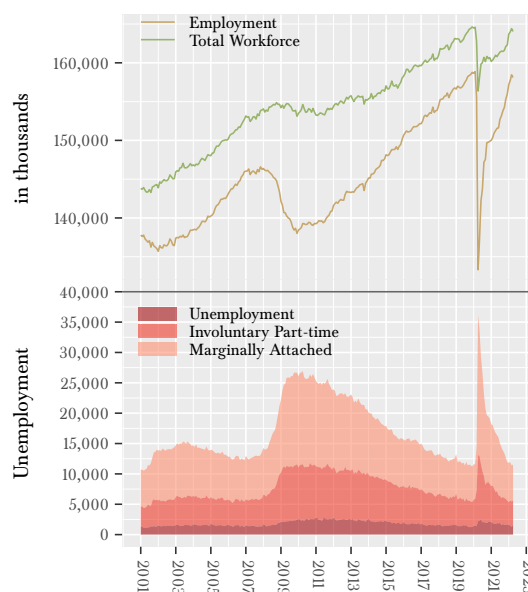


Note that the y-axes for these charts are limited because of the extreme changes in Q2 2020.

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. It had been trending downward since peaking at 10 percent in 2010 and was 3.5 percent in February 2020, one of its lowest points since 1969 (Figure 5).

Figure 6: Employment and Unemployment



With the shutdown of the economy at 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. 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

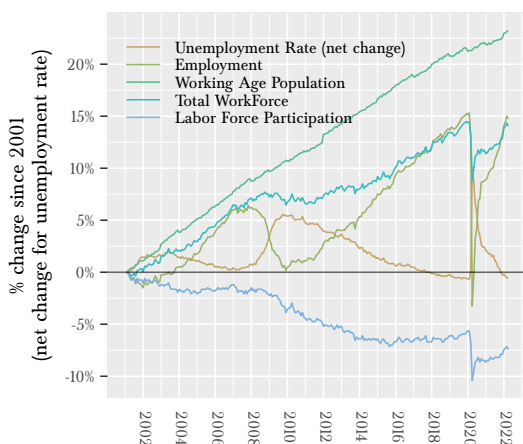
employment.

Since mid-2020, both have improved considerably, with the unemployment rate decreasing to 3.6 percent in April 2022 and the labor force participation rate increasing to 62.3 percent.

Overall, there are around 600,000 fewer jobs in May 2022 than in February 2020 and about 400,000 fewer people in the labor force in April 2022 compared to February 2020 (that is, employed or looking for work). The unemployment rate is expected to continue to trend downward, with many job openings and meaningful wage growth drawing people back into the labor market.

Job openings data from the BLS show that there are roughly 2 million more job openings available in April 2022, compared to April 2021. Altogether, it seems as though the economy is on track to recover all of the jobs lost to the pandemic within the next couple of months.

Figure 7: Labor Market Indicators



Another metric used to understand the employment market is the U-6. The U-6 is an alternative measure of unemployment that includes involuntarily part-time employment (underemployment) and marginally attached workers, who are not included in the headline unemployment rate but who, nevertheless, are likely to be looking for work and would benefit from better job prospects. The U-6 also bal-

looned as a result of the pandemic, increasing from 7.0 percent in February 2020 to 22.8 percent in April 2020. Since then, it has fallen to 7.1 percent in January 2022, which is lower than many of the years prior to the Great Recession (Figure 6).

Overall, the employment situation appears to be improving and will likely continue to support decent economic growth, assuming a recession doesn't undermine that growth.

Inflation

Until recently, aside from a short period in 2012, core inflation had been below the FOMC's target since the recession in 2008. Similarly to GDP forecasts, inflation forecasts were consistently too high, with each year predicted to break the cycle of weak inflation, only to disappoint as the year progresses (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 is a marked departure from policy in the last 10 years, when there were a number of (sometimes-contentious) interest rate increases, even though inflation was well below 2 percent.

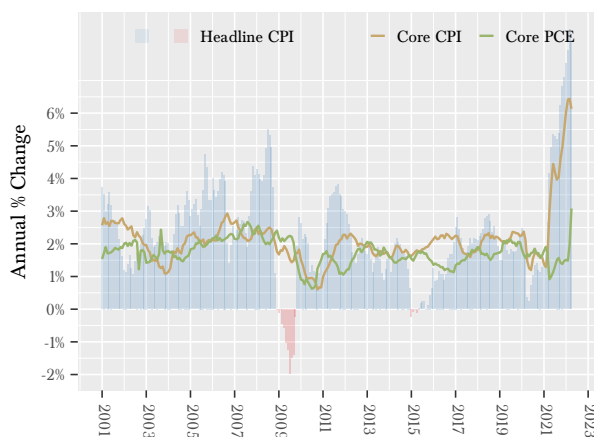
Except for short periods in 2012 and 2018, the core-PCE shows inflation at or below the 2.0 percent target between September 2008 until March 2021. However, since April 2021, inflation has been higher than the FOMC's target, and remained high on the back of supply chain issues and strong demand. In the previous forecast, we were expecting inflation to continue to remain relatively high but dropping off through the year. Of course, that did not take into account the Russian invasion of Ukraine (because it hadn't happened yet) and the consequent spike in oil and agricultural commodities prices.

Beginning in late 2021 core-PCE climbed fairly rapidly, from 3.6 percent in July to 5.1 percent in January 2022. The core-PCE recently fell to 4.9 percent in April, though the other metrics, the headline CPI in particular, have continued to increase. This makes sense, because the core inflation metrics include food and energy prices, which are the specific ones affected by the Russian war.

Notes from its December meeting show that the FOMC expected core inflation between 2.5 and 3.0 in 2022. Those expectations changed markedly in the June meeting materials, showing a range of 5.0 to 5.3 for 2022.

Previously, the expectation was that once the large Omicron wave had abated and supply chain issues eased that inflation would start coming down. Although those two issues have eased, job growth is still very strong. Combined with the war in Ukraine, inflation is likely to remain high for the remainder of the year. However, as discussed below, the FOMC is already increasing rates and is likely to continue increasing them aggressively through the year to pull inflation down.

Figure 8: U.S. Inflation Indices



Interest Rates

Interest rates are a powerful tool used by the Federal Reserve Bank to influence the U.S. econ-

³⁰We refer to interest rates broadly, but the Fed specifically governs the Federal funds rate, which heavily influences interest rates across the economy.

omy³⁰. 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.

From December 2008 to December 2015, the Federal Reserve held the federal funds rate in the 0.0-0.25 percent range. To keep rates that low for that long was unprecedented and reflected the immense damage done by the Great Recession. During that time, the Fed pledged to keep the rates near 0 until it judged that there had been sufficient progress toward its dual mandate of maximum employment and around 2.0 percent inflation.

Beginning in December 2015, the FOMC gradually raised interest rates from 0.0-0.25 percent range to 2.25-2.5 percent range by the end of 2018. It is notable that these increases were made based on progress in the recovery of employment and inflation, and a strong economic growth outlook, rather than employment or inflation that had reached any threshold. Given this history, it was a significant change that the FOMC backed away from this policy in late 2020, promising to keep rates very low until the *average* inflation is around 2 percent.

The Fed began increasing interest rates in March due to continued high inflation. They increased rates by 0.25 percent in each month from March through May, and then increased rates more dramatically by 0.75 percent in June. Along with these increased rates are increases in the expected federal funds rate at the end of the year. As of the June meeting, the FOMC expects the rate will be between 3.1 and 3.6 percent at the end of 2022 - an enormous change from the expectations in December when it was expecting the Federal funds rate to remain at between 0.6 and 0.9 percent.

This will likely slow down economic activity, but it is unclear how much, in part because these interest rates are still very low historically.

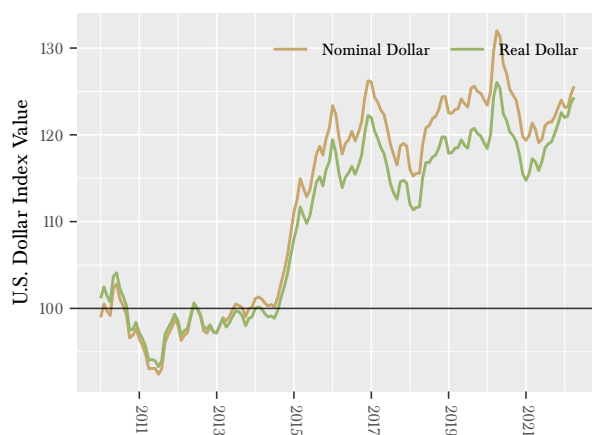
The U.S. Dollar and Foreign Trade

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 since mid-2021 it began quickly climbing again.

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.

However, given the strong domestic demand for timber products, it is doubtful that any price effect on stumpage will be readily identifiable. Additionally, agricultural product prices remain high, and geoduck had one of the highest auction prices ever in the December auction. So if exchange rates are having an impact, it appears to be only that it may be reducing the high prices that are currently being seen.

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.

Prior to the COVID-19 pandemic, there were ongoing trade tensions between the U.S. and China with both countries implementing tariffs. Although a "Phase One" trade deal had been signed before the pandemic to deescalate the trade war, there were not actually any apparent changes to tariffs. Of the products relevant to DNR revenue, softwood logs are subject to a 5 percent tariff. Geoduck, wheat, and many orchard/vineyard agricultural products (such as apples) were subject to a 25 percent tariff, though this was reduced to 5 percent due to the pandemic.

It appears that the U.S. administration is largely focused on matters other than resolving the trade war with China, so we do not expect any easing of tariffs anytime soon. Having said that, it is unclear whether there will be any appetite to increase the tariffs back to their pre-pandemic levels either.

Another recent issue is that the United States has increased the taxes on imported Canadian lumber. This will likely put upward pressure on lumber prices, and by extension, timber prices.

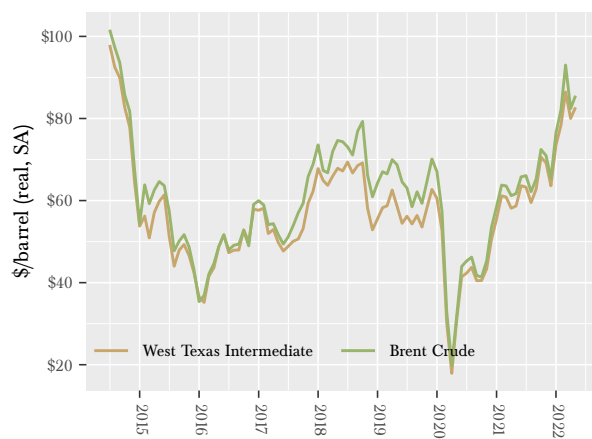
Petroleum

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.

As with everything else, the coronavirus pandemic

has increased oil price volatility, even sending the spot prices negative for a short time (Figure 10). More recently, the Russian invasion of Ukraine has pushed prices much higher. Nominal prices have jumped to over \$100/barrel in the last couple of months — the highest they’ve been since 2014. These prices are high enough that they are most likely going to create a drag on economic growth. Depending upon the geopolitical effects of the Russian invasion, oil could be entering a longer period of higher prices.

Figure 10: Crude Oil Prices

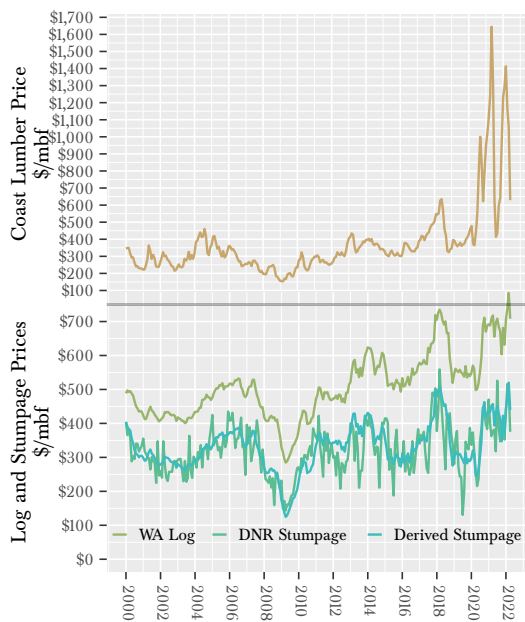


In addition to making timber from the Pacific Northwest less internationally competitive, high oil prices will put downward pressure on timber prices. Diesel fuel is a meaningful part of timber harvest costs — increasing those costs will mean that, all else being equal, harvesters will need to pay less for the actual timber. However, current demand for timber is high enough that this effect may not be noticed.

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

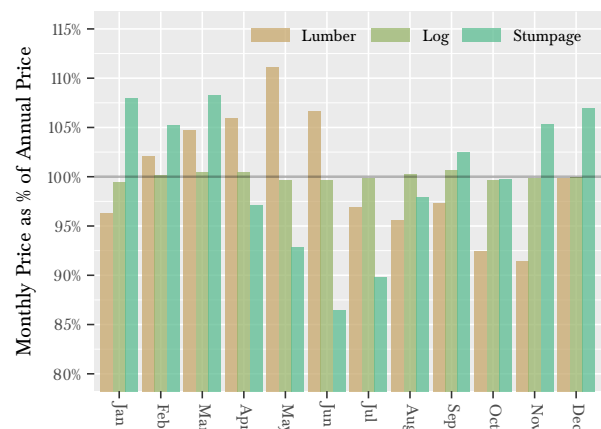


In general, timber stumpage prices reflect demand for lumber and other wood products, timber supply, and regional lumber mill capacity. There is a consistent, positive relationship between log prices and DNR's stumpage prices, despite notable volatility in stumpage prices (Figure 11). High log prices 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.

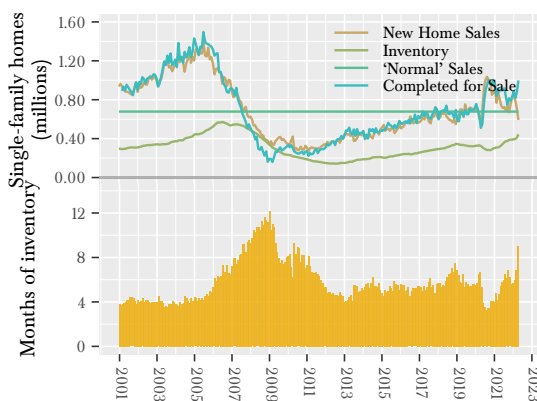
U.S. Housing Market

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. Since the initial collapse in activity in early 2020, both starts and new home sales have risen significantly — largely driven

by strong household balance sheets and record-low mortgage rates.

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 (Figure 13). New home sales increased from 440,000 (SAAR) in 2014 to an average of 616,000 in 2017, still well below the long-term (1963-2010) "normal" rate of 678,000 (SAAR) sales per year. In 2018, new home sales averaged 651,000 (SAAR) through May, before dropping meaningfully to average 593,000 for June-December. From November 2019 through January 2020, new home sales rose steeply to peak at 756,000, the highest it had been since the recession.

From January through April 2020, new single-family home sales fell back 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. Through April of 2022, sales have averaged 731,000 (SAAR) per month.

In the previous forecast, we expected that new home sales would remain high for some time. However, with the much stronger interest rate increases from the Fed, it is likely that new home sales will weaken somewhat, if not fall. Already, the increased rates have led to higher mortgage interest rates, which in turn have substantially increased mortgage payments. This will reduce purchases and blunt home price growth. It is not clear which will be the larger effect, though recently new home sales have dropped (Figure 13).

Some of the recent drop in sales may be due in part to the way that new home sales are estimated by Census, which counts a sale at the time an agreement to sell is signed, often before the home is built, not when the sale is actually completed. This has apparently led to two issues: sales prices be-

ing renegotiated recently as buyers are no longer able to secure financing at current interest rates and sales running well ahead of actual completions. Additionally, it appears that some builders are holding off on constructing new housing until they are able to complete previous projects, many of which have been held up by supply chain issues, such as lack insulation and appliances, etc - which may contribute both to a slow down in starts and measured sales.

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. Additionally, the housing stock in the U.S. is quite old. New housing was underbuilt from 2008 and there is record-low inventories of existing housing on the market while there is still demand.

Overall, it is likely that sales will remain higher than the period between 2008 and 2017, but it would not be surprising to see them come down to the long-term average.

Housing Starts

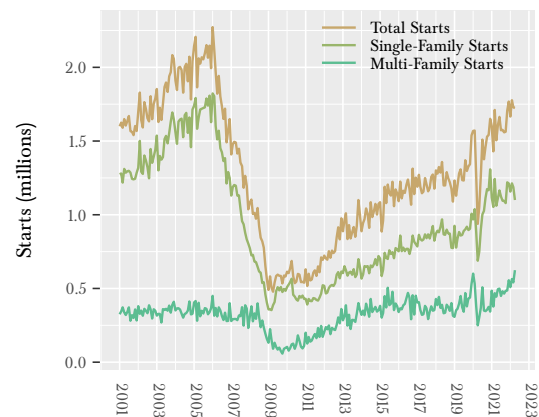
In April 2009, U.S. housing starts fell to the lowest point since the Census Bureau began tracking these data in 1959. U.S. housing starts picked up in 2011 and continued to rise, largely because of increases in multi-family starts. Single-family starts were more or less flat after the recession through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

Starts picked up meaningfully in the last quarter of 2019 to average 1.3 million (note that all of the housing starts figures are SAAR), above the 1.25 million average for 2018. Although this was well above the 2012 average of 0.78 million, it is still well below the pre-recession long-term average of 1.6 million.

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. Starts averaged 1.1 million in 2021, but have increased slightly to an

average of 1.2 million through April 2022.

Figure 14: Housing Starts



Expectations for starts remain relatively high for the foreseeable future. Although interest rates are starting to bite, likely limiting price growth and possibly reducing prices from their current highs, it is still profitable for builders to build. Having said that, the wild fluctuations increases in lumber prices are likely affecting profit margins, possibly making companies more cautious.

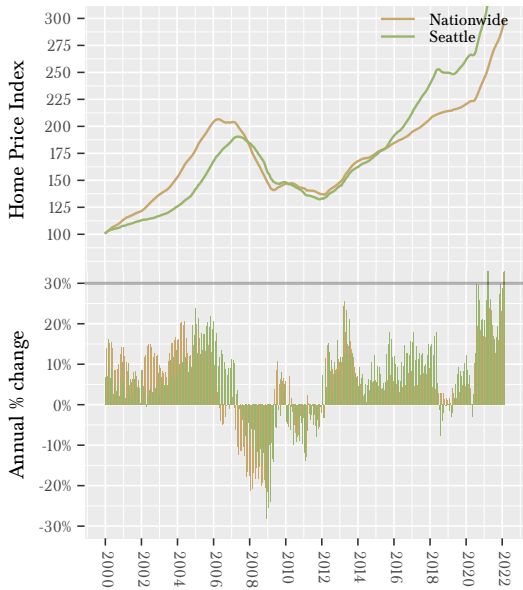
It is notable that the share of single-family starts increased markedly over 2020. In January 2020, around 62 percent of the new starts were single-family. In January 2021, this share had grown to 70 percent. Single-family housing uses more lumber than multi-family housing, so that increase in starts likely had a meaningful effect on lumber demand. However, single-family starts have flattened recently while multi-family starts have increased.

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



Nationally, after increasing in most months since bottoming out in January 2012, the Case-Shiller 20-city composite price index growth slowed significantly from May 2018 to late 2019. Seattle house prices had been growing much faster than national prices, doubling from their low in February 2012 to July 2018, while nationally house prices increased by 62 percent. From late 2019, the index started growing strongly again.

Although the pandemic initially stalled national price growth, the national Case-Shiller ended 2020 with 10 percent year-over-year price growth. Locally, for Seattle, the year-over-year price growth was 13 percent. Since then, prices have increased even faster. In March 2022, year-over-year prices nationwide were 21 percent higher, and Seattle prices were 28 percent higher.

This rapid price growth was the result of both strong demand — largely due to low interest rates but also possibly due to demand from teleworkers looking for homes outside of cities — and *very* limited supply. The inventory of homes for sale

fell as fewer people put their homes up for sale, likely not wanting to have potential buyers walking through. Since around mid-2020, the inventory of new single-family homes has steadily increased, but is still quite low compared to the demand for homes (including both existing and new homes).

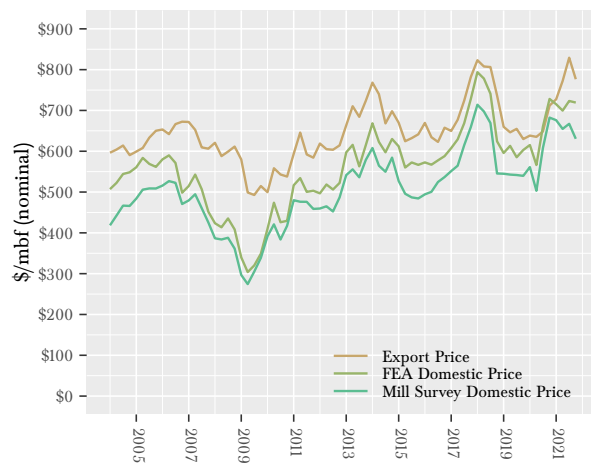
Export Markets

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.

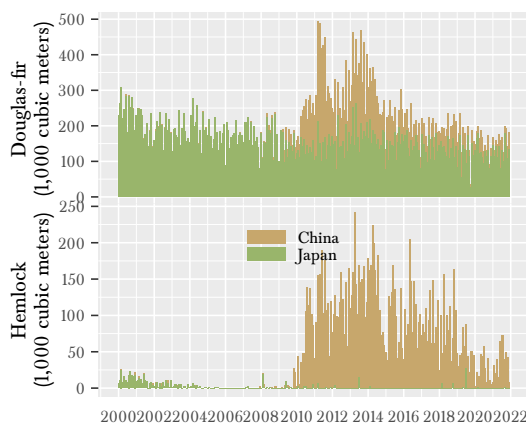
Figure 16: Log Export Prices



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 m³ per year since 2009³¹. 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, exports to Japan in 2020 actually increased by about 7 percent. However, exports to China continue to fall, and were down 41 percent in 2020 compared to 2019. Through September, exports to Japan are down by 2 percent, but exports to China have rebounded and are up around 60 percent — though this is still well below the levels of the mid-2010s.

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. Since then, the prices have fallen sharply to \$600/mbf. Although demand may soften due to the effect of interest rates on housing starts, prices are likely to remain higher than they have historically been through 2022, between \$600 and \$700/mbf.

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 appear to have also bottomed in April 2020 and had recovered by August, 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. After reaching a somewhat-steady range of between \$600/mbf and \$720/mbf from September 2020 to January, jumped to the mid-high \$700s, however prices appear to have fallen back to the \$600/mbf and \$720/mbf from May³².

³¹Trade data is from the U.S. International Trade Commission Dataweb at <https://dataweb.usitc.gov/>

³²We say 'appear' here because DNR Log Price survey had very few responses for May, so it is unclear if the reported prices are actually representative of the market.

Stumpage Prices

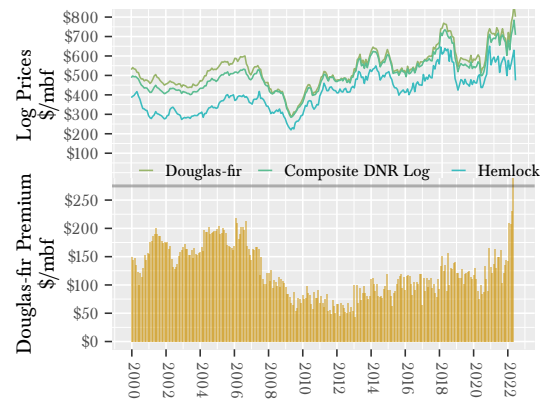
Timber stumpage prices are the prices that successful bidders pay for the right to harvest timber from DNR-managed lands (Figure 19). At any time, the difference between the delivered log price and DNR's stumpage price is equivalent to the sum of logging costs, hauling costs, and harvest profit (Figure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

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 stumpage through the May FY 22 auction was \$427/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 har-

vesting soon or whether they have to do a lot of preparatory work.

Figure 18: DNR Composite Log Prices

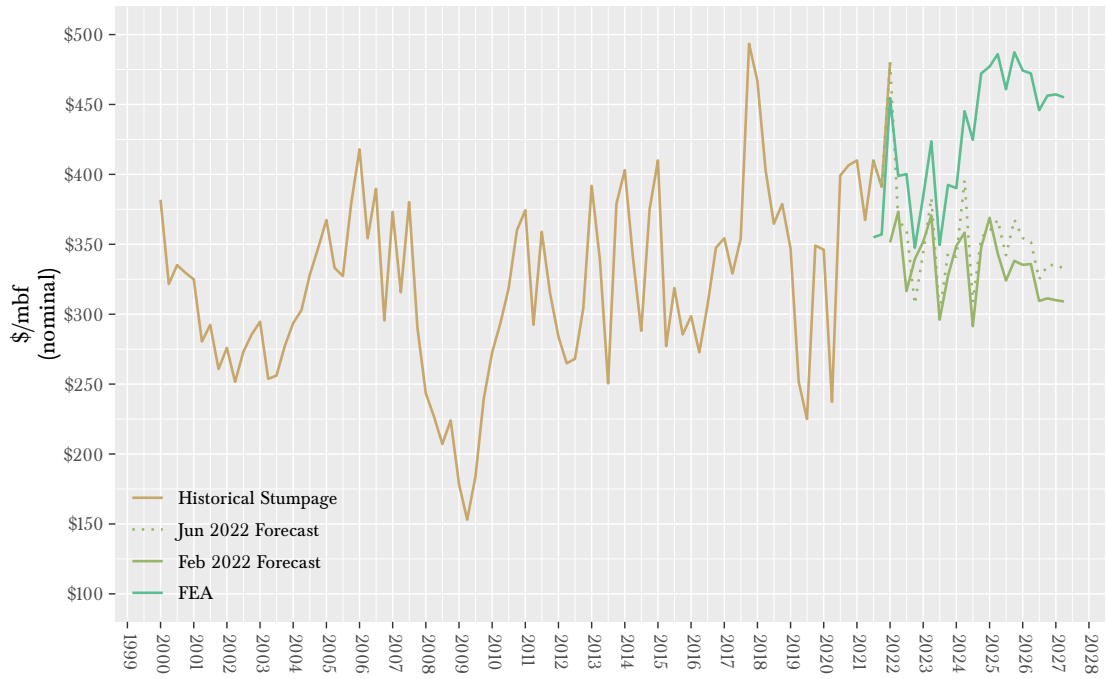


DNR Stumpage Price Outlook

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 forecast for FY 22 is dropped to 430 mmbf, a significant decrease from the 530 mmbf planned in January, and the 500 mmbf forecast in February. As noted in the previous forecast, some of that planned volume was at risk. 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 and January, while staffing constraints in some regions also affected sales planning.

The sales volume forecast for 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 to add these the future years. It is 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 forecast.

Figure 20: Forecast Timber Sales Volume

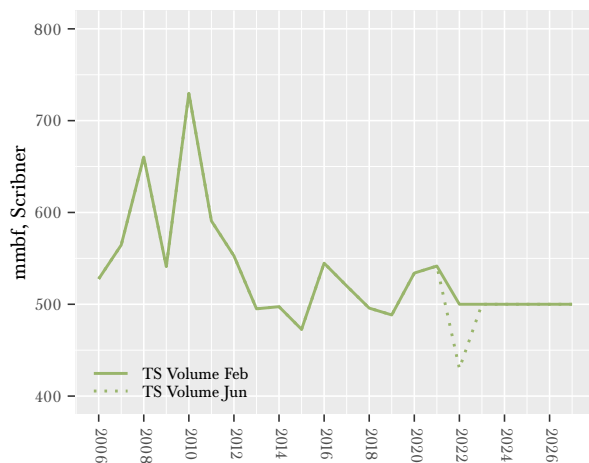
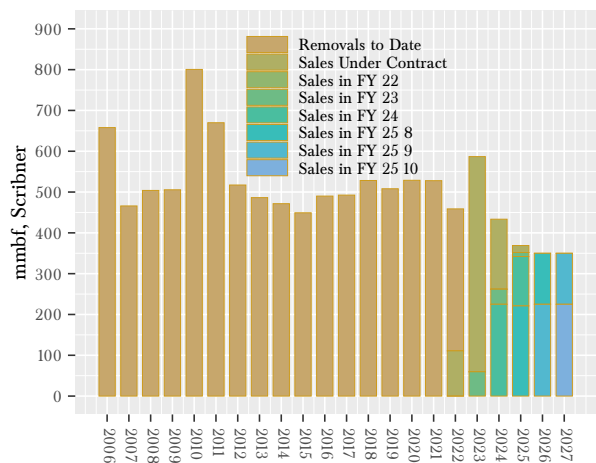


Figure 21: Forecast Timber Removal Volume



Timber Removal Volume

The removal volume forecast is reduced in FYs 22 and 23. Harvests to date have been somewhat slower than expected, forcing a reconsideration of our FY 22 expectations, while the potential for slower demand may undermine harvests in FY 23.

Figure 22: Forecast Timber Sales Price

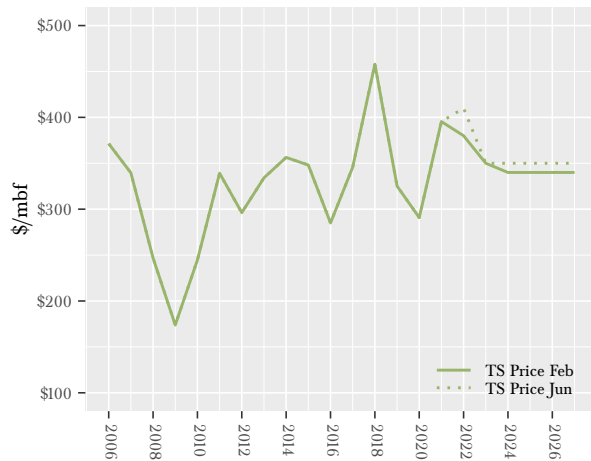
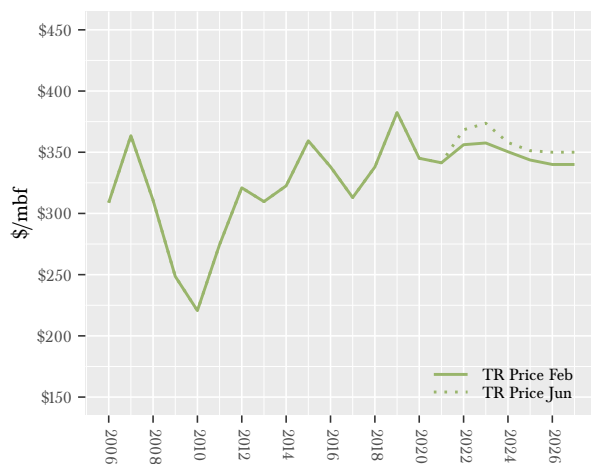


Figure 23: Forecast Timber Removal Price



Timber Sales Prices

The price results of monthly DNR timber sales are quite volatile (Figure 11). As discussed in the stumpage price outlook, the DNR sales price

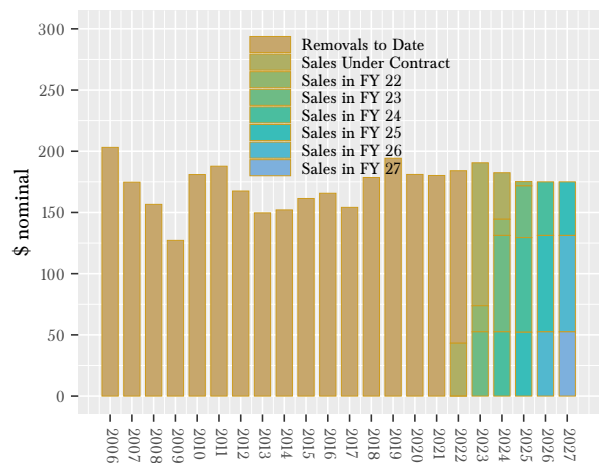
(stumpage) forecast is informed by West Coast log and stumpage price estimates from a forest economics consulting firm.

The increase in forecast sales price to \$380/mbf in February appears to have been too conservative, with the average sales price actually *increasing* since the January auction, from an average of \$407/mbf to \$427/mbf. The forecast timber sales prices are increased to \$410/mbf for FY 22. Given the most recent average sales prices from the May auction, this new forecast price may still be too conservative. The outlying years' forecast prices are held at \$350/mbf due to the downside price risks from increasing mortgage interest rates potentially undermining housing demand.

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 increased primarily due to the increased sales price in FY 22, but also because smaller than expected harvests in FY 22 leave higher valued timber to be harvested in later years.

Figure 24: Forecast Timber Removal Value

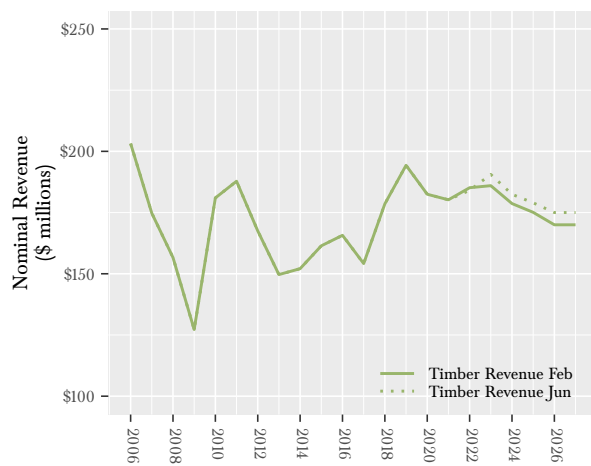


Timber Removal Revenue

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.

Timber revenues for the 2021-23 biennium are \$375 million — around 1 percent higher (\$4 million) than previously forecast. Forecast revenues for the 2023-25 biennium are increased to \$361 million — around 2 percent higher (\$8 million)

Figure 25: Forecast Timber Removal Revenue



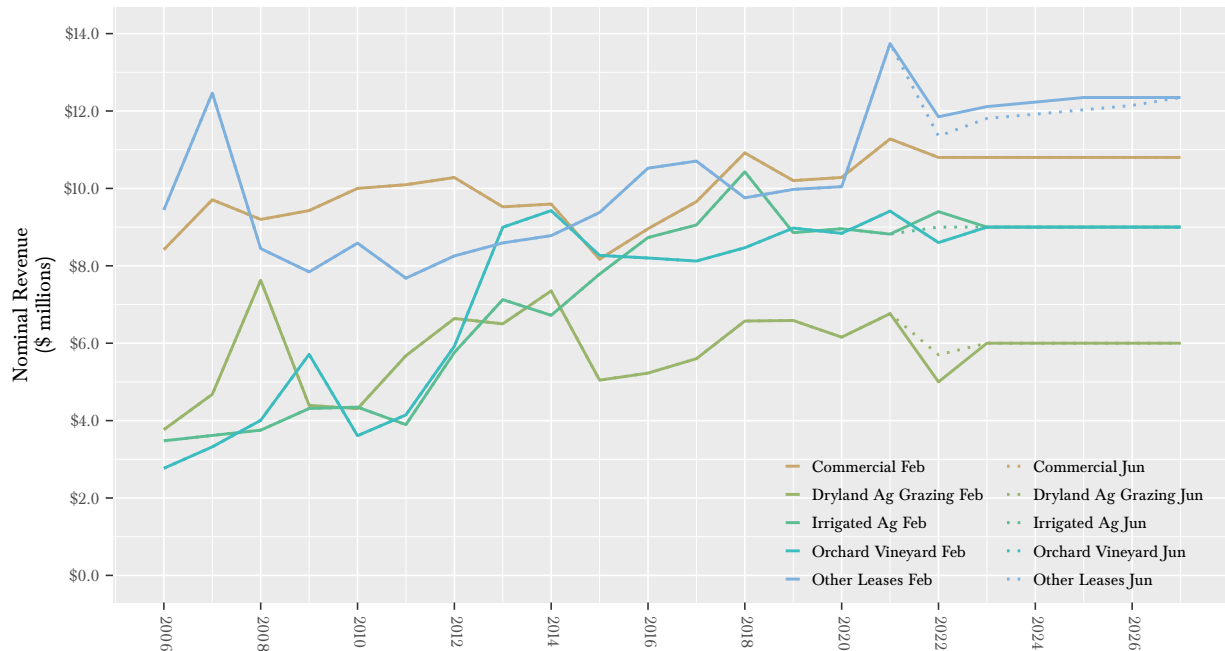
Upland Lease Revenues

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 FY22 is decreased by \$0.2 million to \$46 million, due to higher dry-

land agricultural revenue being offset by lower revenue from irrigated agriculture and communication leases. Outlying years' revenue is reduced due to rebasing built-in annual percentage increases in communication leases to the current fiscal year.

Figure 26: Forecast Upland Lease Revenue

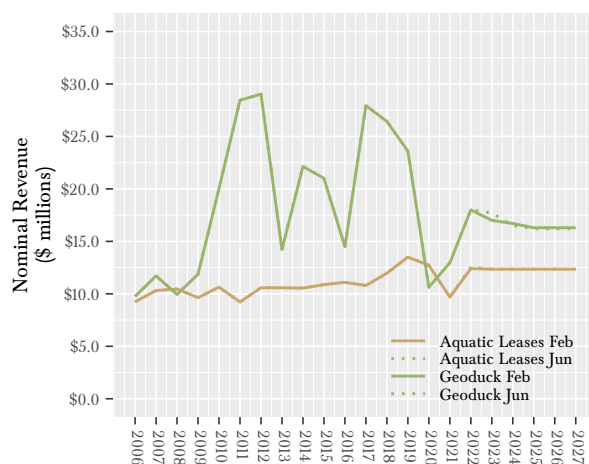


Aquatic Lands Revenues

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, but they have recovered somewhat and are now forecast to account for around 60 percent of aquatic revenue.

The aquatic lease forecast for FY 22 is increased slightly due to higher than expected revenue from water-dependent rents offsetting lower revenues from aquaculture and non-water-dependent rents. (Figure 27).

Figure 27: Aquatic Lands Revenues



The geoduck forecast revenue for FY 22 is unchanged at \$18 million, increased in FY 23 by \$0.7 million to \$17 million, and decreased slightly in outlying years. The price forecast has been adjusted based on consistently high auction prices. The revenue expectations for geoduck would be higher if harvests did not face significant risks in all years. Paralytic shellfish poison harvesting closures are a major risk. Additionally, serious issues with compliance vessel availability remain. Finally, a slew of other risks remain, including labor shortage risks from a small pool of licensed divers, the potential for China to ban geoduck imports for a variety of

reasons, and sewerage contamination from flooding run-off closing tracts. 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 they are still on the books.

At this point, we do not expect to see prices return to consistently being between \$10-\$12/lb., though we will still see exceptional sales like December's.

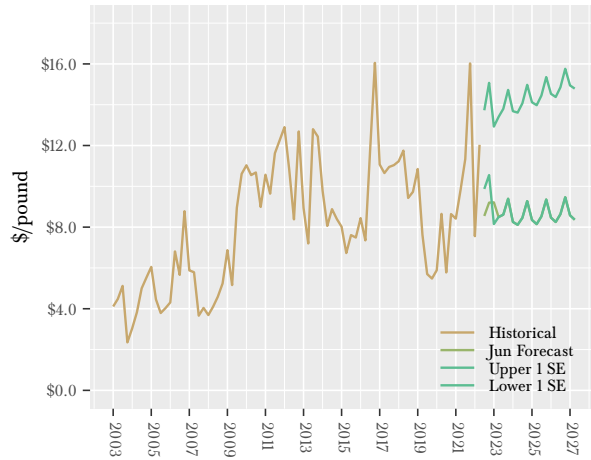
It is notable that the FY 22 geoduck forecast is much higher than the surrounding years. This is because of the timing of some of the latter sales in FY 21, which have their revenue come in in FY 22.

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 political actions in Hong Kong have made some companies wary and driven some to move their operations elsewhere, at least temporarily. Hong Kong is one of the main destinations for live geoduck, which are then sold onward to the mainland. Difficulties in Hong Kong already appear to be hampering current harvests. It is unclear if they will further affect geoduck revenue.
- 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.

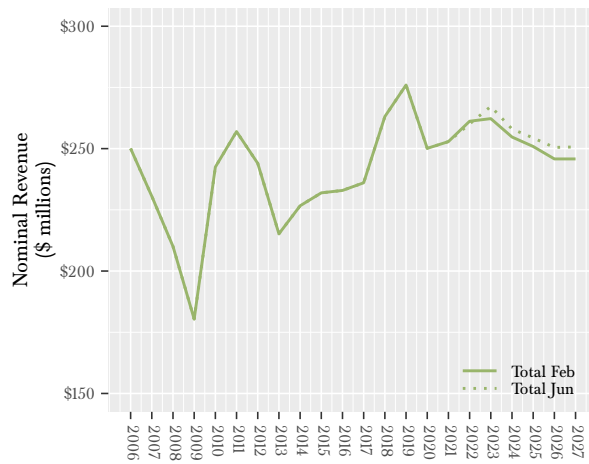
Figure 28: Geoduck Auction Prices



Total Revenues from All Sources

Forecast revenues for the 2021-23 biennium are increased by \$4 million to \$527 million, and are increased by \$7 million to \$512 million in the 2023-25 biennium (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 22 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.