

Department of Natural Resources
Economic & Revenue Forecast

Fiscal Year 2021, Fourth Quarter
June 2021



Forecast Summary

Coronavirus pandemic The COVID-19 pandemic is no longer overshadowing all of the normal constituent parts of the forecast. However, it is still an important consideration for the world economy and still poses a risk to the United States.

Since the last forecast, the number of fully vaccinated people in the U.S. has climbed from 20 million to more than 135 million, with more than 168 million having received at least one dose. Additionally, the number of new daily infections, hospital admissions and deaths have continued downward after a small wave in April, falling from a peak 75,000 cases per day, to around 16,000. This is well down from the almost 250,000 new cases per day in early January. It is also the lowest point since the first peak in daily cases in early 2020.

It looks as if the risk of another spike in cases nationally has substantially diminished—though it seems that some areas of the country have much lower vaccination rates and are at greater risk of further outbreaks later in the year. Although there is still a risk that new strains of the disease will emerge, as fewer people get the virus there will be less chance for it to mutate.

Although we don't expect the pandemic to be an active constraint on the economy, the path of the economic recovery, and how long it will take, is unclear. The massive multiple fiscal stimulus packages and monetary policy response of the U.S. appears to have been enough to mitigate the worst of the damage so that, at least as far as GDP is concerned, the U.S. has fared relatively well. And importantly, personal income and savings *increased* in 2020. This means that U.S. consumers, as a whole, are flush with cash to spend (though this is a very uneven situation, with a significant portion of the population worse off).

Already, the combination of a re-opening economy and relatively high savings have sharply increased demand. However, supply chain constraints have limited the supply response, causing prices to spike from everything from cars to lumber. This will suppress demand in the short term as the various sectors reach new price equilibria.

Regardless of the short term trajectory of the recovery, right now almost all of the major indicators suggest that it will be very strong.

Overall, the outlook this forecast continues the optimism from the previous forecast.

Lumber and Log Prices. Lumber prices in the third quarter of 2020 were extraordinarily high and, after a briefly pulling back through the fourth quarter to just very high, increased even further since January 2021. Through March 2020, lumber prices had been climbing and peaked at \$478/mbf, before crashing to \$363/mbf in May. From May, prices rebounded dramatically, peaking at \$1,000/mbf in September. Prices fell back to \$623/mbf in November and since then have rebounded to \$1,203/mbf in April — almost double the highest real prices in any point between 2000 and mid-2020.

The high lumber prices have pulled up log prices, with the price of a "typical" DNR log rising from a low of \$498/mbf in April 2020 to peak at \$711/mbf in October. By January, the price had pulled back to \$692/mbf, but has again risen to \$718/mbf in April. These are very high historically, but interestingly, still below the prices in early 2018.

Early in the pandemic, we, and others, expected the pandemic to undermine house prices and demand, and, consequently, the demand for lumber. This widely shared expectation, as well as actual COVID-19 outbreaks and restrictions, resulted in slower production at mills, furloughs, layoffs, and some mill closures. However, it appears that the very low interest rates have spurred housing demand and starts, and remodeling and renovation demand also spiked during stay-at-home orders. The result was a sharp drop in supply while strong demand remained, making lumber prices rocket up and pushing up log prices. These high prices have continued as wood manufacturers haven't been able to expand output to completely meet demand due to supply chain and labor supply difficulties. Prices are expected to remain high through the third quarter of 2021, before pulling back in the fourth quarter. Prices in 2022 are expected to remain higher than they have been historically, though they're unlikely to remain as high as they are now.

Timber Sales Volume. DNR now plans to offer around 540 mmbf for sale in FY 21. Given the high demand, it is unlikely that there will be any sales passed in without bids, so we are increasing our FY 21 forecast to 540 mmbf. Forecast sales volumes in future years are unchanged.

Timber Sales Prices. Sales prices throughout FY 21 have been consistently high, with every sale being above the five-year average of \$340/mbf, and many of them well above. We are increasing the sales price forecast for FY 21 to \$395/mbf — from our initial FY 21 forecast of \$300/mbf in the June 2020 forecast, \$320 in September, \$340 in November, and finally \$380/mbf in February. This is due to the continued strong demand and prices.

Timber Removal Volume and Prices. The removal volume in FY 21 is decreased by 10 mmbf to 490 mmbf. Even after our harvest volume forecast reduction in February, harvest volumes to-date have been less than we had expected. It appears that the fire salvage operations from the 2020 Oregon wildfires have continued to tie up much of the log hauling capacity, suppressing harvests in Washington state.

The removal volume forecast is unchanged in outlying years.

The forecast average removal price for FY 21 is increased by \$6/mbf to \$337/mbf due to the continued high average price of removals to-date and the high value of remaining inventory. Removal prices in outlying years are increased as well, based on higher sales prices in FY 21.

Timber Revenue. Forecast timber revenue in FY 21 is decreased slightly by \$0.1 million to \$165 million. FYs 22 and 23 are increased, by \$3.5 million and \$0.3 million respectively.

Forecast timber revenues for the 2019-21 biennium are essentially unchanged at \$348 million, while revenues for the 2021-23 biennium are increased by \$4 million to \$364 million.

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

The non-timber uplands revenue forecasts are increased by \$1.5 million in FY21 due to additional revenue from back rent and lease increases in communications, higher revenue from minerals and hydrocarbon, and increased rights-of-way revenue.

The aquatic lease revenue forecast for FY21 is decreased again this forecast due to continued low rent revenue from non-water-dependent rents.

The forecast geoduck revenue has been increased meaningfully for all forecast years due to better-than-expected prices in recent auctions. Typically, we are wary of increasing outlying years' price forecast based on recent prices, but the recent prices suggest that there is something of a mean reversion of geoduck prices. Prices dropped significantly in mid-2019 as tariffs between the U.S. and China began affect demand. Then, in early 2020, they fell sharply as the Chinese economy was essentially shut down. As China has gained a level of control over the pandemic, demand has increased and it looks like there's a new equilibrium of between \$7-9/lb. The new forecast reflects the lower side of this range.

FY 22 revenue is higher than the surrounding years because the revenue from the final two geoduck auctions from FY 21 will fall in that year.

Geoduck prices are not expected to increase much above the \$7-9/lb. range. Aside from the COVID-19 pandemic, there remains a trade war between the U.S. and China, with high tariffs on geoduck. These are expected to continue indefinitely, limiting Chinese consumption and continuing to push Chinese consumers toward other luxury seafood.

Total Revenues. Forecast revenues for the 2019-21 biennium (FYs 20 and 21) are increased by \$2.2 million to \$484 million. Revenues for the 2021-23 biennium are increased by \$11.2 million to \$510 million.

Other notes to the Forecast. In addition the possibility of a COVID-19 resurgence, a number of sources of uncertainty may affect DNR revenue specifically, and the overall economic activity more broadly. These include: legal challenges to the sus-

tainable 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; the ongoing trade war and political tension with China directly affecting timber and agricultural exports and prices; and uncertainty about the stability of the current high housing starts level. Additionally, while the timber sales volume estimates are based on the best available internal planning data, they are subject to adjustments due to ongoing operational and policy issues.

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's no indication that tariffs between the countries will be reduced further or removed soon.

In addition to the coronavirus and the trade tensions discussed above, other things could undermine Chinese demand for wood, such as the continued loss of Pacific Northwest market share to international and Southeastern U.S. competitors.

One issue on the horizon that should be mentioned is that Russia is moving forward with legislation banning the export of timber from the beginning of 2022. Given that Russia supplies around 12 percent of world log exports, the ban will have a significant impact on log supply across the world. In the short term, this will likely push up log prices across the world, and will mainly affect China, which gets a significant amount of logs from Russia. This will also likely push up lumber and wood product prices. This has not been built into the forecast prices, but will likely be when the legislation is finalized.

As always in the geoduck fisheries, paralytic shellfish poison closures create uncertainty around harvest volumes as well.

Table 1: June 2021 Forecast by Source (millions of dollars)

Timber Sales		FY 18	FY 19	FY 20	FY 21	FY 22	FY 23	FY 24	FY 25
Volume (mmbf)		496	488	534	540	500	500	500	500
	Change				20	-	-	-	-
	% Change				4%	0%	0%	0%	0%
Price (\$/mbf)		458	325	291	395	340	340	340	340
	Change				\$ 15	\$ -	\$ -	\$ -	\$ -
	% Change				4%	0%	0%	0%	0%
Value of Timber Sales		227.1	158.8	155.3	213.1	170.0	170.0	170.0	170.0
	Change				\$ 15.5	\$ -	\$ -	\$ -	\$ -
	% Change				8%	0%	0%	0%	0%
Timber Removals									
Volume (mmbf)		528	508	529	490	520	520	510	500
	Change				(10)	0	(0)	0	-
	% Change				-2%	0%	0%	0%	0%
Price (\$/mbf)		338	382	345	337	351	348	343	340
	Change				6.4	6.4	0.9	1.0	-
	% Change				2%	2%	0%	0%	0%
Timber Revenue		178.6	194.3	182.5	165.2	182.7	180.9	174.6	170.0
	Change				(0.1)	3.5	0.3	0.6	-
	% Change				0%	2%	0%	0%	0%
Upland Leases									
Irrigated Agriculture		10.4	8.9	9.0	8.8	9.0	9.0	9.0	9.0
	Change				(0.2)	-	-	-	-
	% Change				-2%	0%	0%	0%	0%
Orchard/Vineyard		8.5	9.0	8.8	8.2	8.2	8.2	8.2	8.2
	Change				-	-	-	-	-
	% Change				0%	0%	0%	0%	0%
Dryland Ag/Grazing		6.6	6.6	6.2	5.7	6.0	6.0	6.0	6.0
	Change				-	-	-	-	-
	% Change				0%	0%	0%	0%	0%
Commercial		10.9	10.2	10.3	10.8	10.8	10.8	10.8	10.8
	Change				0.4	-	-	-	-
	% Change				4%	0%	0%	0%	0%
Other Leases		9.8	10.0	10.0	12.4	10.8	11.0	11.1	11.3
	Change				1.3	0.7	0.8	0.9	1.0
	% Change				12%	7%	8%	9%	10%
Total Upland Leases		46.1	44.6	44.3	45.9	44.8	45.0	45.1	45.3
	Change				1.5	0.7	0.8	0.9	1.0
	% Change				3%	2%	2%	2%	2%
Aquatic Lands									
Aquatic Leases		12.0	13.5	12.7	10.1	12.5	12.5	12.5	12.5
	Change				(0.8)	0.1	0.1	0.1	0.1
	% Change				-7%	1%	1%	1%	1%
Geoduck		26.4	23.6	10.6	12.4	16.6	15.2	15.2	15.2
	Change				1.6	3.9	1.8	1.9	1.9
	% Change				15%	31%	13%	14%	14%
Aquatic Lands Revenue		38.4	37.1	23.4	22.5	29.1	27.7	27.7	27.7
	Change				0.8	4.0	1.9	2.0	2.0
	% Change				4%	16%	7%	8%	8%
Total All Sources									
		263.1	276.0	250.1	233.6	256.5	253.5	247.3	243.0
	Change				2.2	8.2	3.0	3.5	3.0
	% Change				1%	3%	1%	1%	1%

Table 2: June 2021 Forecast by Fund (millions of dollars)

Key DNR Operating Funds		FY 18	FY 19	FY 20	FY 21	FY 22	FY 23	FY 24	FY 25
041	RMCA - Uplands	40.6	39.9	33.5	31.9	38.1	40.3	40.0	39.4
	Change				(0.5)	(0.2)	(0.0)	0.3	0.3
	% Change				-2%	-1%	0%	1%	1%
041	RMCA - Aquatic Lands	17.6	16.7	9.9	9.7	12.7	12.0	12.0	12.0
	Change				0.5	2.0	0.9	1.0	1.0
	% Change				6%	19%	8%	9%	9%
014	FDA	22.1	25.6	28.3	24.1	22.4	22.3	21.5	20.9
	Change				0.9	(0.2)	0.1	0.3	0.1
	% Change				4%	-1%	1%	1%	1%
21Q	Forest Health Revolving	4.4	7.5	7.9	12.5	16.0	9.1	7.6	7.7
	Change				(0.8)	5.2	0.5	(0.8)	(0.3)
	% Change				-6%	48%	6%	-9%	-4%
Total DNR Key Operating Funds		84.7	89.7	79.7	78.2	89.3	83.8	81.1	80.0
	Change		1.0		0.1	6.8	1.5	0.9	1.1
	% Change				0%	8%	2%	1%	1%
Current Funds									
113	Common School Construction	62.6	64.2	59.5	52.2	61.2	66.1	66.1	65.2
	Change				0.3	(0.4)	(0.2)	0.4	0.4
	% Change				1%	-1%	0%	1%	1%
999	Forest Board Counties	59.6	69.5	68.7	59.8	54.0	54.5	52.8	51.3
	Change				2.4	(1.3)	0.0	0.6	0.3
	% Change				4%	-2%	0%	1%	1%
001	General Fund	2.1	1.9	4.7	4.5	3.9	3.7	3.4	3.3
	Change				(0.2)	0.1	0.1	0.1	0.0
	% Change				-3%	1%	2%	2%	1%
348	University Bond Retirement	3.2	1.3	0.6	1.7	2.0	2.1	2.0	1.9
	Change				(0.2)	0.1	0.0	0.0	0.0
	% Change				-10%	8%	2%	1%	0%
347	WSU Bond Retirement	1.6	1.4	1.9	1.8	1.7	1.8	1.8	1.8
	Change				0.1	0.1	0.1	0.1	0.1
	% Change				4%	3%	4%	4%	5%
042	CEP&RI	5.3	2.7	3.6	2.0	2.9	3.9	4.1	4.1
	Change				0.1	(0.5)	(0.2)	(0.0)	0.0
	% Change				5%	-16%	-5%	0%	1%
036	Capitol Building Construction	6.2	9.8	4.4	6.7	7.8	7.9	7.6	7.4
	Change				(1.0)	(0.5)	(0.1)	0.1	0.0
	% Change				-12%	-6%	-1%	1%	0%
061/3/5/6	Normal (CWU, EWU, WWU, TESC) School	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2
	Change				0.0	0.0	0.0	0.0	0.0
	% Change				2%	3%	3%	3%	3%
Other Funds		1.1	1.2	1.1	0.7	1.1	0.4	0.2	0.1
	Change				0.3	0.9	0.3	0.0	0.0
	% Change				86%	372%	160%	36%	0%
Total Current Funds		141.7	152.1	144.7	129.5	135.0	140.4	138.1	135.4
	Change				2.0	(1.7)	0.0	1.4	0.9
	% Change				2%	-1%	0%	1%	1%

(Continued)

Table 3: June 2021 Forecast by Fund (millions of dollars), cont'd

Aquatic Lands Enhancement Account		FY 18	FY 19	FY 20	FY 21	FY 22	FY 23	FY 24	FY 25
02R		20.8	20.4	13.5	12.8	16.4	15.7	15.7	15.7
	Change				0.3	2.0	1.0	1.0	1.0
	% Change				2%	14%	7%	7%	7%
Permanent Funds									
601	Agricultural College Permanent	4.2	4.1	5.4	5.3	5.7	4.6	4.0	3.8
	Change				0.5	0.3	0.2	0.1	0.0
	% Change				10%	6%	4%	3%	0%
604	Normal School Permanent	4.1	2.9	2.6	2.7	2.8	2.8	2.7	2.6
	Change				0.2	0.1	0.0	0.0	0.0
	% Change				6%	3%	1%	1%	0%
605	Common School Permanent	0.8	0.2	0.2	0.3	0.3	0.3	0.3	0.3
	Change				-	-	-	-	-
	% Change				0%	0%	0%	0%	0%
606	Scientific Permanent	7.0	5.4	3.1	4.3	6.5	5.4	4.8	4.5
	Change				(0.7)	0.7	0.3	0.1	0.0
	% Change				-15%	12%	6%	3%	0%
607	University Permanent	0.3	0.7	0.1	0.4	0.5	0.5	0.5	0.5
	Change				(0.0)	0.0	0.0	0.0	0.0
	% Change				-4%	1%	1%	1%	0%
Total Permanent Funds		16.5	13.3	11.4	13.0	15.8	13.6	12.4	11.9
	Change				(0.1)	1.1	0.5	0.3	0.0
	% Change				-1%	8%	4%	2%	0%
Total All Funds		263.7	275.4	249.4	233.6	256.5	253.5	247.3	243.0
	Change				2.2	8.2	3.0	3.5	3.0
	% Change				1%	3%	1%	1%	1%

Figure 1: Timber Forecast Charts

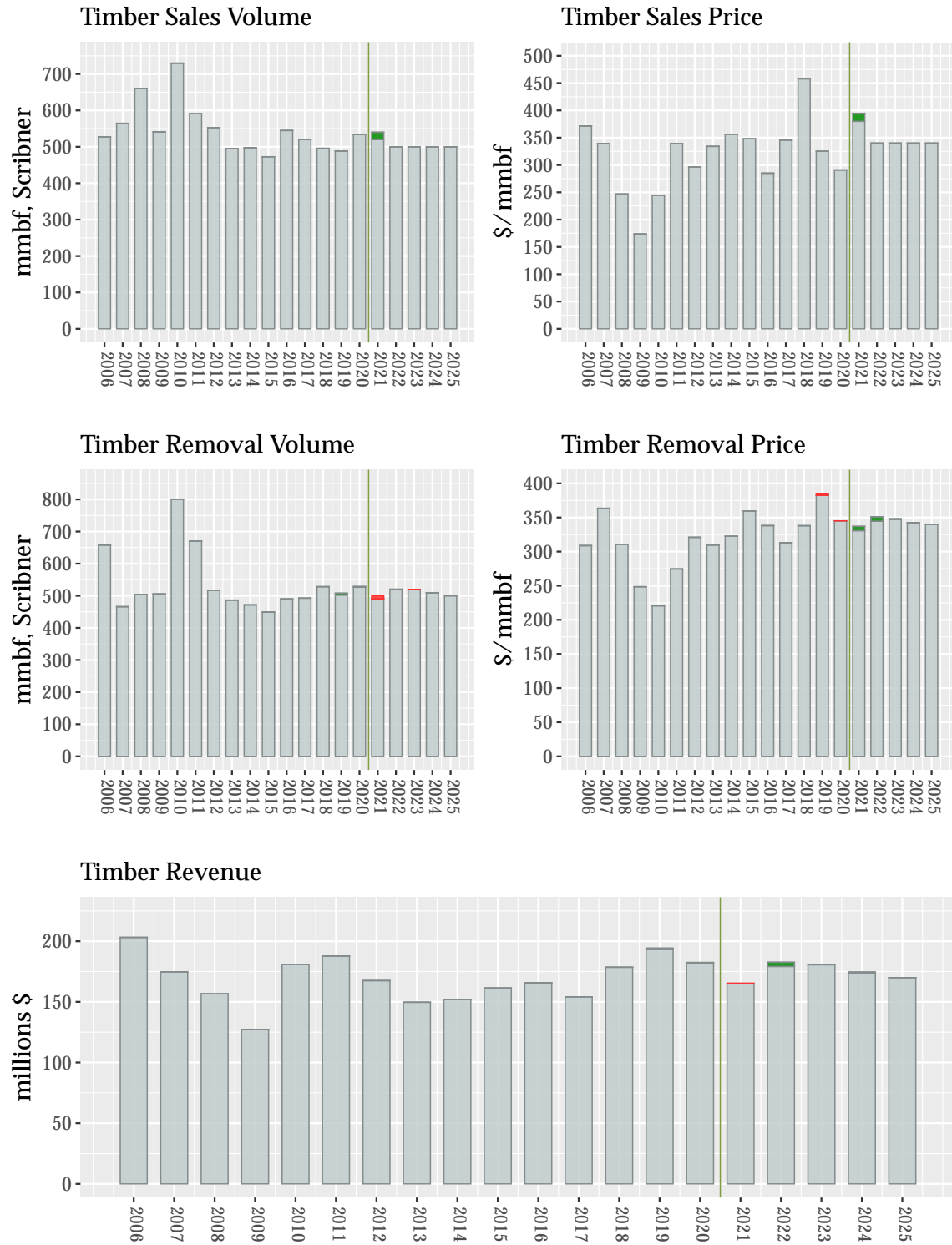


Figure 2: Other Uplands Forecast Charts

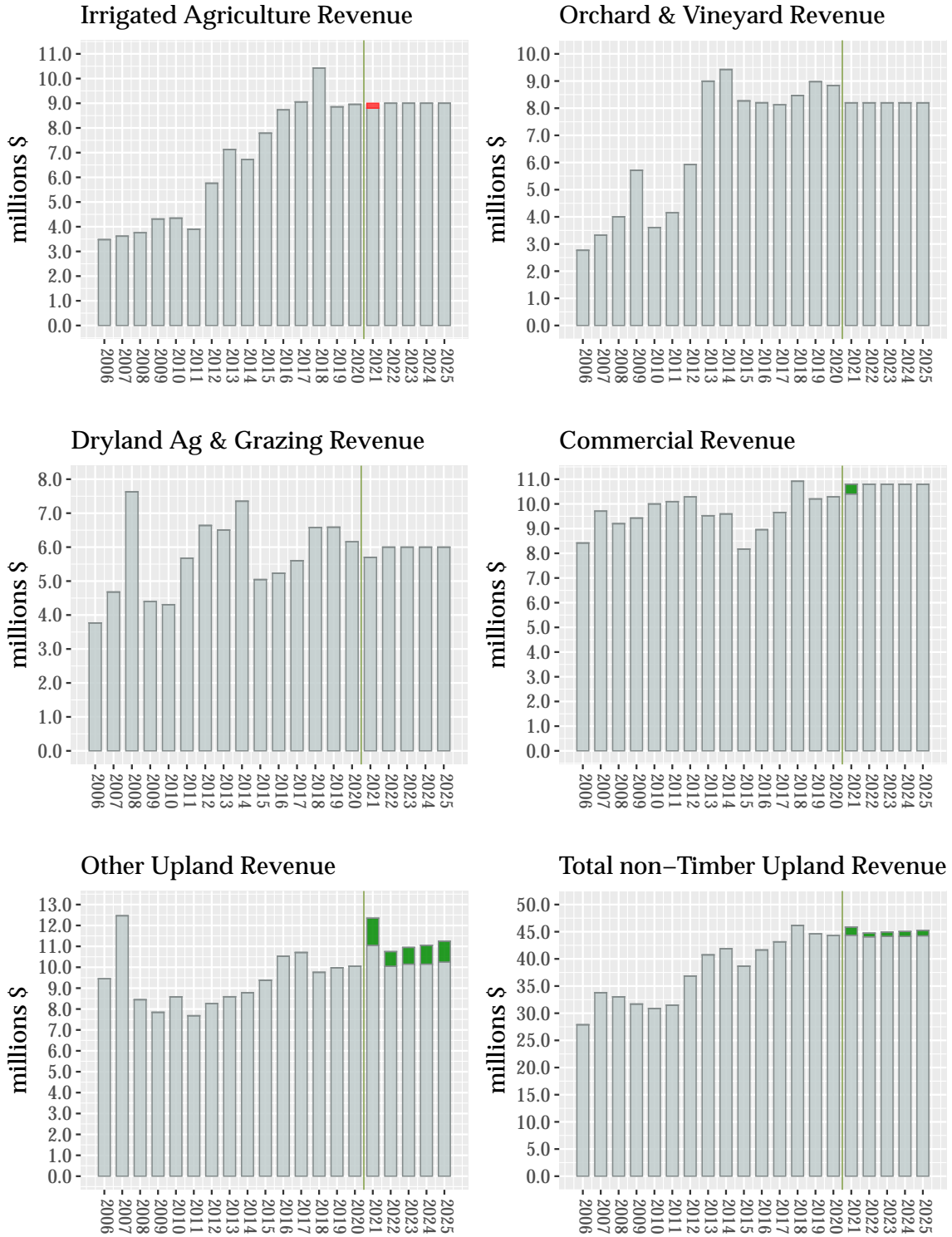
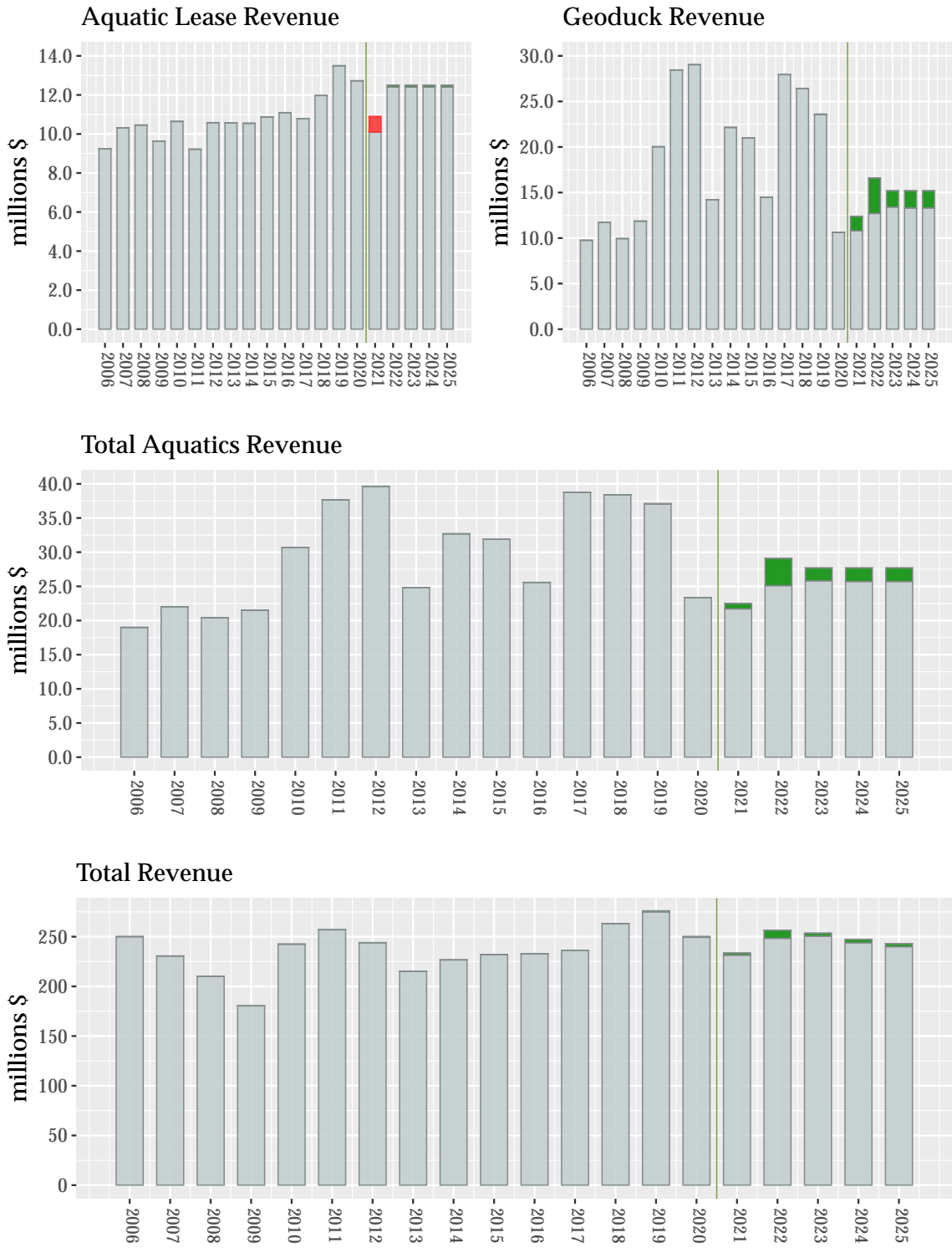


Figure 3: Aquatics and Total Forecast Charts



Contents

Forecast Summary	I
Macroeconomic Conditions	1
COVID-19 Pandemic	1
U.S. Economy	1
Gross Domestic Product	1
Employment and Wages	2
Inflation	4
Interest Rates	4
The U.S. Dollar and Foreign Trade	5
Petroleum	6
Wood Markets	7
U.S. Housing Market	8
New Home Sales	8
Housing Starts	8
Housing Prices	9
Export Markets	10
Current Lumber Prices	11
Price Outlook	12
Lumber Prices	12
Log Prices	13
Stumpage Prices	13
DNR Stumpage Price Outlook	13
DNR Revenue Forecast	16
Timber Revenue	16
Timber Sales Volume	16
Timber Removal Volume	16
Timber Sales Prices	17
Timber Removal Prices	17
Timber Removal Revenue	17
Upland Lease Revenues	19
Aquatic Lands Revenues	20
Total Revenues from All Sources	22
Distribution of Revenues	23

List of Tables

1	June 2021 Forecast by Source (millions of dollars)	IV
2	June 2021 Forecast by Fund (millions of dollars)	V
3	June 2021 Forecast by Fund (millions of dollars), cont'd	VI

List of Figures

1	Timber Forecast Charts	VII
2	Other Uplands Forecast Charts	VIII
3	Aquatics and Total Forecast Charts	IX
4	U.S. Gross Domestic Product	2
5	Unemployment Rate and Monthly Change in Jobs	2
6	Employment and Unemployment	3
7	Labor Market Indicators	4
8	U.S. Inflation Indices	4
9	Trade-Weighted U.S. Dollar Index	5
10	Crude Oil Prices	6
11	Lumber, Log, and Stumpage Prices in Washington	7
12	Lumber, Log, and DNR Stumpage Price Seasonality	7
13	New Single-Family Home Sales	8
14	Housing Starts	9
15	Case-Shiller Existing Home Price Index	9
16	Log Export Prices	10
17	Log Export Volume	10
18	DNR Composite Log Prices	13
19	DNR Timber Stumpage Price	15
20	Forecast Timber Sales Volume	16
21	Forecast Timber Removal Volume	16
22	Forecast Timber Sales Price	17
23	Forecast Timber Removal Price	17
24	Forecast Timber Removal Value	17
25	Forecast Timber Removal Revenue	18
26	Forecast Upland Lease Revenue	19
27	Aquatic Lands Revenues	20
28	Geoduck Auction Prices	21
29	Total Revenues	22

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 2021 through 2025. Fiscal years for Washington State government begin July 1 and end June 30. For example, the current fiscal year, Fiscal Year 2021, runs from July 1, 2020, through June 30, 2021.

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

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: Koshare Eagle, 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.

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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

The COVID-19 pandemic is no longer overshadowing all of the normal constituent parts of the forecast. However, it is still an important consideration for the world economy and still poses a risk to the United States.

Since the last forecast, the number of fully vaccinated people in the US has climbed from 20 million to more than 135 million, with more than 168 million having received at least one dose. Additionally, the number of new daily infections, hospital admissions and deaths have continued downward after a small wave in April, falling from a peak of 75,000 cases per day, to around 16,000. This is well down from the almost 250,000 new cases per day in early January. It is also the lowest point since the first peak in daily cases in early 2020.

It looks as if the risk of another spike in cases nationally has substantially diminished — though it seems that some areas of the country have much lower vaccination rates and are at greater risk of further outbreaks later in the year. Although there is still a risk that new strains of the disease will emerge, as fewer people get the virus there will be less chance for it to mutate.

Although we don't expect the pandemic to be an active constraint on the economy, the path of recovery from the economic mayhem caused by pandemic, and how long it will take, is unclear. The massive multiple fiscal stimulus packages and monetary policy response of the U.S. appears to have been enough to mitigate the worst of the damage so that, at least as far as GDP is concerned, the US has fared relatively well. And importantly, personal income and savings *increased* in 2020. This means that U.S. consumers, as a whole, are flush with cash to spend (though this is a very uneven situation,

with a significant portion of the population worse off).

In addition to the real health and economic problems that the pandemic have caused, the suddenness of the changes have increased the difficulty of economic modeling. Broadly, economic models rely on historical data to try to forecast or understand how the future will look. And most economic data that feed into these models is delayed by at least a month, and often longer. The suddenness and severity of the coronavirus impacts mean that economic models are operating well outside of their historical bounds. This causes "out of sample" or "generalization" errors — the current data is just so far outside of the normal bounds that the models become ever more inaccurate.

These difficulties with economic modeling mean that it is even more difficult than normal to predict where the economy will be, even in the near future. Already, the combination of a re-opening economy and relatively high savings have sharply increased demand. However, supply chain constraints have limited the supply response, causing prices to spike from everything from cars to lumber. This will suppress demand in the short term as the various sectors reach new price equilibria.

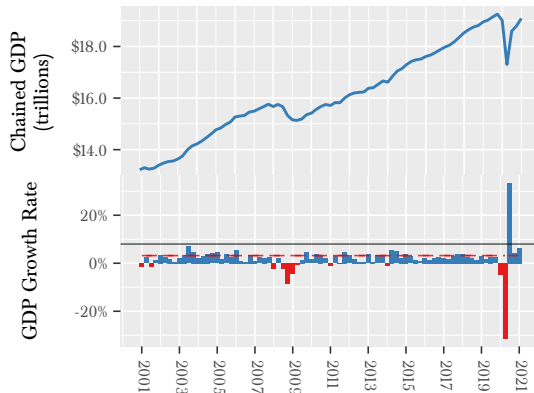
Regardless of the short-term trajectory of the recovery, right now almost all of the major indicators suggest that it will be very strong.

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.

Figure 4: U.S. Gross Domestic Product

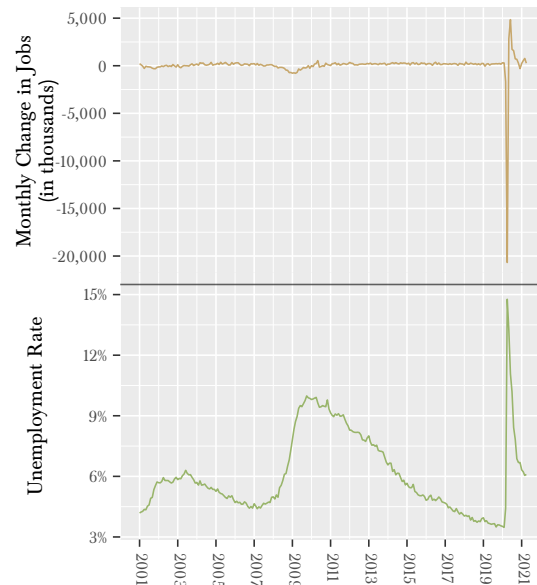


The COVID-19 pandemic caused the sharpest quarterly GDP decline in history, first -0.86 percent in Q1 and then a staggering -9.62 percent in Q2 (-31.4 percent SAAR). However, it rebounded with growth of 33.4 (SAAR) percent in Q3 and 4.0 percent (SAAR) in Q4. This meant that the average annualized GDP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

Typically, GDP growth rebounds after a recession, spiking to well above the historical average. This didn't happen with the Great Recession in 2008-09, but with the stimulus and the drop in COVID-19 cases, near-term economic growth is likely to be quite strong. Continuing to see the 2020 Q3 rebound growth rate of 30+ percent is unrealistic, but seeing the 2020 Q4 growth of around 4 percent is not.

In their December forecast, the FOMC projected that GDP would grow by between 3.7 and 5.0 percent in 2021, with a median estimate of 4.2 percent — up slightly from their September forecast. These growth rates in 2021 would be the highest annual GDP growth since before the Great Recession and would leave GDP at about what it was at the end of 2019. In their updated forecast in March, the FOMC projected real GDP growth of between 5.8 and 6.6 percent (higher than any annual growth since 1983).

Figure 5: Unemployment Rate and Monthly Change in Jobs



Current high-frequency forecasts, such as the Atlanta Fed's GDPNow and the New York Fed's Nowcast, predict Q2 2021 GDP growth of between 4.3-10.3 percent (SAAR).

Employment and Wages

The labor market is the 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, one of its lowest points since 1969 (Figure 5).

With the shutdown of the economy, 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 substan-

tially from 63.4 percent in February to 60.2 percent in April. 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, with the unemployment rate decreasing to 6.1 percent in April 2021 and the labor force participation rate increasing to 61.7 percent.

Overall, despite the rebound, there are around 8 million fewer jobs in April 2021 than in February 2020 and about 3.5 million fewer people in the labor force (that is, employed or looking for work).

It is unclear what job growth in the near future will look like. It is likely that it will be characterized by fits and starts. Although job growth has been strong in some areas — services and, the leisure and hospitality sectors accounted for almost all of the job growth in April — there has been little change, or even a decline, in employment in other sectors. Additionally, there are numerous reports of employers having difficulty filling roles. As in other sectors of the economy, this is likely due to everything opening up all at once, spiking demand while supply catches up. It will likely take some time before labor markets reach a new equilibrium.

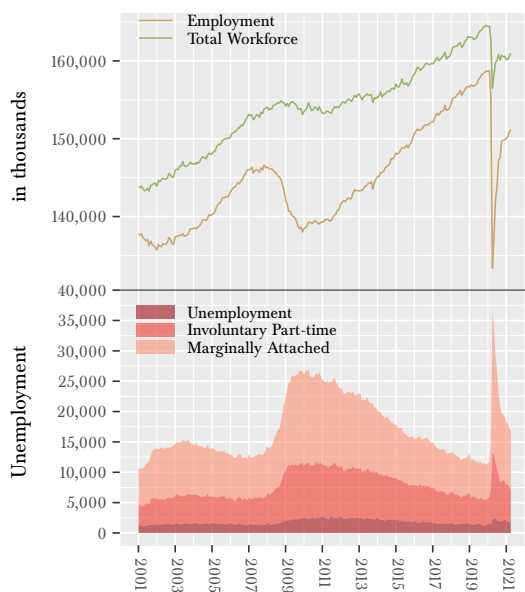
The FOMC forecast is for the 2021 unemployment rate to be between 4.2-4.7 percent, down from the December forecast range of 4.7-5.4 percent.

Another way to get insight into the unemployment situation is to look at how many people have been unemployed for a long period of time. The number of long-term unemployed (27 weeks or longer) has ballooned from a low of 939,000 in April 2020 to 4.0 million in January. The number of long-term unemployed has continued to rise, even as the unemployment rate has fallen. Only in April 2021 did it start to fall, dropping to slightly below 4.2 million from slightly above 4.2 million in March.

Another metric of this is continued unemployment claims — a measure of the number of people who have continued to file unemployment insurance claims after their initial claim. During the Great Recession continued claims peaked at 6.6 million in 2009. The most recent week's estimate on June 3, 2021, is continued claims of 3.5 million, down from 6.8 million in November. This is well below the recent peak of 24.9 million in May 2020, but is still quite high historically.

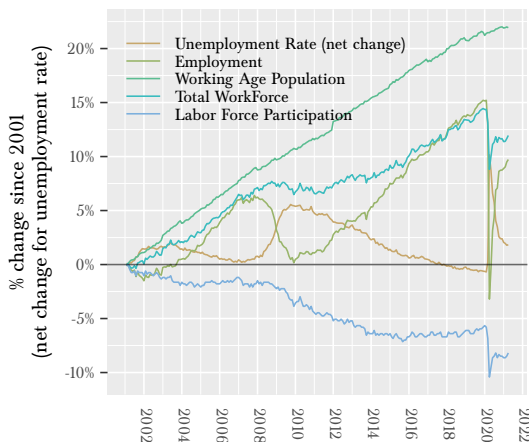
Finally, the U-6 is an alternative measure of unemployment that includes involuntarily part-time employment (underemployment) and marginally attached workers, who are not included in the headline unemployment rate but who, nevertheless, are likely to be looking for work and would benefit from better job prospects. The U-6 also ballooned, increasing from 7.0 percent in February 2020 to 22.8 percent in April 2020. Since then, it has fallen to 10.4 percent in April 2021 (Figure 6).

Figure 6: Employment and Unemployment



The speed of job re-growth slowed considerably in late 2020—dropping from a high of 4.8 million new (or re-created) jobs in June 2020 to a 306,000 loss in December. Since then, job creation has picked up, averaging 451,000 jobs/month in January through April 2021. At this rate, it will take about 20 months to recover all of the jobs lost since February 2020.

Figure 7: Labor Market Indicators



Inflation

Aside from a short period in 2012, core inflation has been below the FOMC’s target since the recession in 2008. Similarly to GDP forecasts, inflation forecasts have been 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. This measure shows long-term inflation at or below the 2.0 percent target since September 2008. Core PCE growth averaged between 1.4 and 1.7 percent from 2015-2017, rose to average 1.9 percent in 2018 and fell back to average 1.5 percent in 2019.

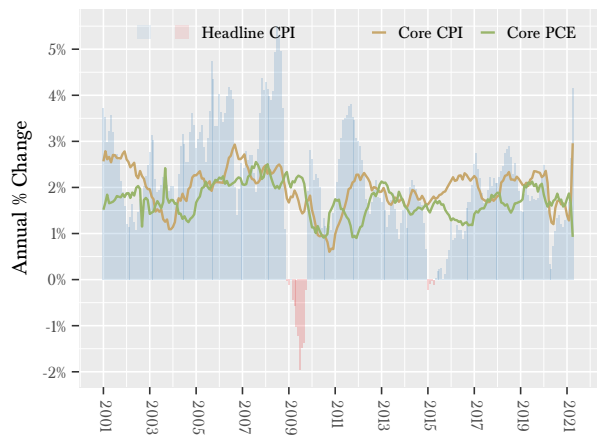
Inflation in 2020 remained low, at 1.5 percent. In the last few months, inflation expectations for 2021 have shifted above the 2.0 percent target, with the FOMC expecting core inflation between 2.0 and 2.3 percent for the year. This is up from its December forecast range of 1.7-1.8 percent.

Inflation has recently increased more sharply than in the previous few months, with the April annualized core inflation measures higher than any point since 2000. This has precipitated a lot of discussion and worry about potential runaway inflation. How-

ever, as many economists have noted, employment is still very low, and short-term jumps in the inflation rate are to be expected as economies open up and issues with ramping up production are worked through. Right now, there is no reason to suspect that inflation will prove to be a problem in the near future and, even in the medium term, the Fed has a number of tools at its disposal to ensure that inflation doesn’t get out of control.

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.

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. economy. 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 bor-

row, impeding demand in the housing and auto markets. In normal times, a decrease in interest rates will expand investment, employment, wages, and consumer credit. The opposite of all of this is also true—decreasing or low interest rates can help drive economic expansion.

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 zero 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. Its 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 is a significant change that the FOMC has backed away from this policy, promising to keep rates very low until the *average* inflation is around 2 percent.

In response to the economic threat of the novel coronavirus pandemic, the FOMC held a special meeting in March and dropped the federal funds rate to 0.1 percent. In addition to the new policy, the FOMC outlook released on September 16 was extraordinary, showing that its median projections are for a 0.1 percent federal funds rate until 2022 at least. Its projections were unchanged in December, but updated in March, when the projected 2022 interest rate range increased from 0.1-0.6.

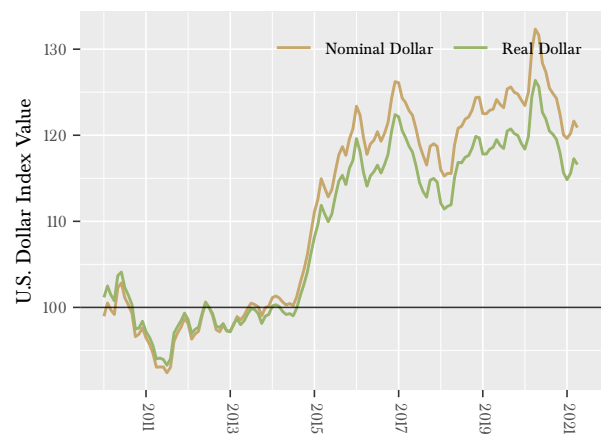
The U.S. Dollar and Foreign Trade

The trade-weighted U.S. dollar index climbed dramatically from 2014 through late 2016. Through 2015 and 2016, this was largely due to the relative strength of the U.S. economy, which, although fairly weak, was growing faster than most other advanced countries. Although the value of the U.S. dollar was below its 2015 peak for most of 2016, the results of

the U.S. presidential election pushed the exchange rate well above its previous high. From mid-2017 to May 2018, the dollar dropped back, but then increased above its earlier 2016 high. 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). Since April 2020, it has fallen back significantly, and is about where it was in mid-2018.

The lower dollar means that timber and lumber from the Pacific Northwest has become less expensive for international buyers and, conversely, timber and lumber imported into the U.S. becomes more expensive. This will tend to support local prices and DNR's timber and agricultural revenues. Wildstock geoduck revenue will also be positively 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.

Prior to the COVID-19 pandemic, there were ongoing

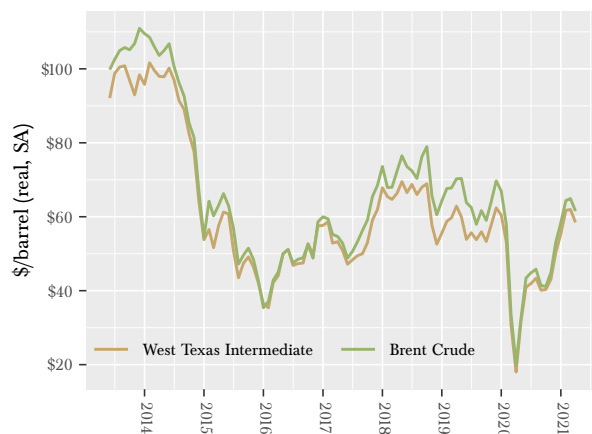
ing trade tensions between the U.S. and China with both countries implementing tariffs. Although a "Phase One" trade deal had been signed before the pandemic to deescalate the trade war, there weren't actually any apparent changes to tariffs. Of the products relevant to DNR revenue, softwood logs are subject to a 5 percent tariff. Geoduck, wheat, and many orchard/vineyard agricultural products (such as apples) are also subject to a 5 percent tariff, apparently due to the pandemic. Prior to the pandemic, they were taxed with a 25 percent tariff.

It appears that the new U.S. administration is focused on matters other than resolving the trade war, so we don't expect any easing of tariffs anytime soon. For timber this is likely to be immaterial. Domestic lumber, and timber, demand is largely driven by the housing market, which is booming. This will likely support prices, regardless of the export markets.

sensitive industries—such as Pacific Northwest logging and agriculture—more competitive in international markets.

As with everything else, the coronavirus pandemic has had a major impact on oil prices, even sending the spot prices negative for a short time (Figure 10). However, since then, prices have recovered to around \$58/barrel in real terms—slightly below the 2019 average price. These are fairly low prices historically, so they are unlikely to put much of a drag on economic growth.

Figure 10: Crude Oil Prices



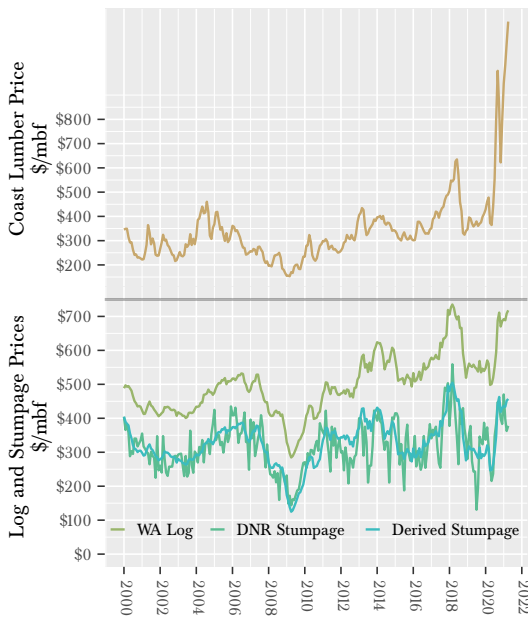
Petroleum

Crude oil and its derivatives strongly affect production, transportation, and consumption in the world and U.S. domestic economies. Broadly, a drop in oil prices acts like a tax cut for consumers and can encourage consumption. Additionally, all other things being equal, lower petroleum prices will decrease diesel fuel prices and will make transportation-

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

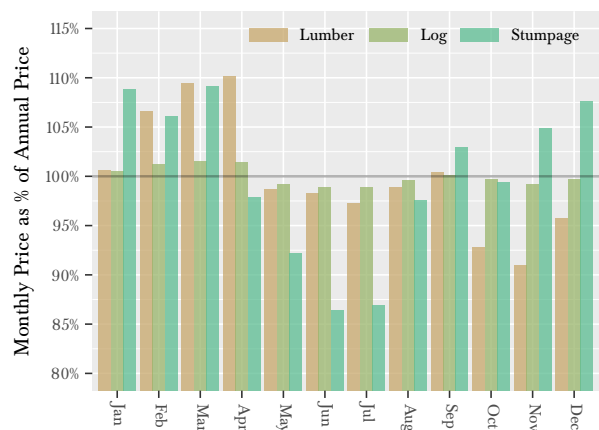


In general, timber stumpage prices reflect demand for lumber and other wood products, timber supply, and regional lumber mill capacity. There is a consistent, positive relationship between log prices and DNR's stumpage prices, despite notable volatility in stumpage prices (Figure 11). High log prices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

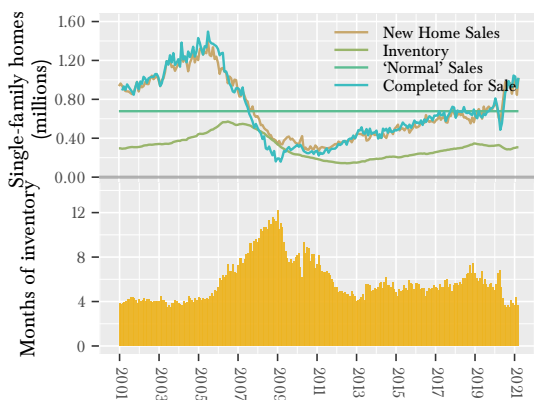
U.S. Housing Market

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

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, an increase in housing starts has driven an increase in lumber demand, though not to nearly the extent of the peak. Prolonged growth in starts is essential for a meaningful increase in the demand for lumber.

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, 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 977,000 (SAAR) in August, averaging 934,000 in the latter half of the year. In January 2021, 993,000 (SAAR) new homes were sold, and have averaged 907,000 (SAAR) per month—24 percent more than highest peak month between 2008-2020.

Based on the consistent high number of sales, very low interest rates for the foreseeable future, solid household balance sheets, and strong demand, new home sales are expected to remain high for some time, although they may be offset by more existing housing coming on to the market.

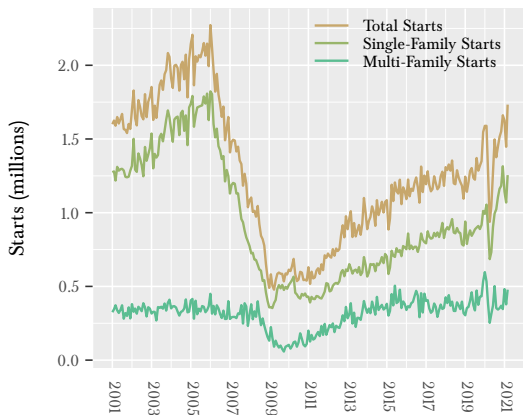
Housing Starts

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 increased to more than 1.5 million in October through January. January through April, starts have averaged 1.6 million.

Figure 14: Housing Starts



Like sales, expectations for starts for the foreseeable future have been increased based on the current rebound, very low interest rates, and underlying demand.

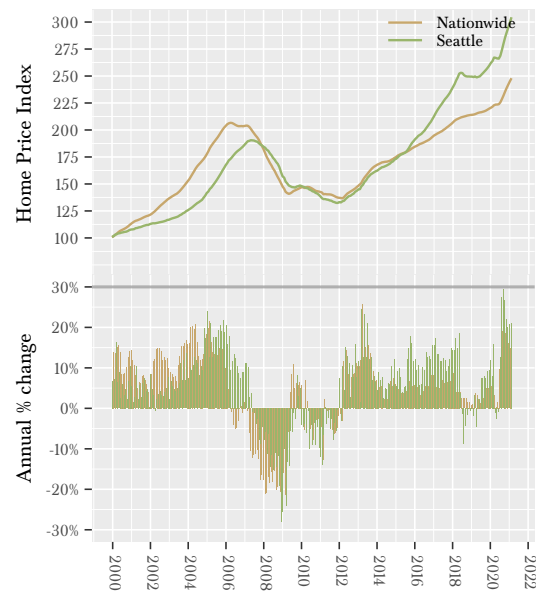
It's notable that the share of single-family starts has increased markedly in the past year. In January 2020, around 62 percent of the new starts were single family. In January 2021 this share had grown to 70 percent. Single family housing uses more lumber than multi-family housing, so the increase in overall starts in 2021 will reflect higher lumber demand than the starts in early 2020.

Housing Prices

U.S. housing experienced six unprecedented years of falling or flat prices following the 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.

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 its low in February 2012 to July 2018, while nationally house prices increased by 62 percent. From late 2019, the index started growing strongly again.

Figure 15: Case-Shiller Existing Home Price Index



Although the pandemic initially stalled national price growth, the national Case-Shiller ended the year with 9.7 percent year-over-year price growth in December. Locally, the Seattle Case-Shiller Index actually fell from a high of 267.1 in March to a

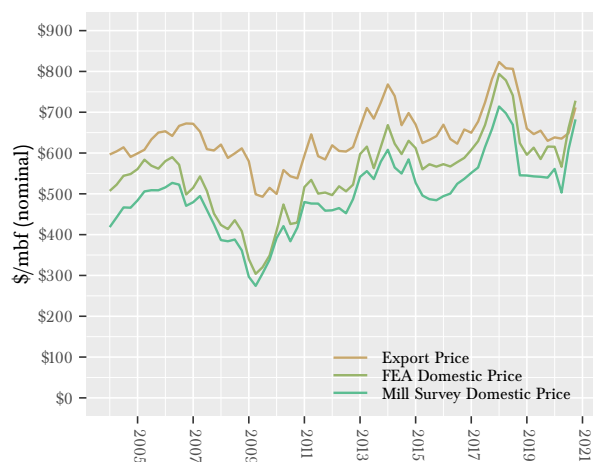
low of 265.9 in June, but prices grew rapidly in the latter half of 2020. In December, the year-over-year price growth was 12.5 percent.

This rapid price growth is the result of both strong demand—largely due to low interest rates but also possibly due to demand from tele-workers looking for homes outside of cities—and *very* limited supply. The inventory of homes for sale plummeted as fewer people put their homes up for sale, likely not wanting to have potential buyers walking through.

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, thereby raising all domestic prices. However, changes in export prices do not necessarily influence domestic prices in a one-to-one relationship.

Figure 16: Log Export Prices



Export prices are almost always higher than domestic prices, a difference which 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.

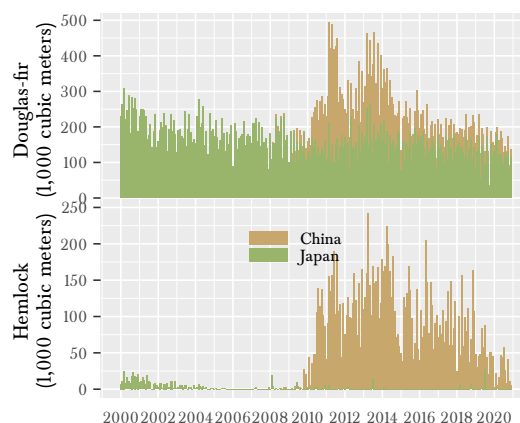
Note that the export prices shown in Figure 16 are weighted by DNR's typical species mix, not the species mix of actual export volumes.

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 m³ per year since 2009. China primarily imports hemlock, but 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.

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.

Figure 17: Log Export Volume



There is currently legislation in Russia that would ban log exports. This could strongly affect China, where many mills were built near the Russian bor-

der to take advantage of cheap logs. The Russian export ban is designed to support local mill operations. In the longer term, it may mean that China still has access to cheap lumber, as they will likely be the main export market. However, in the short term, it will likely increase Chinese dependence on other log exporters, including the Pacific Northwest.

Current Lumber Prices

Lumber prices have skyrocketed in the past eight months, to around double the highest price from 2000-2019.

Broadly, there are at least four key things that have made lumber prices explode in the past 12 months:

- housing starts and home improvements;
- the loss of supply from British Columbia;
- lead time and inventory management for projects; and
- the production capacity of mills and their caution about expanding.

The high prices have been across the board in wood-based building materials (all building materials, really). But the story for lumber is representative of most other wood products as well.

First, as mentioned above, housing starts are the dominant driver of lumber demand in the U.S., making up almost 70 percent of demand historically.

Single-family housing starts collapsed from February 2020 at 1.1 million units (SAAR) to 0.7 million in April 2020. At the same time mills drastically slowed down, either actually completely stopping production or seriously reducing it – putting people out of work or furloughing them. Some of those people went to other lines of work, making it harder to ramp up production later. Notably, this is generally the time when mills are ramping up production, building up their inventory in preparation for higher demand for the housing construction season.

However, April was the nadir. From there, starts increased dramatically every month; by August they were higher than any month from 2008-2019. Starts peaked at 1.3 million (SAAR) in December, shooting up demand for lumber, and have remained above the December 2019 peak. Mills started increasing production again in July, but took a while to ramp back up. While production was still catching up, orders were piling up and *piling up for the future*. Since December, starts have been between 1.1 and 1.2 million (SAAR) – every month has had more starts than any month in the past 13 years.

Remodeling and renovation started climbing earlier and peaked much earlier, but were also much higher than previous years. In 2019, home improvement consumption peaked at 1.78 billion board feet (bbf) in September. In 2020, June had just under that at 1.73 bbf and then every month from July to November had more lumber consumption than the peak in 2019.

The huge increase in residential improvements started this wave in demand. That demand took up much more lumber than previous years, started to bid up prices, and took up supply that would have been inventory to fill orders for home building.

Second, this all happened with the backdrop of British Columbia's supply falling off a cliff from 2018. The beetle kill harvest there, which increased harvest volume from 2000, is basically done and mills have started closing, shutting down a key lumber import supply. With that decreased supply and the closing mills, there's less flexibility in supply – it just can't be ramped up as easily. This likely decreased the elasticity of supply, so that even small increases in (unexpected) demand resulted in sharp increases in price.

Third comes from the orders piling up for the future. The snowball of lumber orders started rolling in mid-year 2020 with the surprising home improvement demand. It kept getting bigger because everyone wanted wood, but the new supply was still taxed and mills hadn't built up their inventories.

When home-building started picking up, home-builders also needed lumber. Typically, home builders buy their lumber in advance, tying up production into the future. But they don't always get it right, so some need wood as soon as possible. However, nobody has lumber available because all of the mills' output has already been bought months in advance. Those who need wood immediately have two choices, buy on the cash market at exorbitant prices and/or buy up unsold stuff in the future. And it's not just buy it up, but *bid it up* to make sure they have the supply they need.

The home building demand is, of course, linked to house prices. Builders are willing to pay higher prices for lumber because the houses they are building have high prices. Housing demand right now is such that many home builders are selling the homes far in advance of building them – so they are guaranteed to sell at current high prices, and the company can preorder the lumber at the high price of lumber, knowing that their profit is locked in.

Fourth, the Great Recession was devastating to mills. For instance, the number of lumber mills in Washington went from 68 mills in 2006 to 37 in 2016 (according to the Washington Mill Survey). The remaining mills survived because they are cautious about expanding capital, taking on debt or hiring too many people. They're part of a cyclical commodity market, so they know it has booms and busts. Lumber is fairly cyclical, so if a company takes on a lot of debt and expands during a boom, then the bust will bankrupt them.

Mills saw the high prices in July and August 2020 and likely thought that it was a nice bonus, but unlikely to last – as the recent spike in 2018 didn't. Mills did expand production some, but slowly, while selling off their future production. West Coast lumber production increased from mid-2020, but by the end of the year was only up to what it was in peak 2019. Only in the past couple of months have mills increased output to close to peak output in 2018 (when West Coast lumber prices spiked to \$635/mbf).

Additionally, even though it seems like mills are trying to expand output now, they are apparently hav-

ing difficulty finding the labor for it.

Like the reduced production from British Columbia, having fewer mills in Washington state likely limited the flexibility in the lumber supply, further reducing the elasticity of supply.

In addition to the major drivers above, there are also supply chain issues – particularly glue for oriented strand board and plywood, and transport issues for everyone. For instance, companies were apparently offering bonuses of \$1,500/day for log truck drivers in Oregon to haul fire salvage because they were having difficulty finding drivers.

There is also likely some financial speculation going on as well. Lumber is traded on futures markets and futures are financial contracts that can be traded by anyone. So when the price increases sharply, some people are likely purchasing contracts to speculate on it, which increases the volatility of prices, at least in the short term.

Price Outlook

Lumber Prices

As shown in Figure 11, lumber prices started increasing rapidly in late 2017. In June 2018, prices hit \$635/mbf, higher in real terms than any since 2000. However, from June 2018, prices dropped dramatically to a low of \$324/mbf in November 2018 — a 47 percent drop. Prices through October 2019 made a modest recovery to average \$371/mbf before jumping to \$411/mbf in December 2019.

Lumber prices continued to recover through the beginning of 2020, but fell when the pandemic began. As discussed above, since late 2020, lumber prices have skyrocketed. However, they have fallen from the outrageous highs of \$1,800/mbf that some futures contracts reached. The outlook for lumber prices is that they will remain very high through at least the third quarter of 2021, when housing construction starts to slow down. After that, prices are expected to fall to around the \$800/mbf range — still exceptionally high, but much closer to historic highs.

Prices into 2022 are expected to continue to decline

to much more normal range, averaging around \$500/mbf, as the backlog in orders is cleared out.

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, but they have obviously not reached the same extremes as lumber prices. Prices are not likely to see those same extremes either, because 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. Prices have continued to rise since August 2020 and are expected to peak in Q1 2021, before slowly decreasing through the rest of the year.

Calendar year 2021 is still expected to have a higher average price through the year than 2020, though prices will likely fall a bit later in the year. Prices for 2022 are expected to remain close to what they were in 2018 – around \$700/mbf.

Stumpage Prices

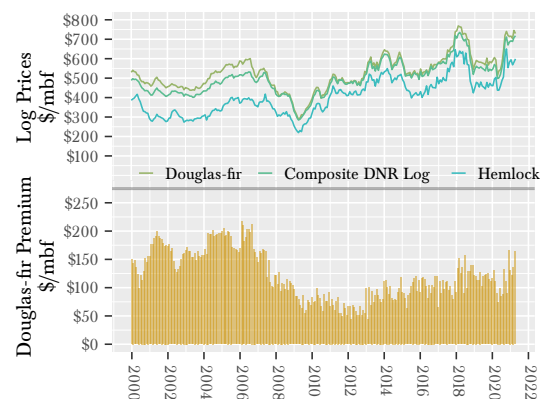
Timber stumpage prices are the prices that successful bidders pay for the right to harvest timber from DNR-managed lands (Figure 19). At any time, the difference between the delivered log price and DNR's stumpage price is equivalent to the sum of logging costs, hauling costs, and harvest profit (Figure 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 a bit lower than we'd expect, given log prices

— having diverge in recent months as stumpage prices have fallen. While 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. Since then, DNR timber auctions have had very strong prices, so that the average stumpage for FY 21 is \$400/mbf for sales through April 2021.

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.

Figure 18: DNR Composite Log Prices

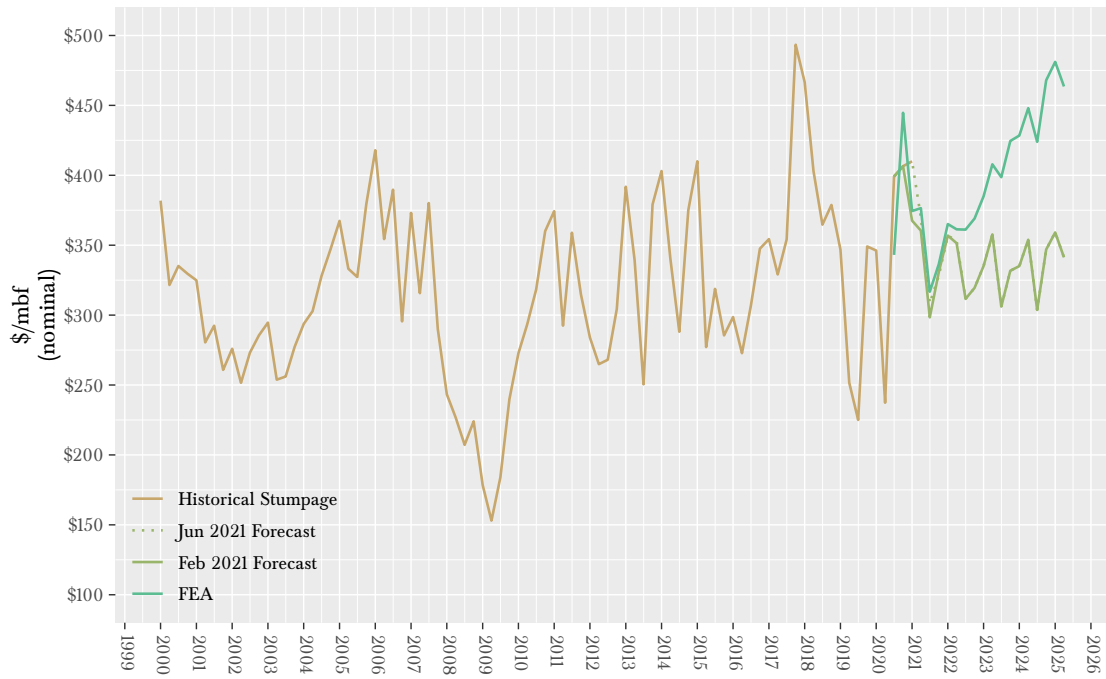


DNR Stumpage Price Outlook

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

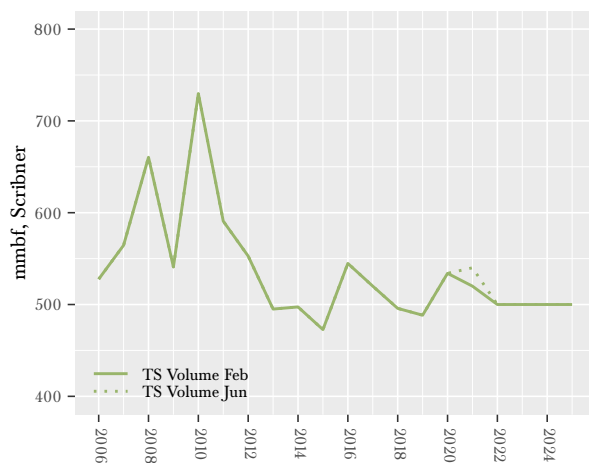
This Revenue Forecast includes revenue generated from timber sales on trust uplands, leases on trust uplands, and leases on aquatic lands. It also forecasts revenues to individual funds, including DNR management funds, beneficiary current funds, and beneficiary permanent funds. Caveats about the uncertainty 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 around two years. 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.

Figure 20: Forecast Timber Sales Volume

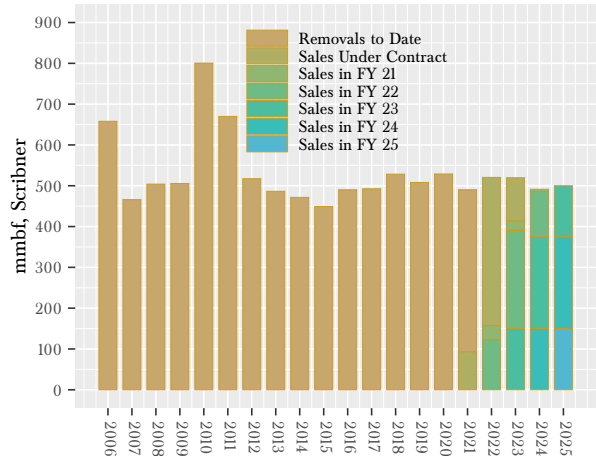


Timber Sales Volume

The sales volume forecast for FY 21 is increased to 540 mmbf, the amount that DNR plans to offer (Figure 20). Given the high demand, it is unlikely that there will be any sales passed in without bids. Forecast sales volumes in future years are unchanged.

FY15 was the first year of the new sustainable harvest decade (FY 15 through FY 24) for Western Washington, though the new Sustainable Harvest Calculation wasn't officially adopted until December 2019. However, multiple lawsuits have been filed that put the status of the new sustainable harvest estimates into question. Without certainty on the sustainable harvest limit, annual Westside sales volumes forecasts are unchanged at 450 mmbf for future years. Together with projected Eastside timber sales of 50 mmbf for each of the next several years, we arrive at a projected annual timber sales volume of about 500 mmbf for FYs 22-25.

Figure 21: Forecast Timber Removal Volume



Timber Removal Volume

The FY 20 removal volume was 527 mmbf (Figure 21). The FY 21 volume harvest forecast is reduced by 10 mmbf to 490 mmbf due to continued slow harvest activity. It appears that this is due primarily to an enormous amount of fire salvage timber coming out of Oregon. Burned timber must be harvested quickly to recover any value out of it

and the salvage operations are tying up a lot of the available log hauling capacity. Removal volumes in outlying years are unchanged.

high demand and auction prices. Sales prices in future fiscal years are unchanged.

Figure 22: Forecast Timber Sales Price

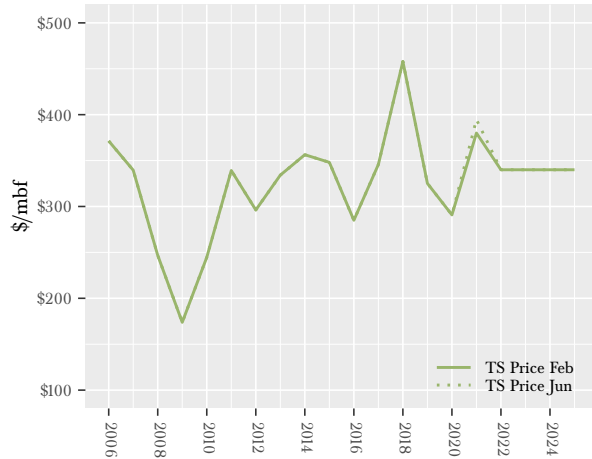
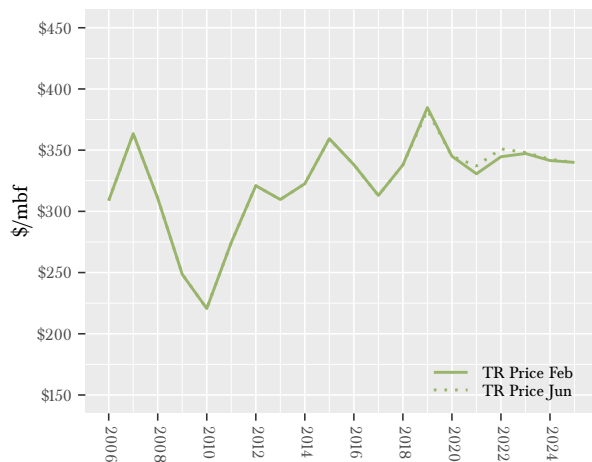


Figure 23: Forecast Timber Removal Price



Timber Sales Prices

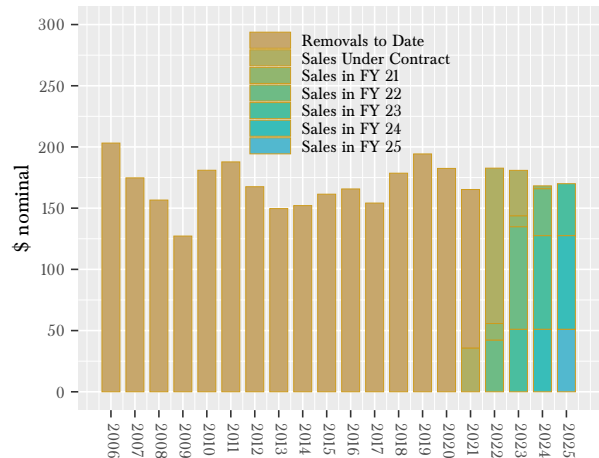
The price results of monthly DNR timber sales are quite volatile (Figure 11). As discussed in the stumpage price outlook, the DNR sales price (stumpage) forecast is informed by West Coast log and stumpage price estimates from a forest economics consulting firm. The sales price forecast for FY 21 are increased by \$15/mbf due to consistently

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).

The expected increase in FY 21 sales prices, a high average removal price for harvests to date and an increase in the value of timber inventory have increased removal price expectations through FY 24.

Figure 24: Forecast Timber Removal Value

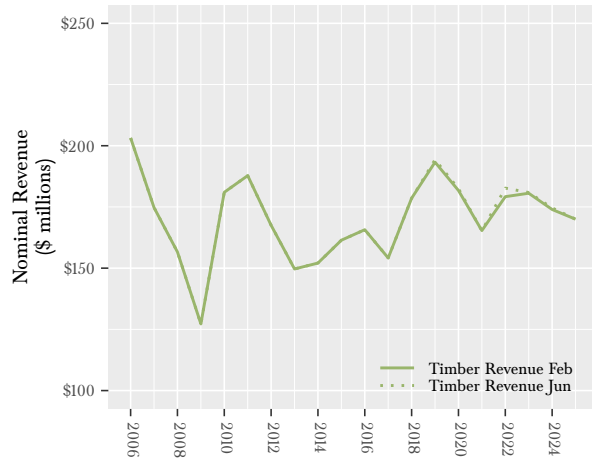


Timber Removal Revenue

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 revenues for the 2019-21 biennium remain essentially unchanged at \$348 million (+\$0 million) and revenues for the 2021-23 biennium are increased to \$364 million (+\$4 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).

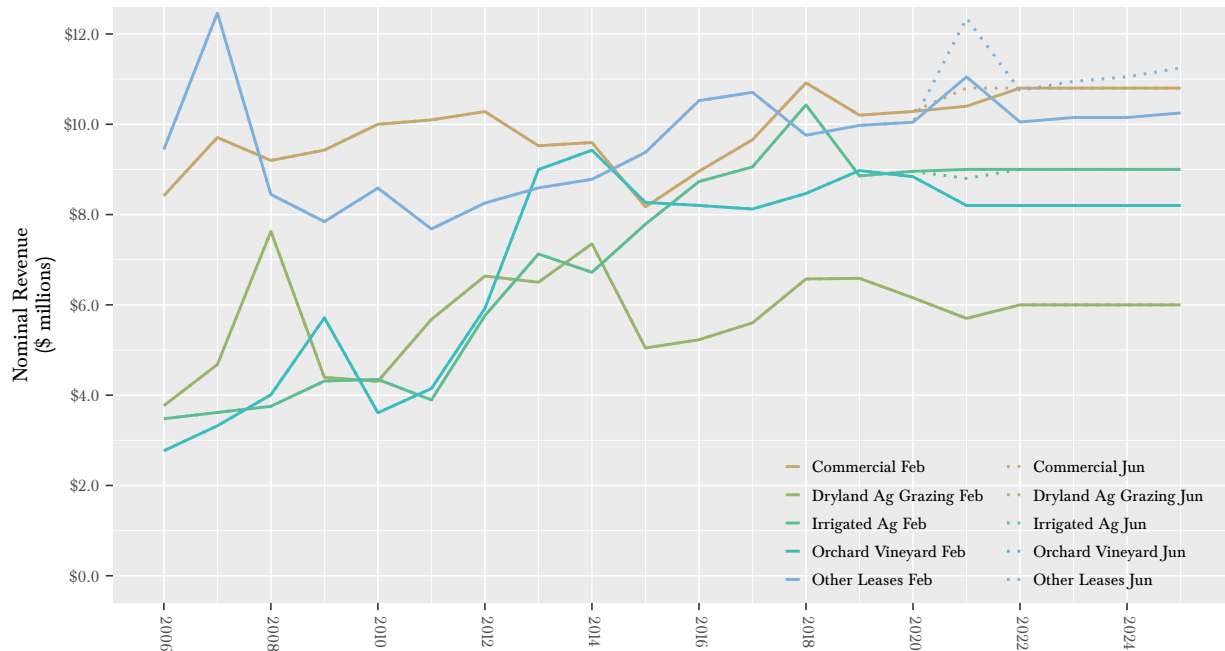
Overall, upland lease revenues are increased meaningfully in FY 21 by \$1.3 million due to higher-than-expected revenue from a number of different sources. Communication lease revenue forecast is increased again this forecast, this time by \$0.6 million in FY 21. This is due to lease renewals that required payment of back rent and increases in the base rent, which has also increased the forecast in outlying years. Other lease revenues are increased by \$0.3 million in all forecast years, due to increased revenue from the rights-of-way which has been improving their processes to bring revenue closer to market value.

Additionally, commercial rents are increased for FY 21 by \$0.4 million. This is the amount that seemed at risk of delayed payment this fiscal year due to the pandemic. However, businesses were able to meet their payments on time, despite the pandemic.

Finally, mineral and hydrocarbon rents have remained higher than expected due to increased quarry production.

These increases in revenue have offset a \$0.2 million reduction in forecast irrigated agricultural revenue. It's unclear what exactly has driven revenue to be lower than expected, though there were some billing issues that may have caused it. This new forecast is based on current data, though it is possible that this revenue source will end up being what was previously forecast.

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 have plummeted since the beginning of FY 20, so we are now forecasting geoduck to make up a bit over half of the aquatic lands revenue for FY 21.

The aquatic lease revenue forecast is decreased by \$0.8 million in FY 21 due to continued very low to-date revenue in non-water-dependent rents and slightly lower other revenue offsetting higher-than-expected revenue in aquaculture (Figure 27).

By late 2019, geoduck prices had already fallen substantially because of the slowdown in Chinese economic growth and the impact of the trade war. After the lockdown in China due to COVID-19, harvest of geoduck destined for China basically stopped, leaving only about 10 percent of the normal daily harvest—which is bound for other international locations or for domestic consumption.

Demand from China recovered substantially by mid-2020. We had assumed that harvest volumes would recover reasonably quickly to the roughly 95 percent of sales volume that we typically see. However, that was too optimistic and harvest volumes lagged for much longer. Our harvest volume assumptions are 85 percent of the sales volume for the foreseeable future.

Prices held up much better than we had feared at the outset of the pandemic. The April 2020 auction offered indemnification for purchasers if they did not harvest all of their contracted pounds—which led to a surprising \$8.98/lb. average price (Figure 28). However, the June 2020 auction had an average price of \$8.46/lb. and, importantly, did not offer a blanket indemnification. Prices for the July and September, 2020, auctions fell to \$5.05/lb. and \$6.11/lb., respectively. The December price rebounded to \$8.64/lb. — higher because this auction harvest period covered Chinese New Year, typically a period of very high demand. In January

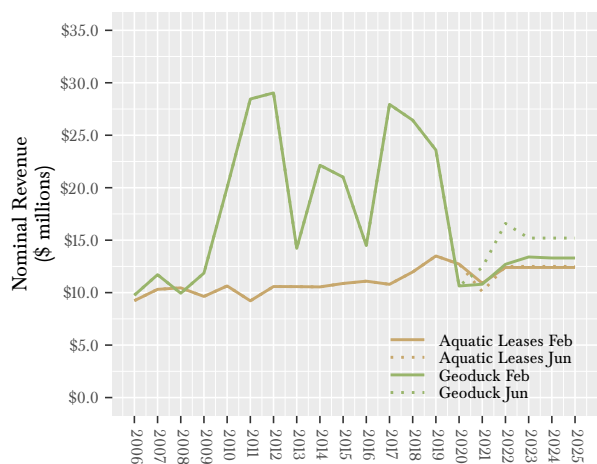
2021, prices fell back to \$6.82/lb. before fetching almost \$10/lb. in the February auction. The most recent auctions, in April and the beginning of June, fetched \$10.35/lb. and \$9.54/lb, respectively.

Forecast geoduck revenue is increased in all years, due to prices falling in the \$8-10/lb range for the last several auctions (barring January). The consistency of these prices, combined with the fact that they have fallen in what is seasonally a lower priced time of the year, suggests that demand has indeed returned from China. Our updated price forecast falls in the \$7-9/lb range, building in risk of price shocks compared to recent prices.

At this point, we don't expect to see prices return to consistently being between \$10-12/lb, or even above, though this is obviously still possible. The trade tensions with China don't seem to be easing, and Chinese consumers are moving to other luxury seafoods instead of geoduck.

It's 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 will have their revenue come in in FY 22.

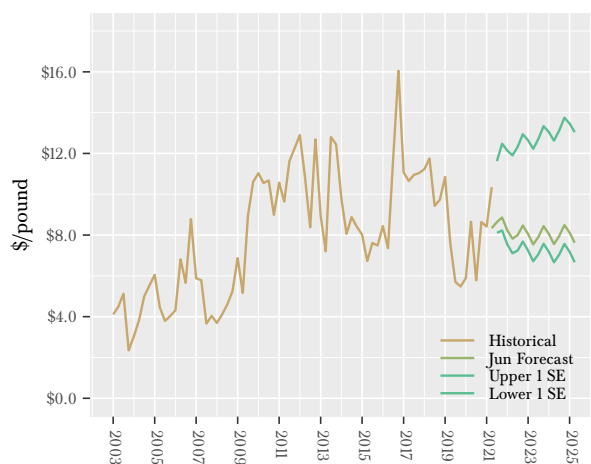
Figure 27: Aquatic Lands Revenues



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:

- 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.
- Furloughs at the Washington State Department of Health have delayed PSP and arsenic analyses and have led to lost fishing days in the past couple of months. It is unclear if these will continue or how disruptive they will be.
- 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.

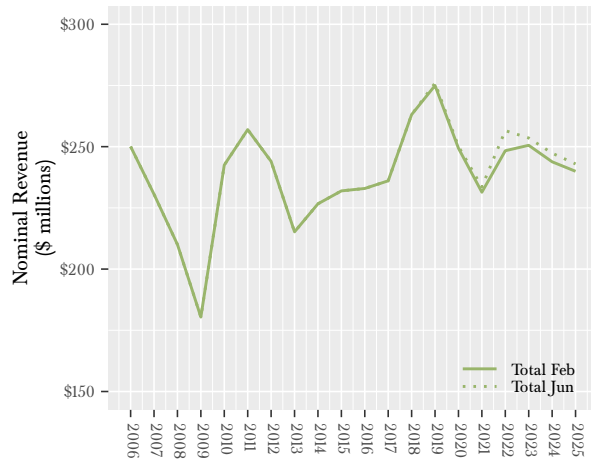
Figure 28: Geoduck Auction Prices



Total Revenues from All Sources

Forecast revenues for the 2019-21 Biennium (FYs 20 and 21) are increased by \$2.2 million to \$484 million, and revenues for the 2021-2023 biennium are increased by \$11 million to \$510 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 21 by trust, and relative historical timber prices by DNR region by trust; and
- The volumes of timber by trust for FYs 22-25 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 underlying statutory management fee deductions to DNR as authorized by the Legislature are 25 percent or less, as determined by the Board of Natural Resources (Board), for both the Resources Management Cost

Account (RMCA) and the Forest Development Account (FDA). In biennial budget bills, the Legislature has authorized a deduction of up to 30 percent to RMCA since July 1, 2005. In 2015, they began authorizing an RMCA deduction of up to 31 percent.

At its April 2011 meeting, the Board adopted a resolution to reduce the RMCA deduction from 30 to 27 percent and the FDA deduction from 25 to 23 percent. At its July 2011 meeting, the Board decided to continue the deductions at 27 percent for RMCA (so long as this rate is authorized by the Legislature) and at 23 percent for FDA. At its October 2011 meeting, the Board approved a resolution to reduce the FDA deduction from 23 to 21 percent. The Board decided in July 2013 to raise the FDA deduction to 25 percent and the RMCA deduction to 29 percent. In August 2015, the Board raised the RMCA deduction up to 31 percent for the 2015-2017 biennium.

The Forecast uses the 31 percent deduction for the all forecast years. This assumes that the Legislature will continue to approve RMCA deductions of up to 31 percent.

Given this background of official actions by the Legislature and the Board, the management fee deductions assumed in this Forecast are:

	FY 21	FY 22	FY 23	FY 24	FY 25
FDA	25	25	25	25	25
RMCA	31	31	31	31	31