

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

Fiscal Year 2016, First Quarter  
September 2015



WASHINGTON STATE DEPARTMENT OF  
**Natural Resources**



## 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 fell precipitously in the first five months of 2015 to a low of \$287/mbf in May before recovering moderately to average \$317/mbf for the year thus far. The price of a 'typical' DNR log moved up sharply from a two-year plateau in 2013 to \$591/mbf in 2014. However, prices have declined through 2015 to average \$524/mbf so far. The decline in log price is primarily due to the dramatic slowdown in demand from China (noted as a significant risk in the March Forecast) and ample regional supply of both logs and lumber. A price decline was largely foreseen, though the depth of the drop was unexpected.

**Timber Sales Volume.** DNR sold 473 mmbf in FY 15, around 3 mmbf higher than the June forecast. Those 3 mmbf are moved from the previous FY 16 sales volume forecast, leading to a new sales volume forecast of 518 for FY 16. Through August 2015, DNR has sold 36 mmbf, leaving a remaining 485 mmbf in expected sales volume for the year. Given current timber sales plans—and absent a new sustainable harvest calculation—sales volumes are still pegged at about 500 mmbf in FY 17 and beyond.

**Timber Sales Prices.** The volume-weighted average stumpage price for FY 15 was \$348/mbf, \$4/mbf below the June forecast. Stumpage prices in all forecast years are reduced slightly from the June due to revisions in the price outlook for logs and lumber. For FYs 16 and 17 the stumpage prices are forecast to be \$344/mbf and \$371, respectively.

**Timber Removal Volume and Prices.** Higher than expected harvests at the end of FY 15, the temporary statewide logging ban since late June, and harvester plans have altered expectations for FY 16 removals. Harvest volume for FY 15 was 19 mmbf higher than expected in the June Forecast. The new harvest volume forecast for FY 16 is reduced by 44

mmbf, with the difference shifting into FY 17 and outlying years. Sluggish demand—both domestic and export—also contributes to the reduction in FY 16. Removal volumes for FYs 16-19 are forecast to be 564 (-44), 587 (+29), and 509 (-12) mmbf. Timber removal prices are projected to be about \$337 (-\$10), \$348 (+\$1), \$364 (+\$4) per mmbf for FYs 16-18. 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 in all forecast fiscal years. Revenue for FY 15 is \$13 million more than forecast in June, resulting in 2013-2015 biennial revenue of \$313 million. Revenue for the 2015-2017 biennium decreased by \$13 million to \$394 million, down three percent from June's forecast.

**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.

Revenues from agricultural and other upland leases were \$39 million in FY 15, four percent higher than forecast in June. Projected revenue for FY 16 is reduced by \$0.6 million, due to a shift in dryland revenue from FY 16 to FY 15. Outlying years are unchanged.

Revenues from aquatic lands were \$32 million in FY 15, \$1 million more than forecast in June. Revenue expectations for FYs 16 and 17 have been revised to \$28 and \$31 million due to changes in geoduck sales expectations.

**Total Revenues.** Revenues for the 2013-2015 biennium totaled \$459 million, up \$15 million (four percent) from the previous forecast. Revenues for the 2016-2017 Biennium are expected to total \$527 million, down \$13 million (two percent) from the June Forecast.

**Notes to the Forecast.** Although the sales

volume estimates in FY16 are based on the best available internal planning data, they are subject to downward adjustments due to on-going 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.

We had incorporated fairly conservative market assumptions into the June forecast, based on industry analyst forecasts of falling stumpage prices. However, these assumptions appear to have been insufficiently conservative: with prices plummeting to an average of \$274/mbf in the fourth quarter of FY15, from an average of \$410 in the first quarter. Stumpage on the first two sales of FY16 averaged \$187/mbf and \$342/mbf, for a combined average of \$297/mbf. We have slightly lowered the expected FY16 stumpage price for the first quarter, but the remaining quarters are unchanged. Given the expectations of external forecasters, our sales prices forecasts for this and outlying years appear to be on the lower end of the likely range.

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 market, there is growing concern that that the slowdown in Chinese construction, and economic growth more generally, will be much more dramatic than previously expected.

Another major downside risk is the pending October expiration of the Softwood Lumber Agreement (SLA, 2006) between the U.S. and Canada. The SLA was signed in 2006 after a long running trade dispute where U.S. producers claimed that Canada was unfairly subsidizing their lumber industry by selling government owned timber at administratively set prices, as opposed to market based prices. It provided for a tariff on Canadian lumber exports to the U.S. that was set based on the market price of lumber. From November 2013 to April 2015, lumber prices were high enough that there was no tax. However, since then lumber prices have dropped precipitously and exports attract the maximum tax of 15 percent. After Oc-

tober, that tax will disappear.

The effect that this has on U.S. lumber and timber prices will depend heavily on demand conditions both in the U.S. and internationally, particularly China. If demand increases again, enough to push lumber prices to the levels seen prior to April, then the effect will be negligible because there would be no tax at those prices anyway. However, until demand recovers sufficiently, U.S. producers will likely see increased competition and lower prices. This means lower demand, and therefore prices, for logs which would undermine DNR stumpage prices.

There is an unlikely upside potential for increases in timber price due to unexpectedly rapid strengthening of U.S. housing demand. This potential has become somewhat more likely given the strong employment growth and reasonable wage growth from 2014 continuing into 2015. However, there are still a number of issues that are likely to impede demand—many that are especially meaningful for younger, would-be first-time homebuyers, who are facing a tough labor market, student loan debt, and persistently stringent lending standards.

Finally, although the end of the Chinese ban on geoduck imports from the Pacific Northwest has eased much of the uncertainty surrounding geoduck demand, geoduck prices are historically volatile and there is no guarantee that a blanket ban will not be reinstated. Additionally, on-going friction between purchasers and divers has further disrupted the market. Taken together, both the geoduck sales price and harvest volumes may become even more difficult to predict in the coming years.

DNR Office of Budget and Economics  
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Table 1: September 2015 Forecast by Source (millions of dollars)

<b>Timber Sales</b>		FY 14	FY 15	FY 16	FY 17	FY 18	FY 19
Volume (mmbf)		497	473	518	500	500	500
	Change		3	(3)	-	-	-
	% Change		1%	-1%	0%	0%	0%
Price (\$/mbf)		\$ 356	\$348	\$ 344	\$ 371	\$ 369	\$ 367
	Change		\$ (4)	\$ (2)	\$ (1)	\$ (1)	\$ (0)
	% Change		-1%	-1%	0%	0%	0%
<b>Value of Timber Sales</b>		<b>\$ 177.2</b>	<b>\$ 164.5</b>	<b>\$ 178.3</b>	<b>\$ 185.5</b>	<b>\$ 184.6</b>	<b>\$ 183.5</b>
	Change		\$ (0.8)	\$ (2.1)	\$ (0.3)	\$ (0.3)	\$ (0.2)
	% Change		-1%	-1%	0%	0%	0%
<b>Timber Removals</b>		FY 14	FY 15	FY 16	FY 17	FY 18	FY 19
Volume (mmbf)		471	451	564	587	509	507
	Change		19	(44)	29	(12)	7
	% Change		4%	-7%	5%	-2%	1%
Price (\$/mbf)		\$ 323	\$ 358	\$ 337	\$ 348	\$ 364	\$ 369
	Change		\$ 14	\$ (10)	\$ (3)	\$ 4	\$ (1)
	% Change		4%	-3%	-1%	1%	0%
<b>Timber Revenue</b>		<b>\$ 152.1</b>	<b>\$ 161.4</b>	<b>\$ 189.9</b>	<b>\$ 204.4</b>	<b>\$ 185.1</b>	<b>\$ 187.0</b>
	Change		\$ 13.1	\$ (20.9)	\$ 8.2	\$ (2.5)	\$ 2.2
	% Change		9%	-10%	4%	-1%	1%
<b>Upland Leases</b>		FY 14	FY 15	FY 16	FY 17	FY 18	FY 19
Irrigated Agriculture		\$ 6.7	\$ 7.8	\$ 6.3	\$ 6.3	\$ 6.3	\$ 6.3
	Change		\$ (0.1)	\$ -	\$ -	\$ -	\$ -
	% Change		-2%	0%	0%	0%	0%
Orchard/Vineyard		\$ 9.4	\$ 8.3	\$ 5.7	\$ 5.8	\$ 6.0	\$ 6.0
	Change		\$ 0.4	\$ -	\$ -	\$ -	\$ -
	% Change		4%	0%	0%	0%	0%
Dryland Ag/Grazing		\$ 7.4	\$ 5.0	\$ 6.4	\$ 6.5	\$ 6.6	\$ 6.6
	Change		\$ 0.9	\$ (0.6)	\$ -	\$ -	\$ -
	% Change		22%	-8%	0%	0%	0%
Commercial		\$ 9.6	\$ 8.2	\$ 9.0	\$ 9.9	\$ 9.9	\$ 9.9
	Change		\$ 0.2	\$ -	\$ -	\$ -	\$ -
	% Change		2%	0%	0%	0%	0%
Other Leases		\$ 8.8	\$ 9.4	\$ 9.1	\$ 9.3	\$ 9.4	\$ 9.5
	Change		\$ 0.2	\$ -	\$ -	\$ -	\$ -
	% Change		2%	0%	0%	0%	0%
<b>Total Upland Leases</b>		<b>\$ 41.9</b>	<b>\$ 38.6</b>	<b>\$ 36.5</b>	<b>\$ 37.8</b>	<b>\$ 38.3</b>	<b>\$ 38.4</b>
	Change		\$ 1.5	\$ (0.6)	\$ -	\$ -	\$ -
	% Change		4%	-1%	0%	0%	0%
<b>Aquatic Lands</b>		FY 14	FY 15	FY 16	FY 17	FY 18	FY 19
Aquatic Leases		\$ 10.5	\$ 10.9	\$ 10.4	\$ 10.9	\$ 11.0	\$ 11.1
	Change		\$ (0.0)	\$ -	\$ -	\$ -	\$ -
	% Change		0%	0%	0%	0%	0%
Geoduck		\$ 22.1	\$ 21.0	\$ 17.9	\$ 19.8	\$ 18.9	\$ 19.4
	Change		\$ 0.9	\$ (0.8)	\$ 1.4	\$ -	\$ -
	% Change		5%	-4%	8%	0%	0%
<b>Aquatic Lands Revenue</b>		<b>\$ 32.7</b>	<b>\$ 31.9</b>	<b>\$ 28.2</b>	<b>\$ 30.7</b>	<b>\$ 29.9</b>	<b>\$ 30.5</b>
	Change		\$ 0.9	\$ (0.8)	\$ 1.4	\$ -	\$ -
	% Change		3%	-3%	5%	0%	0%
<b>Total All Sources</b>		<b>\$ 226.6</b>	<b>\$ 231.9</b>	<b>\$ 254.6</b>	<b>\$ 272.9</b>	<b>\$ 253.3</b>	<b>\$ 255.9</b>
	Change		\$ 15.4	\$ (22.2)	\$ 9.6	\$ (2.5)	\$ 2.2
	% Change		7%	-8%	4%	-1%	1%

Table 2: September 2015 Forecast by Fund (millions of dollars)

Management Funds			FY 14	FY 15	FY 16	FY 17	FY 18	FY 19
041	RMCA - Uplands		\$ 33.2	\$ 30.4	\$ 39.2	\$ 42.5	\$ 37.2	\$ 38.3
	Change			\$ 1.7	\$ 0.5	\$ 4.4	\$ (0.2)	\$ 0.3
	% Change			6%	1%	12%	-1%	1%
041	RMCA - Aquatic Lands		\$ 14.8	\$ 14.4	\$ 12.6	\$ 13.7	\$ 13.3	\$ 13.6
	Change			\$ 0.4	\$ (0.4)	\$ 0.7	\$ -	\$ -
	% Change			3%	-3%	5%	0%	0%
014	FDA		\$ 19.6	\$ 23.2	\$ 24.9	\$ 26.2	\$ 23.9	\$ 24.4
	Change			\$ 1.9	\$ (3.8)	\$ 0.1	\$ (0.6)	\$ 0.3
	% Change			9%	-13%	0%	-2%	1%
<b>Total Management Funds</b>			<b>\$ 67.6</b>	<b>\$ 68.0</b>	<b>\$ 76.7</b>	<b>\$ 82.4</b>	<b>\$ 74.4</b>	<b>\$ 76.3</b>
	Change			\$ 4.0	\$ (3.6)	\$ 5.2	\$ (0.8)	\$ 0.6
	% Change			6%	-5%	7%	-1%	1%
Current Funds			FY 14	FY 15	FY 16	FY 17	FY 18	FY 19
113	Common School Construction		\$ 56.6	\$ 50.4	\$ 63.6	\$ 67.5	\$ 66.9	\$ 67.9
	Change			\$ 1.4	\$ (4.7)	\$ 0.2	\$ (0.5)	\$ 0.5
	% Change			3%	-7%	0%	-1%	1%
999	Forest Board Counties		\$ 52.0	\$ 64.8	\$ 62.7	\$ 66.9	\$ 59.3	\$ 59.8
	Change			\$ 7.1	\$ (10.9)	\$ (0.4)	\$ (2.4)	\$ 0.7
	% Change			12%	-15%	-1%	-4%	1%
001	General Fund		\$ 2,173.5	\$ 1.8	\$ 3.4	\$ 3.1	\$ 3.6	\$ 3.9
	Change			\$ (0.3)	\$ (0.2)	\$ (0.2)	\$ 0.1	\$ 0.0
	% Change			-14%	-6%	-6%	2%	1%
348	University Bond Retirement		\$ 1.8	\$ 2.8	\$ 2.0	\$ 2.4	\$ 2.8	\$ 2.1
	Change			\$ 0.1	\$ (0.1)	\$ 0.6	\$ 0.3	\$ 0.0
	% Change			5%	-5%	31%	12%	1%
347	WSU Bond Retirement		\$ 1.7	\$ 1.8	\$ 1.6	\$ 1.6	\$ 1.7	\$ 1.7
	Change			\$ 0.1	\$ (0.1)	\$ (0.0)	\$ -	\$ -
	% Change			7%	-4%	-2%	0%	0%
042	CEP&RI		\$ 5.5	\$ 5.2	\$ 3.6	\$ 3.6	\$ 4.3	\$ 4.5
	Change			\$ 1.9	\$ (1.7)	\$ (1.0)	\$ (0.0)	\$ 0.0
	% Change			58%	-33%	-21%	-1%	1%
036	Capitol Building Construction		\$ 6.7	\$ 4.9	\$ 6.8	\$ 8.6	\$ 9.0	\$ 8.8
	Change			\$ (0.2)	\$ (0.9)	\$ (0.3)	\$ (0.1)	\$ 0.1
	% Change			-4%	-11%	-3%	-2%	1%
061/3/5/6	Normal (CWU, EWU, WWU, TESC) School		\$ 0.2	\$ 0.1	\$ 0.1	\$ 0.1	\$ 0.1	\$ 0.1
	Change			\$ (0.0)	\$ (0.0)	\$ (0.0)	\$ -	\$ -
	% Change			-10%	-5%	-3%	0%	0%
Other Funds			\$ 1.5	\$ 0.5	\$ 0.4	\$ 1.5	\$ 0.5	\$ 0.2
	Change			\$ (0.1)	\$ 0.4	\$ 1.5	\$ 0.4	\$ 0.0
	% Change			-12%	+500%	+500%	326%	15%
<b>Total Current Funds</b>			<b>\$ 128.1</b>	<b>\$ 132.4</b>	<b>\$ 144.3</b>	<b>\$ 155.3</b>	<b>\$ 148.2</b>	<b>\$ 149.0</b>
	Change			\$ 10.1	\$ (18.1)	\$ 0.5	\$ (2.3)	\$ 1.4
	% Change			8%	-11%	0%	-2%	1%
(Continued)								

Table 3: September 2015 Forecast by Fund (millions of dollars), cont'd

		FY 14	FY 15	FY 16	FY 17	FY 18	FY 19
<b>02R</b>	<b>Aquatic Lands Enhancement Account</b>	<b>\$ 17.9</b>	<b>\$ 17.4</b>	<b>\$ 15.7</b>	<b>\$ 17.0</b>	<b>\$ 16.6</b>	<b>\$ 16.9</b>
	Change		\$ 0.5	\$ (0.4)	\$ 0.7	\$ -	\$ -
	% Change		3%	-2%	4%	0%	0%
<hr/>							
<b>Permanent Funds</b>		FY 14	FY 15	FY 16	FY 17	FY 18	FY 19
601	Agricultural College Permanent	\$ 3.5	\$ 4.1	\$ 7.3	\$ 6.6	\$ 4.5	\$ 4.2
	Change		\$ (0.2)	\$ (0.5)	\$ 1.3	\$ 0.4	\$ 0.1
	% Change		-4%	-6%	25%	9%	1%
604	Normal School Permanent	\$ 1.8	\$ 1.7	\$ 3.2	\$ 4.5	\$ 3.5	\$ 3.1
	Change		\$ (0.0)	\$ 0.3	\$ 1.1	\$ 0.1	\$ 0.1
	% Change		-2%	11%	33%	4%	2%
605	Common School Permanent	\$ 0.4	\$ 0.7	\$ 0.3	\$ 0.3	\$ 0.3	\$ 0.3
	Change		\$ 0.4	\$ 0.0	\$ 0.0	\$ 0.0	\$ 0.0
	% Change		128%	13%	13%	13%	13%
606	Scientific Permanent	\$ 6.1	\$ 7.1	\$ 6.4	\$ 5.9	\$ 5.1	\$ 5.5
	Change		\$ 0.4	\$ 0.0	\$ 0.5	\$ (0.1)	\$ 0.0
	% Change		6%	0%	9%	-1%	1%
607	University Permanent	\$ 1.1	\$ 0.4	\$ 0.6	\$ 0.8	\$ 0.7	\$ 0.6
	Change		\$ 0.2	\$ 0.0	\$ 0.2	\$ 0.1	\$ 0.0
	% Change		159%	3%	43%	17%	2%
<b>Total Permanent Funds</b>		<b>\$ 13.0</b>	<b>\$ 14.0</b>	<b>\$ 18.0</b>	<b>\$ 18.2</b>	<b>\$ 14.0</b>	<b>\$ 13.7</b>
	Change		\$ 0.8	\$ (0.1)	\$ 3.2	\$ 0.6	\$ 0.2
	% Change		6%	-1%	21%	4%	2%
<hr/>							
<b>Total All Funds</b>		FY 14	FY 15	FY 16	FY 17	FY 18	FY 19
	Change		\$ 15.4	\$ (22.2)	\$ 9.6	\$ (2.5)	\$ 2.2
	% Change		7%	-8%	4%	-1%	1%

# Contents

## Forecast Summary

### Macroeconomic Conditions

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

### Log, Lumber, and Stumpage Prices

U.S. Housing Market . . . . .	9
Existing Home Sales . . . . .	9
New Home Sales . . . . .	10
Shadow Inventory . . . . .	10
Household Formation . . . . .	10
Housing Starts . . . . .	11
Housing Prices . . . . .	11
Housing Affordability . . . . .	12
Export Markets . . . . .	12
Timber Supply . . . . .	13
Price Outlook . . . . .	14
Lumber Prices . . . . .	14
Log Prices . . . . .	14
Stumpage Prices . . . . .	14
DNR Stumpage Price Outlook . . . . .	15

### DNR Revenue Forecast

Timber Revenue . . . . .	16
Timber Sales Volume . . . . .	16
Timber Removal Volume . . . . .	16
Timber Sales Prices . . . . .	17
Timber Removal Prices . . . . .	17
Timber Removal Revenue . . . . .	17
Upland Lease Revenues . . . . .	18
Aquatic Lands Revenues . . . . .	19
Total Revenues from All Sources . . . . .	20
Some Caveats . . . . .	20
Distribution of Revenues . . . . .	21

## Appendix: Comparison of Forecast and Actual Values 2013-2015 Biennium

<b>I</b>		
	<b>Revenue by Source</b>	<b>A.2</b>
	Timber Sales Volume . . . . .	A.2
	Timber Sales Price . . . . .	A.3
	Timber Removal Volume . . . . .	A.4
	Timber Removal Price . . . . .	A.5
	Timber Removal Revenue . . . . .	A.5
	Agriculture and Other Uplands . . . . .	A.6
	Commercial . . . . .	A.7
	Aquatic Lands . . . . .	A.8
	Total Revenue . . . . .	A.9
	<b>Revenue by Fund</b>	<b>A.11</b>
	RMCA Uplands . . . . .	A.11
	RMCA Aquatics . . . . .	A.12
	FDA . . . . .	A.12
	Common School Construction . . . . .	A.13
	Forest Board Counties . . . . .	A.13
	General Fund . . . . .	A.14
	University Bond Retirement . . . . .	A.14
	WSU Bond Retirement . . . . .	A.15
	CEP&RI . . . . .	A.15
	Capitol Building Construction . . . . .	A.16
	Normal School . . . . .	A.16
	ALEA . . . . .	A.17
	Agricultural College Permanent . . . . .	A.17
	Normal School Permanent . . . . .	A.18
	Common School Permanent . . . . .	A.18
	Scientific Permanent . . . . .	A.19
	University Permanent . . . . .	A.19

## List of Tables

1	September 2015 Forecast by Source (millions of dollars) . . . . .	III
2	September 2015 Forecast by Fund (millions of dollars) . . . . .	IV
3	September 2015 Forecast by Fund (millions of dollars), cont'd . . . . .	V



## List of Figures

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

## 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* (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 commodities. 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 2015 through 2019. 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 August 1st, 2015. 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 July 2015. 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 Title	Baseline Date	Draft Revenue Data Release Date	Final Data and Publication Date (approximate)
September 2015	August 1, 2015	September 5, 2015	September 30, 2015
November 2015	October 1, 2015	November 9, 2014	November 30, 2014
February 2016	January 1, 2016	February 18, 2016	February 31, 2016
June 2016	May 1, 2016	June 17, 2016	June 30, 2016

## **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 by 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, Tom Heller, Duane Emmons, Kristin Swendall, and Blain Reeves 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  
David Chertudi, Lead Economist  
Kristoffer Larson, Economist

## Macroeconomic Conditions

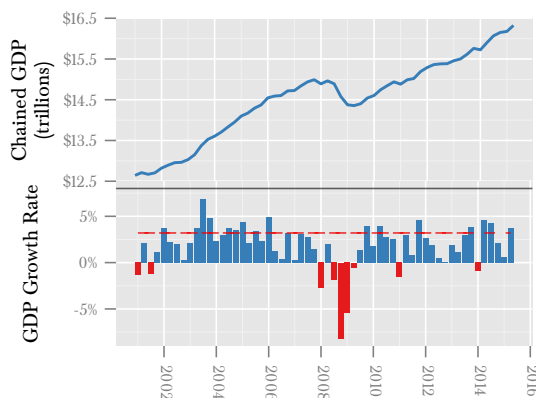
This section briefly reviews macroeconomic conditions in the United States and world economies because they influence DNR revenue—most notably through the bid prices for DNR timber sales and lease revenues from DNR-managed lands.

### 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 1). 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.

Figure 1: U.S. Gross Domestic Product



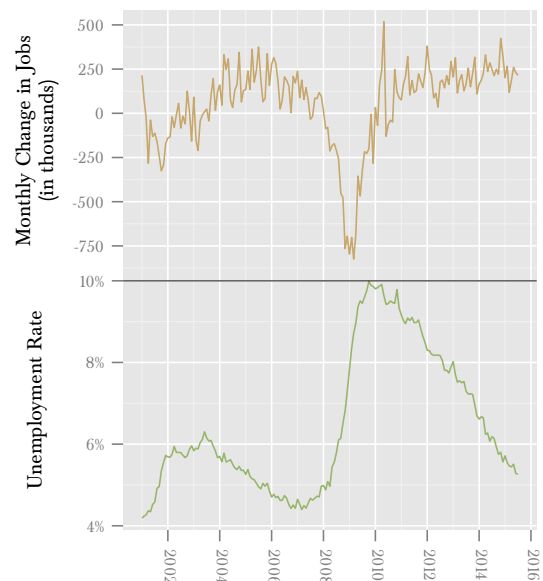
2014 was widely predicted to be the year that broke the pattern of stagnation, but the annual growth was held down to 2.4 percent because a harsh winter and business inventory adjustments caused GDP to contract. 2015 was also widely predicted to be the year that broke the pattern, with a continuation 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. A harsh winter sti-

fled consumption and investment while net exports shrank because of the dollar's strength, for annualized growth of 0.6 percent. Second quarter estimates have rebounded with annualized growth of 3.7 percent, but this still puts annualized growth at only 2.2 percent. Predictions for real GDP growth in 2015 from various sources have been repeatedly lowered and tend to fall in the range of 1.6-2.4 percent. The FOMC also significantly lowered its forecast range in June, from 2.1-3.1 percent to 1.7-2.3 percent.

#### Employment and Wages

The U.S. headline unemployment rate has continued to decline since the beginning of the year from 5.6 percent in January to 5.1 percent in August (Figure 2). This is down from a high of 10.0 percent in October 2009 and slightly above the average unemployment rate of 5.2 percent from 2001-2006. Analysts are still predicting over 250,000 jobs created per month in 2015 and 2016; however, with over half of the year gone, 2015 has averaged 212,000 jobs per month.

Figure 2: Unemployment Rate and Monthly Change in Jobs



While the unemployment rate continues to decline, it has not translated into strong wage growth, which is a pre-requisite for broader improvement in the economy. It is possible that this is because the headline unemployment rate is actually 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.

The U-6 unemployment rate is a useful measure because it includes involuntarily part-time employment and marginally attached workers, who are not included in the headline rate but who, nevertheless, are likely looking for work and would benefit from better job prospects. The U-6 has declined from the beginning of the year at 11.3 percent in January to 10.4 percent in July; down from a high of 17.1 percent in 2010, but still notably higher than the average of 9.1 percent from 2001-2006 (Figure 3). The decline in the year-on-year U-6 is the result of a drop in all three of its components.

Positive month-over-month job gains have been the main driver behind the unemployment rate's decline, though reductions in the labor force participation rate have also helped move the unemployment rate lower (Figure 4). 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. If there are many people waiting to look for employment until jobs are easier to find—such as when people are staying 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. However, if people are not in the labor market for other reasons, then the number of people in the labor market is relatively fixed and wages will be pushed up as companies compete for labor.

Figure 3: Employment and Unemployment

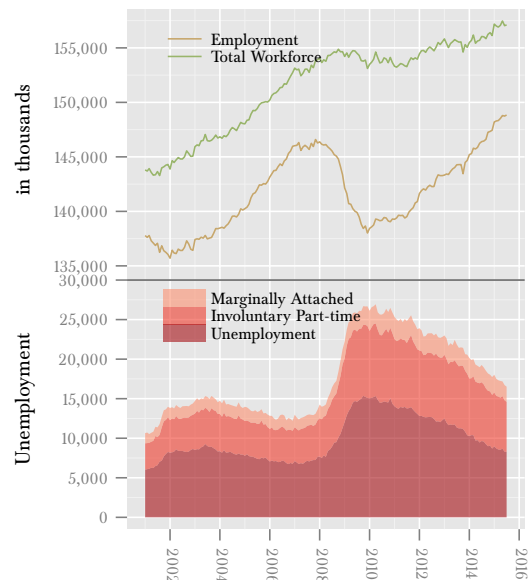
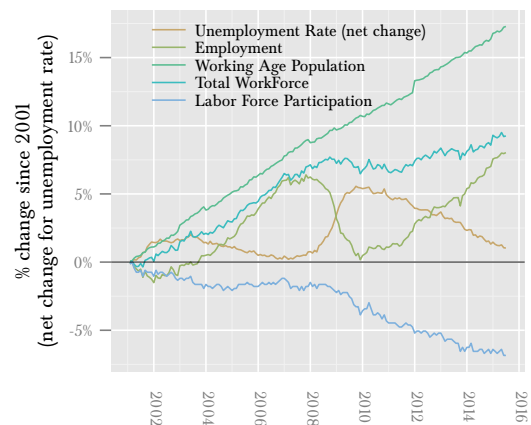


Figure 4: Labor Market Indicators



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, some analysts have suggested that the recent decline in participation may be part of a longer-term decline starting in the late 1970s and pausing during the 1990s. If so, and there are no potential workers waiting on the sidelines, then the recent growth in employment should put pres-

sure on wages—and inflation—very soon.

Recent real wage estimates suggest that there is currently little upward pressure on wages, with real wages increasing 2.1 percent from August 2014 to August 2015, about the same as they have since 2013 and only slightly higher than 2010-2012.

**Inflation**

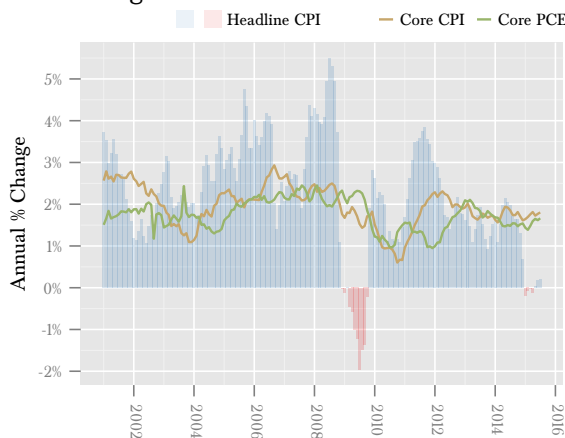
The inflation outlook for 2015 has deteriorated significantly since the March forecast, with analysts downgrading the outlook from two percent to below one percent. The FOMC has also reduced its outlook, from a range of 1.0-2.2 percent in its December Summary of Economic Projections, to a range of 0.6-1.5 percent in its March Projections and further down to 0.6-1.0 percent in its June Projections. The consensus among forecasters, including the FOMC, hasn’t changed for the outlying years, with inflation rates of around two percent still expected.

Figure 5 shows several measures of the U.S. inflation rate. It is notable that the headline CPI has only recently become positive again. This is largely due to the sudden fall in oil prices, which are excluded from the ‘core’ measurements.

sure of inflation. The PCE shows that long-term inflation has been at or below the two percent target since September 2008 (83 consecutive months).

Estimates of expected long-term inflation—derived from the behavior of bond and other financial markets—appear to range between 1.2 and 1.6 percent.

Figure 5: U.S. Inflation Indices



The FOMC uses the core Personal Consumption Expenditures (PCE) index as the guiding mea-

## Interest Rates

Two weeks ago, I argued that a Federal Reserve decision to raise rates in September would be a serious mistake. As I wrote my column, the market was assigning a 50 per cent chance to a rate hike. The current chance is 34 per cent. Having followed the debate among economists and Fed governors and bank presidents I believe the case against a rate increase has become somewhat more compelling even than it looked two weeks ago.

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*Lawrence Summers*  
President Emeritus and Charles W. Eliot  
University Professor  
Harvard University

Monetary policy, too, operates with a lag. If the Fed waits for full employment and then has to throttle back sharply, there will be a nasty shock. The upcoming Fed meetings present a timely opportunity to start slowing down the engines, however slightly, so as to maintain the confidence of markets, businesses and consumers alike.

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*Richard Fisher*  
Former President  
Reserve Bank of Dallas

Seldom in U.S. history has it been so inexpensive to borrow money. Interest rates have remained at record lows while the Federal Reserve has continued to hold the funds rate in the 0.0-0.25 percent range since December 2008. Since 2008, the Fed has pledged to keep rates near zero until it judges that there has been sufficient progress toward its dual-mandate of maximum employment and two percent inflation.

More recently, however, pressure has been building to increase interest rates. 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, but 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 the asymmetrical risk of raising rates too quickly could further undermine the weak recovery we have experienced.

The question of whether or not to raise interest rates is so 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, the opposite is true, a decrease in interest rates will expand investment, employment, wages, and consumer credit.

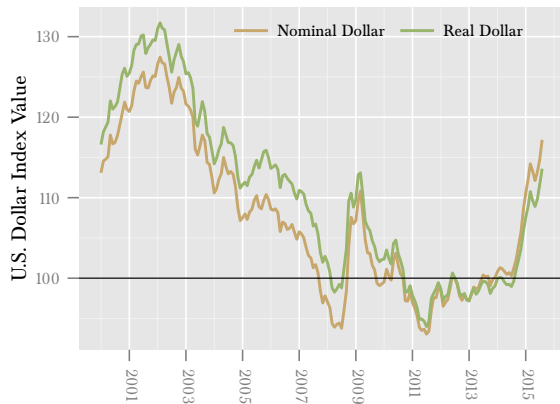
Given the arguments around whether to raise rates sooner rather than later, analysts have been closely examining both current and expected inflation rates and dissecting any official FOMC statements, as well as statements of individual members, in an attempt to divine when rate rises will begin. There was strong speculation that rate rises would begin in September, given the statement from the June 2015 FOMC meeting: “the Committee expects inflation to rise gradually toward 2 percent over the medium term...” However, with the poor first quarter, and expected third quarter, GDP growth and low inflation outlook for the remainder of the year, many experts, including at the IMF and World Bank, suggest that the FOMC should hold off until it is clear that rate changes will not derail the recovery.



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

The trade-weighted U.S. dollar index has climbed dramatically, increasing by more than 20 percent since mid-2014. (Figure 6).

Figure 6: Trade-Weighted U.S. Dollar Index



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) have subtracted 3.8 percent from GDP growth over the last year and a half. It is likely that this would have been a much larger impact if not for the expansion of U.S. oil production, which has offset 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.

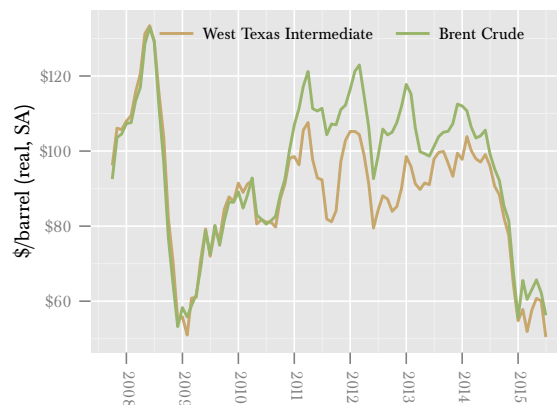
### Petroleum

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 \$50/barrel in July 2015. Broadly, a drop in oil prices acts like a tax cut for consumers and can encourage consumption; however, current data suggests that households are saving the wind-fall instead of spending it just yet.

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 7: 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 between Greece and its eurozone creditors that averted (at least temporarily) a Greek default or exit from the euro. Unfortunately, it appears that Greek debt will not be repaid without significant restructuring because it simply cannot grow fast enough to maintain or resolve the debt, though there seems to exist little political will within Europe to restructure.

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 impossible to identify significant tangible effects on the U.S. economy.

## China

China is a major export market for logs and lumber from the Pacific Northwest. The Seattle Customs District sent China 324 mmbf of softwood logs (out of a total regional export volume of 493 mmbf) and 109 mmbf of softwood lumber (out of a total of 474 mmbf) in 2012. 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 seven 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 7.4 in 2014. The IMF forecasts a further decline to 6.8 percent in 2015 and 6.3 percent in 2016.

The recent (and continuing) dramatic stock

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

There is growing concern that the above 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. Investment is almost 50 percent of China's GDP. A debt crisis would undermine that investment, which would have an out-sized effect 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 to do this are impeded by entrenched interests.

## Japan

Japan is another major export market for the Pacific Northwest—importing 68 mmbf of softwood logs and 153 mmbf of softwood lumber from the Seattle-Snohomish customs district in 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.

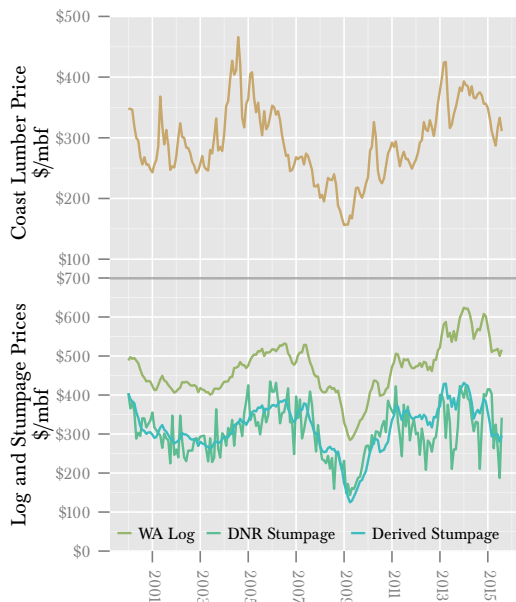
These policies were initially well received by the Japanese, judging by increasing consumer confidence and GDP growth. However, GDP in 2014 actually shrank by 0.1 percent and the IMF expects weak growth of 1.0 and 1.2 percent in 2015 and 2016, respectively.

On the other hand, it appears that Japan may be escaping from the deflationary spiral, with CPI growing by 2.7 percent in 2014 and positive inflation projected for 2015 and 2016.

## Log, Lumber, and Stumpage Prices

Over the past decade, timber stumpage revenue have constituted over 75 percent of total 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 8: Lumber, Log and Stumpage Prices in Washington

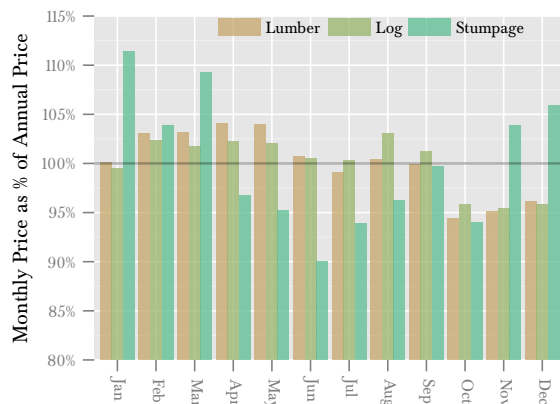


In general, timber stumpage prices reflect demand for lumber and other wood products; timber supply; and regional lumber mill capacity. There is a consistent, positive relationship between log prices and DNR’s stumpage prices, despite notable volatility in stumpage prices (Figure 8). High log prices make access to logs more valuable and increase purchasers’ willingness to pay for stumpage, or the right to harvest. Volatility in stumpage prices arises not only from log prices, but also from the amount 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 relationship between lumber prices and log prices is less consistent. Lumber prices are significantly more volatile and both the direction and size of price movements can differ from log prices. This is due to both demand and supply-side factors. On the demand side, mills will often have an inventory of logs in their yards, as well as an inventory of standing logs, so they do not always need to bid up log 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 9. 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 lowest from August through September.

Figure 9: Lumber, Log, and DNR Stumpage Price Seasonality



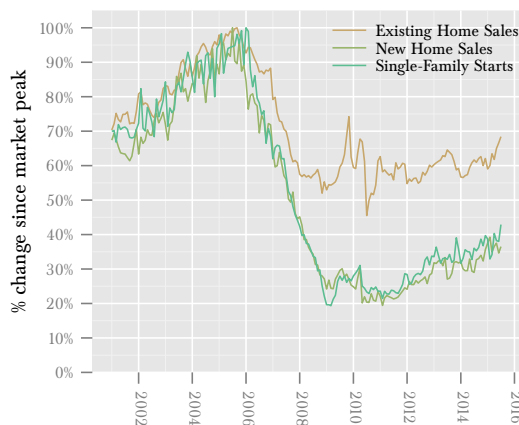
### U.S. Housing Market

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.

The crash in the housing market and the following recession drastically reduced demand for new housing, which undermined the total demand for lumber (Figure 10). Since the trough from 2009-11, the lumber demand for residential construction has increased slightly, due to an increase in housing starts. Prolonged growth in starts is essential for a meaningful increase in the demand for lumber.

Figure 10: Home Sales and Starts as a Percentage of Pre-Recession Peak

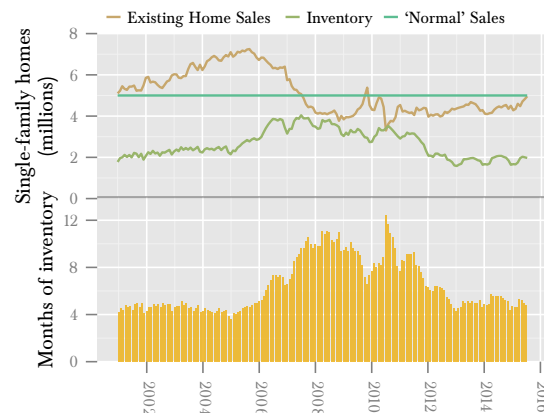


A number of measures suggest that the modest recovery in housing demand, which was driven by new home sales, has resumed after stalling through late 2014. In July, new single family sales were up 26 percent year-on-year, up 5 percent from June. Housing demand has remained subdued due to tight lending standards, weak labor markets, and declining real wages for much of the population.

### Existing Home Sales

Existing home sales plummeted during the recession and have remained stagnant at around 4.5 million (SAAR) units per month (Figure 11).

Figure 11: 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. The current inventory, which has averaged around two million since 2012, suggests that demand for existing houses is, on average, matching well with supply.

After house prices fell in the recession, private investors moved into depressed housing markets and purchased large numbers of lower-priced foreclosed residential properties. These investors have helped drive demand and may have set a floor under several key urban housing markets. Investor purchases appear to have fallen slightly since the beginning of 2014, when they represented more than 20 percent of home sales. There is concern among analysts about the potential impact on house prices if investors were to begin selling en-masse and increase 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.

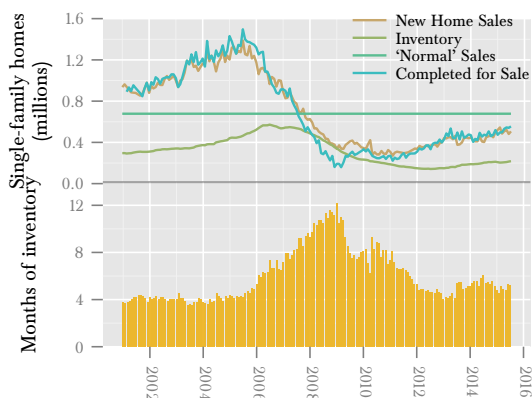
It is notable that monthly sales have been in-

creasing since the beginning of 2015 and in July were higher than they have been since 2010.

### New Home Sales

Unsurprisingly, new home sales also plummeted during the recession, reaching a record low of 306,000 in 2011 before beginning a slow rise (Figure 12). New home sales have increased from 440,000 in 2014 to 510,000 (SAAR) thus far in 2015, still well below the long-term (1963-2010) ‘normal’ rate of 678,000 sales per year.

Figure 12: 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 out-paced sales. However, both sales and construction are still well below ‘normal’ levels.

### Shadow Inventory

The inventories of existing and new homes discussed above are made up of those housing units that are currently listed for sale (‘on the market’). While it exists even in normal times, there is also a ‘shadow inventory’ that gained attention after the recession as an important measure of the health of the housing market. The shadow inventory comprises homes not currently on the market, but ex-

pected to be listed in the next few years. The shadow inventory usually includes the number of properties currently in the process of foreclosure, properties with seriously delinquent mortgages, and properties owned by banks or real estate firms. A large shadow inventory can drive distressed sales (including short sales), put downward pressure on prices, and stifle housing starts.

The shadow inventory has been declining for some time. Serious delinquencies have declined from 1.66 million in August 2014 to 1.30 million in July 2015. During the same period, the number of houses in the process of foreclosure fell from 629,000 to 469,000 and completed foreclosures fell from 45,000 to 38,000.

### Household Formation

Household formation (or the growth in the number of households) is the 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 occasioned, 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 ana-

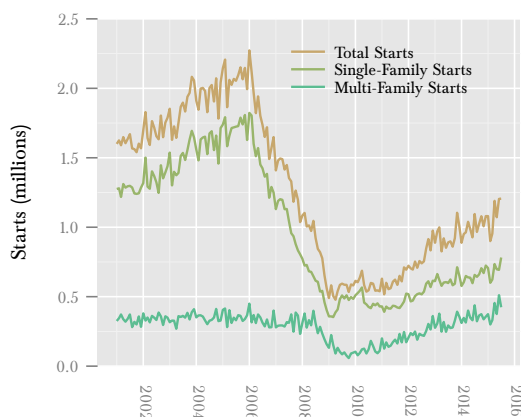
lysts in the past several years has been around how there is a large, and growing, pent-up demand as more young adults want to move out and create their own households. Analysts have consistently overestimated its impact on the housing market, repeatedly predicting a strong rebound in household formation 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.

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 affordability. Despite these necessary conditions, analysts are forecasting formations around 1.1-1.2 million for the next couple of years.

### Housing Starts

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 13). In April 2009, U.S. housing starts fell to an all-time record low since the Census Bureau began tracking housing starts in 1959. In 2014 there were around 1.0 million starts, while 2015 is forecast to increase modestly to 1.1 million and 2016 is forecast to be around 1.3 million.

Figure 13: Housing Starts



The dependence of total housing starts on multi-family units is a new development since the recession. It is notable because multi-family structures use much less lumber than single-family houses per unit, so the increase in overall starts has had a more muted effect on timber prices than historical starts increases.

The outlook for housing starts in 2015 is fairly positive, despite first quarter starts being dragged down by severe weather. Continued 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 housing.

Impediments to increased housing starts include the sentiment of construction companies, who report being very wary of building more houses until demand clearly picks up, and supply impediments, such as the lack of buildable lots or problems getting permits in a timely manner. Given the lead time necessary to build houses, these could cause some volatility in both prices and supply.

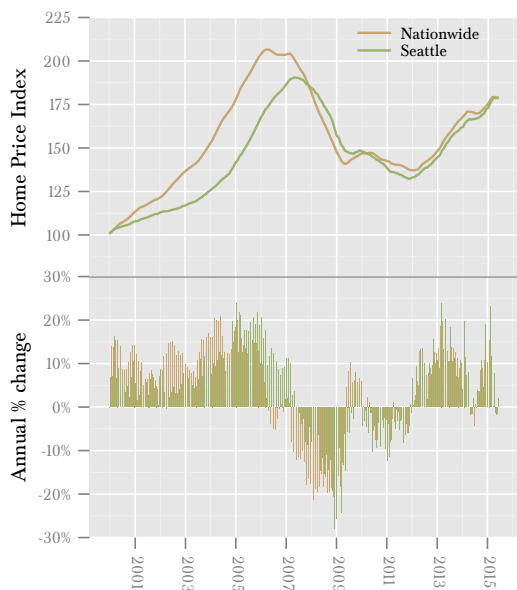
### Housing Prices

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

Seattle house prices are following a similar trajectory to national prices, having increased 7.3 percent year-on-year as of July 2015. When Seattle prices bottomed in February 2012—at their lowest point since June 2004—the average existing house

in Seattle was worth only 70 percent of the May 2007 peak. As of July, the average Seattle home was worth 94 percent of its peak price.

Figure 14: Case-Shiller Existing Home Price Index



An increase in prices would allow the return to more normal foreclosure conditions, in which homeowners are able to make rational decisions about when or whether they wish to sell—as opposed to being forced to sell or to remain ‘underwater’ to avoid selling at a loss or compromising their credit.

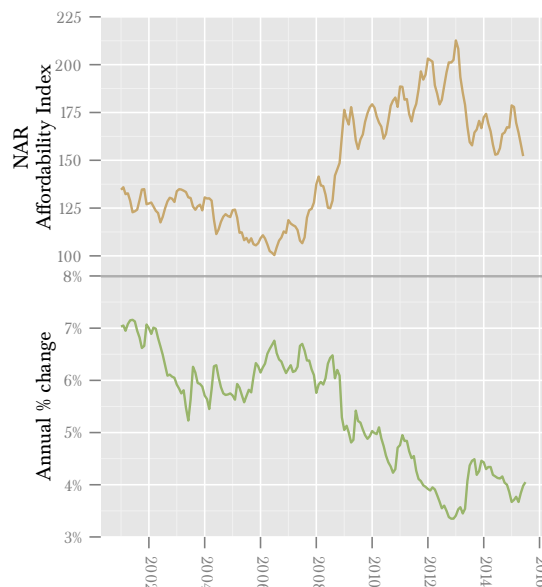
### Housing Affordability

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.

Affordability peaked at a record high of 208 in February 2013 and then crashed to 156 in August of that year—its steepest decline in 30 years—on the back of increased interest rates and house prices (Figure 15). Following that decline the index rose and fell as housing market sentiment oscillated be-

tween bullish in the wake of price increases, and bearish as buyers withdrew and interest rates increased. From August 2014 the index increased on the back of declining mortgage rates and increases in the median wage, but has fallen since January due to a roughly 16 percent increase in prices, a 0.15 percentage point increase in mortgage interest rates, but only a one percent increase in the median income.

Figure 15: Housing Affordability



The income needed to purchase a house is growing much faster than actual annual incomes. For now, low mortgage rates are offsetting this, but this trend cannot continue indefinitely, either price growth will need to slow or incomes will need to rise. The urgency for this type of adjustment will increase when mortgage interest rates begin to rise.

### 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 16). The export premium exists primarily due to the characteristics of the export markets, which can include a demand for higher quality wood, a high value placed on long-term contracts, and high transaction costs.

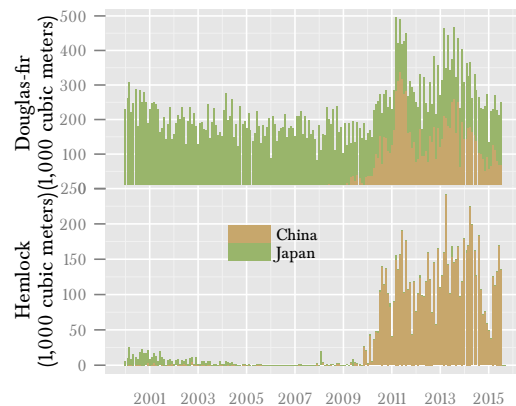
Note that the export prices shown in Figure 16 are weighted by DNR’s typical species mix, not species mix of actual export volumes.

Figure 16: Lumber Export Prices



Since 2010, demand from China has been a major support of 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 has continued into 2015, with Douglas-fir log exports down 47 percent through July and Hemlock (and other whitewood) exports down 37 percent (Figure 17).

Figure 17: Lumber Export Volume



In May, China re-entered the North American lumber and Hemlock log markets, but did not come back to the Douglas-fir markets with their previous gusto, and forecasters expect demand to remain elevated in the near term. Further out, market analysts expect the export premium 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, though much will depend on supply constraints from key international suppliers and transportation constraints from the south eastern U.S..

## Timber Supply

Timber supply is up in the Coast region, as well as in the competing U.S. Inland and South timber regions, because timberland owners reduced harvests during the recession in response to low prices. 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 have constrained the growth of the timber inventory in that region. Thus the deferred volume in the Coast region is not as great as elsewhere. Harvesting on the U.S. West Coast reportedly exceeded growth in 2014, which will begin to deplete the stumpage inventory.

The timber resources of British Columbia have been devastated by the mountain timber beetle, which has affected about a third of the province's timber resources. This damage has increased British Columbia's timber supply since 2007: timber killed by beetles must typically be harvested between 4 and 10 years after being killed, so the government increased the allowable harvest to ensure that the dead timber not be wasted. Analysts expect that British Columbia's elevated timber supplies will not fall until after 2015. 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 8, lumber prices have dropped precipitously since mid-2014 to April 2015. This was largely due to a bitterly cold winter across much of the U.S. causing weak domestic demand, ample local timber and lumber inventories, and the drop in export demand from China. Since May, futures prices have rebounded strongly as Chinese demand increased and housing starts resumed—though futures prices are not always the best indicator of prices in the Pacific Northwest.

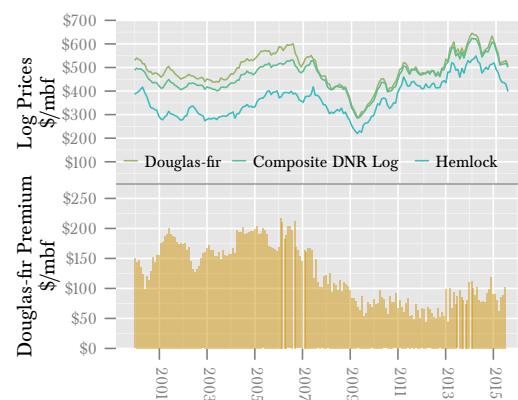
Lumber prices had a brief respite from their downward trajectory in June and July, but analysts expect prices to trend downward until the near the end of 2015. Prices may increase near the end of the year after dealers have run-down inventory and mills curtail production over the holidays. Until then, low prices are likely to remain the norm as the end of the construction season undermines demand.

Prices are expected to increase slightly in 2016 as consumption increases, dealer inventories are held cautiously low and mills' effective capacity remains constrained.

### Log Prices

Figure 18 presents prices for Douglas-fir, hemlock, and DNR's composite log. The latter is calculated from prices for logs delivered to regional mills, weighted by the average geographic location, species, and grade composition of timber typically sold by DNR. In other words, it is the price a mill would pay for delivery of the typical log harvested from DNR-managed lands. The dark green line for the DNR composite log price on Figure 18 is the same as the light green line on Figure 8.

Figure 18: DNR Composite Log Prices



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.

### Stumpage Prices

Timber stumpage prices are the prices that successful bidders pay for the right to harvest timber from DNR-managed lands (Figure 19). At any time, the difference between the delivered log price and DNR's stumpage price is equivalent to the sum of logging costs, hauling costs, and harvest profit (Figure 8). Subtracting the average of these costs from the log price line gives us a derived DNR stumpage price.

Stumpage prices from actual DNR timber sales in 2012 were generally lower than stumpage prices

inferred from log prices, which suggested 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. Since then prices have dropped well below the inferred stumpage, but rebounded in the most recent sales.

**DNR Stumpage Price Outlook**

There are slight downward adjustments to the annual stumpage prices throughout the forecast years (Figure 19). In FY 16 this is due to lower than expected first quarter stumpage prices at auction. In later years the drop in annual stumpage price is due to a change in the expected volume of sales between quarters, with some volume moving into quarters with lower expected prices. Aside from first quarter FY 16, we have kept our previous quarterly price forecast. 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 aver-

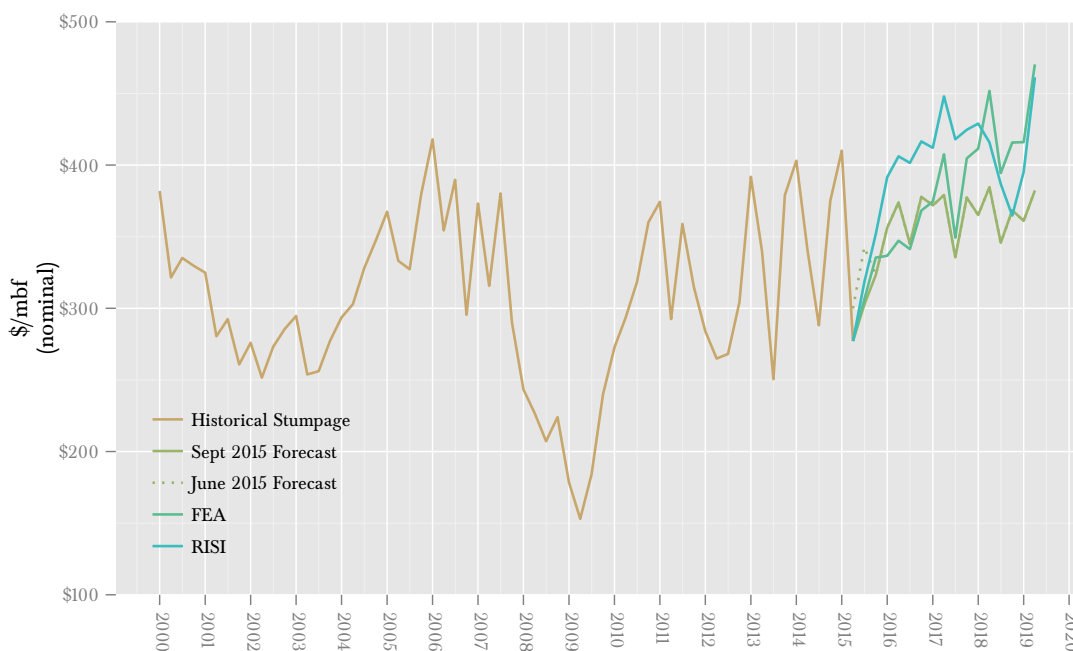
ages.

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 19).

Previously, the updated DNR Forecast represented a weighted middle ground between the two consultants’ outlooks, however, while the consultants’ outlooks have informed this forecast, we are taking a more pessimistic view with our spot price forecasts. These are still well within the range of likely stumpage prices, but are weighted to take a more cautious approach to the downside risks.

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

Figure 19: DNR Timber Stumpage Price



## DNR Revenue Forecast

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

### Timber Revenue

DNR sells timber through auctioned contracts that vary in duration. For instance, contracts for DNR timber sales sold in FY 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. As a result, timber revenues to beneficiaries and DNR management funds lag behind sales, are subject to purchaser's harvest decisions, and are likely based on their perceptions of market conditions.

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 as the timber is harvested.

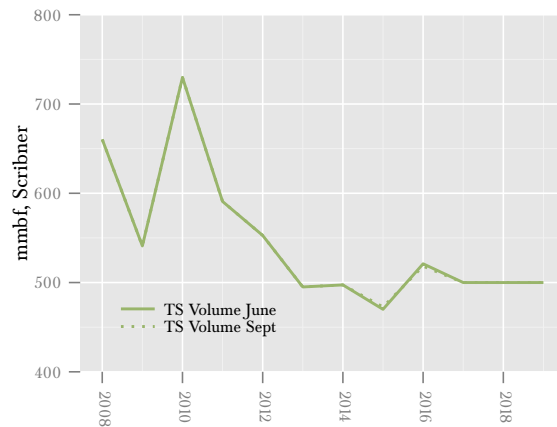
### Timber Sales Volume

Actual volume of timber sold in FY15 was 473 mmbf, three mmbf more than expected in the June forecast. These three mmbf have been pulled from the previous FY16 projection, resulting in a FY16 forecast of 518 mmbf. (Figure 20).

FY15 was the first year of the new sustainable harvest decade (FY15 through FY24) for western Washington; however, new harvest limits 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.

Figure 20: Forecast Timber Sales Volume



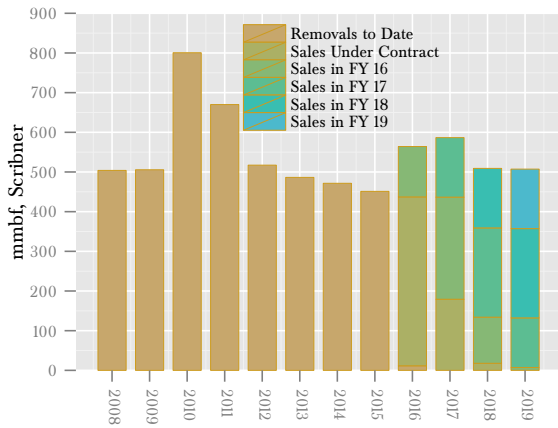
### Timber Removal Volume

Removals in FY15 were 451 mmbf, 19 mmbf more than expected in the June forecast.

At the end of August, the Department had 622 mmbf of timber under contract, valued at \$206 million, or \$331/mmbf. 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 426 mmbf of inventory volume in the remainder of this fiscal year, 179 mmbf of the existing inventory in FY17, and the remaining 18 mmbf in FY18 (Figure 21).

Including the survey responses, removals to date, and removals expected from future FY16 sales, about 564 mmbf will be removed in FY16, seven percent less than the June estimate of 608 mmbf. Due to the changes in harvest plans, our harvest forecasts have been increased to 587 mmbf (+29 mmbf) for FY17 and decreased to 509 (-12 mmbf) for FY18.

Figure 21: Forecast Timber Removal Volume



**Timber Sales Prices**

The price results of monthly DNR timber sales are quite volatile (Figure 8). As discussed in the stumpage price outlook, the DNR sales price (stumpage) forecast uses estimates from two forest economics consulting firms. Primarily because of lower than expected auction prices in the first quarter, FY16 prices are slightly reduced to \$344/mbf and outlying years are reduced slightly due to changes to sales volume timing. (Figure 22).

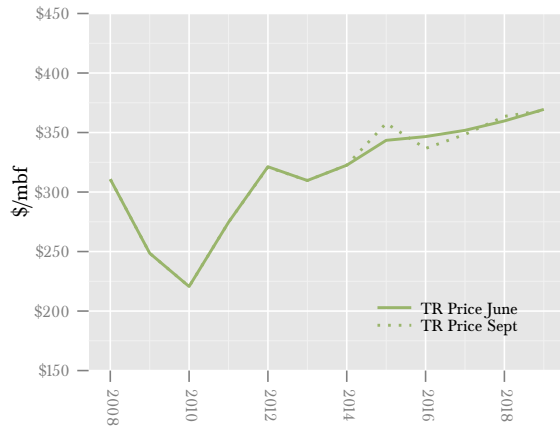
Figure 22: Forecast Timber Sales Price



**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 23).

Figure 23: Forecast Timber Removal Price

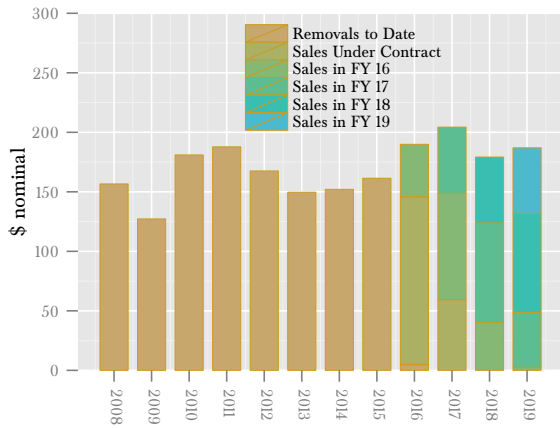


**Timber Removal Revenue**

Figure 24 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 August 1st, 2015). Removal revenue for FY15 was \$161 million, \$14 million more than forecast in June, due to higher than expected removals. Expected removal value for FY16 is reduced by around \$21 million, to \$190 million, due to the lower removal prices and volume. FY17 removal value is increased to \$204 million, because the increase in expected volume outweighs the expected decrease in price.

The 2013-2015 biennium timber revenues was \$313 million (Figure 25). For the 2015-2017 Biennium, forecast timber removal revenues are projected to decrease by 3.1 percent to \$394 million.

Figure 24: Forecast Timber Removal Value



### 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 only change to forecast uplands revenue is for dryland agriculture in FY 16. Dryland agriculture revenue relies heavily on sales of wheat grown on DNR managed lands. DNR takes possession of the wheat and sells it throughout the marketing year. At the end of FY 15 DNR had around 70,000 bushels of wheat remaining, which was not expected to sell before the new fiscal year. However, in late June, prices jumped and DNR sold all of its remaining wheat, moving \$0.6 million we expected in FY 16 back to FY 15 (Figure 26).

Figure 25: Forecast Timber Removal Revenue

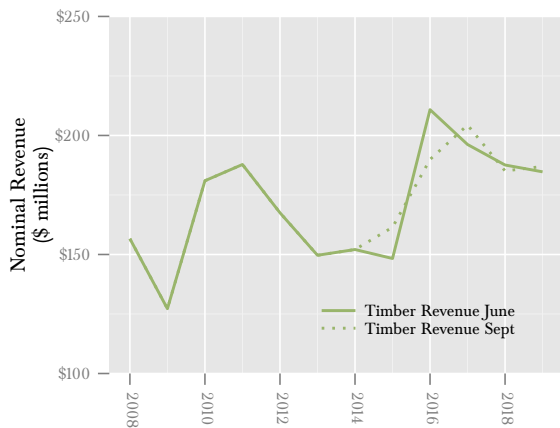
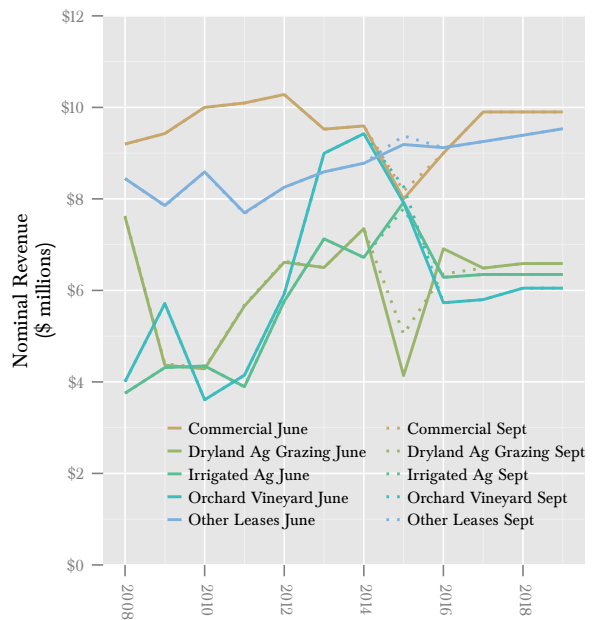


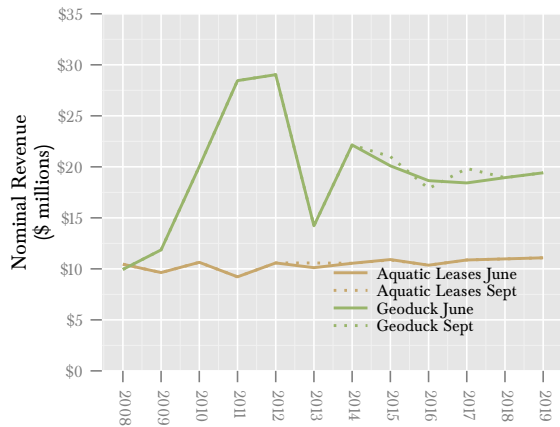
Figure 26: Forecast Upland Lease Revenue



### Aquatic Lands Revenues

The expected revenue from geoduck marketing is decreased by \$0.8 million in FY16 and increased by \$1.4 million due to changes in the expected timing of auctions, though the predicted price is unchanged (Figure 28). FY16 and 17 aquatic lease revenue is unchanged (Figure 27).

Figure 27: Aquatic Lands Revenues

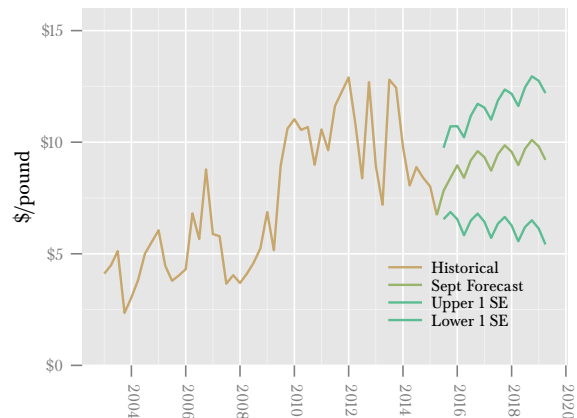


There are significant downside risks to geoduck revenues, even in the near term, that are important to consider but difficult to forecast:

1. Harvests (and therefore revenues) could be deferred or lost if geoduck beds are closed due to occurrence of PSP toxin.
2. A further slowdown in China’s economic growth could lower demand for this luxury export in its largest market.
3. 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.

Importantly, if none of the downside risks eventuate, it is quite possible for geoduck prices to be much higher than expected, given its historic volatility. On balance, the forecast is conservative given the range of likely prices given by our modeling.

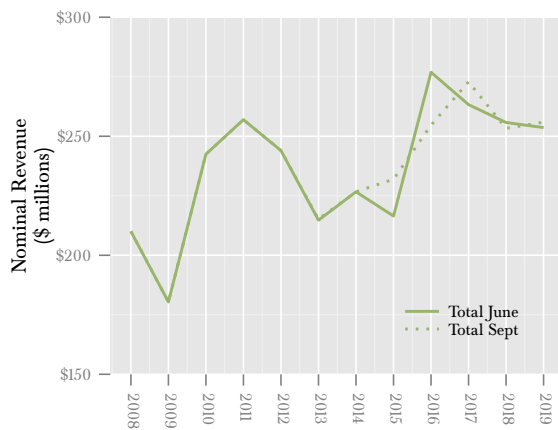
Figure 28: Geoduck Auction Prices



### Total Revenues from All Sources

Total forecast revenues for the 2013-15 Biennium (FYs 14 and 15) were \$459 million, \$15 million more than forecast in June. Forecast revenues for the 2015-2017 Biennium (FYs 16 and 17) are reduced by \$13 million to \$528 million (Figure 29). Overall, most of the revenue change is driven by a change in planned timber harvests and timber sales prices.

Figure 29: Total Revenues



### Some Caveats

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

As events and market conditions develop, DNR will incorporate new information into future Forecasts. We judge the downside to the overall forecast to be slightly greater than the upside because of the risks to the timber sales volume (and therefore to timber removal volume and revenues) as well as the ongoing weakness and vulnerabilities of the U.S. and world economies that affect the housing market, and therefore stumpage prices.

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 FY15 by trust, and relative historical timber prices by DNR region by trust; and
- The volumes of timber by trust for FYs 15-17 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 Account (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 2015	FY 2016	FY 2017	FY 2018	FY 2019
FDA	25	25	25	25	25
RMCA	29	31	31	29	29

## Appendix: Comparison of Forecast and Actual Values 2013-2015 Biennium

At the close of a biennium, the Office of Budget and Economics publishes a comparison of all past projections with final realized values for each of the two years. We do this to assess forecast accuracy, and as an exercise in improving our understanding of the history of our projections and of the models underlying the forecast. This comparison is for the 2013-2015 biennium—FY 14 and FY 15.

The comparison is made graphically, via waterfall charts instead of within tables, to make changes between forecasts readily visible and easily understandable. The charts share the same order as the revenue sources and funds in the main tables of each forecast. We address major influences narratively.

### Waterfall Chart Guide

- The blue bar on the left of the chart is the initial projection.
- Red bars indicate a decrease in the projection from the previous forecast.
- Green bars indicate an increase in the projection from the previous forecast.
- The blue bar at the right is the final value for the fiscal year.
- The light blue shading at the top of the final value shows the difference between the final value and the last forecast. In the example below, the light blue signifies a final value lower than our last forecast in June. In some cases the light blue is above the final forecast value, meaning the realized revenue was higher than expected.

Figure 30: Example - University Bond

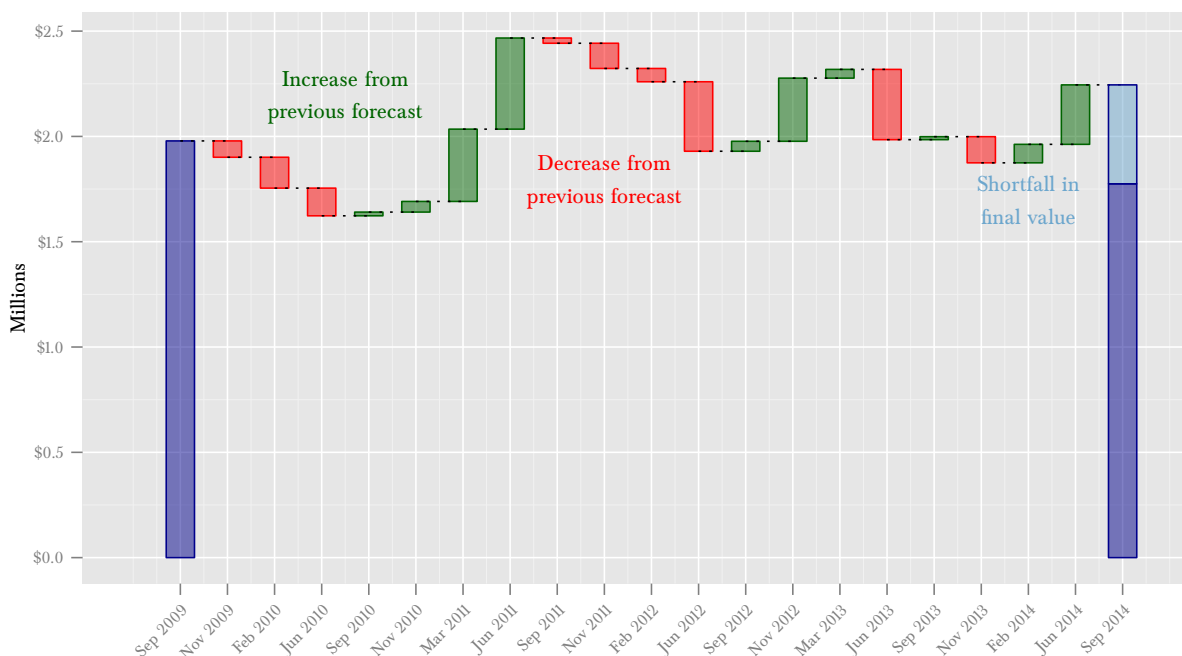
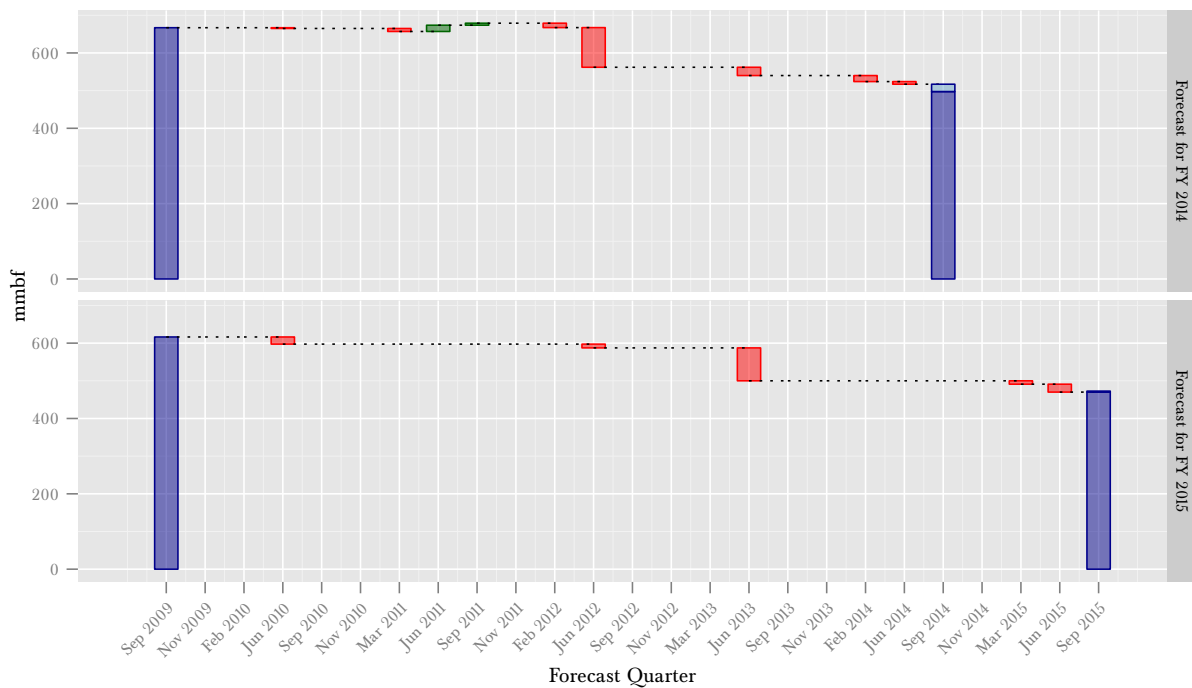


Figure 31: Timber Sales Volume



## Revenue by Source

### Timber Sales Volume

In September 2009 the initial timber sales volume forecast for FY14 assumed 588 mmbf from Western Washington and 79 mmbf from Eastern Washington, for a total of 667 mmbf. This was based on a sustainable harvest target of 550 mmbf from Western Washington for the FY 05–FY 14 sustainable harvest decade. However, in four of the first five years of the sustainable harvest decade DNR timber sales fell short of the sustainable target by 233 mmbf. It is unclear why the sales volume forecast for FY14 was so much higher than the sustainable harvest limit, but it is likely due to the cumulative shortfall as of FY 09.

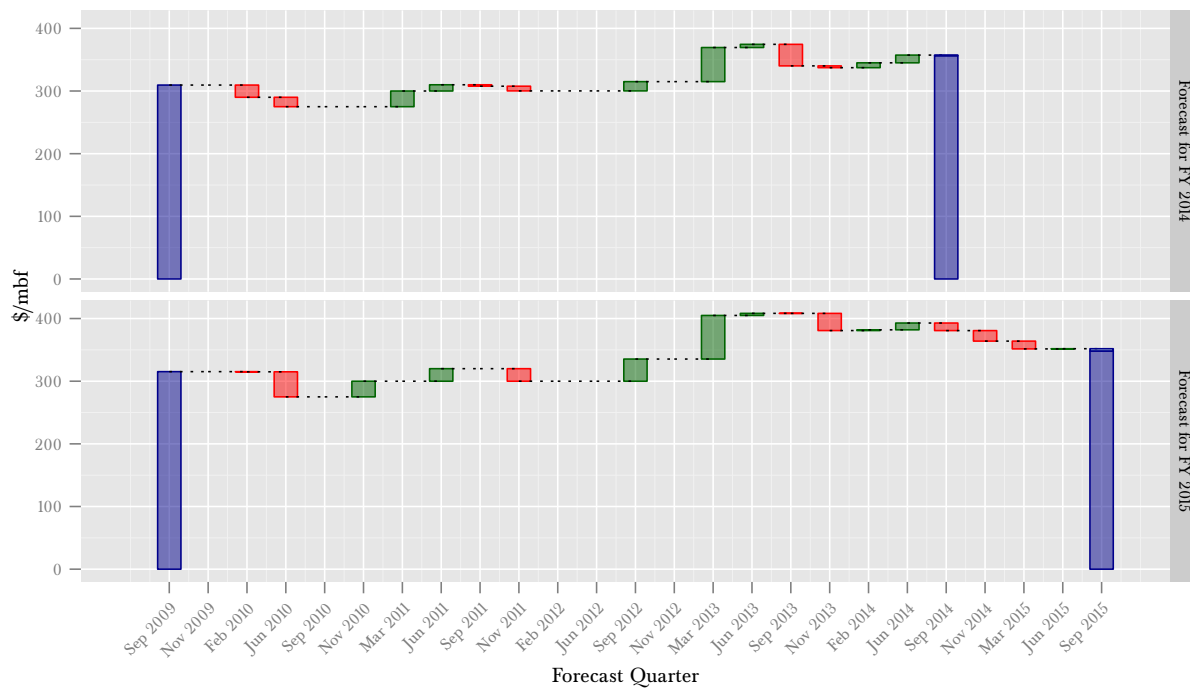
The initial forecast for FY15 was based on the second decade of the same sustainable harvest calculation, because a new plan had not yet been published. This limit assumed sales of 537 mmbf from Western Washington and 79 mmbf from Eastern Washington, for a total of 616 mmbf.

Sales in FY10 were higher than the average yearly target, leaving a cumulative shortfall of 128 mmbf in FY11. DNR planned on spreading that shortfall over the remaining years of the sustainable harvest decade. In June 2011, the FY14 sales volume forecast was adjusted upward based on an additional shortfall from sales in FY11.

In July 2012 the forecast sales volume for FY14 was dropped by 105 mmbf because it became clear that the decadal sustainable harvest target would not be reached. Prior to that revision, it appears that the sales volume forecasts were dictated by targets set by the sustainable harvest target, as opposed to reflecting likely sales volumes.

Forecast sales volumes were lowered dramatically for FY15 in June 2013; by then it had become clear that the placeholder value of 537 mmbf from Western Washington would be extremely unlikely. The

Figure 32: Timber Sales Price



more appropriate estimate of 450 mmbf was introduced at this time. Eastern Washington volumes were forecast to be 50 mmbf.

Both FYs 14 and 15 volumes were adjusted downward as the fiscal years progressed and more information was gained about the market through auctions and no-bids.

### Timber Sales Price

The initial forecast of timber prices assumed that a recovery in the housing markets through 2012 and 2013 would cause a steady increase in prices to \$282/mbf and \$305/mbf in FY 14 and FY 15 respectively. DNR adjusted these forecasts downward in the February and June forecasts of 2010 because the housing market was not recovering as quickly as expected.

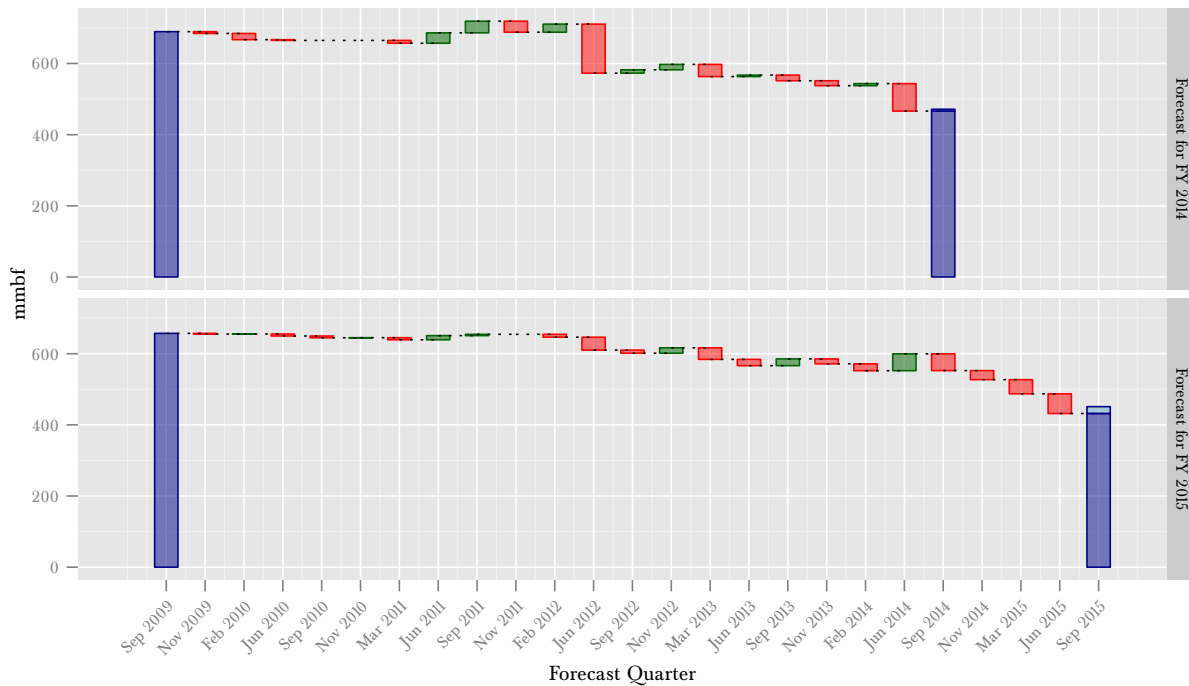
The increase in the November 2010 forecast of the FY15 prices appears to have been a mistake: the text of the forecast explains that the price was reduced to reflect continued pessimism about the housing market.

In early 2011 it appeared that demand from China was countervailing the downward influence of weak domestic housing demand. The corresponding increases in price expectations were tempered later in 2011 due to a slowdown in Chinese demand (which turned out to be temporary).

In September 2012, and again in March 2013, forecast timber prices were increased on the back of expected improvements in the U.S. housing market and in improved timber sales volume mix.

FY 14 prices were reduced in September 2013 because higher than expected thinning volumes had driven down prices to-date and they were expected to continue for several months. The FY15 price forecast was lowered in November 2013 due to predicted weakness in log prices through 2017, largely because of continued worries about the U.S. housing and labor markets.

Figure 33: Timber Removal Volume



Subsequent adjustments followed from updated information about prices received at auction and updated timber mix information.

**Timber Removal Volume**

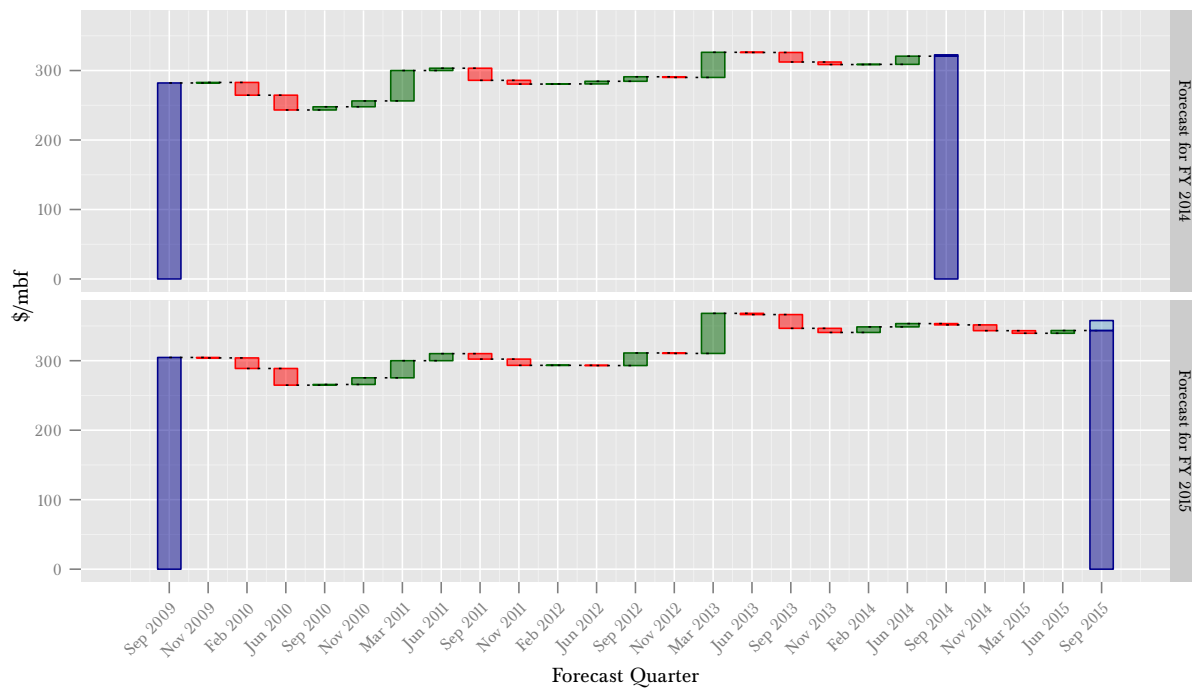
In June and September 2011 removal volume forecasts were increased to reflect higher expected sales volumes in FYs 12 and 13. It is unclear why this increase was reversed for FY14 in the November 2011 forecast; there was no change in expected sales or removal volumes for any of the preceding fiscal years. It appears to be an artifact of the assumptions behind harvest timing in future years. In both the September forecast and the November forecast, it was assumed that 30 percent of the remaining sales in FY12 would be harvested two years out: that is, in FY14. However, in the interim between September and November an additional 74 mmbf were sold, creating a situation where the FY14 removal volume forecast was forced down by an artifact of the assumptions of the model, not for any change in the underlying understanding or reality of the market. The same did not happen for FY15, because it was not assumed to have any harvest from FY12’s sales volume in either of those forecasts.

The reduction in the forecast FY14 removal volume was reversed in the February 2012 forecast based on a shift in the planned harvest timing of DNR timber purchasers.

The June 2012 reassessment of sales volume caused the dramatic drop in FY14 forecast removal volume.

The drop in projected removal volumes in the March 2013 forecast was due to a drop in the projected removals in the purchaser survey—purchasers were both bringing forward some harvest from the 2013-2015 biennium and pushing some out to the 2015-2017 biennium.

Figure 34: Timber Removal Price



The June 2014 forecast found purchasers harvested much less than they had planned in February 2014 and had pushed out their harvest plans to the next fiscal year (FY 15) and beyond.

In September 2014 the purchaser survey indicated that purchasers were further delaying harvest, out to FY 16, reducing expectations for volumes in FY 15. This downward trend in purchaser expectations continued through subsequent forecasts in FY 15.

### Timber Removal Price

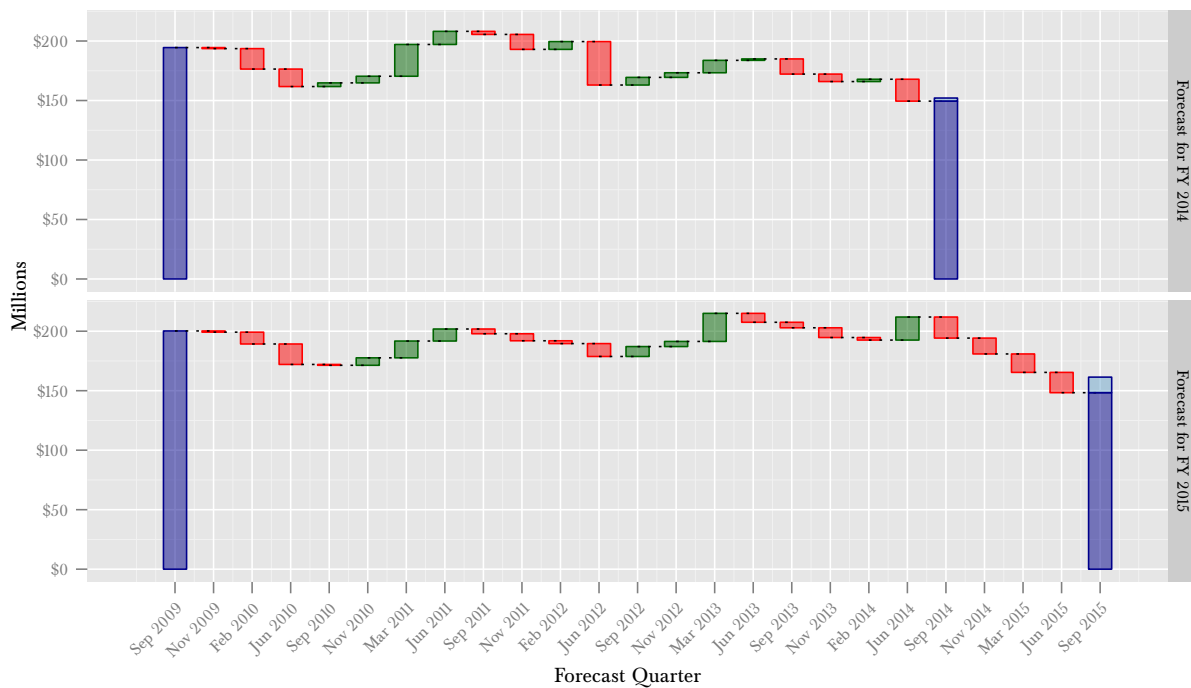
Timber removal price forecasts are a function of lagged sales price forecasts, or actual sales prices nearer to the forecast year, and the timing of harvests.

DNR’s economists increased the removal price forecast in March 2011 and 2013, both following an increase in sales prices forecasts.

### Timber Removal Revenue

Timber removal revenue is a direct outcome of the removal price and the removal volume at a given time; the causes of changes in revenue can therefore be found in those sections above.

Figure 35: Timber Revenue



## Agriculture and Other Uplands

For the agriculture revenue sources, we have reviewed the forecast for agriculture as an aggregate of agricultural revenue and other upland revenue, because this is the way it was initially presented in September 2009 (the first time FY14 revenues were forecast). Agricultural revenue sources were not broken out until the November 2013 forecast.

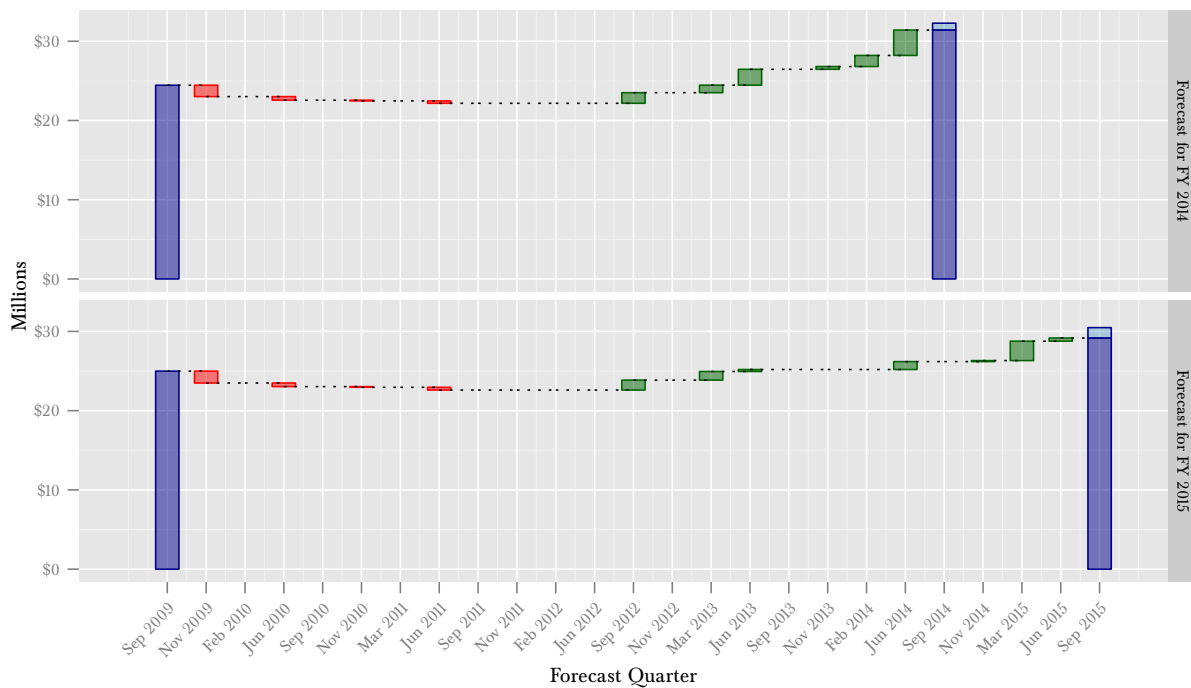
In the initial forecast for FYs 14 and 15, agricultural revenue was expected to increase linearly from the then-current level. This was immediately reduced in the November 2009 forecast due to lowered expectations for communication leases—because of a planned sale of communication equipment—and for mineral leases. A reduction in expectations for mineral lease revenues was incorporated in June and November of 2010 and again in September 2011.

Agricultural and other upland revenue was revised upward in September 2012 due to:

1. additional revenue from communication sites due to the cancellation of the equipment sale;
2. improved agricultural lease prospects due to a completed and an anticipated land acquisition; and
3. additional revenue from a new high-value rock pit lease.

Revenue forecasts were further increased in March and June of 2013 due to higher-than-expected commodity prices and revised revenue assumptions regarding land acquisitions. The February and June 2014 forecasts featured increased agricultural revenue from higher commodity prices (primarily from orchard leases).

Figure 36: Agriculture and Other Uplands



FY15 agriculture revenue expectations were increased in the March 2015 forecast due to strong irrigated, orchard, and vineyard revenues; these outweighed a drop in wheat revenue that stemmed from low prices and unsold inventories.

The June 2015 forecast was lower than the final FY15 revenue because we assumed no further wheat sales would occur. As the June forecast was written, wheat prices were near their nadir and there were no plans to sell the remainder of the 2014 crop—over 100,000 bushels—in that year. However, there was a short-lived spike in wheat prices and DNR sold the remaining wheat in the last five days of the fiscal year.

## Commercial

The initial forecast of commercial revenue for both FYs 14 and 15 was based on an assumption that revenue would continue unchanged from 2010. While the authors acknowledged that this was unlikely, the upside uncertainty was whether there would be any change in lease rates (which are slow to change) while the downside uncertainty was whether there would be any increase in vacancies. The authors thought that the downside risk was somewhat higher, but had no way to quantify it.

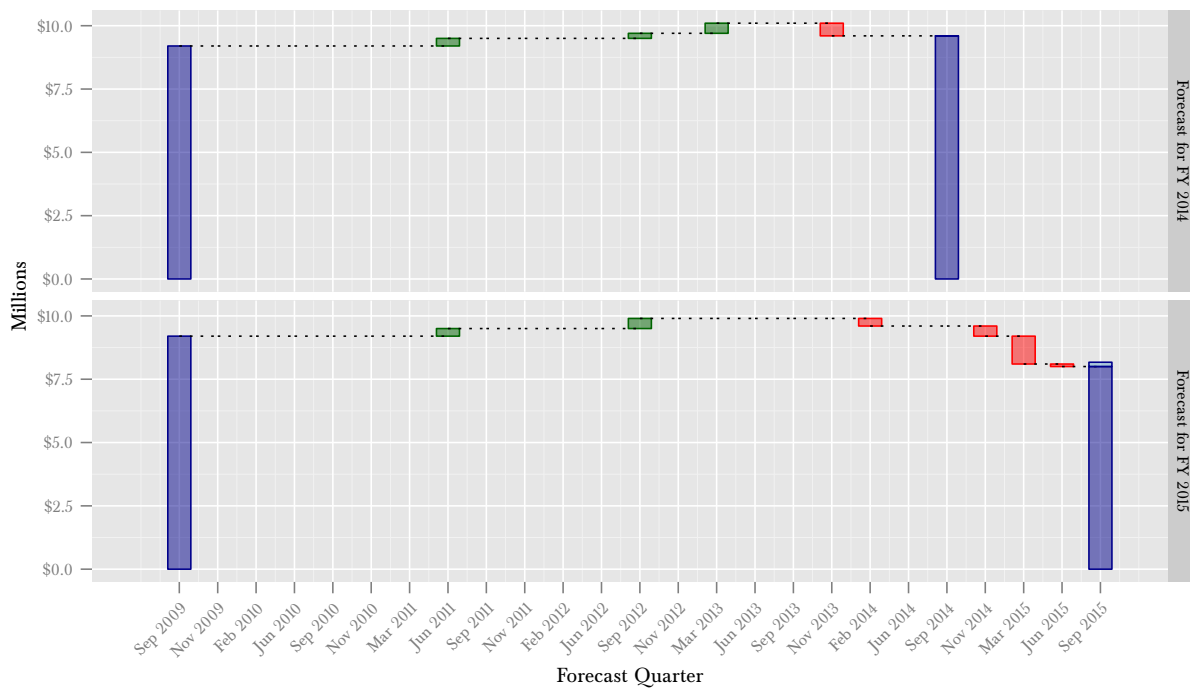
Revenue projections were increased in the June 2011 forecast based on realized revenue of around \$10 million in 2010 and 2011.

FY14 revenue expectations were increased in March 2013 due to a temporary lease that did not extend into FY15. Expected revenues were reduced in November 2013 and February 2014 due to vacancies lasting longer than expected.

FY15 revenue was reduced dramatically in November 2014 and March 2015 for a number of reasons. First was the revelation by the lease managers that a major lease was ending in January and that new



Figure 37: Commercial



tenants would need to do significant remodeling, meaning it was unlikely to be leased soon. Additionally, there were higher-than-expected vacancy rates in some buildings, rent was retained by a building manager for basic maintenance, and the cost of roof repairs for another buildiner were withheld from lease revenue.

### Aquatic Lands

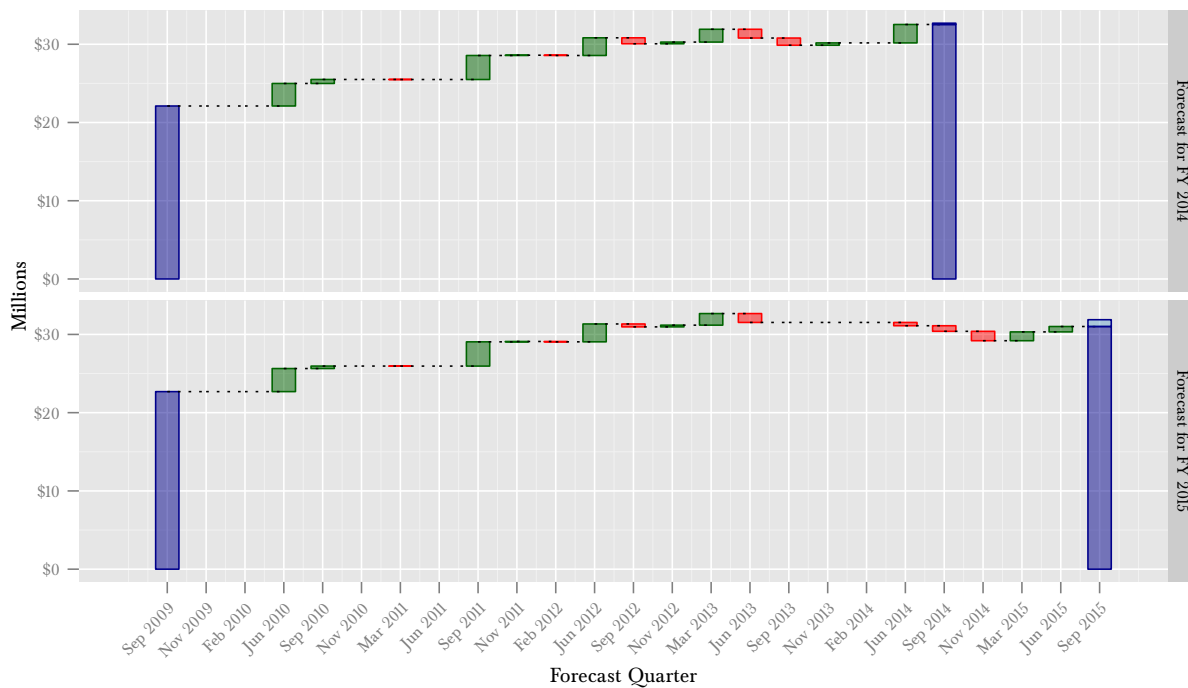
The initial forecast for aquatics revenue was based on slowly increasing revenues from aquatic leases and a near constant price and revenue for geoducks. By the September 2009 forecast, Geoduck prices had already increased well beyond their historical average. However, the DNR economists were cautious about increasing the forecast because of the historical volatility of geoduck prices.

Expected revenue was increased in June and September 2010, September 2011, June 2012, and March 2013 based on continued high prices for geoducks. Geoduck prices changed from their historical average so quickly and were so volatile that it was difficult for forecasters to get a handle on what they should consider the new normal.

In June the 2013 forecast, aquatic revenues were reduced slightly, primarily because of improved modeling techniques for geoduck prices. In September 2013, FY 14 expected revenues were reduced due to a smaller-than-expected volume of geoduck being auctioned.

In December 2013, the Chinese government banned shellfish imports from most of the West Coast of North America, citing health concerns. China is the major market for geoducks, so this announcement had the potential to devastate geoduck revenue. However, in the February 2013 forecast we left aquatic lands revenue unchanged, largely because harvester behavior indicated that the ban was porous—harvesters continued to harvest and had taken all of the poundage auctioned in November by the end of

Figure 38: Aquatic Lands



January. Additionally, the forecasts prior to February had featured somewhat conservative volume and price assumptions, so without better information the revenue forecast was held steady.

By the time of the June 2014 auction, it was clear that the risks to FY 14 geoduck revenue were not coming to pass and aquatic revenue expectations were increased accordingly.

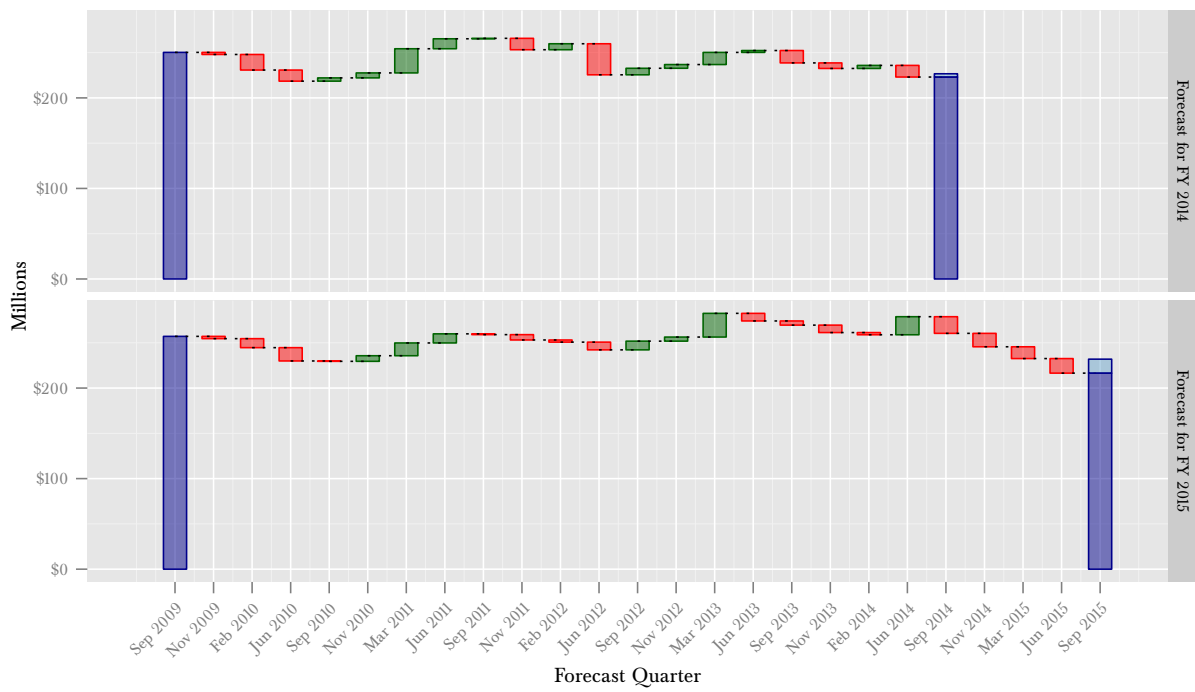
The gradual reductions in the revenue forecast for FY 15 aquatic lands revenue were due to a continued decline in geoduck prices. This was likely caused by two major developments. First, the continued weakness in the Chinese economy likely reduced the demand for geoduck. Second, geoduck divers successfully lobbied the government to restrict the number of geoduck licenses beginning in January 2015. In addition to ongoing discord between purchasers and divers, the diver entry restrictions may have lowered revenues by increasing diver wages.

Only in March 2015 were expectations increased due to a dramatic increase in the volume of geoduck planned for sale offsetting a sizable drop in expected geoduck prices.

## Total Revenue

Changes in total revenue are largely driven by changes to timber removal volume or prices because timber revenue is such an overwhelming proportion of total revenue. Figure 39 presents a summary of all of the foregoing forecast changes.

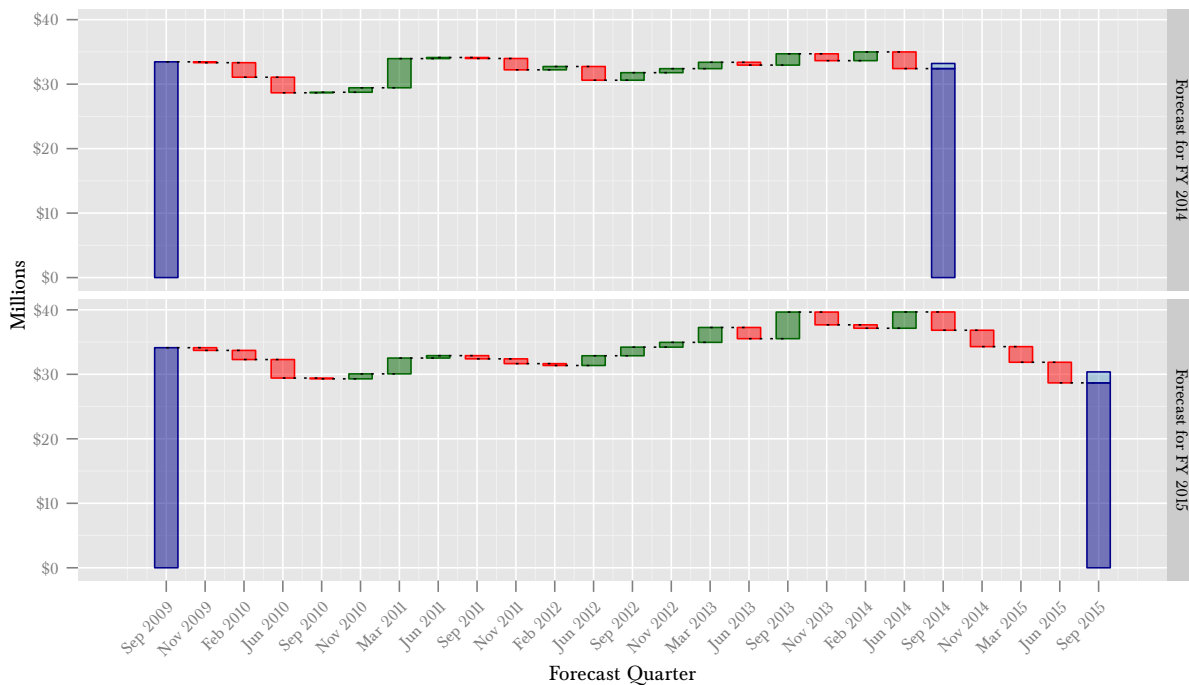
Figure 39: Total All Sources



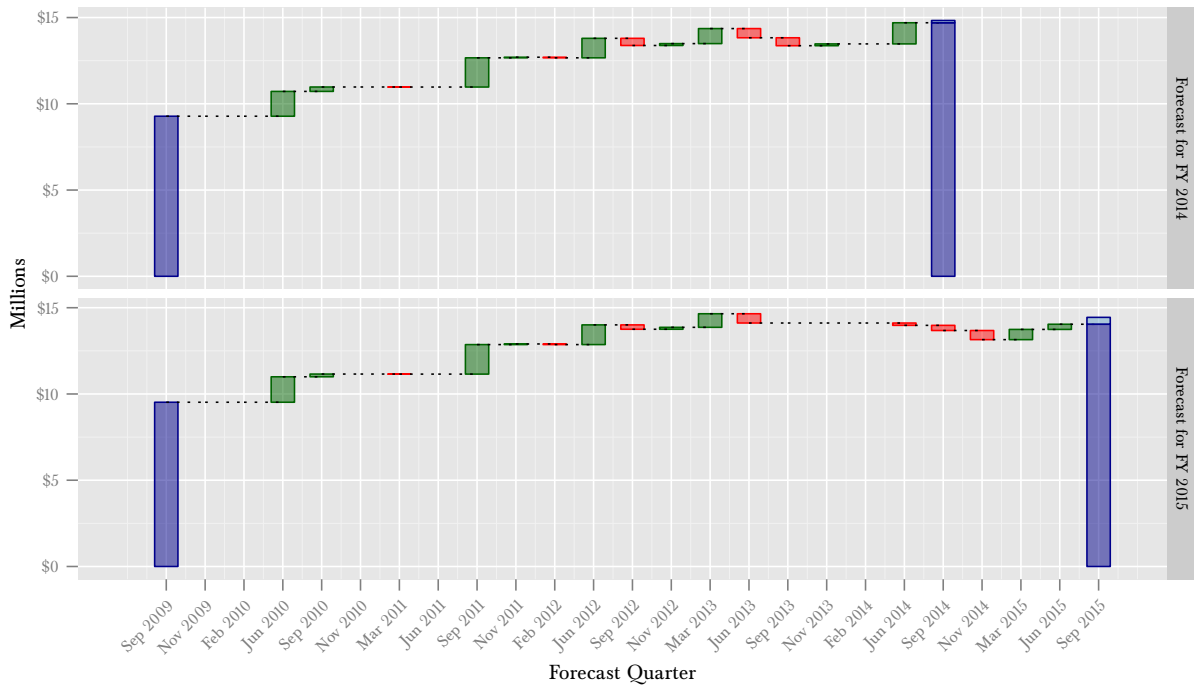
## Revenue by Fund

It is beyond the scope of this supplement to delve into the specific causes of changes to the fund revenue forecasts—the allocation of revenue from trust sources to funds is complex. Generally, funds will be affected by changes to total trust revenues but they may be affected unequally, largely because frequent changes in planned timber sales can significantly alter the planned sales from land managed on behalf of specific trusts. The following charts present the fund-side changes whose by-source causes were explained above.

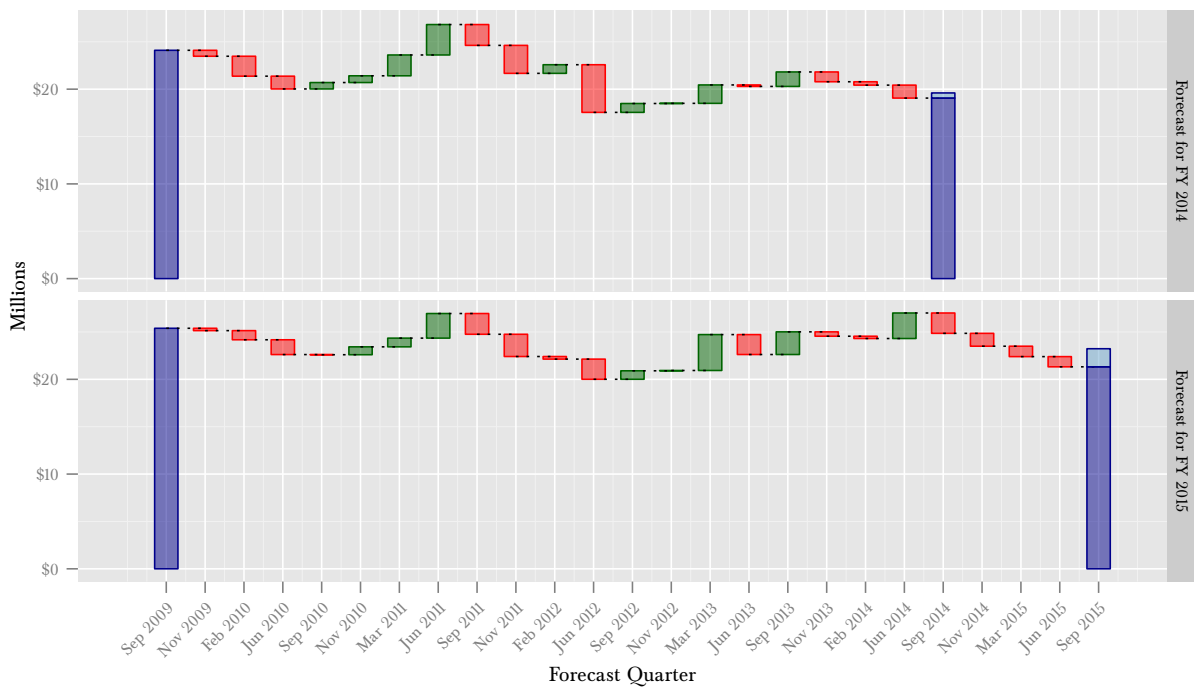
### RMCA Uplands



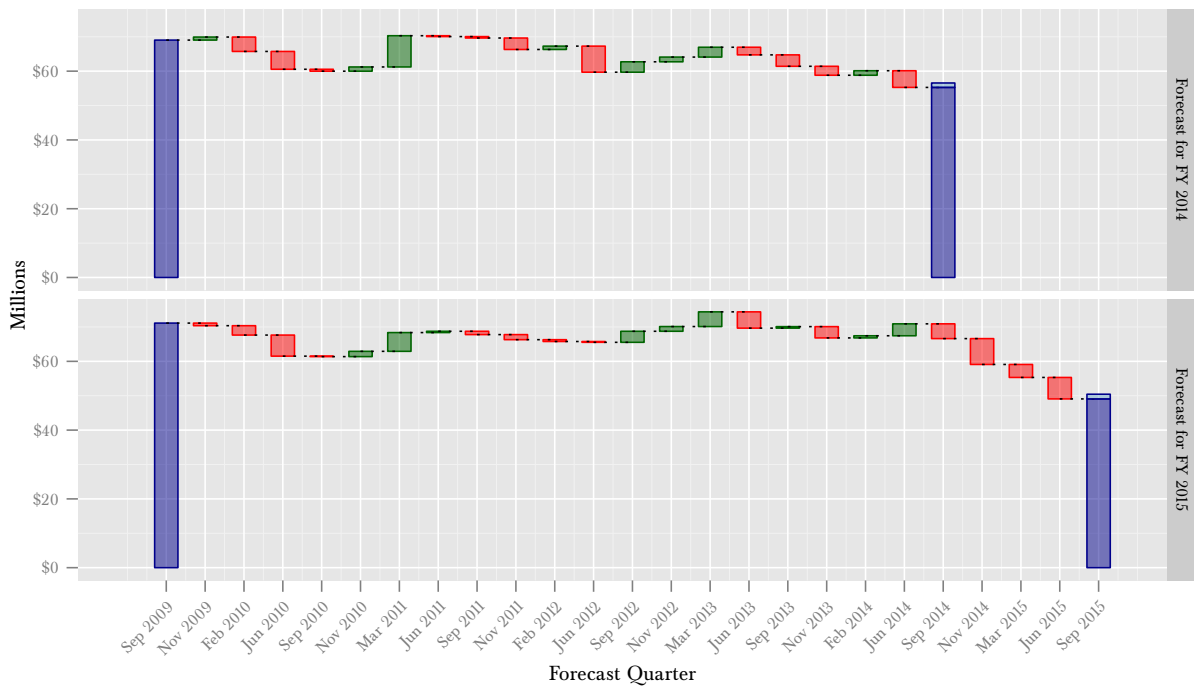
**RMCA Aquatics**



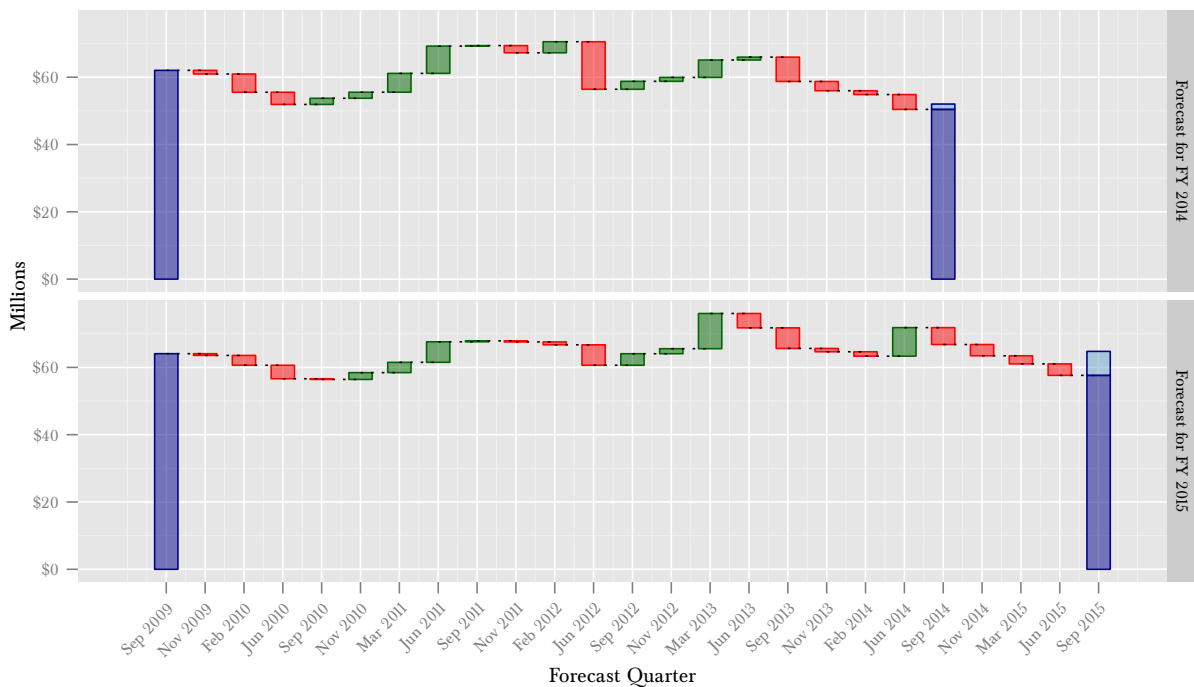
**FDA**



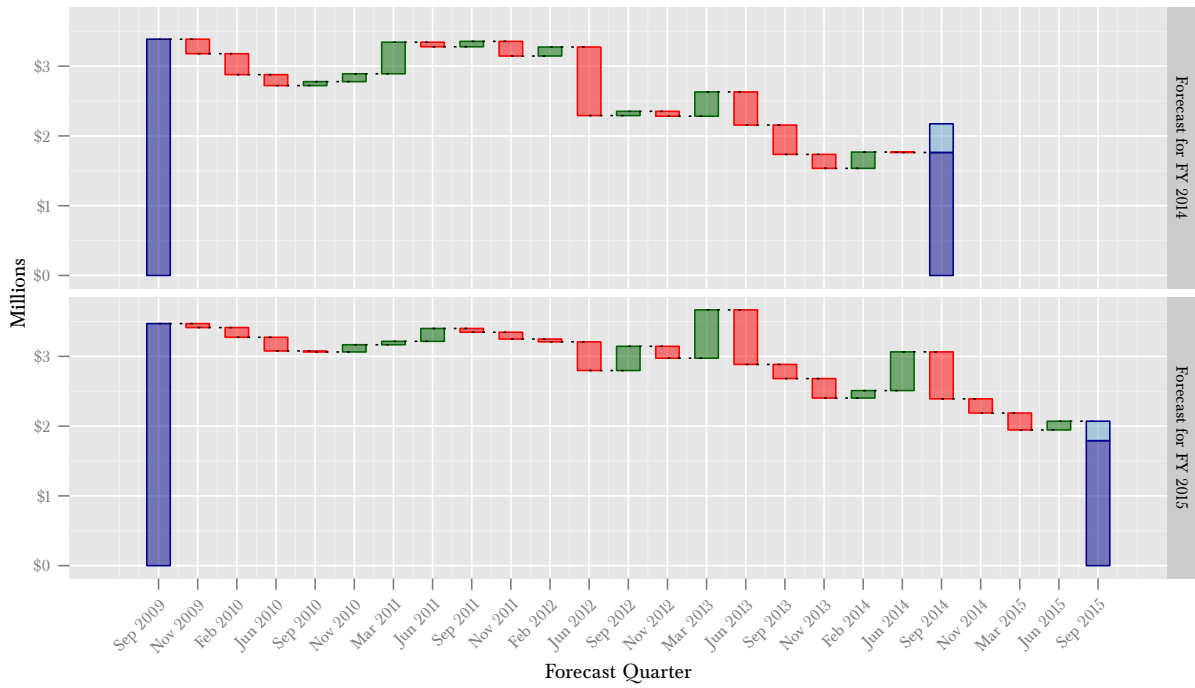
Common School Construction



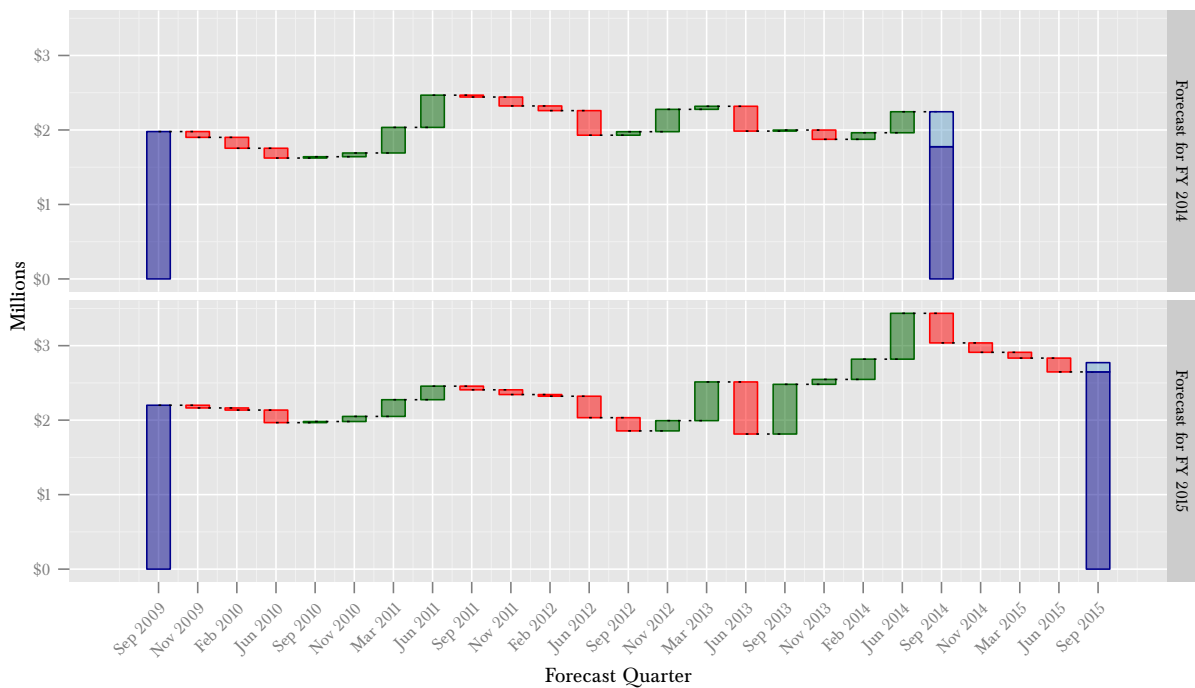
Forest Board Counties



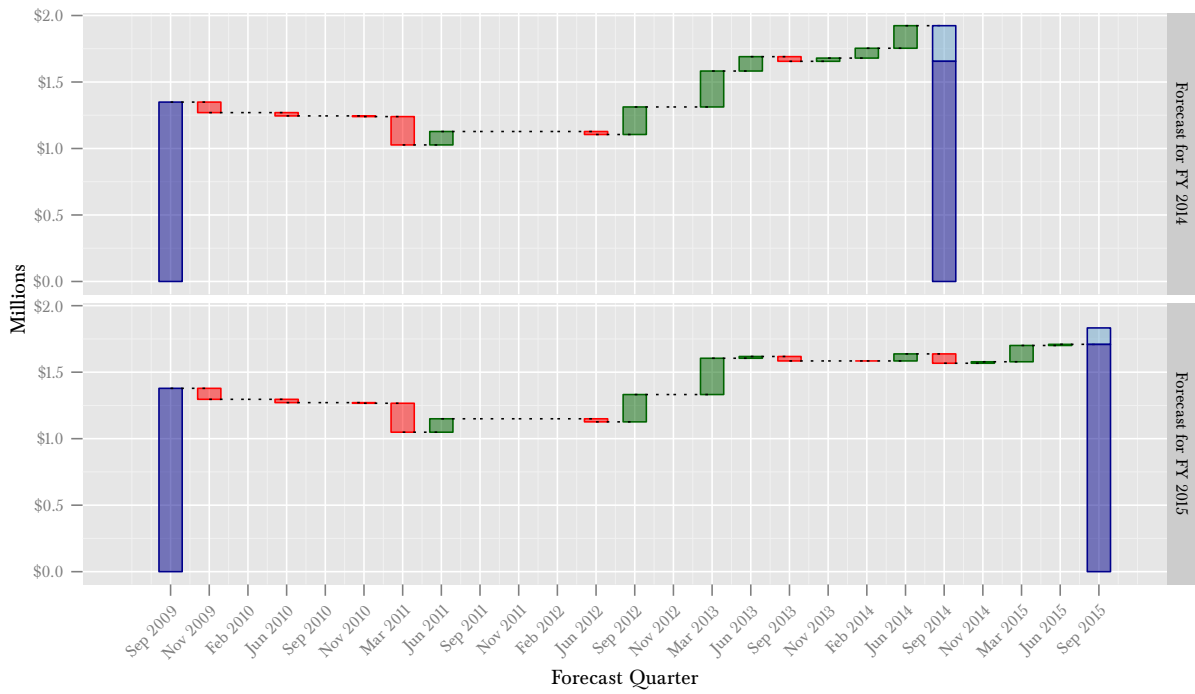
**General Fund**



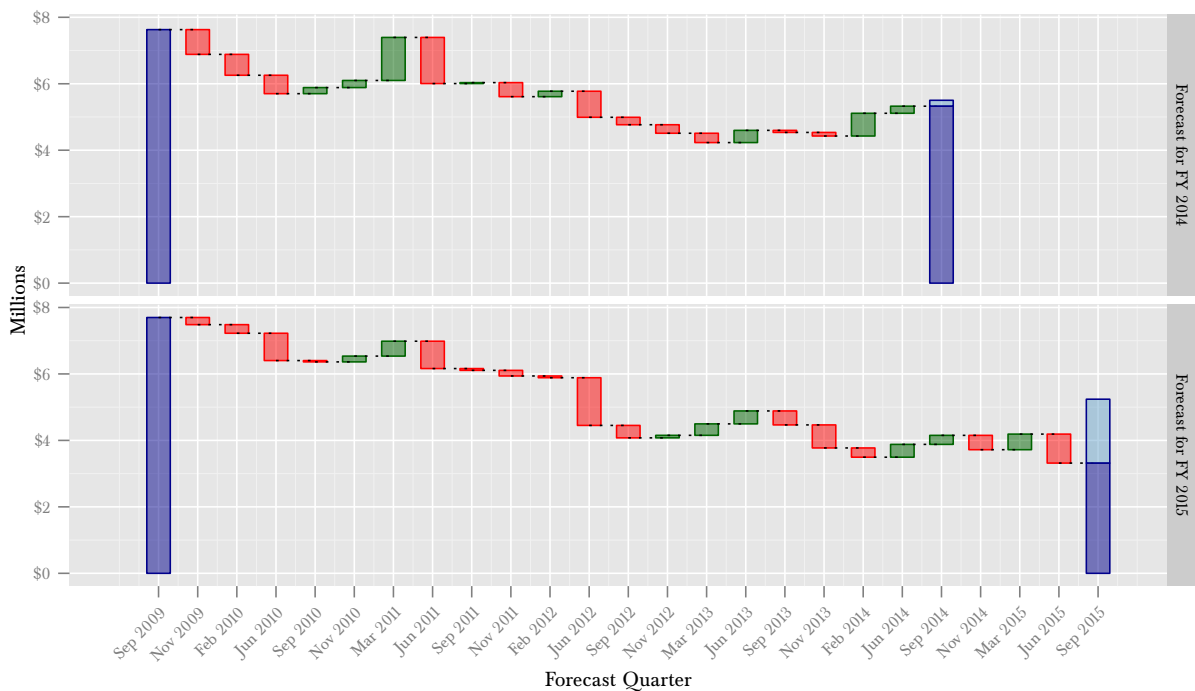
**University Bond Retirement**



WSU Bond Retirement

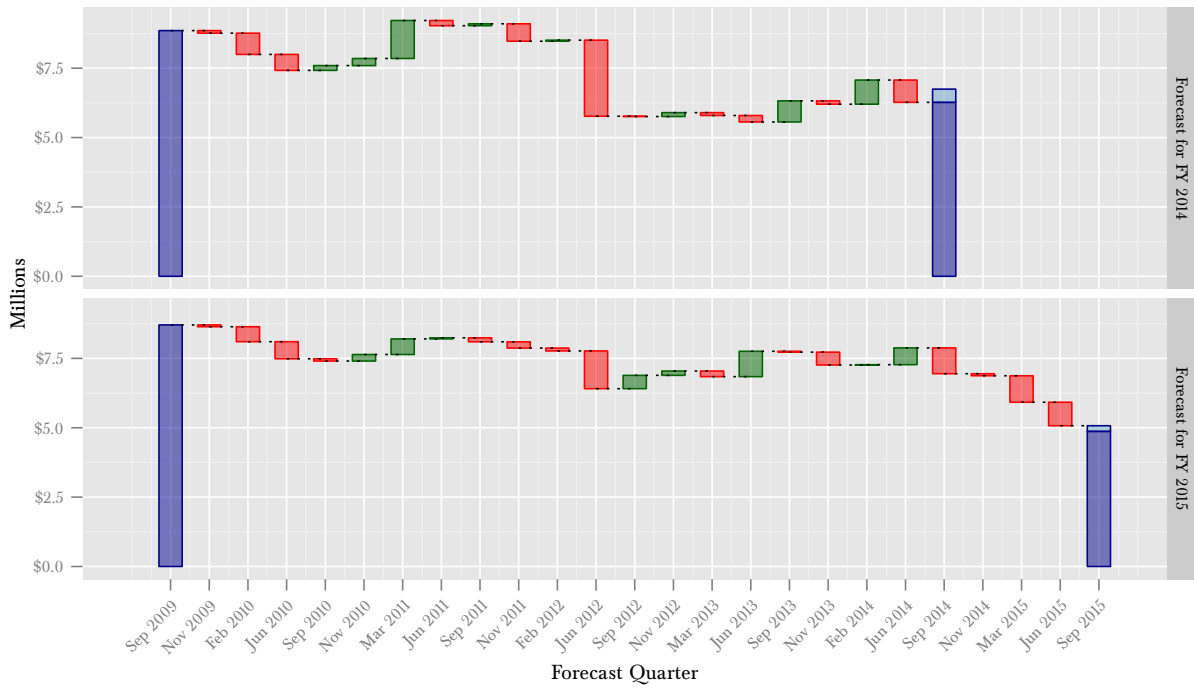


CEP&RI

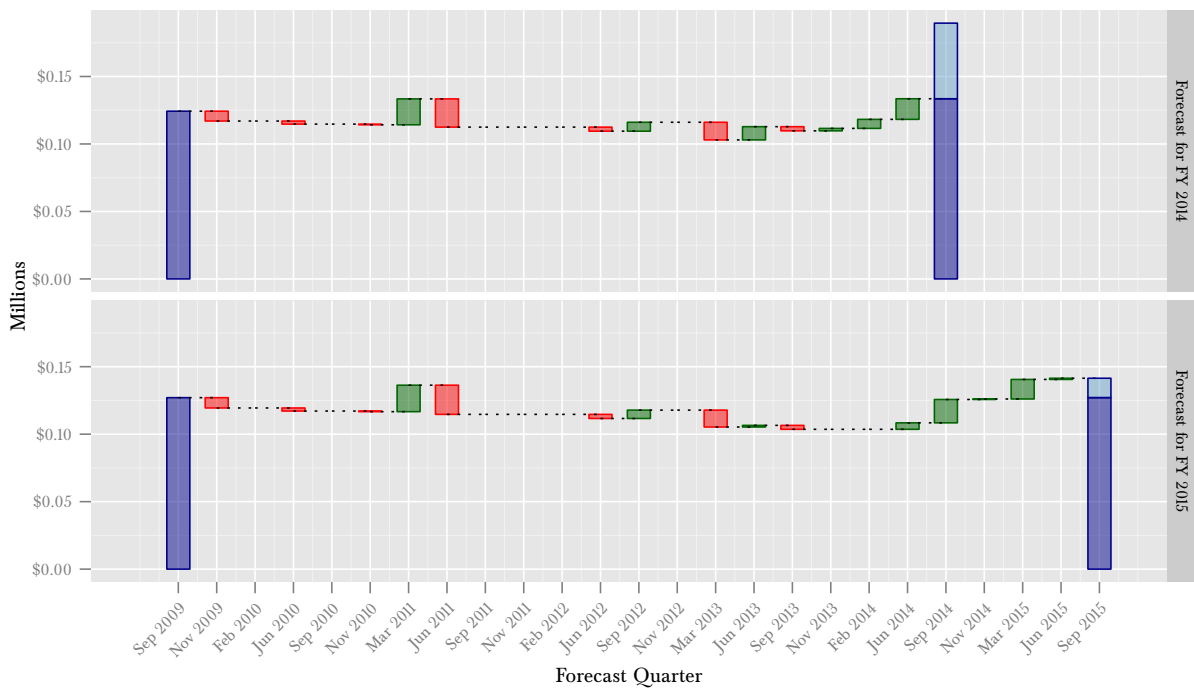




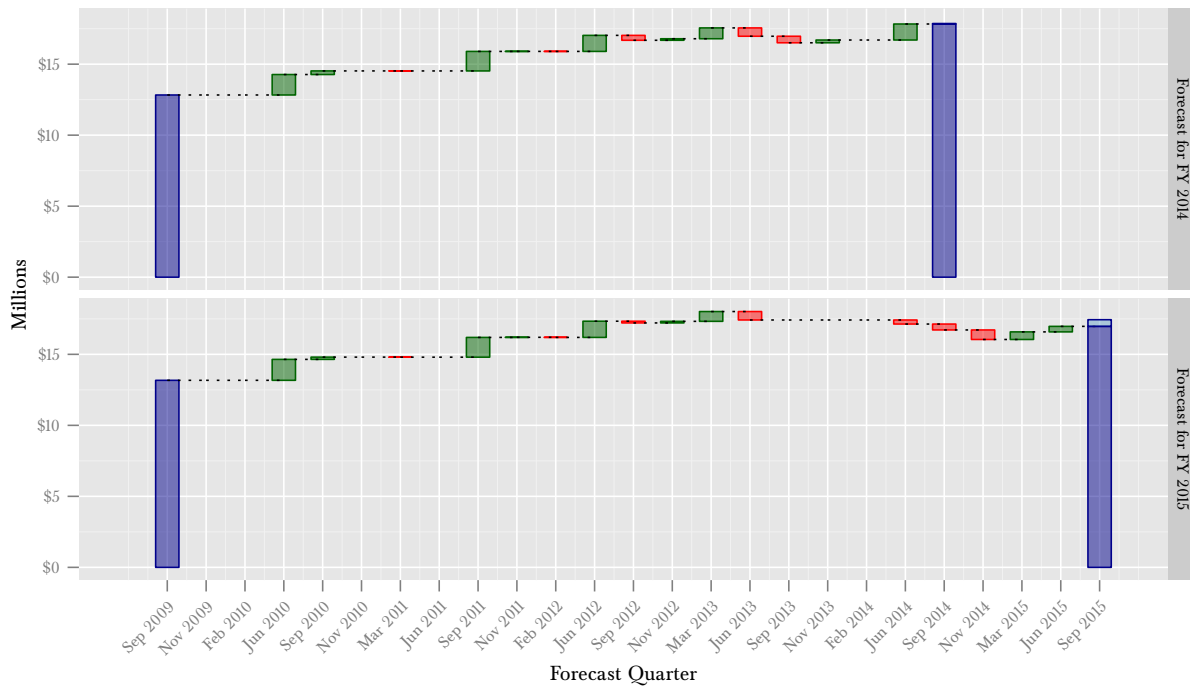
Capitol Building Construction



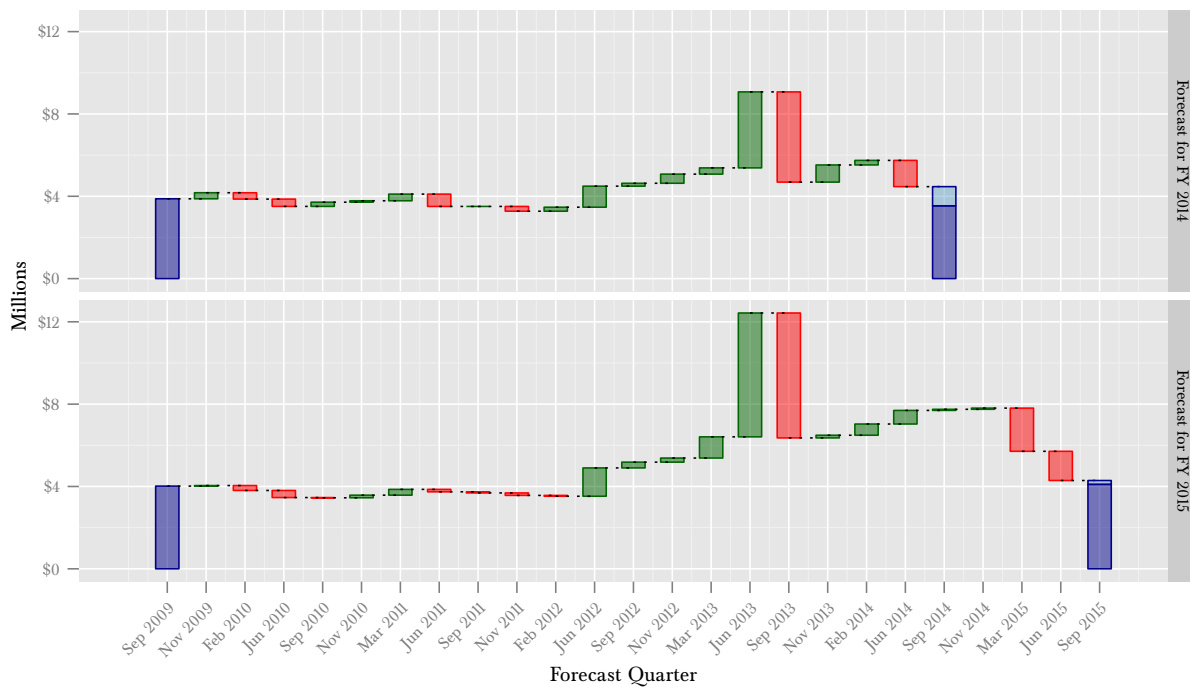
Normal School



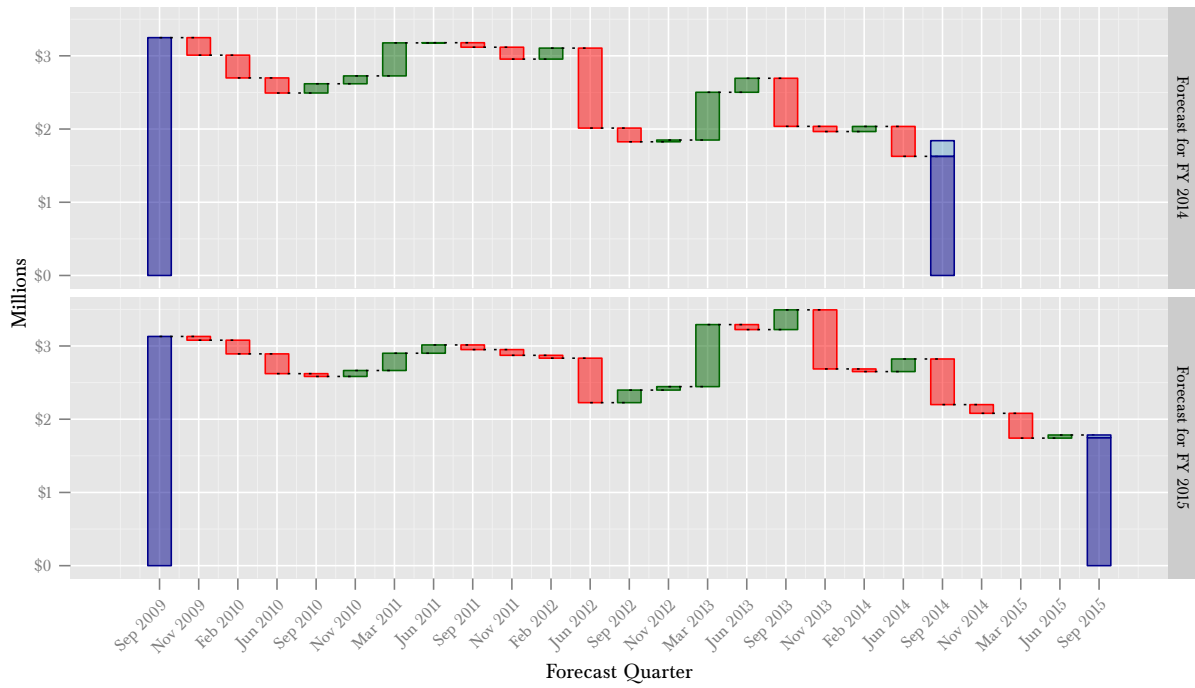
**ALEA**



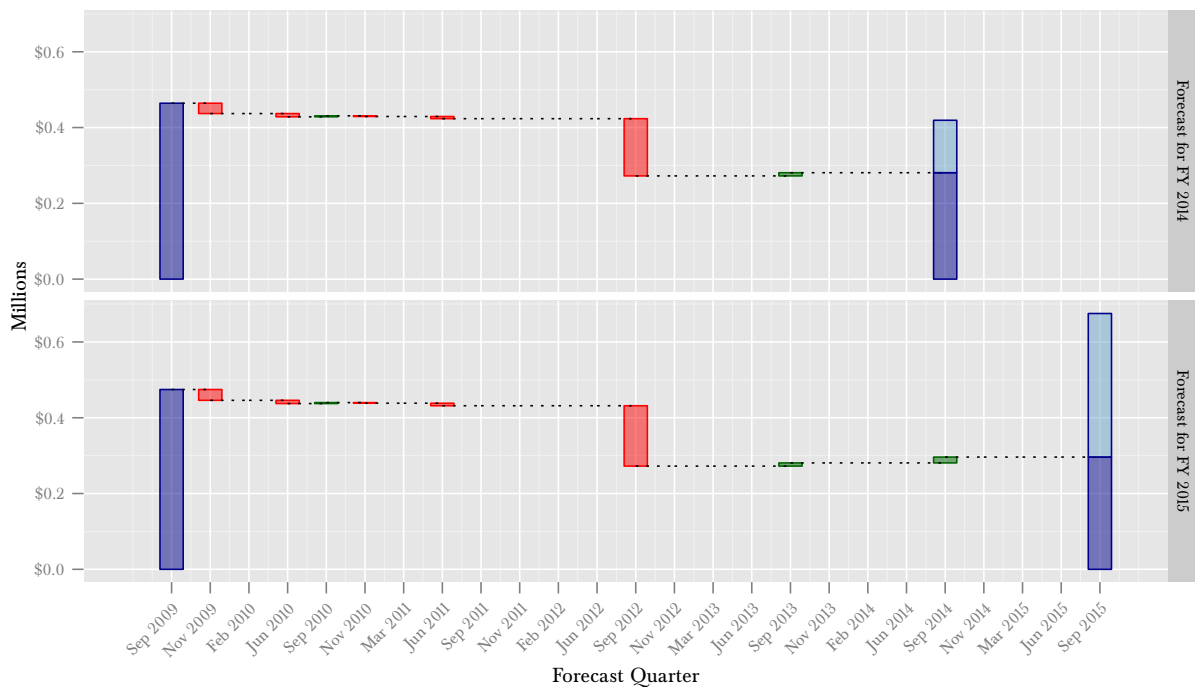
**Agricultural College Permanent**



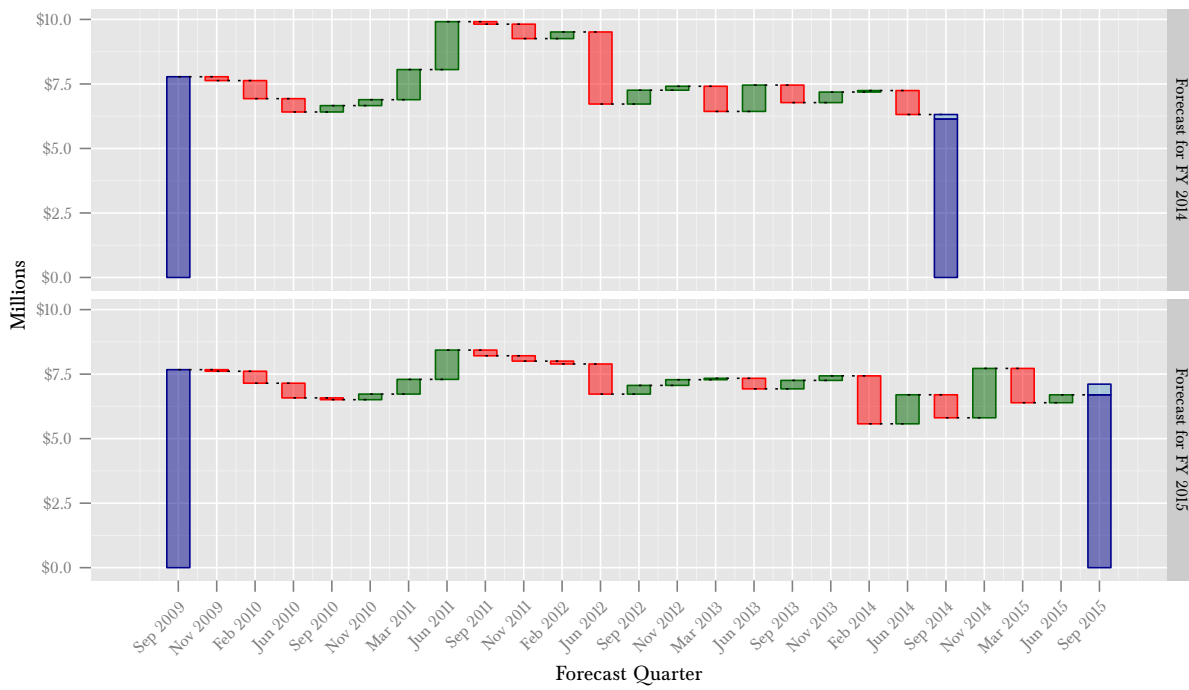
Normal School Permanent



Common School Permanent



Scientific Permanent



University Permanent

