

Department of Natural Resources  
**Economic & Revenue Forecast**

Fiscal Year 2016, Fourth Quarter  
June 2016





## Forecast Summary

**Lumber and Log Prices.** Lumber and log prices have fallen markedly since peaking in mid-2014. Random Lengths' Coast Dry Random and Stud composite lumber price peaked at \$393/mbf in January 2014 but fell throughout the rest of the year to average \$373/mbf. The composite lumber price continued to fall to a low of \$287/mbf in May 2015 to average \$311/mbf for 2015. Prices have averaged \$315/mbf thus far in 2016, with a spike in prices in April to \$342/mbf pulling the average up. The recent jump in prices appears to have been due to much higher first quarter housing starts compared to 2015, which spiked lumber demand and caught lumber dealers off-guard. Analysts expect prices to remain elevated in the second calendar quarter, but will likely pull back by the third.

Beginning in 2013, the price of a 'typical' DNR log moved up sharply from a two-year plateau to average \$591/mbf in 2014. However, prices dropped through 2015 to average \$521/mbf and have averaged \$518/mbf for the first quarter of 2016. This decline is mostly due to the dramatic slowdown in demand from China and an ample regional supply of both logs and lumber. Log prices are expected to remain flat through 2016.

**Timber Sales Volume.** As of the November 2015 forecast, DNR's timber sales plan suggested that 500 mmbf was a realistic base estimate for DNR's FY16 sales volume. However, there were a number of fires on trust lands during the record 2015 fire season and the February forecast included these fire salvage sales. Given the large volume of fire salvage sales coming in the last five months of this fiscal year, the February volume forecast was tempered by the understanding that many sales may not sell, resulting in a modest increase from 500 mmbf to 515 mmbf. Since February, more green wood sales were prepared than expected and fire-sales did not offset them as much as expected, so the forecast has been increased by 35 mmbf to 550 mmbf.

Given current timber sales plans—and absent a new sustainable harvest calculation—sales volumes are still pegged at 500 mmbf in FY17 and beyond.

**Timber Sales Prices.** In the February forecast, stumpage price expectations for FY 16 were lowered from \$340/mbf to \$310/mbf due primarily to the large volume of fire salvage sales, which are generally much less valuable than green wood. Auction prices since February have been even weaker than expected, largely because of the green timber mix, so the price forecast for FY 16 has been lowered by \$20/mbf to \$290/mbf.

Stumpage price forecasts for further years are unchanged at \$371, \$369 and \$367/mbf for FYs 17, 18, and 19, respectively.

**Timber Removal Volume and Prices.** Harvest expectations for FY16 have been increased from 492 mmbf to 500 mmbf, due to apparent changes in harvests plans. This runs counter to the trend of previous forecasts, where harvesters were continually pushing harvest plans out into future years. Removal volumes for FYs 17-19 are forecast to be 625 (-8), 565 (+42) and 514 (-1) mmbf. Timber removal prices are projected to be about \$330 (+\$8), \$309 (-\$22), \$345 (-\$15) and \$366 (-2) per mbf for FYs 16-19. These removal prices reflect changes in the removal timing and follow from, and lag behind, the changes projected in timber sales prices.

**Bottom Line for Timber Revenue.** The above changes to timber sales prices, sales volumes, and harvest timing have shifted projected revenue up in FYs 16 and 18, but down in FYs 17 and 19. Revenues for the 2015-2017 biennium are forecast to total \$358 million, down three percent (\$9 million) from February's forecast. Revenues for the 2017-2019 biennium will be up by one percent to \$383 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.

Projected uplands revenue for FY 16 is increased by around \$2 million to \$41 million, due to higher than expected earnings from irrigated agriculture and orchards and vineyards, and to continued strength in mineral sales. These increases outweigh a drop in expected dryland leasing revenues. Continued

higher irrigated agriculture revenue is expected in outlying years.

Aquatics revenue expectations for FY16 have been revised downward by \$2 million to \$25 million. This is due entirely to a change in the timing of when geoduck income is recognized as revenue. Consequently, all of the decrease in revenue in FY16 is moved to FY17. Aquatics revenues are expected to be \$28 (+\$2), \$29 (+\$0), and \$29 (+\$0) million in FYs 17-19.

**Total Revenues.** Forecast revenues for the 2015-2017 Biennium (FYs 16 and 17) are lowered by \$6 million to \$493 million. Most of the revenue change is driven by a change in expected timber harvests and timber sales volume. Revenues for the 2015-2017 Biennium (FYs 18 and 19) are increased by \$8 million to \$522 million.

**Notes to the Forecast.** While the sales volume estimates are based on the best available internal planning data, they are subject to downward adjustments due to ongoing operational and policy issues. These issues may also affect sales volumes in outlying years, where the assumed sustainable harvest volume of 500 mmbf could prove too high.

A continuing major downside risk for the forecast is timber and lumber demand from China. While it seems that a decrease in demand has largely been accounted for in the current market prices, the Chinese economy continues to have issues, with growth slowing more quickly than previously expected. There is continuing concern that the slowdown in China could result in a hard landing with a much more dramatic impact than currently expected.

In the November forecast, we noted that the expiration of the Softwood Lumber Agreement posed a major downside risk to the forecast because the expiration of tariffs might allow a flood of cheap logs and lumber to stream across the border with Canada. This has not occurred and probably will not because of constraints on Canadian log supply as they run out of excess wood from beetle-kill, the importance of China to the BC lumber market, and the significant presence of Canadian companies that own U.S.-based sawmills.

Robust growth in U.S. housing demand would provide much needed, if unlikely, high-side potential. This has not yet eventuated, despite strong employment growth for the last two years. The lack of housing demand is likely due to a number of impediments—persistently stringent lending standards, a continued tough labor market for younger workers, student loan debt, and general malaise—all of which are lessening, but none of which show signs of completely abating just yet.

In late 2015, China, once again, instituted a ban on geoduck imports from the Pacific Northwest due to paralytic shellfish poison (PSP) and arsenic concerns. However, once again, this doesn't appear to have had an impact on prices or harvest activity. In late February, 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. The previous geoduck ban was in late 2014.

Additionally, on-going friction between geoduck purchasers and divers could disrupt the market. As always in the geoduck fisheries, PSP closures create uncertainty around harvest volumes as well.

DNR Office of Budget and Economics

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Table 1: June 2016 Forecast by Source (millions of dollars)

<b>Timber Sales</b>	FY 14	FY 15	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21
Volume (mmbf)	497	473	550	500	500	500	500	500
Change			35	-	-	-		
% Change			7%	0%	0%	0%		
Price (\$/mbf)	\$ 356	\$348	\$ 290	\$ 371	\$ 369	\$ 367	\$ 340	\$ 340
Change			\$ (20)	\$ -	\$ -	\$ -		
% Change			-7%	0%	0%	0%		
<b>Value of Timber Sales</b>	<b>\$ 177.2</b>	<b>\$ 164.5</b>	<b>\$ 159.6</b>	<b>\$ 185.5</b>	<b>\$ 184.6</b>	<b>\$ 183.5</b>	<b>\$ 170.0</b>	<b>\$ 170.0</b>
Change			\$ (0.2)	\$ -	\$ -	\$ -		
% Change			0%	0%	0%	0%		
<b>Timber Removals</b>	FY 14	FY 15	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21
Volume (mmbf)	471	451	500	625	565	514	500	500
Change			9	(8)	42	(1)		
% Change			2%	-1%	8%	0%		
Price (\$/mbf)	\$ 323	\$ 358	\$ 330	\$ 309	\$ 345	\$ 366	\$ 359	\$ 347
Change			\$ 8	\$ (22)	\$ (15)	\$ (2)		
% Change			2%	-7%	-4%	-1%		
<b>Timber Revenue</b>	<b>\$ 152.1</b>	<b>\$ 161.4</b>	<b>\$ 165.2</b>	<b>\$ 193.1</b>	<b>\$ 194.8</b>	<b>\$ 188.1</b>	<b>\$ 179.7</b>	<b>\$ 173.4</b>
Change			\$ 6.8	\$ (16.0)	\$ 6.8	\$ (1.3)		
% Change			4%	-8%	4%	-1%		
<b>Upland Leases</b>	FY 14	FY 15	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21
Irrigated Agriculture	\$ 6.7	\$ 7.8	\$ 8.8	\$ 7.9	\$ 7.9	\$ 7.9	\$ 7.9	\$ 7.9
Change			\$ 1.3	\$ 1.0	\$ 1.0	\$ 1.0		
% Change			17%	14%	14%	14%		
Orchard/Vineyard	\$ 9.4	\$ 8.3	\$ 8.0	\$ 6.8	\$ 7.0	\$ 7.0	\$ 7.0	\$ 7.0
Change			\$ 1.3	\$ -	\$ -	\$ -		
% Change			19%	0%	0%	0%		
Dryland Ag/Grazing	\$ 7.4	\$ 5.0	\$ 5.2	\$ 6.5	\$ 6.6	\$ 6.6	\$ 6.6	\$ 6.6
Change			\$ (0.8)	\$ -	\$ -	\$ -		
% Change			-13%	0%	0%	0%		
Commercial	\$ 9.6	\$ 8.2	\$ 8.8	\$ 9.4	\$ 9.4	\$ 9.4	\$ 9.4	\$ 9.4
Change			\$ -	\$ -	\$ -	\$ -		
% Change			0%	0%	0%	0%		
Other Leases	\$ 8.8	\$ 9.4	\$ 10.1	\$ 9.3	\$ 9.6	\$ 9.8	\$ 9.8	\$ 9.8
Change			\$ 0.3	\$ -	\$ -	\$ -		
% Change			3%	0%	0%	0%		
<b>Total Upland Leases</b>	<b>\$ 41.9</b>	<b>\$ 38.6</b>	<b>\$ 41.0</b>	<b>\$ 39.9</b>	<b>\$ 40.5</b>	<b>\$ 40.8</b>	<b>\$ 40.8</b>	<b>\$ 40.8</b>
Change			\$ 2.2	\$ 1.0	\$ 1.0	\$ 1.0		
% Change			6%	3%	3%	3%		
<b>Aquatic Lands</b>	FY 14	FY 15	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21
Aquatic Leases	\$ 10.5	\$ 10.9	\$ 10.6	\$ 10.9	\$ 11.0	\$ 11.1	\$ 11.1	\$ 11.1
Change			\$ 0.2	\$ -	\$ -	\$ -		
% Change			2%	0%	0%	0%		
Geoduck	\$ 22.1	\$ 21.0	\$ 14.8	\$ 17.5	\$ 17.6	\$ 18.0	\$ 16.8	\$ 16.5
Change			\$ (2.0)	\$ 1.9	\$ 0.1	\$ 0.1		
% Change			-12%	12%	1%	1%		
<b>Aquatic Lands Revenue</b>	<b>\$ 32.7</b>	<b>\$ 31.9</b>	<b>\$ 25.4</b>	<b>\$ 28.3</b>	<b>\$ 28.6</b>	<b>\$ 29.1</b>	<b>\$ 27.9</b>	<b>\$ 27.6</b>
Change			\$ (1.8)	\$ 1.9	\$ 0.1	\$ 0.1		
% Change			-7%	7%	0%	0%		
<b>Total All Sources</b>	FY 14	FY 15	FY 16	FY 17	FY 18	FY 19	FY 20	FY 20
<b>Total</b>	<b>\$ 226.6</b>	<b>\$ 231.9</b>	<b>\$ 231.5</b>	<b>\$ 261.3</b>	<b>\$ 264.0</b>	<b>\$ 258.0</b>	<b>\$ 248.4</b>	<b>\$ 241.8</b>
Change			\$ 7.1	\$ (13.1)	\$ 7.8	\$ (0.2)		
% Change			3%	-5%	3%	0%		

Table 2: June 2016 Forecast by Fund (millions of dollars)

<b>Management Funds</b>		FY 14	FY 15	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21
041 - RMCA - Uplands		\$ 33.2	\$ 30.4	\$ 36.1	\$ 41.0	\$ 38.8	\$ 39.1	\$ 37.9	\$ 36.9
	Change			\$ 0.7	\$ (1.8)	\$ 1.2	\$ 0.1		
	% Change			2%	-4%	3%	0%		
041 - RMCA - Aquatic Lands		\$ 14.8	\$ 14.4	\$ 11.1	\$ 12.5	\$ 12.6	\$ 12.9	\$ 12.3	\$ 12.2
	Change			\$ (0.9)	\$ 0.9	\$ 0.0	\$ 0.0		
	% Change			-8%	8%	0%	0%		
014 - FDA		\$ 19.6	\$ 23.2	\$ 21.8	\$ 24.8	\$ 25.5	\$ 24.5	\$ 23.5	\$ 22.7
	Change			\$ 1.3	\$ (2.0)	\$ 1.0	\$ (0.1)		
	% Change			6%	-8%	4%	-1%		
<b>Total Management Funds</b>		<b>\$ 67.6</b>	<b>\$ 68.0</b>	<b>\$ 69.0</b>	<b>\$ 78.4</b>	<b>\$ 77.0</b>	<b>\$ 76.5</b>	<b>\$ 73.6</b>	<b>\$ 71.8</b>
	Change			\$ 1.1	\$ (2.9)	\$ 2.2	\$ (0.0)		
	% Change			2%	-4%	3%	0%		
<b>Current Funds</b>		FY 14	FY 15	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21
113 - Common School Construction		\$ 56.6	\$ 50.4	\$ 59.4	\$ 63.8	\$ 69.1	\$ 69.5	\$ 67.6	\$ 66.0
	Change			\$ 2.2	\$ (2.3)	\$ 1.6	\$ 0.3		
	% Change			4%	-4%	2%	0%		
999 - Forest Board Counties		\$ 52.0	\$ 64.8	\$ 54.7	\$ 63.6	\$ 63.4	\$ 60.3	\$ 57.6	\$ 55.6
	Change			\$ 2.6	\$ (4.4)	\$ 2.7	\$ (0.4)		
	% Change			5%	-6%	4%	-1%		
001 - General Fund		\$ 2,173.5	\$ 1.8	\$ 3.6	\$ 3.2	\$ 3.9	\$ 3.9	\$ 3.7	\$ 3.6
	Change			\$ 0.7	\$ (0.6)	\$ 0.1	\$ (0.0)		
	% Change			23%	-15%	3%	-1%		
348 - University Bond Retirement		\$ 1.8	\$ 2.8	\$ 1.7	\$ 2.6	\$ 3.0	\$ 2.1	\$ 2.0	\$ 1.9
	Change			\$ (0.5)	\$ (0.2)	\$ (0.0)	\$ (0.0)		
	% Change			-22%	-9%	-1%	-1%		
347 - WSU Bond Retirement		\$ 1.7	\$ 1.8	\$ 1.8	\$ 1.7	\$ 1.8	\$ 1.8	\$ 1.8	\$ 1.8
	Change			\$ 0.1	\$ 0.0	\$ 0.0	\$ 0.0		
	% Change			7%	3%	3%	3%		
042 - CEP&RI		\$ 5.5	\$ 5.2	\$ 3.2	\$ 4.1	\$ 4.6	\$ 4.6	\$ 4.5	\$ 4.3
	Change			\$ (0.6)	\$ (0.4)	\$ 0.1	\$ (0.0)		
	% Change			-16%	-8%	2%	0%		
036 - Capitol Building Construction		\$ 6.7	\$ 4.9	\$ 6.4	\$ 9.8	\$ 9.9	\$ 9.0	\$ 8.5	\$ 8.2
	Change			\$ (0.0)	\$ (0.1)	\$ 0.6	\$ (0.1)		
	% Change			0%	-1%	7%	-1%		
061/3/5/6 - Normal (CWU, EWU, WWU, TESC) School		\$ 0.2	\$ 0.1	\$ 0.2	\$ 0.2	\$ 0.2	\$ 0.2	\$ 0.2	\$ 0.2
	Change			\$ 0.0	\$ 0.0	\$ 0.0	\$ 0.0		
	% Change			7%	4%	4%	4%		
Other Funds -		\$ 1.5	\$ 0.5	\$ 0.0	\$ 0.8	\$ 0.2	\$ 0.2	\$ 0.2	\$ 0.1
	Change			\$ (0.0)	\$ 0.1	\$ (0.0)	\$ (0.0)		
	% Change			-22%	9%	-13%	-3%		
<b>Total Current Funds</b>		<b>\$ 128.1</b>	<b>\$ 132.4</b>	<b>\$ 131.0</b>	<b>\$ 149.8</b>	<b>\$ 156.1</b>	<b>\$ 151.5</b>	<b>\$ 146.0</b>	<b>\$ 141.9</b>
	Change			\$ 4.4	\$ (7.9)	\$ 5.1	\$ (0.1)		
	% Change			3%	-5%	3%	0%		

(Continued)

Table 3: June 2016 Forecast by Fund (millions of dollars), cont'd

	FY 14	FY 15	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21
<b>02R - Aquatic Lands Enhancement Account</b>	<b>\$ 17.9</b>	<b>\$ 17.4</b>	<b>\$ 14.3</b>	<b>\$ 15.8</b>	<b>\$ 15.9</b>	<b>\$ 16.2</b>	<b>\$ 15.6</b>	<b>\$ 15.5</b>
Change			\$ (0.9)	\$ 0.9	\$ 0.0	\$ 0.0		
% Change			-6%	6%	0%	0%		
<hr/>								
<b>Permanent Funds</b>	FY 14	FY 15	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21
601 - Agricultural College Permanent	\$ 3.5	\$ 4.1	\$ 8.1	\$ 7.3	\$ 4.9	\$ 4.3	\$ 4.1	\$ 3.9
Change			\$ 1.8	\$ (2.3)	\$ (0.1)	\$ (0.1)		
% Change			29%	-24%	-2%	-1%		
604 - Normal School Permanent	\$ 1.8	\$ 1.7	\$ 2.8	\$ 3.8	\$ 3.4	\$ 3.1	\$ 2.9	\$ 2.8
Change			\$ 0.3	\$ (0.3)	\$ 0.1	\$ (0.0)		
% Change			12%	-7%	3%	-1%		
605 - Common School Permanent	\$ 0.4	\$ 0.7	\$ 0.3	\$ 0.3	\$ 0.3	\$ 0.3	\$ 0.3	\$ 0.3
Change			\$ -	\$ -	\$ -	\$ -		
% Change			0%	0%	0%	0%		
606 - Scientific Permanent	\$ 6.1	\$ 7.1	\$ 5.4	\$ 5.7	\$ 5.9	\$ 5.5	\$ 5.3	\$ 5.1
Change			\$ 0.2	\$ (0.4)	\$ 0.5	\$ (0.0)		
% Change			3%	-7%	8%	0%		
607 - University Permanent	\$ 1.1	\$ 0.4	\$ 0.6	\$ 0.2	\$ 0.5	\$ 0.6	\$ 0.6	\$ 0.6
Change			\$ 0.2	\$ (0.2)	\$ (0.0)	\$ (0.0)		
% Change			44%	-62%	-6%	0%		
Total Permanent Funds	<b>\$ 13.0</b>	<b>\$ 14.0</b>	<b>\$ 17.2</b>	<b>\$ 17.3</b>	<b>\$ 15.0</b>	<b>\$ 13.8</b>	<b>\$ 13.2</b>	<b>\$ 12.7</b>
Change			\$ 2.4	\$ (3.3)	\$ 0.4	\$ (0.1)		
% Change			17%	-16%	3%	-1%		
<hr/>								
<b>Total All Funds</b>	FY 14	FY 15	FY 16	FY 17	FY 18	FY 19	FY 20	FY 21
<b>Total</b>	<b>\$ 226.6</b>	<b>\$ 231.9</b>	<b>\$ 231.5</b>	<b>\$ 261.3</b>	<b>\$ 264.0</b>	<b>\$ 258.0</b>	<b>\$ 248.4</b>	<b>\$ 241.8</b>
Change			\$ 7.1	\$ (13.1)	\$ 7.8	\$ (0.2)		
% Change			3%	-5%	3%	0%		

Figure 1: Timber Forecast Charts

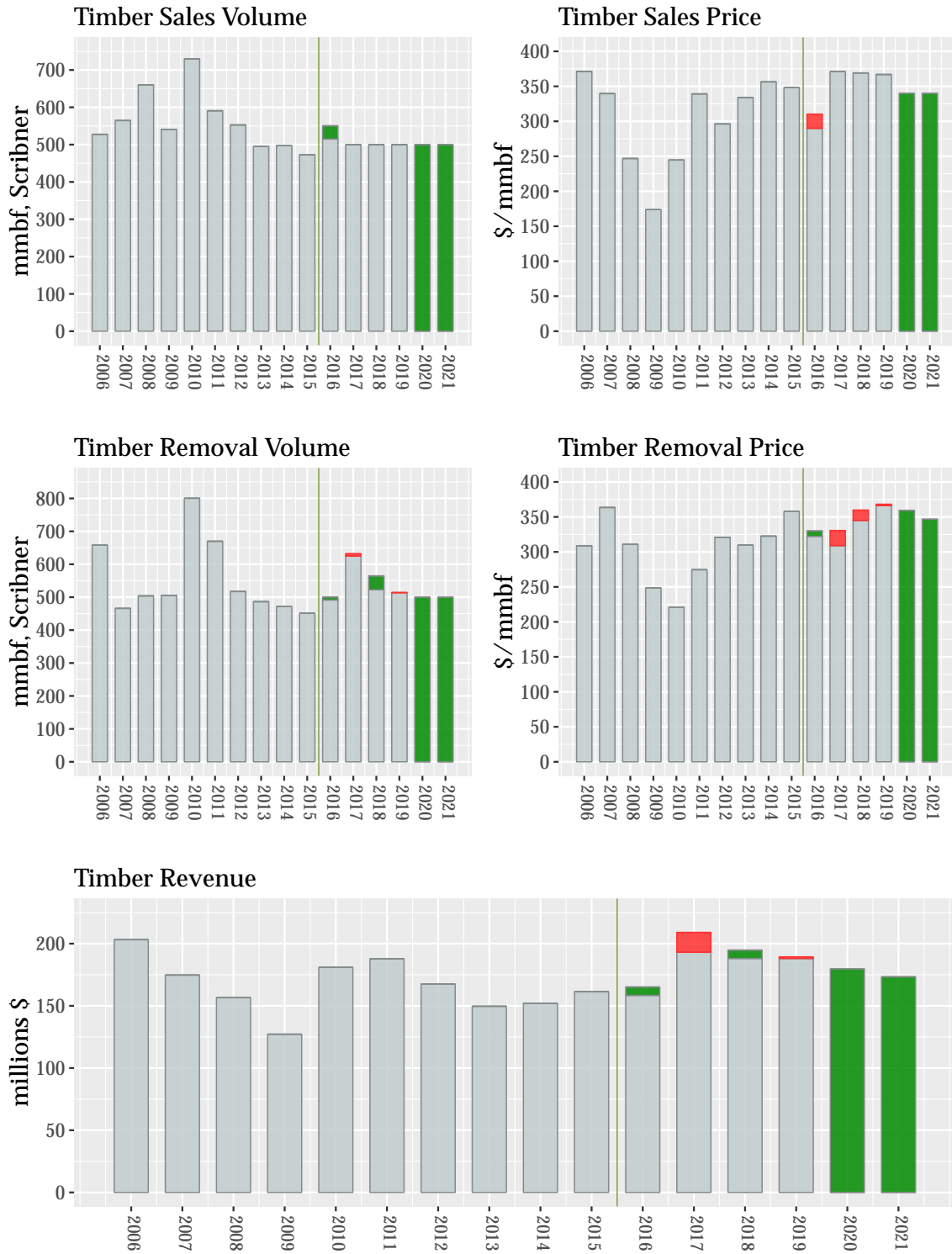




Figure 2: Other Uplands Forecast Charts

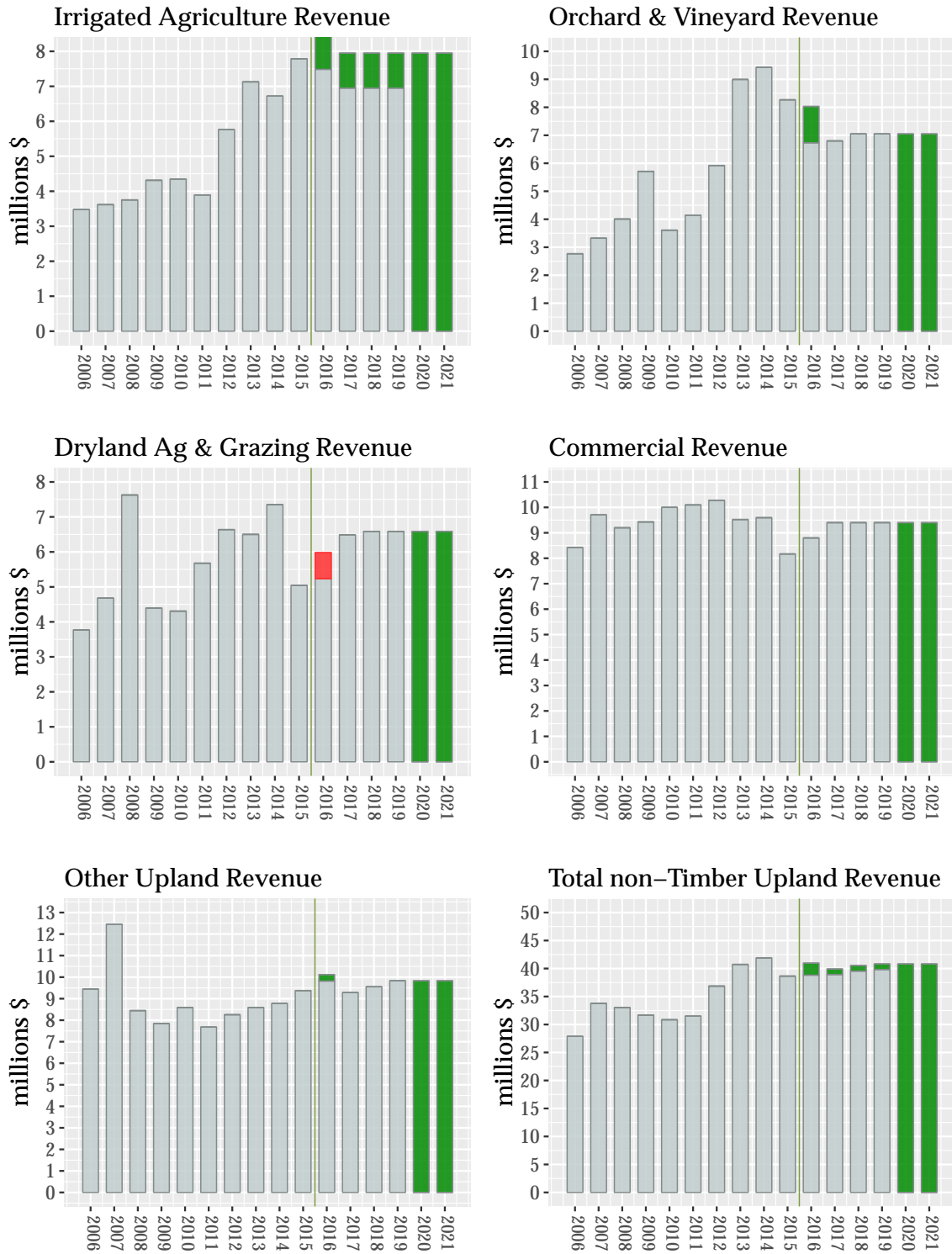
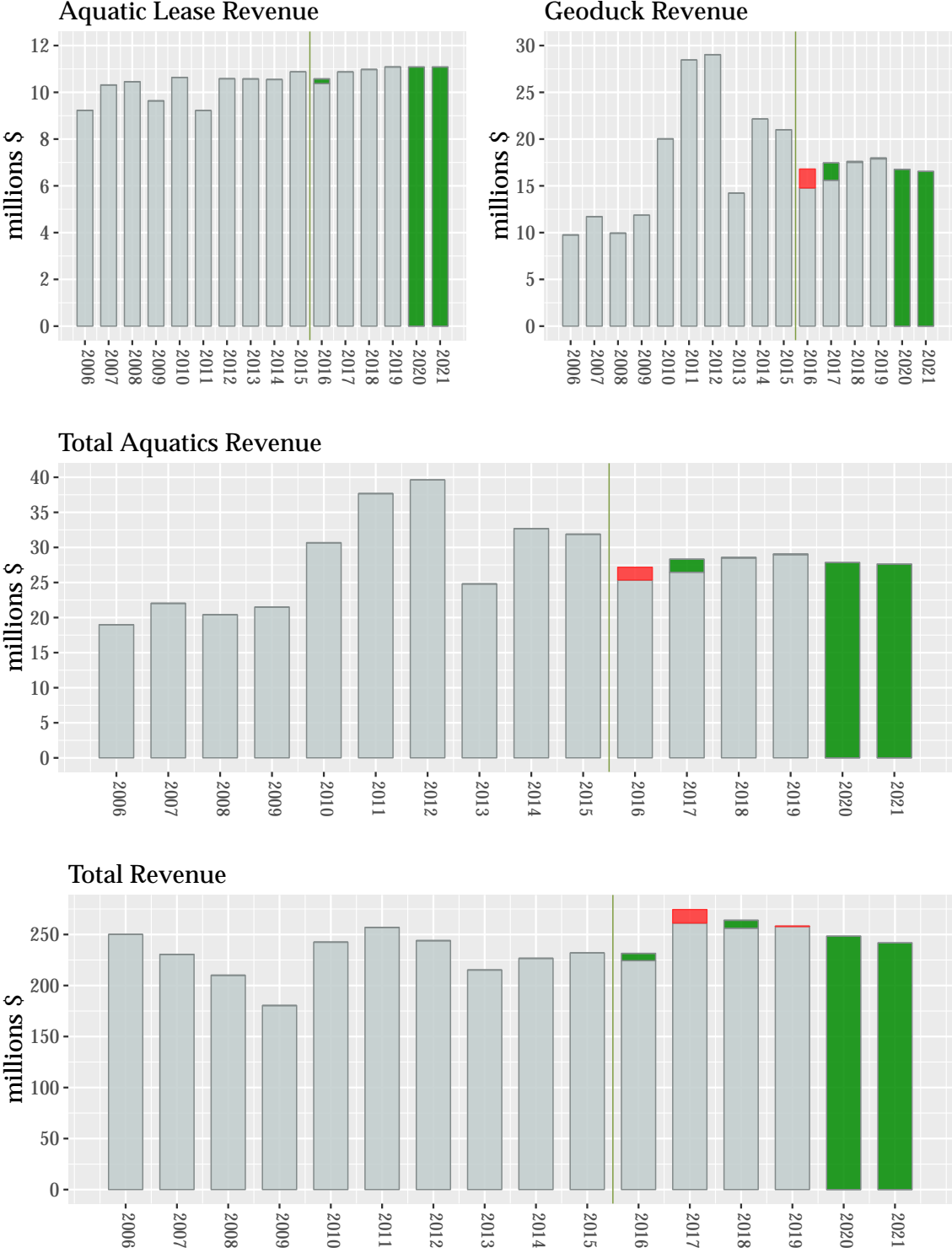


Figure 3: Aquatics and Total Forecast Charts



# Contents

<b>Forecast Summary</b>	<b>I</b>
<b>Macroeconomic Conditions</b>	<b>1</b>
U.S. Economy . . . . .	1
Gross Domestic Product . . . . .	1
Employment and Wages . . . . .	1
Inflation . . . . .	3
Interest Rates . . . . .	4
The U.S. Dollar and Foreign Trade . . . . .	5
Petroleum . . . . .	5
World Economy . . . . .	5
Europe . . . . .	5
China . . . . .	6
Japan . . . . .	6
<b>Wood Markets</b>	<b>8</b>
U.S. Housing Market . . . . .	9
Existing Home Sales . . . . .	9
New Home Sales . . . . .	10
Household Formation . . . . .	10
Housing Starts . . . . .	11
Housing Prices . . . . .	11
Housing Affordability . . . . .	12
Export Markets . . . . .	13
Timber Supply . . . . .	14
Price Outlook . . . . .	14
Lumber Prices . . . . .	14
Log Prices . . . . .	14
Stumpage Prices . . . . .	15
DNR Stumpage Price Outlook . . . . .	15
<b>DNR Revenue Forecast</b>	<b>17</b>
Timber Revenue . . . . .	17
Timber Sales Volume . . . . .	17
Timber Removal Volume . . . . .	18
Timber Sales Prices . . . . .	18
Timber Removal Prices . . . . .	18
Timber Removal Revenue . . . . .	18
Upland Lease Revenues . . . . .	20
Aquatic Lands Revenues . . . . .	21
Total Revenues from All Sources . . . . .	22
Some Caveats . . . . .	22
Distribution of Revenues . . . . .	23

## List of Tables

1	June 2016 Forecast by Source (millions of dollars) . . . . .	III
2	June 2016 Forecast by Fund (millions of dollars) . . . . .	IV
3	June 2016 Forecast by Fund (millions of dollars), cont'd . . . . .	V

## List of Figures

1	Timber Forecast Charts . . . . .	VI
2	Other Uplands Forecast Charts . . . . .	VII
3	Aquatics and Total Forecast Charts . . . . .	VIII
4	U.S. Gross Domestic Product . . . . .	1
5	Unemployment Rate and Monthly Change in Jobs . . . . .	2
6	Employment and Unemployment . . . . .	2
7	Labor Market Indicators . . . . .	3
8	U.S. Inflation Indices . . . . .	4
9	Trade-Weighted U.S. Dollar Index . . . . .	4
10	Crude Oil Prices . . . . .	5
11	Lumber, Log and Stumpage Prices in Washington . . . . .	8
12	Lumber, Log, and DNR Stumpage Price Seasonality . . . . .	8
13	Home Sales and Starts as a Percentage of Pre-Recession Peak . . . . .	9
14	Existing Home Sales . . . . .	9
15	New Single-Family Home Sales . . . . .	10
16	Housing Starts . . . . .	11
17	Case-Shiller Existing Home Price Index . . . . .	11
18	Housing Affordability . . . . .	12
19	Log Export Prices . . . . .	13
20	Log Export Volume . . . . .	14
21	DNR Composite Log Prices . . . . .	15
22	DNR Timber Stumpage Price . . . . .	16
23	Forecast Timber Sales Volume . . . . .	17
24	Forecast Timber Removal Volume . . . . .	17
25	Forecast Timber Sales Price . . . . .	18
26	Forecast Timber Removal Price . . . . .	18
27	Forecast Timber Removal Value . . . . .	19
28	Forecast Timber Removal Revenue . . . . .	19
29	Forecast Upland Lease Revenue . . . . .	20
30	Aquatic Lands Revenues . . . . .	21
31	Geoduck Auction Prices . . . . .	21
32	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 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 2016 through 2021. Fiscal years for Washington State government begin July 1 and end June 30. For example, the current fiscal year, Fiscal Year 2016, runs from July 1, 2015 through June 30, 2016.

The baseline date (the point that designates the transition from "actuals" to predictions) for DNR revenues in this Forecast is May 1st, 2016. The forecast numbers beyond that date are predicted from the most up-to-date DNR sales and revenue data available, including DNR's timber sales results through May 2016. 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	Draft Revenue Data Release Date	Final Data and Publication Date (approximate)
September 2016	August 1, 2016	September 10, 2016	September 30, 2016
November 2016	October 1, 2016	November 10, 2016	November 30, 2016
February 2017	January 1, 2017	February 18, 2017	February 31, 2017
June 2017	May 1, 2017	June 17, 2017	June 30, 2017

## 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, Andrew Hayes, Rick Roeder, Randy Niessner, Tom Heller, Patrick Ferguson, Kristin Swendall, Blain Reeves, and Linda Farr provided data and counsel, including information on 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.

DNR Office of 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 sales and lease revenues from managed lands.

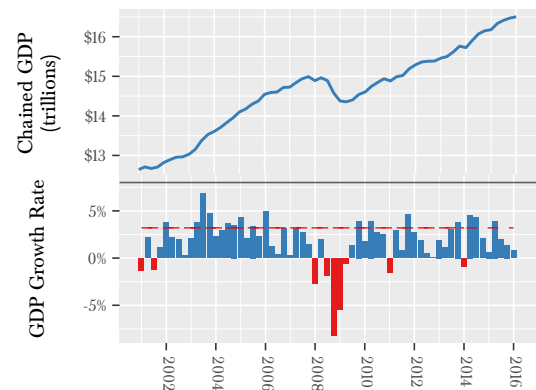
### U.S. Economy

#### Gross Domestic Product

Since the end of the Great Recession during 2008 and 2009, when GDP declined in five out of six quarters, GDP growth has averaged a weak 2.2 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, particularly employment and wages.

The year 2014 was widely predicted to be the year that broke the pattern of stagnation, but annual growth was held down to 2.4 percent because a harsh winter and business inventory adjustments caused GDP to contract. The year 2015 was also widely predicted to be the year that broke the pattern, with a continuation of the strong employment growth from 2014 finally causing an increase in consumption and investment. However, the first quarter of 2015 was also quite poor, with a harsh winter again stifling consumption and investment and the strong dollar constraining exports. Growth recovered in the second quarter 2015 to 3.9 percent, but fell to 2.0 percent in the third quarter and further to 0.8 percent in the fourth quarter. In the end, GDP growth over 2015 was the same as 2014, 2.4 percent.

Figure 4: U.S. Gross Domestic Product



Predictions for real GDP growth in 2015 from various sources were repeatedly reduced as the year progressed, as actual growth disappointed, and as headwinds to growth mounted (particularly the Chinese slowdown and the strength of the dollar). This pattern of reduced expectations has continued in 2016, with analysts dropping forecasts from around 3.0 percent to around 2.5 percent at the beginning of the year after disappointing fourth quarter 2015 growth, then further to below 2.0 percent as first quarter growth disappointed. The FOMC forecasts were also decreased again in March, with the median GDP growth rate prediction decreased from 2.4 to 2.2 percent and the range decreasing from 2.0-2.7 to 1.9-2.5.

#### Employment and Wages

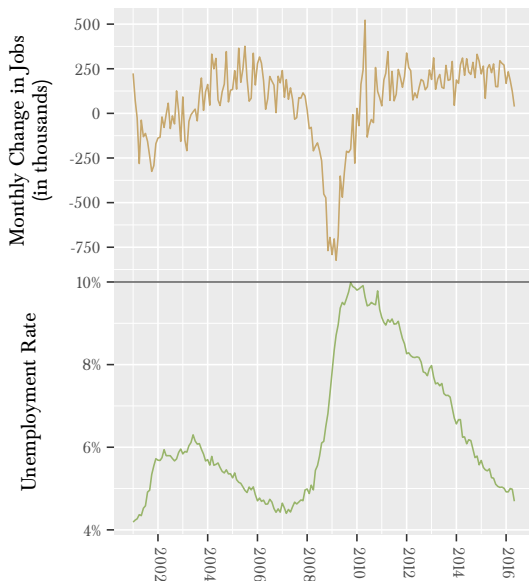
The U.S. headline unemployment rate declined through 2015 from 5.7 percent in January 2015 to 4.9 percent in January 2016 (Figure 5). From January to April 2016, the unemployment rate hovered between 4.9 and 5.0 percent, but in May it dipped further to 4.7 percent. This is well down from a high of 10.0 percent in October 2009 and is below the average unemployment rate of 5.2 percent from 2001-2006. In general, analysts expect the unemployment rate to remain in this range for the next couple of years. The FOMC projections are a median of 4.7 percent unemployment for 2016, with



estimates ranging from 4.3 to 4.9 percent.

Job growth has slowed markedly in 2016, with an average of 150,000 jobs created per month, compared to 219,000 per month for the same time period in 2015. This is generally in line with analyst expectations of somewhat slower job growth in 2016. May only netted 38,000 jobs, which was well below expectations. However, a steep decline in the total workforce, which shrank by 458,000 people, pushed down the unemployment rate despite poor job growth. It's unclear just yet why so many people have left the workforce.

Figure 5: Unemployment Rate and Monthly Change in Jobs

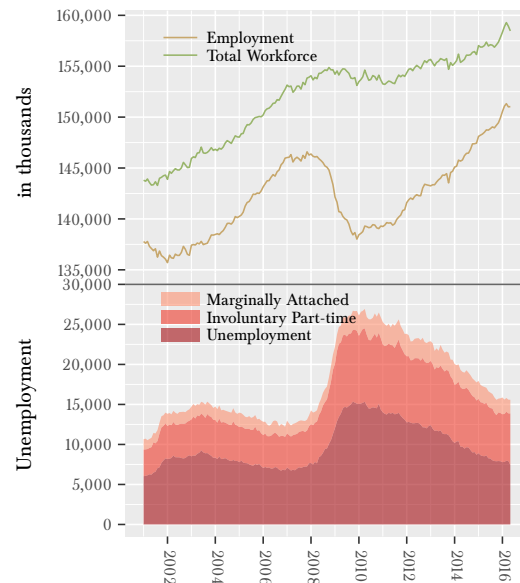


The unemployment rate is a useful indicator to track because it gives insight into slack in the labor market, that is, how many people are available to work before job growth starts driving problematic inflation. The labor market is the driving force behind consumption, which constitutes about 70 percent of GDP and naturally extends to the demand for housing, which is the major driver of timber demand in the U.S. 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.

Although the unemployment rate continues to decline, it has not yet translated into strong wage growth, which is a prerequisite for broader improvement in the economy 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, since the recession the labor force participation rate has declined significantly, possibly because workers left the labor force after they were unable to find jobs.

Figure 6: Employment and Unemployment

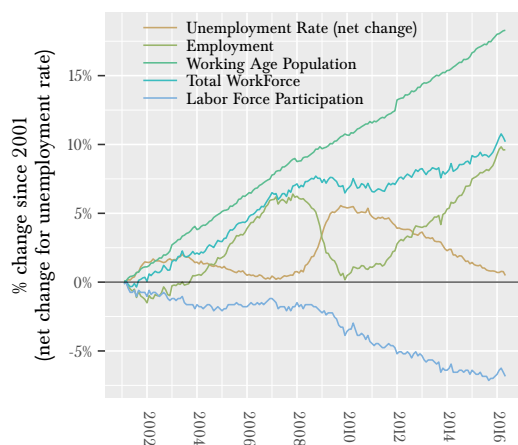


An alternative measure of unemployment is the U-6 unemployment rate, which includes involuntarily part-time employment and marginally attached workers, who are not included in the headline unemployment rate but who, nevertheless, are likely to be looking for work and would benefit from better job prospects. The U-6 has declined from a high of 17.1 percent in 2010 to 11.3 percent in Jan-

uary 2015 to 9.7 percent as of May 2016. It remains higher 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.

Reductions in the labor force participation rate have helped move the unemployment rate and the U-6 lower (Figure 7). 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 waiting to look 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 and as it decreases wages will be pushed up as companies compete for labor.

Figure 7: Labor Market Indicators



The drop in the participation rate since 2008 suggests that something about the recession itself caused people to leave the labor market, and implies that they may return when things are looking 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.

BLS data show that in May, out of the 95 million people not in the labor force, around four million people want a job and are not included in the headline rate or U-6. Seven million people are counted in the headline statistic and the U-6 includes another two million 'marginally attached' workers; so four million additional potential workers (who haven't applied for work in the last year, but want a job) might add meaningful slack to labor supply.

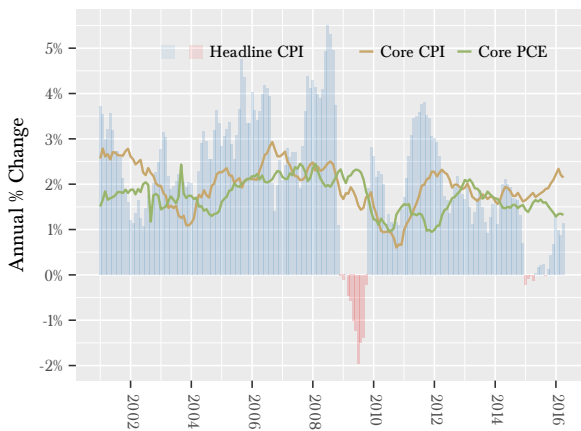
## Inflation

The inflation outlook for 2015 deteriorated significantly through 2015 from a predicted range of 1.0-2.2 percent in the FOMC's December 2014 Summary of Economic Projections, to a final average of 0.7 percent for the year. Since December 2015, the FOMC's projected inflation for 2016 has also dropped, falling from 1.2-2.1 to 1.0-1.6. However, these declines are largely due to the fall in oil and food prices (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. The FOMC reduced its predicted range of the core PCE for 2016 to 1.4-2.1 percent in the December Economic Projections, but their projections have remained stable since then.

The consensus among forecasters, including the FOMC, is that core inflation will remain at or below two percent through 2018.

Figure 8: U.S. Inflation Indices



## Interest Rates

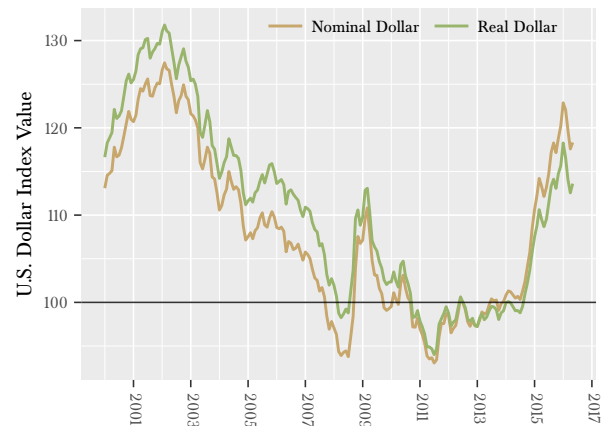
Seldom in U.S. history has it been so inexpensive to borrow money. From December 2008 to December 2015, the Federal Reserve held the federal funds rate in the 0.0-0.25 percent range. During that time the Fed pledged to keep the rates near zero until it judged that there had been sufficient progress toward 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. This was widely expected because the FOMC had been carefully preparing markets for it with each successive meeting statement. However, it was not an uncontroversial decision.

Pressure had been building to increase interest rates since mid-2014. Arguments for raising interest rates revolve around the steady increase in employment, the need to avoid sharp increases in inflation, and the need for the Fed to maintain the confidence of markets. Arguments resisting the increase in rates are manifold. They generally note that sharp increases in inflation are not a danger from any reasonable economic model, that inflation somewhat

above the target rate is not a disaster and easily addressed when it happens, that the inflation target itself is too low, and that raising rates too quickly could further undermine the weak recovery we have experienced.

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



The question of whether to raise interest rates is important because it is the key tool of monetary policy. An increase in interest rates will 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.

From the December rate rise, the FOMC was indicating 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, in March this was revised to 0.9 percent for 2016, suggesting only two rate increases. However, given continued weakness in core inflation and the seeming stabilization of the unemployment rate around 4.9-5.0 percent, it's unclear whether the FOMC will stay with the current plan or hold off until employment growth starts showing a definite effect on inflation.

The effect of the recent increase may not be felt for some time, but it is small enough that it will likely be overshadowed by larger forces in the economy, such as oil prices or China's slowing growth.

### The U.S. Dollar and Foreign Trade

The trade-weighted U.S. dollar index has climbed dramatically and although it has decreased since January, it is still around 15 percent higher than it was in mid-2014. (Figure 9).

The climb in the dollar has threatened the recent improvement in the U.S. economy by making imported goods relatively cheaper than those locally produced, while also making U.S. exports less competitive abroad. This has had a measurable effect on GDP growth, as net exports (exports less imports) subtracted 0.7 percent points from GDP growth in 2015 and 0.21 points from GDP growth in the first quarter of 2016. It is likely that the drag on GDP growth from net exports would have had a larger impact if not for the expansion of U.S. oil production, which has supplanted a significant amount of oil imports.

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.

### Petroleum

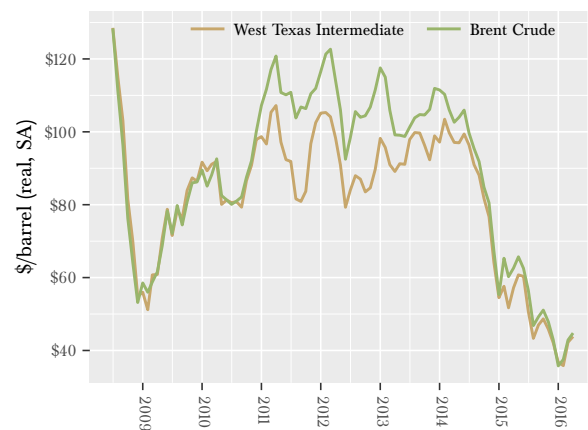
Crude oil and its derivatives strongly affect production, transportation, and consumption in the world and U.S. domestic economies. Prices for Brent crude oil have plummeted from \$108/barrel in January 2014 to \$38/barrel in December 2015, a 65 percent drop. Since December, prices have increased marginally to \$41/barrel.

Broadly, a drop in oil prices acts like a tax cut for consumers and can encourage consumption. However, data suggest that households are saving the

windfall or paying down debt instead of spending it. Additionally, the drop has been sudden and severe enough that it has undermined business investment in oil production, which has created another drag on economic growth.

All other things being equal, this drop in petroleum prices has lowered 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 very 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.

After several dramatic months as the primary concern of the European economy, a deal was reached in July 2015 between Greece and its eurozone creditors that averted (at least temporarily) a Greek default or exit from the euro. However, the European Union is now facing the possibility of a British exit from the union, which would likely have adverse economic effects on both the UK and the EU. Other issues with the European economy include persistent low inflation, though the risk of a deflationary spiral appears to have abated, and an unemployment rate that remains above 10 percent, though it varies widely between countries.

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

## China

China is a major export market for logs and lumber 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. Changes to the Chinese economy can have a dramatic impact on the prices for logs and lumber (and geoduck) in the Pacific Northwest.

China's GDP and employment weathered the global economic and financial crises of the past eight years 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 a 6.9 percent in 2015. The IMF forecasts a further decline to 6.3 percent in 2016.

The dramatic stock market crash in the middle of 2015 and the botched attempt by the government to prop up the markets have undermined confidence in both the government's ability to manage

the economy and its commitment to transitioning to a market-based economy. The crash was more a correction of the speculative bubble that had built up over the prior year—the Shanghai index had increased over 150 percent from late 2014 to June 2015—and does not necessarily reflect the underlying economy, where there are still a number of concerns.

For example, there is growing concern that the IMF forecasts are overly optimistic and 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) has 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.

Analysts seem to broadly agree that in order to continue growing and to stabilize its economy China needs to pivot from its heavy reliance on investment toward a broader consumption basis. In order to do this it would need to encourage domestic spending and move away from saving, but the political measures that are needed to do this are impeded by entrenched interests.

## 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.

These policies were initially well received by the Japanese, judging by increasing consumer confidence and GDP growth. However, GDP in 2014 actually shrank by 0.03 percent and grew by only 0.47 percent in 2015. The IMF expects weak growth of around 0.7 percent in 2016.

In 2014, Japanese CPI grew by 2.7 percent, suggesting they may have escaped their deflationary spiral. However, CPI growth in 2015 was held back by falling energy and food prices and grew by only 0.8 percent. More recently, the Japanese government has delayed implementing an increase in the consumption tax after the CPI fell in both March and April, although the core inflation (inflation less food and oil) was still positive at 0.90 percent year-on-year to April.

The Bank of Japan implemented negative interest rates in late January to augment their quantitative easing activities, which would ideally spur spending and force inflation and GDP higher. This is an unconventional tactic and its full effects will be unknown for some time, though with the weakness in the inflation numbers, there is speculation that they will move rates further into negative territory soon.

## Wood Markets

Over the past decade, timber stumpage revenue has constituted over 75 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.

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.

Figure 11: Lumber, Log and Stumpage Prices in Washington

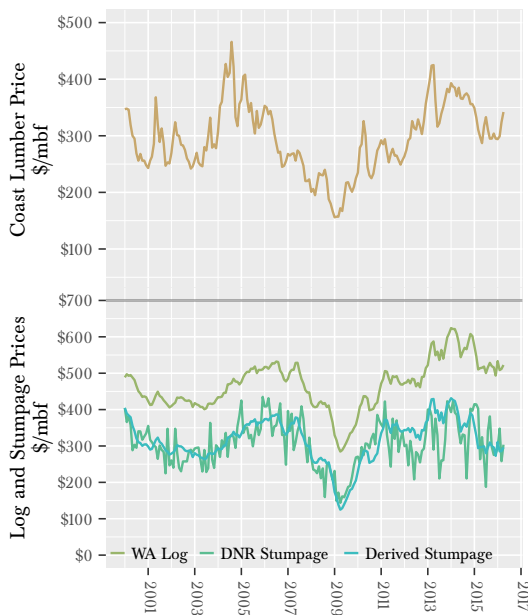
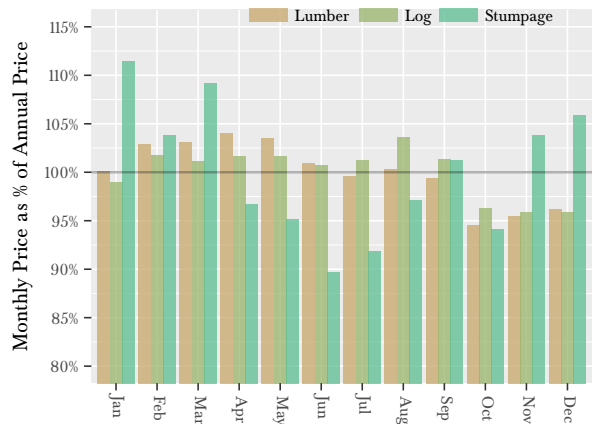


Figure 12: Lumber, Log, and DNR Stumpage Price Seasonality



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.

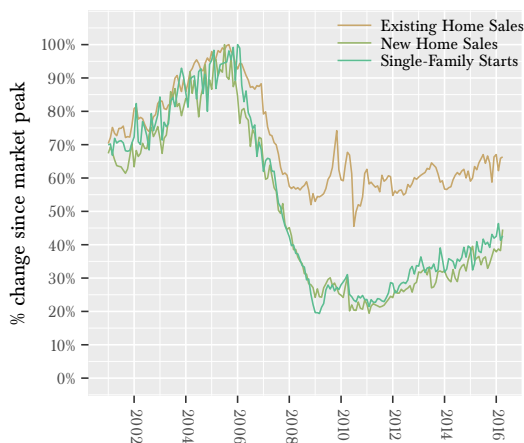
There are differences in price seasonality between lumber, logs, and stumpage, as illustrated in Figure 12. These prices are affected by a degree of seasonality that is largely the result of when each of these commodities will be used. For instance, lumber prices tend to peak in spring, when housing construction picks up, and decline through fall as the demand wanes, while stumpage prices tend to be highest 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 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 trough from 2009-11, 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.

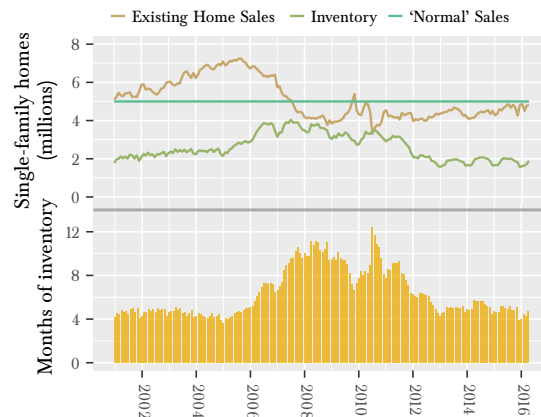
Housing demand has remained broadly subdued due to tight lending standards, weak labor markets, and increasing prices at the same time as stagnant or declining real wages for much of the population. However, lending standards have relaxed a little and the labor market is tightening. A number

of measures suggest that the modest recovery in housing demand has resumed after stalling through late 2014.

### 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 2012. 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 4.7 million sales (SAAR) in the first four months of 2016.

Figure 14: Existing Home Sales



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. Currently, inventories are building up, likely for summer selling.

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

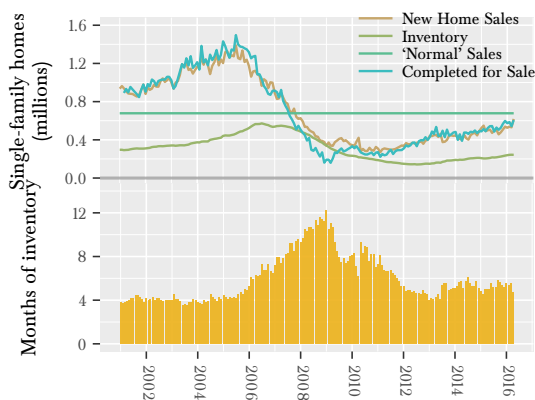


concern among analysts about the potential impact on house prices if investors were to begin selling en-masse, thereby increasing the housing supply while demand continues to be weak. However, without significant potential returns from other investment, there seems little chance of a mass sell-off.

## 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 have increased from 440,000 (SAAR) in 2014 to an average of 502,000 in 2015. The average monthly sales for the first four months of 2016 have been 554,000, an improvement compared to 2015, but still well below the long-term (1963-2010) ‘normal’ rate of 678,000 sales per year.

Figure 15: New Single-Family Home Sales



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. However, construction too is still well below ‘normal’ levels.

## 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.

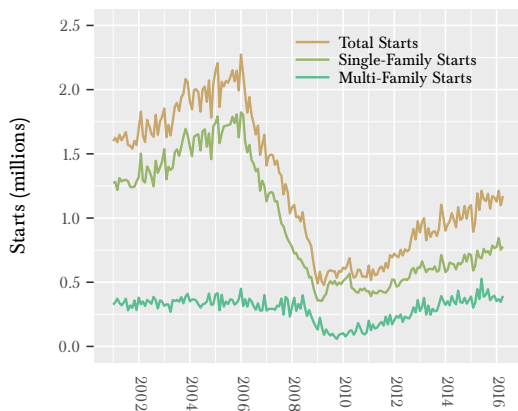
Estimates suggest that there were between 1.3 and 1.5 million formations in 2015. Looking forward, household formation will depend on both the continued recovery in the U.S. labor market—more than just job growth, but also real wage growth—and improvements in housing affordability and mortgage access.

**Housing Starts**

In Sept: consider adding section on PNW and US trend toward multifamily housing

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). In April 2009, U.S. housing starts fell to record lows since the Census Bureau began tracking these data in 1959. In 2014 there were around 1.0 million starts.

Figure 16: Housing Starts



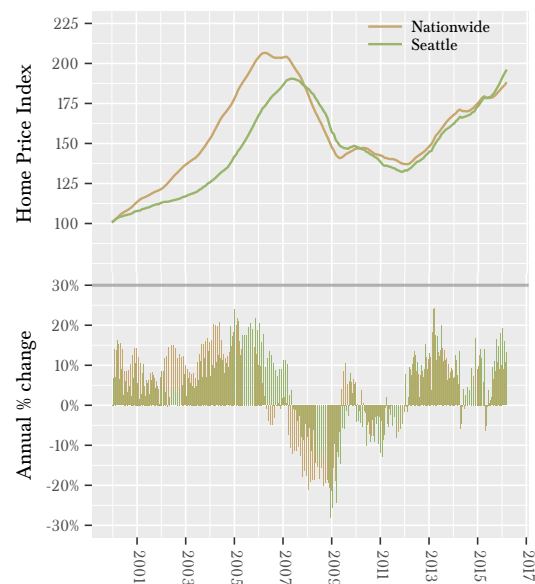
The dependence of total housing starts on multi-family units is a new development. It is notable because multi-family structures use much less lumber than single-family houses per unit, so this increase in overall starts has had a more muted effect on timber prices than historical increases. However, it is not clear how long multi-family starts will drive total starts, in the first four months of 2016 multi-family starts were basically the same as the first four months of 2015, while single family starts increased from 1.0 million to 1.1 million (SAAR).

The outlook for 2016 housing starts is about 1.2 million starts. The year 2015 averaged 1.1 million (SAAR) starts, overcoming low first quarter starts that were dragged down by severe weather. Con-

tinued improvements in household formations will increase demand, though it is unclear how long it will take before formations increase. Additionally, a recovery in house prices should facilitate the ‘move-up’ market. Combined with low market and shadow inventories constraining the supply of existing housing, prices should start increasing and provide incentives to build more houses.

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.

Figure 17: Case-Shiller Existing Home Price Index



**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, almost ten years earlier.

Seattle house prices are growing much faster than national prices, increasing 9.6 percent year-on-year as of March, compared with 4.9 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 March, the average Seattle home was worth three percent more than its peak price, though it was not as much in inflation adjusted terms.

The increase in prices is bringing back more normal foreclosure conditions, where 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.

### Housing Affordability

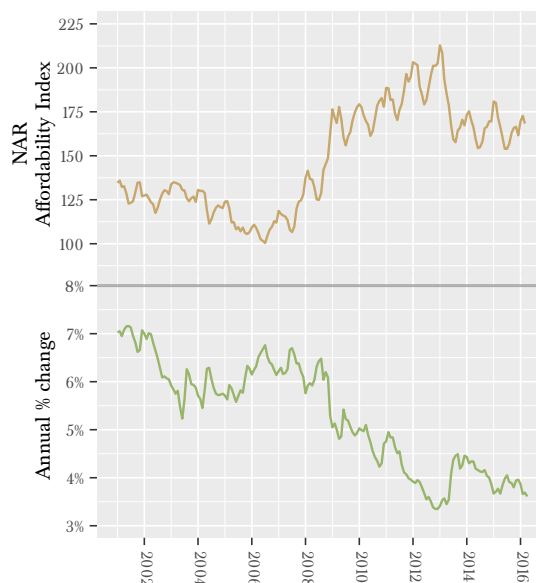
The National Association of Realtors’ (NAR) U.S. Housing Affordability Index is a useful, though imperfect, measure of how affordable or attainable houses are to the average American. Index values increase as affordability increases, and decline as homes become less affordable.

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 their 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) — without the index it might be difficult to guess which one of these changes has a greater effect on affordability.

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 as housing market sentiment oscillated between bullish in the wake of price increases and bearish as buyers withdrew and interest rates increased. The index increased through late 2014 and peaked in January 2015 at 183, before falling through July and then increasing again later in the year. These fluctuations appear to be primarily driven by changes in median prices, which increased through early summer before falling back after June. Since March 2015, the index has oscillated between 170 and 155, with a preliminary estimate of 169 in March 2016.

Figure 18: Housing Affordability



## Export Markets

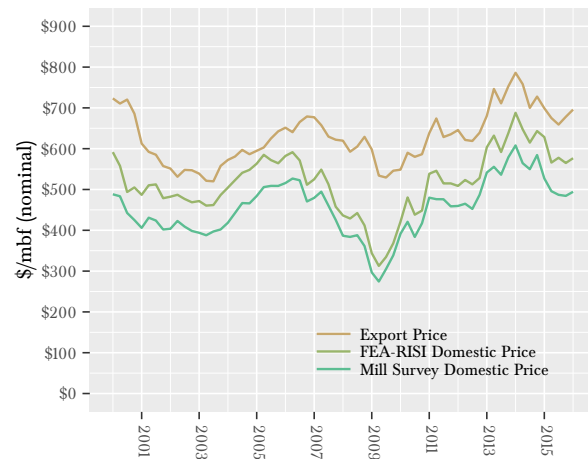
Although Federal law forbids export of logs from public lands west of the 108th meridian, log exports still have a meaningful impact on DNR stumpage prices. Exports compete with domestic purchases for privately sourced logs and strong export competition pulls more of the supply from the domestic market, 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.

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).

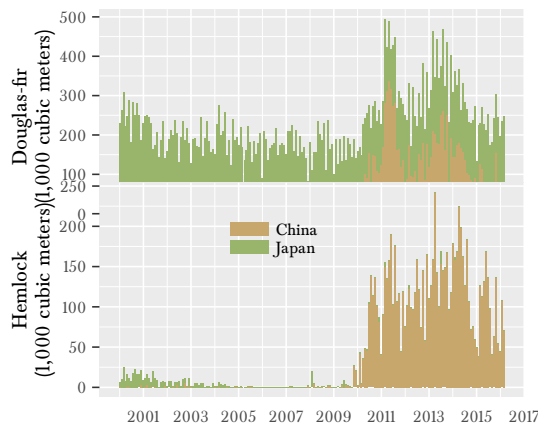
Figure 19: Log Export Prices



Although demand from China increased in the second quarter of 2015, it didn’t recover to its previous levels and further weakened in the second quarter. First quarter 2016 exports to China from the Seattle and Columbia River Customs Districts are still suppressed, at only 82 percent of the first quarter 2015 exports. Demand was expected to be comparatively elevated in the first and second quarters of 2016, but it appears that the export level will continue to shrink.

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.

Figure 20: Log Export Volume



## Timber Supply

Although timber growth has exceeded timber harvest since the beginning of the recession, thereby increasing the potential timber inventory, strong log exports in the U.S. West Coast constrained the growth of the timber inventory in that region, so there is less deferred wood to draw down on. Harvesting on the U.S. West Coast reportedly exceeded growth in 2014, which began to deplete the stumpage inventory, but harvests in 2015 were below growth. Timber growth is expected to continue to exceed harvest through 2017, increasing inventories again.

British Columbian forests were devastated by the mountain timber beetle, which affected about a third of the province's timber resources. This damage has increased British Columbia's timber supply since 2007: typically, timber killed by beetles must be harvested within 4 to 10 years, so the government increased the allowable harvest to ensure that the dead timber was not wasted. These elevated timber supplies are already declining and it's expected that most of the beetle kill will be unviable by 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. Random Lengths' Coast Dry Random and Stud composite lumber price peaked at \$393/mbf in January 2014, but fell throughout the rest of the year to average \$373/mbf. This was largely due to a bitterly cold winter across much of the U.S. weakening 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 \$310/mbf.

The first four months of 2016 have fared somewhat better, starting the year at \$294/mbf to climb to \$342/mbf in April, for an average price of \$315 thus far. For the remainder of the year prices are expected to be subdued, as many of the same issues that held back prices in 2015 continue to weigh down markets.

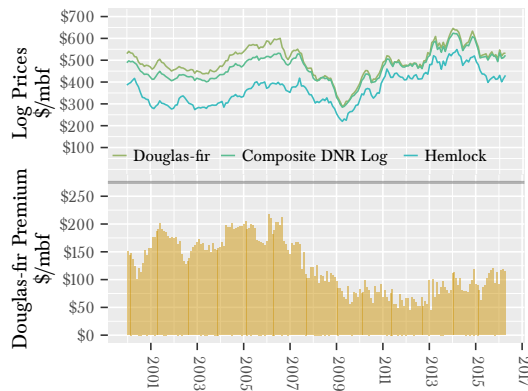
### Log Prices

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 continued drop in prices since late 2014. 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. A price decline was largely foreseen, though the depth of the drop was unexpected.

Figure 21: DNR Composite Log Prices



Log prices in 2016 are expected to be slightly higher than 2015 prices, held back by the same issues plaguing lumber prices. Prices thus far have averaged \$519/mbf.

### 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.

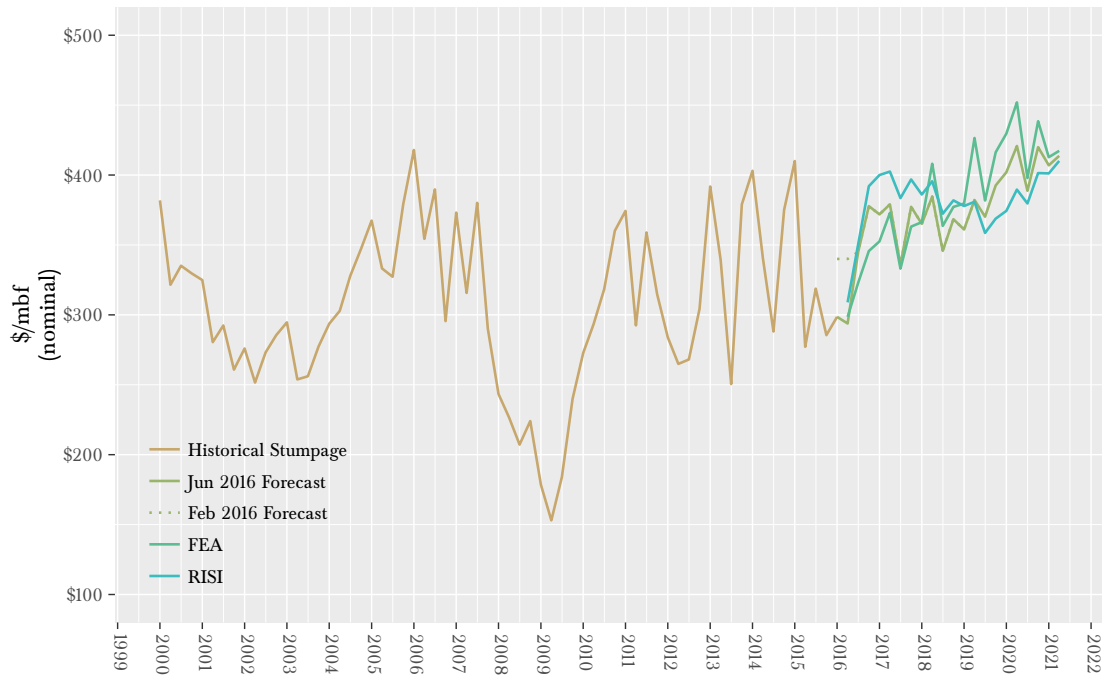
### DNR Stumpage Price Outlook

There is a significant downward adjustment to the expected annual average stumpage price in FY16, but the outlying years are unchanged (Figure 22). Last forecast, FY16 prices were shifted down because there was a significant proportion of fire salvage planned for sale that would pull down average prices. The current downward adjustment is due much weaker prices than expected for stumpage sales, which appear to be related to the timber mix offered.

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).

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

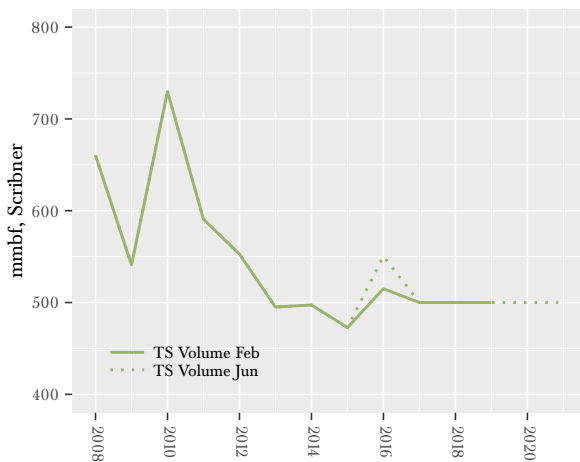
Figure 22: DNR Timber Stumpage Price



## 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

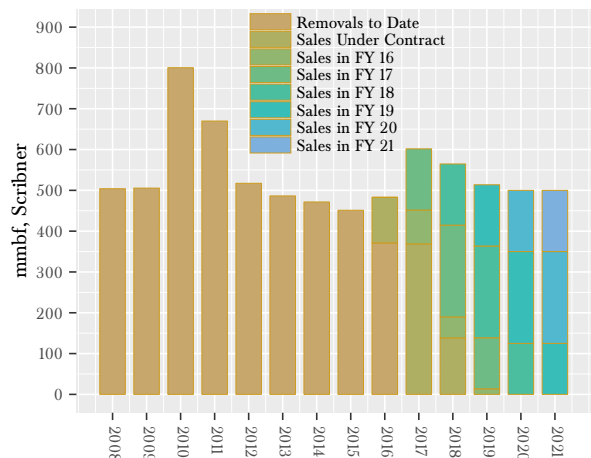
DNR sells timber through auctioned contracts that vary in duration. For instance, contracts for DNR timber sales sold in FY 2014 needed to be harvested between three months and four and a half years from the date of sale, with an average (weighted by volume) of about 25 months. The purchaser determines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

DNR sold 18 mmbf less than expected at the end of FY15. In the June and September Forecasts, those sales were pushed out to FY16, yielding a sales volume forecast of 518 mmbf. Forecast sales volume for FY16 was reduced in November to the more realistic expectation of 500 mmbf. However, in February, sales volume expectations were pushed back up due to the volume of planned fire salvage sales being larger than previously expected. Taking likely no-bids into account, due to the large volume planned for offer at the end of the fiscal year, our sales volume forecast was increased to 515 mmbf for FY16 (Figure 23). However, DNR has sold 473 mmbf through May and has plans to offer another 83 mmbf in the June Auction. Accordingly, the sales volume forecast is increased to 550 mmbf, again allowing for some sales to be passed on.

Figure 24: Forecast Timber Removal Volume



FY15 was the first year of the new sustainable harvest decade (FY15 through FY24) 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

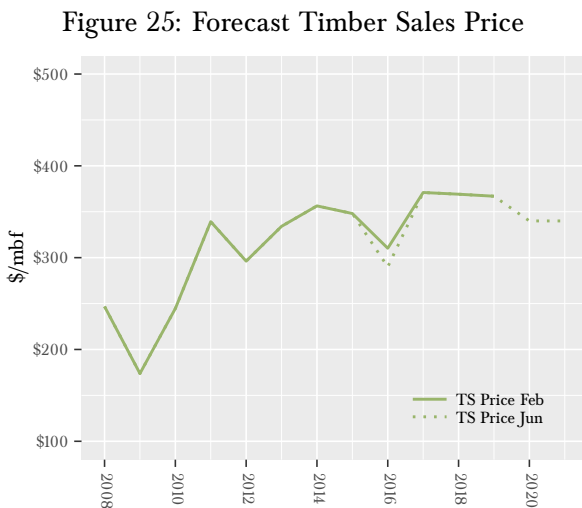


annual timber sales volume of about 500 mmbf for FYs 17-19.

**Timber Removal Volume**

At the end of January, DNR had 640 mmbf of timber under contract (586 mmbf in February), valued at \$194 million, or \$303/mbf, much lower than the average value of \$320/mbf in February. 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 May, indicates that purchasers will likely harvest 112 mmbf of current inventory volume in the remainder of this fiscal year, 369 mmbf in FY 17, and the remaining 138 mmbf in FY 18 (Figure 24).

Including the survey responses and removals to date, about 500 mmbf are expected to be harvested (+9 mmbf) in FY 16, two percent more than the February estimate of 491 mmbf. Due to the changes in harvest plans, our harvest forecasts for outlying years are 625 mmbf (-8 mmbf) for FY 17 and 565 (+42 mmbf) for FY 18.



**Timber Sales Prices**

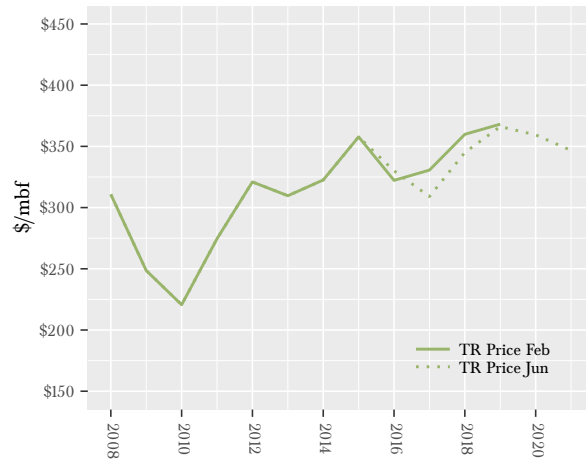
The price results of monthly DNR timber sales are quite volatile (Figure 11). As discussed in

the stumpage price outlook, the DNR sales price (stumpage) forecast uses estimates from two forest economics consulting firms. FY 16 prices are significantly reduced, from \$310/mbf to \$290/mbf (Figure 25). Prices 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 sold timber removed in each time period (Figure 26). Forecast removal prices have increased in FY 16 because of the shift in harvest timing of more valuable wood from FY 17. Removal prices for FYs 17 through 19 are decreased because of lower timber sales prices for FY 16.

Figure 26: Forecast Timber Removal Price



**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, 2016). Expected removal value for FY 16 is increased by around \$7 million, to \$165 million, due to increased removals volume and the price affect of shifting volume from FY 17. Removal revenue in FYs 17 and 19 are reduced due to

lower harvest volume and prices. FY 19 revenue are increased due to an increase in volume outweighing the expected decrease in removal price.

Forecast timber removal revenues for the 2015-2017 Biennium are projected to decrease by about \$9 million (three percent) to \$358 million.

Figure 27: Forecast Timber Removal Value

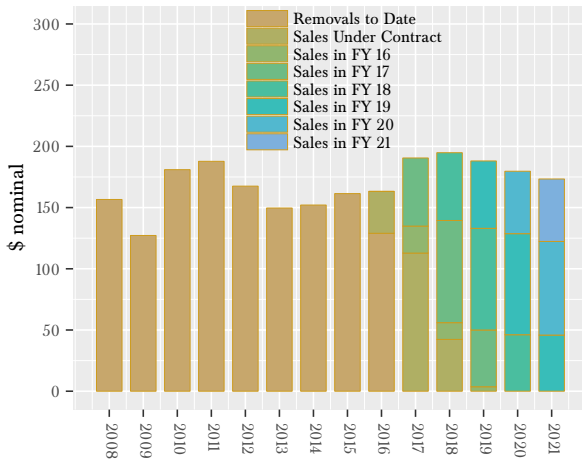
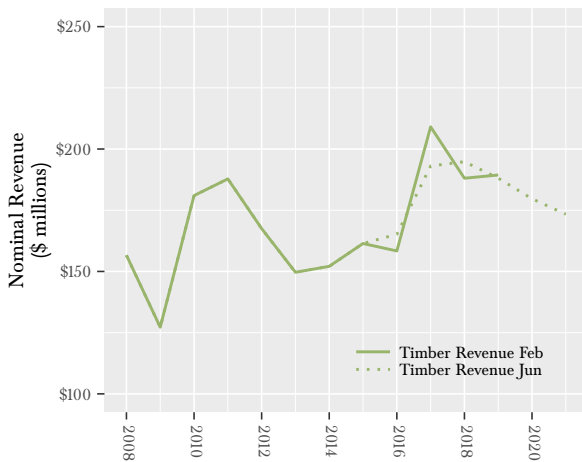


Figure 28: Forecast Timber Removal Revenue



### Upland Lease Revenues

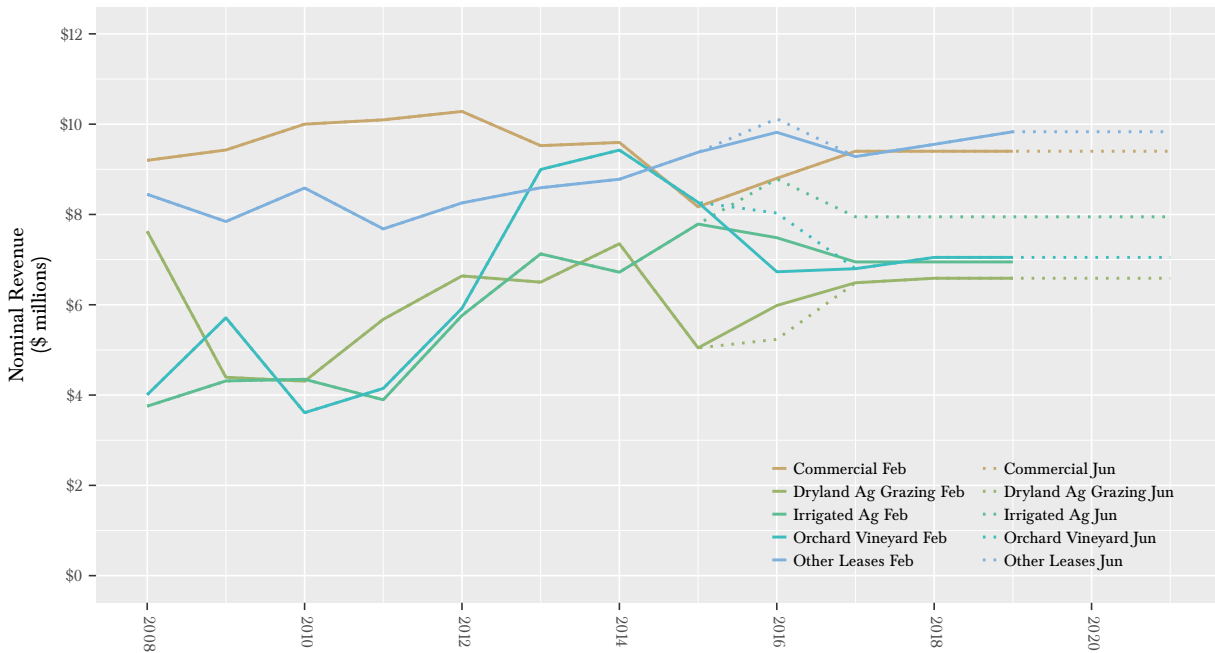
Upland lease revenues are generated primarily from leases and the sale of valuable materials, other than timber, on state trust lands. The upland revenue forecast is increased by \$2 million for FY16 (Figure 29).

This increase is primarily due to higher-than-expected earnings to-date for irrigated agriculture and orchards and vineyards as these leases transition to cash based rents, which are less dependent

on output prices and production than crop-share arrangements. Additionally, continued strength in mineral sales has pushed up expectations for the current fiscal year. These increased expectations have offset weakness in dryland leasing revenues. In outlying years, irrigated agriculture rents are expected to remain elevated.

Overall, in outlying years, the uplands lease revenue forecasts are increased by \$1 million in each year.

Figure 29: Forecast Upland Lease Revenue



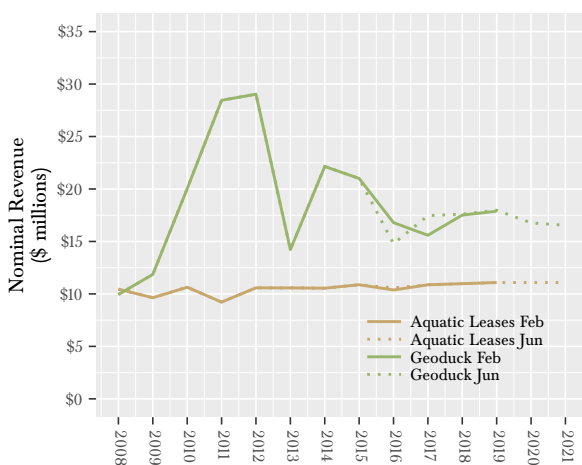
### Aquatic Lands Revenues

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.

Aquatics lands lease revenue expectations have been increased slightly for FY16 due to higher than expected revenue to-date (Figure 30). Forecast revenue for outlying years is unchanged.

The expected revenue from geoduck sales is decreased by \$2 million in FY16. This is due to an accounting change in when certain harvester payments are realized as revenue or held as cash-on-account. Previously, a portion of the auction price of geoduck contracts, the bonus bid, was treated as revenue, even though it may be subject to refunds if there are issues with the harvest. From March, this practice was altered and bonus bid monies will not be treated as revenue until the end of the contract period. In effect, this pushes out around \$2 million in revenue that we previously expected in FY16 to FY17. It also has flow-on effects in outlying years as part of the revenue from the last auction of each fiscal year is pushed out.

Figure 30: Aquatic Lands Revenues

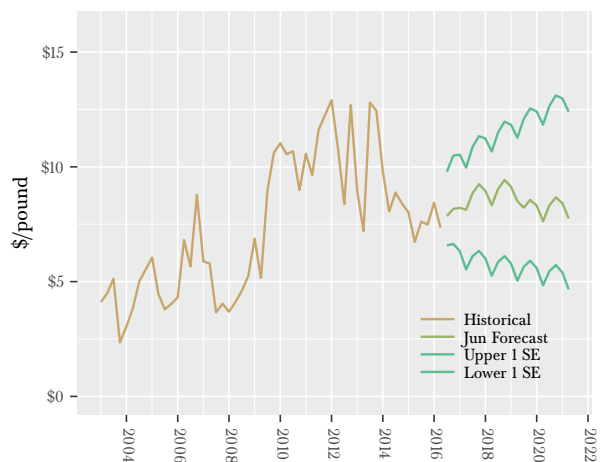


There are significant downside and upside risks to geoduck revenues, even in the near term, that are

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 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.

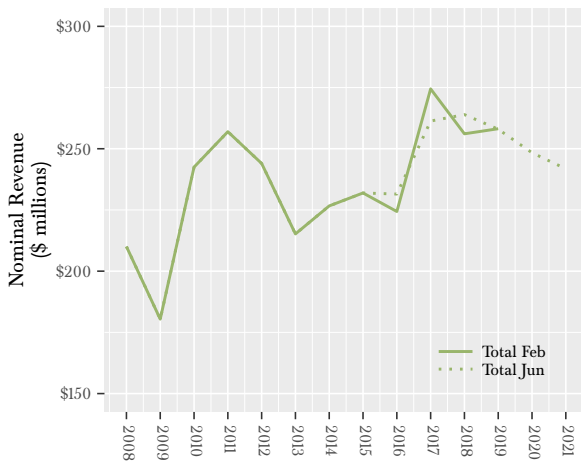
Figure 31: Geoduck Auction Prices



### Total Revenues from All Sources

Forecast revenues for the 2015-2017 biennium (FYs 16 and 17) are reduced by \$6 million to \$493 million (Figure 32). This reduction is offset by an increase in revenue for the 2017-2019 biennium of \$8 million. Most of the revenue change is driven by a change in planned timber harvests and timber sales prices.

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 FY16 by trust, and relative historical timber prices by DNR region by trust; and
- The volumes of timber by trust for FYs 17-19 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 over \$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 Ac-

count (FDA). In budget bills, the Legislature has authorized a deduction of up to 30 percent to RMCA since July 1, 2005, now in effect through the 2013-2015 Biennium.

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 2015-2017 biennium, but assumes that the deduction will be reduced back to 29 percent in the following biennium. This assumes that the Legislature will approve RMCA deductions of up to 30 percent, continuing its practice which started in FY 06.

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

	FY 2016	FY 2017	FY 2018	FY 2019
FDA	25	25	25	25
RMCA	31	31	29	29