Department of Natural Resources

Economic & Revenue Forecast

Fiscal Year 2018, Second Quarter
November 2017

Forecast Summary

Lumber and Log Prices. After peaking at an average or $376/mbf in 2014, west coast lumber prices fell to $317/mbf for 2015. They recovered slightly in 2016, averaging $341/mbf, mostly due to higher first quarter housing starts than in 2015. The increase in starts spiked lumber demand, catching lumber dealers off-guard, and pushed prices up from the end of the first quarter. Prices retreated toward the end of the year but did not fall to earlier lows. Lumber prices for 2017 have been significantly higher, averaging $406/mbf through September.

Through 2015 a 'typical' DNR log averaged $521/mbf, falling from the $591/mbf average in 2014. The average price for 2016 was slightly higher at $536/mbf. The decline in 2015 was primarily due to the dramatic slowdown in demand from China and to an ample regional supply of both logs and lumber. Log prices have increased through 2017, primarily due to increased lumber demand; they've averaged $592/mbf through September. Prices are expected to remain high through early 2018.

Timber Sales Volume. Given current timber sales plans, the sales volume forecast for FY 18 is unchanged as 500 mmbf. Sales plans in outlying years have not changed, so absent a new sustainable harvest calculation, sales volume forecasts in those years also remain at 500 mmbf.

Timber Sales Prices. FY 17 auction prices averaged $345/mbf. To-date, auction prices for FY 18 have averaged $439 with around 20 percent of the forecast volumen sold. The sales price forecasts FY 18 remains at $363/mbf. The sales price forecasts for outlying years are also unchanged.

Timber Removal Volume and Prices. Accounting for changes to purchaser plans and the timing of contract expirations, FY 18 harvest volume expectations are lowered by 50 mmbf to 589 mmbf. This volume is being pushed out to FYs 19, 20, and 21, increasing them slightly to 597, 532, and 515 mmbf, respectively.

The average timber removal price for FY 18 is lowered to $318/mbf. Timber removal prices for FYs 19-21 are projected to be about $341 (+$2), $346 (-$5), and $343 (+$1) per mbf. These removal prices reflect changes in the removal timing.

Timber Revenue. The above changes to timber sales prices, sales volumes, and harvest timing have shifted projected revenue in all forecast years. Revenues for the 2017-2019 biennium are forecast to total $388 million, down around three percent ($11 million) from Septembers's forecast. Forecast revenues for the 2019-2021 biennium are increased by three percent ($10 million) to $361 million.

Uplands and Aquatic Lands Lease (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 upland lease revenue forecast for FY 18 is increased by $1 million due to increases in revenue expectations for irrigated and orchard/vineyard leases and commercial property leases, which outweigh decreased expectations for other leases. Revenue forecasts for outlying years are unchanged.

Aquatic lease revenue expectations are reduced by a small amount for all forecast years due to continually lower expectations for water-dependent leases.

The FY 18 geoduck revenue is increased by $2 million to $22 million due to a higher planned sales volume than previously forecast. The revenue forecasts for the outlying years are unchanged.

Total Revenues. Total revenue for the 2017-2019 Biennium (FYs 18-19) are decreased by $8 million, to $533 million. Revenues for the 2019-2021 Biennium (FYs 20 and 21) are raised by $10 million to $502 million.

Notes to the Forecast. While the sales volume estimates are based on the best available internal planning data, they are subject to adjustments due to ongoing operational and policy issues. In particular, these issues are likely to affect sales volumes in outlying years, where the assumed sustainable harvest volume of 500 mmbf might be too high.

A continuing downside risk for the forecast is timber and lumber demand from China, which has al-

ready experienced a steep decline, could drop even further if the country's economic growth continues to slow down.

In previous forecasts, we noted that the expiration of the Softwood Lumber Agreement posed a major downside risk to the forecast: the expiration of tariffs might allow a flood of cheaper Canadian lumber into the U.S., suppressing domestic prices. This doesn't seem to have happened. Current expectations are that the countervailing duties imposed on Canadian lumber by the U.S. Department of Commerce will continue through 2017, though a deal is expected early in 2018. These duties will support higher prices.

Robust growth in U.S. residential improvements and housing construction would provide much needed, if unlikely, high-side potential. This has not yet occurred, despite strong employment growth for the last two years. Although housing demand has picked up there are still a number of impediments—persistently stringent lending standards, a continued tough labor market for younger workers, student loan debt, and general economic and social malaise—most of which are easing, but none of which show signs of completely abating just yet. Additionally, there are a number of supply side impediments constraining construction growth, primarily a lack of skilled labor and a lack of readily buildable land.

In late 2015, China again instituted a ban on geoduck imports from the Pacific Northwest due to paralytic shellfish poison (PSP) and arsenic concerns. However, once again, this didn't appear to impact prices or harvest activity. In late February 2016, the Washington Department of Health posted an article saying that China had lifted the ban and it listed the areas cleared for geoduck export to China. It is entirely possible that China could re-enact a more forceful ban on geoduck that would have a dramatic effect on geoduck prices, and therefore revenue.

Additionally, friction between geoduck purchasers and divers could disrupt the market, though these seem to have settled. As always in the geoduck fisheries, PSP closures create uncertainty around harvest volumes as well.

Finally, it is unclear how long U.S. economic growth can continue in the absence of coherent, growth-driven federal economic policies.

Table 1: November 2017 Forecast by Source (millions of dollars)

Timber Sales		FY 14	FY 15	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21
Volume (mmbf)		497	473	545	520	500	500	500	500
	Change					-	-	-	-
	% Change					0%	0%	0%	0%
Price ($/mbf)		356	348	285	346	363	350	340	340
	Change					$ -	$ -	$ -	$ -
	% Change					0%	0%	0%	0%
Value of Timber Sales		**177.2**	**164.5**	**155.3**	**179.8**	**181.7**	**175.0**	**170.0**	**170.0**
	Change					$ -	$ -	$ -	$ -
	% Change					0%	0%	0%	0%
Timber Removals									
Volume (mmbf)		471	449	490	493	589	597	532	515
	Change					(50)	19	20	15
	% Change					-8%	3%	4%	3%
Price ($/mbf)		323	359	338	313	314	341	346	343
	Change					(3.7)	2.3	(4.8)	0.6
	% Change					-1%	1%	-1%	0%
Timber Revenue		**152.1**	**161.4**	**165.7**	**154.2**	**185.3**	**203.6**	**184.2**	**176.8**
	Change					(18.2)	7.7	4.3	5.5
	% Change					-9%	4%	2%	3%
Upland Leases									
Irrigated Agriculture		6.7	7.8	8.7	9.1	8.7	8.5	8.5	8.5
	Change					0.2	-	-	-
	% Change					2%	0%	0%	0%
Orchard/Vineyard		9.4	8.3	8.2	8.1	8.3	8.0	8.0	8.0
	Change					0.3	-	-	-
	% Change					4%	0%	0%	0%
Dryland Ag/Grazing		7.4	5.0	5.2	5.6	5.6	6.2	6.2	6.2
	Change					-	-	-	-
	% Change					0%	0%	0%	0%
Commercial		9.6	8.2	9.0	9.7	9.9	9.4	9.4	9.4
	Change					0.5	-	-	-
	% Change					5%	0%	0%	0%
Other Leases		8.8	9.4	10.5	10.7	9.2	10.0	10.1	10.2
	Change					(0.2)	-	-	-
	% Change					-2%	0%	0%	0%
Total Upland Leases		**41.9**	**38.6**	**41.6**	**43.1**	**41.7**	**42.1**	**42.2**	**42.3**
	Change					0.8	-	-	-
	% Change					2%	0%	0%	0%
Aquatic Lands									
Aquatic Leases		10.5	10.9	11.1	10.8	10.2	10.2	10.2	10.2
	Change					(0.2)	(0.2)	(0.2)	(0.2)
	% Change					-2%	-2%	-2%	-2%
Geoduck		22.1	21.0	14.5	27.9	22.4	17.7	17.8	18.1
	Change					1.7	-	-	-
	% Change					8%	0%	0%	0%
Aquatic Lands Revenue		**32.7**	**31.9**	**25.6**	**38.7**	**32.6**	**27.9**	**28.0**	**28.3**
	Change					1.5	(0.2)	(0.2)	(0.2)
	% Change					5%	-1%	-1%	-1%
Total All Sources		**226.6**	**231.9**	**232.9**	**236.1**	**259.7**	**273.6**	**254.4**	**247.3**
	Change					(15.9)	7.5	4.1	5.3
	% Change					-6%	3%	2%	2%

Table 2: November 2017 Forecast by Fund (millions of dollars)

Management Funds		FY 14	FY 15	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21
041	RMCA - Uplands	33.2	30.4	36.0	33.7	41.5	45.1	41.7	40.4
	Change					(2.2)	1.5	3.4	3.4
	% Change					-5%	3%	9%	9%
041	RMCA - Aquatic Lands	14.8	14.4	11.3	17.9	14.8	12.4	12.5	12.6
	Change					0.8	(0.1)	(0.1)	(0.1)
	% Change					6%	-1%	-1%	-1%
014	FDA	19.6	23.2	22.8	22.0	22.5	25.5	23.9	23.1
	Change					(2.7)	0.8	0.3	0.7
	% Change					-11%	3%	1%	3%
Total Management Funds		**67.6**	**68.0**	**70.2**	**73.6**	**78.8**	**83.0**	**78.0**	**76.1**
	Change					(4.1)	2.2	3.6	4.0
	% Change					-5%	3%	5%	6%
Current Funds									
113	Common School Construction	56.6	50.4	59.7	51.8	65.1	71.3	67.4	65.9
	Change					(3.7)	2.3	(1.1)	(0.6)
	% Change					-5%	3%	-2%	-1%
999	Forest Board Counties	52.0	64.8	55.3	58.5	59.8	63.9	58.8	56.8
	Change					(6.2)	1.7	1.1	1.7
	% Change					-9%	3%	2%	3%
001	General Fund	2.2	1.8	4.1	2.6	2.3	3.7	3.7	3.7
	Change					(0.4)	0.2	(0.0)	0.1
	% Change					-15%	5%	-1%	3%
348	University Bond Retirement	1.8	2.8	1.8	1.8	2.9	2.5	2.1	1.9
	Change					(0.0)	(0.1)	0.1	(0.0)
	% Change					-1%	-5%	3%	0%
347	WSU Bond Retirement	1.7	1.8	1.4	1.7	1.7	1.7	1.7	1.7
	Change					0.0	-	(0.0)	(0.0)
	% Change					1%	0%	-2%	-2%
042	CEP&RI	5.5	5.2	3.1	4.1	4.1	4.8	4.4	4.3
	Change					(0.1)	(0.0)	(0.0)	(0.0)
	% Change					-2%	0%	-1%	0%
036	Capitol Building Construction	6.7	4.9	6.7	8.2	8.7	9.8	8.6	8.2
	Change					0.3	1.0	0.1	0.0
	% Change					3%	11%	1%	0%
061/3/5/6	Normal (CWU, EWU, WWU, TESC) School	0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.2
	Change					0.0	-	(0.0)	(0.0)
	% Change					1%	0%	-3%	-3%
Other Funds		1.5	0.5	0.1	0.0	1.3	0.6	0.2	0.2
	Change					(0.5)	0.0	0.1	0.0
	% Change					-26%	3%	61%	3%
Total Current Funds		**128.1**	**132.4**	**132.2**	**129.0**	**146.2**	**158.4**	**147.2**	**142.8**
	Change					(10.6)	5.0	0.1	1.3
	% Change					-7%	3%	0%	1%

(Continued)

Table 3: November 2017 Forecast by Fund (millions of dollars), cont'd

Aquatic Lands Enhancement Account		FY 14	FY 15	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21
02R		17.9	17.4	14.2	20.8	17.8	15.5	15.6	15.7
	Change					0.7	(0.1)	(0.1)	(0.1)
	% Change					4%	-1%	-1%	-1%
Permanent Funds									
601	Agricultural College Permanent	3.5	4.1	7.6	4.6	6.1	5.5	4.4	4.0
	Change					(0.5)	0.1	0.3	0.1
	% Change					-8%	3%	7%	3%
604	Normal School Permanent	1.8	1.7	2.4	3.1	3.8	3.7	3.0	2.8
	Change					(0.6)	0.1	0.1	0.0
	% Change					-14%	2%	3%	1%
605	Common School Permanent	0.4	0.7	1.0	0.6	0.3	0.3	0.3	0.3
	Change					-	-	-	-
	% Change					0%	0%	0%	0%
606	Scientific Permanent	6.1	7.1	5.0	4.1	6.1	6.5	5.4	5.0
	Change					(0.8)	0.2	0.1	0.0
	% Change					-12%	3%	2%	0%
607	University Permanent	1.1	0.4	0.2	0.3	0.5	0.6	0.6	0.6
	Change					0.0	0.0	(0.0)	0.0
	% Change					3%	0%	0%	2%
Total Permanent Funds		**13.0**	**14.0**	**16.2**	**12.6**	**16.8**	**16.6**	**13.7**	**12.7**
	Change					(1.9)	0.4	0.5	0.2
	% Change					-10%	3%	4%	1%

Total All Funds	FY 14	FY 15	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21
	226.6	231.9	232.9	236.1	259.7	273.6	254.4	247.3
Change					(15.9)	7.5	4.1	5.3
% Change					-6%	3%	2%	2%

Figure 1: Timber Forecast Charts

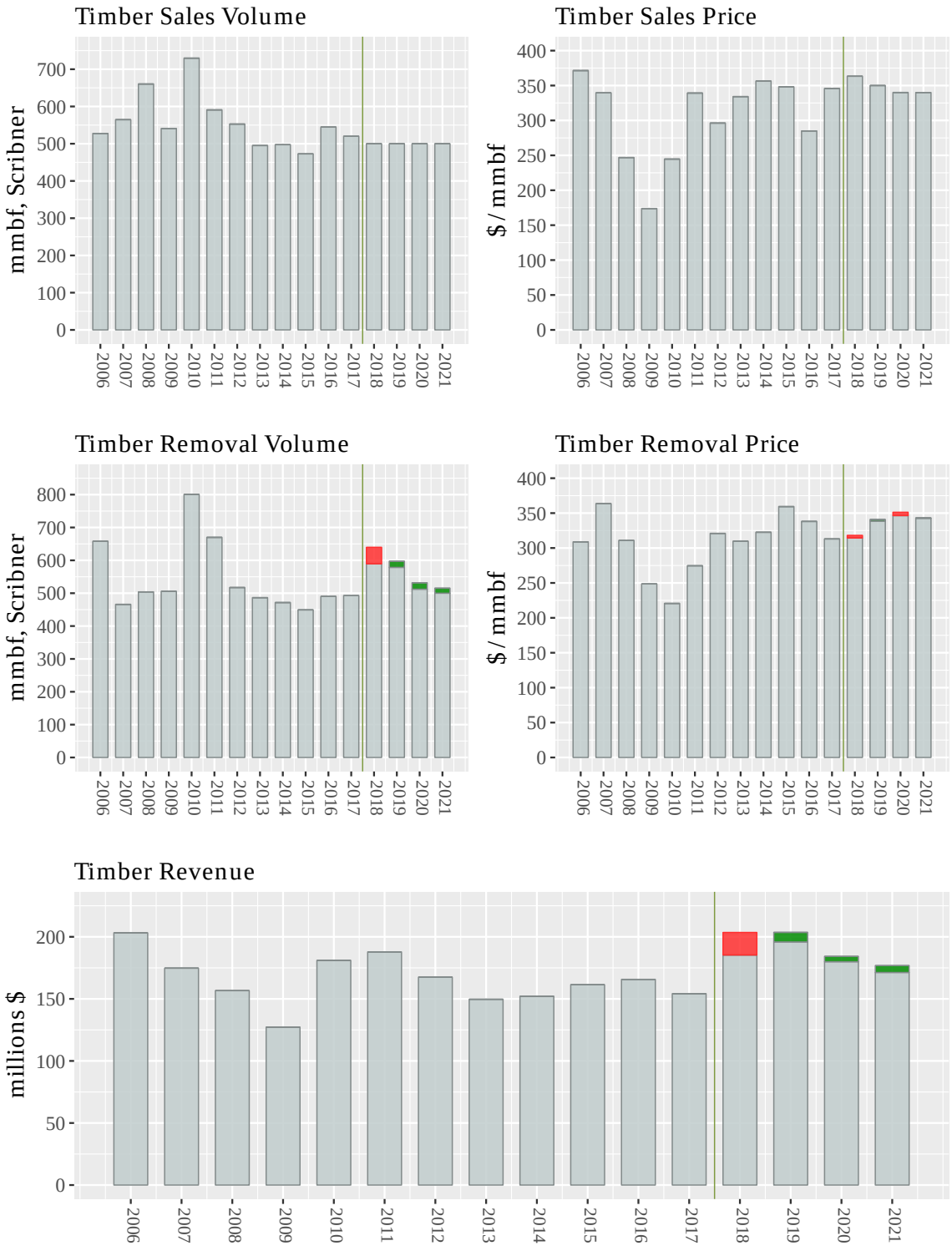


Figure 2: Other Uplands Forecast Charts

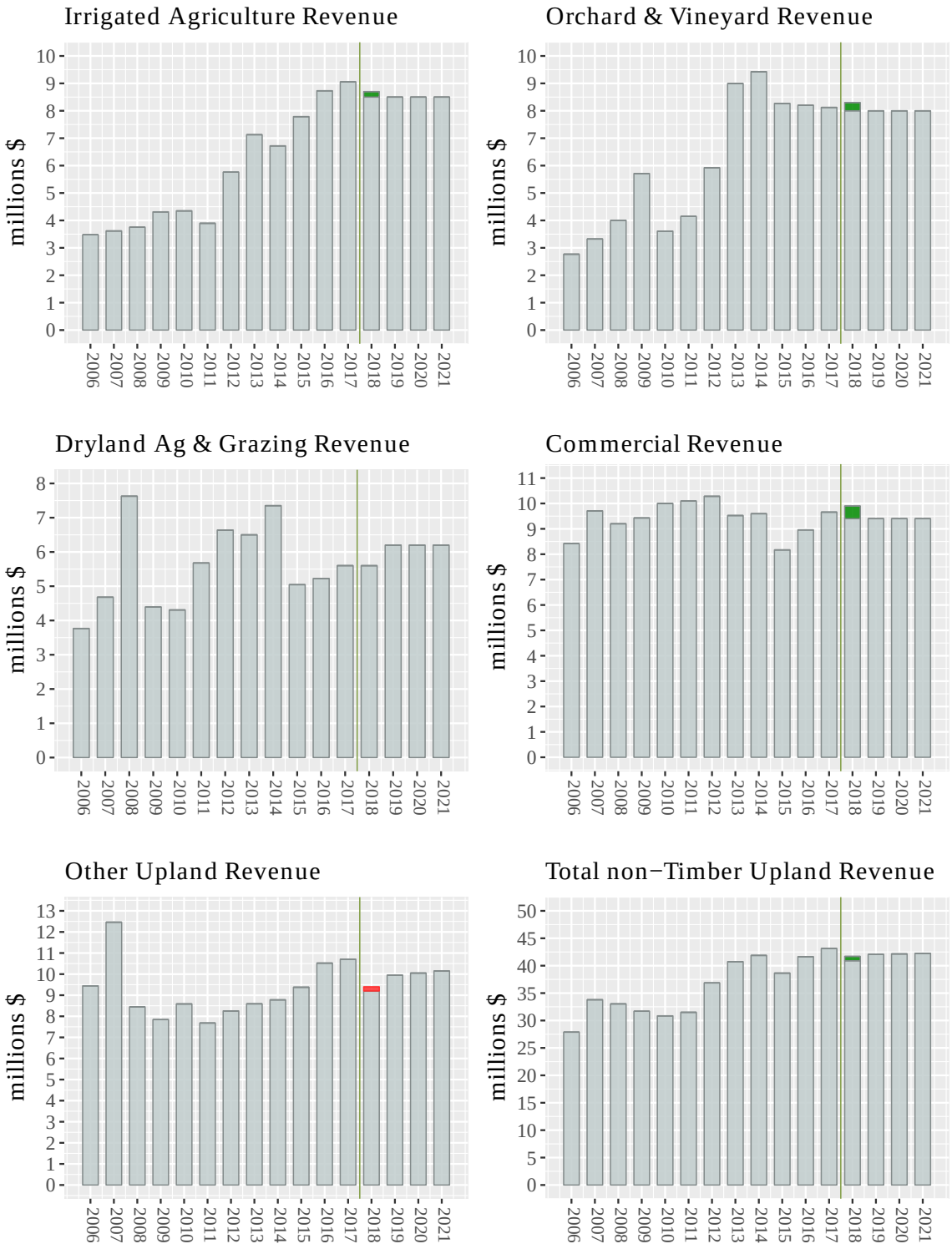
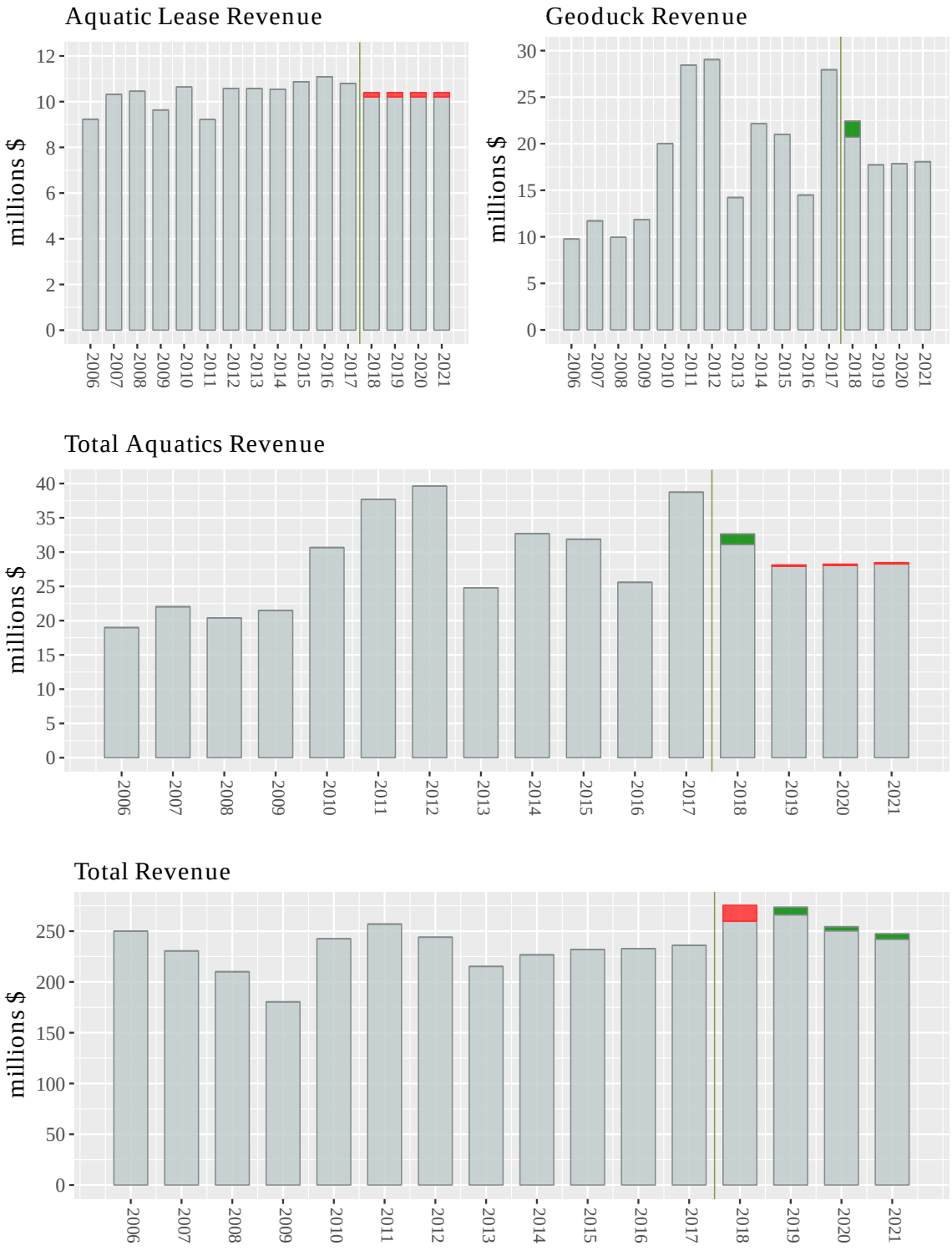


Figure 3: Aquatics and Total Forecast Charts



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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 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
mbf	Thousand board feet
mmbf	Million board feet
PPI	Producer Price Index
Q1	First quarter of year (similarly, Q2, Q3, and Q4)
QE	Quantitative Easing
RCW	Revised Code of Washington
RISI	Resource Information Systems, Inc.
RMCA	Resource Management Cost Account
SA	Seasonally Adjusted
SAAR	Seasonally Adjusted Annual Rate
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. Each re-evaluates world and national macroeconomic conditions, and the demand and supply for forest products and other goods. Finally, each 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 determined 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 2018 through 2021. Fiscal years for Washington State government begin July 1 and end June 30. For example, the current fiscal year, Fiscal Year 2018, runs from July 1, 2017 through June 30, 2018.

The baseline date (the point that designates the transition from "actuals" to predictions) for DNR revenues in this Forecast is October 1st, 2017. 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 October 2017. 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)
February 2018	January 1, 2018	February 15, 2018
June 2018	May 1, 2018	June 15, 2018
September 2018	August 1, 2018	September 15, 2018
November 2018	October 1, 2018	November 15, 2018

Acknowledgements

The Washington 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.

Special thanks are due to those in the wood products industry who provided information for DNR's survey of timber purchasers. These busy individuals and companies volunteered information essential to forecasting the timing of timber removal volumes, a critical component of projecting DNR's revenues on behalf of beneficiaries.

Thanks also go to DNR staff who contributed to the Forecast: Tom Shay, Venice Goetz, Rick Roeder, Katy Mink, Tom Heller, Rod Rennie, Keith Jones, Janet Ballew, Blain Reeves, and Linda Farr. They provided data and counsel, including information on markets and revenue flows in their areas of responsibility.

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

Office of Finance, Budget, and Economics

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Macroeconomic Conditions

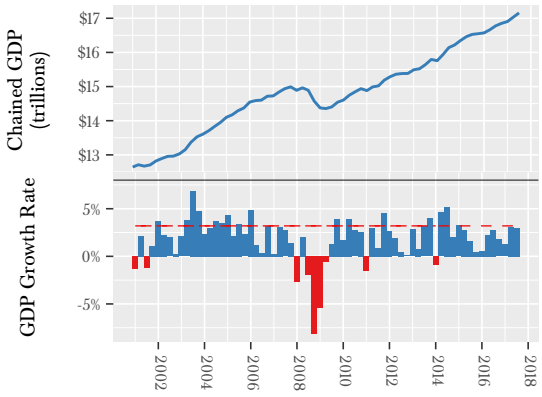
This section briefly reviews macroeconomic conditions in the United States and world economies because they influence DNR revenue—most notably through the bid prices for DNR timber and geoduck auctions and lease revenues from managed lands.

U.S. Economy

Gross Domestic Product

Since the end of the Great Recession of 2008 and 2009, during which GDP declined in five out of six quarters, GDP growth has averaged a weak 2.1 percent on a real annualized basis (Figure 4). This is markedly less than the annualized average of 3.2 percent over the previous 50 years (1960-2009). The Great Recession set back economic growth and seriously harmed many sectors of the economy, with especially lasting effects on employment and wages.

Figure 4: U.S. Gross Domestic Product



The pattern of stagnant GDP growth was widely predicted to break in 2014, then again in 2015 and yet again in 2016. However, as each year progressed expectations were repeatedly reduced. The pattern of reduced expectations was particularly stark in 2016, with analysts dropping forecasts from around 3.0 percent to around 2.5 percent at the beginning of the year, then to below 2.0 percent as first quarter growth disappointed. In the end, GDP growth in those years was disappointing, with only 2.6, 2.9, and 1.5 percent growth respectively.

Growth has been forecast to return to the mid-two percent range for 2017 and outlying years, to-date GDP growth suggests that 2017 will be in the low-two percent range. Predictions for 2017 and outlying years GDP growth are perhaps more uncertain than in previous years because it is still unclear what the economic and trade policies will look like under the current U.S. administration.

Employment and Wages

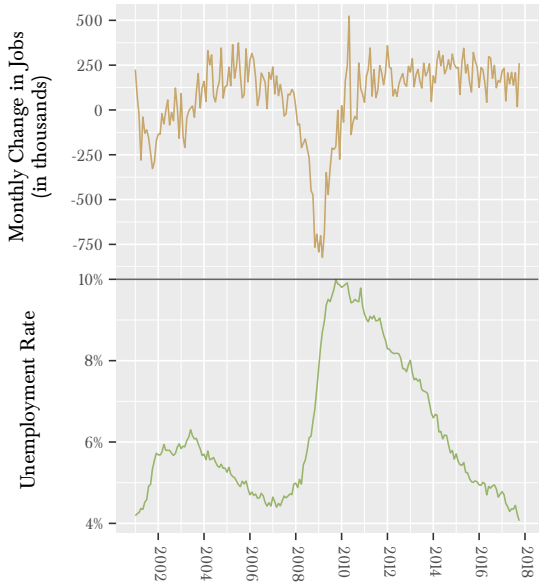
The U.S. headline unemployment rate declined from 5.7 percent in January 2015 to 4.9 percent in January 2016 and 4.8 percent in January 2017 (Figure 5). The unemployment rate ranged between 4.7 and 5.0 percent through the 2016 and ended at the lower end of that range in December. This is well down from a high of 10.0 percent in October 2009 and is below the average unemployment rate of 5.2 percent from 2001-2006. The unemployment rate has averaged 4.4 percent through October of 2017 and has been trending downward. It currently stands at 4.1 percent. In general, analysts expect the unemployment rate to remain in the four-five percent range for the next couple of years, while the FOMC has a range in the high-three to low-four percent through 2019.

Job growth slowed in 2016, with around 187,000 jobs created per month compared to 226,000 per month in 2015. This slowdown was generally expected and is consistent with an economy operating nearer to its long-term capacity; on average, about 169,000 jobs have been added each month to October this year.

The unemployment rate is a useful indicator because it gives insight into slack in the labor market; that is, how many people are available to work before job growth starts driving problematic inflation. The labor market is the driving force behind

consumption, which constitutes about 70 percent of GDP and naturally extends to the demand for housing, which is the major driver of U.S. timber demand. Data and anecdotes abound that show that one of the major effects of high unemployment rates, particularly among young adults, is lower demand for housing as more people live with their parents or take on housemates.

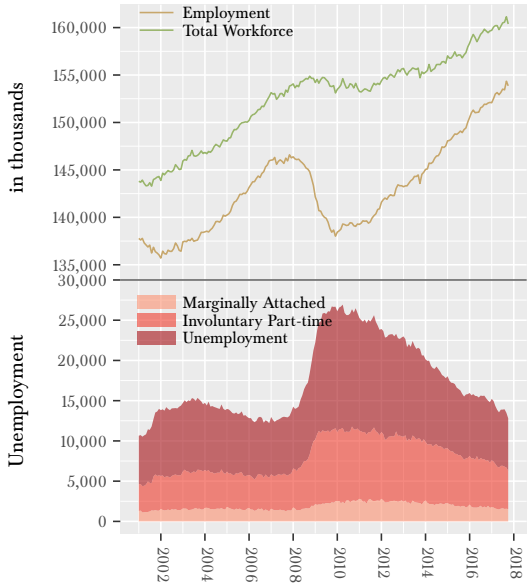
Figure 5: Unemployment Rate and Monthly Change in Jobs



Although the unemployment rate has declined and is below the long term average, it has not yet translated into strong wage growth, which is likely a prerequisite for broader economic improvement and an increase in the demand for housing. One possible reason for this is that the headline unemployment rate may be underestimating the number of people willing to work. During the 2008-09 recession the number of people who were underemployed or marginally attached to the workforce increased dramatically. Additionally, from the beginning of the recession to mid-2015 the labor force participation rate declined significantly, falling by three percentage points to 63 percent, possibly because workers left the labor force after they were unable to find jobs.

The U-6 is an alternative measure of unemployment that includes involuntarily part-time employment 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 has declined from a high of 17.1 percent in 2010 to a low of 7.9 percent in October 2017. This is just lower than the average of 9.1 percent from 2001-2006 (Figure 6). The decline in the year-on-year U-6 is the result of a drop in all three of its components.

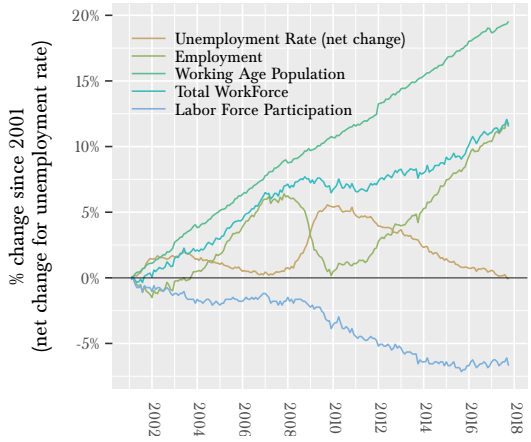
Figure 6: Employment and Unemployment



Reductions in the labor force participation rate helped move the unemployment rate and the U-6 lower roughly through January 2014 (Figure 7). Since then the rate has remained relatively stable between 62.4 and 63.0 percent and has averaged 62.8 percent. The decline in the labor force participation rate is an important confounding factor when examining the unemployment rate and is a key consideration when forecasting whether an increase in employment will trigger an increase in wages and inflation. If there are many people wait-

ing to search for employment until jobs are easier to find—such as when people stay out of the labor force and the participation rate declines—then as employment grows, more people will enter the labor force and there will be little or no pressure on wages despite a low unemployment rate. However, if people are not in the labor market for other reasons, then the unemployment rate is a more accurate reflection of the labor pool. If the latter is the case, then a decrease in the rate means that there are fewer people looking for work, so in order to fill jobs companies will have to compete for labor, pushing up wages.

Figure 7: Labor Market Indicators



The drop in the participation rate since 2008 suggests that the recession itself caused people to leave the labor market, and implies that they may return when things look a bit better. However, Federal Reserve analysts have suggested that the recent decline in participation may be part of a longer-term trend starting in the late 1970s and pausing during the 1990s, not as a result of the recession. Indeed, according to statistics released by the Federal Reserve Bank of Atlanta, many of those dropping out of the labor force can't or don't want to work.

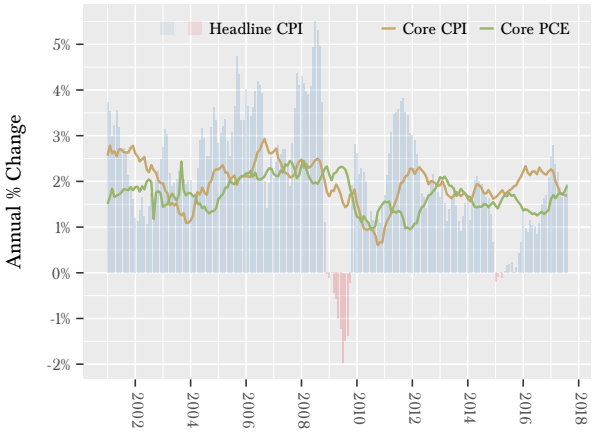
Inflation

Aside from a short period in 2012, inflation has bee 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 at the year progresses. (Figure 8).

For policy purposes, the FOMC uses the core Personal Consumption Expenditures (PCE) index as the guiding measure of inflation, which removes the more volatile fuel and food prices. This measure shows long-term inflation at or below the two percent target since September 2008. Core PCE growth averaged 1.4 percent in 2015 and 1.7 percent in 2016. The December 2016 FOMC projected a range from 1.7-2.0 core PCE inflation for 2017, but that was reduced slightly in the June 2017 meeting to a range of 1.6-1.8 percent. PCE inflation through October has averaged 1.7 percent.

The consensus among forecasters, including the FOMC, is that core inflation will remain at or below two percent through 2019.

Figure 8: U.S. Inflation Indices



Interest Rates

Seldom in U.S. history has it been so inexpensive to borrow money for so long. From December 2008 to December 2015, the Federal Reserve held the federal funds rate in the 0.0-0.25 percent range. 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 two percent inflation.

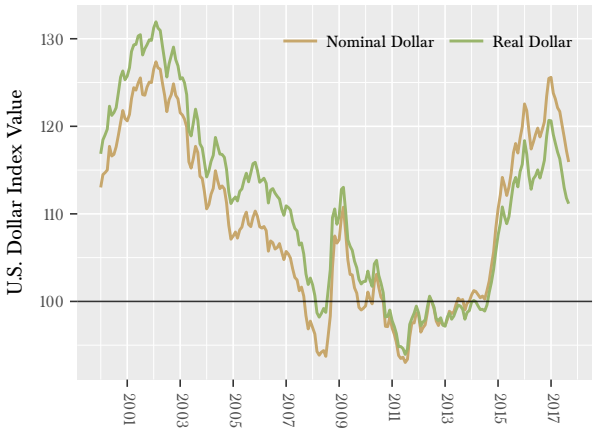
In December 2015, the FOMC raised interest rates to 0.25-0.5 percent after determining that sufficient progress had been made in the recovery of employment and inflation and, importantly, that there was a sufficiently strong outlook to begin lifting interest rates from their historic lows. From the December 2015 rate rise, the FOMC indicated that they expected a median federal funds rate of 1.4 percent in 2016, which would have been four rate increases of about 0.25 percent. However, this didn't happen due to slower than expected inflation and wage growth. In December 2016 the FOMC raised rates again to 0.5-0.75 percent. In March and again in June 2017, the FOMC also increased the rate by 0.25 percent, leading to current rates of 1.00-1.25 percent. These increases were widely expected because the FOMC carefully prepared markets for it with each successive meeting statement.

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 in the housing and auto markets. In normal times, a decrease in interest rates will expand investment, employment, wages, and consumer credit. The question of whether to raise interest rates is important because it is the key tool of monetary policy.

The U.S. Dollar and Foreign Trade

The trade-weighted U.S. dollar index has climbed dramatically since 2014. 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. However, that boost was short-lived; since then, the dollar has dropped back around its 2015 averaged - though this is still almost 15 percent higher than the value through most of 2014 (Figure 9).

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



Importantly, a rising dollar means that timber and lumber from the Pacific Northwest become more expensive for international buyers and imported timber and lumber become less expensive. This will tend to suppress local prices and DNR's timber and agricultural revenues. Wildstock geoduck revenue will also be negatively affected because geoduck is primarily marketed abroad.

Foreign trade and access to export markets is very important for DNR revenues. Chinese demand for timber and lumber have been a major factor supporting lumber prices since 2010, even though DNR timber cannot be exported directly. Additionally, much of the soft white wheat produced in Washington is exported to Asia and a large portion of PNW geoduck harvested is exported to China.

Given the proposed policies of the new U.S. administration, the upcoming months and years are likely to be more volatile for foreign trade and present a large potential downside risk for DNR revenue. Earlier in the year there was a good deal of speculation about 'trade wars', particularly with China and Mexico. However, aside from the duties imposed on Canadian lumber, it doesn't seem as though there has been much effective movement on international trade. Additionally, it is very unclear how

much is actually at risk. Chinese demand for timber and lumber has waned significantly in the past three years, falling from a peak of 4.1 million cubic meters in 2011 to 1.9 million cubic meters in 2016, and forecasts are predicting that increases in domestic demand will offset the drop in Chinese demand. However, unless domestic demand were to expand significantly, there would still be a large drop in overall demand if China were to turn away from Washington log and lumber exports.

Some analysts argue that access to wheat and other agricultural export markets are not in any serious danger because our largest trading partners are dependent upon imports to satisfy their demand and food prices in developing countries are highly political. However, that doesn't mean that they aren't able to preferentially purchase from U.S. competitors, particularly Australia, which is the world's largest exporter of soft white wheat.

Finally, China is apparently the primary market for geoducks (there is very little information about the geoduck market, so much of our understanding is anecdotal), so an increase in geoduck prices in the Chinese market could have a large impact on that program. However, China has already initiated two bans on geoduck from the Pacific Northwest and for reasons that are unclear, neither ban had an appreciable affect on prices—so its possible that geoduck demand is fairly inelastic, that is, it won't drop very much despite large changes in price.

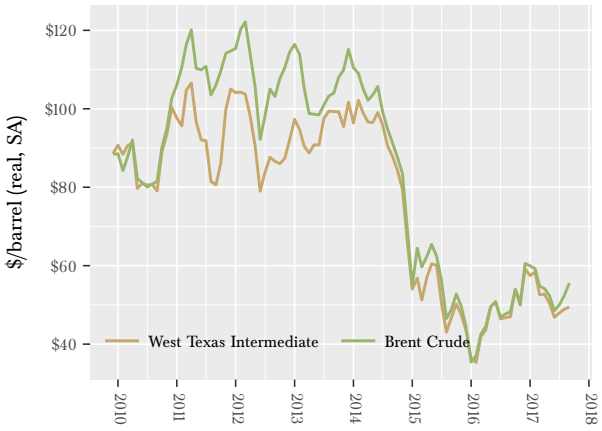
Petroleum

Crude oil and its derivatives strongly affect production, transportation, and consumption in the world and U.S. domestic economies. Prices for Brent crude oil plummeted from $108/barrel in January 2014 to $30/barrel in January 2016, a 70 percent drop. Prices increased through 2016 but fell through much of 2017 to-date, except September, when they jumped to $56/barrel - it's highest price since July 2015.

Broadly, a drop in oil prices acts like a tax cut for consumers and can encourage consumption. However, data suggest that households initially saved the windfall or paid down debt instead of spending it, with no noticeable increase in consumption. Additionally, the drop was sudden and severe enough that it has undermined business investment in oil production, creating another drag on economic growth.

All other things being equal, lower petroleum prices will lower diesel fuel prices and will make transportation-sensitive industries—such as PNW logging and agriculture—more competitive in international markets. However, all other things are not equal: as discussed above, the U.S. dollar has risen dramatically and will make PNW timber more expensive internationally. These two forces are opposing and it is unclear which will be more influential on PNW natural resource exports.

Figure 10: Crude Oil Prices



World Economy

Europe

Forecasts for the U.S. economy often cite Europe's ongoing financial crisis and weak economic performance as a significant downside risk. The EU (28 countries) is the fourth largest trading partner of the U.S. and, as a whole, was hammered by the Great Recession, collectively suffering a 4.5 percent contraction in 2009. This was followed by two years of slow growth, and another year of contraction. After no growth in 2013, 2014 saw real

EU GDP growth of 1.3 percent—finally surpassing 2007's GDP in real terms.

Politically, Europe appears to have become less stable. This political turmoil started most visibly with the possibility of a Greek exit from the EU in mid-2015 (Grexit), continued with the UK's 2016 vote to leave the EU (Brexit), and remains with the increase in support for nationalist political parties opposed to trade, thought as yet these parties have not been given power in the most influential countries. Markets have calmed down after the turmoil of the Grexit and Brexit vote, but the implementation of the Brexit will likely have a negative effect on the economies of both the UK and the EU and introduce further uncertainty.

Weakness and uncertainty in Eurozone economies means reduced demand for U.S. exports, but it has been difficult to identify specific tangible effects on the U.S. economy.

China

China is a major export market for logs, lumber and geoduck from the Pacific Northwest. Since 2011, between 50 and 60 percent of the softwood log exports leaving the Seattle and Columbia River Customs District have gone to China and China is (anecdotally) the primary export market for Washington's geoduck. Changes to the Chinese economy can have a dramatic impact on the prices for logs, lumber, and geoduck in the Pacific Northwest.

China's GDP and employment weathered the global economic and financial crises better than most other economies. However, that resilience is proving to be illusory, as the costs of propping up investment and maintaining significant political control over the economy mount and the likelihood of a dramatic slowdown increase. Already, Chinese GDP growth has slowed from 10.4 percent in 2010 to 6.9 percent in 2015 and 6.3 percent in 2016.

There is growing concern that Chinese GDP growth will fall much lower, possibly even into recession. This risk is mostly due to the prominence of investment as a component of GDP, the huge amount of debt in the country, and the way that debt is held. Household and corporate debt (to non-financial corporations) ballooned from about 110 percent of GDP in 2008 to over 190 percent in 2014, and much of it is linked to real estate. Investment comprises almost 50 percent of China's GDP. At those levels of debt a slowdown in an economy can lead to a drop in income and an inability to service debt en-masse, potentially leading to a debt crisis that would undermine that investment and have a tremendous impact on China's GDP.

Another source of uncertainty is the current U.S. administration, which has been critical of trade with China. China is particularly vulnerable to changes in access to international markets, particularly the U.S., with exports making up 25 percent of GDP and a large proportion of employment dependent upon labor-intensive export industries. Policies targeting Chinese imports could be very damaging to Chinese GDP. There is speculation these types of policies would be met with retaliatory action from China, which would likely undermine demand for many of DNR's revenue-generating products.

Japan

Japan is another major export market for the Pacific Northwest—importing around 35 percent of the softwood logs exported from the Seattle and Columbia River customs districts since 2012. Unfortunately, Japan's growth has stagnated since the early 1990s after a stock market and property bubble bust trapped the economy into a deflationary spiral. After his election in late 2012, Japanese Prime Minister Shinzo Abe began a fairly bold combination of economic policy moves, dubbed 'Abenomics', in an attempt to revitalize Japan's economy.

Although Abenomics was initially well received, it hasn't been able to increase inflation or make a noticable impact on GDP. In January 2016, the Bank of Japan added negative interest rates to the mix of Abenomics policies and quantitative easing, hoping to spur spending and force inflation and GDP

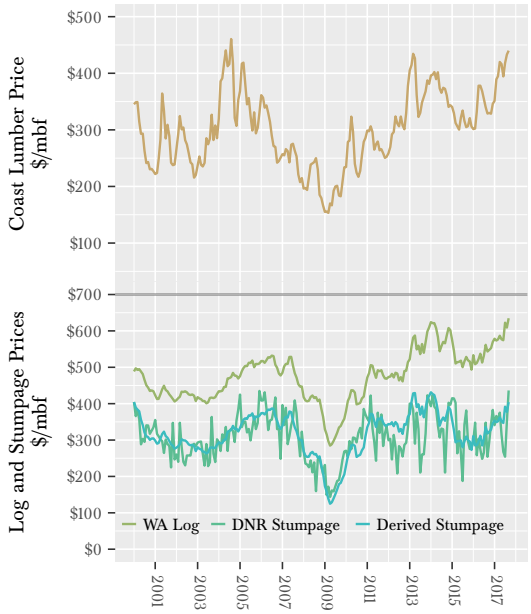
higher. However, this hasn't been effective.

While the Japanese economy hasn't pulled out of slow growth, it does not appear to be in any danger of a recession or slower growth, so it is unlikely to be a source of risk for timber prices.

Wood Markets

Over the past decade, timber stumpage revenue has constituted about 70 percent of total DNR revenues. DNR is, therefore, 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 revenues generated by DNR.

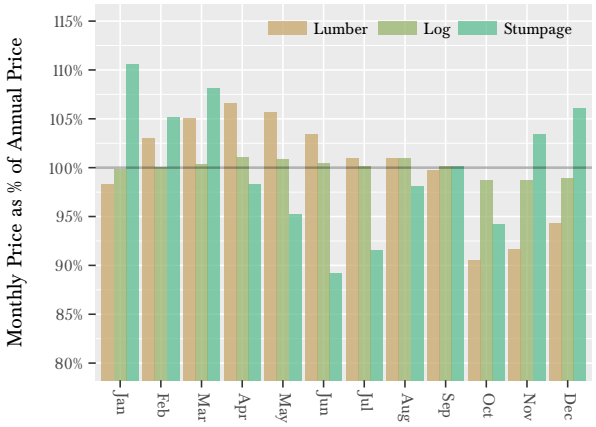
Figure 11: Lumber, Log and Stumpage Prices in Washington



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 and increase purchasers' willingness to pay for stumpage (the right to harvest). Volatility in stumpage prices arises 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 stumpage prices to take advantage of high lumber prices. From the supply side, land owners do not often 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 peak in spring, when housing construction picks up, and decline through fall as demand wanes, while stumpage prices tend to be highest in January-March, when harvesters are lining up harvestable stock for the summer. DNR stumpage price volatility is also affected by the fire-fighting season and the quality of the stumpage

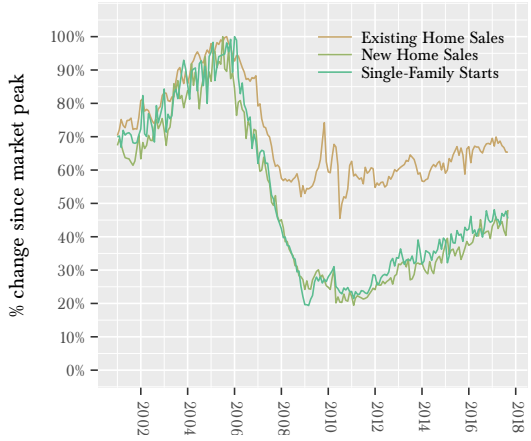
mix, which varies throughout the year but tends to be worse from July through September.

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. Historically, these sectors have constituted over 70 percent of softwood consumption—45 percent going to housing starts and 25 percent to improvements—with the remainder going to industrial production and other applications.

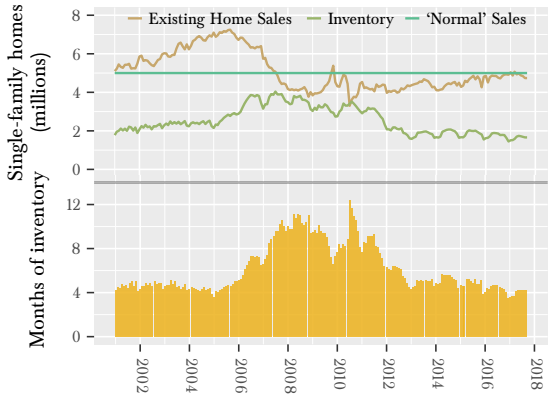
Figure 13: Home Sales and Starts as a Percentage of Pre-Recession Peak



The crash in the housing market and the following recession drastically reduced demand for new housing, which undermined the total demand for lumber (Figure 13). Since the 2009-11 trough, the 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.

Housing demand appears to be growing after stalling through late 2014, but has been broadly subdued due to tight lending standards and increasing prices at the same time as stagnant or declining real wages for much of the population. Although lending standards have relaxed a little and the labor market is tightening, these improvements are happening very slowly.

Figure 14: Existing Home Sales



Existing Home Sales

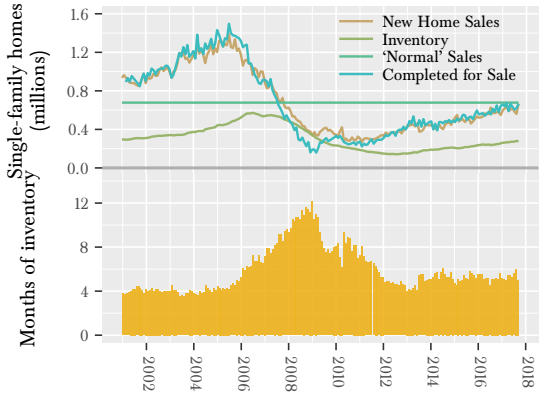
Existing home sales plummeted during the recession from around 6.5 million (SAAR) in 2006 to a low of around 4.1 million in 2008. They rose to average 4.6 million (SAAR) in 2015, an increase on the 4.3 million average of 2014 (Figure 14). There were about 4.8 million sales (SAAR) in 2016, just a bit shy of 'normal' annual sales of around 5 million homes. Through October 2017, annualized sales of existing single family homes has averaged 4.9 million.

Changes in inventory can be a useful signal about the current relationship between supply and demand. A decreasing inventory suggests that demand is outstripping supply, which should put upward pressure on prices and encourage more homes to be listed or built. Single-family inventory has ranged between 1.6 and 2.2 million homes, with clear seasonal influences. Inventories built up in the beginning of 2016 but have fallen since then and, as of October, are well below historical norms: there

are currently 1.7 million homes in inventory, compared to a little over 2 million homes in inventory prior to the housing market crash in 2006.

After house prices fell in the recession, private investors moved into depressed housing markets and purchased large numbers of low-priced foreclosed residential properties. These investors have helped drive demand and may have set a floor under several key urban housing markets. There has been some concern among analysts about the potential impact on house prices if investors were to begin selling en-masse, thereby increasing the housing supply while demand continues to be weak. However, without significant potential returns from other investments, there seems little chance of a mass sell-off.

Figure 15: New Single-Family Home Sales



New Home Sales

Unsurprisingly, new home sales also plummeted during the recession, reaching a record low of 306,000 (SAAR) in 2011 before beginning a slow rise (Figure 15). New home sales increased from 440,000 (SAAR) in 2014 to an average of 502,000 in 2015. The monthly sales for 2016 averaged 561,000 homes, an improvement compared to 2015 (which averaged 500,000 homes over the same period), but still well below the long-term (1963-2010) 'normal' rate of 678,000 sales per year. New home sales through October 2017 averaged an annualized 609,000.

As low as new home sales fell, new home construction fell even lower from early 2007 through mid-2011, causing the inventory of newly built homes for sale to decline over the period. After bottoming out in July 2012, the inventory of new homes has crept up as construction slightly outpaced sales.

Household Formation

Household formation (the growth in the number of households) is a key component of housing demand and a major driver of U.S. housing starts. Due to the job and income losses and to the greater financial precarity that the recession created, household formation fell as people shared housing and many younger people, who were hit especially hard, moved back in with their parents. Net immigration from Mexico also approached zero following the recession, and may have actually been negative, contributing to slowing household formation.

The drop in household formation and the consequent reduction in demand for home purchases contributed to the surge in the inventory of available housing units and significant drop in housing starts. Historically, U.S. household formation has ranged between 1.2 and 1.3 million per year; following the recession, household formations dropped dramatically to average 0.7 million per year from 2009-2014.

An important concept frequently discussed in relation to household formation is that of 'pent-up' demand—the demand for housing from those who wish to form households, but are currently unable to because of employment, earnings, or credit eligibility issues. Much of the discussion from analysts in the past several years has been about a large, and growing, pent-up demand as more young adults want to move out and create their own households. Analysts have consistently overestimated its impact on the housing market, repeatedly predicting a strong rebound in household formation and housing starts that has yet to emerge. In other words, pent-up demand has so far failed to become real demand, largely because of issues

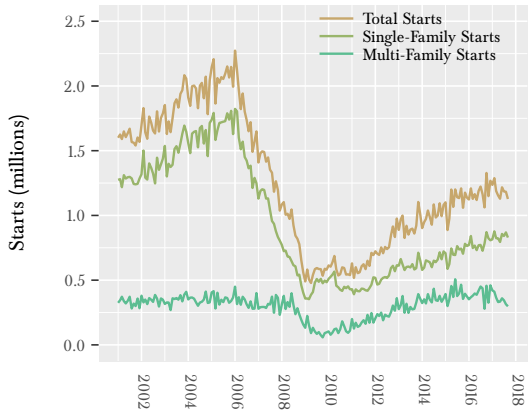
with employment, wages, credit requirements, and affordability.

Forecasts for household formation are for a return to the 1980-2007 average of a bit over 1.4 million formations per year. Looking forward, household formation will depend on both the continued recovery in the U.S. labor market—more than just job growth, but also real wage growth—improvements in housing affordability and mortgage access, and net immigration.

Housing Starts

In April 2009, U.S. housing starts fell to record lows 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 have been rising slowly since (Figure 16).

Figure 16: Housing Starts



Since the recession, total housing starts have been made up of a larger portion of multi-family units than in the past. This is pertinent because multi-family structures use much less lumber than single-family houses per unit, so the slow recovery in overall starts has had a more muted effect on timber prices than historical increases. However, it is not clear how long multi-family starts will drive total starts: in 2016 multi-family starts were lower than in 2015, 385,000 and 395,000 starts respectively, while single family starts increased from 718,000 to 783,000 (SAAR). In 2017, multi-family starts are on track for a further decline, averaging 353,000 starts (annualized) through August, while single-family starts have averaged 837,000.

Starts totaled around 1.0 million and 1.1 million (SAAR) in 2014 and 2015, overcoming low first quarter starts that were dragged down by severe weather in both years. Housing starts in 2016 totaled 1.2 million. Continued improvements in household formations will increase demand and drive an increase in starts, though it is unclear how long it will take before formations increase. Additionally, a recovery in house prices should facilitate the 'move-up' market. An increase in the move-up market combined with low total inventories constraining the supply of existing housing should start increasing prices and provide incentives to build more houses; again, this is likely to be constrained by how much people can afford, so wages and lending standards will play a significant role.

Builder confidence is no longer an impediment to housing starts, as estimates of confidence are consistent with housing starts of over 1 million. However, there are significant supply impediments, such as the shortage of buildable lots and permit delays. Given the lead time necessary to build houses, these are likely to cause volatility in both prices and supply.

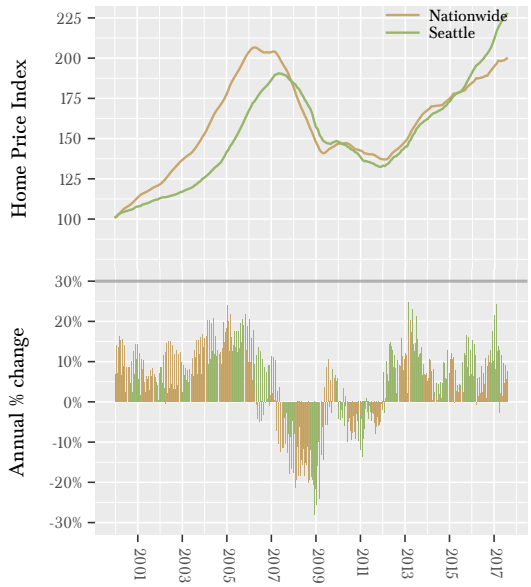
Housing Prices

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 17 charts the seasonally adjusted S&P/Case-Shiller Home Price Index for the 20-city composite, which estimates national existing home price trends. The 20-city composite index has increased in most months since bottoming out in January 2012—its lowest point since October 2002.

Seattle house prices are growing much faster than national prices, increasing 12.5 percent year-on-year as of August, compared with 5.9 percent nationally. When Seattle prices bottomed in February 2012—their lowest point since June 2004—the average existing house in Seattle was worth only 70 percent of the May 2007 peak. As of August, the average Seattle home was worth over 20 percent more than its peak price before the recession (in nominal terms).

The increase in prices is bringing back more normal foreclosure conditions in which homeowners can make rational decisions about whether to sell—as opposed to being forced to sell or to remain 'underwater' to avoid selling at a loss or compromising their credit. However, house prices elsewhere in the U.S.—especially in those areas most devastated by the foreclosure crisis—have not increased as quickly as in Seattle.

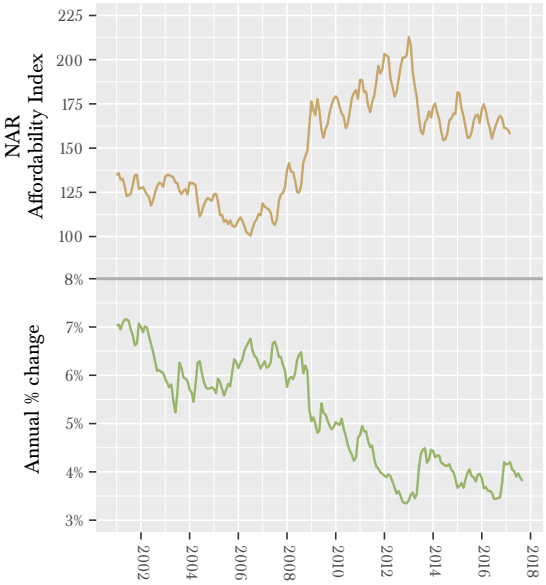
Figure 17: Case-Shiller Existing Home Price Index



Housing Affordability

The National Association of Realtors' (NAR) U.S. Housing Affordability Index is a useful, though imperfect, measure of how affordable or attainable houses are to the average American. Index values increase as affordability increases, and decline as homes become less affordable.

Figure 18: Housing Affordability



The affordability index is based on house prices, mortgage rates and income. The index increases if house prices decrease, mortgage rates decrease or incomes increase. The index is useful because movements in house prices, mortgage rates and household income can offset each other so that it might not be immediately obvious how those changes affect the overall house buying power of the average household. The index provides an easy way to assess whether houses are more or less affordable on average. For instance, suppose incomes increase (which will generally increase affordability and put upward pressure on the index) but that mortgage rates also increase (which would put downward pressure on the index) — while imperfect, the index provides a consistent method to asses these changes.

The affordability index peaked at a record high of 213 in January 2013 and then crashed to 158 in August of that year—its steepest decline in 30 years—

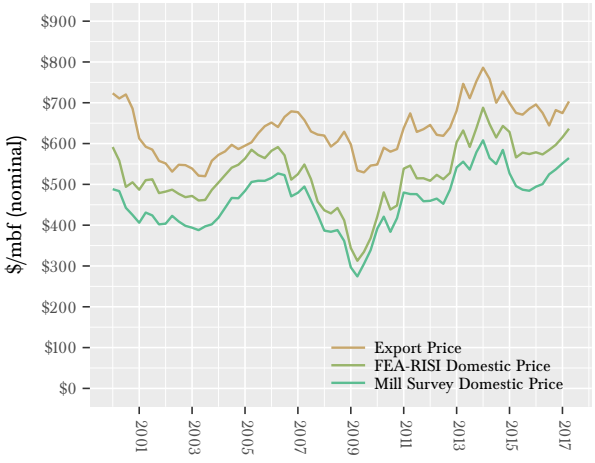
on the back of increased interest rates and house prices (Figure 18). Following that decline the index rose and fell largely because of seasonal house price changes. From August 2013 through May 2017, the index was been between 153 and 180. However, since March the index has dropped to 149 in August, largely because house prices and interest rates increased while income remained flat.

Export Markets

Although Federal law prohibits export of logs from public lands west of the 108th meridian, log exports 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 influence domestic prices in a one-to-one relationship.

Export prices are almost always higher than domestic prices, a difference which is referred to as the 'export premium' (Figure 19). 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.

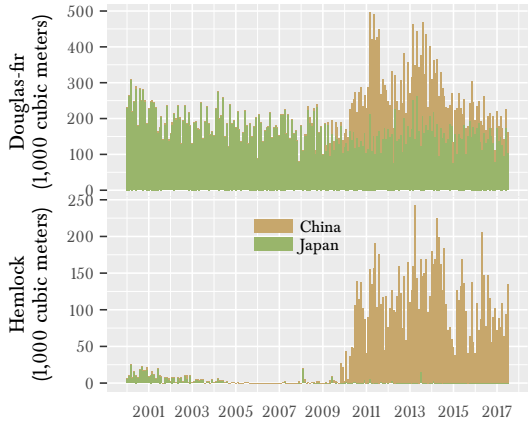
Figure 19: Log Export Prices



Note that the export prices shown in Figure 19 are weighted by DNR's typical species mix, not the species mix of actual export volumes.

Since 2010, demand from China has been a major support for log and lumber prices in Washington. That demand waned significantly 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 the Russian tariff on log exports was reduced. The downward trend in demand continued through 2015, with Douglas-fir log exports down 46 percent and hemlock (and other whitewood) exports down 33 percent from 2014 (Figure 20). Exports to China from the Seattle and Columbia-Snake River Customs Districts for both Douglas-fir and Hemlock are were 11 percent lower in 2016 than 2015, 1.9 million m^3, compared to 2.1 million m^3 in 2015 and 3.2 million m^3 in 2014.

Figure 20: Log Export Volume



The trend of decreased exports to China has continued in 2017, with 0.6 million m^3 of Hemlock and 0.3 million m^3 of Douglas-fir shipped through July, compared to 0.7 million m^3 of Hemlock and 0.4 million m^3 of Douglas-fir through the same time period in 2016.

The export premium is expected to shrink due to strong demand from recovering domestic markets and decreased demand from importing countries, China in particular. In the long run, the export premium may shrink yet more as West Coast log

exports face stronger international competition and export prices are pushed down. Much will depend on supply constraints from key international suppliers and transportation constraints from the southeastern U.S.

Timber Supply

Since the beginning of the recession timber growth throughout the U.S. has generally exceeded timber harvest, increasing the timber inventory. However, strong log exports from the West Coast drove up harvests relative to other parts of the country, so that inventory growth was slower than in other parts of the country, particularly the U.S. South. Timber growth is expected to continue to exceed harvest through 2017, further increasing inventories. The relatively ready availability of timber is unlikely to put significant downward pressure on prices because not all of the timber will enter the market at once and an expected increase in demand for timber, via an improving housing market, will offset the higher supply.

Since the late 1990s British Columbian forests have been devastated by the mountain timber beetle, which affected about a third of the province's timber resources. Typically, timber killed by beetles must be harvested within 4 to 10 years so in 2007 the government increased the allowable harvest to ensure that the dead timber was not wasted, which increased British Columbia's harvestable timber supply. These elevated timber supplies are already declining and it's expected that most of the beetle kill will be unviable by late 2017. The supply from Canada will be further diminished by Quebec's allowable annual cut being reduced by Bill 57, which was implemented in April 2013, and may be additionally reduced by the 'North for All' plan (formerly Plan Nord).

Price Outlook

Lumber Prices

As shown in Figure 11, lumber prices dropped precipitously from mid-2014 to mid-2015, before leveling off. FEA's coast lumber price peaked at $402/mbf in May 2014, but fell throughout the rest of the year to average $376/mbf. This was largely due to a bitterly cold winter across much of the U.S. which weakened domestic demand, ample local timber and lumber inventories, and the drop in export demand from China. Prices in 2015 continued their general downward trend and ended the year averaging $317/mbf. Prices increased in 2016 to average $341/mbf; they've averaged $406/mbf through September of 2017.

Prices early in 2017 were expected to spike with an anticipated imposition of countervailing and antidumping duties on Canadian lumber, which the US Department of Commerce initiated in April. These additional duties have been expected since the end of the Softwood Lumber Agreement (SLA) in October 2015, which governed the quantity of Canadian lumber imports allowed and duty levels allowed based on lumber prices. Due to constraints in the SLA, the U.S. was prevented from bringing any trade action against Canada until 12 October, 2016. A petition was filed with the Department of Commerce and the International Trade Commission in November 2016.

Lumber prices were expected to spiked prior to the new duties, as lumber buyers increased orders to avoid the new taxes, but also increased after the duties were in place because they constrained supply. For the rest of 2017, lumber prices were expected to be somewhat weaker as buyers draw down on inventory in anticipation of the slower building season and a 'gap' in the countervailing duties[1]. This price decrease has not happened. Instead, prices have risen through 2017 from $351/mbf in January to $440/mbf in September.

In the longer run, prices are expected to gener-

[1]Apparently countervailing duties can only be collected for four months, but the International Trade Commission may take several a couple of months to make a final determination, meaning that there will be some time gap when countervailing duties will not be collected.

ally increase with increased demand, but they may be more volatile due to the Canadian lumber duties.

Log Prices

Figure 21 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 21 is the same as the light green line on Figure 11.

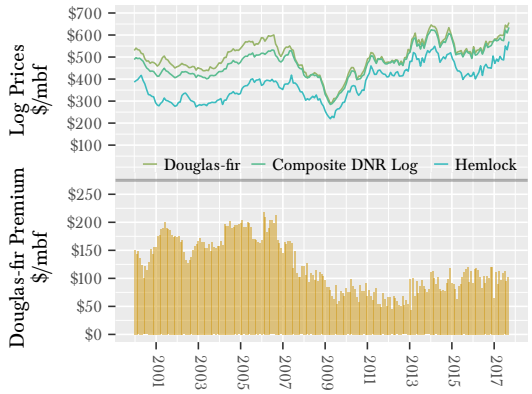
Readily visible on the graph is the decline in the premium for Douglas-fir—due in large part to Chinese demand fortifying hemlock prices. Also readily visible is the drop in prices from late 2014 to early 2016. The price of a 'typical' DNR log moved up sharply from a two-year plateau in 2013 to $591/mbf in 2014. However, prices declined through 2015 to average $521/mbf. The decline in log price is primarily due to the slowdown in demand from China and ample regional supply of both logs and lumber.

Log prices in 2016 increased to average $536/mbf, they've averaged $592 through September 2017, and we expect them to remain strong for the rest of the year.

Stumpage Prices

Timber stumpage prices are the prices that successful bidders pay for the right to harvest timber from DNR-managed lands (Figure 22). At any time, the difference between the delivered log price and DNR's stumpage price is equivalent to the sum of logging costs, hauling costs, and harvest profit (Figure 11). Subtracting the average of these costs from the log price line gives us a derived DNR stumpage price.

Figure 21: DNR Composite Log Prices



When actual DNR stumpage prices differ significantly from the derived stumpage prices, a correction is likely to occur. For instance, in 2012 actual stumpage prices were generally lower than stumpage prices inferred from log prices, suggesting that an upward market 'correction' would be forthcoming. This correction seems to have occurred with generally higher stumpage in 2013 and 2014. However, the situation reversed in late 2014, when actual DNR stumpage prices were well above the inferred stumpage prices.

DNR Stumpage Price Outlook

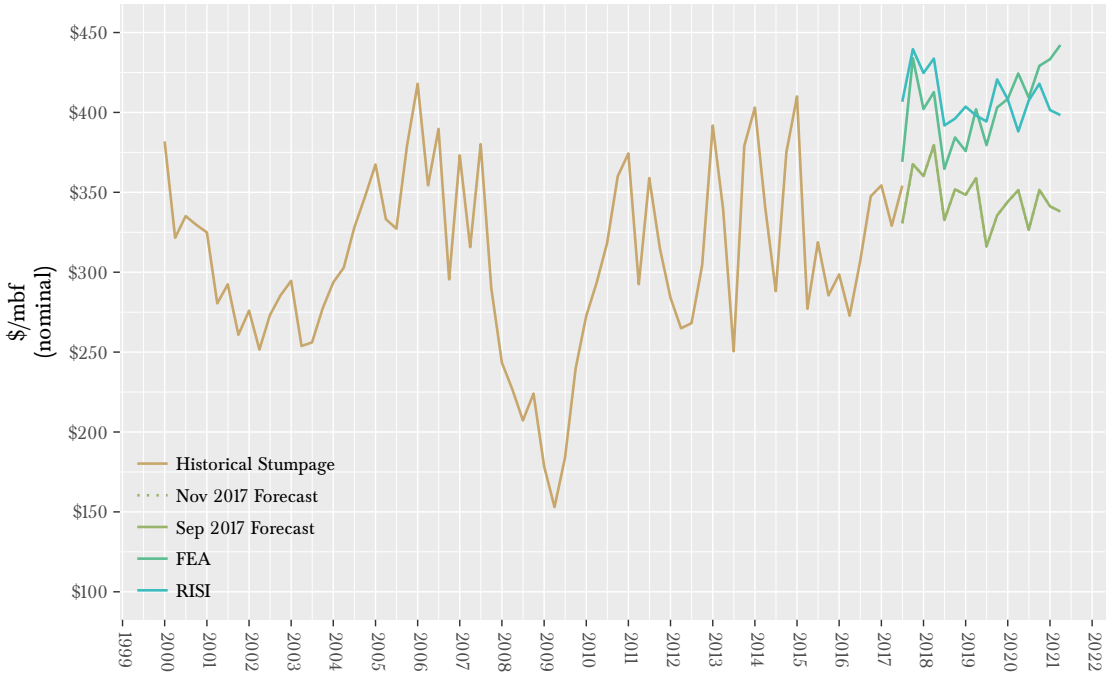
DNR currently contracts with two forest economics consulting firms that provide log and timber stumpage price forecasts, as well as valuable insights into the housing, lumber, and timber markets. By modeling DNR's historical data on their price forecasts, we arrive at two alternative stumpage price outlooks (Figure 22, note that the RISI and FEA 'forecast' series are both adapted to reflect the species and class characteristics of typical DNR timber; the original series were West Coast averages, and are not shown).

In previous forecasts, the DNR stumpage price forecast represented a weighted middle ground between the two consultants' outlooks; however, since the September 2015 Forecast we have taken a more pes-

simistic view with our spot price forecasts. This decision appears to have been well founded, as both consultants lowered their price forecasts through FY 16. Even taking into account the large number of salvage sales in that year, the forecast prices were still too high.

It is important to note that these are nominal price expectations. In real (inflation adjusted) terms, the forecast stumpage prices will still be much lower than the highs achieved during the housing boom.

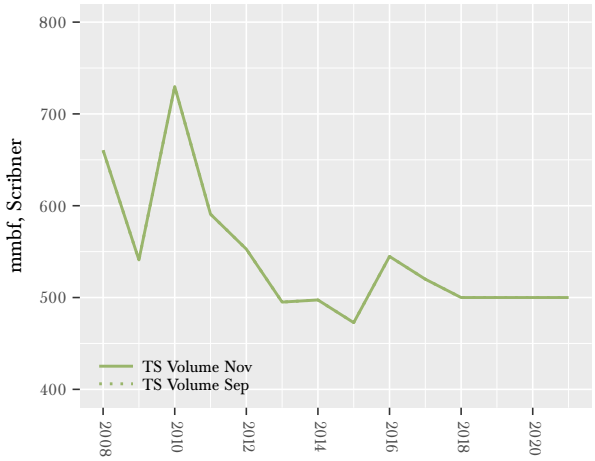
Figure 22: DNR Timber Stumpage Price



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.

Figure 23: Forecast Timber Sales Volume



Timber Revenue

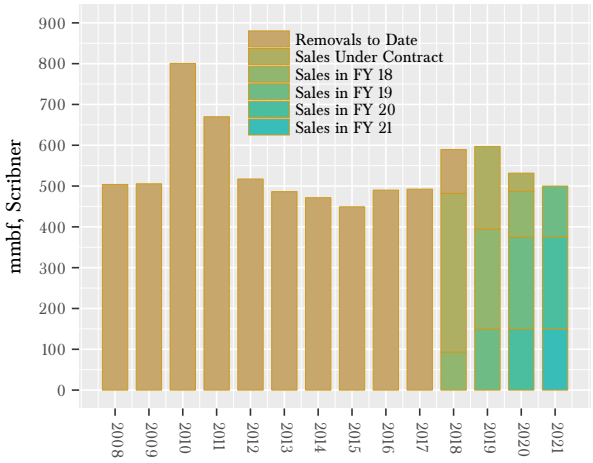
DNR sells timber through auctioned contracts that vary in duration. For instance, contracts for DNR timber sales sold in FY 2014 needed to be harvested between three months and four and a half years from the date of sale, with an average (weighted by volume) of about 25 months. The purchaser determines 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

Sales volume forecasts all years are unchanged (Figure 23).

Figure 24: Forecast Timber Removal Volume



FY 15 was the first year of the new sustainable harvest decade (FY 15 through FY 24) for western Washington; however, new harvest targets for the this sustainable harvest decade have not yet been determined or approved by the Board of Natural Resources. Without an updated sustainable harvest limit, annual Westside sales volumes are forecast to be 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 18-21.

Timber Removal Volume

For each Forecast, we survey timber sale purchasers to determine their planned harvest timing for the timber volume they have under contract at the time of the survey. This Forecast's survey, conducted in the first half of October, indicates that purchasers are planning to harvest 389 mmbf of current inventory (688 mmbf) volume in the remainder of this fiscal year. Combined with harvests to-date through August and harvests expected from remaining sales in the fiscal year, FY 18 removal volume is forecast

to total 589 mmbf—a decrease of 50 mmbf from the September prediction.

The volume not harvested in FY 18 is expected to be harvested in outlying years (see Figure 24).

Figure 25: Forecast Timber Sales Price

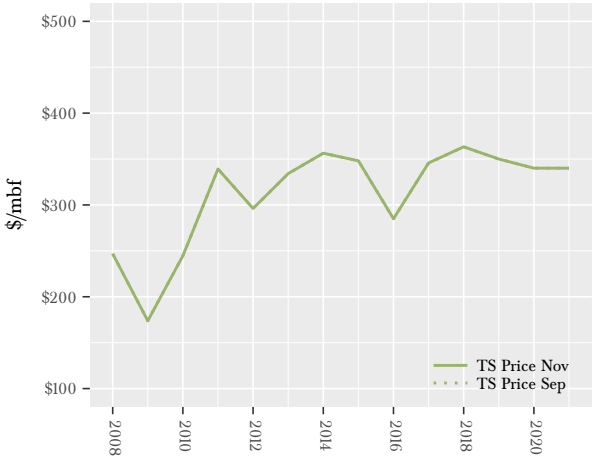
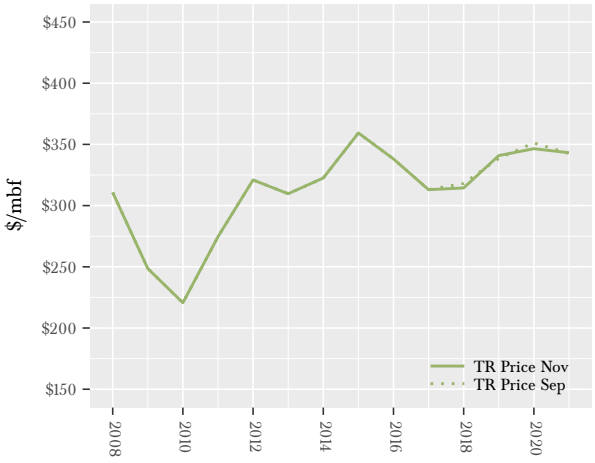


Figure 26: Forecast Timber Removal Price



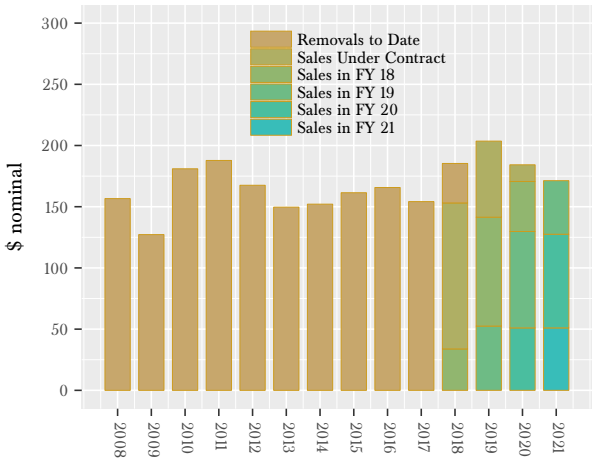
Timber Sales Prices

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 uses estimates from two forest economics consulting firms. Sales price forecasts in outlying years are unchanged.

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 26). Removal prices are decreased slightly in FY 18 due to a shift in the harvest timing of more valuable timber, which cascades into small removal price changes in outlying years.

Figure 27: Forecast Timber Removal Value

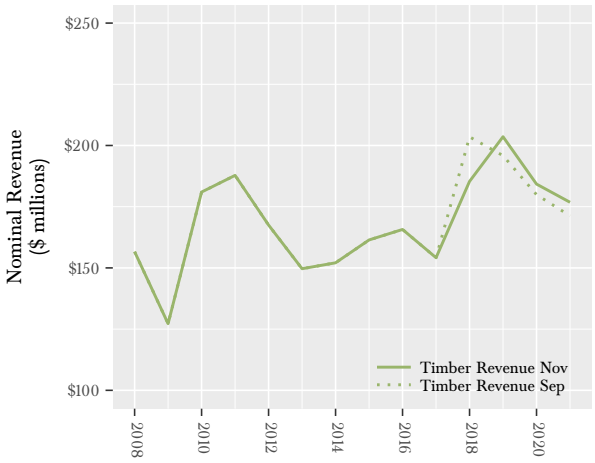


Timber Removal Revenue

Figure 27 shows projected annual timber removal revenues, broken down by the fiscal year in which the timber was sold ('sales under contract' are already sold as of May 1st, 2017). Revenue estimates reflect all of the changes described above.

Projections for the 2017-2019 Biennium are $388 million, lower by about $11 million than forecast in September (2.6 percent), and $361 million for the 2019-2021 Biennium, higher by about $10 million (2.8 percent).

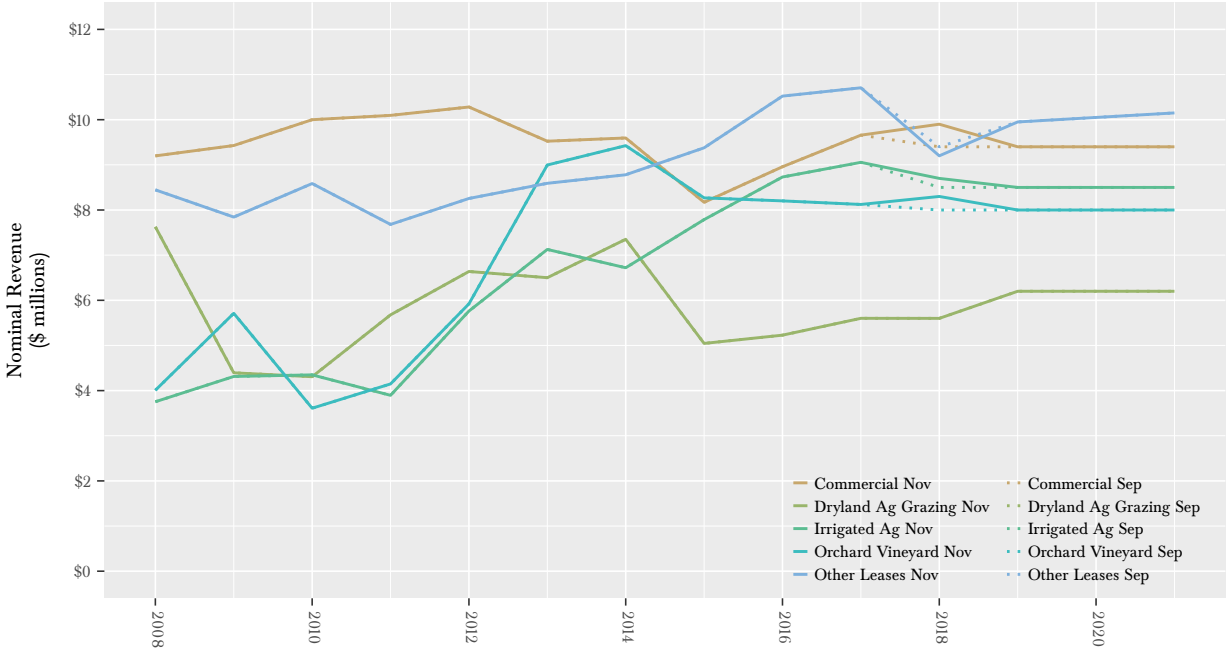
Figure 28: Forecast Timber Removal Revenue



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 29). Projected revenue from irrigated agriculture is increased by $0.2 million in FY 18 due to higher than expected revenue to-date, but unchanged in outlying years. Orchard and vineyard lease revenues are increased by $0.3 million in FY 18, again due to higher than expected revenue to-date. Commercial lease revenues are increased by $0.5 million after a careful analysis of all of the commercial leases revealed that previously forecast was likely too low. Other leases are dropped by $0.2 million, due to lower than expected revenue to-date.

Figure 29: Forecast Upland Lease Revenue



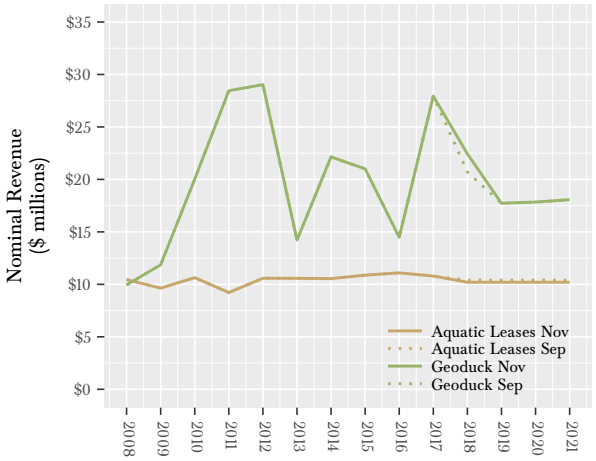
Aquatic Lands Revenues

Aquatic lands revenues are generated from leases on aquatic lands and from sales of geoduck. On average, leases account for one-third of the revenue while geoduck sales account for the remainder.

The aquatic lease revenue forecast is reduced for all forecast years due continued lower assessed land values undermining revenue growht. This trend shows no signs of abating (Figure 30).

The geoduck revenue forecast for FY 18 has been increased to $22 million due to an increase in expected pounds offered for auction (Figure 31).

Figure 30: Aquatic Lands Revenues

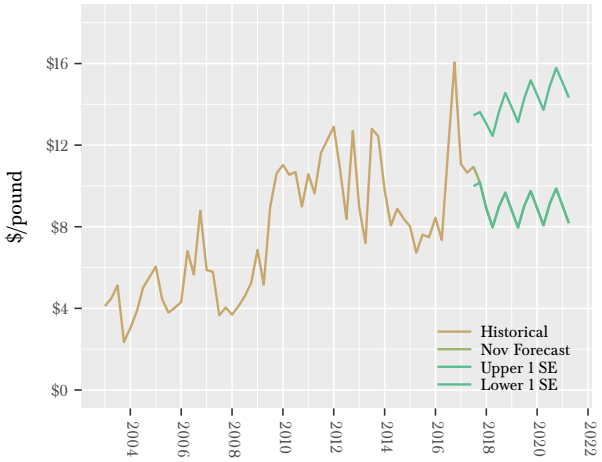


Starting in Q2 2014, our geoduck price forecasts were consistently high and prices seemed to have entered a period of fairly low volatility. This suggested that there may have been some change in the equilibrium price of geoduck—that the lower prices weren't just part of the natural volatility of the market, but a fundamental shift in the price level. The consistently higher auction prices since August 2016, threw that hypothesis into question and suggested that a new price level was somewhat higher than the average in 2014. However, given the historical volatility of the market, it seems imprudent to increase the outlying years' auction price forecasts too much, so the auction price forecast is unchanged at one standard error below the mean forecasted model.

There are significant downside and upside risks to geoduck revenues, even in the near term, that are important to consider but difficult to forecast. On the downside:

- Harvests (and therefore revenues) could be deferred or lost if geoduck beds are closed due to occurrence of paralytic shellfish poison.
- A further slowdown in China's economic growth or a trade war could lower demand for this luxury export in its largest market.
- In light of recent WDFW surveys of closed south Puget Sound geoduck tracts showing declining recovery rates, and of evidence of active poaching, future commercial harvest levels may be further reduced.

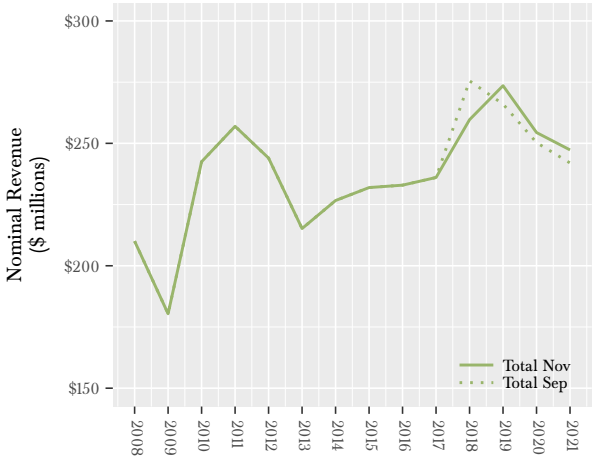
Figure 31: Geoduck Auction Prices



Total Revenues from All Sources

Forecast revenues for the 2017-2019 biennium are reduced by $8 million to $533 million, while revenues for the 2019-2021 biennium are raised by $10 million to $502 million (Figure 32).

Figure 32: Total Revenues



Some Caveats

DNR strives to produce the most accurate and objective projections possible, based on DNR's current policy directions and available information. Actual revenues will depend on future policy decisions made by the Legislature, the Board of Natural Resources, and DNR, as well as on market and other conditions beyond DNR's control.

See the Forecast Summary for more details.

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 FYs 17-18 by trust, and relative historical timber prices by DNR region by trust; and
- The volumes of timber by trust for FYs 19-21 based on provisional output of the sustainable harvest model and relative historical timber prices by DNR region by trust.

Since 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 authorized a deduction 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 2017-2019 and 2019-2021 biennia. This assumes that the Legislature will 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 2018	FY 2019	FY 2020	FY 2021
FDA	25	25	25	25
RMCA	31	31	31	31