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# The 2012 Forest Report

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## An Economic Assessment of Oregon's Forest and Wood Products Manufacturing Sector

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Prepared for:  
Oregon Forest  
Resources Institute



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July 31, 2012

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## Executive Summary

### Overview

Nearly half the state of Oregon is forested, and these forests touch every part of the economy, from providing raw material for wood products to providing forested landscapes that make Oregon an attractive place to live and work.

The state of Oregon's forest sector in 2012 has been strongly influenced by two major issues: the decline in home building caused by the recession and a lack of clear management direction of Oregon's federal forestland.

The national recession from 2007 to 2009 – what many now call the Great Recession – pulled the rug out from under the forest sector as the U.S. housing market fell from a peak of 2.3 million housing starts in 2006 to 478,000 starts in 2009. Currently, Oregon has about 49 fewer primary wood manufacturing facilities than it did in 2003 and those remaining are operating well below capacity. The slow recovery of the housing market is still being felt by the forest sector and by rural counties where timber is an economic mainstay. Some of those counties face long-term poverty that threatens to affect the rest of the state.

After 20 years under the Northwest Forest Plan and east-side screens, Oregon's federally managed forests — approximately 60 percent of all forestland in the state — are at greater risk today from fire, insects and disease than in the late 1980s. Designed to create older forest habitat for a variety of endangered species while maintaining a base level of economic activity, the plan has never been fully implemented and there has been no alternative policy guidance for management of millions of federal acres.

Much of the manufacturing and forestry know-how in eastern and southern Oregon – the mills, skills and people – have been lost as a result of the decline in harvests over the past two decades. Many timber-based communities have not evolved new and equivalent sources of jobs and income.

## Forest Resource

In spite of these challenges, Oregon's forest sector remains a potentially strong and vital contributor to the state's economy. The forest sector is positioned to grow again as the economy recovers from the recession. There is an array of opportunities to expand markets for Oregon's wood products. Private forests are highly productive and Oregon's land use and forest protection laws have been effective in helping to maintain a viable private forest land base. The manufacturing facilities that remain are low cost and highly competitive in North American and world markets, and Oregon's business climate is favorable

Across all ownerships, public and private total standing timber volume is about 87.9 billion cubic feet and growing — this is more than 95 percent of the standing timber volume of 92.0 billion cubic feet present across all ownerships 50 years ago.

In 2011, harvest volume across all ownerships was 3.65 billion board feet (BBF) — just 16 percent below pre-recession harvest levels. More than 75 percent of this harvest came from private land.

In western Oregon, harvest in federal forests is 11 percent of annual growth. In comparison, harvest on private forests is about 60 percent of annual growth. On the east side of the state, where the majority of forestland is under federal management, harvest from federal forests is 7 percent of annual growth. Private lands provide more than 70 percent of eastside annual harvest, and the combination of harvest and mortality has exceeded growth for the past two decades.

## Economic Impact

The forest sector accounts for about 6.8 percent of Oregon's economic base statewide. However, outside the Portland metro area, the forest sector's contribution to the economic base is an average of 11 percent — and in some rural areas as high as 20 percent.

Oregon's forest sector employs about 76,000 people and provides about \$5.2 billion in total income that underpins much of Oregon's rural economy. The sector accounts for about \$12.7 billion in total industrial output, making it one of the state's largest traded sectors.

## Summary of Recommended Actions

Oregon's forest sector pays about \$250 million to \$350 million in state and county taxes each year, or about 5 percent of the state's total annual revenue.

About 14,000 jobs and \$527 million of income have been lost since 2007 in forest-sector industries reported as covered employment.

The Great Recession and slow recovery have weakened Oregon's forest sector; but as markets improve, there is opportunity for the sector to grow market share. Any improvement will require a concerted effort by leaders from government, industry and the conservation community. Following are summaries of five key recommendations that, if pursued, will improve both the forest resource and the economic activity dependent on it. A full discussion of the recommendations can be found in Chapter 5.

### **1. Reassess and reshape policies for Oregon's federal forests.**

A successful effort here will lead to healthier, more fire-resistant federal forests and more robust and resilient rural economies.

The forest sector needs to examine whether 20 more years under the same management regime as the Northwest Forest Plan and east-side screens will produce outcomes that balance environmental, economic and social benefits. A fair and comprehensive assessment can provide the basis for charting a new course.

Federal forests make up nearly 60 percent of Oregon's forest base, but account for about 12 percent of the statewide annual timber harvest. This occurs despite the fact that these forests are among the most productive in the world. In western Oregon, harvest on federal forests is only 11 percent of annual growth, while on the east side of the state, harvest is just 7 percent of annual growth.

In eastern Oregon especially, growth in excess of mortality and harvest, combined with a century-long policy of fire suppression, has altered the structure and composition of forests, creating higher stocking densities, increased fuel loads, and a higher proportion of fire-intolerant tree species. These conditions heighten the risk and susceptibility of these forests to uncharacteristically large, intense wildfires, in addition to disease and abnormal populations of insects that attack stressed stands of trees.

Efforts to address the forest health crisis have been unsuccessful over the past two decades, although recent efforts by Congress and the U.S. Forest Service to initiate and fund Collaborative Forest Landscape Restoration Projects (CFLRP) nationally, including three sites in Oregon, show promise.

However, many stakeholders believe these efforts are too limited. Absent congressional action to directly address the federal forest health crisis, Oregon's federal forests could experience disasters such as those already seen in Arizona, Colorado, New Mexico and British Columbia, Canada. In the meantime, vital sector infrastructure such as sawmills, logging equipment and trained workers, continues to disappear.

**2. Pursue new markets for Oregon wood products.**

A marketing partnership between industry and the state, modeled after the highly successful effort in British Columbia, could generate significant results. An effort tailored to Oregon's strengths can promote forest products where Oregon has competitive advantage.

**3. Promote and defend the Oregon Forest Practices Act.**

Ensure that any changes to the act are based on sound science. Regulations representing political compromise will not be regarded as credible and thus will promote controversy. Because it balances protection of non-timber resources with timber production, the Act provides Oregon forest landowners a competitive advantage. As well, Oregon's rigorous land use planning and zoning laws ensure that private forests remain in forested use.

**4. Protect, maintain and enhance Oregon's forest sector.**

Build on past successes linked to policies, institutions, efforts and expertise that are focused on developing the infrastructure needed to grow and harvest trees and manufacture wood products. Many ongoing efforts deserve continued support, and we offer a few recommendations for further discussion:

- Forest restoration on the east side of the state will require investment in new processing facilities and certainty of wood supply over an extended period, e.g., 10 or more years.

- The logging industry would benefit from focused attention on workforce recruitment and programs that help in accessing capital for new equipment and technologies.
- The biomass industry would benefit from policies and assistance that recognize that biomass offers superior benefit related to greenhouse gas emissions.

**5. Promote markets for ecosystem services.**

A state-level effort to define, develop, encourage and promote such markets will help accelerate progress and encourage participation. Accessing these markets can help keep forestland in forest use by compensating landowners for ecosystem services.



## Introduction

### Preface

Oregon's forests play an integral role in shaping Oregon's economy, landscape and culture.

This report provides a quantitative and qualitative assessment of the economic contributions of Oregon's Forest and Wood Products Manufacturing Sector ("forest sector"). The broadest definition of the forest sector includes any and all economic activity that could be associated with forest resources. The focus of this report, however, is on those parts of the forest sector that account for the bulk of economic activity — planting, tending, harvesting, manufacturing and trading in forest products.

We recognize that forests provide a variety of other uses that produce economic value, especially recreation, hunting and fishing. Budgets, time and data constraints limit our investigation into these additional portions of the forest sector.

Figure 1 shows the conceptual relationship between Oregon's forest sector (forestry support, primary and secondary wood products, transportation, and forestland management) and influential factors such as forest owners and forest regulation, while acknowledging that public policy, research and innovation help shape all economic activity associated with the forest resource.

This report contains newly collected data about current employment and income for the forest sector. We visited most of the communities with some kind of primary wood processing facilities to build a more complete and specific picture of employment in the forest sector. **Our data, therefore, should not be compared to historical employment and income data derived from standard government reports.**

Data for other sections of this report came from standard sources. When we found multiple sources, we selected the source that in our opinion was most reliable.

## Study Background

In 2004, the Oregon Forest Resources Institute (OFRI) commissioned a study to help understand the economic, environmental and social contributions of the forest sector to Oregon residents and businesses. In addition, the 2004 report evaluated the potential for the forest sector to assist in the revitalization of Oregon's prosperity by enhancing those contributions. This study was well received as it focused attention on comprehensive strategies to strengthen and broaden the existing base, and position Oregon for future success.

Much has changed since 2004, and OFRI commissioned this current study to re-examine the economic contributions of the forest sector in light of the following:

- The housing boom peaked in 2006 and was soon followed by the worst recession since the 1930s, leaving a portion of the logging and wood processing industries in a vulnerable position.
- The recession led to major reductions in North American wood processing capacity.
- The recession delayed anticipated growth in markets for energy produced from forest biomass and wood waste.
- A new and substantial demand for wood products in China has shifted wood flows between industries and between states.
- Federal land management policies appear to be incapable of addressing both forest health and the health of rural economies tied to federal forests.
- National policies have become more polarized, and it appears unlikely the federal government will continue funding Oregon counties that have relied on federal forest revenue sharing.
- State budgets are compressed, leading legislators and the governor's office to seek strategies to promote economic development that does not rely on state funding.
- A new governor willing to rethink and reconsider state policies affecting Oregon's forest resources. There is a new willingness for the state to take an active role in strengthening Oregon's forest sector.

## **Purpose of the Study**

This study is intended to provide an accurate assessment of the forest sector's status and capacity. The findings are intended to inform elected officials, public and private forest-sector leaders, and members of the conservation community as they evaluate forest sector challenges and opportunities to enhance Oregon's prosperity and quality of life.

Specifically, this study:

- Describes the nature, extent and condition of Oregon's forest resources and forest processing infrastructure
- Describes and quantifies contributions of the forest sector to Oregon's economy and how those contributions have changed over time and may change in the future
- Describes current markets for wood products and offers opinions about how Oregon's forest sector will be positioned as the economy recovers, with careful attention given to Oregon's competitive advantages
- Identifies opportunities for Oregon forest products to better compete in domestic and global markets
- Provides recommendations that could enhance the performance or contributions of the forest sector

## **Forest Economic Assessment Team**

To conduct this assessment, researchers from five organizations formed the Forest Economic Assessment Team. Team members are:

- Mark Rasmussen, Roger Lord and Brandon Vickery from Mason, Bruce & Girard Inc.
- Charles McKetta, Dan Green and MaryAnn Green from Forest Econ Inc.
- Tom Potiowsky from the Northwest Economic Research Center at Portland State University
- Darius Adams and Greg Latta from the Department of Forest Engineering, Resources and Management at Oregon State University
- Roy Anderson, Bill Mitchell and Dan Mack from The Beck Group

## **Acknowledgements**

Work conducted during the course of this project has been guided and supported by OFRI's staff and board of directors, as well as forest-sector participants and experts who volunteered time to form:

- The Expert Review Panel, which focused on methodology, data sources and other technical aspects of the final report
- The Project Steering Committee, which provided overall direction on study approach and design

We also offer our thanks to those who participated in stakeholder interviews and met with our field data collection team. Without their open and honest communication, valuable insight into the forest sector would have not been incorporated into this report.

Please see Appendix V for a listing of people who participated in this study.

## **Report Organization**

This report is organized into five chapters:

### Chapter 1: Oregon Forest Sector Supply Factors

- Forest Resource Conditions
- Employment, Income and Status of Oregon's Forest Sector
- Regional Analysis of Oregon's Forest Sector
- Forest-Sector Manufacturing

### Chapter 2: Oregon Forest Sector Demand Factors

- Wood Product Demand
- Biomass Energy and Biofuels
- Forest Affiliated Assets

### Chapter 3: Oregon's Forest Sector Operating Environment

- Forest Sector's Institutional Culture
- Investment and Innovation in the Forest Sector
- Tax Revenue Generated by the Forest Sector

### Chapter 4: Summary of Stakeholder Interviews

### Chapter 5: Summary and Recommended Actions

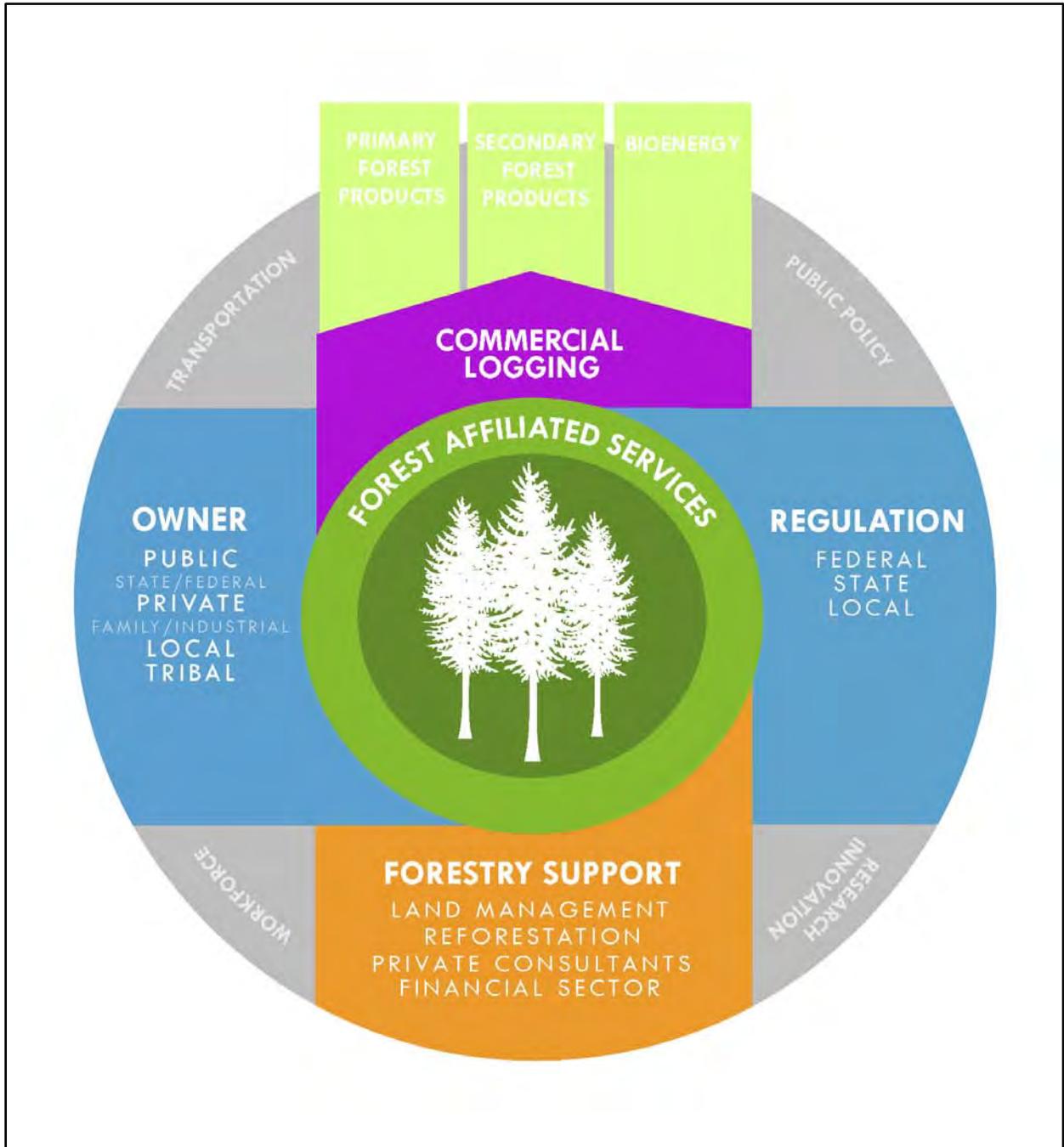


Figure 1: Conceptual diagram of Oregon's forest sector and its operating environment

## **Chapter 1: Oregon's Forest Sector Supply Factors**

## Section 1.1 — Forest Resource Conditions

### **Forest resource base**

Retention of the forested base, the forms of management practiced and the frequency and intensity of any harvesting are closely linked to ownership of land. Table 1.1-1 and

Figure 1.1-1 summarize forestland and timberland areas by broad ownership for the state as a whole and for eastern and western Oregon for roughly the first decade of the 2000s.

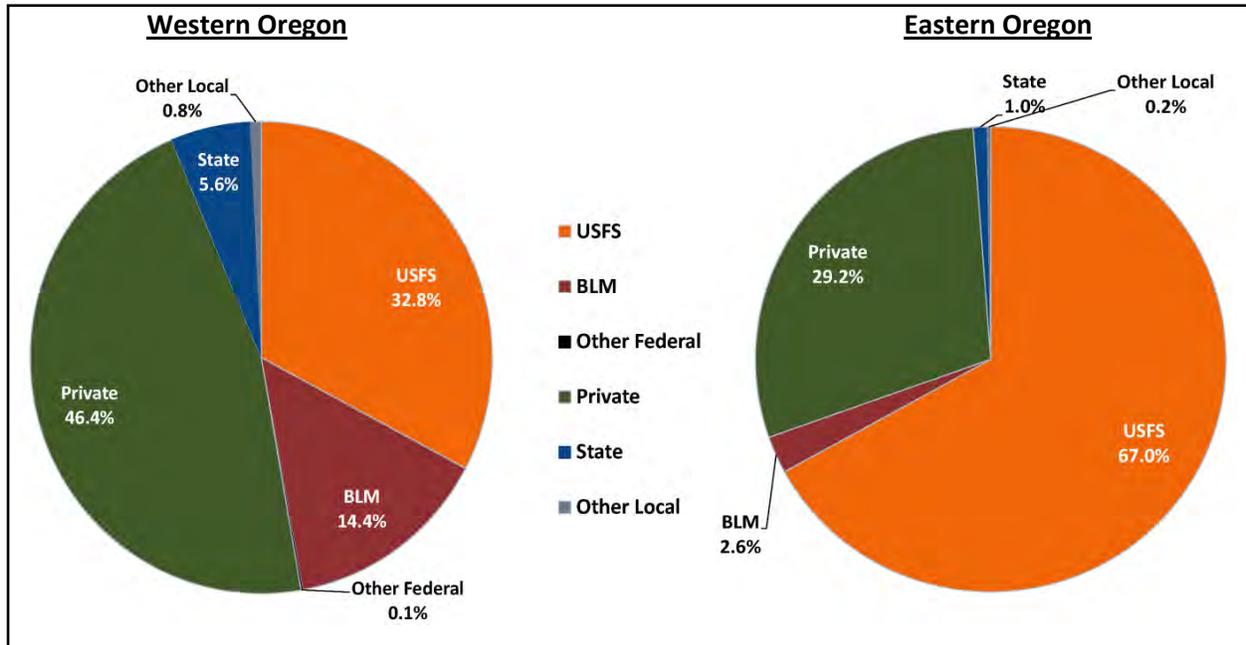
**Forestland** is land that is at least 10 percent stocked by forest trees of any size, or land formerly having such tree cover, and not currently developed for a nonforest use. The minimal area for classification as forestland is one acre. Roadside, streamside and shelterbelt strips of timber must be at least 120 feet wide to qualify as forestland (USDA Forest Service, 2006).

**Timberland** is forestland that is producing or capable of producing more than 20 cubic feet per acre per year of wood at culmination of mean annual increment. Timberland excludes reserved forestlands.

**Table 1.1-1: Forestland area in Oregon by ownership (acres), 2008**

<b>TOTAL LAND AREA</b>	<b>63,018,000</b>
Forestland	30,472,000
Other land (urban, cropland, grazing, etc.)	32,546,000
<b>GOVERNMENT FORESTLAND</b>	<b>19,408,000</b>
Federal	
USFS National Forestland	12,133,000
USFS Reserved Lands (Wilderness)	2,139,000
USFS National Grassland	11,000
National Park Service	159,000
Bureau of Land Management (BLM)	3,760,000
US Fish and Wildlife	16,000
Other federal	27,000
Total federal forestland	18,245,000
State	
State forests	848,000
Other	159,000
Total state forestland	1,007,000
County and municipal	156,000
<b>PRIVATE FORESTLAND</b>	<b>10,601,000</b>
<b>TRIBAL FORESTLAND</b>	<b>463,000</b>
<b>TOTAL FORESTLAND IN OREGON</b>	<b>30,472,000</b>

Source: Adapted from OFRI, 2011



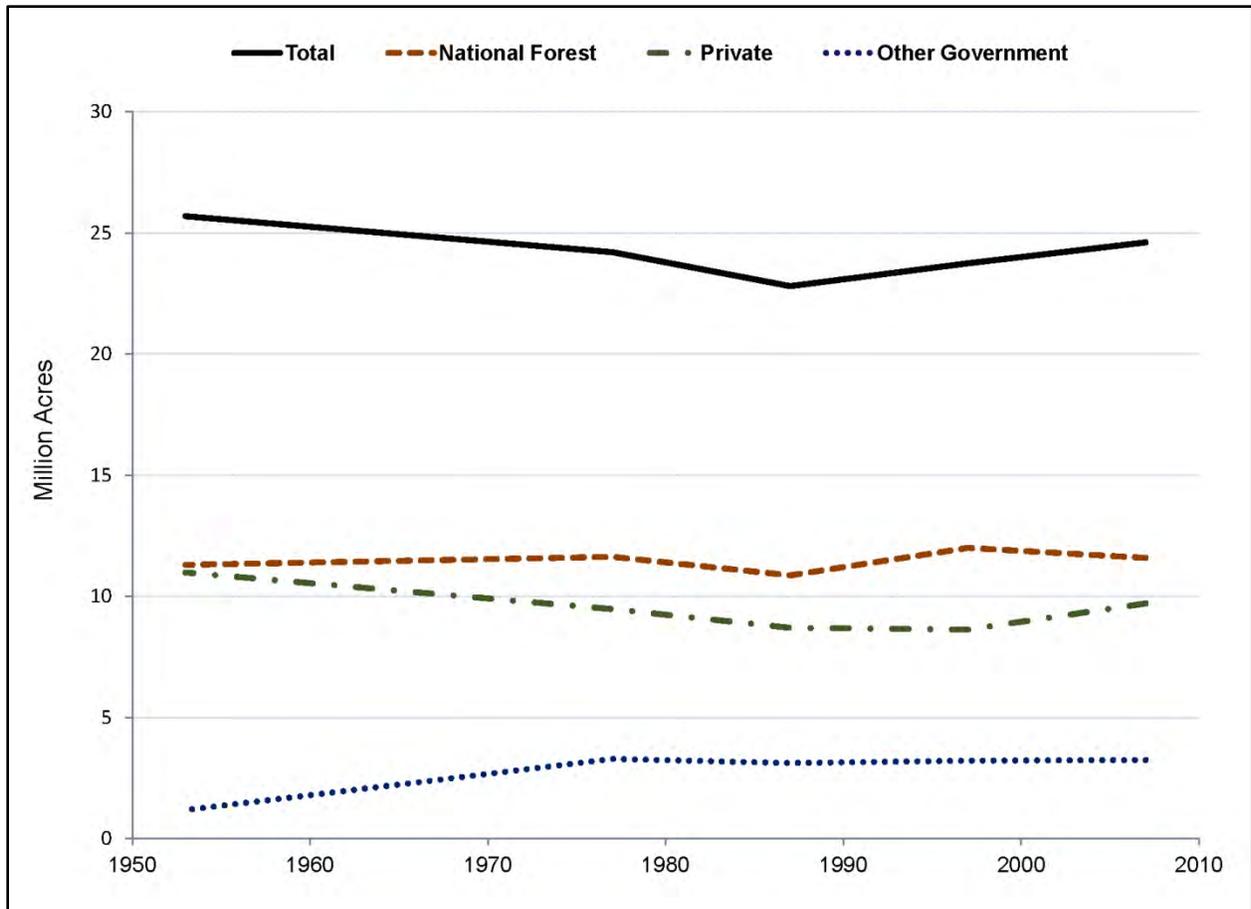
**Figure 1.1-1: Percent timberland area by ownership in western Oregon and in eastern Oregon**  
 Source: USFS FIA data, 2001-09

As shown in Figure 1.1-1, the largest share of Oregon timberlands are national forests followed by privately owned timberland tracts, but there is wide variation between eastern and western Oregon. Privately owned lands comprise the largest share of timberland on the west side, while federal forests represent more than twice the private timberland area on the east side. Most federal timberland is currently administratively withdrawn from timber management.

In virtually all regions of the world, timberland is subject to growing pressure to shift to other

human uses: agriculture, housing and commercial development, and infrastructure. These forces have been at work in Oregon as well. Between 1950 and the late 1980s, Oregon’s timberland base fell by nearly 2 million acres (Figure 1.1-2).

Non-industrial private landowners owned most of the converted timberland in both the western and eastern portions of the state. In the last 20 years, these trends have largely abated due in part to land use laws that have limited conversion to other uses, and the timberland base has been relatively stable.

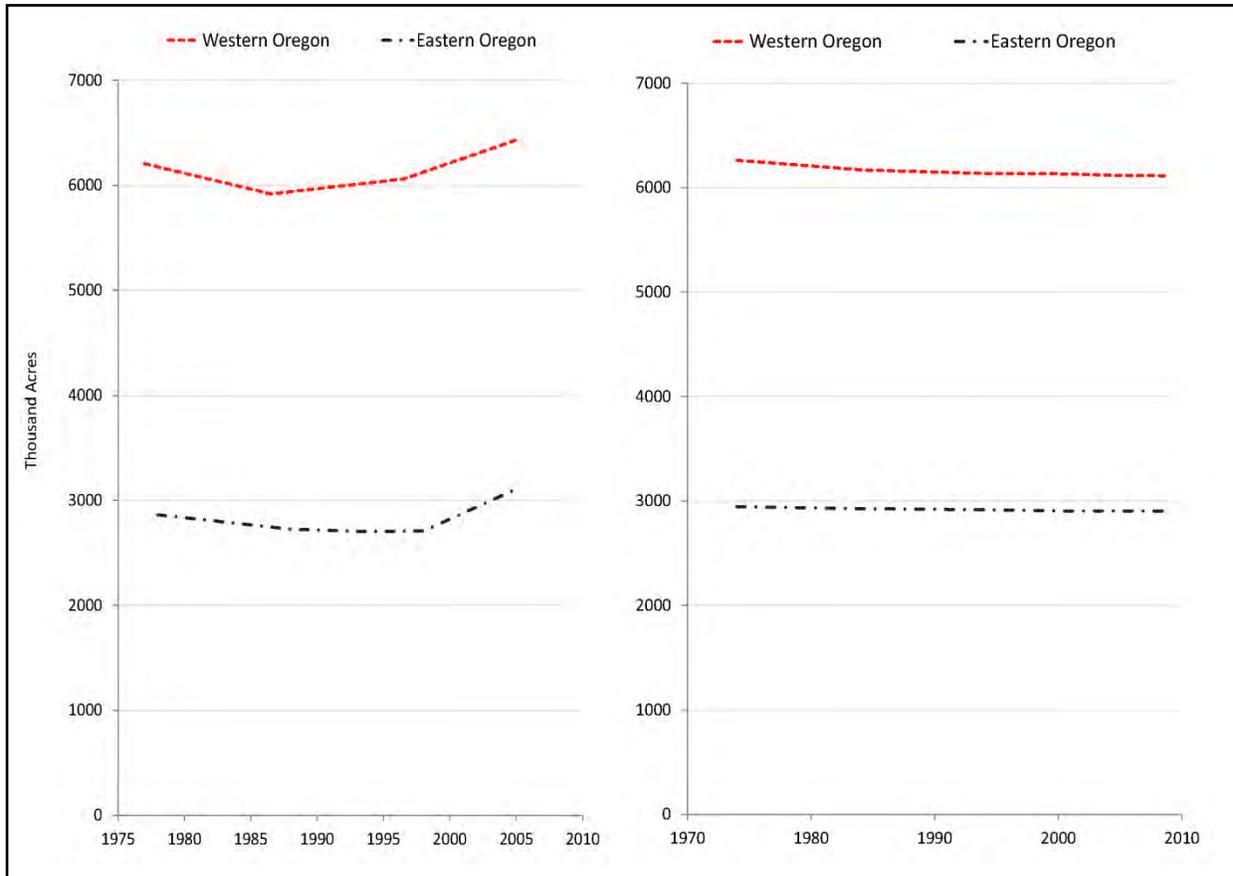


**Figure 1.1-2: Timberland area in Oregon by ownership**

Source: Smith et al., 2009

Figure 1.1-3 provides a detailed look at the private timberland base using area data from the U.S. Forest Service (USFS) Forest Inventory and Analysis (FIA) Program and from the ongoing land use change assessment efforts of the Oregon Department of Forestry (ODF) (Lettman et al., 2011). The general stability of the timberland base after the late 1980s is clear; the USFS data actually show a modest increase. The ODF data allow us to look at changes in land use in greater geographic detail and at uses for former timberland. Between 1974 and 2009 (the years assessed by the ODF), Oregon’s private industrial lands lost only

13,000 acres in a fairly uniform fashion over time, mostly to low-density suburban development. Non-industrial lands, in contrast, lost 179,000 acres, mostly before the late 1980s, to both low-density residential areas and agriculture. The ODF data show that most of the losses of forestland occurred in western Oregon (nearly 80 percent over the 35-year period). In western Oregon, losses were concentrated in the southwest counties, the southern Willamette Valley and the Portland metro area (in that order). In eastern Oregon, the city of Bend and Klamath County accounted for the bulk of the land use shifts.



**Figure 1.1-3: Unreserved private timberland in Oregon (USFS) and private wildland forest area<sup>1</sup> (ODF)**  
 Sources: USFS FIA data, 2001-09; ODF, Lettman et al., 2011

**Inventory**

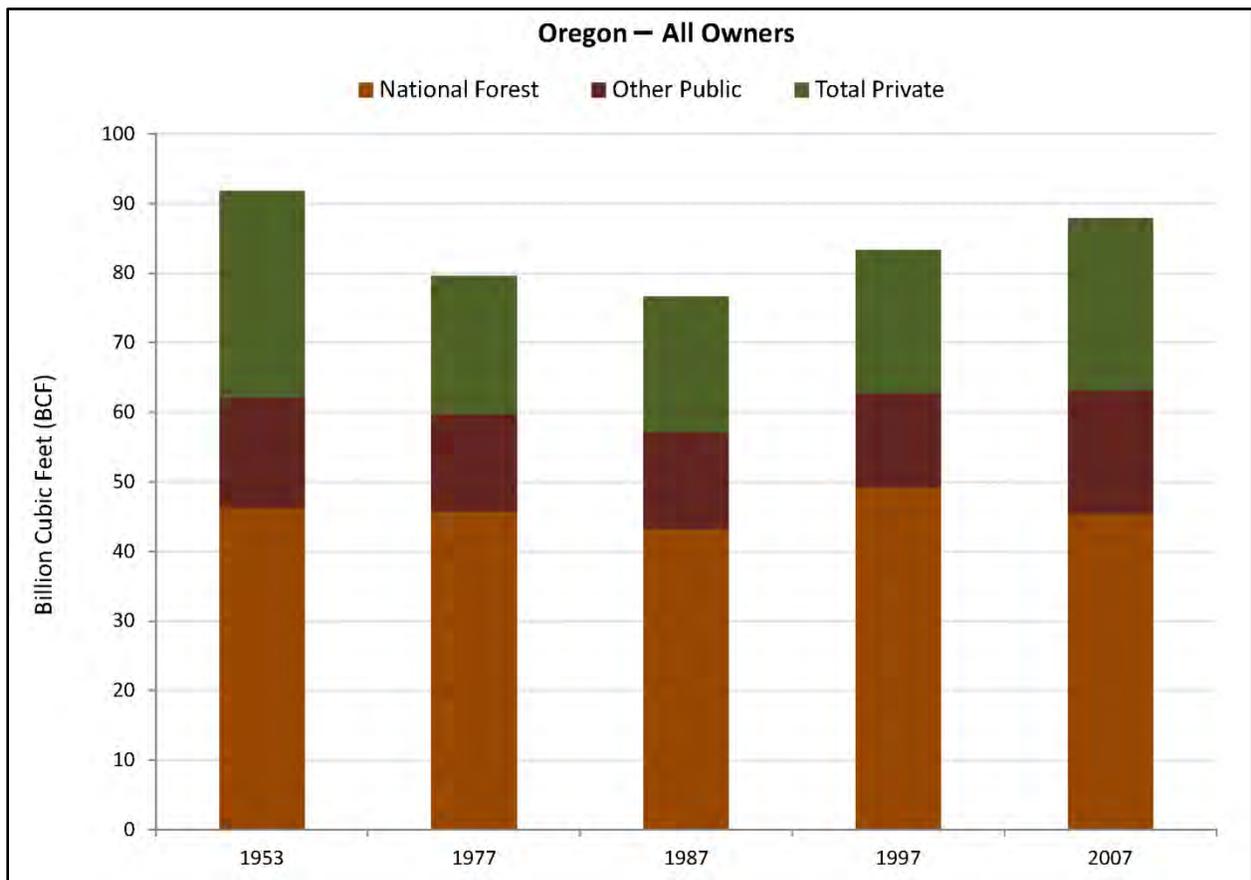
The inventory of growing stock is the base on which forest volume growth occurs and from which the harvest is drawn. Volumes of growing stock by ownership in Oregon are roughly, but not exactly, correlated with the area of timberland ownership because of the effects of stand age and stocking per unit area. For example, public lands comprise 61 percent of the unreserved timberland in Oregon but contain 73 percent of the cubic volume of growing stock.<sup>2</sup> This differential is particularly large in western Oregon, where public lands account for 54 percent of the timberland and 71 percent of the growing stock. In eastern Oregon, public lands comprise 71 percent of the

land base and hold 80 percent of the growing stock. Disparities between proportions of area and volume by ownership reflect differences in the ages –and stocking – of the various lands. For the state as a whole, the site quality and growth potential of public lands is generally lower than that of private lands. As a result of past management decisions, timber on public lands is older on average than on private lands and has 1.5 to 2 times the stocking per unit area (cubic feet per acre) of private lands.

During the period of most rapid loss of private lands to other uses (1950 to the late 1980s), private growing stock inventory also declined markedly as a result of expanded timber

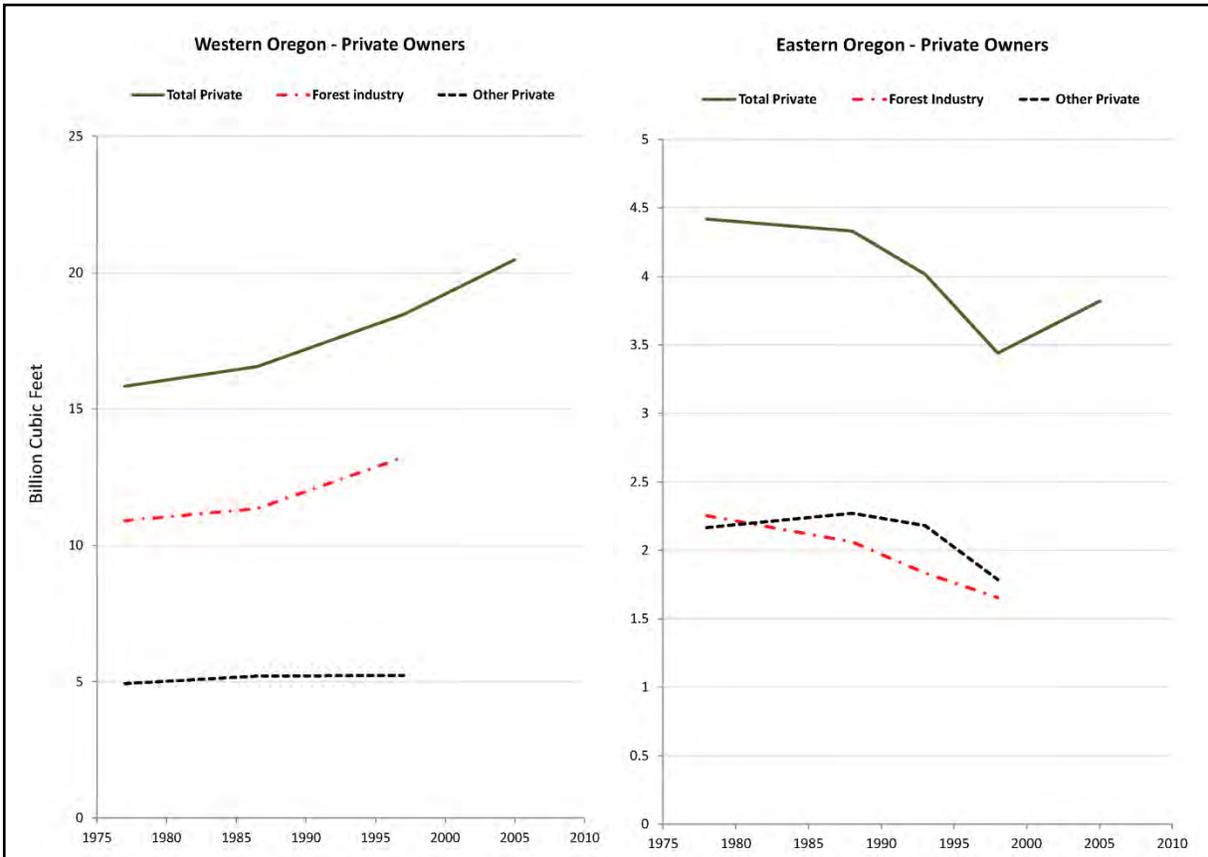
harvests. As illustrated in Figure 1.1-4, harvest programs on publicly owned lands also led to inventory reductions on these lands, though to a lesser extent. Lower harvests in recent years (particularly on public lands) and expanded growth (on some private lands) have reversed these trends. Recent estimates by Smith et al. (2009) suggest that Oregon’s total growing stock inventory may have nearly returned to

levels observed more than 50 years ago. In western Oregon, aggregate private inventory has increased steadily since the late 1970s, with major increases on industrial lands (Figure 1.1-5). In eastern Oregon, private inventory had been declining in total and on lands owned by both large and small private owner groups until the most recent inventory re-measurement.



**Figure 1.1-4: Growing stock inventory for all Oregon timberland owners**

Source: Smith et al., 2009



**Figure 1.1-5: Growing stock inventory for privately owned land in western Oregon and in eastern Oregon**

Sources: Various inventory reports from the USFS Pacific Northwest Research Station, 1976, 1987, 1997; USFS FIA data, 2001-09, plotted as 2005 total

Note: The 2001-2009 inventory report does not separate forest industry from other private for western and eastern Oregon.

When interpreting long-term growing stock inventory charts, bear in mind there were few consistent periodic inventories of USFS and BLM lands before establishment of the Continuous Vegetation Survey in the 1990s. Thus, short-term movements largely reflect different methods of estimating inventory rather than actual changes in the resource. For example, Figure 1.1-4 shows a rise in national forest inventories in Oregon from the late 1980s to the late 1990s, and then a decline to 2007 (the last plotted point). Since harvest on national forestlands fell sharply in this latter period, the

decline would have to result from a dramatic increase in mortality (ignoring changes in estimation methods). No data support such a conclusion. On non-federal lands, in contrast, there have been several inventories over the decades. This may increase confidence in interpreting short-term movements, though the details of the inventories varied over time in ways that may in fact markedly reduce their comparability.

From 1953 to 2007, as shown in Figure 1.1-4, two periods are readily discernible in national forest and private inventories: 1953 to 1987 and 1987 to 2007. In the earlier period, both national forest and private inventories were declining.

This is the period of major expansion in harvest on national forestlands, from minimal levels following World War II to peaks in the late 1970s and 1980s. The stands being harvested were primarily old-growth, harvest exceeded growth across the ownerships and inventory declined. On private lands, particularly industrial (now “large trust landowners”) ownerships, harvest was also concentrated in older stands, with harvest in excess of growth. After 1987, national forest harvest fell sharply as a result of the spotted owl decision (in 1990) and subsequent judicial rulings that required eliminating disturbance in large areas of critical habitat. Growth came to exceed harvest and inventory rose (ignoring the anomalous bump in 1997).

The post-1987 inventory trend for private lands is also positive, but as Figure 1.1-5 shows, this results from marked inventory growth on the west side offsetting decline on the east side. Rising inventories (growth in excess of harvest) on west-side industrial ownerships reflect both a relatively young age structure and high levels of management input designed to accelerate growth. Other private owners have consistently maintained a large fraction of their land base in older stands and invest less in growth-enhancing silvicultural activities. On the east side, where harvesting is primarily selection or partial cutting based on size/value

considerations, both private ownerships have steadily reduced the average diameter of the residual inventory over the past several decades. In addition, mortality in the decade before 2000 was roughly 20 percent of gross growth due to insects and diseases. Inventory fell steadily as a result.

#### **Net growth and forest health**

Over time, growing stock inventory declines in the face of harvest and rises as a result of growth. Gross growth reflects management actions such as harvest and thinning, environmental conditions in the forest (site quality, temperature and precipitation), and the age and species structure of the forest. Net growth is gross growth less deductions for mortality losses to insects, disease, fire and other natural disturbances.

Aggregated across all owner groups, as in Table 1.1-2, gross growth has been rising, mortality has been declining, and net growth has been rising since 1976 in western Oregon over the set of available FIA inventories that include all owners. In eastern Oregon, aggregate gross growth and net growth had fallen until the most recent annual inventory report, and mortality had risen.

Between 1976 and 1999, eastern Oregon’s net growth dropped by more than half. From the first five years of annual plot measurements for 2001-05, east-side gross growth jumped, mortality decreased and net growth exceeded 1976 levels.

As of July 2012, the current annual USFS FIA inventory scheme has not produced a recent estimate of mortality, so net growth trends into the 21st century are unclear. It is important to recognize that the sampling schemes used in each periodic re-inventory by the USFS FIA in Oregon have differed. As a result, the comparisons and trends in any of the tables and figures in this report derived from FIA data are of uncertain accuracy.

Most recently, the agency shifted to a system in which 10 percent of the sample plots are measured every year for a 10-year cycle. It is unclear if reports derived from this new system are in fact comparable to older inventory measurements. It should also be noted that not all periodic inventory reports for Oregon have included federal lands, leading to the irregular gaps between time periods reported in some of our tables.

USFS FIA has completed Oregon’s first 10-year cycle and new estimates of mortality will be available by the end of 2012.

**Table 1.1-2: Annualized gross growth, mortality and net growth (million cubic feet) for all timberland in western and eastern Oregon, 1976, 1999 and estimated 2001-05**

Year/Half of State	GROSS GROWTH		MORTALITY		NET GROWTH	
	WEST	EAST	WEST	EAST	WEST	EAST
1976	1,200	485	306	121	894	364
1999	1,368	321	260	184	1,108	137
2001-05	1,699	502	140	123	1,559	379

Sources: 2001-05 — Donnegan et al., 2008; 1999 — Campbell et al., 2004; 1976 — USFS, 1982

Note: Mortality and net growth values for 2001-05 are estimated; they’re not yet available from annual surveys.

The historical data record is shorter if we seek further detail on growth at the ownership level. The available data are summarized in Table 1.1-3, normalized for differing sizes of land base (expressed on a per-acre basis). In western Oregon, the data show that gross growth is higher and mortality lower on private lands than on public ones. Recognizing the limitations of the most recent inventory results, the data also suggest that gross growth has been falling on western public lands and rising on private. If mortality after 2001 were similar to levels around 1999, net growth would be falling on public lands and rising on private. Interestingly,

the 1999 estimates of per-acre mortality by owner (Table 1.1-3) do not differ greatly between eastern and western Oregon.

In eastern Oregon, Table 1.1-3 shows that public lands have higher per-acre gross growth than private lands, but public lands also have higher mortality (in 1999), so net growth levels have been similar (around 20 cubic feet per acre per year). Differences between the survey years, consistent with the aggregate results in Table 1.1-3, show gross growth rising on public lands while growth on private lands has changed only slightly.

**Table 1.1-3: Annualized gross growth, mortality and net growth (cubic feet per acre) on timberland in Oregon by ownership and region for two most recent USFS FIA inventory measurements**

	GROSS GROWTH		MORTALITY		NET GROWTH	
	1999	2001-05	1999	2001-05	1999	2001-05
<b>WEST</b>						
PUBLIC	131.2	99.8	28.4	N/A	102.8	N/A
PRIVATE	136.9	149.0	16.4	N/A	120.5	N/A
<b>EAST</b>						
PUBLIC	44.7	52.2	24.9	N/A	19.8	N/A
PRIVATE	37.0	35.4	16.1	N/A	20.9	N/A

Sources: 2001-05 — Donnegan et al., 2008; 1999 — Campbell et al., 2004; 1976 — USFS, 1982

Note: Values for 2001-05 for mortality and net growth by ownership and per half-state are not yet available from USFS FIA annual surveys.

Higher per-acre mortality on public lands in both eastern and western Oregon has caused some concern. These conditions, in turn, reflect the dramatic reduction in harvest on public lands since 1990 and the long-term policy of fire exclusion. Natural disturbance cycles have been altered, significantly in some cases, and have not been replaced by managed systems. Insect and disease losses have increased in these stands as a result of higher stocking, slower growth and reduced vigor. The consequence is a higher potential for significant loss of key ecosystem components in a wildfire.

**Fire Regime Condition Class**

The Fire Regime Condition Class (FRCC) system was developed to assess the extent of these landscape changes.<sup>3</sup> FRCC attempts to determine how similar a landscape's fire regime is to its natural or historical state.

- Condition Class 1: Fire regimes are within a historical range, and the risk of losing key ecosystem components is low. Vegetation attributes (species composition and

structure) are intact and functioning within a historical range.

- Condition Class 2: Fire regimes have been moderately altered from their historical range. The risk of losing key ecosystem components is moderate. Fire frequencies have departed from historical frequencies by one or more return intervals (either increased or decreased). This results in moderate changes to one or more of the following: fire size, intensity and severity, and landscape patterns. Vegetation attributes have been moderately altered from their historical range.
- Condition Class 3: Fire regimes have been significantly altered from their historical range. The risk of losing key ecosystem components is high. Fire frequencies have departed from historical frequencies by multiple return intervals. This results in dramatic changes to one or more of the following: fire size, intensity and severity, and landscape patterns. Vegetation

attributes have been significantly altered from their historical range.

Table 1.1-4 summarizes FRCC classifications for all forestlands in eastern and western Oregon. Eastern Oregon has a somewhat higher proportion of land in the highly modified Class 3 (27 percent, compared to 19 percent in western Oregon). The geographic distribution of forestland area by FRCC is shown in Figure 1.1-6. The largest contiguous areas of Class 3 occur on the west slopes of the Cascades in western Oregon and in Klamath and Lake Counties in eastern Oregon.

Higher categories have greater departures and higher risks of ecosystem component loss, not

necessarily higher risks of ignition and not necessarily higher fuel loadings or other indicators of fire hazard.

For example, a young, intensively managed stand on the west side (part of the red areas west of the Cascades) may have relatively low fuel loadings, but its vegetation is so altered from natural states that when a fire occurs, there is a high chance it will become a crown fire.

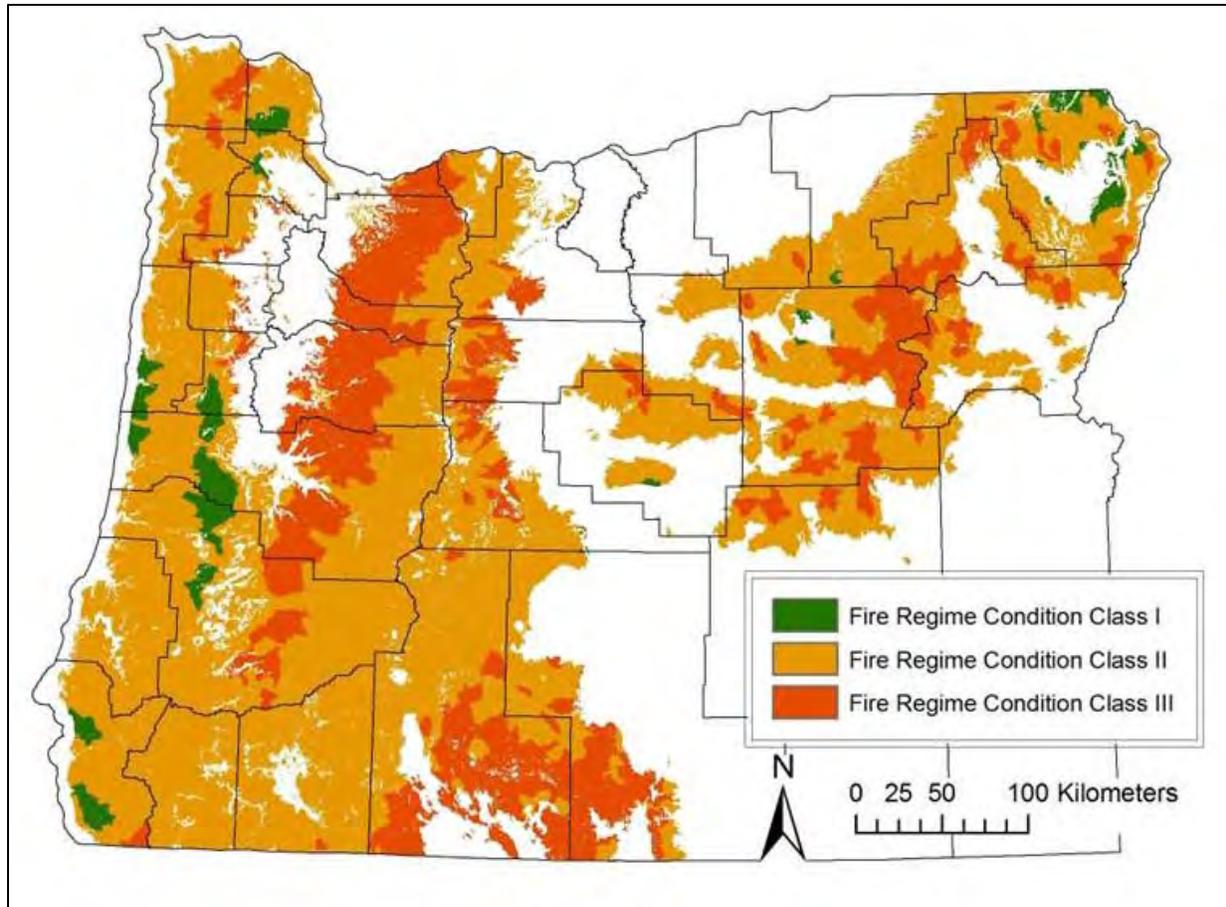
The higher proportions of FRCC Class 3 on the east side mean a greater proportion of areas at risk of losing a key ecosystem component should a fire occur relative to the natural state of vegetation and fire frequency.

**Table 1.1-4: Approximate areas of forestland by Fire Regime Condition Class in Oregon and Oregon regions**

Description	Western Oregon	Eastern Oregon	Oregon
	Acres		
Fire Regime Condition Class 1	719,470	248,184	967,654
Fire Regime Condition Class 2	12,112,922	11,018,884	23,131,806
Fire Regime Condition Class 3	3,041,408	4,233,745	7,275,153
Total	15,873,800	15,500,813	31,374,613

Sources: Forestland — Kagan and Caicco, 1992; Condition Class — Ecoshare, 2010

Note: Areas are derived from expansion of pixel counts and subject to errors of uncertain magnitude. As a result, areas are close to, but do not exactly match, forestland areas in published USFS FIA documents.



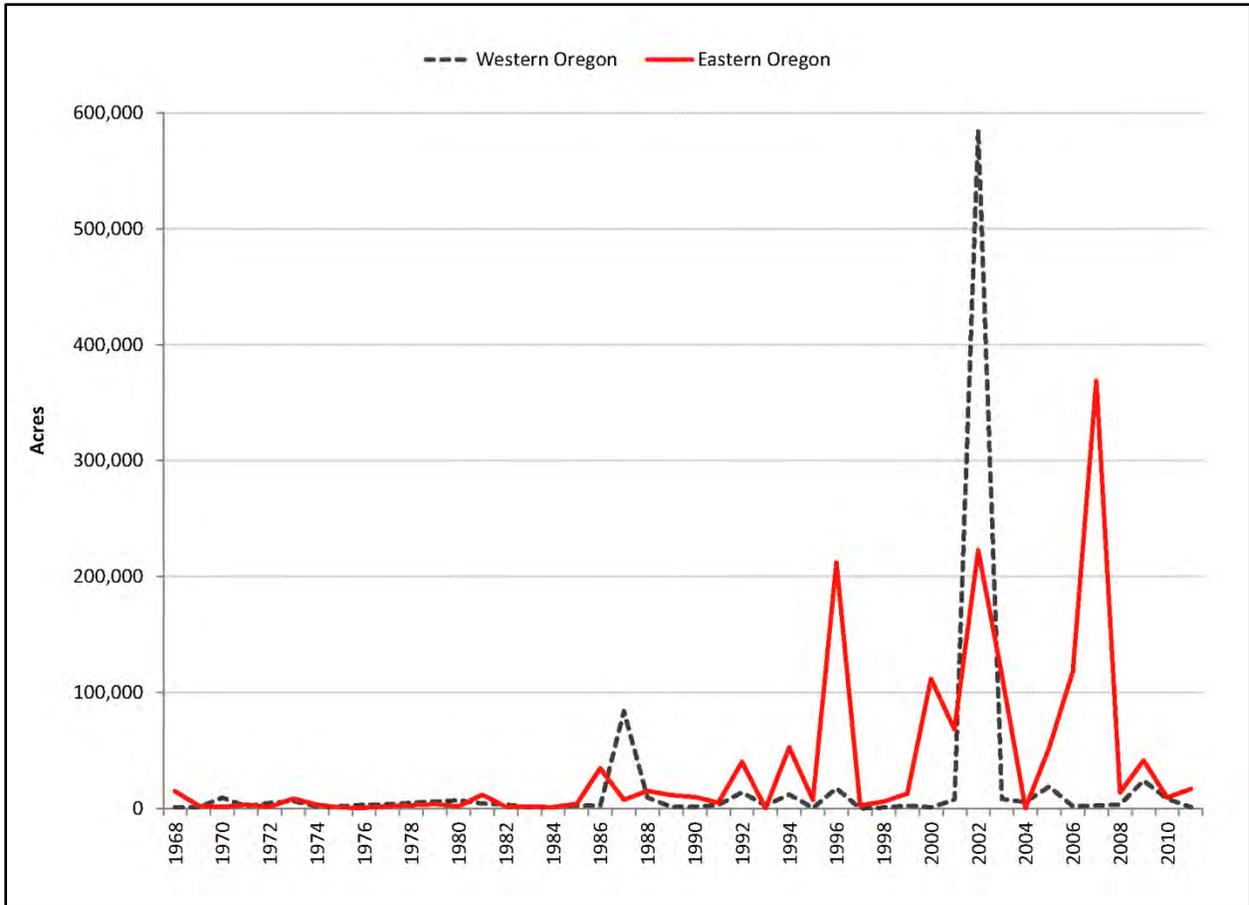
**Figure 1.1-6: Approximate forestland areas by Fire Regime Condition Class in Oregon**

Sources: See Table 1.1-4

Note: FRCC maps will differ depending on which version of FRCC classification is used and the scale at which the analysis is conducted (stratum or landscape). Figure 1.1-6 shows the Landscape FRCC using version 2.2.0.

Figure 1.1-7 shows the number of acres burned since 1968 in western and eastern Oregon. From 1968 to 1985, fires burned an average of 3,700 acres per year across the entire state. After 1985, through 2011, the average fire size increased to 46,000 acres per year. The average for western Oregon during that time period was 32,000 acres per year;

in eastern Oregon, an average 60,000 acres burned per year. In 2002, the Biscuit Fire burned approximately 500,000 acres in western Oregon, as seen in the figure below. Eastern Oregon has experienced several large fire years, beginning in 1996 and continuing through 2007. The B&B Complex fire burned about 91,000 acres in the summer of 2003.



**Figure 1.1-7: Forest fire size (acres) in Oregon, 1968-2011**

Source: ODF Historic Fires Geographic Information System dataset, 2012

## Section 1.2 —Employment, Income and Status of Oregon’s Forest Sector

The effects of the Great Recession of 2007-09 were severe for Oregon’s forest sector. Thousands of jobs were lost in the woods, mills and supporting industries of the forest sector. This estimate of the contribution of Oregon’s forest sector comes at what people hope is the bottom of the recession. We share this hope and expect the sector will see a strong recovery that adds thousands of new jobs to Oregon’s economy. Evaluating a sector at the bottom of a cycle gives a good reference point for future analysis.

Our task was to identify all forest-related industries that contribute to Oregon’s overall economy. To do so, we developed economic impact models for estimating and displaying economic conditions and impacts at the community, county and regional level.

Economic impact models are based on input-output analysis, which is a means of examining relationships within an economy, both between businesses and with final consumers. Input-output analysis captures all monetary market transactions in the local economy in a given time period (Appendix II provides a detailed description of modeling methodology).

Impact Analysis for Planning (IMPLAN) software, developed by MIG Inc., uses a data engine that estimates the actual employment, income or industrial output using mechanical estimation techniques. Industry output in IMPLAN is estimated from national employment/output ratios that do not reflect regional differences in productivity. Accurate impact modeling requires

considerable fieldwork to develop base data for each model area, thereby ensuring the accuracy of model components. As such, we have recalibrated IMPLAN’s data engine through a rigorous effort to collect field data that more accurately reflect the forest sector economies (Appendix III provides further detail about the recalibration process).

Economic impact estimates reflect conditions as close as possible to 2012. We recalibrated the most recent available IMPLAN data (2010) with primary data collected during field surveys the spring of 2012 to more accurately reflect current conditions.

We grouped forest-sector-associated industries into five general categories:

- Forestry support activities
- Primary wood products production
- Secondary and tertiary wood products manufacturing
- Transportation, distribution and sales of forest products
- Forestland management and forest-dependent industries

### Statewide Summary

Table 1.2-1 provides a summary of the forest sector's economic impact in Oregon.

The forest sector provides for 76,073 direct jobs that generate approximately \$5.2 billion dollars in total income that includes wages, proprietor income and property income.

The forest sector has a total industrial output of \$12.7 billion.

The goods and services purchased by these industries support 37,000 indirect jobs, and payroll spending by the forest sector supports another 43,000 induced jobs.

**Direct effects.** Direct employment refers to employment directly related to the production of forest products or services and represents the total number of people employed in sole proprietorships, partnerships and companies belonging to the forest sector.

**Indirect effects.** As a result of direct employment, employment is also generated in the businesses that supply goods and services to the forest sector, such as equipment supply and repair. This is referred to as indirect employment.

**Induced effects.** Finally, when these directly and indirectly generated incomes are spent and respent on a variety of items in the broader economy (e.g., food, clothing, entertainment), it gives rise to induced employment effects.

**Table 1.2-1: Forest-sector employment, income and industrial output — direct, indirect and induced effects**

Forest-Sector Group	Employment (Direct Effects)	Indirect Effects	Induced Effects	Type I Multiplier*	Type II Multiplier**
Forestry support	19,055	4,514	13,662	23,569	36,231
Primary wood products	16,688	10,891	8,033	27,579	35,612
Secondary and tertiary wood products	15,858	9,974	9,010	25,832	34,842
Transportation and distribution of forest products	6,833	1,385	2,199	8,218	10,417
Forestland management	12,613	5,645	5,817	18,257	24,074
Forest-dependent industries	5,026	4,296	4,275	9,322	13,597
<b>Total</b>	<b>76,073</b>	<b>36,705</b>	<b>42,996</b>	<b>112,777</b>	<b>154,773</b>

Forest-Sector Group (million dollars)	Total Income (Direct Effects)	Indirect Effects	Induced Effects	Type I Multiplier*	Type II Multiplier**
Forestry support	\$1,190	\$257	\$660	\$1,447	\$2,107
Primary wood products	\$1,572	\$938	\$646	\$2,510	\$3,156
Secondary and tertiary wood products	\$902	\$518	\$420	\$1,420	\$1,840
Transportation and distribution of forest products	\$327	\$115	\$168	\$442	\$610
Forestland management	\$915	\$418	\$510	\$1,333	\$1,843
Forest-dependent industries	\$258	\$110	\$187	\$368	\$555
<b>Total</b>	<b>\$5,164</b>	<b>\$2,356</b>	<b>\$2,591</b>	<b>\$7,520</b>	<b>\$10,111</b>

Forest-Sector Group (million dollars)	Output (Direct Effects)	Indirect Effects	Induced Effects	Type I Multiplier*	Type II Multiplier**
Forestry support	\$2,204	\$579	\$1,198	\$2,683	\$3,881
Primary wood products	\$5,762	\$3,494	\$2,378	\$9,256	\$11,634
Secondary and tertiary wood products	\$2,527	\$1,568	\$1,254	\$4,094	\$5,348
Transportation and distribution of forest products	\$634	\$220	\$320	\$854	\$1,174
Forestland management	\$1,094	\$524	\$581	\$1,618	\$2,199
Forest-dependent industries	\$432	\$336	\$358	\$768	\$1,126
<b>Total</b>	<b>\$12,653</b>	<b>\$6,721</b>	<b>\$6,089</b>	<b>\$19,273</b>	<b>\$25,362</b>

\*Type I Multiplier = Direct Effects + Indirect Effects

\*\*Type II Multiplier = Direct Effects + Indirect Effects + Induced Effects

**Forestry support activities**

**(19,055 total employment and \$1.2 billion in total income in Oregon)**

Forestry support includes the harvest of timber and a variety of other forest products, and all of the support activities associated with harvesting forest products. In Oregon, forestry support employs about 19,055 people and generates

about \$1.2 billion in income (Table 1.2-2). It is not as evident as primary processing of forest products, but it supports more jobs. It does not generate as much income as primary processing, because these jobs pay less.

**Table 1.2-2: Jobs and income — forest support activities**

Activity	Jobs	Total Income
Forest nurseries, greenhouses and forest gathering	536	\$25,154,160
Timber tract production	2,117	\$166,720,000
Commercial logging	8,054	\$701,487,335
Logging and sawmill equipment manufacturing	1,915	\$149,421,370
Other support activities	6,433	\$147,094,625
<b>Total</b>	<b>19,055</b>	<b>\$1,189,877,490</b>

**1. Forest nurseries, greenhouses and forest gathering**

Forest nurseries, greenhouses and forest gathering employ about 536 people. This sector generates a total of \$25 million in total income. However, salaries in this industry are not as high as other forest jobs, with an average salary of about \$25,000 and a total estimated payroll (employee compensation) of about \$17 million. Forest nurseries and greenhouses are concentrated on the west side of the state, where growing conditions are favorable for tree seedlings.

Forest-gathering activities such as gathering mushrooms, firewood, salal and other floral products, bear grass, yew bark, and other plants and medicinal herbs are important to consider. Unfortunately, there are no accurate estimates of the number of people engaged in these

activities, and their sales go largely unreported.

Thousands of permits are issued annually by the USFS, the BLM, and state and private forest landowners for firewood collection and the gathering of special forest products. Typically, forest collection crews work several crops: mushrooms in the spring, floral products and berries in the summer, and holiday greens in the fall. Among low-income households that engage in forest collecting, the income from forest collecting is typically an important component of their total household income (Schlosser and Blatner, 1997). The ability to supplement family income with forest products plays a critical role in keeping families financially independent.

A study of special forest products harvesting in Washington and Oregon found 20,400 people

were employed in harvesting these products. The majority of this industry is concentrated on the west side of Oregon and Washington. Oregon probably accounts for more than one-third of all forest gathering in the two states. This study found that non-timber forest products gathered from the forest account for more than \$700 million in wholesale sales in the two-state region (Schlosser and Blatner, 1997).

## **2. Timber tract production**

Timber tract production accounts for about 2,117 jobs, with total income of about \$167 million.

This sector comprises all the economic activities related to the selling of standing timber on private land. Activities related to managing public forests are included under government. Timber tracts include industrial private forestlands and non-industrial private forestlands (NIPFs). Typically, industrial lands are managed for short rotations of commercially valuable species of softwood and hardwood timber. NIPFs, in contrast, are managed for a wider range of objectives that may not be focused on short rotations for high production.

Timber tract employment and income are badly underestimated from standard sources. The majority of timber tract operations are not reported to the state nor the federal government (U.S. Census Bureau and U.S. Bureau of Labor Statistics [BLS], 2012; Oregon Employment Department, Oregon Labor Market Information System [OLMIS], 2012). Many small timber tract operations do not hire any employees (covered by state workers compensation insurance). They enter into

contracts with independent contractors for timber sales, forest stand improvement and other forestry work.

Employment statistics on industrial forestlands also do not reflect the contribution these sectors make to the Oregon economy. Relatively few employees are required to plan and conduct timber sales (included under forestry support), and to manage real-estate operations. Many of the jobs associated with industrial forest management are coded by the state under other sectors (i.e., management of companies, forestry and real estate). We surveyed 14 industrial forest companies in Oregon, and they listed 1,292 employees in their timberlands and corporate offices. We have listed most of these employees under land management or forestry support (foresters).

NIPFs make a major contribution to the Oregon economy when measured in terms of timber production. In 2010, they accounted for 7.1 percent of the total timber harvest. When measured in terms of jobs, they make a small contribution (no more than 100 jobs). Most of the income from non-industrial timber harvest activities is captured by proprietors (landowners), while most of the employment derived from private timber harvest is in logging, log trucking and other forestry support sectors.

The National Woodland Owners Survey shows 149,000 NIPF owners in Oregon. For the most part, NIPFs are families who own between one acre and 5,000 acres of forestland. The majority owns 10 acres or less and likely do not have a strong interest in managing their lands for

timber production. Here's an approximate breakdown (Butler, 2008):

- < 10 acres — 81,000
- 10 – 49 acres — 55,000
- > 50 acres — 14,000

A more accurate reflection of the contribution of this industry to the Oregon economy is private timber harvested. Public timber offerings have declined since the 1990s, and private timber sales now account for the majority of timber sales. NIPF owners have the flexibility to sell timber when log markets are higher. They are particularly important players in log markets in eastern Oregon. Industrial forestlands tend to be more concentrated in western Oregon, where timber growing conditions are better. Non-industrial timberlands are more concentrated in areas where multi-use values such as recreation and scenery are important attributes of the forest landscape.

This industry is vitally important to Oregon's economy because it generates so much downstream activity in logging, hauling, primary processing, secondary processing and construction. For this sector, neither employment nor income is the best measure of economic impact: The best measure is the more than 3 BBF of timber this sector produces annually.

### **3. Commercial logging**

We estimate Oregon has 8,054 total loggers (covered employees plus independent contractors), who have a total income of \$701 million.

In Oregon, 1,164 companies identified themselves as logging contractors (Manta, 2012). In comparison, the Oregon Department of Employment lists 644 employing units with 5,345 employees in the logging industry (OLMIS, 2012). The U.S. Census reported 5,337 logging workers in Oregon (U.S. Census Bureau, County Business Patterns, 2010). These estimates underscore the prevalence of independent logging contractors in the industry.

Another approach to estimating logging revenue and employment is to tie logging activity directly to timber harvest. A closely linked activity that is not well documented is the number of log trucks and trucking employment associated with log hauling. We estimated both of these activities based on Oregon timber harvest data supplied by the ODF (ODF, 2012).

Logging includes a variety of occupations needed to harvest timber. Logging companies hire equipment operators, fellers, crew supervisors and general logging workers. Data are available on all of these specific occupations (BLS, 2010):

- Fallers — 430
- Logging equipment operators — 2,010
- Log graders — 230
- Other logging workers — 1,180
- Supervisors of forestry workers — 260

These figures include only covered employees, so as expected, the total number of workers in each category is underestimated.

The economic recession idled many logging firms in Oregon, and it is not known how many of these operations will start up when housing markets recover. Oregon lost about one-third of its logging jobs in the last five years (OLMIS, 2012).

In the current “logging depression,” many logging firms do not have as much business as they need to be profitable. We expect that logging firms will increase their operations and make a major contribution to the economy as stumpage prices increase in the years ahead.

#### **4. Logging and sawmill equipment manufacturing**

Manufacturers of logging and sawmill equipment employ an estimated 1,915 people, with a total income of about \$150 million.

This industry used to be much larger in Oregon, and included manufacturers of expensive cable-logging systems. Most of the equipment used in logging is now being manufactured in other countries. Some specialized items (such as wire cable) are fabricated locally. Some components of sawmills are custom-manufactured, and there will continue to be a market in Oregon for sawmill fabrication services.

#### **5. Other support activities**

We estimate that other forestry support activities account for about 6,433 jobs that create a total income impact of \$147 million.

This industry includes forestry, forest management, silvicultural activities, forest firefighting and other forest conservation jobs. Forestry support jobs tend to be concentrated on the west side of the state, where timber production has been highest.

This is a particularly difficult sector to estimate employment in because many of the jobs are seasonal and are contract work rather than covered employment. The Oregon Department of Employment estimates 4,652 people are employed in forestry support activities in the state (Rooney, 2012).

Data supplied by the USFS indicated that it has total annual contract expenses of \$67 million in Oregon. A total of 1,219 firms and sole proprietors contracted with the USFS in 2010. These contract expenses are for normal operations and do not include large fire expenses, which are handled through a different accounting system. Large fires are much more expensive and often require thousands of firefighters every year in Oregon. For example, the Biscuit Fire in 2002 burned about 500,000 acres and had suppression costs of about \$150 million (U.S. General Accounting Office, 2004).

About 60 percent of these expenditures are for aviation support, and although they are part of the overall firefighting picture, they do not fit into the forestry support sector.

**Primary forest products**

**(16,688 total employment and \$1.57 billion in total income in Oregon)**

Primary forest products are what many people associate with the forest sector, including lumber, plywood and paper. Primary forest

products manufacturing employs about 16,688 people in Oregon. These jobs provide Oregonians with \$1.57 billion in total income.

**Table 1.2-3: Jobs and income — primary forest products manufacturing**

Industry	Jobs	Total Income
Sawmills and wood preservation	6,340	\$355,946,661
Veneer and plywood manufacturing	4,899	\$276,715,136
Pulp mills	1,603	\$292,779,988
Paper mills	815	\$176,197,287
Paperboard mills	917	\$197,377,773
Paperboard container manufacturing	910	\$82,960,150
Paper bag and coated and treated paper manufacturing	340	\$69,210,182
Stationery product manufacturing	80	\$8,652,240
Other converted paper product manufacturing	422	\$6,224,738
Sanitary paper products	300	\$102,541,502
Forest share of electric power generation	62	\$3,000,000
<b>Total</b>	<b>16,688</b>	<b>\$1,571,605,657</b>

**1. Sawmill and wood preservation**

Total employment in the sawmill industry was 6,340, with wages and total income of more than \$355 million.

The collapse of the housing market caused sawmills in Oregon to close and lay off employees. To obtain current data on this industry, we conducted a survey of sawmill operations. We also referenced other recent mill surveys (Ehinger, 2006; Gale et al., 2012) and industry directories (Random Lengths, 2011 and 2012).

Oregon sawmills have reduced their workforce by about one-third in the current recession. Most sawmills are running only one shift and

will have to rehire a large number of employees to increase production with a second shift. Most sawmills are not profitable operating only one shift, so expanding production and employment should improve conditions in the industry. One concern is that many sawmill workers laid off in recent years have moved out of the area or moved on to other employment.

Modern sawmills employ highly trained and technically skilled workers, and it will be difficult and time consuming to train new employees as mills increase production. On the other hand, increased mill efficiency will limit the number of jobs.

Existing sawmills in Oregon can expand production dramatically, as they are currently running at an estimated 57 percent capacity as of 2010 (Gale et al., 2012). Given existing constraints on supplies of logs, it is not likely that significant additional sawmill capacity will be added as lumber markets recover. This is particularly true in eastern and central Oregon, where national forests make up a larger proportion of productive forestlands.

As the operating margin in lumber production disappeared, sawmills in the state modified their operations to develop higher-value products such as metric beams for export and high-quality industrial-grade lumber for remanufacturing. It is difficult to predict whether mills will continue to produce these specialty items as they expand back into framing lumber production.

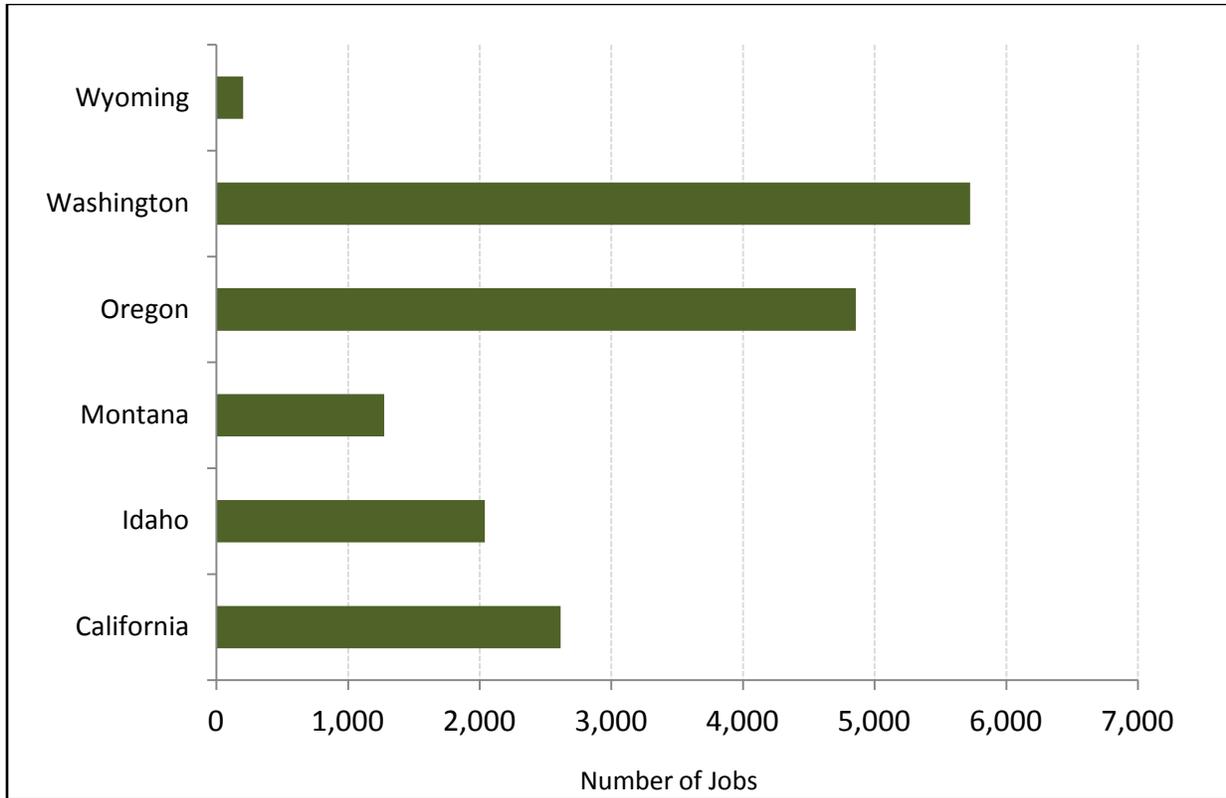
These new product lines also reflect stronger vertical linkages with secondary manufacturing industries in Oregon. Higher-quality industrial pine and fir feed into cut stock, millwork and other remanufacturing facilities in central Oregon. Remanufacturing facilities in turn

supply door, window, cabinet, furniture and manufactured homes industries in Oregon and the West.

Many of Oregon's major sawmills closed during this recession. Some of these could reopen with a major infusion of capital, but timber supply conditions would have to improve significantly to stimulate a reasonable investment climate within the sector.

Oregon's sawmill sector has experienced a much longer contraction than the rest of the nation due to the high proportion of federal lands that have a decreased emphasis on timber production. The contraction of the sawmill sector in Oregon began in the 1990s. Since that time, there are 46 fewer sawmills in the state (Brandt et al., 2006; Gale et al., 2012; Forest Econ Inc. Field Surveys, 2012).

Even with contraction in the industry, Oregon is still a major player in the western sawmill trade. Oregon mills employ about one-third of all sawmill workers in the western states (Figure 1.2-1).



**Figure 1.2-1: Sawmill employment in Western United States, 2009**

Source: U.S. Census Bureau, County Business Patterns, 2012

We surveyed 15 wood treatment plants and found that this industry strengthened in 2011. Railroads are taking advantage of low lumber prices to increase tie replacement on main lines. This has improved markets for treated wood, but wood treatment plants are having difficulty obtaining enough ties to meet demand.

Lumber treatment facilities in Oregon employ 430 people and have a payroll of about \$24 million. They are normally included with sawmills in employment statistics, but they are more of a secondary manufacturing industry because they purchase lumber and treat it (remanufacture it) to add value.

Their annual sales are estimated at about \$500 million. Ties are shipped primarily to main-line railways in Oregon, Idaho, Washington and California. The other component of this industry is lumber treatment for sill plates, decking and other applications that require treated lumber. This market segment is closely tied to the housing market and has not recovered from the recession.

## 2. Veneer and plywood manufacturing

The veneer and plywood manufacturing sector employs about 5,000 people and generates \$277 in total income.

Veneer and plywood manufacturing includes four closely related industries: veneer production, plywood plants, reconstituted wood fiber products and engineered wood products. Employment data normally aggregate all these industries into one sector. Veneer plants are often integrated with plywood (layup) plants in a single manufacturing operation. Oregon is a major plywood producer nationally and has a complex collection of softwood and hardwood veneer plants and layup plants. The industry is concentrated along Interstate 5.

In a survey of major manufacturers, we found 28 plywood mills still operating in Oregon, with a combined production of about 4,500 million square feet (MMSF, 3/8-inch basis). Nationally, plywood has been losing market share to strand board products for about 20 years. Strand board products are cheaper to manufacture and can use a much poorer grade of logs. Plywood is a superior product in most respects, but few builders are willing to pay the premium for plywood over strand board.

Oregon plywood manufacturers found new markets for some of their product lines in this recession, and employment stabilized in 2009 but has not recovered. Early in the recession, several veneer and plywood mills closed or were “mothballed indefinitely,” but overall production did not decline because of increased productivity of other mills. However, mills are not running at full capacity, and softwood

plywood production will ramp up rapidly as housing markets improve.

Oregon also produces a significant amount of hardwood plywood, which is used in cabinets, finish work and other applications. Hardwood plywood competes with overlaid particleboard and medium-density fiberboard products in the lower end of the cabinet, door and finish-work market.

Board mills produce panel products from reconstituted wood fibers (chips and sawdust). Oregon does not have any strand board plants, but does have 10 board plants that produce medium-density fiberboard, particleboard and melamine. They employ slightly more than 1,000 people (1,077) and produce about 1,000 MMSF (3/8-inch basis) of composite panels, with a payroll of about \$60 million and sales of about \$300 million.

Engineered wood products include laminated beams, laminated veneer lumber, trusses and other laminated products. They are used primarily in structural applications for new construction. They are manufactured from high-grade Douglas-fir, particleboard and plywood. Most engineered wood products involve remanufacturing lumber or particleboard into higher-value products such as trusses. Engineered wood products employ about 1,000 people (973) in Oregon, with a payroll of about \$40 million.

Truss manufacturing is tied directly to new-home construction, and has declined dramatically in the recession. Other engineered wood products have somewhat broader markets and have fared better in the recession.

### 3. Pulp mills

Oregon has one pulp mill, which employs 166 workers with an estimated payroll of \$12 million.

This number reflects a coding problem in secondary data. Pulp and paper operations are typically combined in one mill. Most of the pulp mill jobs in Oregon are coded as paper mills, paperboard mills or other types of paper product mills. We did not want to double-count jobs, so we left these jobs in the paper mill sectors. In reality, pulp mill operations employ about 1,600 workers in Oregon, with a total income of \$293 million. In addition to the one pulp mill, there are five other combined pulp and paper mills in Oregon.

Pulp mills in Oregon have been closing for about 20 years. The only remaining mill has changed hands several times in the past 10 years, and is currently owned by the International Grand Investment Company. It produces 180,000 tons of bleached and unbleached pulp per year.<sup>4</sup>

International competition and the cost of air- and water-quality compliance have been major factors in the decline of the industry.

### 4. Paper mills

Paper manufacturing employs 815 workers in Oregon, with \$176 million in total income.

Pulp and paper mills are important components of the forest sector in Oregon because they provide a market for sawmill residuals and low-quality timber products. They are some of the highest-paying manufacturing jobs in the state. There are six paper mills in Oregon.

Paper mills have been cutting back operations or closing through the entire recession. The primary factors causing the contraction of the industry are Chinese competition, decreased demand due to the recession and declining domestic use of some paper products.

The Chinese paper industry has tripled its production since 2002 by investing \$33 billion in new paper production facilities. At the same time, China has increased imports of chips from the West Coast and Canada. If present trends continue, Oregon will lose more paper mills, export more chips to Asia and import more paper from Asia. Industry contacts indicated that the Chinese are dumping cheap paper on the United States. The U.S. Commerce Department has imposed “anti-dumping tariffs” on Chinese paper imports, but it may be too little, too late to save some paper mills.

Looking at the issue optimistically, paper demand in China and India is growing rapidly, and if U.S. mills can gain a better market share in those regions, the industry could have a renaissance. The segment most likely to grow is sanitary paper products. Oregon is not well positioned in this sector, but with significant investment could alter product lines toward more sanitary paper production. As sanitation standards change in developing markets, this sector could grow significantly (Tissue World, *The Sky is the Limit*, 2012a).

### **5. Paperboard mills and paperboard container manufacturing**

Paperboard mills in Oregon employ 917 workers, with total income of about \$197 million. Paperboard container manufacturing employs 910 workers and generates \$83 million in total income.

This has been a stable industry nationally, with only a small change in employment in the recession. Oregon has mirrored national trends, with a modest loss of payroll and employment in the recession. Capacity has not changed, and the industry may increase output somewhat as the economy recovers.

### **6. Converted paper products**

Coated-paper and paper-bag manufacturing employs 762 workers in Oregon, with an estimated total income of \$69 million.

Converted paper products include coated and laminated paper, paper bags, stationery products and other converted paper products such as paper egg cartons. They are all downstream products of primary paper manufacturing. Oregon is not strong in this sector, as it has less than 1 percent of the U.S. market share of all converted paper products. In comparison, California manufacturers have 8 percent of the domestic market for converted paper products (U.S. Census Bureau, Census of Manufacturers, 2012).

Converted paper products have a growing market throughout the world and are a possible market opportunity as Oregon's paper industry recovers.

### **7. Sanitary paper products**

The sanitary paper product sector has about 300 employees and a total income of about \$102 million.

Sanitary paper products include towels, napkins, toilet paper, sanitary pads and related household products. The western United States is a net importer of sanitary paper products. The Chinese have seen this supply/demand imbalance as an opportunity to develop their paper industry. Tissue paper imports from China are more competitive in the U.S. western region than other parts of the country, due to the proximity of China to West Coast ports connected to main-line railroads (Tissue World, 2012b).

### **8. Biomass energy**

Biomass energy conversion facilities use wood fuel (hog fuel) to produce electrical energy. Oregon has one stand-alone active biomass energy plant, with an estimated employment of about 62 and a \$3 million payroll.

In addition to the stand-alone biomass facility, there are a number of mills that produce energy from wood residue and hog fuel. This energy is used to fire dry kilns and in some cases to produce co-generated electricity. These jobs were assigned to the sawmill category, so we have not listed them here to avoid double-counting jobs.

**Secondary and Tertiary Wood Products Manufacturing**  
**(15,858 total employment and \$900 million in total income in Oregon)**

Secondary manufacturing of wood products employs 15,858 people in Oregon and provides \$902 million in total income (Table 1.2-4). This group includes all industries that use primary wood products in their manufacturing

operations. These include sawmill residuals and chips, millwork and cut-stock, wood containers and pallets, log homes, timber-framed homes, pre-built wood sheds, and mini-barns and wood furniture.

**Table 1.2-4: Jobs and income — secondary wood products**

Industry	Jobs	Total Income
Wood chips and other residual	973	\$45,731,000
Millwork and cut stock	7,903	\$566,109,013
Wood containers and pallets	622	\$31,389,971
Manufactured homes	1,590	\$71,371,141
Other wood products	754	\$31,976,387
Wood kitchen cabinets	2,649	\$79,935,808
Other wood household furniture	934	\$56,293,395
Office fixtures and furniture	433	\$19,110,937
<b>Total</b>	<b>15,858</b>	<b>\$901,917,652</b>

**1. Wood chips and other residuals**

Wood chips and other residual products employ about 973 people in Oregon, with total income of about \$45.7 million.

Sawmills, plywood mills, remanufacturing facilities, chipping in the forest, chipper plants and bark chipping businesses produce a variety of residual products. Some of these activities are included in other sectors or industries to avoid double counting. They are an important aspect of the profitability of sawmills, remanufacturing plants and logging operations.

While markets for other forest products have declined, markets for residuals have improved in the recession. This is common as residual markets tend to be counter-cyclical with log markets.

Asian chip exports are the primary factor driving the market expansion of residuals. Domestic consumption of residuals has declined as mills have scaled back operations and paper mills have closed. Primary wood processing facilities generate about 4.5 million bone-dry tons of residuals (Gale et al., 2012).

Asian markets for chips have increased significantly in recent years. Japan has traditionally been the destination market for the majority of Columbia River and Oregon chips (Busby, 2006). Chinese chip demand is increasing due to a rapid expansion of paper production in China.

Another market for residuals is wood fuels such as pellets, bricks and biomass electrical generation plants. While increased log and chip

exports to Asia produce jobs in the woods, they have altered log and chip markets and made it more difficult for Oregon wood fuels manufacturers who utilize chips as raw material to be profitable.

## **2. Millwork and cut-stock**

Millwork and cut-stock facilities employ about 7,900 people, and those jobs generate about \$566 million in total income.

Oregon has 108 millwork facilities. Millwork and cut-stock operations purchase lumber and remanufacture the lumber into more valuable products. The industry produces molding, siding, flooring, veneered products, window and door components, decorative columns, railings and balusters, finger-jointed lumber, and many other finished lumber products.

Remanufacturing industries provide a link between Oregon's primary manufacturing facilities and the window and door industry in central and eastern Oregon. Lumber remanufacturing facilities are concentrated in central Oregon, southern Oregon and the northern Willamette Valley area. Central Oregon has the largest concentration of facilities, with plants located in Prineville, Madras, Redmond and Bend. These facilities are closely linked to pine-producing mills in Pilot Rock, La Grande, and Gilchrist. They supply window and door components to JELD-WEN, Marvin and Anderson windows. They also supply specialty lumber and trusses used in manufactured housing (mobile home) plants in Oregon and the Midwest.

Lake, Klamath, Josephine and Jackson Counties all have concentrations of remanufacturing

facilities. A particularly large concentration of facilities is in White City (12 plants). Several of these facilities are closely linked to JELD-WEN operations in Klamath County.

Remanufacturing facilities in the Willamette Valley take advantage of the supply of cedar and hardwood species in that region. They produce a mix of hardwood molding, trim, decorative finish lumber, fencing, railings and remanufactured hardwood lumber. The region's remanufacturing plants tend to be smaller and more specialized than central and southern Oregon remanufacturing facilities.

The millwork sector in Oregon is strongly tied to new-home construction and has been hit hard by the recession. The market for remanufactured products such as molding has contracted, along with the market for framing lumber and other construction items. Some remanufacturing firms have adjusted to the decline in the housing market by targeting foreign niche markets. These firms are developing new product lines of higher-value-added products that sell into the commercial and industrial market or into the remodeling market. Some examples of these products are wood columns and wood veneers over metal and plastic.

## **3. Wood containers and pallets**

Wood pallets, skids and other wooden containers employ about 622 people and generate about \$31 million in total income in Oregon. Wood container firms manufacture fruit bins for growers in Oregon and Washington State. Wood pallets and skids are low-value items that sell into a regional market. A local source of pallets and skids is an

economic asset to a variety of other manufacturers that use pallets in their product distribution.

#### **4. Manufactured homes and other wood products**

This sector employs an estimated 2,344 people, with a total income impact of \$93 million.

Other wood products is a “catch-all sector” that includes manufactured homes, log homes, timber-framed homes, prefabricated sheds and a variety of other finished wood products.

The manufactured home industry has experienced a decline even stronger than the decline in new housing construction. Recently, however, the industry has shown some signs of recovery, and mobile home manufacturers are rehiring employees. In total, the manufactured homes industry employs about 1,600 people with a total income of \$71 million.

Oregon has a small log home and timber frame industry. The state lists only 10 employing units in this sector, but other surveys have shown about 22 log home manufacturers (Gale et al., 2012). A Web search found 20 log home manufacturers in Oregon, with an estimated employment of 75 and income of about \$3 million.

Oregon has a large inventory of “red and dead” lodgepole pine that is ideal for log home manufacturing. A pine beetle epidemic, along with catastrophic forest fires, played an important role in the development of the log home industry in the Bitterroot and Flathead valleys of Montana. Oregon has significant transportation advantages over other Western

states in manufacturing log homes for the California market and the export market. Demand has been growing for timber-framed and log homes in Japan and other Asian countries. Oregon already manufactures high-quality beams and laminated beams from a number of sawmills. These are ideally suited for timber framing and log home applications. This is a high-value-added industry, and would be well-suited to the pine regions of central and eastern Oregon.

The log and timber-frame home markets have suffered even more severely in the recession than the overall housing market. Some mountain states manufacturers and dealers have gone out of business in the recession. This represents an opportunity for Oregon firms to get back into the business or expand operations as the market for log and timber-framed homes recovers.

#### **5. Kitchen cabinets**

The kitchen cabinet manufacturing sector employs about 2,600 people in Oregon and generates about \$80 million in total income.

Almost every county in Oregon has a manufacturer of kitchen cabinets. The state has a mixture of small, custom-built cabinet shops and larger manufacturers. The larger manufacturers are concentrated along Interstate 5.

Kitchen cabinet manufacturers are dependent on both the housing and the remodeling markets. In the recession, the remodeling market has held up better than the new-home construction market, but the industry has still declined significantly.

The industry displays a cyclical trend that follows the housing market. It peaked in 2006, and has lost more than half its employment since then. As housing markets recover, this industry should experience a rapid recovery in Oregon. The state has some market advantages for this industry, due to local suppliers of hardwood lumber and hardwood plywood and veneer. We did not find strong linkage in Oregon between the industry and hardwood plywood manufacturers. Stronger linkages to hardwood lumber production were evident.

#### **6. Wood furniture**

The wood furniture sector in Oregon employs about 934 people and generates about \$56 million in total income.

The state's wood furniture industry is diverse and produces a wide variety of products. Oregon manufacturers produce wooden household furniture, household furniture with wooden components, institutional wood partitions, wooden office furniture, driftwood

furniture items, wood-burl furniture, myrtlewood furniture items, juniper decorative furniture items, and a variety of other hardwood furniture. This is a conservative estimate because many of the decorative furniture businesses (myrtlewood and juniper) are not accounted for in employment data. This may be accounted for under gift stores or miscellaneous retail businesses.

Domestic wood furniture production has been hit hard by the globalization of furniture production (Kennan, 2012). Cheap, imported wood furniture has replaced domestic production in most furniture stores.

Decorative items made from juniper, myrtle, and other hardwoods constitute a niche market in the wood furniture arena. The production of decorative wood furniture items from myrtle, ironwood and juniper is labor-intensive, and these items have a high retail value (high value-added).

**Transportation and distribution of forest products**

**(6,833 total employment and \$327 million in total income in Oregon)**

The transportation and distribution of lumber, plywood and paper products employs about 6,833 people and produces about \$327 million in income (Table 1.2-5). It includes rail

transportation, ocean and seaport shipping of logs and wood products, inland marine transportation of wood products, log and lumber hauling, and warehousing and distribution of wood and paper products.

**Table 1.2-5: Jobs and income — transportation and distribution of forest products**

Industry	Jobs	Income
Transport by rail	110	\$16,921,403
Transport by water	263	\$82,019,203
Transport by truck and helicopter	3,421	\$215,627,980
Wholesale trade, warehousing and storage	3,039	\$12,681,190
<b>Total</b>	<b>6,833</b>	<b>\$327,249,776</b>

**1. Transport by rail**

We estimate that forest-related rail transport employs about 110 people, with a total income of about \$16.9 million.

Railroad employment data are suppressed because the state has multiple major rail lines. It is difficult to ascertain the share of this activity that is associated with the forest sector. Oregon has several short-line railroads, and most of their shipping is associated with wood products.

**2. Transport by water (ocean, seaport and inland water transportation)**

About 263 people are employed in handling chips and logs destined for foreign markets and transporting forest products through inland water networks. These industries generate about \$82 million in total income.

This is a segment of the forest sector that has been expanding during the recession, due to

the development of Asian log and chip markets. China has tripled its paper production capacity in the recession, and is expected to continue to be a major importer of wood chips from Oregon ports. Chinese log exports have also increased, both through Oregon seaports and via the Columbia River system.

An active woodchip and log industry exists on the Columbia River. It supplies sawmills and paper mills along the river, and serves the log and chip export markets. Columbia River log shipments are increasing as Asian markets develop. This expansion will not be a major source of employment, as water transport is inexpensive and labor-efficient.

Oregon has an advantage over other areas in accessing aging Asian markets because of the inexpensive cost of transporting lumber and wood products down the Columbia River.

### **3. Transport by truck and helicopter (log and lumber transportation)**

Log and lumber trucking employs about 3,421 people in Oregon, with a total income of about \$215 million.

Secondary data on log trucking is poor because a large percentage of the jobs in log trucking are with independent contractors. We estimate that log trucking employs about 2,400 people in Oregon, with an estimated total income of \$158 million.

Economic activity and log trucking have declined at about the same rate as the decline of logging jobs and timber harvesting in Oregon. The recession has idled a significant percentage of Oregon's log trucking firms. It is difficult to ascertain how many log trucking firms will be able to start up and resume operations as logging activity increases.

Lumber hauling is difficult to differentiate from other flatbed long-distance hauling operations because they use similar equipment and are not differentiated in secondary data from other long-haul trucking operations. Interviews with sawmills indicated that trucks transport a high percentage of lumber products in Oregon. We

estimate that lumber hauling employs more than 1,000 people in Oregon, with a total income of about \$50 million.

The steep terrain of the coastal range and Cascades necessitates helicopter logging of some areas. We estimate that helicopter logging employees 52 people in Oregon, with an associated total income of about \$7 million.

Helicopters are also used by a variety of forestry and land management operations. During the fire season, helicopter logging firms contract their services to the USFS, BLM and ODF for firefighting support.

### **4. Wholesale trade, warehousing, storage and distribution of wood products**

We estimate that about 3,039 people are employed in wholesale trade, warehousing and distributing forest products in Oregon, generating about \$12.7 million in total income.

Most of the larger wood products manufacturing firms have sales and distribution offices in Oregon. Some of these jobs become coded in employment data under other sectors of the economy (sawmills, plywood and other wood products operations).

**Forestland Management and Forest Dependent Industries**

**(17,638 total employment and \$1.2 billion in total income in Oregon)**

Forestland management includes employment and income in the three principal forest landownership categories:

Private-sector management includes corporate management of forest products companies, consulting and scientific services associated with forestlands, and other forest engineering services (Table 1.2-6).

Federal forest and state forest management includes the USFS, the ODF, and state administration of other natural resources and environmental management of forestlands throughout Oregon.

Forest-dependent industries include employment and income in forest-related recreation industries.

**Table 1.2-6: Jobs and income — forestland management and forest-dependent industries**

<b>Activity</b>	<b>Jobs</b>	<b>Total Income</b>
<b>Forest products industry</b>	1,304	\$258,400,000
<b>Government forestry operations</b>		
USFS	4,046	\$191,293,085
ODF	616	\$38,808,000
<b>Private consultants</b>		
Management, scientific and technical	-	-
Environmental and other technical	-	-
Scientific research and development	-	-
Forest-sector share	6,647	\$426,813,285
<b>Forest-dependent industries</b>		
Forest-related recreation	5,026	\$257,505,297
<b>Total</b>	<b>17,639</b>	<b>\$1,172,819,667</b>

**1. Forest products industry**

Oregon forest products companies employ 1,304 people in corporate management offices, with a total income of about \$258 million.

Many of these jobs are high-paying executive management jobs, with offices concentrated in the Eugene and Portland metro areas. Private industrial forest companies also employ a large staff in forest management operations. These jobs are included in employment data under forestry support, and therefore are not included here.

**2. Federal government**

The USFS employs 4,046 people in Oregon, with a total income of \$191 million and a budget of \$242 million.

In addition, the USFS contracts for \$67 million in forestry services such as recreation management and firefighting services. This does not include expenditures associated with major fires. The cost of major fires is difficult to predict from one year to the next, and is handled by the national wildland fire budgets of each federal land management agency.

Fire-suppression contracting has become a significant employer in parts of Oregon, particularly in central and eastern Oregon. Purchases of goods and services for fire support make an important seasonal contribution to the economy. Due to the uncertain aspects of fire conditions and expenditures, expenditures vary greatly from year to year and region to region.

In western Oregon, the BLM manages approximately 2.5 million acres of forestland known as the O&C Lands. Statewide the BLM manages over 15.7 million acres. We didn't estimate the BLM's economic impact because, statewide, the agency isn't entirely dedicated to forestland management (U.S. Department of Interior documentation reports that BLM forestland management in Oregon generates an estimated 890 direct jobs and \$245.9 million in direct output) (U.S. Department of the Interior, 2011).

### **3. State government**

The ODF employs 616 people, with a total income of about \$39 million.

Another 130 people are employed in the administration of other natural resource and mining programs, with a payroll of about \$6 million. Secondary data also shows 2,635 state employees who administer environmental programs (with a payroll of \$128 million). We estimate as many as half these employees are associated with the

forestlands of the state, but we did not include these jobs to avoid overestimation.

### **4. Forestry and environmental consulting and research**

A total of about 6,647 people are employed in forestry and environmental consulting in Oregon, with a total income of about \$426 million.

Oregon has several public and private forest laboratories and research centers including Oregon State University. Combined, these centers and laboratories employ several hundred people. They are concentrated in the Portland, Corvallis and Eugene areas. Perhaps as much as 30 percent of their activities are associated with Oregon forests. This varies considerably from year to year as research priorities change in response to shifts in public policy.

### **5. Forest-related recreation**

Forest-related recreation in Oregon accounts for an estimated 5,026 jobs, with a total income of about \$257 million.

Many of these jobs are tied to ski areas, which provide full-time and seasonal employment opportunities. Other forest-related recreation jobs can be linked to seasonal recreational guiding services such as white water rafting and fishing.

Table 1.2-7 shows the number of forest sector jobs that are created or retained by an increase in 1 MMBF of timber harvest. The total marginal effect of a change in timber volume on Oregon’s forest sector is 10.88 direct jobs per MMBF. Additional indirect and induced jobs, resulting from forest sector company and employee purchases could add or save more jobs. These estimates are based on the reasonable assumption that short-term gains in employment occur with those sectors most closely related to timber harvesting.

Sawmills are currently operating at about two jobs per MMBF. Veneer plants are even more efficient, with about 1.5 jobs per MMBF. Additional jobs are tied to logging (2.5 jobs per MMBF), log and lumber trucking (1 job per MMBF), forestry and silviculture (1 job per MMBF) and land management activities (about .5 jobs per MMBF). We have not included the USFS in these calculations, because at this time their employment and budgets are not very responsive to changes in timber harvest. Most of the timber harvested in Oregon is sourced from private land.

**Table 1.2-7: Forest sector industries directly linked to timber harvest (jobs per MMBF)**

<b>Forest Sector Industry</b>	<b>Jobs per MMBF</b>
<b>Forestry Support</b>	
Forest Greenhouse	0.17
Forestry, forest products, and timber tract production	0.66
Commercial logging	2.50
Margined for Direct Forestry Support	1.00
<b>Primary Forest Products Manufacturing</b>	
Sawmills and wood preservation	1.96
Veneer and plywood manufacturing	1.52
Pulp mills	0.50
Paper mills	0.25
Paperboard Mills	0.28
<b>Secondary and Tertiary Wood Products</b>	
Wood chips, bark and residuals	0.30
<b>Transportation and Distribution of Forest and Wood Products</b>	
Transport by rail	0.03
Transport by water	0.08
Transport by truck	1.04
<b>Land Management</b>	
Private Forest Products Management	0.40
Oregon Department of Forestry	0.19
<b>Total</b>	<b>10.88</b>

Source: Forest Econ Inc. (input-output models)

### **Oregon's forest sector — employment changes during in the great recession**

To see how employment within Oregon's forest sector changed during the Great Recession, we compared employment from 2006 to 2010 in each forest industry in Oregon with that in the same industry in the United States as a whole.

The forest sector nationally has contracted in the recession, and Oregon's forest sector has contracted faster than comparable national forest-sector industries. Table 1.2-8 shows how employment in each of the forest-sector industries has changed in the United States and in Oregon.

We then calculated how many jobs Oregon would have had in 2010 if its forest sector had retained the same market share as in 2006. This is shown as the standardized employment in Table 1.2-9. We used shift-share analysis to calculate market shares and standardized employment. This shows how Oregon has either

gained or lost market share and jobs in each forest industry.

All but a few of Oregon's forest-sector industries have contracted more rapidly than the national rate of change. The industries that have done substantially better than the national average are hardwood plywood, engineered wood products, millwork, and wood windows and doors.

Forest-sector industries that performed the worst in relation to national employment averages were reconstituted wood products, other wood products, and pulp and paper mills.

The largest numerical job losses in relation to national averages were in reconstituted wood products, other wood products and paper mills.

If forest-sector industries in Oregon had kept pace with national job growth, Oregon would have 5,362 additional forest-sector jobs today.

**Table 1.2-8: Employment of Oregon's core forest sector, 2006-10**

Industry/Sub-industry	2010			2006		
	U.S.	OREGON	Oregon Share	U.S.	OREGON	Oregon Share
	Jobs (thousands)			Jobs (thousands)		
<b>Logging</b>	<b>49.6</b>	<b>5.030</b>	<b>10%</b>	<b>62.2</b>	<b>7.230</b>	<b>12%</b>
<b>Forestry support</b>	<b>14</b>	<b>3.672</b>	<b>26%</b>	<b>15.7</b>	<b>4.148</b>	<b>26%</b>
<b>Sawmills and wood preservation</b>	<b>82.5</b>	<b>6.013</b>	<b>7%</b>	<b>117.3</b>	<b>9.014</b>	<b>8%</b>
<i>Sawmills</i>	73.9	5.590	8%	105.6	8.396	8%
<i>Wood preservation</i>	8.6	0.423	5%	11.7	0.618	5%
<b>Plywood and engineered Wood</b>	<b>268.0</b>	<b>11.647</b>	<b>4%</b>	<b>437.9</b>	<b>23.307</b>	<b>5%</b>
<i>Hardwood plywood</i>	14.7	1.403	10%	22.4	1.619	7%
<i>Softwood plywood</i>	14	3.773	24%	19.6	5.255	27%
<i>Engineered wood</i>	4.0	0.531	13%	9.1	1.108	12%
<i>Truss manufacturing</i>	18.2	0.359	2%	50	1.081	2%
<i>Reconstituted wood manufacturing</i>	23.3	1.100	5%	19.1	1.619	8%
<i>Other wood products</i>	193.8	4.481	2%	317.7	12.625	4%
<b>Millwork</b>	<b>91.8</b>	<b>4.839</b>	<b>5%</b>	<b>158.7</b>	<b>6.597</b>	<b>4%</b>
<i>Wood window and doors</i>	45	1.948	4%	78.7	1.443	2%
<i>Cut stock</i>	11.8	2.070	18%	19.4	3.711	19%
<i>Flooring and other millwork</i>	35	0.821	2%	60.6	1.443	2%
<b>Wood container and pallets</b>	<b>50.6</b>	<b>0.619</b>	<b>1%</b>	<b>58.8</b>	<b>0.737</b>	<b>1%</b>
<b>All other wood products</b>	<b>51.3</b>	<b>1.413</b>	<b>3%</b>	<b>100.1</b>	<b>3.154</b>	<b>3%</b>
<i>Manufactured homes</i>	19.2	0.873	5%	47.4	2.240	5%
<i>Prefabricated wood buildings</i>	13.4	0.224	2%	26.7	0.390	1%
<i>Miscellaneous wood products</i>	18.7	0.316	2%	26.0	0.524	2%
<b>Paper manufacturing</b>	<b>469.3</b>	<b>6.820</b>	<b>1%</b>	<b>722.2</b>	<b>11.150</b>	<b>2%</b>
<i>Pulp and paper</i>	111.7	2.74	2%	136.4	3.900	3%
<i>Pulp mills</i>	5.9	0.200	3%	6.4	0.600	9%
<i>Paper mills</i>	76	1.719	2%	93.5	2.500	3%
<i>Newsprint mills</i>	7.8	0.200	3%	9.2	0.300	3%
<i>Converted containers</i>	146.6	0.909	1%	332	2.626	1%
<i>Corrugated box and solid fiber</i>	92.6	0.848	1%	112.6	0.939	2%
<i>Coated and laminated paper</i>	28.7	0.204	1%	32.1	0.285	1%
<b>Industry Total</b>	<b>1,077.1</b>	<b>40.053</b>	<b>3.7%</b>	<b>1,672.9</b>	<b>65.337</b>	<b>3.9%</b>

Source: BLS, Quarterly Census of Employment and Wages, 2012

**Table 1.2-9: Shift in market share of Oregon's core forest sector, 2010**

Industry/Sub-industry	2010 Oregon	2010 Standardized	Shift Jobs	Percent Shift
<b>Logging</b>	<b>5,030</b>	<b>5,765</b>	<b>(735)</b>	<b>-13%</b>
<b>Forestry support</b>	<b>3,672</b>	<b>3,699</b>	<b>(27)</b>	<b>-1%</b>
<b>Sawmills and wood preservation</b>	<b>6,013</b>	<b>6,330</b>	<b>(317)</b>	<b>-5%</b>
<i>Sawmills</i>	5,590	5,876	(286)	-5%
<i>Wood preservation</i>	423	454	(31)	-7%
<b>Plywood and engineered wood</b>	<b>11,647</b>	<b>15,374</b>	<b>(3,727)</b>	<b>24%</b>
<i>Hardwood plywood</i>	1,403	1,062	(341)	32%
<i>Softwood plywood</i>	3,773	3,754	19	1%
<i>Engineered wood</i>	531	489	42	9%
<i>Truss manufacturing</i>	359	393	(34)	-9%
<i>Reconstituted wood manufacturing</i>	1,100	1,975	(875)	-44%
<i>Other wood products</i>	4,481	7,701	(3,220)	-42%
<b>Millwork</b>	<b>4,839</b>	<b>3,915</b>	<b>924</b>	<b>23%</b>
<i>Wood window and doors</i>	1,948	825	1,123	136%
<i>Cut stock</i>	2,070	2,257	(187)	-8%
<i>Flooring and other millwork</i>	821	833	(12)	-1%
<b>Wood container and pallets</b>	<b>619</b>	<b>634</b>	<b>(15)</b>	<b>-2%</b>
<b>All other wood products</b>	<b>1,413</b>	<b>1,478</b>	<b>(65)</b>	<b>-4%</b>
<i>Manufactured homes</i>	873	905	(32)	-4%
<i>Prefabricated wood buildings</i>	224	196	28	14%
<i>Miscellaneous wood products</i>	316	377	(61)	-16%
<b>Paper manufacturing</b>	<b>6,820</b>	<b>8,220</b>	<b>(1,400)</b>	<b>-17%</b>
<i>Pulp and paper</i>	2,740	3,194	(454)	-14%
<i>Pulp mills</i>	200	553	(353)	-64%
<i>Paper mills</i>	1,719	2,032	(313)	-15%
<i>Newsprint mills</i>	200	254	(54)	-21%
<i>Converted containers</i>	909	1,160	(251)	-22%
<i>Corrugated box and solid fiber</i>	848	772	76	10%
<i>Coated and laminated paper</i>	204	255	(51)	-20%
<b>Total Shift in Market Share</b>	<b>40,053</b>	<b>45,415</b>	<b>(5,362)</b>	<b>-12%</b>

Source: Forest Econ Inc., 2012 (input-output models)

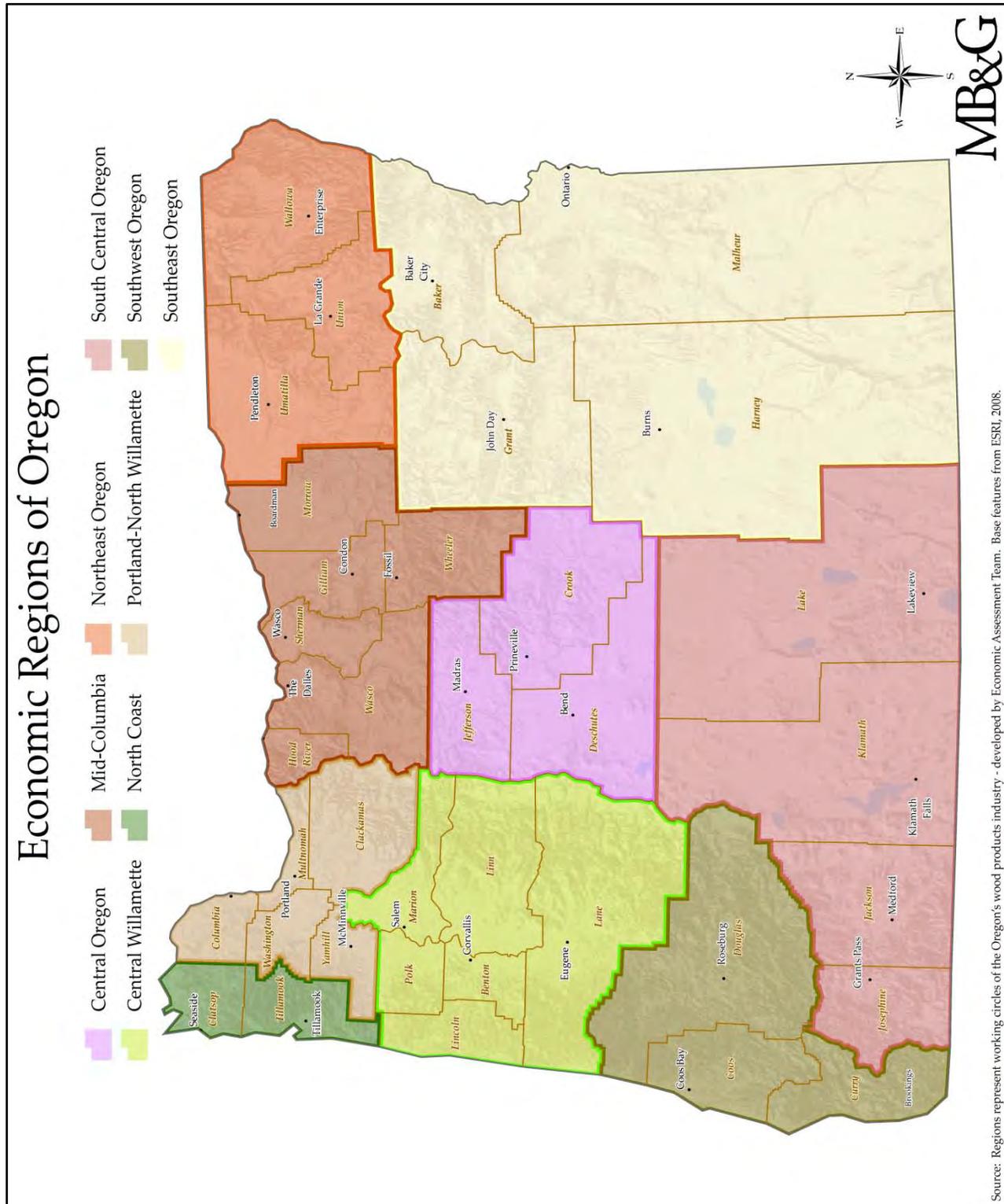
## Section 1.3 — Regional Analysis of Oregon’s Forest Sector

### **Introduction**

This section describes the role of the forest sector in each region of the state (Figure 1.3-1). These regions correspond in most cases with Oregon labor market regions (OLMIS, 2012), but also reflect large trade areas of Oregon’s two major cities (Portland and Eugene). They are as follows:

- Northeast Oregon (Umatilla, Union and Wallowa counties)
- Southeast Oregon (Baker, Grant, Harney and Malheur counties)
- Mid-Columbia (Gilliam, Hood River, Morrow, Sherman, Wasco and Wheeler counties)
- Central Oregon (Crook, Deschutes and Jefferson counties)
- South Central Oregon (Jackson, Josephine, Klamath and Lake counties)
- Southwest Oregon (Coos, Curry and Douglas counties)
- Central Willamette (Benton, Lane, Lincoln, Linn, Marion and Polk counties)
- Portland-North Willamette (Clackamas, Columbia, Multnomah, Washington and Yamhill counties)
- North Coast (Clatsop and Tillamook counties)

We included Portland in the Portland-North Willamette region, and Eugene in the Central Willamette region. Columbia County was included in the Portland-North Willamette region because of a strong commuting pattern into the Portland metro area. These regions are also consistent with the resource area identified in Oregon Mill surveys (Ehinger, 2006, and Gale et al., 2012).



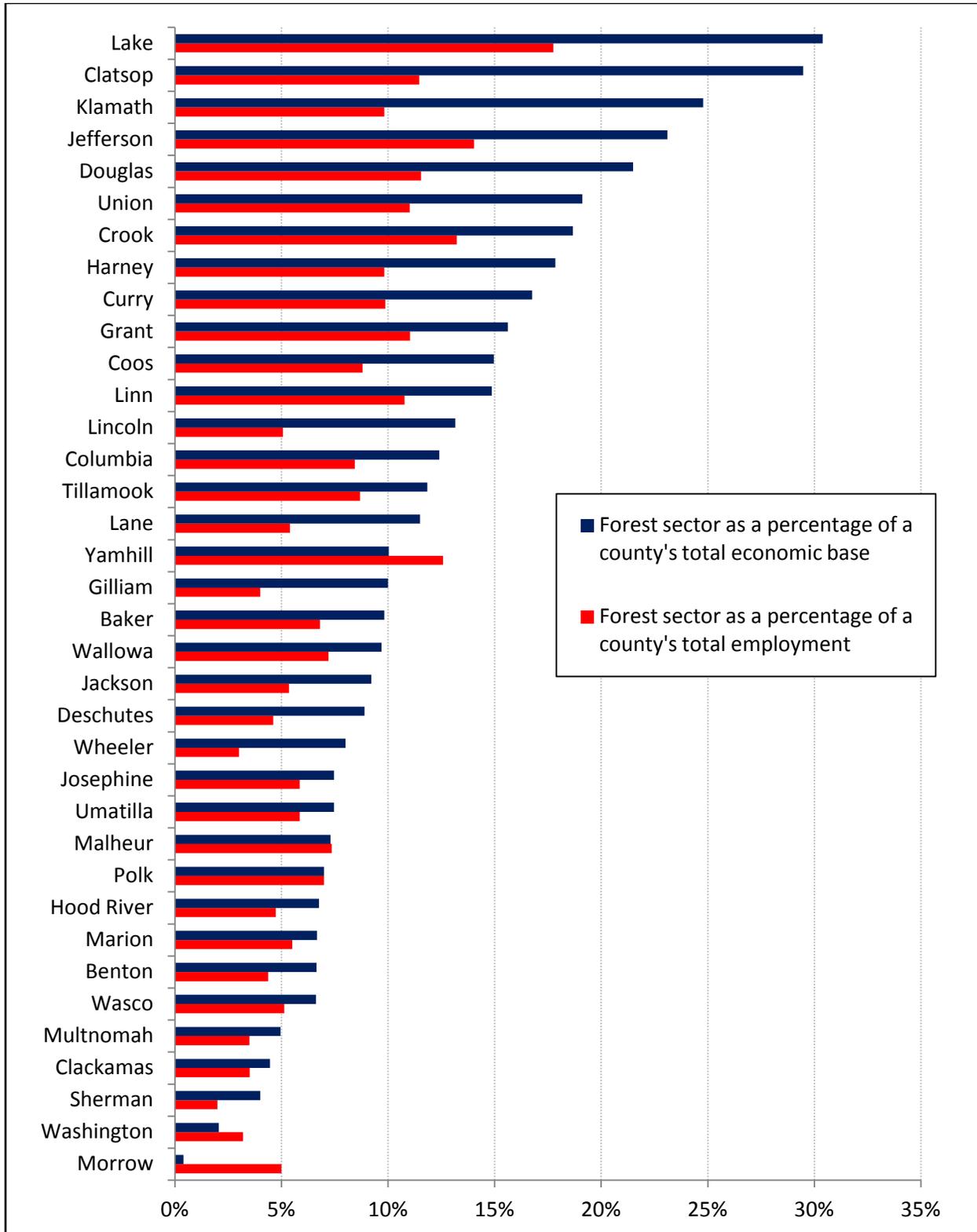
**Figure 1.3-1: Economic regions of Oregon**

Sources: Regions represent working circles of Oregon's forest sector developed by Forest Econ Inc., 2012; base features are from Environmental Science Research Institute (ESRI), 2008.

Two types of economic analyses are used in the following regional descriptions:

- Economic base analysis uses several techniques (supply-demand pool and regional purchase coefficients) to identify those sectors of the economy that are exporting goods and services. Export sales bring money into the economy and support other sectors of the economy. Other sectors of the economy provide goods and services for residents of the area. Re-spending in these non-basic sectors creates a multiplier effort as dollars are re-spent on locally consumed goods and services.
- Shift-share analysis compares a region's or industry's actual growth to the growth of the national economy (standardized) to show how the economy would have changed if local industries grew at the same rate as corresponding industries in the nation. The difference shows how many additional jobs the county lost or gained compared to national averages. This analysis answers the question, "How has the region performed compared to the national economy?" We used shift-share analysis to see how regions of Oregon fared from 2001 to 2010.

Forest industries make a major contribution to the economy of Oregon (Figure 1.3-2). Even with major plant closures and layoffs during the recession, they remain the driving force in the economy of many Oregon counties. About half of Oregon counties are timber-based communities, that is, the forest sector makes up a significant portion of employment relative to other industries. The more populous and economically diverse counties around Portland and the agriculturally based counties in the mid-Columbia region are not significantly dependent upon forest industries to support the overall economy.



**Figure 1.3-2: Contribution of the forest sector to Oregon's economy by county**

Source: Forest Econ Inc., 2012 (input-output models)

**Northeast Oregon (Umatilla, Union and Wallowa counties)**

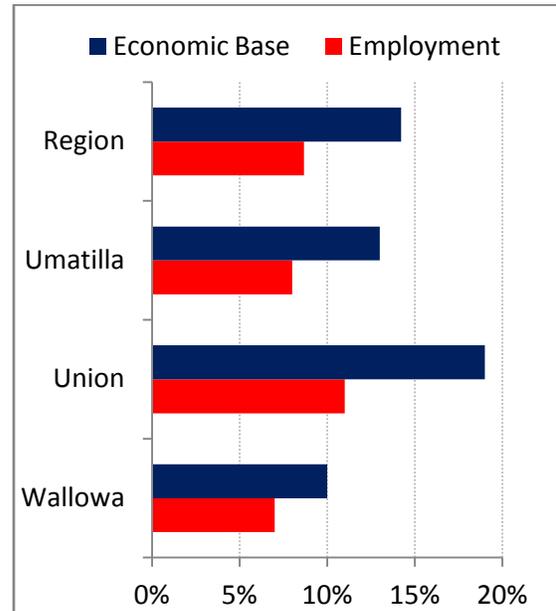
**8.7 percent of region’s employment and 14.2 percent of region’s economic base**

In eastern Oregon, the forest sector is concentrated in the northeast region with Boise Cascade being the dominant wood products company in the region. A combination of reduced federal timber supply, the housing market crash and Chinese log export competition has resulted in a decline in the region’s sawmill capacity in recent years. Some mills have redirected their product lines for the remanufacturing industry in central Oregon.

All three counties are timber-based, with Union County having the highest percent of its economic base tied to forest industries (Figure 1.3-3). Forest-sector industries are also important in Umatilla County, but its economy is more diversified and is growing into other sectors.

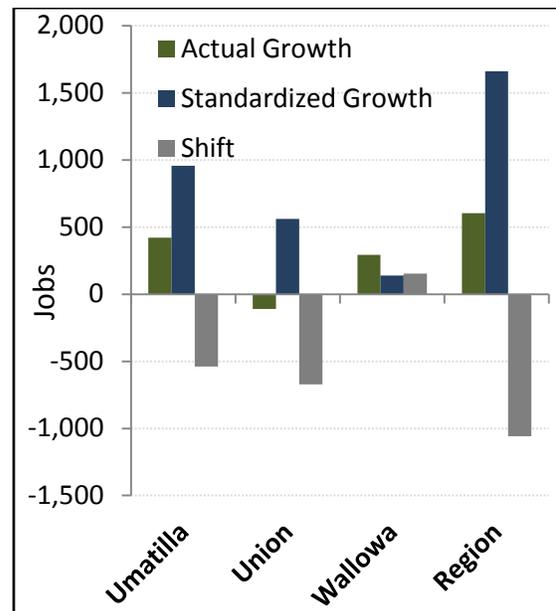
The forest sector is still important in Wallowa County, but the county has lost a considerable portion of its forest employment and processing capability. Gradually, tourism and recreation are becoming more important in that county. Seasonal homes also make an important contribution to the economic base, particularly in Wallowa County.

Shift-share analysis indicates that the area has about 1,050 fewer jobs than it would have if its industries had grown at a rate comparable to the national growth rate of these industries (Figure 1.3-4). The area is losing jobs in key industries to other areas of the country. Most of this loss can be traced to underperformance of the wood products cluster in the three counties.



**Figure 1.3-3: Forest-sector contribution to the economy in northeast Oregon**

Source: Forest Econ Inc., 2012 (input-output models)



**Figure 1.3-4: Shift-share analysis of northeast Oregon, 2001-10**

Source: Project REAP, 2012

**Southeast Oregon (Baker, Grant, Harney and Malheur counties)**

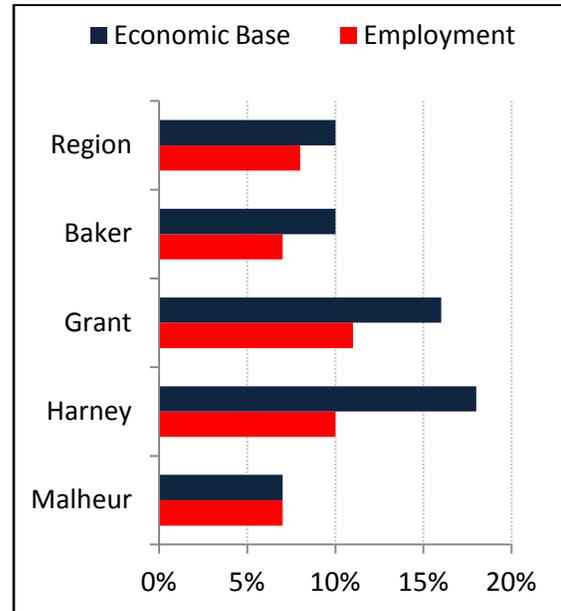
**7.9 percent of region’s employment and 10.2 percent of region’s economic base**

The southeast region has a high percentage of federal forestlands, and as federal timber harvests declined in the 1990s, the region lost most of its wood products manufacturing infrastructure. Two major mills in the region are temporarily closed. For them to reopen, a significant increase in federal timber supply would have to occur.

Forest-sector industries are a significantly larger proportion of the base in Grant and Harney counties, but the larger population of Malheur County lowers the regional percentage (Figure 1.3-5). Malheur County is also a more agriculturally based county with very little forest-sector contribution.

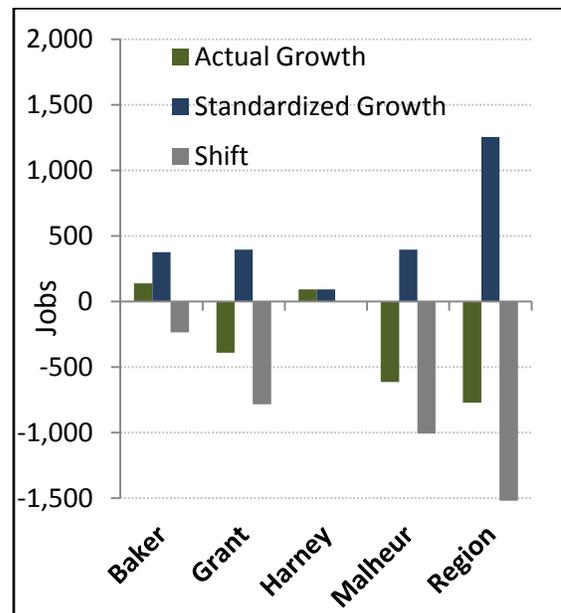
Southeast Oregon is the most economically distressed region in the state. Shift-share analysis shows the region lost market share in most forest-sector industries. If those industries would have grown at the same rate as corresponding industries in the nation, the region would have gained 1,200 jobs (Figure 1.3-6).

Demographically, the Southeast Oregon region is characterized by high poverty rates, low per-capita and household income, declining population, aging population structure and a hollowing out of the economic base. Residents in these three counties earn the majority of their income in wage and salary employment. Transfer payments and investment income are also important.



**Figure 1.3-5: Forest-sector contribution to the economy in southeast Oregon**

Source: Forest Econ Inc., 2012 (input-output models)



**Figure 1.3-6: Shift-share analysis of southeast Oregon, 2001-10**

Source: Project REAP, 2012

**Mid-Columbia (Gilliam, Hood River, Morrow, Sherman, Wasco and Wheeler counties)**

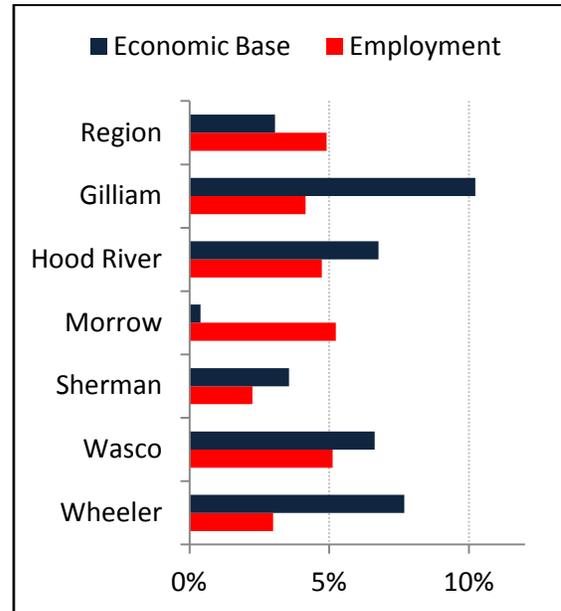
**4.9 percent of region’s employment and 3.1 percent of region’s economic base**

The forest sector is not a major employer in the mid-Columbia region. This region has the lowest percentage of forestlands of any region. The region is characterized by scattered small agricultural and ranching communities that are not strongly tied to forest-sector industries. The agriculture-based economy has provided a buffer against the effects of the recession in this region. Like many agricultural regions, this area is not growing, but has a stable economy.

Hood River County is much wetter than the other mid-Columbia counties and is heavily forested. Forest-sector industries in this county account for about 5 percent of employment and about 7 percent of the economic base (Figure 1.3-7).

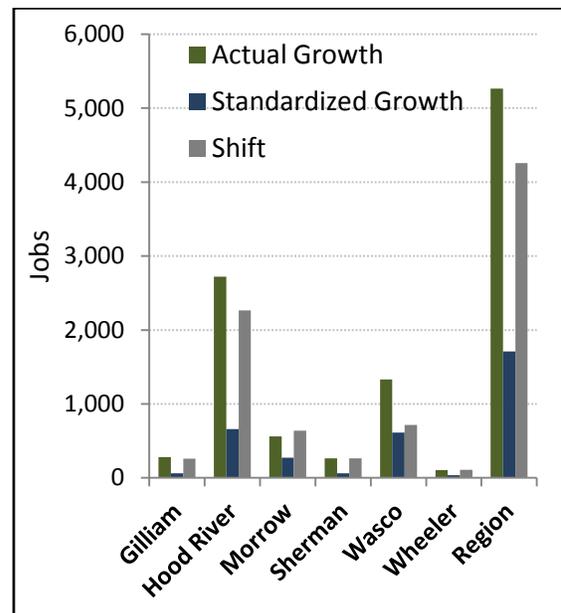
Commuting to the Portland metro area is becoming more common in the region, but its contribution has not yet been captured by the Portland labor market area. If high-tech industries continue to locate in Hood River County, it could become part of the greater Portland economy.

Shift-share analysis shows that the region gained more jobs compared to national growth for a similar mix of industries (Figure 1.3-8). Hood River County gained 2,720 jobs from 2001 to 2010, while, nationally 662 jobs were gained in corresponding industries.



**Figure 1.3-7: Forest-sector contribution to the economy in the Mid-Columbia region**

Source: Forest Econ Inc., 2012 (input-output models)



**Figure 1.3-8: Shift-share analysis of the Mid-Columbia region, 2001-10**

Source: Project REAP, 2012

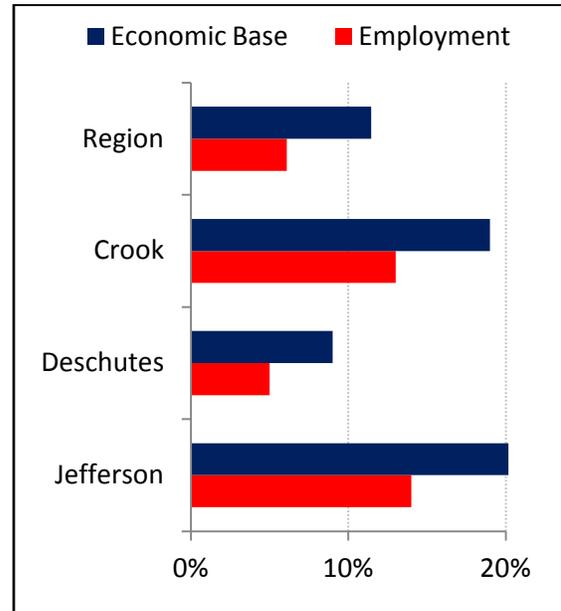
**Central Oregon (Crook, Deschutes and Jefferson counties)**

**6.1 percent of region’s employment and 11.5 percent of region’s economic base**

Central Oregon lost the majority of its primary wood products infrastructure during the recession. This region has the largest concentration of remanufacturing facilities in the state, including industrial pine lumber manufactured by the mills in eastern and south central Oregon. Window and door manufacturers in southern Oregon use window and door components. The millwork plants also use fir and hardwood from other areas of Oregon to manufacture molding and other millwork products.

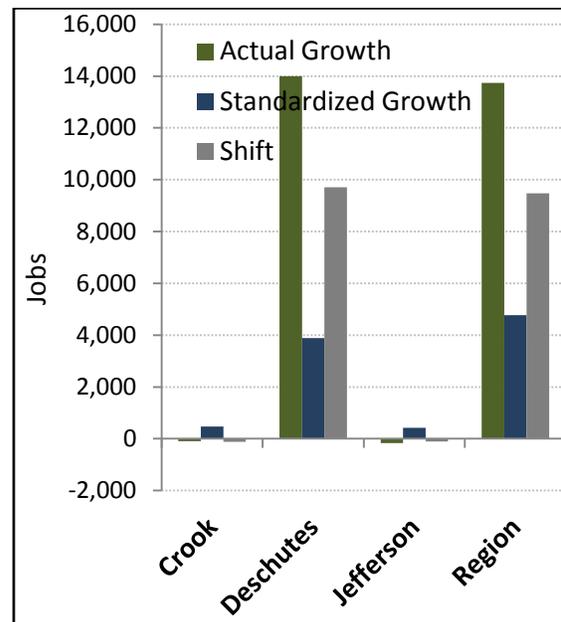
Some remanufacturing industries have developed new niche markets and foreign markets to cope with the loss of domestic sales. They manufacture high-value-added products such as veneered beams, columns, laminated and veneered lumber, and hardwood overlay components.

Shift-share analysis shows the region gained market share, particularly in Deschutes County, due to its diverse and broad-based economy. High-tech industries (Apple and Facebook data storage facilities) compensated for the jobs lost within the forest sector. Corresponding industries in the nation grew faster than those in Crook and Jefferson counties, but overall, the region outpaced the nation in employment growth (Figure 1.3-10).



**Figure 1.3-9: Forest-sector contribution to the economy in central Oregon**

Source: Forest Econ Inc., 2012 (input-output models)



**Figure 1.3-10: Shift-share analysis of Central Oregon, 2001-10**

Source: Project REAP, 2012

**South Central Oregon (Jackson, Josephine, Klamath and Lake counties)**

**6.5 percent of region’s employment and 12.3 percent of region’s economic base**

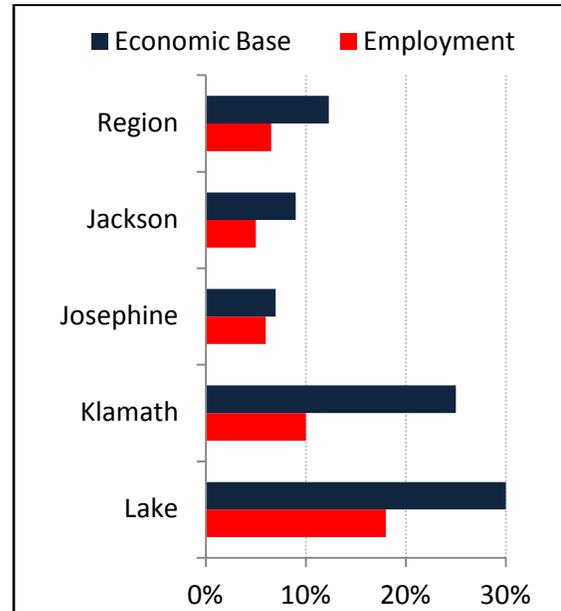
The working circle for mills in south central Oregon encompasses a large area of industrial private timberlands, state forests and BLM lands that have been managed until recent years for non-declining harvest. Several mills in the region are no longer dependent on federal timber supplies.

The forest sector is an important component of the economic base of all four counties in the region. There is a mix of primary and secondary processing facilities throughout the region, and the corporate headquarters and regional offices of several wood product firms are located here.

Forest-sector industries are the strongest and most diversified in Jackson and Josephine counties, but make a proportionately important contribution to the economy of Lake and Klamath counties (Figure 1.3-11).

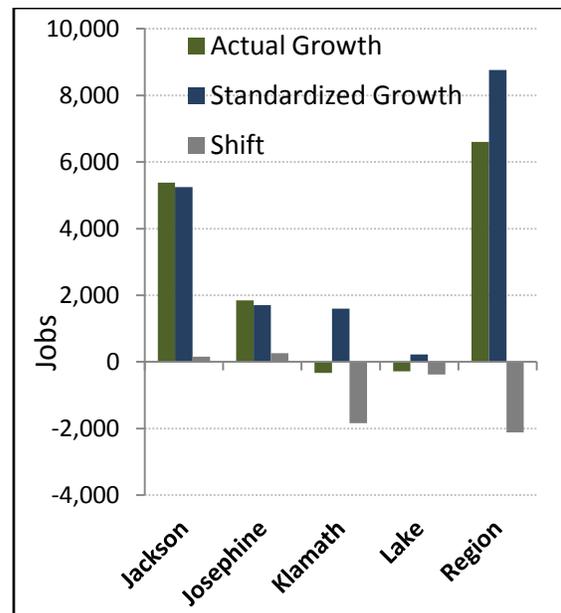
The region has grown more slowly than the national average for the mix of industries present. Jackson and Josephine are the only counties that have done better than national averages in the region. Klamath County has fared worse, with Lake County showing similar trends.

Overall, if industries in the region would have grown at the same rate as corresponding industries in the nation, south central Oregon would have gained 2,100 jobs (Figure 1.3-12).



**Figure 1.3-11: Forest-sector contribution to the economy in south central Oregon**

Source: Forest Econ Inc., 2012 (input-output models)



**Figure 1.3-12: Shift-share analysis of south central Oregon, 2001-10**

Source: Project REAP, 2012

**Southwest Oregon (Coos, Curry and Douglas counties)**

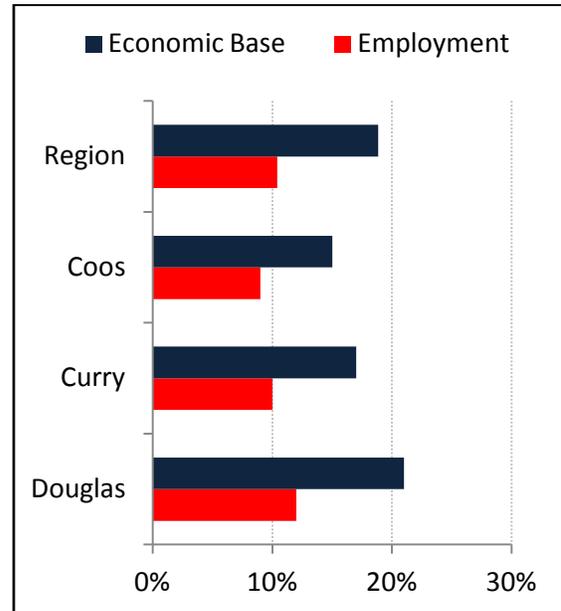
**10.4 percent of region’s employment and 18.8 percent of region’s economic base**

Historically, this was one of the nation’s most productive regions in terms of timber production and processing, but because of species habitat issues, timber supplies on both public and private lands have been reduced significantly since the 1990s. Douglas County was the most severely impacted, losing about 40 percent of employment in the forest sector.

Within the region, Douglas County has the best-developed and integrated forest-sector industries with a combination of plywood mills, reconstituted fiber board mills and high-production sawmills. These facilities coped with the recession by reducing production and employment, developing new product lines and shutting down operations indefinitely. A number of smaller mills in the region produce high-quality beams and laminated beams that are sold to high-end commercial construction around the world.

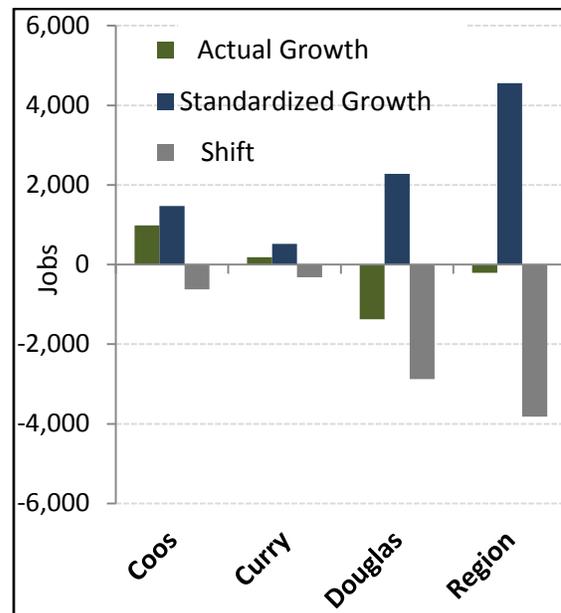
Twelve percent of the employment in Douglas County is related to the forest sector, accounting for 21 percent of the county’s economic base (Figure 1.3-13).

Southwest Oregon has an industry mix that would have supported a fairly healthy growth of around 4,500 jobs in the region’s economy had it grown at the same pace as the nation’s from 2001-10 (Figure 1.3-14). Douglas County accounts for most of this shift.



**Figure 1.3-13: Forest-sector contribution to the economy in southwest Oregon**

Source: Forest Econ Inc., 2012 (input-output models)



**Figure 1.3-14: Shift-share analysis of southwest Oregon, 2001-10**

Source: Project REAP, 2012

**Central Willamette (Benton, Lane, Lincoln, Linn, Marion and Polk counties)**

**5.9 percent of region’s employment and 9.6 percent of region’s economic base**

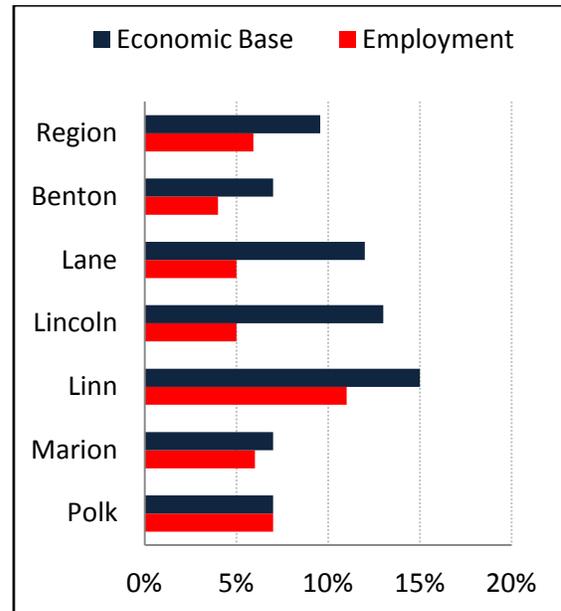
The central Willamette region is the heart of Oregon’s forest sector. From Cottage Grove to Albany, forest-sector facilities are concentrated on both sides of Interstate 5. Forest-sector industries are a key component of the economy in all these counties.

Unlike eastern and southern Oregon, this region also has a diversified economy with a strong mix of industries that are growing nationally. All of the counties except Linn County showed employment growth over the past 10 years.

Linn County is the most economically distressed county in the region as it has lost major components of its primary processing facilities and has not yet recovered from the recession. The tax base suffered from mill closures, and the county has experienced more fiscal problems than surrounding counties.

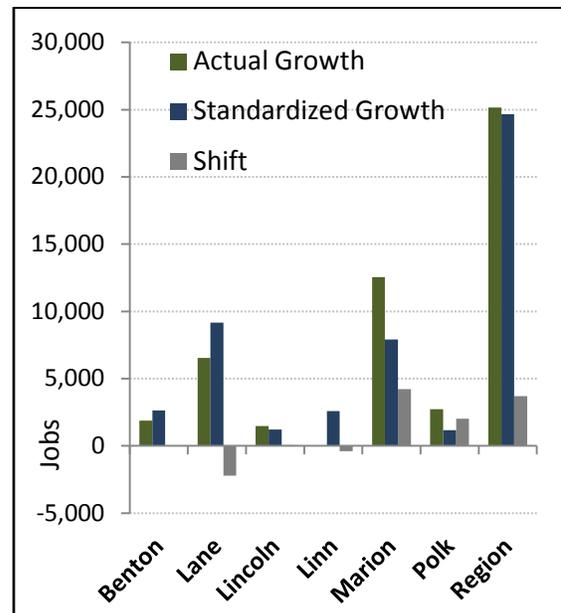
Eleven percent of the employment in Linn County is related to the forest sector, accounting for 15 percent of the county’s economic base (Figure 1.3-15).

The central Willamette region, as a whole, has kept pace with national growth within similar industries (Figure 1.3-16). All counties except for Linn County continued to expand through the recession.



**Figure 1.3-15: Forest-sector contribution to the economy in the central Willamette region**

Source: Forest Econ Inc., 2012 (input-output models)



**Figure 1.3-16: Shift-share analysis of the central Willamette region, 2001-10**

Source: Project REAP, 2012

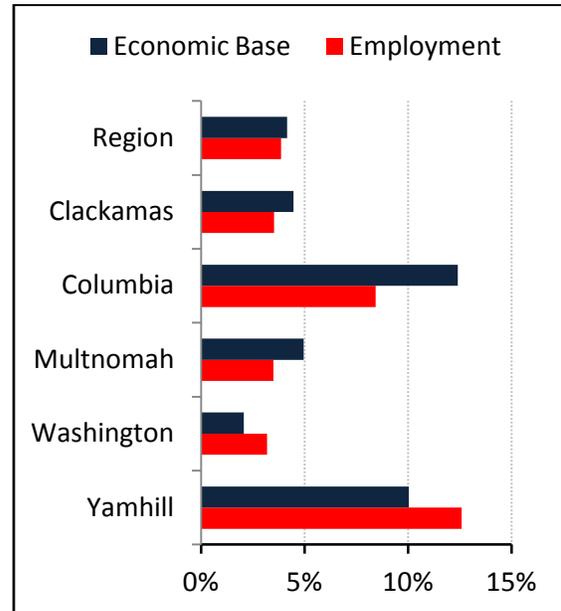
**Portland-North Willamette (Clackamas, Columbia, Multnomah, Washington and Yamhill counties)**  
**3.9 percent of region’s employment and 4.1 percent of region’s economic base**

This is Oregon’s most economically diversified region, with the best industry mix for future growth. The Portland area outperformed the rest of the state in growth, and all the counties, except Multnomah County, grew more than expected based on their mix of industries.

Multnomah County’s weaker performance is probably best explained by expansion of the Portland metro economy into neighboring counties (Figure 1.3-17).

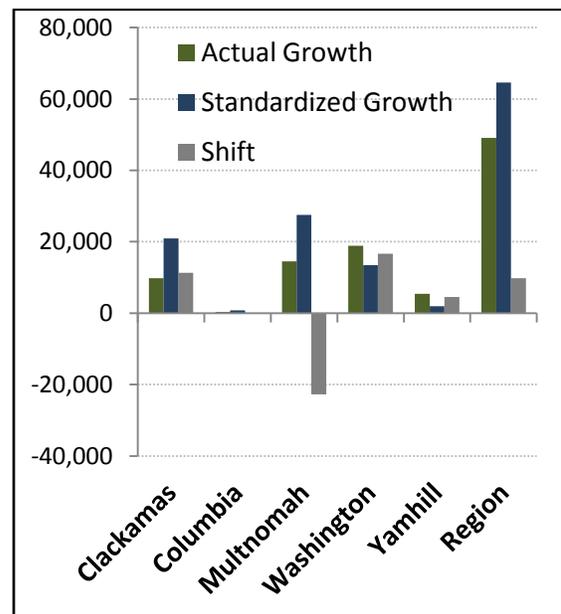
There are concentrations of sawmills in Molalla and Forest Grove and along the Columbia River. The combination of barge transportation, the Union Pacific mainline and Interstate 84 offers the best overall transportation system in the Pacific Northwest. Portland dominates both grain and wood products trade in this multi-state region.

Shift-share analysis shows that the region experienced employment growth, but lagged behind national growth in similar industries (Figure 1.2-18).



**Figure 1.3-17: Forest-sector contribution to the economy in the Portland-North Willamette region**

Source: Forest Econ Inc., 2012 (input-output models)



**Figure 1.3-18: Shift-share analysis of the Portland-North Willamette region, 2001-10**

Source: Project REAP, 2012

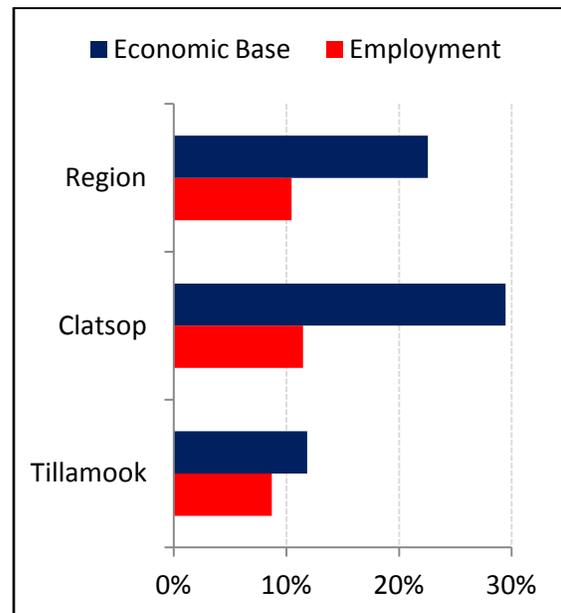
**North Coast (Clatsop and Tillamook counties)**

**10.5 percent of region’s employment and 22.6 percent of region’s economic base**

The north coast counties have an industry mix of wood products, agriculture, tourism, land development, seasonal homes, and fishing and seafood processing. The forest sector has been more stable here due to the presence of Tillamook State Forest, and a healthy mix of industrial private forestlands. Timber harvests have not declined on these lands, and the forest sector is much more vigorous in this region than others.

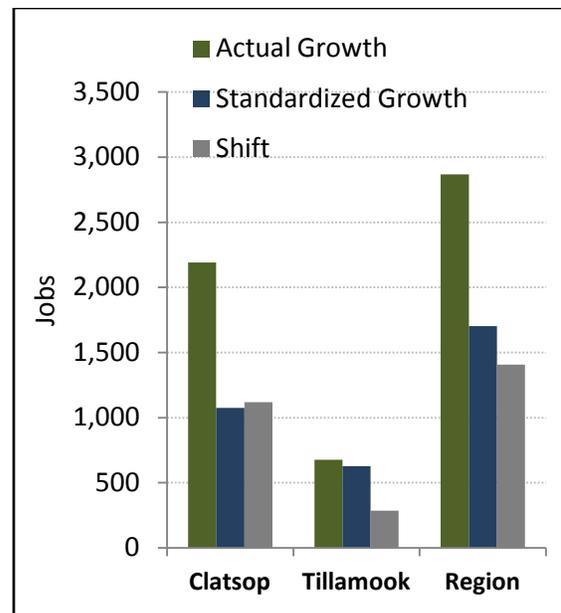
The forest sector is the strongest employment industry in the region, but fishing and seafood processing is also a strong employment sector. The two coastal counties have narrow, resource-based economies, with forest industries being the most important component of the economic base (Figure 1.3-19). Forest industries make a proportionately greater contribution to the economic base here than in any other region of the state.

Shift-share analysis indicates that industries in the north-coast region outperformed similar industries across the nation. Both counties did well, with Clatsop County showing particularly strong growth (Figure 1.3-20).



**Figure 1.3-19: Forest-sector contribution to the economy in the north coast region**

Source: Forest Econ Inc., 2012 (input-output models)



**Figure 1.3-20: Shift-share analysis of the north coast region, 2001-10**

Source: Project REAP, 2012

## Section 1.4 — Forest-Sector Manufacturing

### **Forest products output and wood supplies**

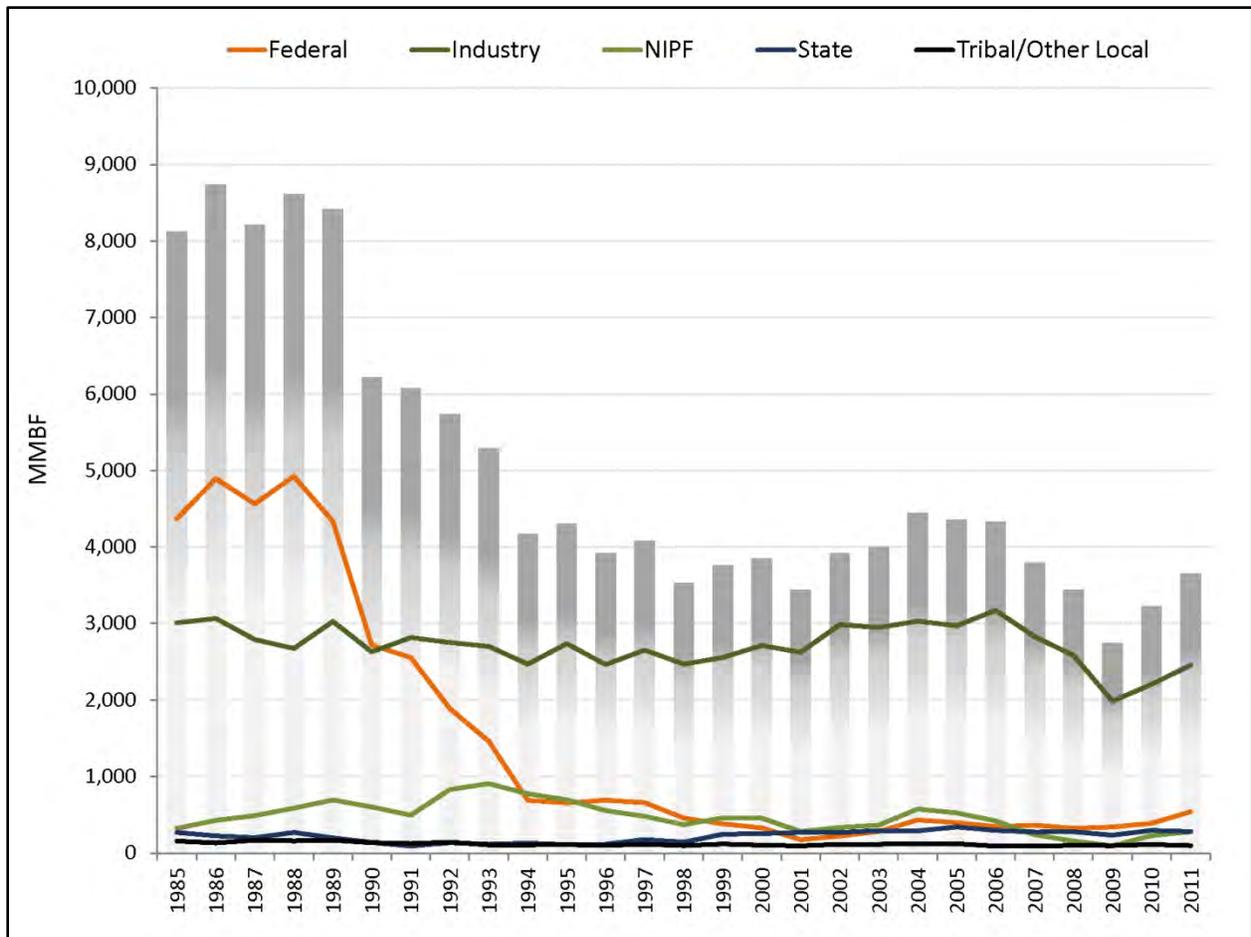
Supplies of wood and fiber play a major role in shaping the behavior of wood products firms in Oregon. For solid-wood manufacturers, for example, raw material remains the largest single cost of production, amounting to nearly two-thirds of variable costs for lumber and 55 percent to 60 percent for plywood.

Harvest decisions by timberland owners control the levels of timber harvest and hence the prices of wood and fiber in log markets. On public timberlands, timber harvests are determined by policies established through both administrative and legislative processes. In some instances, such as Oregon's state forestlands, policies recognize revenues from timber sales as a management objective, but in other cases, they do not.

Private owners tend to be more sensitive to timber prices and demand in log markets, but there is wide variation across owners and regions. In setting their harvest levels, industrial or corporate owners with timber revenue objectives balance market price signals, cash flow needs and concerns about the return on investment. Non-industrial or non-

corporate ownerships have a highly diverse set of management objectives that may or may not include revenue generation from timber sales. As a result, harvests may not always follow market price movements.

A look at timber harvest and forest products output in Oregon since 1985 demonstrates the impact of wood supply changes on manufacturing behavior (Figure 1.4-1). In 1990, the spotted owl was listed as an endangered species under the Endangered Species Act, leading to a rapid decline in harvest on all federal lands (and eventually on state and other public lands). In 2010, the federal timber harvest in Oregon was 387 MMBF, an 85 percent drop from 1990 levels. Timber harvest on private land peaked in 2006 at 3,596 MMBF, before the financial crisis led to reduced timber harvests through 2009. Timber harvest levels on state forestland have remained relatively stable during the last decade, averaging approximately 252 MMBF on Board of Forestry lands and 28.7 MMBF on state Common School Forest Lands (ODF 2010, ODF 2011).



**Figure 1.4-1: Oregon timber harvest by ownership and combined harvest, 1985-2011**

Source: ODF

In western Oregon, public harvests stabilized at new lower levels by 1995, while in eastern Oregon, the process was complete by 2000. As illustrated in Figures 1.4-2 and 1.4-3, the drop in public harvest coincided with the 1990-91 recession and decline in new housing construction. Output of Oregon’s lumber industry fell sharply in both eastern and western regions. In the recovery beginning in 1992, however, lumber output behavior differed markedly between regions.

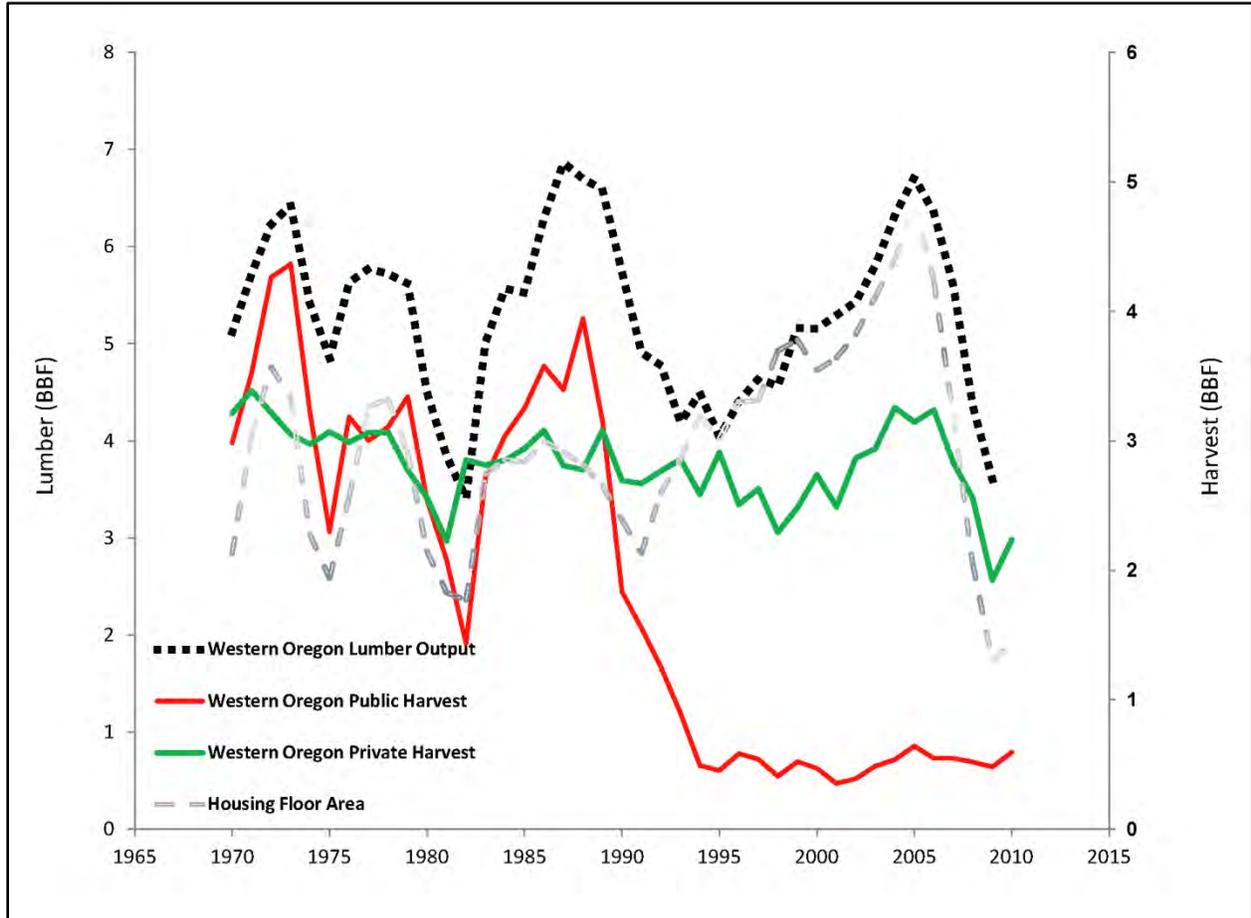
On the west side, private owners continued to harvest at about the average levels of the previous two decades. Coupled with improvement in lumber recovery<sup>5</sup> and a

reshuffling of log allocations from export and panels to lumber, west-side lumber output followed the general pattern of the housing recovery. Western Oregon’s privately owned forestlands had ample inventory and had been employing growth-enhancing silvicultural approaches, so harvest could be maintained with no reduction in inventory.<sup>6</sup>

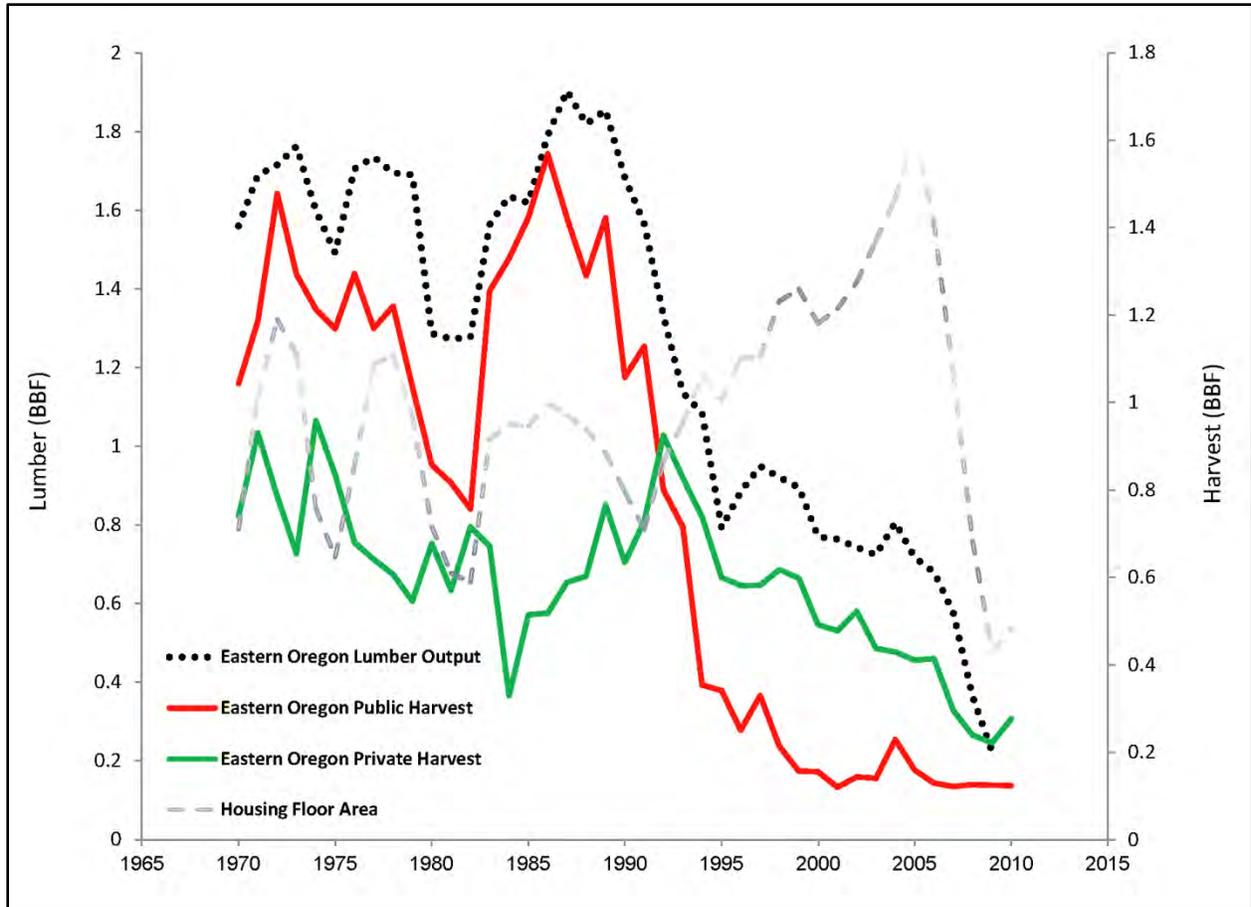
In eastern Oregon, by contrast, private harvest fell steadily after 1992. As discussed in detail in Adams and Latta (2003, 2004, 2007), private inventories and growth have been declining in eastern Oregon over the past decades as a result of high harvests and losses to insects and disease. There was no capacity for maintaining

or expanding private harvest in the face of the decline in public cut, and there were limited options for redirecting log volumes (e.g., from plywood to lumber as on the west side). Despite an improvement in lumber recovery of nearly

25 percent (between 1990 and the market peak in 2005), lumber output in eastern Oregon trended downward, and the region was not able to participate in the dramatic growth of lumber demand from 1992 to 2005.



**Figure 1.4-2: Lumber output and timber harvest by owner group for western Oregon, 1970-2010**  
 Sources: Lumber output — Western Wood Products Association; harvest — ODF; housing floor area — US Census Bureau (starts x average floor area per start)



**Figure 1.4-3. Lumber output and timber harvest by owner group for eastern Oregon, 1970-2010**

Sources: Lumber output — Western Wood Products Association; harvest — ODF; housing floor area — US Census Bureau (starts x average floor area per start)

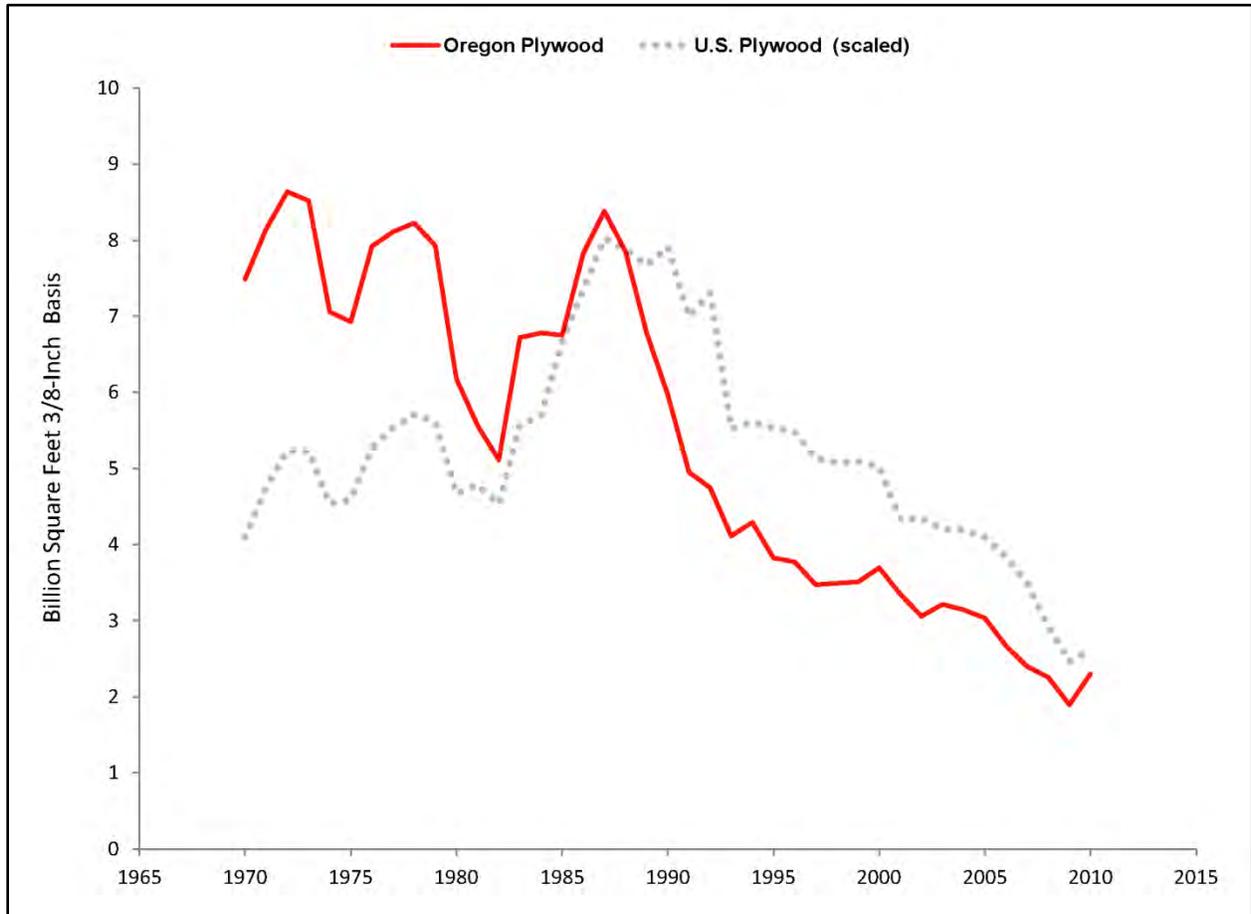
Would expanding public supplies back toward historical levels lead to a rebound in solid-wood products output in eastern Oregon? Is the process of the past two decades reversible?

In the longer term, private forests would have an opportunity to regain inventory (with harvest less than growth) and eventually return harvests to the levels experienced in the 1990s.

Some recent studies of options for restoration thinning programs on federal lands suggest this might be the case (Adams and Latta, 2005; Haynes et al., 2007). While the regional focus of these studies varies, they are consistent in suggesting that expanded public harvest in the near term would justify renewed capacity investment in manufacturing facilities and lead to increased product output.

Plywood has faced increasing competition from oriented strand board (OSB) in all market sectors over the past two decades. Oregon plywood mills, in turn, have faced competition from plywood producers in Southern states and, in recent years, from imported softwood panels, mostly from South America. Oregon and

U.S. total production are shown in Figure 1.4-4. Unlike lumber, the plywood sector did not participate in the long housing upswing beginning in 1992, since OSB captured virtually all of the market growth.



**Figure 1.4-4: Oregon and total U.S. softwood plywood production, 1970-2010**

Source: APA — The Engineered Wood Association

In the fiber products sector, Oregon pulp and board producers employ a markedly different structure of wood inputs. Lumber and plywood production in Oregon generates a large volume of residue, and the modern pulp and board sector in the state was based largely on exploiting this fiber source. Despite substantial changes in the number of mills, production methods and products in this sector, the relative importance of residues in overall wood fiber input has varied little over the past 20 years. Howard and Ward (1991) reported that residues accounted for roughly 80 percent of wood fiber use in 1988. In 1998, Ward et al. (2000) estimated that residues were 75 percent of wood fiber input to Oregon's pulp and board mills. The most recent study of Oregon's forest sector (Gale et al., 2012) found residues to be 75 percent of wood fiber use in 2008.

The number of Oregon's pulp and board mills have declined over this period, falling from 33 to 20 by 2008. Fiber input and associated costs have been an important cause of the

decline, though this is a relatively complex issue. Wood residue production has been contracting as lumber and plywood mills have become more efficient at converting logs into their primary products.<sup>7</sup>

At the same time, solid-wood mills recognize the value of residues in their total revenue mix and vary the joint production of lumber (or plywood) and chippable residues partly in response to market chip prices. In addition, wood fiber (from residues and roundwood) is heavily supplemented by recycled fibers in the production of many of the important paper grades in the Pacific Northwest.

In recent years, and particularly with the advent of commingled curbside recycling in the United States, and the rapid expansion of growth in China and other Asian countries, the prices of recycled fiber in the region have risen, and much of the supply is now exported. This has increased the Oregon producers' costs.

**Oregon’s primary wood product manufacturers**

Oregon now has approximately 200 primary wood product manufacturing facilities (Table 1.4-1). Since the mid-1980s, the number of facilities has been steadily decreasing, and since 2008, there has been a 44 percent reduction in active facilities across the state.

The decline in manufacturing facilities can be attributed to several factors influencing the forest sector in Oregon as well as throughout the western United States (Gale et al., 2012):

- Production has been concentrated in larger, more efficient facilities that require higher capital investments.
- The timber supply from federal forestlands has dropped and is unreliable.
- Recessions in 1980 and 2007 created unfavorable market conditions for wood product manufacturers.

Despite the decrease in active manufacturing facilities, lumber production capacity rose steadily from 5 BBF in 1995 to a peak of 7.4 BBF in 2005. Over time, facilities in Oregon have become larger and more efficient in lumber recovery through technological improvements that have increased the volume of output per unit of input. Facilities have improved sensing capabilities, better sawing accuracy and thinner saw kerfs to increase solid-wood recovery (Gale et al, 2012).

The shift from harvesting old-growth to harvesting second- and third-growth stands has steadily decreased the average log diameter processed in Oregon facilities. However, from 2003 to 2008, the average diameter increased, perhaps because poor market conditions made it less profitable for facilities to saw lumber from smaller diameter logs (Gale et al., 2012).

**Table 1.4-1: Active Oregon primary wood product facilities, 1988-2012**

Survey Year	Sawmills	Plywood & Veneer	Pulp & Board	Other*	Total
1988	165	87	33	75	360
1992	115	64	30	44	253**
1994	106	34	31	30	201**
1998	93	43	29	35	200**
2003	126	33	23	67	249
2008	116	28	20	57	221
2012	69	29	18	84	200

Sources: Forest Econ Inc. Field Surveys, 2012; Gale et al., 2012; Brandt et al., 2006

\* Other manufacturers include log furniture, house/log home; post, pole, piling, and utility pole; and cedar products

\*\*Survey participation was low during these years.



**Table 1.4-2: Product sales\* value of Oregon’s primary wood product manufacturers, 2008**

Facility Type	Product Sales (\$2008, Thousand U.S. Dollars)
Pulp and paper	\$2,821,171
Sawmills	\$1,461,155
Plywood and veneer plants	\$1,154,709
Reconstituted board	\$374,919
Other facilities**	\$136,748
Chipping facilities	\$41,369
Log home plants	\$8,002
Posts, pole, pilings and utility pole plants	\$5,217
Log furniture plants	\$860
Total	\$6,004,150

Source: University of Montana Bureau of Business and Economic Research (UM-BBER)

\*Sales = FOB (free on board the producing facility)

\*\*Other includes: bark products, cedar products, energy/biomass, EWP, export and fuel pellet/fire manufacturers.

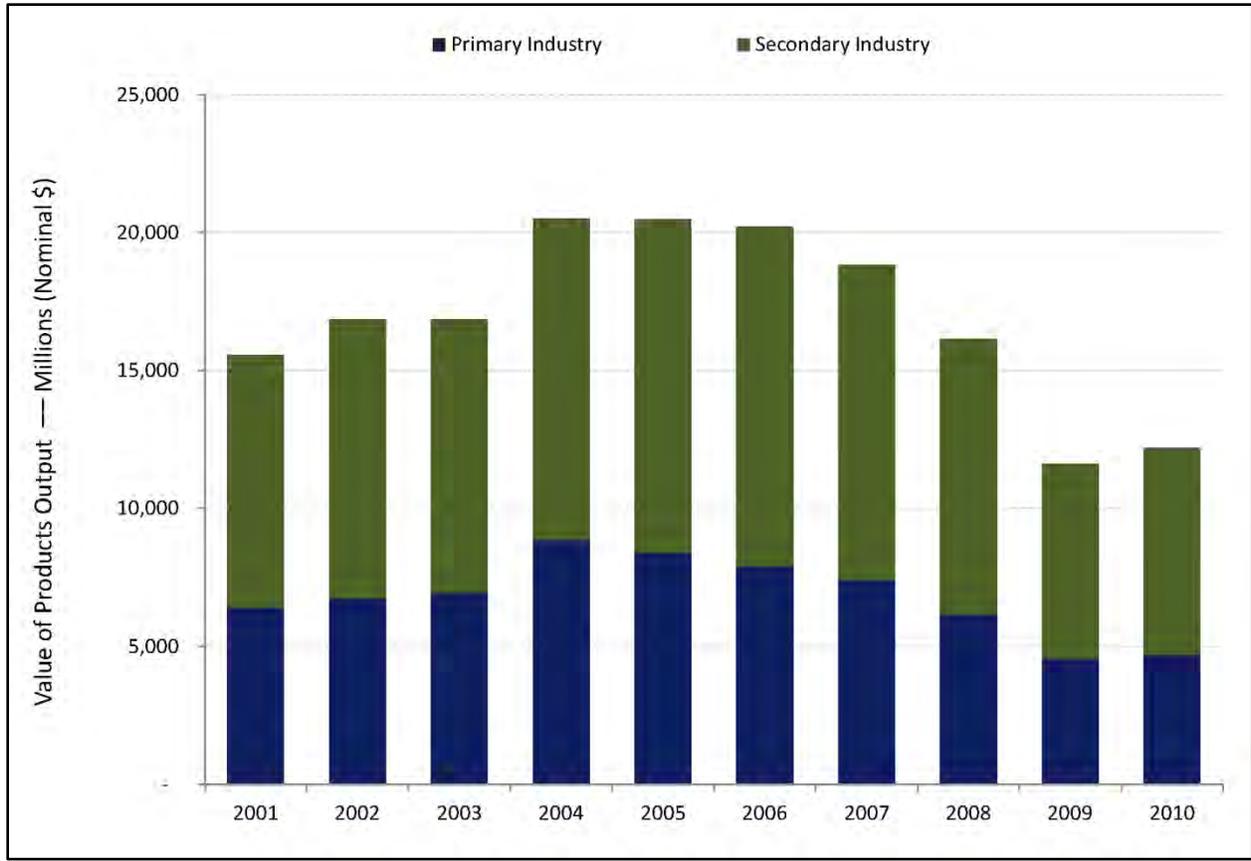
In 2008, Oregon facilities reported a total sales value of \$6.0 billion for all products produced by the primary wood products sector. Pulp and paper accounted for 47 percent of the total sales values at \$2.8 billion, while sawmills produced \$1.5 billion in value. Veneer and plywood plants contributed 25 percent to the forest sector’s total sales, and other facilities made up the balance (9.5 percent) at \$567 million in sales (Table 1.4-2).

Between 2001 and 2010, total sales values from Oregon’s primary wood manufacturers peaked in 2004 at just under \$10 billion, and then steadily decreased, hitting a decade low of \$4.5 billion in 2009. Sales in 2010 increased slightly to \$4.7 billion (Figure 1.4-6).

Figure 1.4-7 illustrates the flow of timber in Oregon from the harvest of 100 million cubic feet of logs. About 63 percent of the harvest goes to sawmills, while the remaining volume is directed to plywood and veneer plants, pulp mills and board plants, and other manufacturers.

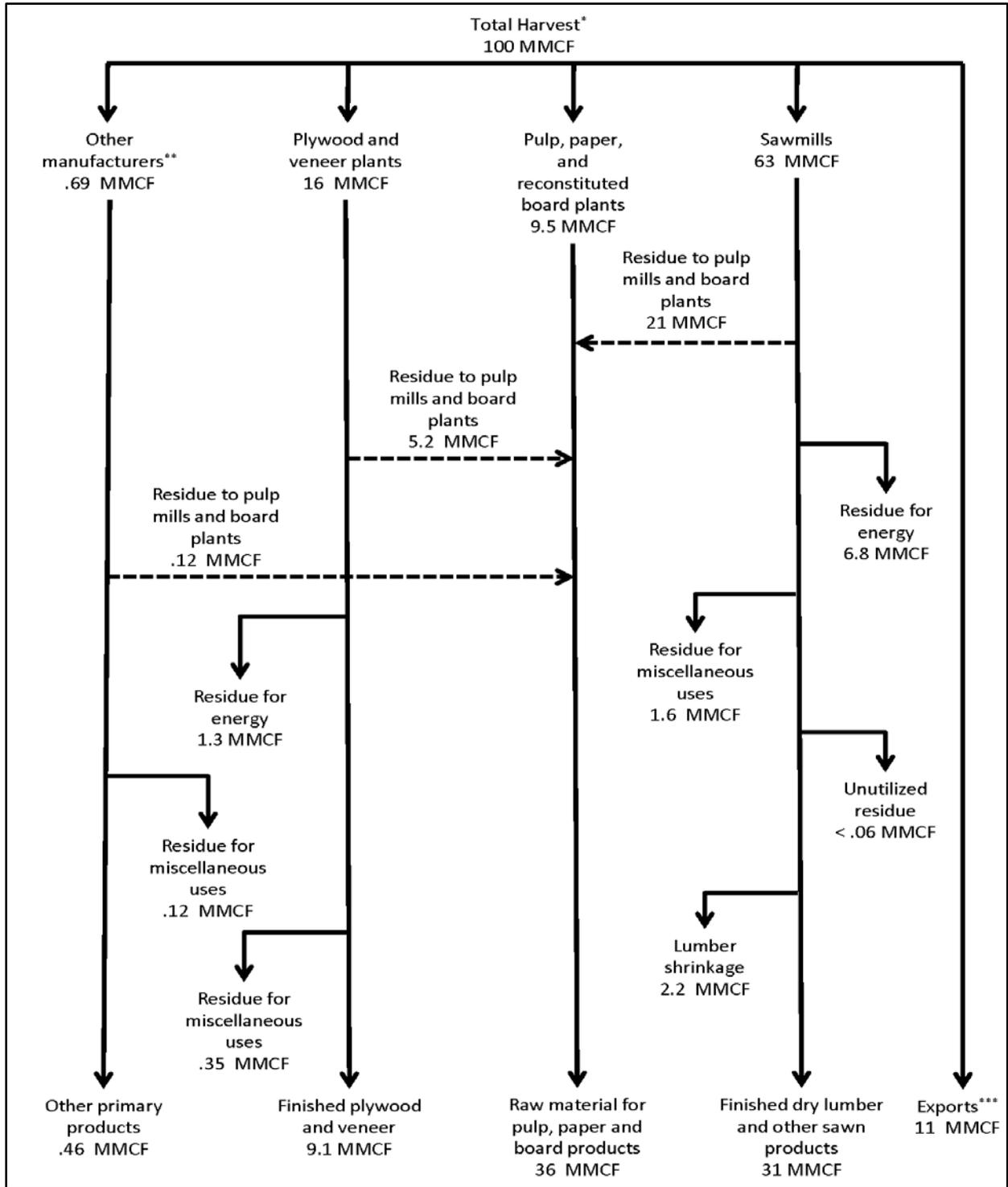
As the timber is processed, a majority of the residue is directed to pulp and reconstituted board plants that produce 36 MMCF of raw material for pulp, paper and board products. The remaining residue is captured to produce energy and other miscellaneous products such as animal bedding, and a small portion is unused.

Approximately 11 MMCF of the harvest is exported to other states and foreign markets.



**Figure 1.4-6: Total sales value of primary and secondary wood products in Oregon, 2001-10**

Sources: U.S. Department of Commerce, Census Bureau, Annual Survey of Manufacturers; Western Wood Products Association (WWPA); UM-BBER Forest Industry Data Collection System



**Figure 1.4-7: Oregon timber harvest flow, 2008**

Source: Adapted from Gale et al., 2012

\* Excluding bark

\*\* Other manufacturers including log furniture, house/log home; post, pole, piling, and utility pole; and cedar products

\*\*\* Timber exported from Oregon to Washington and other countries

### **Assessment of Oregon's primary wood products manufacturing**

Oregon's primary wood product manufacturers compete regionally and nationally for market share of wood products. The following section compares these industries to those in competing regions by looking at key factors that influence the general competitive standing of wood manufacturing facilities — factors such as wood costs, mill costs and overhead, average lumber and byproduct sales, and average capital investment per mill per year.

This assessment is based on The Beck Group's Benchmarking Studies in 2010. Mill database results are based on samples of mills in Washington (coastal and inland), Oregon (coastal only), Southern United States (three regions) and the B.C. interior. The Beck Group's approach allows participating firms to identify their competitive position and opportunity areas; if addressed, this often results in improved financial performance.

Staff at The Beck Group recruit similar firms (e.g., stud mills and dimension mills) to participate in a confidential study. Once a large enough pool of participants has been confirmed, an electronic worksheet is sent to each participating mill to gather the required data. Various staff at each mill complete different portions of the worksheet, such as accountants and mill managers.

The completed worksheets are returned to The Beck Group, where they are given a preliminary review to ensure complete and accurate reporting of information. A staff member from The Beck Group then visits each mill to verify the accuracy of the worksheet information. During the on-site review process, The Beck Group staff is provided with copies of financial statements, production reports, sales records, etc. to verify accuracy. After the mill visits have been completed, The Beck Group compiles all the benchmarking data, which is used to conduct analyses such as this assessment.

The data in this assessment reflect the following number of mills: Oregon (5-10), Washington (5-10), interior B.C (10-20), U.S. Southwest (5-10), U.S. south central (< 5), U.S. Southeast (15-20).

U.S. Southwest states include Texas, Oklahoma, Arkansas, and west Louisiana.

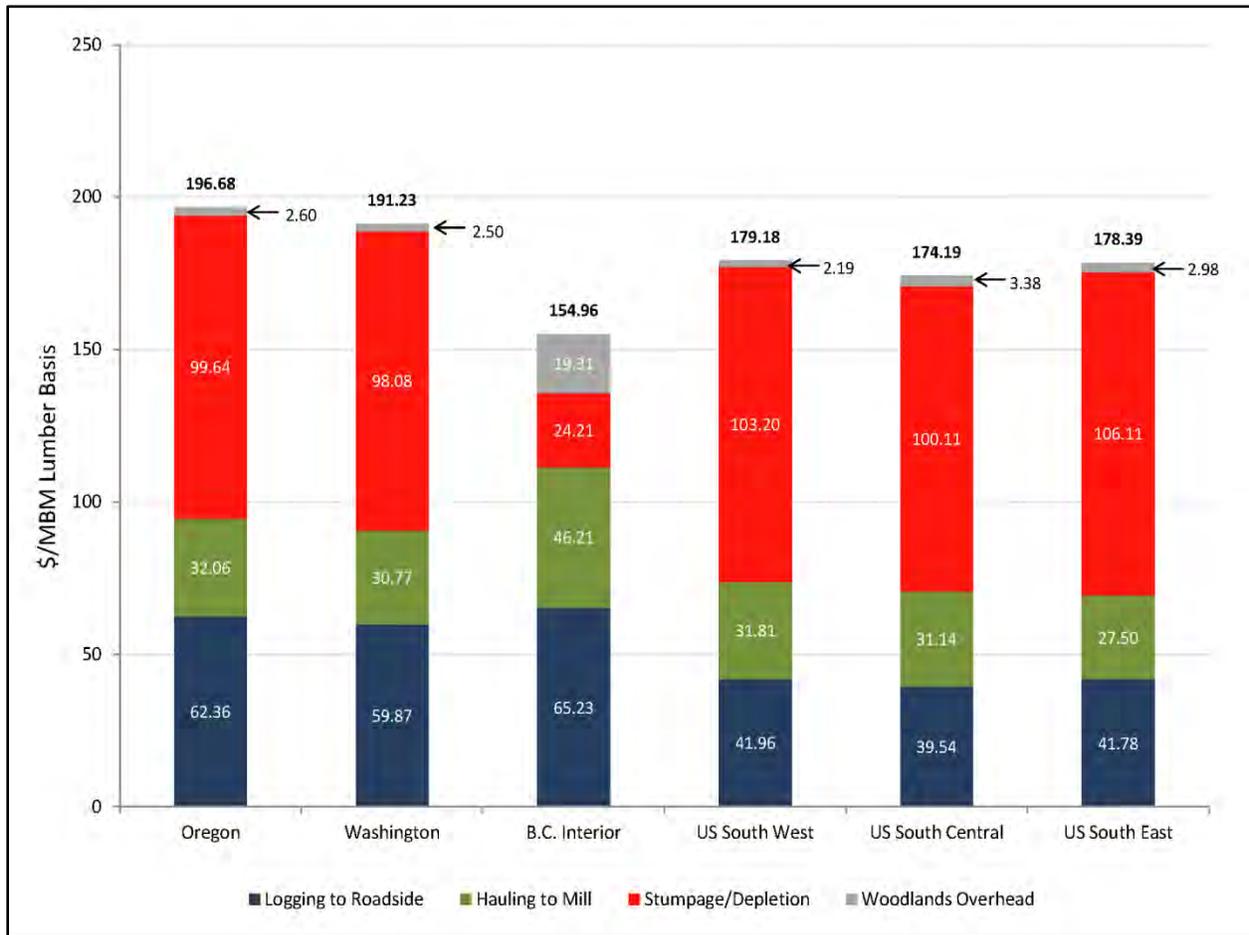
U.S. south central states include east Louisiana, Alabama, Mississippi, and the Florida panhandle.

U.S. Southeast states include the remainder of Florida, South Carolina, North Carolina, and Virginia.

The exchange rate was calculated from the annual Canada/U.S. Foreign Exchange Rate established by the Board of Governors of the Federal Reserve System.

Costs and revenues are shown on a lumber basis, \$/thousand board measure (MBM), since different measures of log volume are used in each region (MBF Scribner in the U.S. West, cubic meters in B.C., tons in the U.S. South).

**Wood Cost (Figure 1.4-8)**



**Figure 1.4-8: Wood costs, 2010**

Source: The Beck Group, 2012

The most significant expense by far in the manufacturing of lumber is wood cost, which is a combination of delivered log cost and the efficiency of the mill in converting logs to lumber (i.e., lumber recovery).

Another factor is the average size of the timber processed by the mills. Typically, log size is greater in the Western United States than in B.C., Canada, and the Southern United States. Manufacturing costs tend to decrease as average log size increases. Thus, to the extent Western U.S. mills process larger logs, they often have an inherent manufacturing cost advantage.

In Figure 1.4-8, total wood cost is divided into these components: stumpage, logging to roadside, hauling and woodlands overhead. As shown, Oregon and Washington have the highest wood costs among the regions being compared. A likely reason for this is the impact of the increased demand for log exports from Oregon and Washington to Asia that occurred in the later part of 2010.

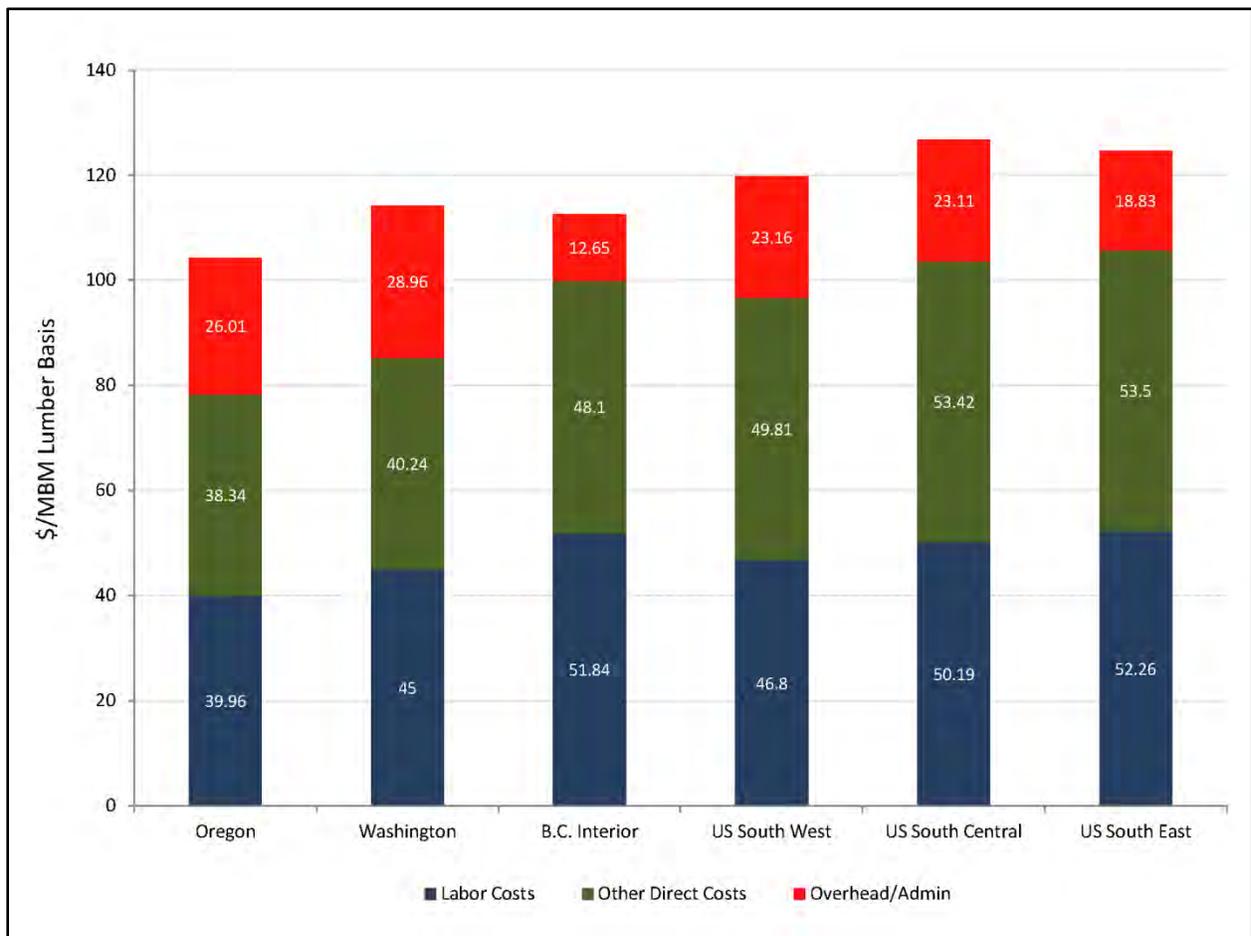
The total wood cost in the South is slightly less than in Oregon and Washington. Most of this difference is due to lower logging and hauling costs. The terrain in the South is much gentler than that in western Oregon and Washington,

so all logging can be done by tractors/skidder. Logging costs in B.C. are higher due to smaller timber and steeper terrain considerations.

The stumpage costs for B.C. are much lower than for the U.S. regions. While there is some difference in stumpage between Oregon and Washington and the three Southern pine regions, we caution that these differences may

be within the margin of error of the data collection/sampling process. In our view, it is unlikely that significant stumpage differences exist among the U.S. regions. Woodlands overhead in B.C. is higher than the other regions because there are additional planning and compliance costs in Canada due to the timber concession/licensing requirements.

**Mills Costs and Overhead (Figure 1.4-9)**



**Figure 1.4-9: Mill costs and overhead, 2010**

Source: The Beck Group, 2012

The manufacturing and overhead cost comparison is shown in Figure 1.4-9.

Please note that these figures do not include wood costs.

While there are differences across the regions in terms of lumber products, it is apparent that the conversion (i.e., manufacturing) costs are lower in the West than in the South, with Oregon having the lowest costs. One factor that impacts manufacturing costs (including labor costs) in Oregon is there are several mills in western Oregon that produce green (i.e., not dried) Douglas-fir lumber. Drying costs typically are in the range of \$15–\$20/MBM. Most of the lumber produced in B.C. is dried, and virtually all lumber in the South is dried.

Labor costs on a per unit of production basis are lowest in Oregon, but this is not due to lower wages and benefits (Table 1.4-3).<sup>8</sup> The West average wage rate and loaded wage rate are

higher than in the South but lower than those in the B.C. interior.

Relative mill size and productivity are also important factors to consider when comparing conversion costs. The average lumber output (i.e., mill size) in the interior of B.C. is in the range of 225 MMBF per year, with several mills being much larger. The average annual output for Oregon and Washington mills, as reflected in The Beck Group benchmarking studies, is about 140 million board measure (MMBM). Mills in the South are typically even smaller, with annual output of about 115 MMBM.<sup>9</sup>

The average lumber output per man-hour worked in the West during 2010 was approximately 700 board feet. Productivity in the South was lower at about 450 board feet per man-hour, while productivity in the interior of B.C. was likely significantly higher than in the United States due to the economies of scale of the bigger mills.<sup>10</sup>

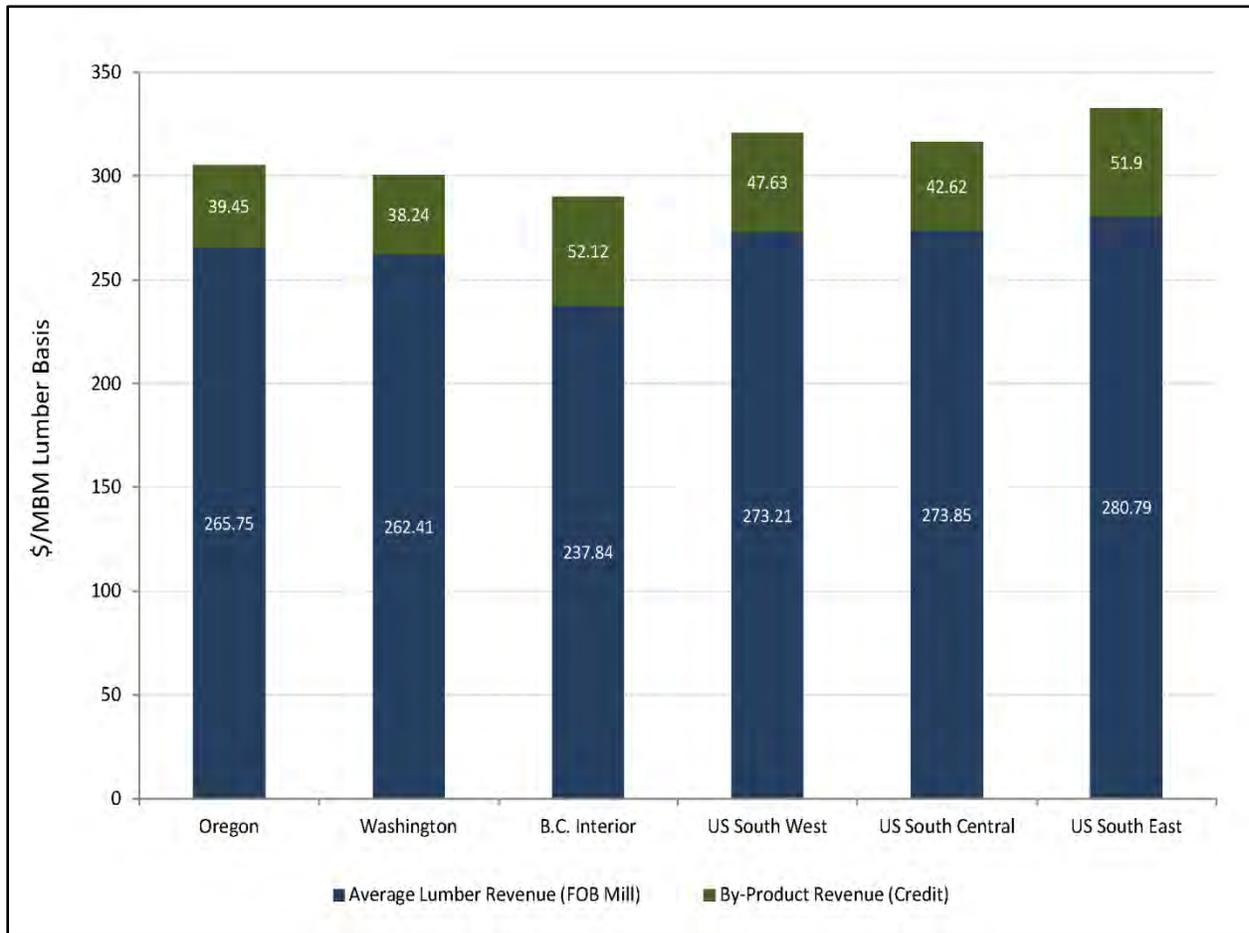
**Table 1.4-3: Labor cost comparison by region**

<b>Labor Costs &amp; Fringe Loading</b>	<b>U.S. West</b>	<b>B.C. Interior</b>	<b>U.S. South</b>
Average wage rate (\$/hour)	\$19.30	\$27.24	\$14.27
Loaded wage rate (\$/hour)	\$28.97	\$36.66	\$20.50
<b>Fringe Loading</b>			
Federal/state/provincial taxes	11.06%	5.15%	9.59%
Medical insurance	19.65%	4.78%	15.55%
Pension/401k	5.92%	6.77%	5.03%
Vacation/holiday/personal leave	8.21%	14.44%	8.04%
Workers' compensation	3.84%	3.20%	3.11%
Incentive pay	0.73%	0.11%	1.13%
<b>Total Fringes</b>	<b>49.42%</b>	<b>34.45%</b>	<b>42.46%</b>

Note: Loaded wage rate is the total cost of employment (wage plus fringe benefits); totals may differ due to rounding.

Source: The Beck Group, 2012

**Lumber and byproduct sales (Figure 1.4-10)**



**Figure 1.4-10: Average lumber and byproduct sales revenue, 2010**

Source: The Beck Group, 2012

As seen in Figure 1.4-10, some differences exist in the total revenue generated by mills in the different regions, with the South having highest combined lumber and byproducts figures. These figures are net mill with all freight removed. The South typically has higher lumber prices since many of the mills are closer to major markets than mills in the West. For the interior B.C. region, high freight costs — reflecting the distance from the mills to the markets, located primarily in the United States — account for the lower lumber prices mills received. The importance of byproduct sales is also apparent in this graph.

Byproduct revenue is a function of both the volume of chips, bark, sawdust, shavings or hog fuel (i.e., mix of bark and sawdust used for boiler fuel) produced and sold by a mill and the distance of the mill to viable buyers. Geography is a major consideration since the freight to market often determines the value at the mill.

One reason for the lower byproduct revenue in the West is that the lumber recovery figures in the region are higher on a relative basis than for the other regions. Part of this recovery difference is due to the average log size being larger in the West. In the South and B.C., the average log size is smaller, so a greater volume

of residuals is produced, and the byproduct revenue stream is higher.

While there are differences in lumber products across the regions due to species characteristics and customer preferences, delivered price is often the most important variable, with freight costs being a major consideration.

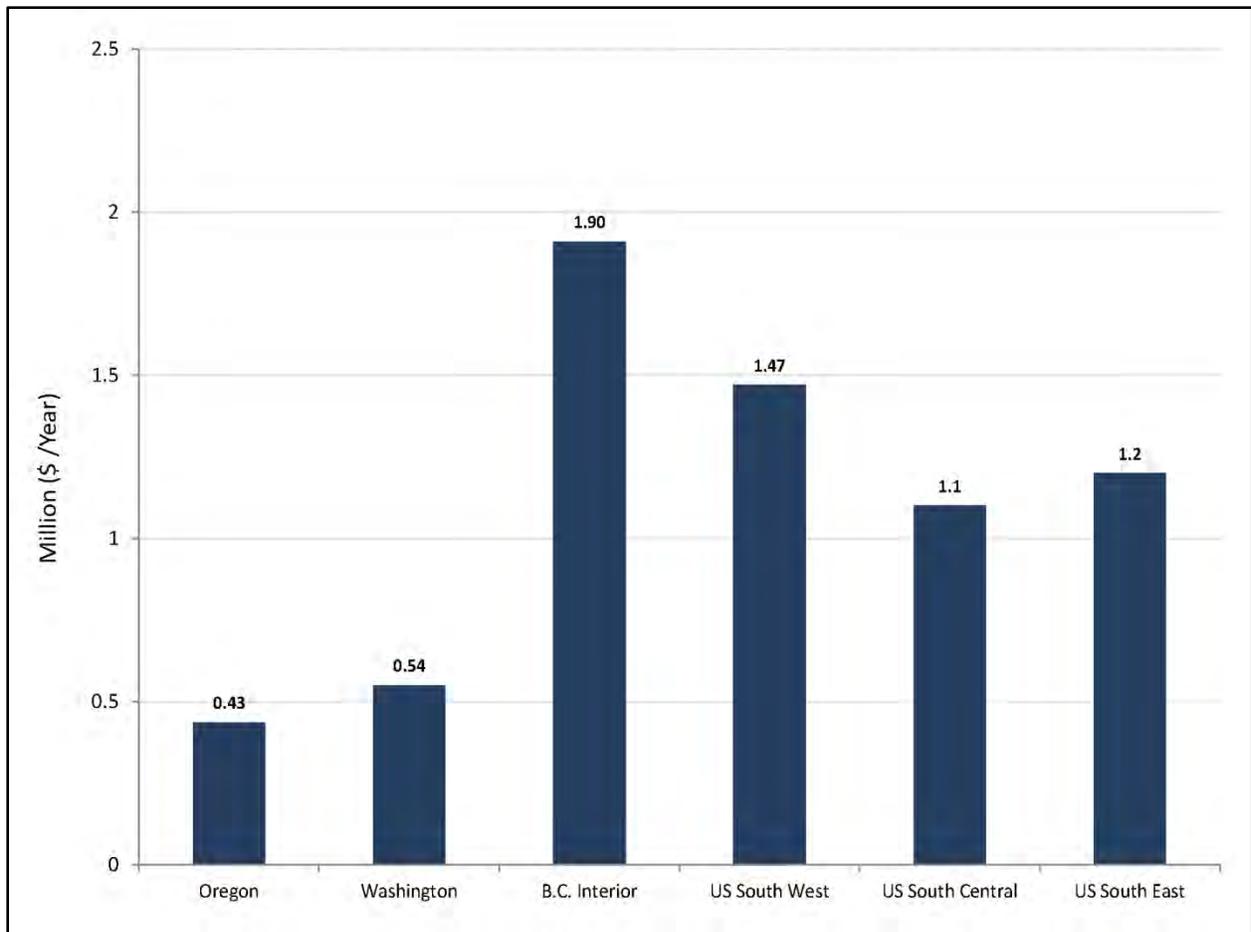
Mills in the Southern pine region traditionally have received higher net mill prices than those in other regions, primarily due to closer proximity to major markets in the East and Sun

Belt. Note that the Southeastern zone has the highest lumber revenue.

One of the major factors causing the lower average lumber revenue at mills in the interior B.C. region is the distance and cost of shipping lumber from the province to markets in the United States, to which much of Canada's lumber is traditionally exported. Another likely contributing factor to the lower lumber revenue in B.C. is that a higher percentage of lower grade lumber is being produced due to the beetle-killed timber being harvested in that region.

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**Annual capital investment per mill (Figure 1.4-11)**



**Figure 1.4-11: Annual capital investment per mill per year, 2005-10**

Source: The Beck Group, 2012

Figure 1.4-11 shows the estimated capital investment per mill per year for sawmills in the various regions based on the investments made by the mills during the five-year period between 2005 and 2010. It is important to recognize that most of this time period was economically challenging for the mills.

As is readily apparent, the B.C. mills made a significantly higher level of investment at just under \$2 million per year per mill. That is likely due, at least in part, to the fact that mills in this region were more profitable than those in the other regions. In addition, some new investment was made in an effort to increase use of the beetle-killed timber that is a major problem in that region. Another factor: During this period, the Canadian lumber industry received approximately \$4 billion in refunds in 2006 for duties that had been collected over several years as part of the softwood lumber dispute. When this money was given back to the producers, it provided an opportunity to make investments in new technology.

The level of investment in Oregon and Washington was low — essentially replacement capital — with little if any investment in new technology. This lack of capital investment, in our view, was because many operations were in survival mode. They were trying to minimize all costs because they were losing money.

Subsequently, mills have identified capital investment needs, but have not yet funded these projects. It should not be inferred that mills in the West made higher investments than the other regions prior to 2005. There have been advances in technology, such as optimized/automated lumber grading equipment and continuous dry kilns that have become available in the last few years, so even if mills made major investments earlier, there could be a need for new investment to take advantage of the new technology.

In general, mills in Oregon are competitive with those in other U.S regions and B.C. As the economy continues to recover, Oregon's mills have the potential to capture a significant percentage of the North American timber processing capacity. Oregon mills have the lowest overhead costs due to overall mill size and productivity.

Wood costs and lumber sales revenue are similar for all competing mills in the United States, although revenue in the South is slightly more because of higher lumber prices connected to large East Coast markets.

However, mills in Oregon invested the least amount in capital improvements from 2005 to 2010. As mentioned above, those five years were financially difficult for Oregon mills and most had to minimize all costs to survive the recession. As the economy improves, mills may begin to increase capital investment levels to catch up on new technology advancements developed the past five to seven years.

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## Chapter 2: Oregon's Forest Sector Demand Factors

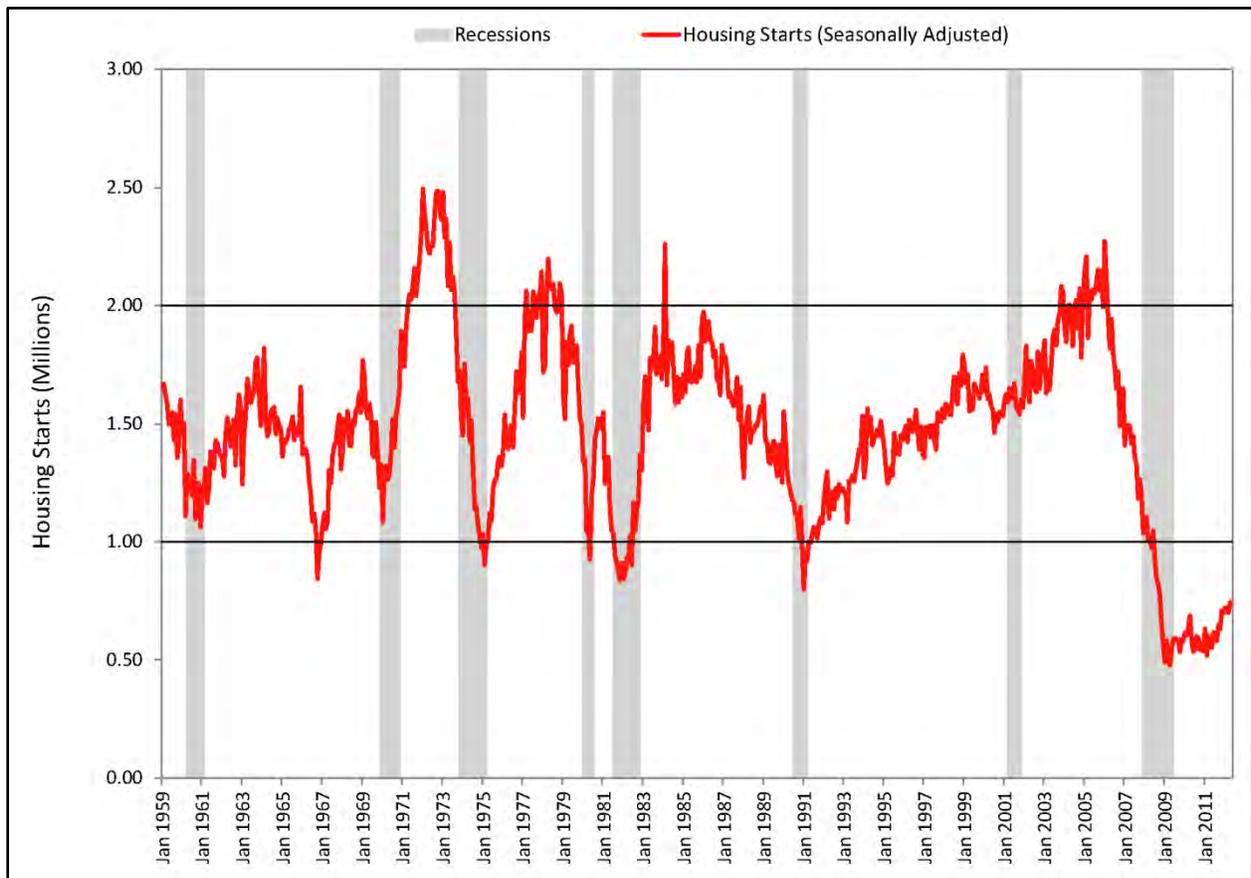
## Section 2.1 — Wood Product Demand

This assessment of Oregon’s forest sector takes place as the U.S. economy begins to recover from the Great Recession of 2007-09. This recession was uncharacteristically broad and deep across all sectors of the economy, but the forest sector was hit especially hard because an oversupply of housing was a key factor driving the economy into recession and remains a drag on the recovery.

In this section, we look at historical and current demand for wood products, the outlook for recovery in these markets and implications for the future of Oregon’s forest sector.

### U.S. housing markets

An understanding of the demand for housing is fundamental to an understanding of the demand for wood products. Since the end of World War II, demand for new homes has been somewhat volatile. While broad demographic and economic trends and public policies establish a foundation for the demand for housing, new housing starts in any particular year reflect more specific factors such as the cost of housing, interest rates, unemployment, etc. Figure 2.1-1 shows that over the last 60 years, annual housing starts are especially sensitive to recessions.



**Figure 2.1-1: U.S. housing starts and economic recessions, 1959-2011**

Sources: U.S. Census Bureau; National Bureau of Economic Research

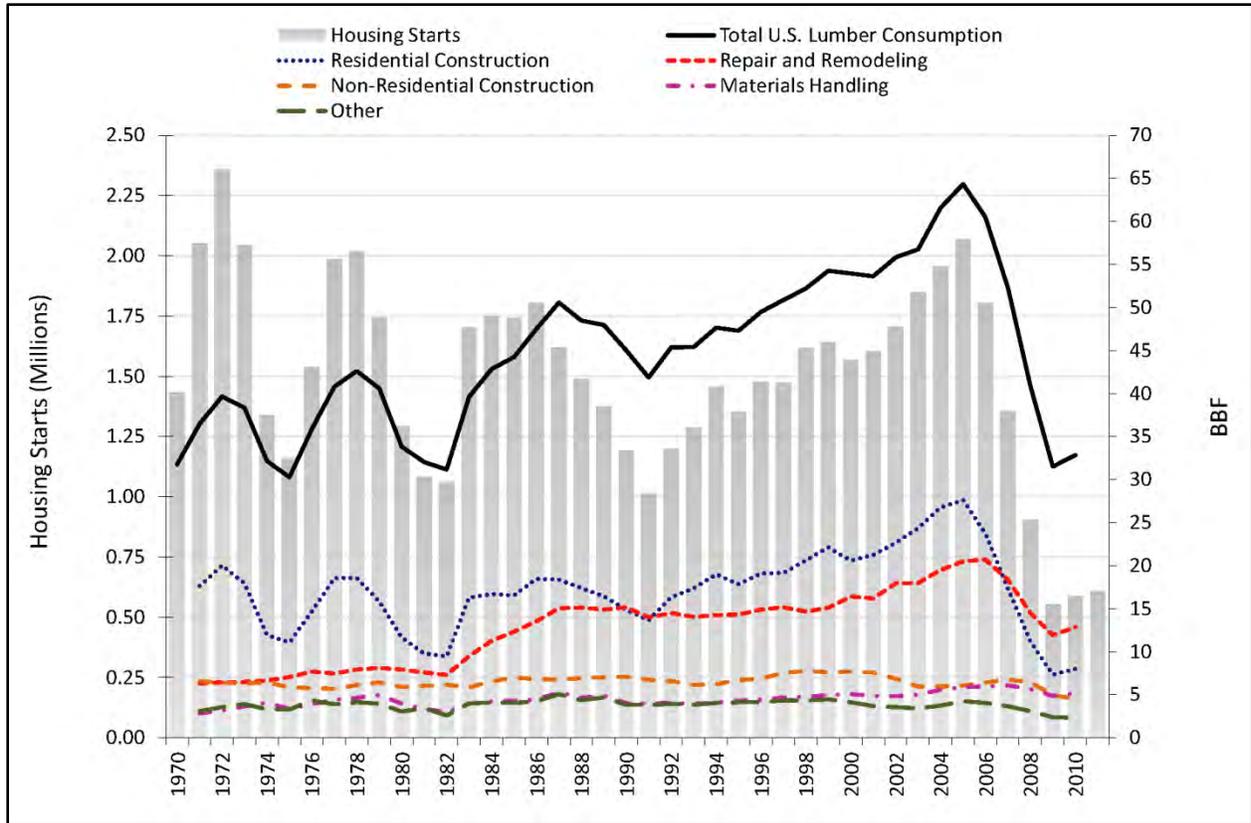
Housing in the United States enjoyed a remarkable period of steady growth from 1991 to 2006. Starts peaked at 2.3 million in 2006, surprising some who had thought starts would never again approach the level set in the 1970s when the federal government was subsidizing housing construction. In retrospect, it is now clear this was a bubble fueled by an excessively relaxed monetary policy after the 2002 stock market crash, lax lending policies at Freddie Mac and Fannie Mae designed to encourage home ownership, and misguided confidence among oversight and rating agencies that market risks were manageable.

When the housing bubble burst in 2006, the economy began sliding toward a recessionary period (fourth quarter 2007 through second quarter 2009), now known as the Great Recession. The recession hit housing especially hard; housing starts fell 79 percent between 2006 and 2009. On a seasonally adjusted basis, the U.S. Census Bureau estimated just 478,000 new housing starts in April 2009, by far the

lowest number since 1959, when the statistic was first recorded.

New housing construction typically accounts for about 40 percent of domestic lumber demand, while remodeling accounts for another 20 percent. As a result, total U.S. softwood lumber consumption is highly correlated with housing starts (Figure 2.1-2). Lumber demand for residential construction averaged 55 BBF per year from the late 1990s to the early 2000s. As the housing bubble began to form, total U.S. consumption increased to 64.3 BBF in 2005. It plummeted to just 31.5 BBF in 2009.

In previous recessions, the repair and remodeling sectors held steady while new construction fell. Homeowners tended to improve their existing homes rather than move to new homes. In the Great Recession, because of suddenly tight credit and falling home values, homeowners were unable to access equity to fund improvements, and repair and remodeling activity also declined, amplifying the effect of the decline in new construction.



**Figure 2.1-2: U.S. housing starts compared to U.S. lumber consumption by use, 1970-2010**

Sources: U.S. Census Bureau; WWPA Statistical Yearbooks

About 26.5 percent of the lumber produced in Oregon is shipped to Oregon, Washington and California (Western Wood Products Association, 2009). Table 2.1-1 shows that housing in

California — the largest market for Oregon lumber — was hit particularly hard by the recession, and that through 2010 the recovery has been weak.

**Table 2.1-1: Number of building permits in metro areas in Oregon, California and Washington, 2005-11**

State Metro Areas	2005	2006	2007	2008	2009	2010	2011	6 Year Change (%)
<b>Oregon</b>	30,988	26,415	21,539	12,554	8,273	8,578	7,663	-75%
<b>California</b>	205,020	160,503	110,073	62,981	35,069	43,716	45,471	-78%
<b>Washington</b>	52,988	50,033	47,397	28,919	17,011	20,691	20,864	-61%

Source: U.S. Census Bureau, 2012

### **Economic impact of housing crisis**

The economic impact of the housing slump on Oregon's forest sector will continue until housing recovers. Most forecasts now call for housing to break 1.0 million starts sometime beyond 2014.

We can estimate the impact to date by comparing actual production with an historical average. We can assume, for example, that but for the recession, 2007-10 would have averaged at close to early 2007 production levels. Then, we can estimate the economic impacts from both lost production volume and lower product prices.<sup>11</sup> Using this approach, we estimate:

- From 2007 to 2010, sectors involved in U.S. housing construction cumulatively lost \$775 billion. About 82 percent of the lost value was due to reductions in housing starts, while the remaining 18 percent was due to reductions in new-home prices.
- U.S. lumber manufacturers lost about \$30 billion — \$18.82 billion on reduced consumption and \$11.2 billion on the production side from price drops.
- Oregon's lumber production loss was approximately \$2.31 billion — \$1.67 billion in volume and \$0.63 billion in price.

Oregon manufacturers of plywood, chipboard, pulp and paper mills incurred additional losses. For some of the time, there was also a decline in export logs and prices.

In 2004, sales of Oregon's primary wood and paper products were over \$9 billion. Due to the housing collapse and resulting financial crisis, sales values dropped to approximately \$6 billion

in 2008 and to \$4.6 billion in 2009, a 51 percent reduction of annual sales (Gale et al., 2012).

### **Housing recovery — the next five years**

Most forecasters agree that housing hit bottom in 2009 and is now beginning to recover. However, it is clear the housing sector is recovering much more slowly from this recession than from any previous one (Figure 2.1-3). Housing starts bottomed out 39 months after the January 2006 peak of 2.3 million starts to 478,000 starts in April 2009. Since then, housing starts have shown little sign of recovery except for some minor monthly gains, taking 36 months to reach a seasonally adjusted rate of 700,000 starts. The United States is still at less than half the 1.2 million to 1.7 million starts thought to represent a sustainable level of new-home construction.

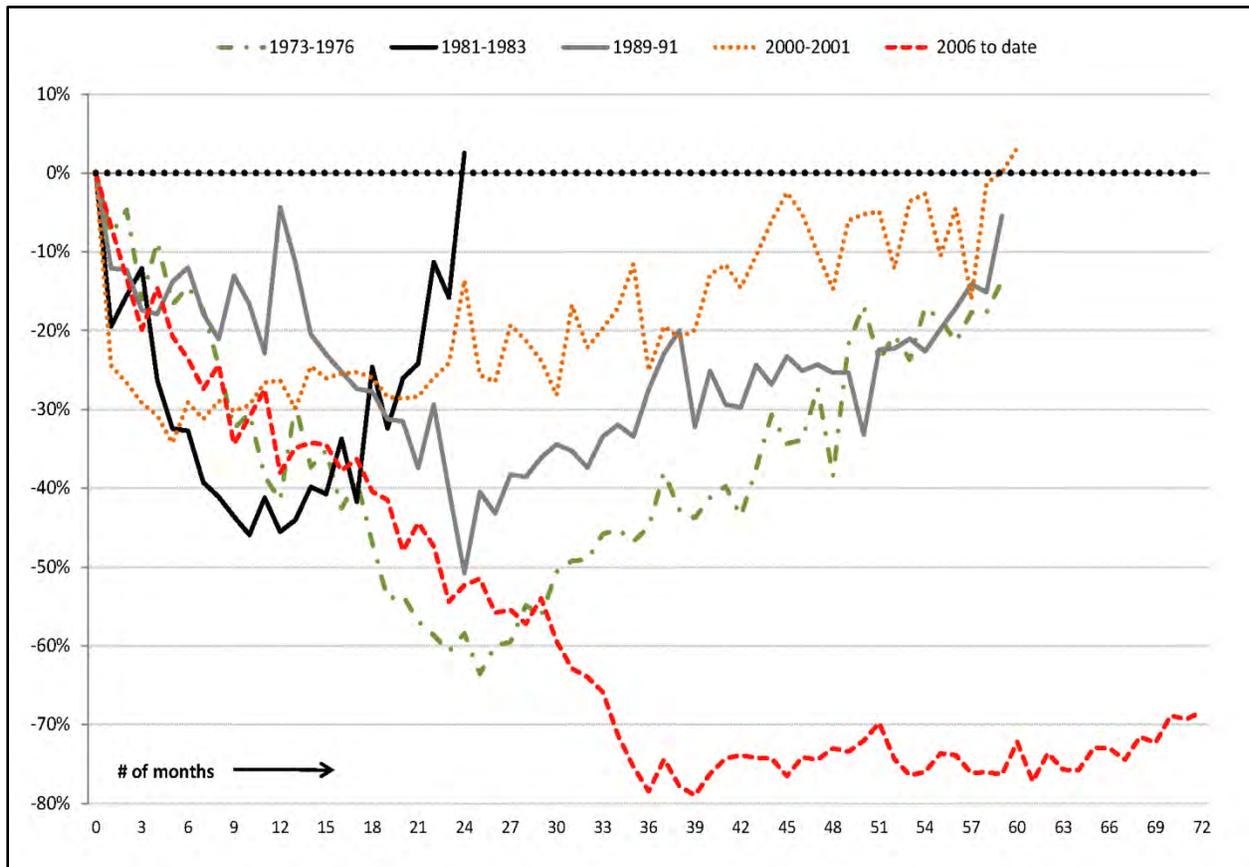
One factor in the slow pace of recovery is that, unlike with previous recessions, a housing bubble was a key factor leading to the Great Recession. When the bubble burst, there was an immediate and obvious oversupply of housing. Recovery of the housing sector requires a readjustment of prices and supply. Chronically high unemployment, tight credit and general concern about the economy have dampened demand, keeping new housing starts near historical lows for three years running (2009-12).

Over the longer term, there is cause for optimism. Household formations slowed during the recession, due to unemployment and tight credit. While credit is tight, mortgage rates are near historical lows, making housing more affordable for those who can qualify for a loan. New housing has been at or below what had been considered the level necessary just to replace the stock of housing lost due to

deterioration. By every calculation, demand should be building, although it is pent up. This should eventually lead to stronger housing demand as economic factors improve.

Most but not all forecasts call for starts to cross the threshold 1.0 million mark in 2014 or 2015, and rise to close to 2002-03 levels by 2016.

Other forecasters are somewhat less optimistic, pointing to the difficulties of working through the excess inventory of existing homes and the likelihood of significant additional foreclosures. We are unaware of any forecasts that project a return to sustainable levels of housing at 2004-05 levels.

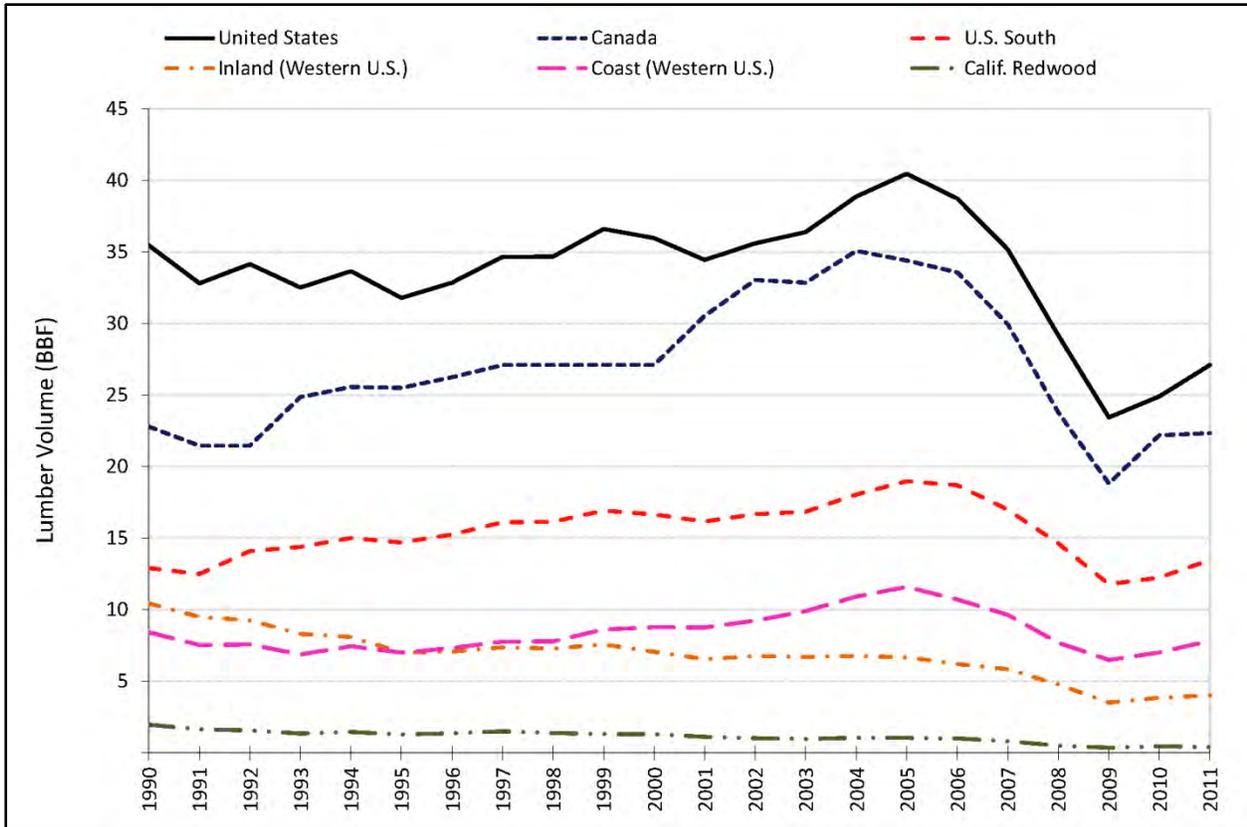


**Figure 2.1-3: Percent loss in housing starts (seasonally adjusted) relative to peak of recession**  
 Source: U.S. Census Bureau

**Wood products**

The effects of recession have not been spread evenly across North American mills. Figure 2.1-4 shows that while softwood lumber production fell across all of the major producing regions;

Canada fell off the most, both in terms of absolute volume and market share. Canadian mills suffered from an unfavorable shift in the exchange rate, along with duties designed to protect U.S. manufacturers in soft markets.



**Figure 2.1-4: U.S. and Canadian lumber production, 1990-2011**

Sources: WWPA; Random Lengths

As the economy recovers, we expect to see a shift in market share:

- Canada will lose market share. It appears the Canadian dollar has reset to a new level, closer to par with the U.S. dollar. That reduces profits to Canadian mills exporting lumber into the United States. Interior B.C. mills appear to have found a strong new market in China for lower-quality lumber. Those same mills face a log shortage from a massive insect infestation, as discussed on page 91.
- Western interior mills will have a difficult time maintaining share of an improved market. These mills have been more dependent on federal timber, and without

major policy changes making more timber available for harvest, those mills will not be in a position to substantially increase production. NIPF owners have the capacity to increase harvest, but will only do so if log prices increase enough to draw them back into the market.

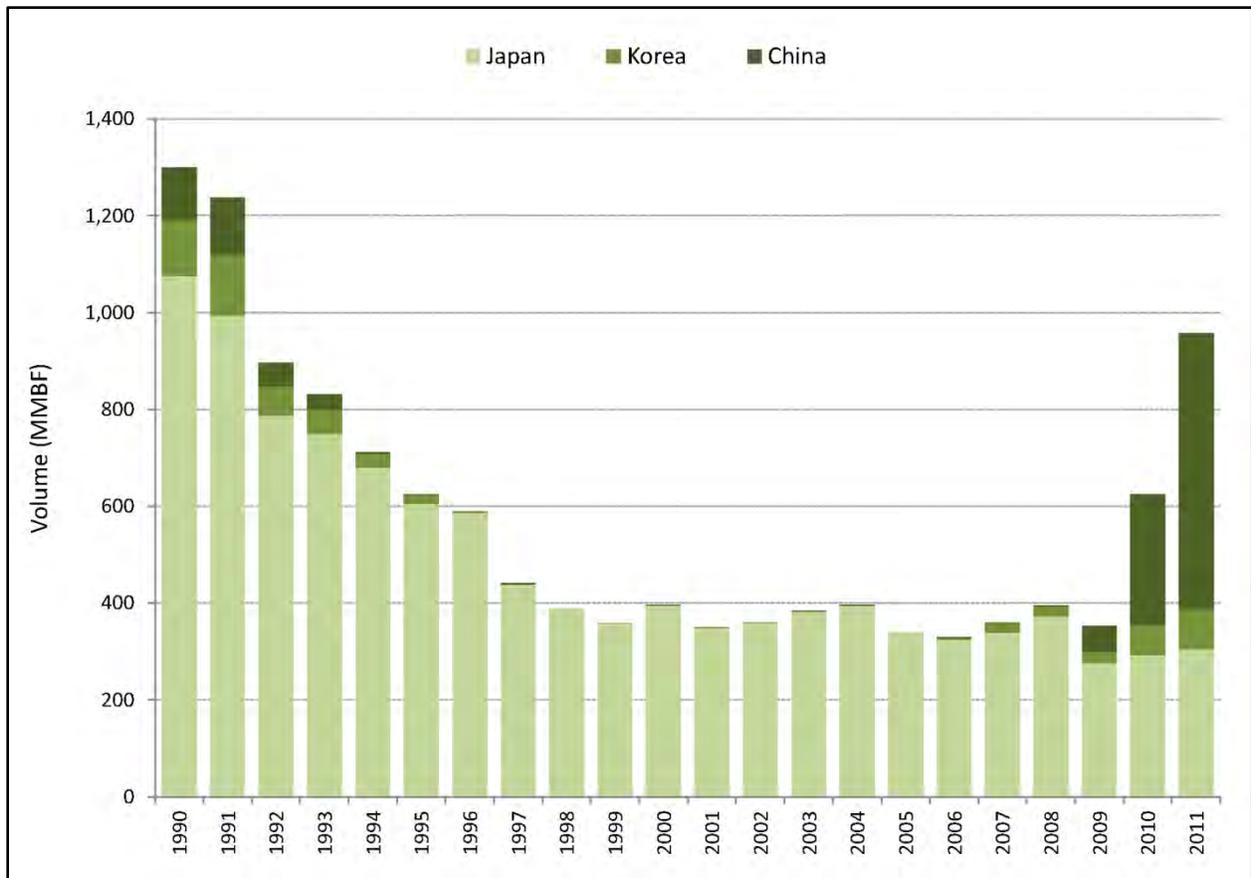
- Western coastal mills have room to increase production, but will need more timber supply. While federal lands have the capability to provide a substantial increase in harvest, doing so would require significant change to federal policies. Without new supply, any increase in production will require coastal mills to bid logs away from the Asian log export markets.

- Southern mills have both the capacity and the potential log supply to quickly respond to improving markets. These mills compete with the pulp and paper industry for log supply, and rotations are often determined by the relative value of lumber and pulp. During the recession, harvest has been delayed on many acres, meaning more sawtimber will be available to mills as the economy improves.

Foreign demand for logs increased markedly in 2010 and 2011, helping prop up harvest levels, providing much-needed work for loggers and haulers, and providing revenues for timberland owners.

Figure 2.1-5 illustrates the trends in log exports. We report log and lumber exports for the Columbia-Snake Customs District from the U.S. International Trade Commission report statistics and the USFS's Annual Production, Prices, Employment and Trade data. Although data can be found to estimate exports from Oregon ports only, we recognize that a good portion of Oregon logs are exported from southern Washington ports and provide value to Oregon's forest sector.

The Columbia-Snake Customs District includes Oregon ports (Astoria, Coos Bay, Columbia-Snake River and Portland International Airport), Idaho ports (Boise) and Washington ports (Vancouver, Longview and Kalama).



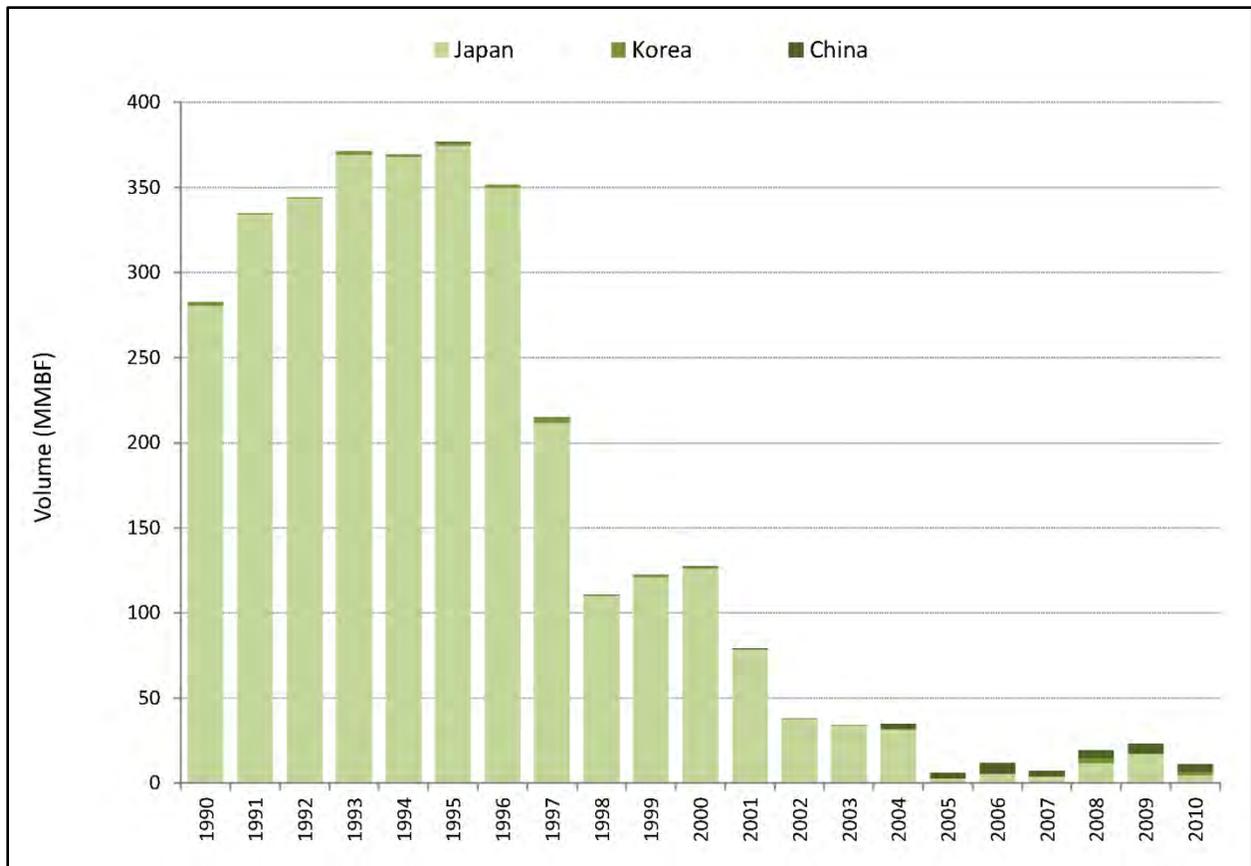
**Figure 2.1-5: Log exports from Oregon and southern Washington by primary destination, 1990-2011**  
 Sources: Warren, 2011; U.S. International Trade Commission Database

China accounted for most of the increase in log exports since 2009. While Japanese mills seek the highest quality U.S. logs to support traditional exposed post and beam construction, Chinese demand is heavily weighted toward providing forms for concrete. As a result, Chinese demand focuses on less expensive hemlock and lower grades of Douglas-fir logs.

Lumber exports from the region have not accelerated at the same pace as log exports (Figure 2.1-6). Japan has been the region’s primary market for exported lumber, and Japanese lumber demand has been steadily

declining since the mid-1990s, dropping to an all-time low in 2005 of just 19.5 MMBF. Lumber exports increased in 2009 to 30.7 MMBF, with Japan still receiving the majority of shipments.

Lumber exports from the United States to China are increasing as China continues to cast a wide net to supply its growing demand for wood products. In 1995, the region exported only 39 thousand board feet (MBF) of lumber to China, as compared to 5.3 MMBF in 2009. This is just a fraction of the amount of lumber that B.C. mills ship to China, however, as discussed below on page 95.



**Figure 2.1-6: Lumber exports from Oregon and southern Washington by primary destination, 1990-2010**

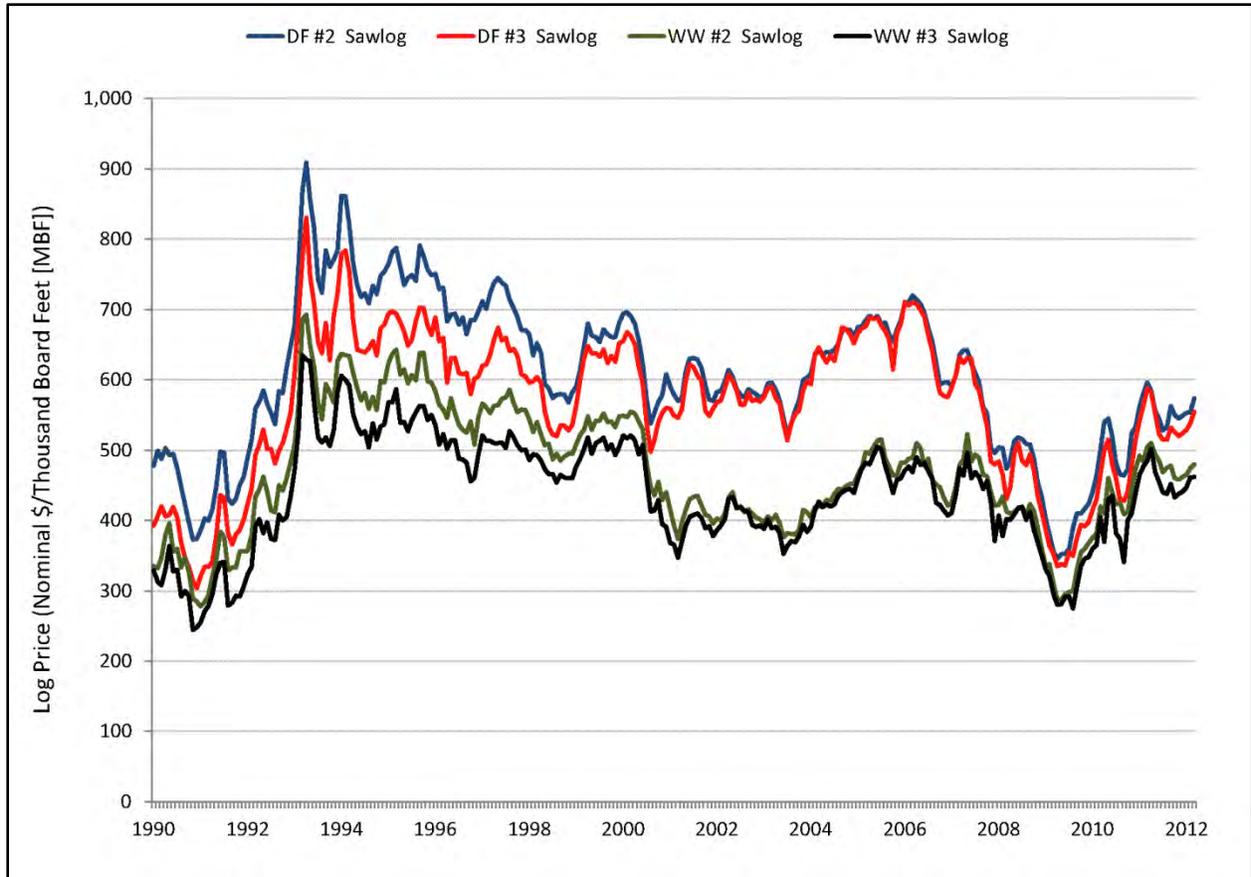
Sources: USFS, PNW Research Station; Warren, 2011

Note: Lumber export data is not available for 2011.

**Log and lumber price recovery**

How will economic recovery affect prices? A look at log price history provides some background necessary to understand potential recovery prices. Figure 2.1-7 shows log prices for #2 and #3 Douglas-fir and western hemlock delivered to mills in Willamette Valley; trends for other west-side regions are similar. Premiums for larger #2 sawlogs<sup>12</sup> narrowed during the 2000s as mills optimized manufacturing processes for the smaller logs sourced from private lands. As housing began to

soften in 2006, log prices fell. Prices for both Douglas-fir and western hemlock reached a point close to harvest and delivery costs, explaining 2009’s low harvest level. Beginning in 2010, Chinese demand played a significant role in supporting log prices. The Chinese focused on lower-priced logs, substantially narrowing the historical margin between Douglas-fir and hemlock, but lifting prices for both species. Currently, log prices are back to 2007 levels, a substantial recovery considering the lackluster housing recovery.



**Figure 2.1-7: Willamette Valley Douglas-fir and white wood delivered log prices (#2 and #3 sawlog)**

Source: Loglines

Note: DF = Douglas-fir; WW = white woods

Ultimately, however, it is the domestic lumber market that has mass sufficient to move lumber and log prices back toward levels seen before the 1990s. The recovery period following the 1981-82 recession provides insight about how difficult that might be. That recession was caused by a monetary policy that resulted in excessively high interest rates, which knocked back demand for housing and other goods. As rates lowered, pent-up housing demand pushed housing starts from just above 1.0 million in 1982 to 1.7 million in 1983 — a 70 percent turnaround in one year. But, as Figure 2.1-8 shows, lumber prices held relatively constant from 1983 to 1987, in spite of strong demand. The 1981-82 recession was especially hard on

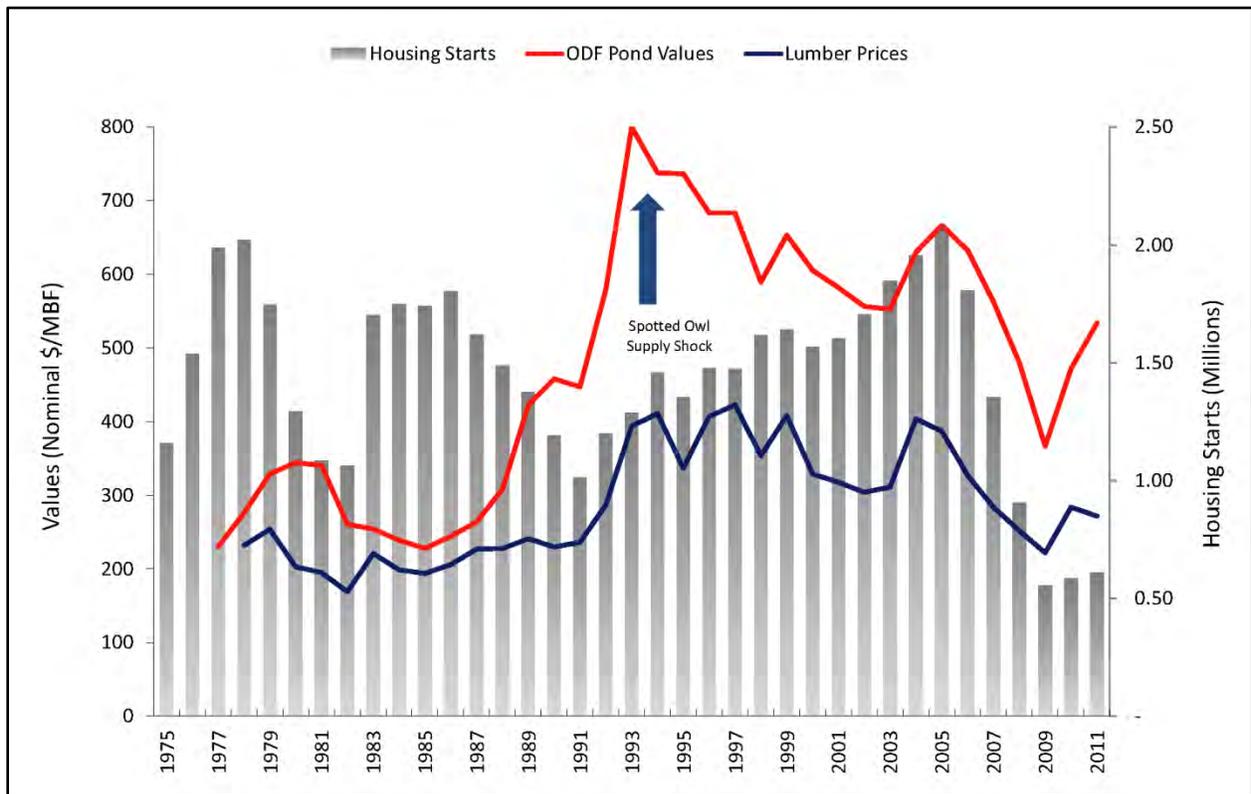
older, less efficient mills, and some permanently closed during the recession. The remaining mills were more efficient on average, and new investments at some made them even more efficient. The recession illustrated the benefit of being the low-cost producer, and there was a race to fill that slot. Because lumber prices were flat, log prices remained flat as well.

In 1990, the spotted owl was listed as threatened under the Endangered Species Act. This limited the amount of federal timber available for harvest in the Pacific Northwest. When housing began to recover from the 1991 recession, it became clear that for the first time, Western mills would not be able to respond to

increased demand with increased supply. As a result, lumber prices increased rapidly, as did Pacific Northwest log prices. Prices remained high for several years, until capacity in other producing regions increased to fill the demand Pacific Northwest mills could not.

Recovery from the Great Recession will be different, given that an oversupply of housing was a contributory factor. Figure 2.1-9 compares demand for and the capacity to produce softwood lumber across North

America. Demand for lumber increased through the 1990s and into the mid-2000s, and so did the capacity to produce lumber. By 2005, lumber production capacity had exceeded 80 BBF. Demand for lumber began to fall in 2006 and accelerated as the economy fell into recession. The rapid falloff in lumber demand was a direct reflection of the crash in housing (affecting new construction), loss of equity and tighter credit (affecting repair and remodeling) and a slowdown in every other sector (affecting all the other uses of wood).



**Figure 2.1-8: U.S. housing starts and price recovery**

Sources: U.S. Census Bureau; ODF Pond Values (all regions, Douglas-fir logs - Grade 2S); Random Lengths National Composite Framing Lumber Index

Note: Pond value is the amount a mill will pay for a log delivered to the mill location.

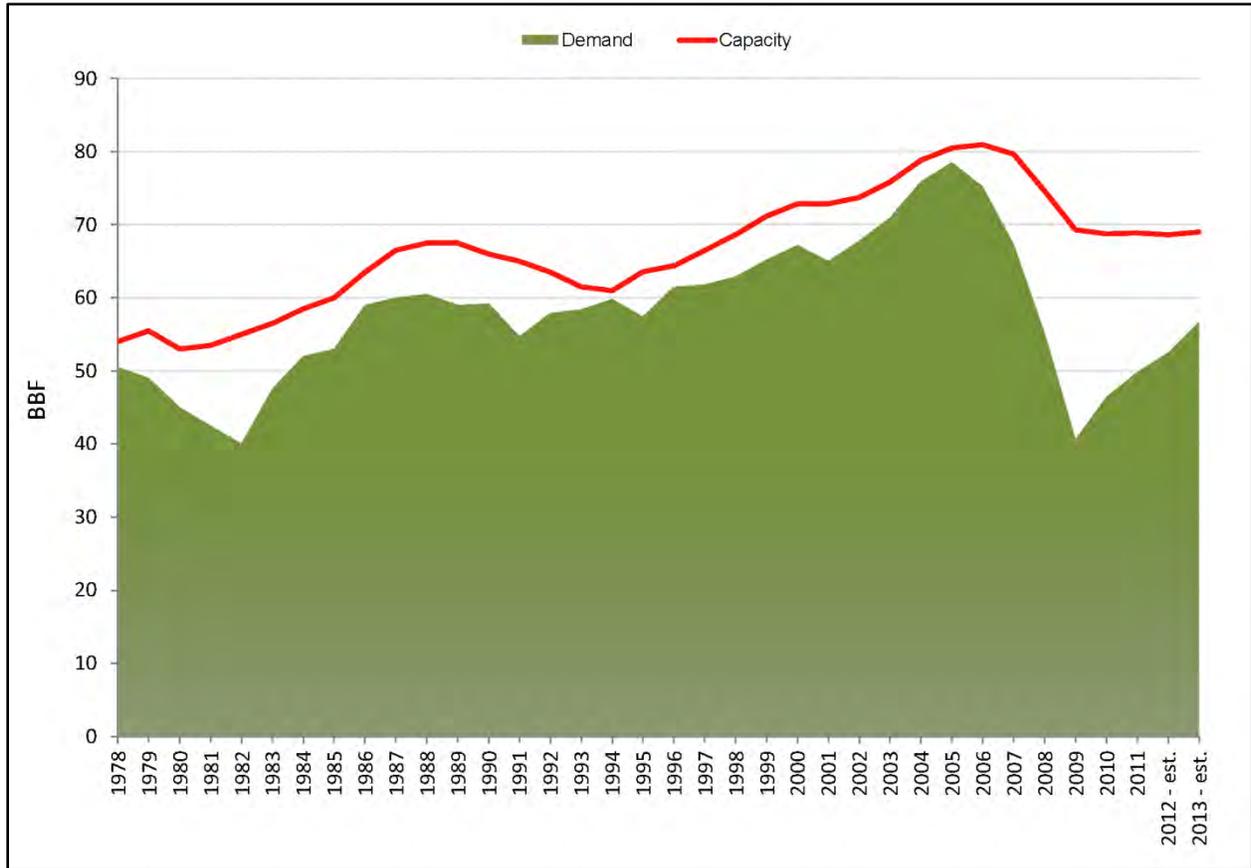
North American lumber capacity has fallen back to 1998 levels but still exceeds domestic demand by a large margin. Lumber prices, margins and investments in existing and new

mills will remain at low levels until there is additional demand to rationalize existing capacity or until capacity is further reduced. The sharp increase of Canadian lumber exported to

China will help, as will a recovery in U.S. housing.

Some forecasters see a convergence of supply and demand shifts that could markedly increase the demand for and price of Pacific Northwest

wood products. This “perfect storm” forecast is predicated on a strong housing recovery, a reduction in B.C. lumber production and strengthening demand from Asia. Housing was discussed above; the other factors follow.



**Figure 2.1-9: North American softwood sawmills — demand vs. capacity**

Sources: Resource Information Systems Inc. (RISI) North American Lumber Summary Report; USFS Research Report FPL-RP-659, Softwood Sawmills in the United States and Canada — Profile 2009 and Feb. 1, 2010, Feb. 3, 2011; Random Lengths Market Report, Dec. 10, 2009; International Wood Markets Group, January 2011; H. Spelter (personal communication), February 2012

**B.C. timber supply problems**

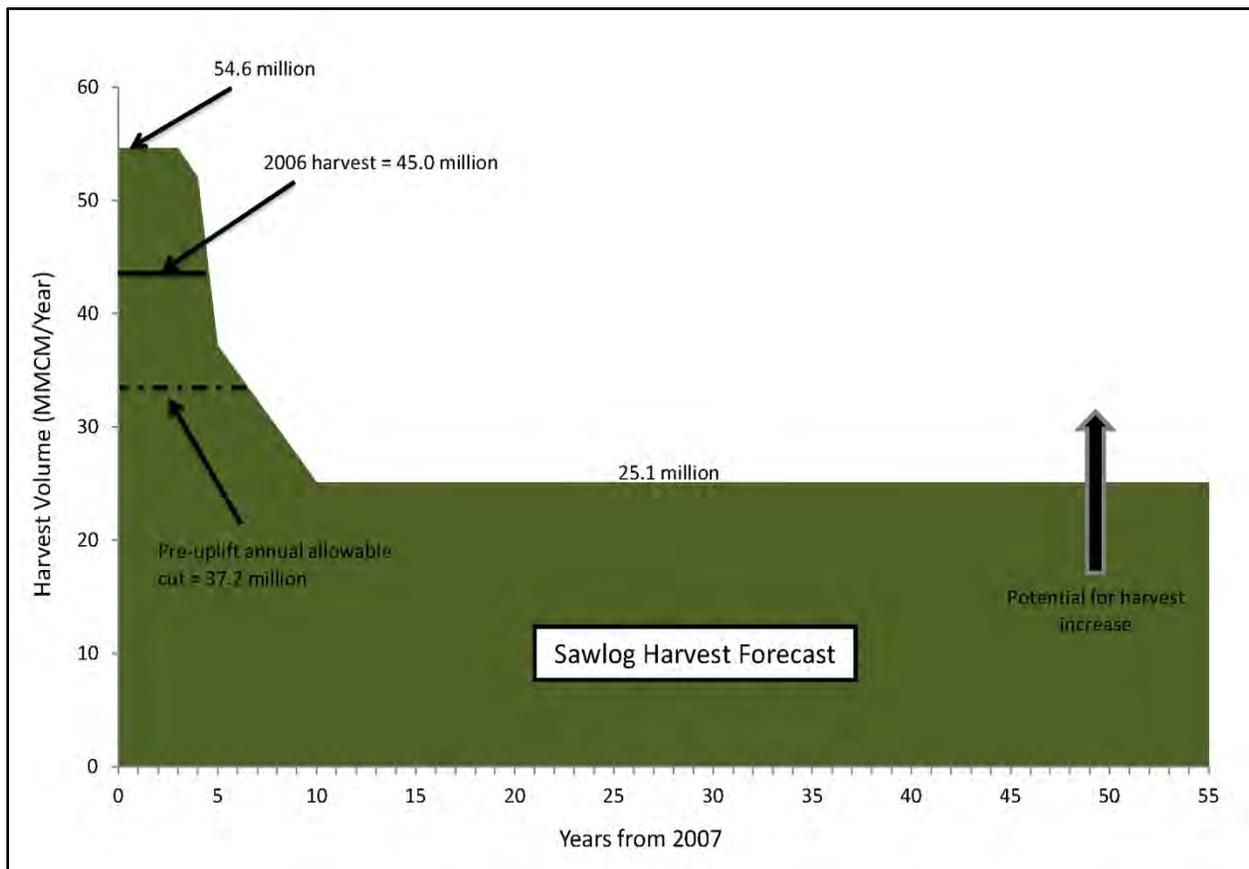
British Columbia is experiencing the most severe and widespread infestation of mountain pine beetles (MPBs) in recorded history. The B.C. Ministry of Forests and Range estimates that through 2011, beetles killed more than 710 million cubic meters (MMCM) of commercially valuable pine timber (about 157 BBF), covering

more than 45 million acres — an area 55 percent greater than the entirety of Oregon’s timberlands (B.C., 2012).<sup>13</sup> This volume represents 40 percent of the merchantable pine volume in the province. By 2016, projections are that 58 percent of the pine volume in the interior of B.C. might be dead (International Wood Markets Group, 2012).

The B.C. interior region is the source of more than 40 percent of Canadian softwood lumber production, and historically fills about 16 percent of U.S. lumber demand (B.C., 2007). Furthermore, B.C. has been a top exporter of lumber to China, sourcing approximately 35 percent of China’s total lumber imports in 2010.<sup>14</sup>

Over the last several years, B.C.’s annual allowable cut has been accelerated to allow harvest of as much of the beetle-killed timber as economically possible. To facilitate the salvage, the province’s lumber capacity has expanded 20 percent since 2000.

The 54.6 MMCM (12 BBF) current harvest level is unsustainable and is scheduled for reduction soon. Then, the annual allowable cut will decrease to 37.2 MMCM (the pre-uplift level), followed by a gradual decrease to 25.1 MMCM around 2018 (Figure 2.1-10). This is a reduction equivalent to about 7.5 BBF annually — more than the reduction the spotted owl brought to federal harvests in the Pacific Northwest. This sharp reduction in harvest, along with the redirection of B.C. lumber from U.S. to Chinese markets, is one force leading some to predict a “super cycle” lumber and log price increase (The Campbell Group, 2012).



**Figure 2.1-10: Timber supply forecast reflecting the harvest priorities of the B.C. MPB infestation**  
 Source: Adapted from B.C. Ministry of Forests and Range, “Timber Supply and the Mountain Pine Beetle in British Columbia: 2007 Update,” 2007

## **Wood product trade**

### ***Japan***

For the first time since 1962, the combined total import volume of lumber and logs to Japan dropped below 11 MMCM (about 2.4 BBF) in 2009 (Figure 2.1-11). While Japanese housing starts fell 40 percent between 2006 and 2009, the long-term downward trend in wood imports predates the Great Recession, reflecting lackluster economic growth over a long period, changing homeowner demographics, an aging population and the construction of higher-quality homes with longer lifespans.

Even so, 2010 saw starts increase to levels not seen since the early 1960s, and starts are expected to improve somewhat in the future, especially as the Japanese economy rebuilds after the 2011 tsunami.

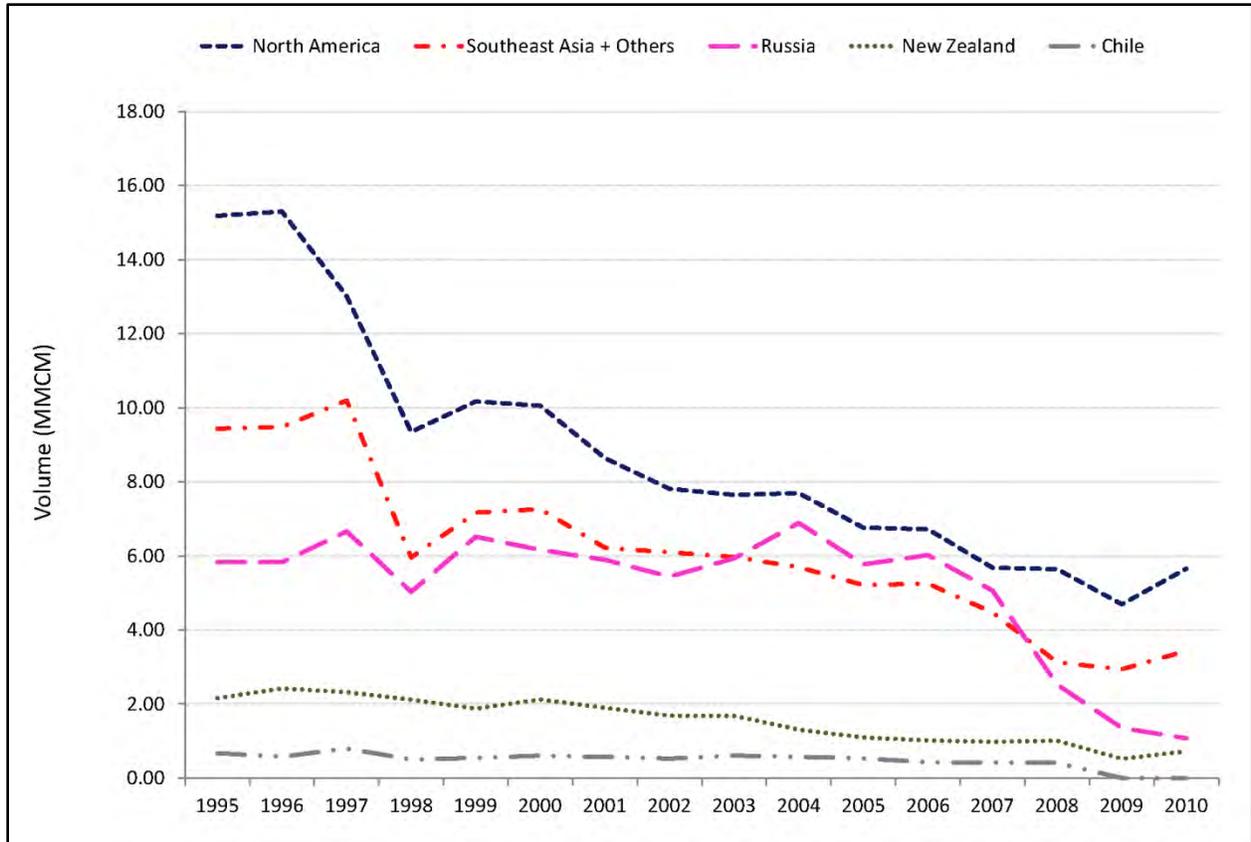
Figure 2.1-11 also illustrates the effect of policy decisions on trade flows. Russia maintained a relatively stable share of the Japanese log market until 2008, when it announced a

25 percent tax on raw log exports and an intention to increase the tax to 85 percent.

While the policy was designed to encourage manufacturing capacity in Russia, there was much less investment than Russia had hoped. While Russian lumber exports did increase, the major effect was that both Japan and China reshuffled their purchases of Russian logs to the benefit of North American log suppliers.

In 2011, Russia was approved to join the World Trade Organization (WTO), leading to predictions that Russia's log export tax would be reduced by 50 percent or even eliminated altogether to meet WTO trade requirements (The Campbell Group, 2011).

A reduced Russian log export tax has the potential to affect worldwide softwood lumber markets as major importing countries turn back to purchasing Russian logs.



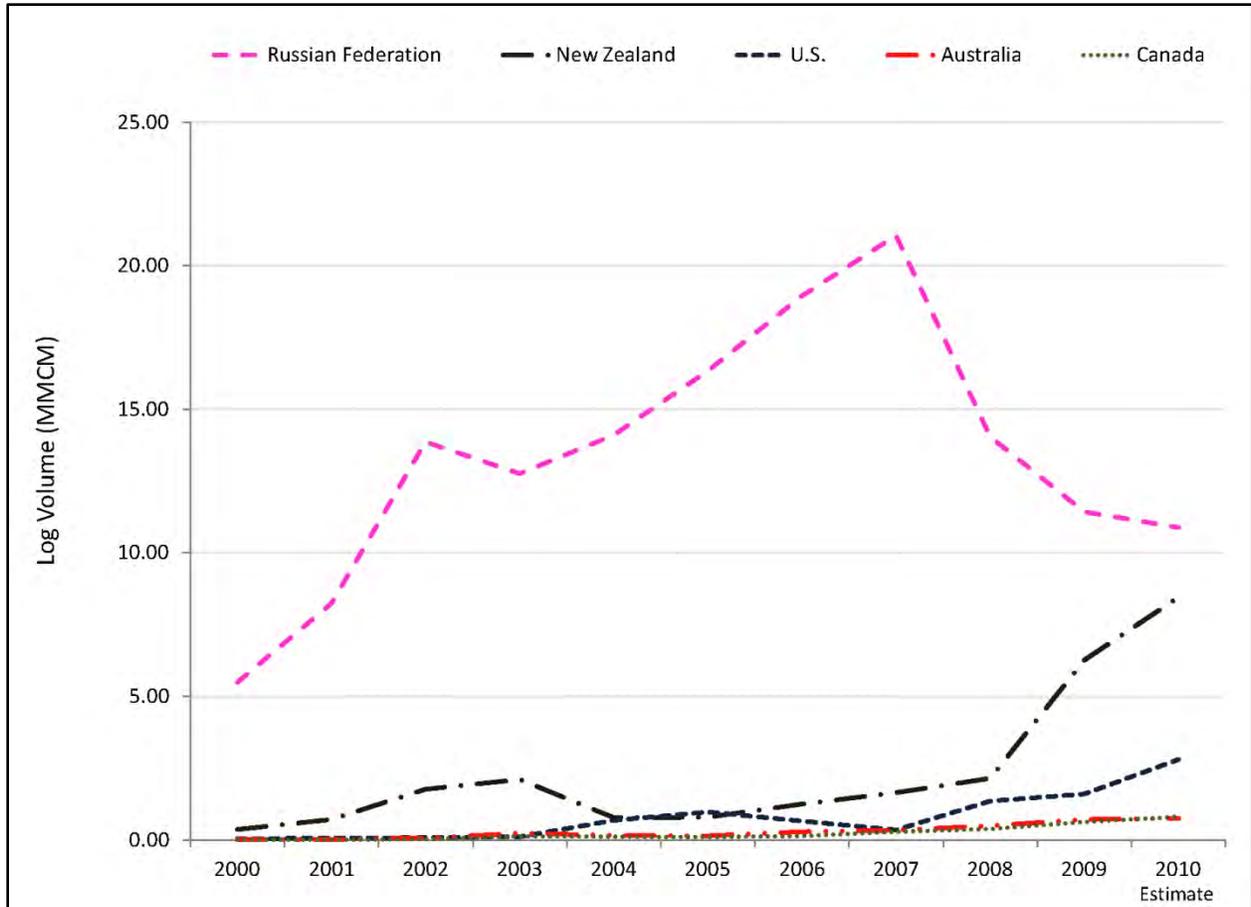
**Figure 2.1-11: Total lumber and log imports into Japan, 1995-2010**

Source: Japan Wood Products Information and Research Center, Lumber Reports

**China**

In 2011, China became the largest importer of softwood lumber and logs in the world with a total value reaching almost U.S. \$8 billion — a 57 percent increase from 2010, and up from U.S. \$70 million 15 years ago (Wood Resources International, 2012). While demand did slow

during the early part of the recession, Chinese demand for North American wood has been a bright spot during the nascent recovery, ramping up dramatically in 2009 and 2010 (Figure 2.1-12). China’s strategic move to diversify log suppliers resulted in a sharp increase in demand for U.S. logs.

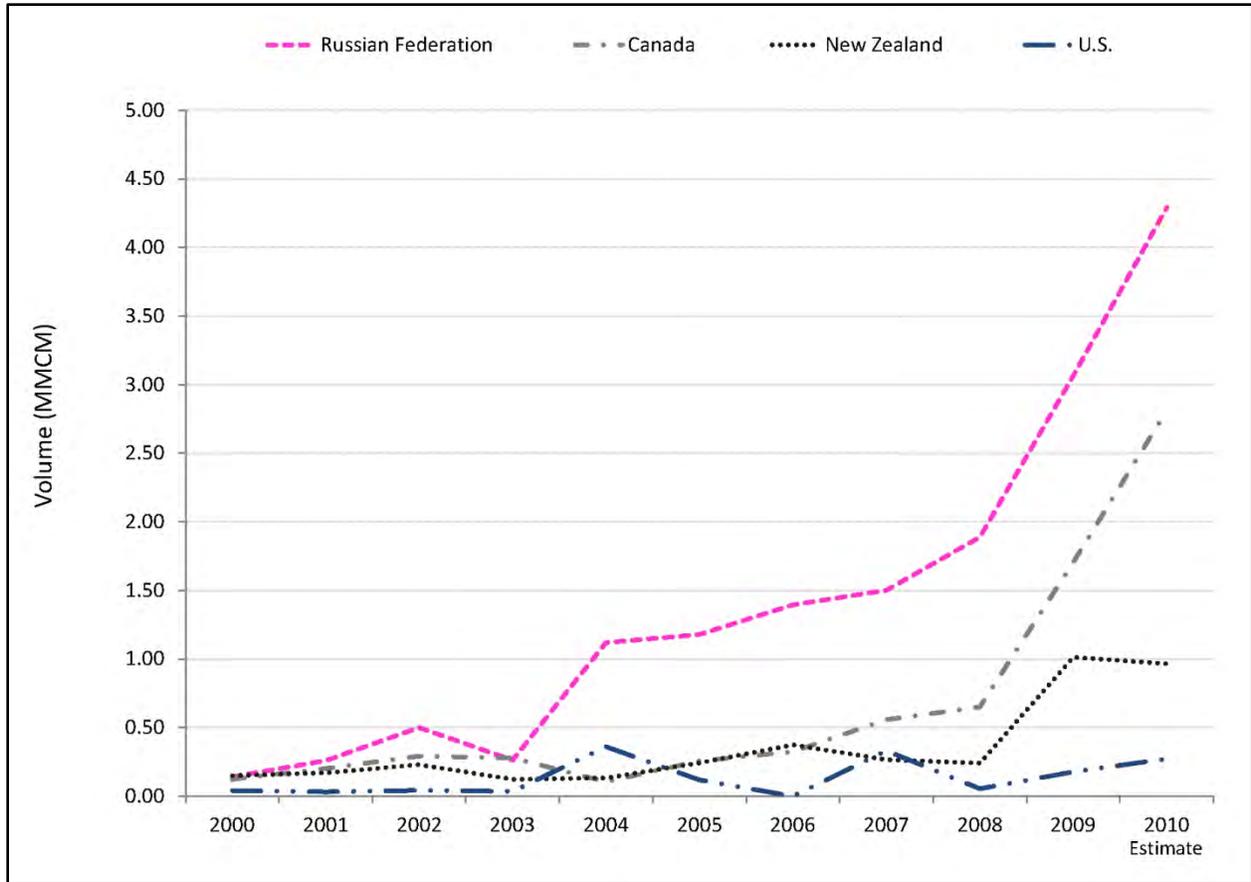


**Figure 2.1-12: Chinese softwood log imports, 2000-10**

Sources: FAO of the United Nations (FAOSTAT Forestry Trade Flows); International Wood Market Group estimate

Chinese lumber imports held steady in 2008, more than doubled in 2009 and jumped again in 2010 (Figure 2.1-13). Imports from Russia continue to dominate market share; however, Canadian lumber imports are expanding quickly and may surpass Russian lumber by 2013, as Canadian lumber exports to China have outpaced Russian lumber exports (International Wood Market Group, 2010). Nevertheless, these two countries have become the two main lumber-supplying countries, accounting for more than half of China’s total lumber imports in 2009 and 2010.

China has a target GDP growth rate of 7 percent per year and expects personal income to increase at the same rate. In addition, the Chinese government has developed an ambitious goal of developing 36 million housing units by 2015 to urbanize approximately 51 percent of the citizens (KPMG, 2011). China’s demand for raw wood materials is expected to increase at a rate of 8 percent to 10 percent per year, contributing to a growing wood supply deficit that will have to be filled by log and lumber imports (IFI, 2011).



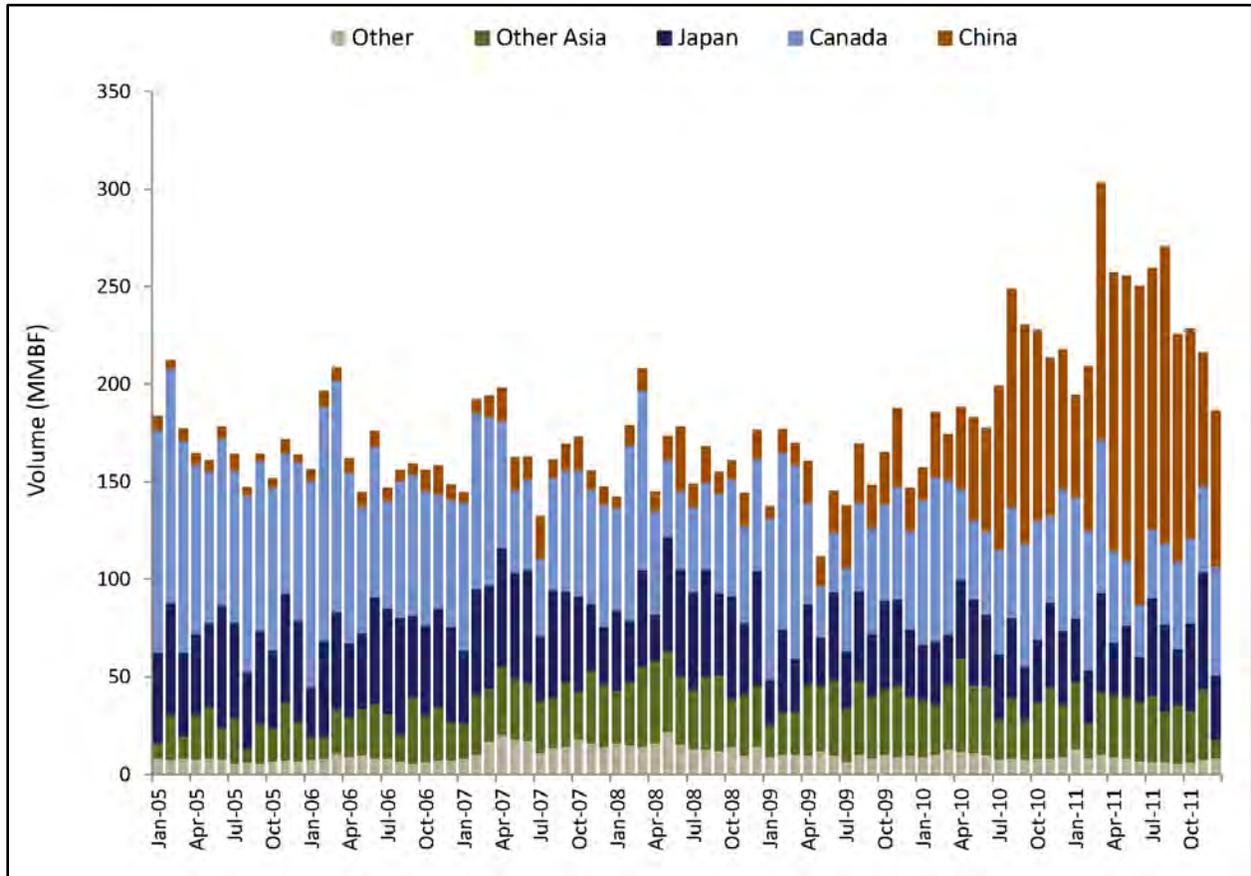
**Figure 2.1-13: Chinese softwood lumber imports, 2000-10**

Sources: FAO (FAOSTAT Forestry Trade Flows); International Wood Market Group estimate

**U.S. log and lumber exports**

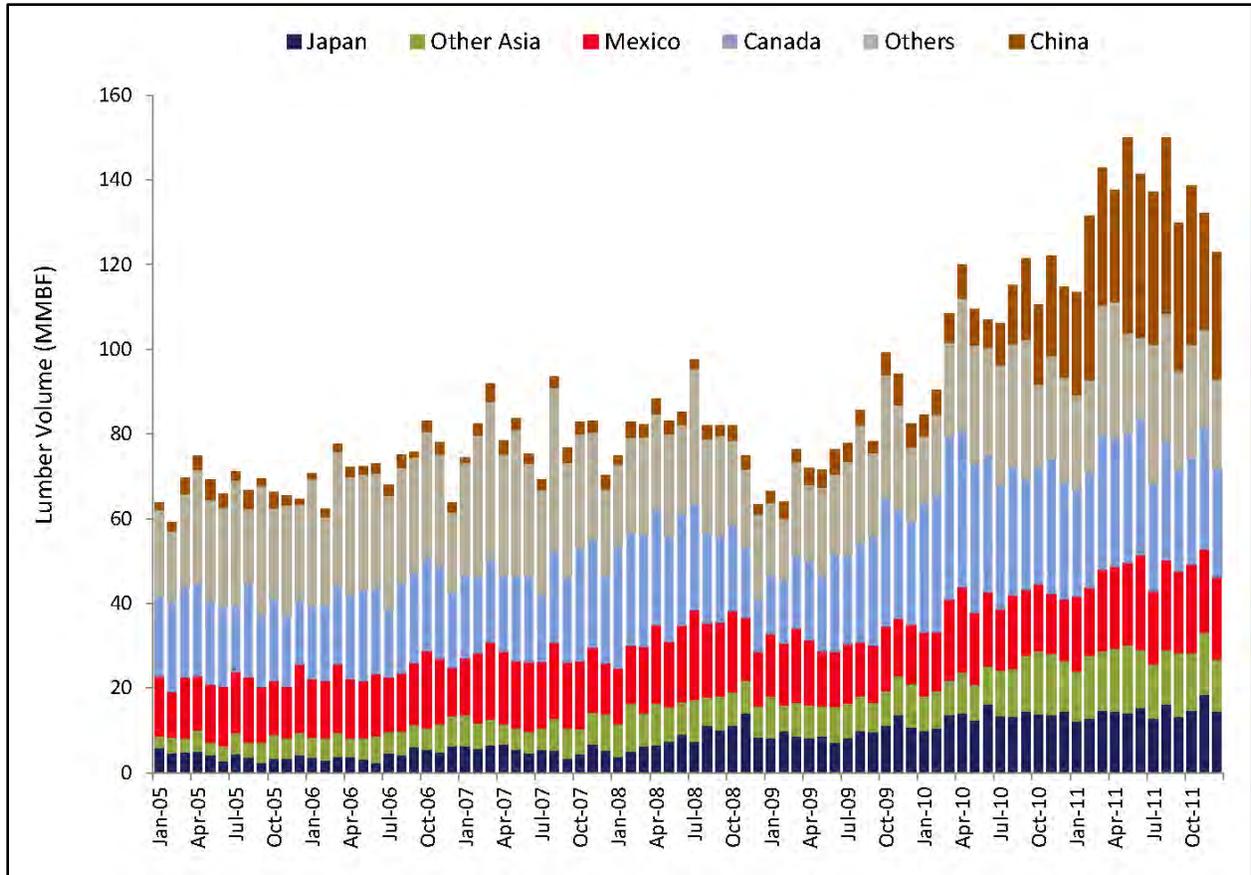
From 2005 to 2009, U.S. log and lumber exports remained relatively consistent in terms of volume and destination. Since then, U.S. log and lumber exporters have responded to increasing demand from China (Figures 2.1-14 and 2.1-15).

In 2009, the United States exported approximately 258 MMBF of logs (and chips) and 53 MMBF of lumber to China. By the end of 2011, the United States increased its log exports to China by 81 percent (1,378 MMBF) and lumber exports by 87 percent (414 MMBF).



**Figure 2.1-14: U.S. softwood log and chip exports, 2005-11**

Source: U.S. Department of Agriculture (USDA) Foreign Agricultural Service

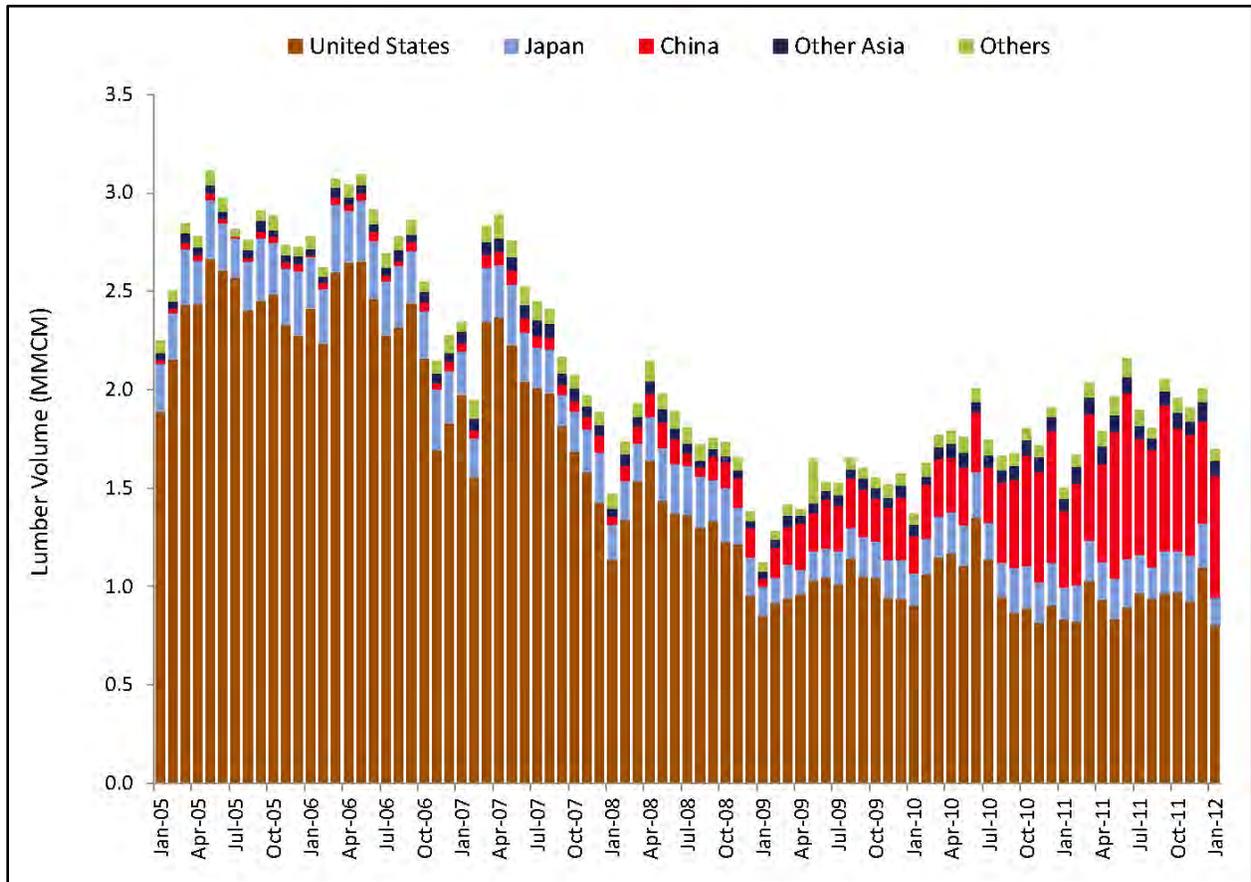


**Figure 2.1-15: United States softwood lumber exports, 2005-11**  
 Source: USDA Foreign Agricultural Service

**British Columbia**

The United States has historically been the primary export market for B.C. lumber, averaging 2.2 MMCM (486 MMBF) per year and typically accounting for some 80 percent of total British Columbia lumber exports (Figure 2.1-16). The B.C. government and industry had

been actively courting Chinese markets, and as U.S. housing softened, that strategic investment paid off. B.C. lumber manufacturers were able to redirect lower-priced lumber from the United States to China. In 2011, China accounted for 32 percent of B.C. lumber exports.



**Figure 2.1-16: B.C. softwood lumber exports, 2005-present**

Source: Statistics Canada

## Section 2.2 — Biomass Energy and Biofuels

Wood is the oldest source of energy in Oregon, and the forest sector has long contributed to the state's energy system. Mills were early adopters of energy technologies and used these technologies to reduce emissions from the burning of mill waste, contributing to improved air quality.

The use of woody biomass in Oregon to produce heat, power and liquid fuels is an important center of economic activity that has the potential to contribute to Oregon's energy needs of the future, support forest health restoration and improve rural economies through job creation. The bioenergy industry in Oregon is diverse and growing, consisting of well-established companies as well as new technologies and market entrants.

Biomass is the sum total of all organic materials in trees, agricultural crops and other living plant material. Woody biomass is any biomass composed of wood, and it is the demand for this form of biomass that is of interest to the forest sector. In Oregon, woody biomass comprises primarily three sources:

- **Wood products residue** is the wood waste, including trim, shavings, wood chips, sawdust, bark and other residues, generated at sawmills and other wood products plants.
- **Urban wood waste** includes discarded wood and yard debris. The waste stream often ends up in landfills, but it can be diverted for energy production.
- **Forest residue** is the material from trees and woody plants (limbs, tops, needles, leaves and other woody parts) grown in a forest that is the byproduct of forest management, ecosystem restoration or hazardous fuel reduction treatments.

### Wood products residues

The market for woody mill residuals from the production of primary wood products in Oregon is a mature commodity market. Most residuals produced from the state's lumber and veneer mills are subsequently used in the production of fiber products such as pulp and paper; composite wood products such as particle board; or lower-value products such as fuel pellets, mulch and bedding.

Vertically integrated companies transfer residues from solid-wood facilities to pulp mills and particleboard plants. Solid-wood facilities without an internal use for the higher-value residues market them to pulp mills or other users, often through short- or long-term contracts. Residuals that do not have high-value use are generally used as fuel for energy production on-site at the primary facility.

The volume of residue produced by the mills in 2008 is summarized in Table 2.2-1 by residue type and byproduct (Gale et al., 2012). The majority of residues, 69 percent, was used in secondary pulp and board products, while 26 percent was used as fuel. Less than 1 percent of the 4.5 million bone dry tons (BDT) generated in 2008 in Oregon were unused.

**Table 2.2-1: Volume of mill residues (BDT) produced in Oregon and end use, 2008**

Primary Mill Residues	Total Residue Product	Secondary End Use			
		Pulp & Board	Fuel	Miscellaneous <sup>1</sup>	Unutilized
Coarse <sup>2</sup>	2,530,247	2,349,434	158,059	22,754	319
Sawdust	655,974	466,439	183,415	6,121	417
Planer shavings	371,496	271,404	90,815	9,277	57
Bark	1,003,899	49,099	761,174	193,626	5,486
<b>Total</b>	<b>4,561,616</b>	<b>3,136,376</b>	<b>1,193,463</b>	<b>231,778</b>	<b>6,279</b>

Source: Gale et al., 2012

<sup>1</sup>Other uses primarily include animal bedding and landscape material.

<sup>2</sup>Peeler cores are included in coarse residue.

### **Forest Biomass**

Forest biomass from logging waste and pre-commercial thinning for fire hazard reduction presents a much larger potential supply than mill residues (CH2M Hill, 2005). The most common use of forest biomass is for energy. Wood fiber or pulping liquor combustion produces steam for industrial purposes. Some of these combustion facilities use combined heat and power generation (cogeneration) to power thermally activated systems while simultaneously generating electricity that can be captured to satisfy on-site electrical demand or sold to power utilities.

Trends in forest biomass utilization in Oregon include the following:

- Wood fuel manufacturing plants that produce compressed wood-based fuels such as pellets, bricks and fuel logs.
- Facilities such as schools and hospitals that use wood fuel to heat their buildings. This use of forest biomass to produce thermal energy is advantageous in communities with plentiful access to wood fuel that are underserved by other energy sources such as heating oil or natural gas.
- Cellulosic ethanol production facilities that incorporate forest residues as a feedstock for conversion to liquid fuel. One BDT of forest biomass is estimated to produce 135 gallons of fuel, which could be a significant payoff, if the technology proves to be commercially viable (ZeaChem, 2012). If that proves to be the case, producing biofuels from Oregon’s forest products could offer long-term economic development in rural areas, create an opportunity to produce transportation fuels in the state, and provide additional market demand to spur forest health and restoration activities (The State of Oregon Forest Biomass Working Group, 2007).
- Biofuel Production. Northwest Advanced Renewables Alliance (NARA), is a collaboration among scientists from public universities, government laboratories and private industry from throughout the Pacific Northwest (and beyond) who are working together to develop ways to produce biomass-derived aviation fuel and other petroleum-derived chemicals. NARA aims to create a sustainable industry that produces aviation biofuels and important co-products using a variety of feedstocks, including

forest and mill residues, construction waste and new energy crops.

**Current woody biomass demand (Figure 2.2-1)**

Demand for woody biomass at any particular time is dependent upon market factors, competing energy pricing and facility-specific planning. These estimates of current demand represent the conditions at the time of this report. Total consumption for each facility is based on the total potential consumption, recognizing that some facilities are not operating at full capacity or have shifted some of their energy use to other sources such as natural gas.

- Wood fiber combustion facilities

Wood fiber biomass combustion boilers operate at 38 industrial sites in Oregon. The boilers process steam for industrial processes, supply heat for dryers, and at some sites, produce electric power. The facilities consume more than 1.2 million BDT of biomass fuel, with an energy value of about 20 trillion British thermal units (tBtu).

- Chemical recovery boilers

There are four pulping liquor combustion facilities in Oregon. The boilers at these facilities produce steam for industrial processes and drive turbines, and two of these sites also produce electricity. The facilities consume roughly 1.8 million BDT of biomass fuel, with an energy value of about 24 tBtu.

- Cogeneration facilities

Of the 42 combustion boilers in Oregon, 10 are wood-based biomass cogeneration facilities in Oregon: nine wood-fiber combustion boilers and one pulping liquor facility. The electrical capacity of these facilities is about 200 MW — enough electricity to power approximately 150,000 average homes in Oregon for a year.<sup>15</sup>

- Biomass fuel manufacturers

The 11 biomass fuel manufacturing facilities in Oregon produce fuel pellets, bricks and compressed fire logs from both mill residues and forest biomass. The facilities have the potential to consume approximately 700,000 BDT of sawdust and wood residuals.

- Biomass heating facilities

Sixteen biomass heating facilities in Oregon use woody biomass to produce thermal energy. These facilities combined have enough thermal energy to constantly heat the space and water of about 5,400 households for a full year.<sup>16</sup>

- Biofuel production

One cellulosic ethanol conversion facility is planned in Oregon that will use forest biomass. This facility will incorporate hybrid poplar into its agricultural residue feedstock to produce biofuel. The current demonstration facility produces approximately 250,000 gallons per year primarily from corn syrup; a planned commercial size facility will produce up to 25 million gallons per year from biomass.

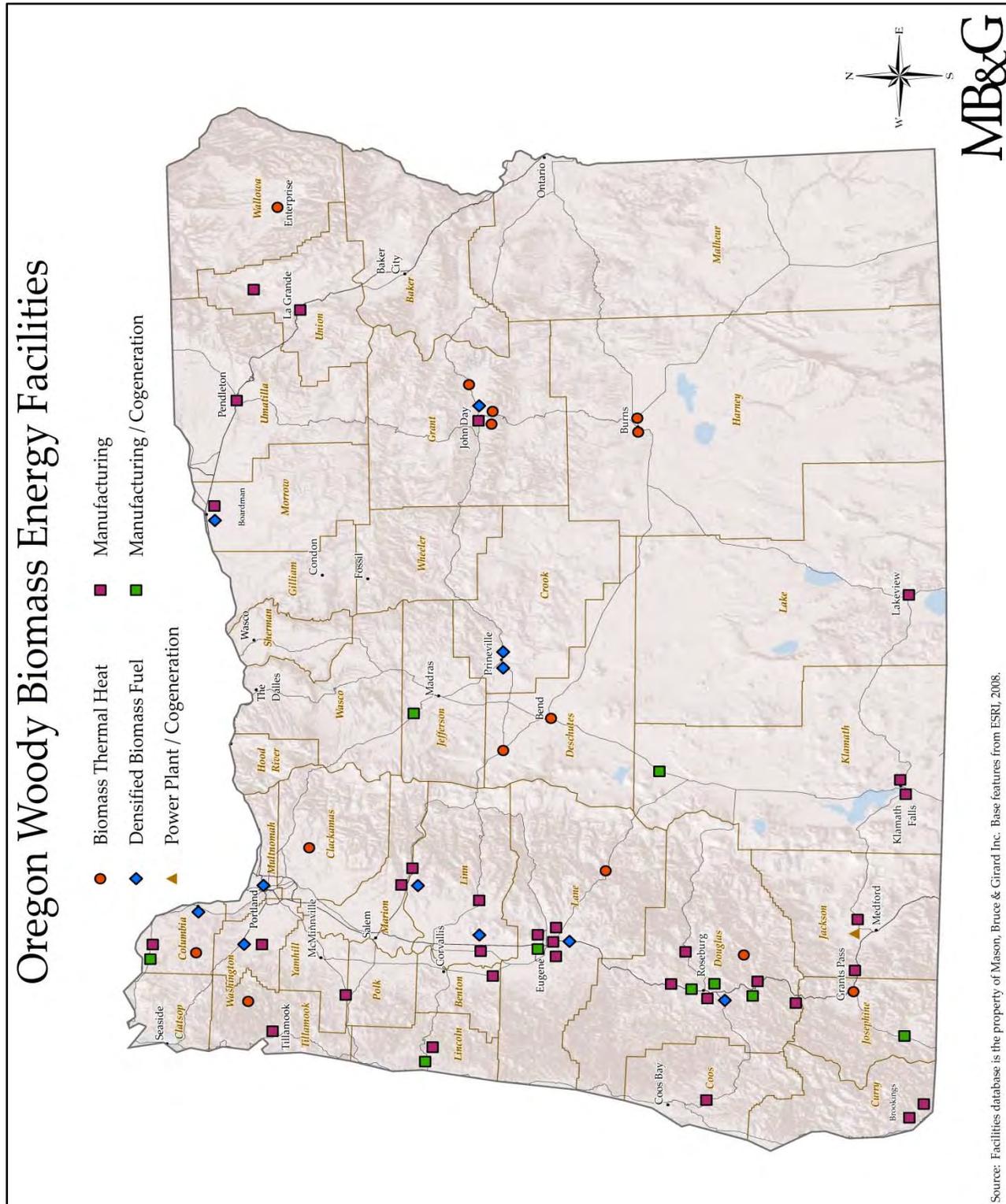
**Table 2.2-2: Summary of Oregon bioenergy facilities utilizing woody biomass**

Type of Facility	Number of Facilities	Annual Production	Annual Consumption
<b>Woody biomass (electric generation stations, steam plants and cogeneration)</b>	42	Less than 200 MW plus undetermined amount of steam use for process and heat energy	3 million BDT of forest slash, mill residuals, pulping liquor, urban wood and yard debris
<b>Fuel manufacturers</b>	11	Approximately 520,000 tons of pellets, bricks, logs	700,000 tons of sawdust and wood residuals
<b>Biomass heating</b>	16	Heat for buildings	Approximately 900-1,200 tons of wood chips and pellets
<b>Cellulosic ethanol*</b>	1	250,000 gallons	1,300 BDT** of forest residue and hybrid poplar feedstock

Sources: Oregon Department of Energy (ODOE), 2005; ODOE, 2010; Northwest Power and Conservation Council, 2012; 2012 Biomass Energy Facility Database (provided by ODOE)

\*Demonstration facility that is not using 100 percent biomass in current production.

\*\*One BDT produces 135 gallons of fuel; 70 percent of total feedstock is from forest residue



**Figure 2.2-1: Oregon woody biomass energy facilities**

Source: Facilities — Oregon ODOE, 2005; ODOE, 2010; Northwest Power and Conservation Council, 2012; 2012 Biomass Energy Facility Database (provided by ODOE); base features — ESRI, 2008

### **Future of Oregon's bioenergy production**

Oregon has significant potential for bioenergy development, with the greatest near-term opportunity being thermal and combined heat and power production, while biomass-derived electricity generation represents long-term opportunities. Over the longer term, Oregon is in a strong position to exploit cellulosic ethanol markets, assuming technologies for converting cellulose to ethanol can be commercialized successfully.

The active participation of the state's forest sector will be necessary to fully capture the potential benefits of continued woody biomass development; otherwise, decisions may be made that do not maximize potential returns or that lead to whole new industries that are exclusive of the current forest sector. The advantages of a forest-sector approach to bioenergy development are many, and if fully engaged, Oregon will benefit.

Oregon's Forest Biomass Working Group (FBWG), coordinated by the ODOE, has been working toward development of a statewide Biomass Utilization Strategy to support policymakers, agencies and the industry in making decisions that will enhance the biomass industry in Oregon.

Through this process, the FBWG has identified critical barriers and challenges that must be addressed and overcome for the potential for bioenergy to be realized in Oregon.<sup>17</sup> The work of the FBWG is presented in the following section.

### ***Barriers and challenges***

- **Markets**
  - Existing markets are not sufficient to address the forest restoration need or the available biomass.
  - Power from stand-alone woody biomass plants is more expensive than market prices for alternative energy sources, and power purchase agreements for biomass are not economical.
  - Full benefits of biomass utilization are not reflected in current market prices.
  - The playing field is not level with respect to funding/subsidies for other alternative energy sources such as wind power.
- **Supply**
  - Better information is needed about supply, availability and reliability, as well as the attributes, characteristics and specifications of biomass.
  - Secure, long-term, affordable feedstock supplies must be secured.
    - Supply from federal lands and other sources is uncertain.
    - The cost of supply for forest-based biomass is high relative to its value. Transportation costs are a critical factor because of the weight-to-value ratio.
    - Supply uncertainty creates financing access difficulties (due to high risk), and creates both short- and long-term operational risks.

- There is a lack of infrastructure for harvesting and delivering biomass, including workforce limitations.
  - No developed marketplace exists for biomass, and there is no transparent market price and no standard supply terms for woody biomass fuel.
  - There is no unified voice for the biomass industry.
  - Policymakers, regulators and agencies lack the capacity to seek out information about new forms of energy.
- Biomass Legislation and Incentives**
- The Oregon Renewable Portfolio Standard<sup>18</sup>***
- Enacted in 2007, the Oregon Renewable Portfolio Standard (RPS) became law through Senate Bill (SB) 838, and is captured under Oregon Revised Statute (ORS) 469A. In short, Oregon's RPS requires utilities to meet a percentage of their retail electricity needs with qualified renewable resources. Oregon's three largest utilities (Portland General Electric, PacifiCorp, and the Eugene Water and Electric Board) must use renewable resources for 25 percent of their total electricity needs by 2025 in gradual steps that began with 5 percent in 2011. Depending on their size, other utilities must meet standards of 5 percent or 10 percent by 2025.
- The Western Renewable Energy Generation Information System determines the eligibility of proposed renewable energy sources and then creates Renewable Energy Certificates that utilities may use to demonstrate compliance. Eligible resources include biomass, geothermal, hydropower, ocean thermal, solar, tidal, wave, wind and hydrogen.
- **Financing**
    - Financing is difficult for new projects. Developers have fewer resources than large generation companies or integrated utilities.
    - Early phase development is expensive, which increases costs and makes it difficult to access capital.
    - Government policies and incentives may be limited or uncertain.
  - **Research and technological advancement**
    - Additional research and development are needed to improve conversion technologies and reduce cost.
    - The majority of federal R&D funding goes to nonrenewable energy sources and other alternative energy sources.
  - **Knowledge, awareness, understanding**
    - There is a general lack of awareness and understanding of the benefits of biomass utilization.
    - Public concern results from a lack of understanding or competing messages.
    - Existing science does not reflect Oregon's biomass utilization opportunities.

ORS 469A.205 (Renewable Energy Sources) defines eligible biomass as:

*Forest or rangeland woody debris from harvesting or thinning conducted to improve forest or rangeland ecological health and to reduce uncharacteristic stand replacing wildfire risk. Wood material from hardwood timber grown on land described in ORS 321.267 (3).<sup>19</sup> Electricity generated from the direct combustion of biomass may not be used to comply with an RPS if any of the biomass combusted to generate electricity includes wood that has been treated with chemical preservatives such as creosote, pentachlorophenol or chromate copper arsenate.<sup>20</sup>*

### **Oregon Business Energy Tax Credit**

The Oregon Business Energy Tax Credit (BETC) was established in 1979 to provide an incentive for Oregon businesses to invest in energy conservation measures and renewable energy projects. Eligible projects can claim 35 percent to 50 percent of project costs as a deduction against Oregon income tax liability, and the tax credit is available to all businesses in Oregon. Energy efficiency projects can claim a 35 percent credit, while renewable energy projects such as solar, wind, biomass, and combined heat and power can claim a 50 percent credit. For most projects, the credit is taken over five years. Any unused portion of the credit after five years can be carried forward for a maximum of eight years (ECONorthwest, 2009).

Between 2002 and 2009, 16 biomass combustion projects received a total of \$60.3 million (2010 dollars) in tax credits through the BETC. The tax credit range was from \$473,500 to \$7.3 million, with an average

tax credit of \$3.5 million (Industrial Economics Inc., 2011).

In 2011, the Oregon legislature passed House Bill (HB) 3672, making several changes to the structure of the state's tax credit programs that became effective Jan. 1, 2012.<sup>21</sup> Listed below are a few of the changes directly affecting future biomass production.<sup>22</sup>

- The BETC has a sunset date at the end of 2012 and will no longer be an active tax credit.
- The Renewable Energy Development Grants program was created. Grants — funded by tax-credit auctions, taxpayer contributions or direct appropriation by legislation — will be awarded to support the development of renewable energy production systems (solar, wind, biomass, and combined heat and power). Individual projects may receive grants up to \$250,000 or 35 percent of the project costs, and the project size is limited to 35 MW nameplate capacity.<sup>23</sup>
- The Energy Conservation Project Tax Credit was created, providing a tax credit for any capital investment for which the first year savings yield a simple payback of greater than three years.

### **Biomass Producer and Collector Tax Credit**

Established in 2007 through HB 2210, the Biomass Producer and Collector (BPC) tax credit encourages the production, collection and transportation of biomass for biomass production. The BPC tax credit helps offset costs, primarily of transportation, by paying a set rate per unit of delivered material.

In 2010, the tax credit provided producers and collectors \$10 per green ton on biomass delivered to a biofuel producer for use as a biofuel or to produce biofuel. The first eligible tax year to claim the credit was 2010. As of March 2011, \$6.6 million in tax credits have been requested, with 85 percent of the claims coming from collectors.

From the total, about \$5.5 million (83 percent) were claimed for approximately 308,000 BDT of delivered biomass (Nielson-Pincus, 2011).

In 2011, the Oregon Legislature passed HB 3672, which extended the BPC Tax Credit through January 1, 2018. The new bill adjusted the pay rate from \$10 per green ton to \$10 per dry ton. A producer or collector will receive a reduced tax credit due to this shift in scaling units; a BDT of delivered biomass is equivalent to about 2 green tons so the tax credit is essentially halved.

## Section 2.3 — Forest Affiliated Assets

In addition to traditional forest products, Oregon’s forestlands provide an abundant and sustainable flow of natural resources that is critical to the state’s general well-being. These forest affiliated assets are often referred to as ecosystem services,

Several definitions have been developed to convey the meaning of ecosystem services. The U.S. Environmental Protection Agency (EPA) provides the following definition of ecological goods and services (EPA, 2012): “The outputs of

ecological functions or processes that directly or indirectly contribute to social welfare or have the potential to do so in the future. Some outputs may be bought and sold, but most are not marketed.”

As shown in Table 2.3-1, these services or outputs can be divided into four major categories to highlight the full suite of values they provide to both people and the environment: (1) Supporting services; (2) provisioning services; (3) regulating services; and (4) cultural services (Deal et al., 2012).

**Table 2.3-1: Categories of ecosystem services**

Ecosystem Services			
<b>Supporting Services</b> Nutrient cycling Soil productivity Primary production	<b>Provisioning Services</b> Food Fiber Genetic resources Fresh water	<b>Regulating Services</b> Air quality regulation Climate regulation (carbon sequestration) Water regulation Erosion regulation Water purification Disease regulation Pest regulation Pollination Natural hazard regulation	<b>Cultural Services</b> Aesthetic values Spiritual and religious values Recreation and tourism

Source: Adapted from Deal et al., 2012

### **Ecosystem services markets**

In recent years, those interested in quantifying ecosystem services have developed ecosystem services markets. These markets are organizational structures that facilitate buying and selling units of environmental benefit called credits (U.S. Fish and Wildlife Service, 2011). The markets attempt to monetize the ecological or societal benefit derived from the protection, restoration and enhancement of the environment.

In Oregon, forest landowners can pursue three primary ecosystem markets (Deal et al., 2012):

- Wetland mitigation and species conservation banking
- Water quality trading (point source pollution discharge, total maximum daily load for water temperature)
- Carbon markets

The Willamette Partnership created an accounting system that facilitates the trade of multiple types of ecosystem credits, including wetlands, salmon habitat and water temperature, between buyers and sellers. In addition, 25 established mitigation banks in Oregon were set up to compensate for impacts to wetlands and species. These include a wetland-in-lieu fee program, a stream mitigation program framework that is under development and a regional vernal pool

conservation strategy (U.S. Fish and Wildlife Service, 2011).

Oregon forest landowners interested in developing carbon offset projects can be approved through a voluntary carbon offset registry that facilitates the sale of carbon offsets on the voluntary carbon market. Three of these registries are:

- American Carbon Registry ([www.americancarbonregistry.org](http://www.americancarbonregistry.org))
- Climate Action Reserve ([www.climateactionreserve.org](http://www.climateactionreserve.org))
- Verified Carbon Standard, formerly Voluntary Carbon Standard ([www.v-c-s.org](http://www.v-c-s.org))

In Oregon, there are two listed voluntary forest carbon offset projects: Pacific Forest Trust's Van Eck Oregon Forest (7,200 acres) in Lincoln County and The Conservation Fund's Gilchrist Forest — East (25,000 acres) in Klamath County. Both projects are listed with CAR but not yet registered for the sale of carbon offsets.

Currently, there is not a mandatory cap-and-trade program in the United States or within Oregon, but Oregon forest landowners do have the option of developing projects that could sell offset credits in California's Cap-and Trade Program (enforceable compliance beginning 2013).

### **Limitations of ecosystem markets**

Inherent in developing markets for ecosystem services is the challenge of monetizing the benefits derived from a particular service. Ambiguous definitions and the combination of market and non-market attributes hinder the achievement of tangible outputs that can be bought and sold on the fair market (Patterson and Coelho, 2009).

Markets that have been developed exist in separate programs with specific regulations regulated across multiple jurisdictions. To offer substantial monetary incentives for forest landowners and managers, ecosystem markets need to link accessibility and transactions costs with transparent and credible transactions based on sound science and biological integrity (Deal et al., 2012).

In an effort to address these limitations, the Oregon Legislature passed SB 513 in 2009 as a means of advancing policy recommendations for integrating ecosystem markets through a framework that produces positive ecological and economic outcomes (Oregon Watershed Enhancement Board, 2010). Oregon is one of the first states to pass such legislation, based on the premise that without a coordinated effort, ecosystem markets will develop, but they will be random and too small to produce tangible benefits (LaRocco et al., 2011). The SB 513 Working Group is exploring a strategic path forward, aiming to provide recommendations for development of an integrated ecosystem

services market that will make revenue available to landowners who are providing such services. The working group is also addressing the need for consistent methodologies in measuring ecosystem services and proposing policy recommendations to help stimulate demand for payment for such services.

### **Other services**

Multiple uses of resources derived from Oregon's forests provide great benefits: water consumption (irrigation and municipal watershed); grazing and forage production for livestock; mining and quarry production (rock, aggregate, minerals, ores, oil and gas exploration); and special use permits (utility corridors, rights of way and easements). Unfortunately, most available research focuses on either a much broader scale or a more detailed geographic area. As far as we are aware, a comprehensive study at the state level attempting to value these services and resources related to forests has not been conducted, and it would be beyond the scope of this project to attempt to assign such values.

Ranching operations, for example, use the forests of Oregon for summer range. In eastern Oregon, forestlands provide more than half the forage for typical ranching operations (Oregon State University [OSU] Extension Service, personal communication, 2012). Forest-based summer range makes a critical contribution to the economics of ranching in Oregon, particularly on the drier east side.

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## **Chapter 3: Oregon's Forest Sector Operating Environment**

## Section 3.1 — Forest Sector’s Institutional Culture

Oregon’s long-standing institutional relationship with the forest and wood products manufacturing sector has evolved over time to develop a framework that gives the forest sector specific advantages that do not exist in other states or regions competing for Oregon’s market share. This supportive institutional culture is built upon a foundation of public and private partnerships that recognize the importance of the forest sector’s contribution to Oregon’s economic well-being.

Oregon is consistently the leading lumber producer in the United States and, as such, has generated an immense amount of wealth for the state. The resulting institutional advantages can help clear the way for recovery from the difficult economic conditions of the past five years.

This section will discuss Oregon’s efforts to protect its forest resource while maintaining and enhancing the productive capacity of the resource. We also discuss the forest sector’s relationship with Oregon’s overall economy and touch upon programs aimed at recruiting the future workforce in the forest sector.

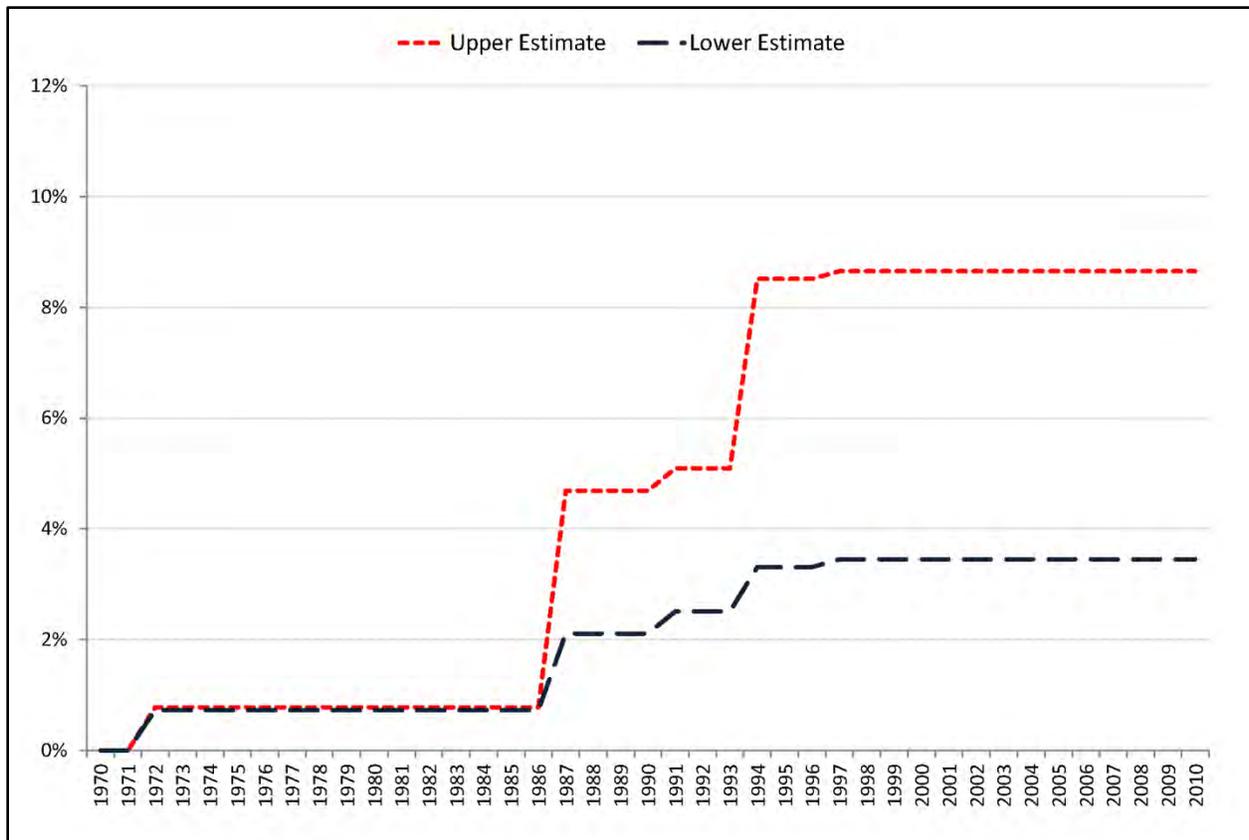
### **Forest resource protection**

Oregon’s Forest Practices Act (FPA), passed by the Legislature in 1971, was the first of its kind in the nation. The Oregon FPA clarifies the public’s stewardship expectations and ensures that landowners operating under its rules can manage their forests for a variety of objectives.

Forests provide environmental, social and economic benefits, and the Oregon FPA helps sustain these values in a socially accountable manner by setting standards for any commercial activity involving the establishment, management or harvesting of trees on Oregon’s forestlands (OFRI, 2011).

The ODF is responsible for reviewing pre-operations plans, overseeing operations, ensuring reforestation, investigating complaints and enforcing corrective actions when violations occur. Most of the time, ODF works closely with landowners and operators to comply with the requirements and avoid problems, but sometimes it is necessary to issue citations that may lead to civil or criminal penalties. Historically, forest landowners and operators planning forest operations have kept ODF informed, and most have complied with FPA regulations on treatment of slash, chemical and petroleum use, harvesting and other best management practices. Notably, compliance with reforestation rule requirements over time has been close to 100 percent.<sup>24</sup>

FPA requirements significantly constrain or encumber timber harvesting on less than 10 percent of Oregon’s private forestland (Figure 3.1-1). Oregon’s FPA strikes a balance between regulation and supporting timber harvesting operations, a clear advantage for forest landowners and operators in Oregon.



**Figure 3.1-1: Percentage of private forestland estimated to be encumbered by the Oregon Forest Practices Act**

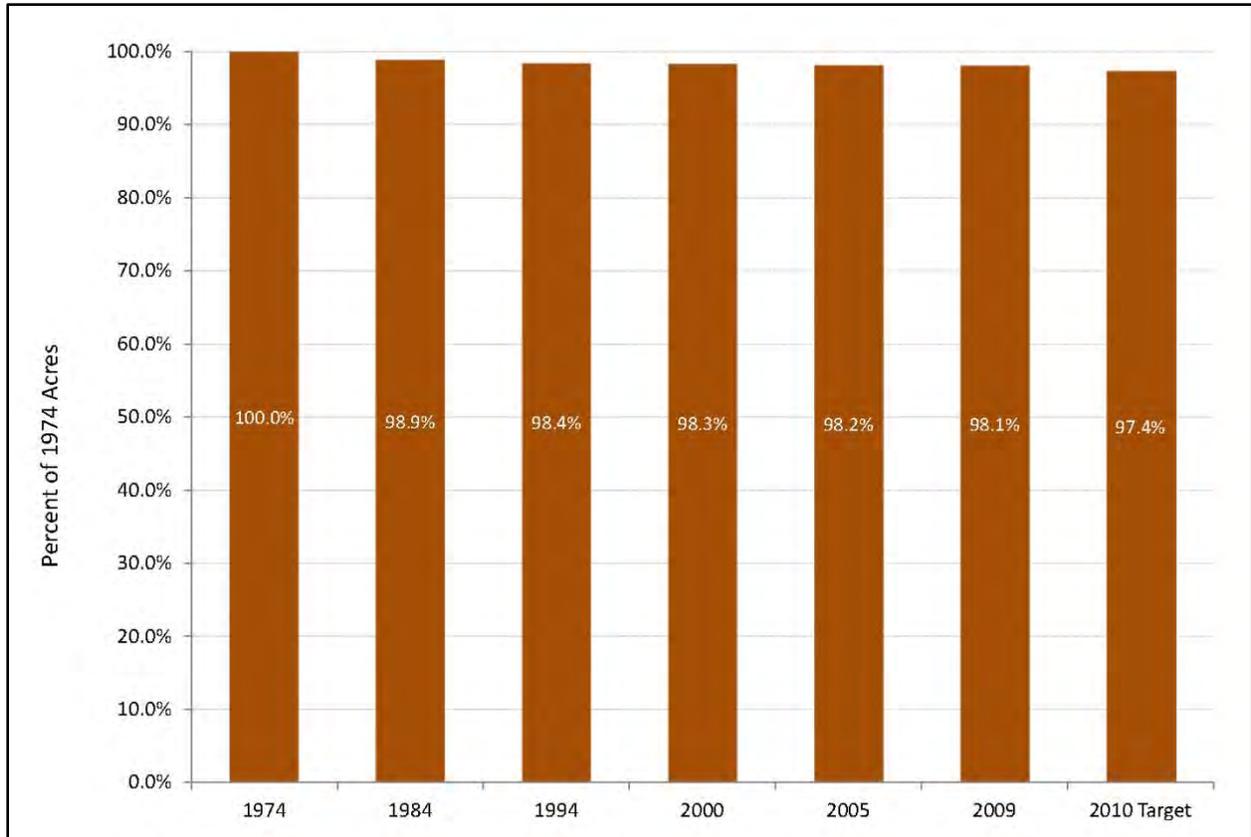
Source: ODF

Note: Estimates take into consideration land ineligible for active forest management because of streamside buffers, significant wetlands, landslide and public safety concerns, and specified resource protection (i.e., northern spotted owl and marbled murrelet).

**Maintaining and enhancing productive capacity of forest resources**

In the early 1980s, Oregon cities and counties adopted comprehensive land use plans to deliberately reduce the rate of forest and agricultural land conversion to more developed uses. This planning has been a critical step in maintaining and enhancing the productive capacity of Oregon’s forests. Limiting development of forestlands has ensured that Oregon’s forest resource base is able to provide the ecological, social and economic values expected from it.

Nonfederal land in wildland forest use, the forest sector’s primary timber supply, is being converted to other uses at a slow rate; 98.1 percent of private land in Oregon that was classified as wildland forestland use in 1974 remained in the same land use category in 2009 (Figure 3.1-2).<sup>25</sup> Regionally, most of the development is occurring around existing developed areas of Portland and other metropolitan areas.



**Figure 3.1-2: Percent of private land in Oregon classified as wildland forestland use in 1974 that remains in that category, 1974-2010**

Source: Lettman et al., 2011

**Proximity to domestic and global markets**

Oregon is situated in an ideal location, positioned with distribution channels and logistics to market its forest products to an increasingly large array of domestic and global customers. The forest sector benefits from a transportation network that enables efficient timber flow from the initial timber harvest to primary and secondary processing, and then to marketplaces across the United States and western regions of Canada. Wood products access these markets through Oregon’s well-established rail and road infrastructure as well as water transportation through industrial ports on the Columbia River and the coast.

Oregon’s primary industrial ports of Coos Bay, Newport, Astoria, Portland and those along the Columbia River provide an opportunity to expand the export of the state’s forest products to global markets, especially to the Pacific Rim countries of China and Japan. Access to the southern Washington ports in Longview and Vancouver provide additional opportunities for the export of Oregon’s forest products.

### **Forest sector's relationship with Oregon's economy**

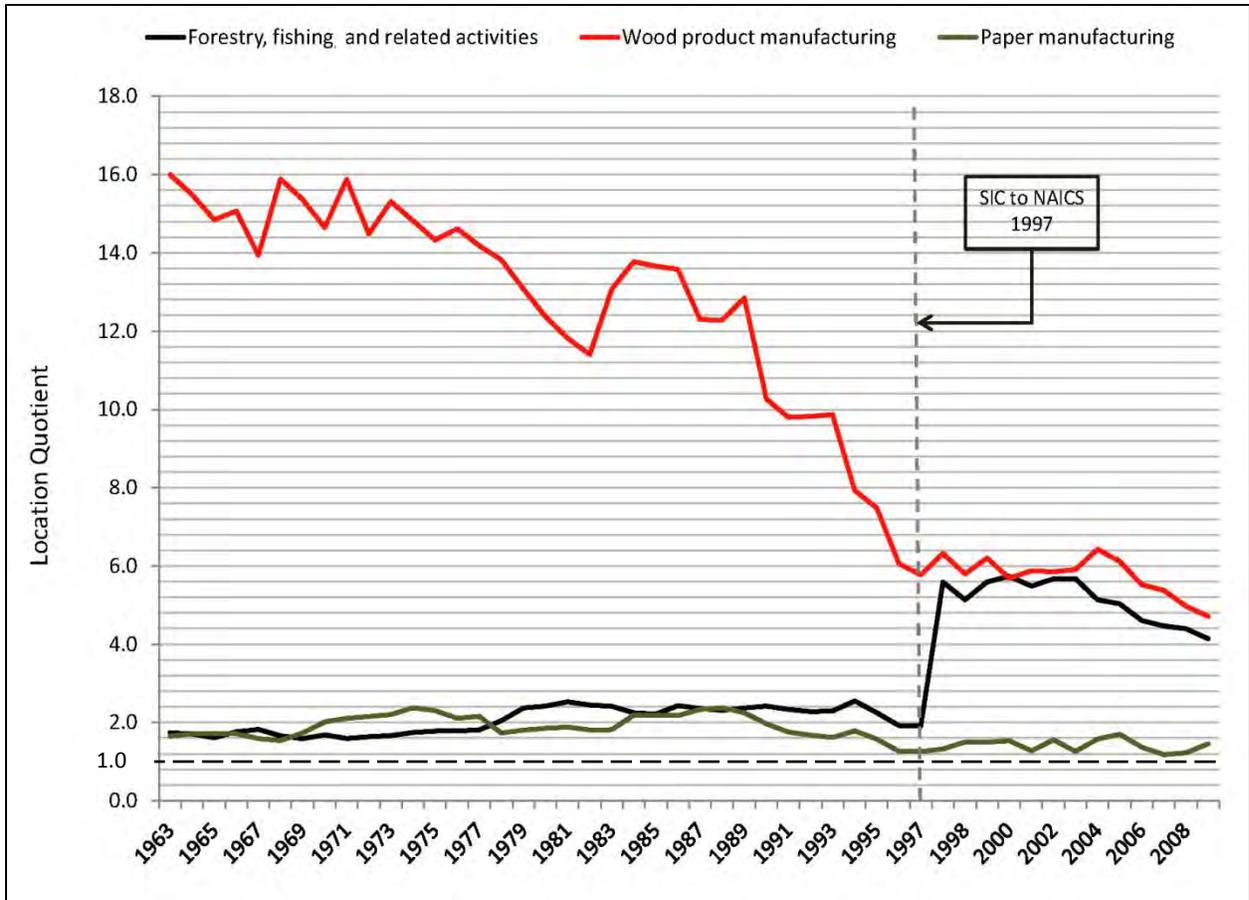
The Oregon economy has evolved over time, from an economy based on natural resources, agriculture and shipping activity to today's mixed-use, manufacturing-based economy. While the forest sector dominated the natural resource and manufacturing sectors up through the 1960s, this sector now shares the main stage with other manufacturers, most notably computers and electronics. Employment in computers and electronics first surpassed jobs in the wood products industry in 1996.

In 1963 the forest sector constituted about 12 percent of the state GDP. This fell to less than 9 percent in 2009, due to both a declining trend and a devastating recession that impacted the forest sector disproportionately. Although the forest sector does not hold its once dominant position in the Oregon economy, it remains an important sector to the state, and especially rural communities, where wood products are often the largest employer.

One view of the relative importance of an industry is given by location quotients (LQs). The LQ looks at an industry's share of activity in a particular region and compares that to the share of activity by that industry in a larger region. For our analysis, we look at the share of

total output from various components of direct private manufacturing in the forest industry in Oregon to the same share measure for the United States. For example, an LQ of 1.0 means this industry's share of the total output in Oregon is the same as for the United States. Above 1.0 means the industry is relatively more important to contributing to output than for the United States as a whole. In Figure 3.1-3, the LQs for Oregon are measured for forestry, fishing and related activities; wood product manufacturing; and paper manufacturing.<sup>26</sup>

Although there were sharp definitional changes in forestry, fishing and related activities as categorization moved from SIC to the North American Industry Classification System (NAICS) in 1997, the trends are still instructive. First, all the LQs are above 1.0 through the latest available data on state GDP, or output. The indication is that compared to the United States as a whole, the forest sector is a larger part of the Oregon economy. There is not much change overall in LQs for forestry, fishing and related activities (note the jump in the line at the point of the aforementioned definition change, and the more recent drop) and for paper manufacturing while there is a drop in LQ associated with wood product manufacturing, it is still four times important in Oregon's economy than Nationally.



**Figure 3.1-3: Direct forest industry output LQs, 1963-2010**

Source: U.S. Bureau of Economic Analysis (BEA)

### **Workforce**

Oregon's forest sector is faced with a maturing workforce and a relatively low rate of replacement from younger generations. However, there is a long-standing history of educational programs aimed at recruiting the future workforce in the forest sector, and more recently, several innovative programs have been developed to help meet the challenges of workforce replacement.

- Approximately 45 high school programs offer some element of forestry. For example, Philomath High School has a long-running four-year forestry program, and Stayton High School has a yearlong forestry and fire class for which students receive five college credits.<sup>27</sup>
- Tillamook High School has developed the Tillamook Consortium, which includes Tillamook Bay Community College, Hampton Lumber, Stimson Lumber and the school district (along with a few other agricultural entities). The program trains the current and emerging workforce in industrial maintenance and helps students enter electrical apprenticeships.
- OFRI's Careers in Forestry program reaches 3,000 high school students annually from about 100 high school classes. The program engages students in discussions about the importance of Oregon's forests, along with opportunities available to them in the forest-sector workforce.<sup>28</sup>
- Enrollment at OSU's College of Forestry in 2012 is 889 undergraduates (the highest since the 1970s), and graduate enrollment is currently at 162 (an increase from the past few years).<sup>29</sup>
- OSU's College of Forestry is developing a Cooperative Education Program for forest engineering, forest operations management and forest management, in which enrolled students will take part in two six-month cooperative education internships, in addition to the required curriculum.
- OSU's College of Forestry is also launching two mentor-protégé programs: Strengthening Employment and Education for Diverse Students and Board of Visitors, for under-represented students.
- Central Oregon Community College and Mt. Hood Community College both have forest resource programs that have seen steady enrollment through the past few years.

## Section 3.2 — Investment and Innovation

Oregon has a long history of investing in and supporting the research, development and implementation of technology and innovation related to forest product manufacturing, forest management, forest operations, tree growing and improvement, transportation, mechanization, logistics and distribution. This continued support will keep the forest sector competitive and ensure that Oregon remains an industry leader.

An example of such innovation through research and development is OSU's Oregon Wood Innovation Center (OWIC). The OWIC, formed in response to industry changes such as reduced raw material supply and globalization forces, aims to improve the competitiveness of the forest sector by fostering innovation in products, processes and business systems.

The OWIC focuses its research, outreach and technology transfer efforts on an extensive range of topics.<sup>30</sup> Currently, these include:

- Anatomy and wood quality
- Biodeterioration, wood protection and product durability
- Development of chemical products from plant materials
- Nanotechnology for advanced textiles, barrier films, membranes, coatings and sensors
- Development of composite materials
- Computer-aided manufacturing
- Wood drying technology
- Timber engineering and structural design
- Forest products business and marketing
- Environmental impacts of wood products

Oregon State University's College of Forestry provides vital support to the forest sector through applied research, innovation, and professional commitment. The College is a world-class center of teaching and learning about forest landscapes and is ranked as one of the premier forestry schools in the nation.

The College's faculty have a long history of working closely with the profession and a broad range of stakeholders. Graduates of the College's professional forestry programs leverage their broad education, rigorous depth of knowledge, and professional focus to become the forest sector's future workforce professionals.

**Innovative programs to increase demand for wood**

***Softwood lumber check-off program***

The USDA softwood lumber check-off program through the Softwood Lumber Board offers an opportunity to increase market share of Oregon’s wood products. Implementation of the program is scheduled to begin in October 2012.

A check-off program is funded by industry to drive generic marketing and research programs with a goal of increasing domestic and/or international demand for an agricultural commodity — in this case, softwood lumber.<sup>31</sup>

The final program is being developed, but the current referendum contains the following provisions:<sup>32</sup>

- Mills are required to pay \$0.35 to \$0.50/MMBF. Companies that manufacture or import less than 15 MMBF per year are exempt, and the first 15 MMBF manufactured by any participant is exempt.
- Once the program has taken in \$20 million, a business-to-business advertising campaign will be launched, with these general messages:
  - Certified lumber is the ultimate “environmentally friendly” building material; it is renewable, energy-efficient, part of the solution to climate change and an economic driver to maintain forests as forests.
  - It offers unmatched versatility and is suited for a broad range of structural and appearance applications in residential and non-residential sectors.

- It offers high-level, proven performance characteristics.
- It offers a significant price-point advantage.

***WoodWorks program***

WoodWorks is an initiative of the Wood Products Council to provide resources that allow engineers, architects, general contractors, developers and others to build non-residential structures out of wood more easily and at less cost.<sup>33</sup>

The initiative is a cooperative venture of all the major wood associations in North America, as well as research organizations and government agencies, with a goal of providing one-stop access to the widest possible range of information on the use of wood in non-residential structures.

The program bases its outreach and services around five values of using wood in non-residential structures:

- Wood structures can be designed for safety and code acceptance.
- Wood performs well in earthquakes and high winds.
- Wood buildings are adaptable.
- Wood is an inherently green building material.
- Using wood is an effective way to reduce a building’s carbon footprint.

**Incentives for privately owned forestland and public investment**

There is pressure to develop or convert the use of much of Oregon's private forestland. About 300,000 acres of private forestland are inside urban growth boundaries, and an additional 1.8 million acres are within one mile of developable areas. Maintaining an abundant supply of high-quality timber has always been important to the Oregon economy, and increasingly, there is recognition of the ecological services forestland provides.

Government agencies at the federal and state level support the preservation, restoration and improvement of private forestland through a variety of programs. These programs are aimed first and foremost at maintaining as much healthy, well-managed forestland as possible. To encourage forest landowners to keep forestland in its current use, agencies provide cost-sharing, technical assistance and hedges against future regulatory uncertainty.

The following are programs available to private forest landowners in Oregon. While the state has a comprehensive set of programs dedicated to all aspects of forest management, programs offered in Washington and California differ slightly.

Washington offers a long-term forest practices application that significantly streamlines the administrative work required of forest landowners and enables greater certainty in long-term planning. California has fewer niche programs, instead offering a large catch-all program called the California Forest Improvement Program. Landowners develop and submit one comprehensive plan that addresses a variety of management and restoration concerns. These are approved and

funded as a package. Oregon forest landowners have access to the same resources but must go through separate processes for each service they request.

***Programs Available in Oregon<sup>34</sup>***

- **Community Forest and Open Space Conservation Program:** Provides financial assistance to create a Community Forest on private land of at least five acres and at least 75 percent covered by forest. Local governments, tribal governments or nonprofits can apply for \$400,000 (and must provide a 50 percent match) to purchase private land for conversion to Community Forest. The surrounding community must be involved in the process of deciding the use of the forest, and the area must be open to the public. Private landowners can apply for funds from the state to help develop a plan.
- **Conservation Reserve Enhancement Program:** Provides funds for private landowners to protect soil, water, fish and wildlife by planting along streams. The program provides cost-sharing and land rental payments. Landowners are provided with \$100 per eligible acre, payment for the cost of installing a riparian buffer and maintenance for the buffer region for five years.
- **Conservation Stewardship Program:** Provides up to \$200,000 from the USDA to develop and follow a plan that directly addresses one of the USDA's priority resource concerns.

- **Environmental Quality Incentives Program:** Provides up to \$300,000 during any six-year period to install capital or buy materials that will implement management practices to conserve soil, water or related natural resources. Funds can also be used to offset lost income as a result of conservation measures.
- **Forest Practices Afforestation Incentive:** Provides assurance that if a private forest landowner plants new trees on land that has not been used to grow commercial forest since 1972, no state regulations will be put into place limiting the owner's ability to harvest most of the first crop rotation. There are exceptions for cutting near streams. The program requires an application, maps and proof of a transition from non-productive to productive land.
- **Bark Beetle Mitigation Funds:** Provides 50 percent cost-share funding for projects that prevent bark beetle infestation or restore areas affected by bark beetles. ODF foresters also provide technical assistance. Funding is subject to availability in eastern, central and southern Oregon. Areas adjacent to current bark beetle outbreaks or areas deemed to be in danger of bark beetle outbreak are prioritized. In 2011, ODF spent \$194,695 on the program using federal funds. This is significantly less than the expenditures from 2006 to 2010, which ranged from \$448,726 to \$819,460.
- **Forest Legacy Program**<sup>35</sup>: Provides funds to private forest landowners who own lands that could be converted to non-forest use by urbanization, development or parcelization. The program provides funds

to purchase development rights through conservation easements or fee-title acquisition into public ownership.

The goal of the program is to maintain working forests that conserve important commodity as well as non-commodity forest resources and conservation values, including water flows and quality, fish and wildlife habitat (especially for threatened and endangered species), stores of carbon, and biodiversity. In addition, the Forest Legacy Program promotes stewardship and sustainable management of private forestlands.

All Oregon forests in the program are managed in accordance with Oregon's Forest Stewardship Plan. Federal funds are used to fund the program. In 2008, there was an unusually high level of funding (\$485,522). In 2011, expenditures were \$47,813, which is in line with historical levels.

- **Forest Stewardship/Oregon Tree Farm Plan:** Provides funds and technical assistance to help private forest landowners develop an assessment of the current resource condition on their land and outline a 10-year action plan to achieve resource management goals. Funds provide a maximum 75 percent cost share. In 2011, \$289,984 was spent on the program, down from \$350,317 in 2010.
- **Healthy Forests Reserve Program:** Offers a percentage of easement value to landowners who participate in a Safe Harbor agreement and develop a Forest Stewardship Plan. The percentage depends on the term of the easement contract.

- **Noxious Weed Control Grants:** Provides funds for landowners to institute noxious weed control plans. The funds are given out based on the Oregon State Weed Board guidelines.
- **Watershed Enhancement Incentives:** Provides funding or matching grants to manage or restore riparian areas. This program has not been funded since 2008, when private forest landowners received \$33,603.
- **Wetlands Reserve Program:** Provides funds for restoring, protecting and enhancing wetland functions. The percentage of easement value depends on the length of easement contract.
- **Wildlife Habitat Incentive Program:** Provides up to \$50,000 to offset installation costs and materials for conservation measures that establish and improve fish and wildlife habitat.
- **Western States Fire Managers Wildland Urban Interface Grants:** Provides funding for services that mitigate fuel hazard risk in wild areas. The program made \$3,167,000 available to ODF in 2011. This represents the available funding; data for the actual expenditures are not available at this time. The largest potential funding for the program came in 2008, with \$4,557,950 in available funding. The American Recovery and Reinvestment Act (ARRA) provided an additional \$1,118,263 for fuel hazard mitigation in 2011.

In total, private forest landowners in Oregon received more funding from state and federal

sources than they had in the mid-2000s. This is largely due to one-time funding from ARRA. Aside from a low of \$3,451,107 in total support in 2009, funding for these programs has been steadily increasing. The \$8,442,879 that private forest landowners received in 2011 was 30 percent higher than the 2008 funding level, the previous recent high.

#### **Business financing resources provided by Business Oregon**

Business Oregon is a state agency tasked with supporting and promoting Oregon businesses. While many of Business Oregon's programs can be applied to the forest sector, there are few forest-specific programs. These programs include support for the OSU and Oregon Built Environment and Sustainable Technologies, which help firms implement green building, biomass and bioproducts-related methods.

For most Business Oregon financing programs, wood and forest products firms must compete against other Oregon industries. Support has decreased as the forest sector's proportion of the Oregon economy has shrunk. These programs include:

- **Oregon Business Development Fund:** Provides fixed-rate financing to purchase land, capital, equipment, machinery and buildings. The program provides low-rate loans (1.5 percent amortized over 20 years) to companies that can demonstrate the ability to create and maintain jobs and show the ability to repay the loan.
- **Oregon Credit Enhancement Fund:** Targeted to businesses in economically distressed areas. The fund guarantees up to 80 percent of loans provided to companies to obtain capital. The fee for enrolling in the

program is 1.5 percent to 3 percent of the loan.

- **Oregon Industrial Development Bonds and Oregon Express Bond Program:** Issues tax-exempt bonds to help manufacturers grow by purchasing land, buildings and capital.
- **Business Retention Program:** Provides up to \$15,000 for consulting fees and \$30,000 for feasibility studies for financially distressed firms. (The firm must pay 25 percent.)
- **State Small Business Credit Initiative:** A \$16.5 million fund provided by the federal government and meant to help small businesses leverage additional financing. This program is short-term.

Business Oregon also provides assistance in setting up export opportunities. This includes assistance with everything from paperwork to identification of export markets.

### ***Energy Trust of Oregon***

Energy Trust of Oregon is a nonprofit organization funded by utility service fees. The organization uses funds to assist businesses and citizens with energy conservation and renewable energy generation projects. To qualify for programs, firms must be serviced by Portland General Electric, NW Natural, Pacific Power or Cascade Natural Gas.

Energy Trust will pay up to 100 percent of the costs for studies identifying energy conservation opportunities. Energy Trust can provide direct technical assistance for energy conservation practices and offers monetary incentives for annual kilowatt hours saved. For

facilities that may benefit, Energy Trust will help defer the costs of planning and implementation for solar, biofuel or hydropower electricity generation or solar water heating.

### **Investment in forest certification**

Oregon's forest landowners have the option of certifying their forestland as sustainable through the Forest Stewardship Council (FSC), the Sustainable Forestry Initiative (SFI) or the American Tree Farm System (ATFS). These certifications are important markers of sustainable forest management.

In all, 4.75 million acres of Oregon's private timberland are certified through one of these programs (Figure 3.2-1).

The general goal of forest certification is to encourage practices that are environmentally, socially and economically sustainable over a long period of time (Hansen et al., 2006). In the United States, there are three primary certification paths a landowner can pursue:

#### **1. American Tree Farm System:**

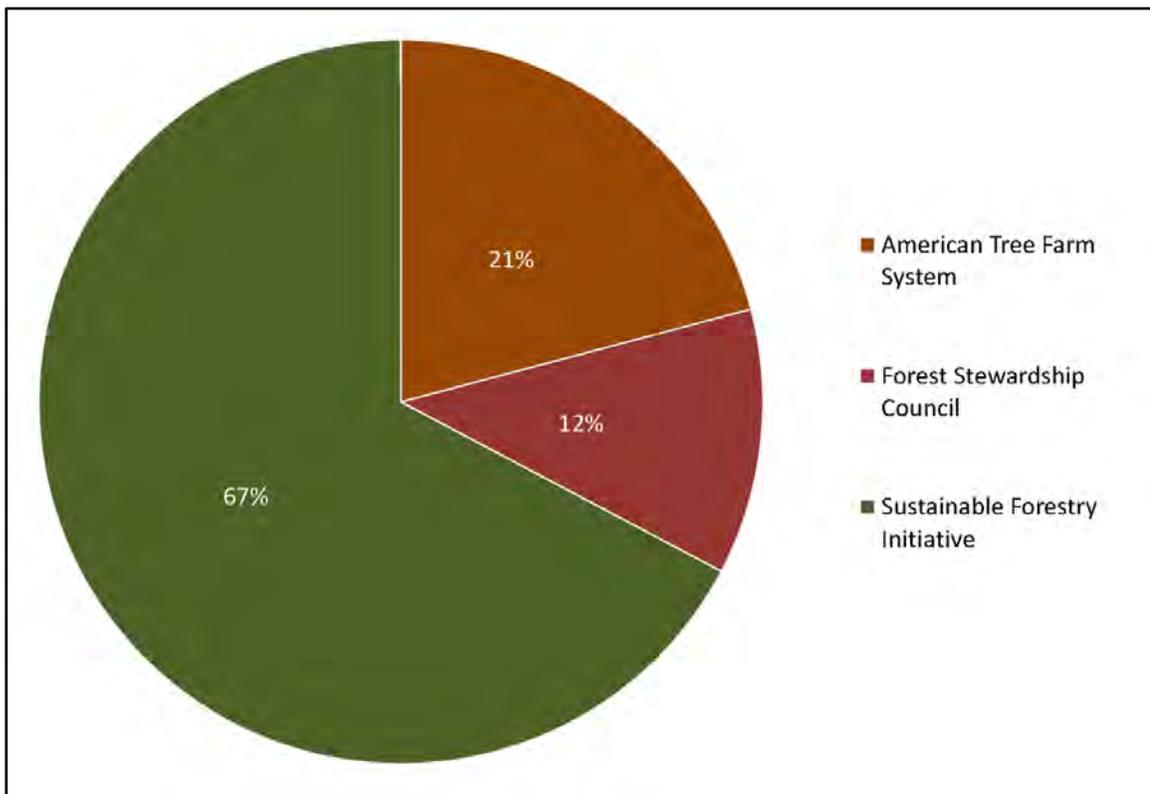
- Established in 1941, a program of the American Forest Foundation
- Oldest and largest sustainable family woodland system in the United States
- Primary certifying body for family forest landowners
- Eight certification standards and required third-party certification
- Estimated 26 million acres owned by 91,000 landowners in the United States are certified under ATFS (Bentz, 2009)
- In Oregon, 898 ATFS-certified tree farms account for 992,952 acres<sup>36</sup>

**2. Forest Stewardship Council:**

- Established in 1993 by concerned business organizations, social groups and environmental groups focused on global forest practices, particularly tropical deforestation
- Ten principles, 52 criteria, regional U.S. standards, chain-of-custody certification for manufacturers processing FSC timber
- Developed Family Forest FSC Program to engage family forest landowners
- In the United States, 34 million acres are FSC certified, and there are 3,682 chain-of-custody certifications<sup>37</sup>
- In Oregon, 565,209 acres are FSC-certified, and there are 144 chain-of-custody certifications

**3. Sustainable Forestry Initiative:**

- Established in 1990s by the American Forest and Paper Association as an industry response to concern over forest practices on industrial forestland
- Certification now managed by SFI Inc., an independent, nonprofit organization responsible for maintaining, overseeing and improving SFI certification
- Fourteen principles, 20 objectives, chain-of-custody standards
- In the United States, 60.8 million acres are SFI-certified, and there are 919 chain-of-custody certifications<sup>38</sup>
- In Oregon, 3.2 million acres are SFI-certified, and there are 34 chain-of-custody certifications



**Figure 3.2-1: Forest certification on Oregon's private timberland**

Source: ATFS, FSC, SFI website data

## Section 3.3 — Tax Revenue Generated by Forest Sector

### Overview of Oregon tax revenue from timberland

#### ***Private timberland***

Between 2001 and 2005, Oregon forest revenues to state and local governments increased by an average 2.22 percent annually, reaching a high of \$375 million in 2005 (Figure 3.3-1).

During the second half of the decade, these revenues declined by an average 8.26 percent annually, reaching a low of \$242 million in 2010. Related to the overall economic downturn, the years 2008 and 2009 marked significant drops in Oregon forest revenues of 13.89 percent and 14.47 percent, respectively.

Personal income tax was by far the largest component, accounting for 64 percent of total revenue over the 10-year period. Revenue from the weight-mile tax was one of only two categories to show an increase between the beginning and ending years 2001 and 2010, increasing from \$9 million to \$14 million. Revenue from the weight-mile tax did, however, decrease steadily during the last six years, from a high of \$20 million in 2004.

Corporate income and excise taxes averaged \$5 million annually for the period but were erratic, ranging from a high of \$13 million in

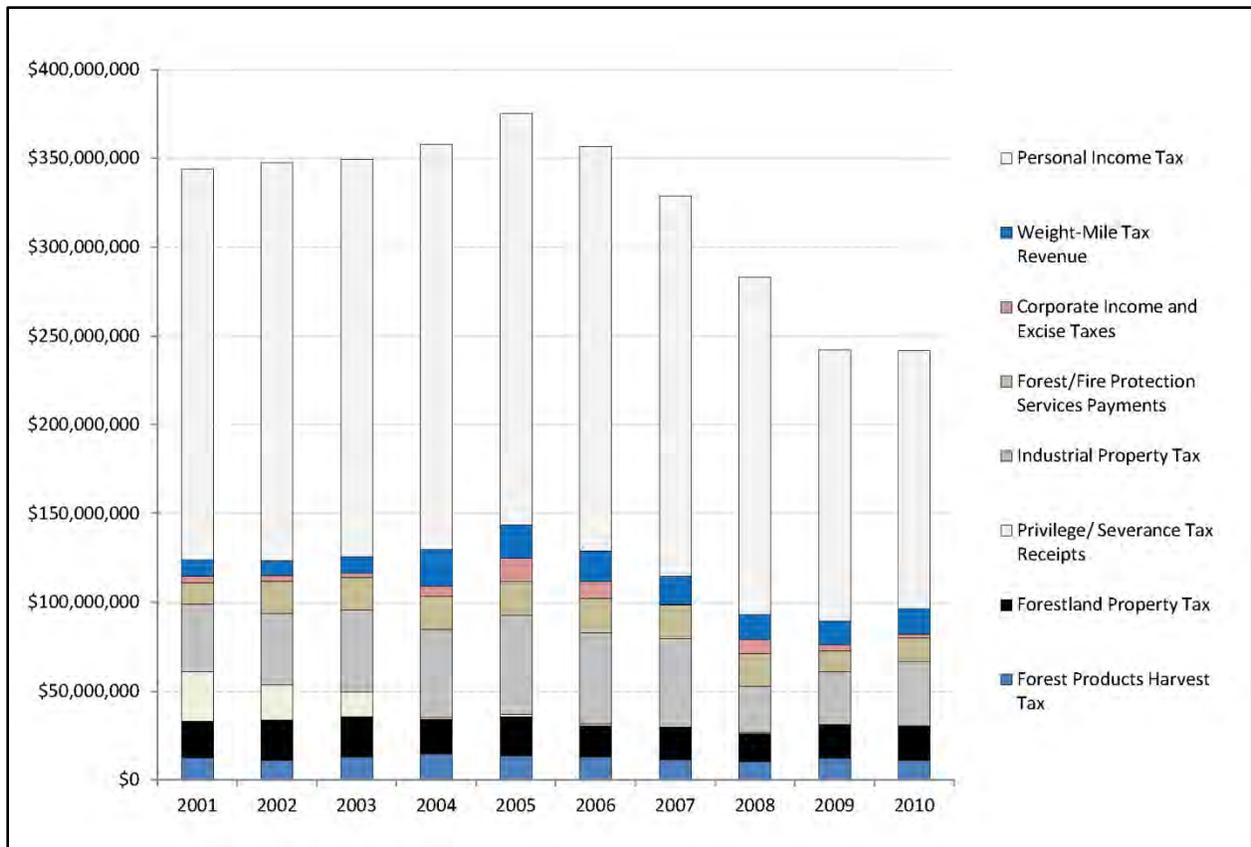
2005 to a low of \$0.17 million in 2007.

Forest/fire protection services payments ran even at about \$18.7 million per year from 2002 to 2008, but declined by almost one-third during the last two years of the period.

Forestland property tax revenue was steady at around \$21 million annually for the first half of the decade. It went down during the second half, but rose back in the last two years to about \$19 million a year.

Industrial property tax was the second largest component of forest revenues, accounting for 13 percent. After rising to \$56 million in 2005, it declined sharply through 2009 to \$30 million, as the real estate market collapsed resulting in the devaluation of all property. Industrial property tax then rebounded modestly to \$36 million in 2010, near its 2001 level of \$38 million.

Privilege/severance tax receipts went down during the decade, particularly after program changes in 2003. In 2001 they were \$28 million, and fell to \$0.22 million by 2010. The forest products harvest tax was the most stable forest revenue component, varying from its \$12 million average by less than 17 percent during each of the 10 years.



**Figure 3.3-1: Oregon private forest revenue to state and local governments, 2001-10**

Source: ODF

Note: Values adjusted for inflation to 2010 dollars

**Forest products harvest tax:** Timber (any logs or chips) is taxed at a rate of \$3.5750 per MBF from calendar year 2010 to 2012. This tax funds OFRI, which sets its rate at the beginning of each calendar year and is currently at \$0.89 per MBF. Every two years, the Oregon Legislature decides on the distribution of the rest of the revenue among support for forestry research at OSU, administration of Oregon’s Forest Practices Act and establishment of the Oregon Forestland Protection Fund. In 2009, 24 percent of the tax receipts were allocated to OSU

forestry research, 29 percent to the FPA, 24 percent to the protection fund and 23 percent to OFRI.<sup>39</sup>

Washington and California have similar programs, which tax the harvested timber value rather than the volume harvested. California currently collects 2.9 percent on the immediate harvest value, while Washington requires owners to pay 5 percent on the value of the timber harvested.

**Table 3.3-1: Oregon’s forest harvest tax rates, 2004-12**

Tax Year	Tax Rate (per MBF)
2004	\$2.95
2005	\$2.85
2006	\$2.61
2007	\$2.61
2008	\$3.5806
2009	\$3.8956
2010	\$3.5750
2011	\$3.5750
2012	\$3.6841

Source: Oregon Department of Revenue

**Forestland property tax:** Two programs were established in 2003 through the Oregon Legislature’s HB 2197 and HB 2188: the Forestland Program and Small Tract Forestland (STF) Program.<sup>40</sup> Lands in Oregon where growing timber and other forest products is identified as the “highest and best use” or best economical use and that satisfy certain other criteria qualify for these programs.

- **The Forestland Program** is for all owners with at least two acres of forestland. Lands qualifying for the Forestland Program would be taxed at the lower of the specially assessed values<sup>41</sup> or maximum specially assessed values<sup>42</sup> instead of at real estate market values.
- **The STF Program** is a special option for owners with 10 to 4,999 acres of forestland.

This program allows landowners to partially defer property taxes until timber is harvested from the land. Landowners who qualify for this program pay an annual property tax on 20 percent of the forestland specially assessed value. The remaining 80 percent is intended to be recovered when harvest occurs through the STF Severance Tax, which is \$3.70 per MBF of harvest (including any logs, chips, poles and pilings) in eastern Oregon and \$4.74 in western Oregon in calendar year 2011. This rate is determined on June 1 of every year.

In California and Washington, counties collect property taxes on private timberland within their jurisdictions. The value of the timber itself is exempt from property tax purposes in both neighboring states.

**Table 3.3-2: STF Severance Tax rates for western and eastern Oregon, 2004-11**

Tax Year	Western Oregon (\$/MBF)	Eastern Oregon (\$/MBF)
2004	\$3.89	\$3.03
2005	\$4.00	\$3.12
2006	\$4.11	\$3.21
2007	\$4.23	\$3.30
2008	\$4.35	\$3.40
2009	\$4.48	\$3.50
2010	\$4.61	\$3.60
2011	\$4.74	\$3.70

Source: Oregon Department of Revenue

**Industrial property tax:** All industrial wood product facilities in the state of Oregon that have an improvement value of more than \$1 million must report all costs of real and personal property.

- *EFC Surcharge* is an additional assessment charged to all forest landowners who have an improved tax lot. The assessment is currently \$47.50 per improved tax lot, and this revenue also goes toward the Oregon Forest Land Protection Fund.

**Forest fire protection services payments:** Forest fire protection funds from private forestlands originate from several sources:

- *ODF Assessment* is the forest patrol assessment for forest landowners whose lands are protected by ODF. Fire protection districts produce district budget rates.
- *ODF Minimum* occurs when the private landowner budget rate times the acres totals less than a set amount (currently \$18.75). The landowner must pay \$18.75, less the EFC Minimum (see below).
- *EFC Acres* is a per-acre assessment paid by all forest landowners in addition to the ODF assessment that goes into the Oregon Forest Land Protection Fund.
- *EFC Minimum*, explained above in ODF Minimum, is a set amount (currently \$3.75) per each minimum assessment charged to private forest landowners. This revenue is distributed into the Oregon Forest Land Protection Fund.

**Corporate excise and income tax:** Corporations doing business in Oregon – meaning they have sales activity and a physical presence – pay the excise tax. Corporations not doing business, but deriving income from an Oregon source, pay the income tax. In 2010, voters approved ballot measure 67, which increased both the corporate minimum tax and tax rate on corporate excise and income taxes based on sales and net income.

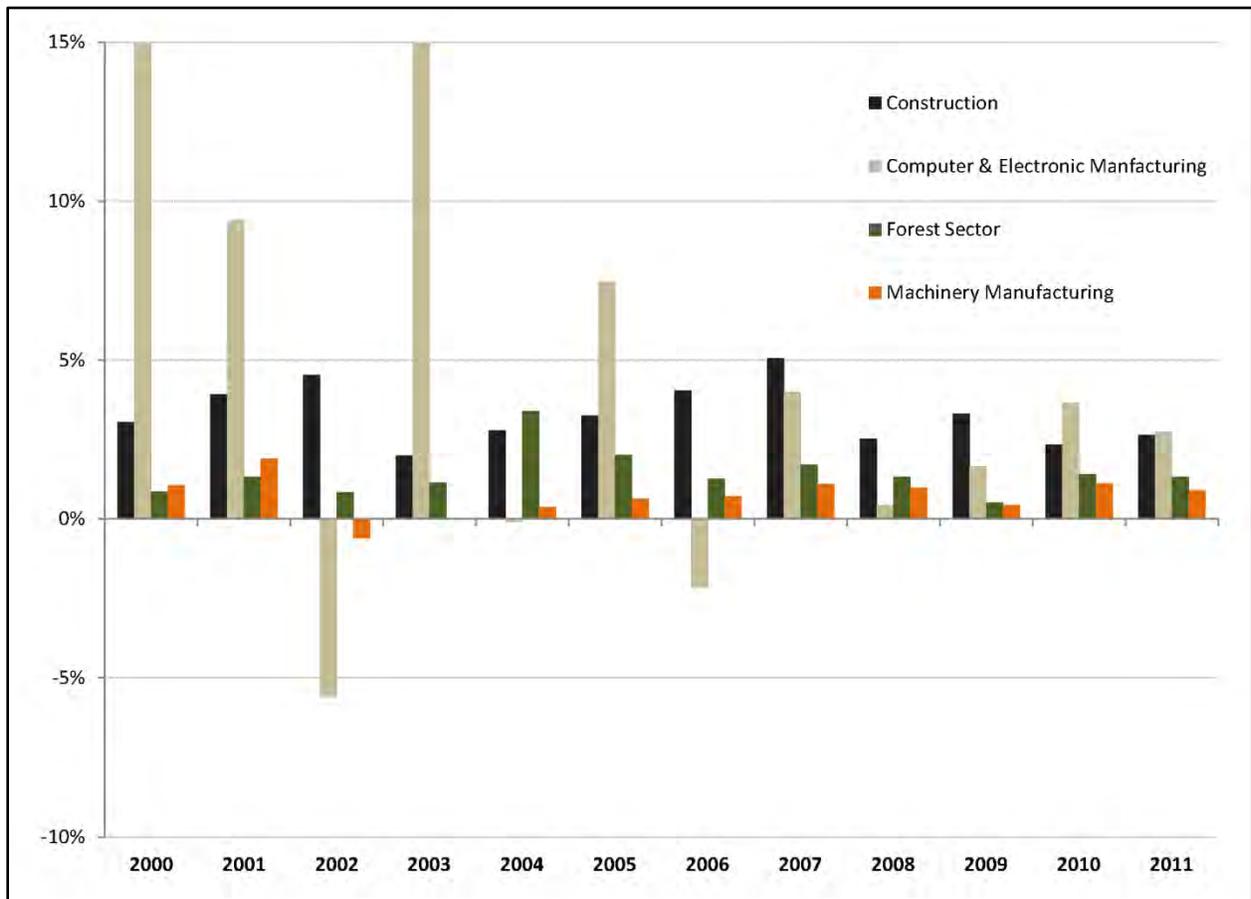
A more detailed look at corporate excise and income tax from the forest sector compared to other sector industries is shown in Figure 3.3-2. Annually, the forest sector contributed an average of 1.43 percent of Oregon’s total corporate income tax from 2000-11. During the same time period, industries such as machinery and fabricated metal manufacturing contributed 0.72 and 0.23 percent, respectively. The construction sector contributed an average of 3.2 percent annually, while the high-tech sector contributed an annual average of

5.43 percent with several drastic swings from year to year.

**Weight-mile tax:** Weight mile taxes are a type of highway user fee. The tax rate increases with the weight of a truck and is paid per mile of truck operation. Trucking companies are required to report their Oregon road miles and submit the calculated weight-mile tax on those miles to the Oregon Department of Transportation. Weight-mile tax revenues are

dedicated to the maintenance of public highways, streets, roads and rest areas.

**Personal income tax:** Oregon’s personal income tax is the state’s largest source of income, representing about 87% of the General Fund revenue. The personal income tax revenue is dedicated to educational and human services, public safety, and other services such as transportation, forestry services, library services, agriculture and environmental quality.



**Figure 3.3-2: Percent contribution to Oregon’s total corporate excise tax, 2001-11**

Source: Oregon Department of Revenue

Note: In 2000 and 2003, the computer and electronic manufacturing sector contributed more than 15 percent in taxes; 27 percent and 17 percent, respectively. The scale was adjusted in order to fully capture the trends of other sectors.

**Public timberland**

In addition to private forest landowners, state and federal forestlands contribute revenue to Oregon counties.

In 2011, BOFL generated \$37.8 million from 821,000 acres, a \$4.8 million decrease from 2010 (Table 3.3-3). The five-year average for revenues generated on BOFL is \$46.3 million, while the 10-year average is at \$47.8 million (ODF 2011a).

**State forestland**

Revenues generated by the state are derived from Board of Forestry Lands (BOFL) and Common School Forest Lands (CSFL), both managed by the ODF. The BOFL provide counties with a share of the total revenue generated through timber harvest, while revenues generated on CSFL are dedicated to the state’s Common School Fund.

The CSFL comprise about 120,000 acres and provided \$8.7 million in 2011, 93% generated from Elliott State Forest (Table 3.3-4). Historically, CSFL have an average revenue stream of \$10.9 million over five years and \$12.8 million over 10 years (OSF 2011b).

**Table 3.3-3: Total revenue to Oregon counties, gross timber sale value and timber harvest volume from BOFL, 2001-11**

Fiscal Year	Revenue to Counties	Gross Timber Sale Value Removed	Timber Harvest Volume (MBF)
2001	\$34,605,675	\$65,489,876	193,069
2002	\$49,801,650	\$79,544,382	228,326
2003	\$47,918,084	\$86,875,185	253,532
2004	\$48,589,600	\$81,104,304	239,386
2005	\$57,997,327	\$89,542,266	281,655
2006	\$57,306,159	\$103,150,843	276,908
2007	\$57,306,159	\$98,287,294	244,398
2008	\$51,183,661	\$84,619,195	236,578
2009	\$42,472,866	\$67,642,199	236,914
2010	\$42,572,163	\$62,821,428	268,142
2011	\$37,795,131	\$68,027,273	239,559
<b>Total</b>	<b>\$527,548,475</b>	<b>\$887,104,245</b>	<b>2,698,467</b>

Source: ODF Council of Forest Trust Land Counties; State Forester’s Annual Reports for the Association of Oregon Counties

**Table 3.3-4: Total revenue to Common School Fund, gross timber sale value and timber harvest volume from CSFL, 2001-11**

Fiscal Year	Revenue to Common School Fund	Gross Timber Sale Value Removed	Timber Harvest Volume (MBF)
2001	\$16,787,101	\$19,231,816	36,621
2002	\$13,671,493	\$14,043,117	29,557
2003	\$8,550,000	\$10,992,972	24,310
2004	\$15,360,073	\$14,260,450	32,520
2005	\$19,092,180	\$20,080,172	42,106
2006	\$9,656,593	\$7,609,658	17,833
2007	\$12,590,076	\$12,760,992	27,084
2008	\$9,841,438	\$11,988,895	22,974
2009	\$13,569,087	\$12,419,783	29,287
2010	\$9,646,062	\$8,221,998	24,812
2011	\$8,704,304	\$11,569,905	32,116
<b>Total</b>	<b>\$137,468,407</b>	<b>\$143,179,758</b>	<b>319,220</b>

Source: ODF CSFL Annual Reports

### Federal forestland

Revenues generated from federal land are derived from USFS and the BLM. Early in the 20th century, Congress passed two major federal forest revenue bills: (1) the 1937 O&C Act (43 U.S.C. §1181a); and (2) the 1908 Twenty-Five Percent Fund Act (P.L. 60-136; 16 U.S.C. 500, 533, and 556d).

The O&C Act specified that 75 percent harvest receipts (later amended to 50 percent) be distributed to the 18 O&C counties. The Twenty-Five Percent Act provided that 25 percent of harvest receipts from national forests are distributed to counties based on the acreage that each county has within that forest. The receipts in each county are split between road (75 percent) and school (25 percent) funds. Counties also receive payments in lieu of taxes based on population, receipt sharing payments and the amount of federal land within the affected county.

Federal timber harvest revenues declined by 80 percent by 2000 due to decreased harvest activity. In response, Congress passed the Secure Rural Schools (SRS) Act of 2000 (P.L. 106-393) to stabilize payments (Table 3.3-5). The county payment rate is based on the three highest years of harvest receipts from fiscal years 1986 to 1999 and was provided in three forms: (1) Title I: 80 percent to 85 percent of total payment for county services and schools; (2) Title II: for restoration on public lands guided by Resource Advisory Committees; and (3) Title III: services connected to federal forestlands.

The SRS Act of 2000 was reauthorized in 2008 with a four-year phase-out schedule for county payments. On July 6, 2012 the SRS Act was reauthorized for federal fiscal year 2012 as part of Public Law 112-141.

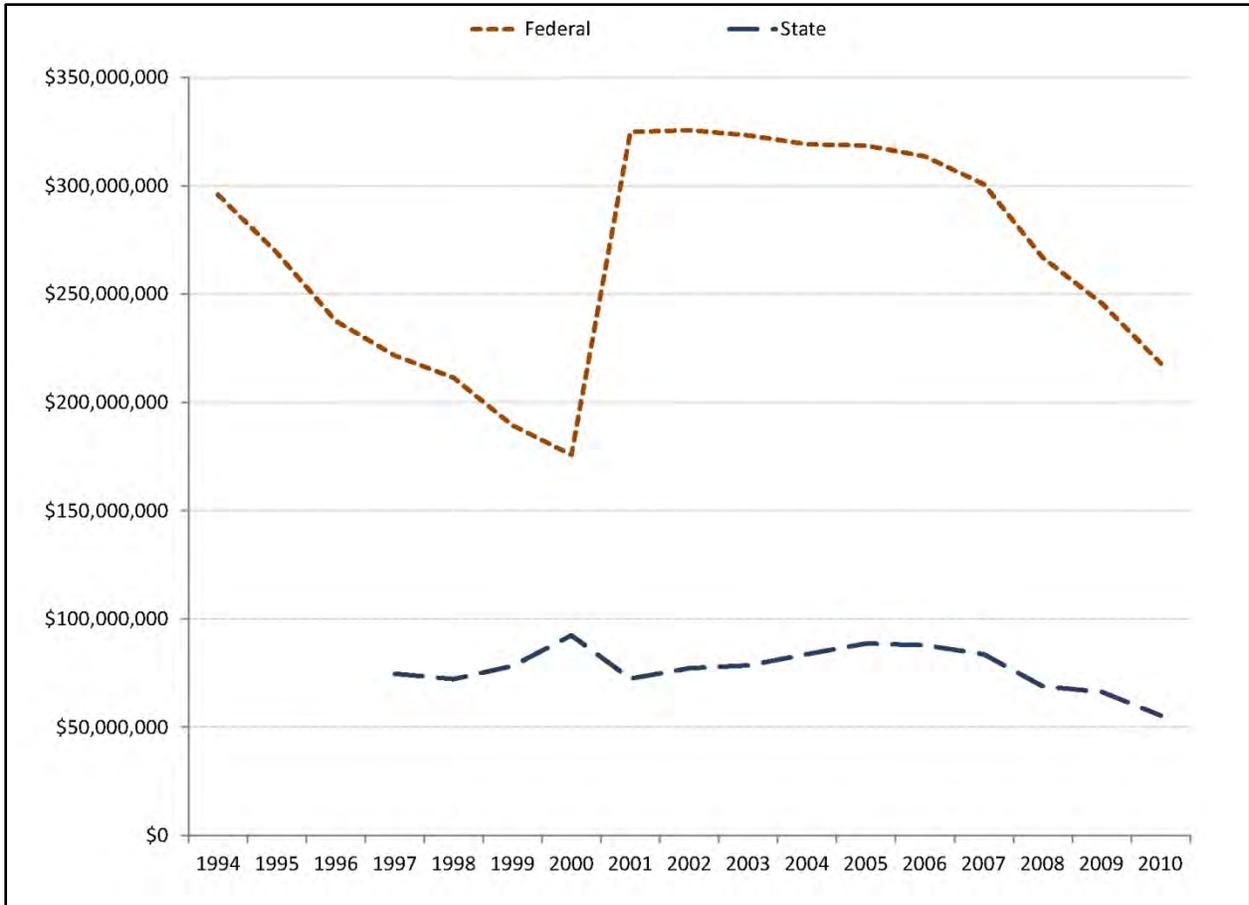
**Table 3.3-5: Total revenue contribution to Oregon counties through federal payments, 1994-2011**

Fiscal Year	USFS	BLM	Payment in Lieu of Taxes (PILT)
1994	\$119,791,067	\$79,211,319	\$2,871,842
1995	\$109,647,413	\$76,415,895	\$2,750,810
1996	\$95,238,953	\$73,619,931	\$3,700,340
1997	\$92,242,534	\$70,824,238	\$3,497,186
1998	\$85,505,450	\$68,028,544	\$8,279,071
1999	\$80,791,483	\$65,232,851	\$3,720,267
2000	\$76,322,960	\$62,437,157	\$4,511,350
2001	\$154,772,014	\$109,680,269	\$6,886,106
2002	\$156,010,193	\$110,557,710	\$7,597,285
2003	\$157,882,316	\$111,884,403	\$6,010,270
2004	\$159,934,782	\$113,338,900	\$6,245,153
2005	\$163,613,284	\$115,945,695	\$6,428,257
2006	\$165,249,417	\$117,105,152	\$6,595,478
2007	\$164,910,278	\$115,854,379	\$6,575,856
2008	\$147,790,383	\$105,394,647	\$10,079,500
2009	\$133,011,345	\$94,855,173	\$14,963,789
2010	\$119,874,422	\$85,486,761	\$12,651,531
2011	\$64,259,824	\$39,690,989	\$13,062,332
<b>Total</b>	<b>\$2,246,848,118</b>	<b>\$1,615,564,013</b>	<b>\$126,426,423</b>

Source: ODF

Figure 3.3-3 compares the revenue generated from Oregon's forestlands by federal and state agencies. State revenue has been fairly consistent since 1997, but has been on a downward trend beginning in 2005. On the federal side, the SRS Act of 2000 kicked in and lifted federal payments to compensate for

reduced timber harvesting. Since the initial increase in 2007, revenue contribution from federal forest owners has been decreasing significantly. As discussed above, the future of SRS payments is unsure and Oregon's counties may continue to see decreased fiscal support from federal agencies.



**Figure 3.3-3: Revenues from federal and state forestlands in Oregon, 1994-2010**

Source: ODF

Note: State data are not available prior to 1997. Values are adjusted for inflation to 2010 dollars.

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## Chapter 4: Summary of Stakeholder Interviews

### **Introduction**

We conducted stakeholder interviews to help identify key ideas, issues, concerns and opinions about Oregon's forest sector. The interviews also helped guide the project's work to ensure that relevant issues were addressed and to discover new ideas that had not been discussed in previous reports.

### **Methods**

We conducted more than 30 stakeholder interviews between March and June 2012 with individuals who were known by the project team to be directly involved in the forest sector. The individuals selected to participate in the study were not intended to be representative of any particular group, but rather to provide the broadest possible range of opinions within the scope of the project.

In addition to the formal interviews, we talked with 100-plus individuals across the state through the primary data collection process. We spoke with forest-sector representatives in every Oregon county, including individuals working in primary and secondary industries, elected officials and other opinion leaders. The information gained from this process, combined with the formal stakeholder interview responses, provided an in-depth look at forest-sector participants' opinions.

Interviews featured open-ended questions designed to encourage informal discussion. No two interviews were identical in questions asked or information obtained, as interviewers generally followed the participant's lead while keeping the conversation on track. This semi-structured format was flexible enough to allow participants to focus on what was important to

them as it related to the forest sector. The interviews were designed to elicit a broad range of opinions from a cross-section of the forest sector, so comparisons and statistical analyses of responses are not practical.

Our interviews focused on four questions:

- What opportunities do you see for Oregon's forest sector?
- What are the key barriers facing the forest sector?
- What can be done to encourage product innovation and usage?
- What kinds of policy levers can be used to overcome barriers and take advantage of opportunities?

Generally, each interview lasted an hour. Notes were taken during the interviews and then summarized to a digital version as soon as possible following the interview. These were confidential interviews with guaranteed anonymity.

This is not the first time these questions have been asked. The 2004 OFRI forest cluster study asked similar questions, and the Ad Hoc Forest Cluster Working Group gathered similar responses in similar exercises. Our purpose here was not to duplicate those efforts or restate those findings, although we reviewed the results of those efforts and considered them in preparation of this report. Our objectives in the interviews were to identify general areas of agreement, identify specific remedies and suggest a path forward.

### **Summary of responses**

We found common themes among those surveyed, and we have organized the responses accordingly. Sometimes, we found contradictions among responses, and we report them here without attempting to reconcile opposing viewpoints.

### ***WOOD PROCESSING MANUFACTURING***

- **Oregon mills enjoy competitive advantages.**

Oregon is the gateway to the Pacific Rim.

Historically, Oregon has enjoyed access to strong domestic markets. Western states have seen a great deal of growth.

Oregon has world-class manufacturing facilities, a favorable institutional structure and a stable operating environment, and is rich in Douglas-fir, a superior building product.

Inventory is growing on federal lands and could support additional harvest.

- **Oregon mills are innovative.**

Oregon mills provide a wide variety of products and aggressively develop specialty markets to the extent possible. In general, specialty products come from larger logs, and future availability is a concern.

Oregon's forest sector will tend toward lower quality and lower-value commodity wood products that come from smaller logs. These commodity products are more susceptible to soft markets.

- **Most of Oregon's west-side mills are world class.**

They can be competitive with other regions as the economy recovers. Oregon mills have much unused capacity that could be brought to bear on an improving market. The ability of these mills to respond to improved markets, however, will be limited by timber supply and logger availability. Reduced private harvests during the recession suggest there is some pent-up private timber supply from those lands, but that it is limited in scope. NIPF owners have the potential to increase harvest if log prices increase enough to bring them back into the market.

Over the longer term, federal forests could provide additional supply. While west-side federal forest health concerns are not as obvious as on the east side, they are developing. There is an opportunity get out ahead of the problem if we act now.

- **Wood processing infrastructure is under compression, especially on the east side.** Substantial capacity has already been lost, and without more wood, remaining capacity is threatened. Without viable manufacturing industries, treatments to restore forest health will be limited.

- **Canadian mills have a competitive advantage.**

The Canadian government sees the forest as a way to provide employment and income.

U.S. federal timber policies, on the other hand, manage for a variety of uses that often limit or even preclude commodity

production. Such policies effectively export the environmental, social and economic impacts of timber harvest to parts of the world that have less restrictive forest protection practices.

- **All of the available timber supply is being used to meet current domestic demand and increased demand from Asia.**

When the U.S. market recovers, Oregon mills will not be in a position to respond to the increased demand, because additional logs will not be available.

In spite of a weak housing market, the 2011 harvest was 3.65 BBF, just 18 percent below the 2004 (post-owl) peak. Oregon mill owners are concerned that with new log demand from China, there won't be enough wood to go around as domestic markets strengthen.

#### **FOREST POLICY**

- **Oregon's natural resource problems are complex.**

Past discussions have been polarizing and dominated by interest groups. Leadership is needed that is not aligned with any particular interest.

There is need for a re-evaluation of forest management policies, especially federal policies. Many said it will take a charismatic leader to begin the conversation. Some noted that people currently in leadership positions often do not have the latitude to undertake such an effort, or may not have the broad public support to initiate and maintain what could become a controversial effort.

We are under-visioned, still plagued by confrontational attitudes. There is an opportunity now to find resolution.

In the past, forest policy has been reactive, responding to crisis. As a result, policy tends to focus on an immediate problem without enough consideration to longer-term consequences. If we act now, we can take a more thoughtful and thorough approach.

- **It has been more than 20 years since the spotted owl was listed as threatened.**

Since then, there have been substantial changes in the communities, the forests, the workforce and the infrastructure. The people who remember how the forest-based economy once worked, and how the communities once were, are retiring.

- **The 20-year experiment in non-management shows the unintended consequences of that approach.**

Those consequences need to be specified and analyzed.

To what extent should the region be burdened by policies set 20-25 years ago?

- **Current public forestland management policies need to be re-evaluated in light of current conditions.**

A number of people in industry, the conservation community and government recognize the need for re-evaluation. The time is ripe for a broad-based policy discussion directed at improving Oregon's forest conditions and rural economies.

The governor is interested in making changes to current policies.

The congressional delegation appears more aligned than in the past. The USFS Regional Forester (Region 6) appears willing to be an agent of change. The Board of Forestry is well-positioned to provide leadership. Some of the collaboratives have been successful in coming together over projects. These and others need to step up and get the process started. Ultimately, it is people who make policy.

Current forest policy has been formed by a minority through lawsuits.

There is a sense of urgency, as people who could contribute to the discussion are ready to retire.

Historically, the pace of change is slow. We need to find a way to accelerate the process.

While there are pockets of political recognition of the problem, there is no momentum.

The O&C lands forest trust proposal is a positive step, a demonstration of leadership.

A paradigm shift toward complementary production of goods and services is needed. In previous policy debates, obstructionists defined the paradigm as competitive production of goods and services.

We need to evolve our scientific thinking and base it on landscapes rather than practices. The question is how to perpetuate a landscape. Arguing about specific practices distracts from the larger

question.

- **The president's Northwest Forest Plan for federal forests inadvertently became the forest plan for all forestland in Oregon, Washington and California.**

Federal forests account for 60 percent of Oregon's forestland, and when the policy changed significantly on those lands, everything else shifted as well.

Harvest on private land intensified, the forest sector retooled and economic opportunities in rural communities disappeared.

While some of this might have been predicted, it was certainly not part of the stated policy. Future policy discussions must recognize that when applied to large federal acreages, federal policies have effects across the entire forest landscape and forest economy.

- **Changing federal forest policy is the best buy for Oregon's forest sector.**  
Even moderate policy modifications can make much more difference than any other effort. The evidence is the magnitude of the impact when the policy was changed 20 years ago.
- **Federal forest policy is tenuous, resulting in unintended consequences.**  
The east-side screens (no harvest of trees over 21 inches diameter at breast height) were originally a temporary measure designed to avoid controversy. They did not have any scientific basis. But they are still in place today and hamper efforts to manage these forests. The USFS has been unable or

unwilling to rescind what was originally a discretionary administrative action.

Oregon's Forest Practices Act provides a much more deliberative and transparent regulatory process.

- **Oregon does not have a forum for natural resource policy discussions.**

Washington's Timber Fish Wildlife Agreement may be a good model of how to bring people together to discuss and establish forest management policies.

There is concern that such a forum promotes never-ending discussions and continual revision of regulations, increasing uncertainty or stricter regulations that would place more encumbrances on forestland management.

- **The urban/rural divide is expressed in forest policy issues.**
- **Well-run field trips are a particularly effective way to help people understand forest issues.**

Regarding what could be done to create more agreement about forest policies, it was noted that field trips have been successful in the past. An organized effort to get Oregon legislators to participate in field trips would be helpful.

## **WORKFORCE**

- **The workforce is aging.**

Properly trained employees are more difficult to find. The logging sector has been particularly hard hit by the recession.

Contractors, most of which are smaller companies, now do nearly all forest management operations.

The recession was particularly difficult for loggers: Many went out of business; others remained only by bidding jobs below cost. This is the case throughout the West. There is widespread concern that as the market recovers, there won't be enough logging and hauling capacity to support higher harvest levels. This will increase logging and hauling costs, thereby making mills less competitive compared to those in other regions.

Mill workers are also aging, and mills have a difficult time finding new workers. There is concern that the educational system no longer prepares students for vocational trades.

## **REGULATORY CLIMATE**

- **Oregon’s regulatory climate received mixed reviews.**

Oregon provides a favorable regulatory climate compared to neighboring states. The Forest Practices Act promotes forest management, and this competitive advantage should be maintained.

The regulatory process needs to be rebalanced to better support resource production. Procedures can be streamlined and made more efficient. Overly restrictive regulations simply export resource opportunities, and environmental impacts, elsewhere in the world.

Federal timber sale contracts and regulations are overly burdensome and costly, reducing both the interest in and the price bid for federal timber.

Current levels of regulation, at all levels, drain entrepreneurial energy from small businesses.

Any changes to the FPA should be rigorously based on scientific evidence.

Oregon needs to avoid federalization of forest practices. The forest roads ruling by the Ninth Circuit has ominous implications.

## **MARKET DEVELOPMENT**

- **Industry should market finished wood products to China.**

British Columbia offers an example of industry and government coming together to grow a market. B.C. had a champion in the provincial government, which found out how to get things done.

A trade mission type of effort, with support from the governor, is required.

- **We need to rebrand the timber industry as the greenest industry in the state.**

Wood offers a variety of positive benefits. Look to the beef and milk branding campaigns for examples.

- **A “Wood First” campaign could make a significant contribution to demand for Oregon’s wood products.**

- **Douglas-fir is a superior species.**

It offers Oregon mills a competitive advantage that should be leveraged more.

- **Timber landowners should be able to recover value for ecosystem services being provided.**

Because we don’t recognize value, we lose track of it. Forests are at risk for development for uses seen as higher and better, simply because we don’t recognize and monetize the ecosystem services forestland provides.

- **There is support for efforts to promote wood use and find new uses for wood.**

## **BIOMASS**

- **Recent discovery of natural gas reserves will reduce long-term energy costs.**

Biomass energy may not be competitive at lower energy prices.

In our 2006 report on the potential for biomass energy (Lord et al., 2006), we found a great deal of enthusiasm for efforts to convert forest biomass to energy. Today, there are about 65 biomass energy facilities, and in our interviews, we found a number of concerns about the long-term future of such efforts.

The discovery and development of vast natural gas reserves is likely to establish electricity prices at levels below break-even for forest biomass. Solar and wind power have captured the public attention and subsidies. The electrical grid is sometimes overloaded, and newer energy producers are cut off from production during periods of oversupply.

On the other hand, there are new efforts to produce transportation fuels from forest biomass, and interest in using biomass for institutional heating is growing. Pellets and bricks for European and Asian markets hold promise. These may be promising areas for the future.

Several respondents noted that currently forest biomass doesn't pay its way out of the woods.

## **PUBLIC FUNDING**

- **Most of those interviewed were reluctant to suggest that some kind of public funding/subsidy/investment would provide the right set of incentives over the long term.**

This is the case even though we identified inequities in public funding supporting the forest sector, as well as some opportunities that might be limited by lack of investment such as biomass market development, commercial logging equipment purchasing and logger training.

## **Chapter 5: Summary and Recommended Actions**

## Section 5.1 — Summary

In spite of challenges posed by the Great Recession, Oregon’s forest sector remains a strong and vital contributor to the state’s economy. Oregon’s forest sector is well-positioned to grow again as the economy recovers from the recession — the forests are productive, the manufacturing facilities are competitive and the business climate is favorable.

But the forest sector faces some challenges:

- Forest health problems on federal forests, especially the dry forests, raise concerns about the long-term viability of these forests.
- Much of the manufacturing infrastructure in these areas has been lost as a result of the decline in harvest on federal forestlands over the past two decades.
- Rural areas of Oregon, heavily dependent on the forest sector before the decline in federal harvest, have generally not evolved new and equivalent sources of jobs and income after more than 20 years of operation under the Northwest Forest Plan.

Below, we more explicitly describe the main findings of this report. In the following section we make recommendations.

### 1. Oregon’s forests provide an abundant and sustainable flow of natural resources.

- Oregon’s forests cover about 30.5 million acres — about 48 percent of the state. The number of forested acres has remained nearly constant over the last 30 years. This is not an accident — Oregon’s Forest Practice Act requires reforestation after harvest, and land use laws and comprehensive planning practices have steered development away from forestland.
- Oregon’s forests are owned and managed by a variety of owners with different objectives. For example, private landowners own about 34 percent of the forestland but currently provide 75 percent of the harvest. Federal agencies, on the other hand, manage about 60 percent of the forestland but provide only 12 percent of the annual harvest.

Ownership	Percent of Forestland	Percent of 2011 Harvest
Federal	60	12
Private — industrial	19	68
Private — non-industrial	15	7
State	3	10
Tribal and local	2.5	3

- Across all ownerships, current timber volume is about the same as it was in 1953 — about 87,900 million cubic feet.

Projections show that on the west side, pre-recession harvest levels from private lands are sustainable into the future. East-side private lands cannot maintain pre-recession harvest levels. At present, annual harvest from federal lands across the entire state is only about 9.6 percent of annual growth. The remainder of annual growth creates the federal forest health crisis.

Development of active management programs on federal lands to improve long-term forest health would lead to a modest expansion in harvest while enhancing critical environmental services provided by Oregon's forests such as clean water, fish and wildlife habitat, and recreation opportunities. These resources form an important part of Oregon's culture and landscape, but are not quantified in this report.

## **2. Oregon's forest sector employs about 76,000 people and provides about \$5.2 billion in total income.**

- As a percentage of the state totals, the forest sector currently accounts for about 5.3 percent of jobs, and 6.8 percent of the economic base.
- The forest sector accounts for a larger share of rural economies. Outside the Portland-North Willamette Region, the forest sector accounts for 7 percent of the jobs and 11 percent of the economic base. In some areas, the forest sector accounts for

20 percent of the economic base.

- Each additional 1 million board feet of timber harvest supports about 11 direct jobs for the entire forest sector.

One million board feet is equal to the volume from about 250 logging trucks, comes from about 40 acres and can frame about 65 single family homes (2,000 square feet).

- Forest-related jobs cover a wide spectrum and include, for example: 8,000 loggers; 17,000 at mills; 16,000 in secondary wood product manufacturing; 13,000 foresters, land managers and consultants; 6,500 in transportation; 4,600 government employees; and 2,000 equipment manufacturing employees.

## **3. Oregon's forest product manufacturers continue to make an important contribution to Oregon's economy.**

- Currently, Oregon's forest sector accounts for about \$12.7 billion in total industrial output.
- Sawmill production accounts for about 11 percent (\$1.4 billion) of the total industrial output. Sawmill production in 2010 was about 37 percent of the average production between 2000 and 2004. During the recession, about 1 billion board feet of lumber processing capacity was lost due to poor market conditions and mill closures.
- Pulp, paper, and paperboard mills are primary users of chips, shavings and sawdust from solid wood manufacturers,

and end up with about 36 percent of the harvest. These mills account for 20 percent (\$2.6 billion) of total industrial output.

- Plywood and veneer mills take about 9 percent of the harvest and account for 7 percent (\$851 million) of the total industrial output. Oregon's plywood manufacturers account for an increasing share of a declining market.
- The secondary wood processing sector adds value to Oregon's forest products, with an annual industrial output of total about \$2.5 billion in 2010.
- Oregon's sawmills are competitive with mills in the U.S. South and in Canada. Due to reduction in Canadian timber supply and a new Asian export emphasis in Western Canada, Oregon mills have an opportunity to increase their share of an improving housing market.

#### **4. Oregon's forest sector makes an important contribution to state and local governments.**

- The forest sector pays about \$250 million to \$350 million in state and county taxes each year, or about 5 percent of the state's total annual revenue.
- Historically, the county share of federal timber revenue was an important part of county budgets. Since federal harvests have declined, the federal government has made up a portion of the shortfall with funding under the Secure Rural Schools program. Long-term Congressional support for the Secure Rural Schools program appears

tenuous, and is already having serious consequences in some rural counties.

- Harvests from state forestlands provide about \$38 million to the 15 counties that contain these lands. In addition, about \$8.7 million in harvest revenue from Common School Forest Land was transferred to the state's Common School Fund in 2011.
- #### **5. Log exports have long provided private forest landowners with another market for their wood. China has recently emerged as an important new market for logs and lumber.**
- In 2011, about 960 million board feet of Oregon and Washington logs were exported from the ports that export Oregon logs. This is a substantial increase from the 395 million board feet exported in 2008, and all the increased demand came from China.
  - Even with this increase, current log exports are only 37 percent of the export levels from the late 1980s and early 1990s.
  - B.C. mills have aggressively pursued Chinese markets for their lumber. Oregon mills have not been as aggressive or as successful in pursuing Chinese customers. B.C. may have an advantage in that it produces Spruce-Pine-Fir lumber, which is lower cost and lower priced than Oregon's predominately Douglas-fir lumber.

**6. The Great Recession hit Oregon's forest sector especially hard.**

- About 14,400 jobs and \$527 million of income have been lost since 2007 for sector industries reported as covered employment.
- Due to reduction in both volumes and prices, lumber mills lost about \$3.2 billion in sales, and forest landowners lost about \$986 million in stumpage revenue.

**7. Timber supply may constrain the ability of Oregon's forest sector to take advantage of improving markets.**

- New demand for export logs to China boosted harvest in 2011 to 3.65 billion board feet — just 16 percent from the pre-recession level of harvest. Demand for logs will increase as housing recovers and domestic markets improve.
- A 'perfect storm' or 'super cycle' is predicted based on a strong housing recovery, a reduction in B.C. lumber production because of mountain pine beetle infestations, and strengthening demand from Asia that could drastically increase demand for and price of Pacific Northwest wood products.
- While pre-recession harvest levels from private lands on the west side are sustainable, there is limited capacity to increase harvests from these lands. In addition, pre-recession harvest levels from east-side private lands are not sustainable. These timber supply constraints may limit Oregon's ability to gain market share in a

recovering market.

**8. Oregon's federal forests, especially those in eastern and southwest Oregon, are at risk from fire, insects and disease, in part due to reduced management. As a result of reduced harvest levels, mill capacity in these areas has fallen off substantially.**

- On the east side, harvest from federal forests is only 7 percent of annual growth. Many of these forests are overstocked with smaller trees with an undesirable species mix.
  - So far, west side federal forests are in somewhat better shape, largely because the wet forest types are more resilient than the dry forest types. But the long-term trends are not good. Lack of active management is resulting in unsustainable stand conditions.
  - East-side mill infrastructure (capacity) has declined by half in the past decade from about 765 million board feet to 370 million board feet. Additional investment is unlikely unless reliable supplies of timber become available.
- 9. There appears to be a growing recognition by a wide range of parties of the need to manage federal forests to restore healthy conditions. But there is still opposition to active management of federal forests.**
- Recent collaborative efforts hold promise as a way to break the gridlock surrounding federal forest management.

- Federal forest planning efforts continue to generate controversy. The process is cumbersome, and it takes too long to come to a decision.
- Federal forest management rules provide dissatisfied parties with the opportunity to block projects through appeals and litigation. This delays management and increases the cost of management. As a result, federal agencies have fallen behind on their efforts to restore forest health.

**10. The use of woody biomass to produce heat, power and liquid fuels is a developing center of economic activity and may facilitate efforts to restore forest health and improve rural economies.**

- Biomass power generation is complementary with wood product manufacturing. Currently, 70 facilities around the state generate about 200 megawatts of energy, enough to power 150,000 homes.
- Sixteen Oregon facilities are using wood fuel to heat their buildings, and several new facilities are currently in development. Thermal energy is one of the best uses of woody biomass, especially in areas with plentiful access to wood fuel that are underserved by other energy sources, such as natural gas.
- A trend in manufacturing is the addition of wood fuel manufacturing plants. There are now 11 wood pellet and wood brick manufacturing plants in the state, consuming 700,000 tons of woody biomass annually.

**11. Oregon provides the forest sector with a favorable business climate that encourages investment.**

- Since 1971, Oregon's Forest Practices Act has required forest landowners to promptly replant after harvest and employ practices that protect other resource values. The administration and maintenance of the Forest Practices Act has been thoughtful and science-based, providing landowners with the certainty needed to encourage long-term management and investment in growing forests for the future.
- The Oregon State University College of Forestry is one of the country's premier forestry schools. Faculty and students make important contributions in terms of employees and practical research designed to help solve real problems.
- State, regional and national programs designed to promote wood products, and especially Oregon's wood products, will help increase the total demand for wood, and Oregon's share of the market. The WoodWorks program, the United States Department of Agriculture softwood lumber check-off program, the Softwood Export Council and the Brand Oregon efforts are good examples of such programs.

**12. Minor forest products, such as mushrooms, bear grass and boughs, are compatible with active forest management but account for a very small percentage of the overall forest-related economy.**

**13. In the future, Oregon's forest landowners may be able to monetize ecosystem services such as wetland mitigation banks and carbon sequestration, but these remain on the horizon for now.**

## Section 5.2 — Recommended Actions

Oregonians are fortunate to be surrounded by a diverse and highly productive forest resource that provides a wide variety of benefits. This forest resource forms the basis of an efficient and innovative forest sector that has made and continues to make an important contribution to Oregon's economy.

Oregon's forest sector has been weakened by the Great Recession but will recover as markets improve. In fact, the expected economic recovery offers Oregon's forest sector an opportunity to grow and increase its share of an improving market. But any improvement will require a focused effort by leaders from government, industry and the conservation community.

Here we outline a few key recommendations for improving the forest resource and the economic activity dependent on it.

### **1. Reassess and reshape policies for Oregon's federal forests**

It is time to assess and reconsider the policies that govern management of Oregon's federal forests. A successful effort could lead to healthier federal forests and more robust and resilient rural economies.

The condition of Oregon's federal forests is declining. Forest health conditions are most concerning on the dry forests, but there is a growing realization the wet forests also require attention. Current federal forest management is governed by policies and procedures that

evolved out of controversy. As a result, efforts to restore forests to a healthier and sustainable condition are limited by an ineffective system built on conflict avoidance.

The federal Northwest Forest Plan is approaching its 20th anniversary. It is now clear that what was ostensibly a plan for federal forests also had significant and in some cases unanticipated impacts on the condition and health of federal forests, the forest sector, rural communities and private land management. Many rural communities have not been able to replace the jobs and income lost in the past decline of timber processing with other industries.

It is time to take a hard look and determine whether 20 more years under the same regime will produce desirable results. A fair and comprehensive assessment will provide the basis for charting a course for a more sustainable and resilient future.

The time is ripe for such an effort. Both the need for more active management and the need for additional wood is becoming obvious to even the casual observer. The stakeholder interviews suggest there is a willingness to engage in a thoughtful process to address the problem head-on.

The following are among the other indicators of a willingness to move beyond past rhetoric:

- Community-based collaboratives are bringing together different interests at a local level. Many have been successful in

finding agreement on landscape-scale management.

- A wide range of interests supported Senator Wyden’s east-side forest management initiative.
- The O&C proposal sponsored by Reps. DeFazio, Schrader and Walden indicates a bipartisan willingness to rethink and reshape management on broad acreages of federal lands.
- Governor Kitzhaber has highlighted the need for more active forest management and appears willing to magnify the state’s role in guiding federal forest management policies.
- The experience of land trusts and community forests is providing active forest management experience to a wider group.

Stakeholder interviews suggest that a successful effort will require a sustained commitment from a leader or a champion. He or she will need to seek out and engage all parties in a larger dialogue focused on restoring federal forests and rural communities to a healthy, resilient and productive condition.

This is a tall order. Meaningful solutions cannot be achieved with a single “summit” or with a 90-day planning effort, or by a single piece of legislation or regulatory fix. A sustained effort is needed to develop a common vision and build lasting and widespread support.

## **2. Pursue new markets for Oregon wood products**

The recession emphasized the need for a continuous effort to identify and pursue new market opportunities. A more concerted effort could provide leverage of limited resources.

Oregon’s forest products manufacturers have a lot to offer:

- Oregon’s forests are made up primarily of Douglas-fir and Ponderosa pine. Douglas-fir is a superior species for construction lumber products, and pine is highly valued for use in windows, doors, molding and other machined products.
- Many of Oregon’s mills are considered world-class — efficient, effective and highly productive.
- Oregon mills are innovative. The recession put many mills in the position of developing new products and/or finding new markets for existing products.
- Efforts to promote a wider application for wood use are already underway. The WoodWorks ([www.woodworks.org](http://www.woodworks.org)) and United States Department of Agriculture softwood lumber check-off ([www.softwoodlumberboard.org](http://www.softwoodlumberboard.org)) programs should help broaden the demand for solid wood products.

More can be done. As markets become more globalized, Oregon's forest products manufacturers can benefit from diversifying the customer base beyond the U.S. housing market. Some Oregon companies have developed offshore markets, but current efforts appear to be company-specific and of limited extent. A more coordinated and sustained effort would better leverage marketing resources.

Oregon should consider a marketing partnership between the industry and the state, modeled after the highly successful effort in British Columbia. Government and industry leaders in British Columbia teamed to support a long-term effort to develop a Chinese market for B.C. lumber. That effort paid off handsomely as the U.S. housing market faltered. Last year, British Columbia shipped more lumber to China than to the U.S.

British Columbia might have a competitive advantage over Oregon in that the beetle-killed lodgepole pine provides a low-cost lumber product, which is what the Chinese want. But it was a market that British Columbia developed, knowing the products they had to offer. An Oregon marketing effort would necessarily develop and promote products where Oregon has the competitive advantage.

Past state-led marketing efforts and trade missions have had limited scope and duration, and limited impact. A larger and more lasting effort will be required to break into developing markets on the Pacific Rim.

### **3. Promote and defend the Oregon Forest Practices Act**

Oregon's Forest Practices Act assures that Oregon's forests are managed responsibly, while offering regulatory certainty to forest landowners. The Forest Practices Act represents a competitive advantage to the forest sector and should be highly valued and protected.

The Board of Forestry is charged with administering the Forest Practices Act. In the past, modifications to the act's regulations have been based on the application of sound science, recognition of local needs and conditions, and an open process. The resulting regulations are a good fit for Oregon landowners who are trying to do the right thing as they manage their forests.

Forest Practices Act regulations will continue to evolve to meet changing needs. We emphasize here a few guiding principles for keeping the act vital and effective:

- The Board of Forestry should resist any efforts to adopt federal forest practices. The success of the Oregon Salmon Plan is a good example of the wisdom of keeping regulations localized.
- The Board of Forestry should continue to insist that any changes to the Forest Practices Act be based on the full body of contemporary science and experience. Regulations that represent political compromise would not be regarded as credible and would promote more controversy.

- The Board of Forestry should recognize that more restrictive modifications to the Forest Practices Act could put Oregon landowners at a competitive disadvantage, which could lead to export of both economic opportunities and environmental impacts to places with less restrictive regulations.

#### **4. Protect, maintain and enhance Oregon's forest sector**

The past success of Oregon's forest sector can be linked to a variety of policies, institutions, efforts and expertise focused on building the infrastructure needed to grow and harvest trees and manufacture wood products. The current recession has shown the importance of maintaining a favorable business climate.

There are many ongoing efforts and they all deserve continued support. We offer here a few recommendations for further discussion.

- The economics of forest restoration on the east side are tenuous at best. Any substantial increase in forest restoration treatments will likely require new investment in facilities designed to process smaller material. That investment will require certainty of supply over an extended period (e.g., 10 or more years), and may require some public support.
- The logging sector has been particularly hard-hit by the recession. Many loggers left the business and will not come back. Equipment is aging and has not been replaced. The logging workforce is aging and recruitment is difficult. The logging sector could benefit from some attention focused on workforce recruitment and

programs that help increase access to capital for equipment upgrades.

- Biomass energy has passed through the pioneering stage where the focus was on electrical generation. Current efforts address a wider array of products — pellets, torrefied pellets, bricks, space heating, transportation fuel, etc.

The industry is learning how to more efficiently collect, transport and process this material. But low prices for natural gas threaten the economic viability of biomass energy projects. Policies and assistance should recognize that biomass offers superior benefit related to greenhouse gas emissions.

#### **5. Promote markets for ecosystem services**

Compensating Oregon's forest landowners for ecosystem services will help keep forestland in forest uses.

The economics of forest management can be difficult on family forest landowners. Revenues from traditional forest products are episodic — a given stand might produce revenue just once or twice in a lifetime, yet require nearly annual tending and investment. Market swings amplify the uncertainty about the timing and magnitude of potential revenue. Financial uncertainty can lead to small forest landowners converting forestland to other uses with more immediate or predictable payoffs.

Oregon's forests provide a variety of goods and services beyond logs delivered to manufacturers — clean water, fish and wildlife habitat, recreation opportunities, carbon capture, undeveloped landscapes, etc. Family

forest landowners tend to manage land less intensively and as a result may provide more of these goods and services than industrial landowners. Society benefits from these goods and services without any compensation to the landowner.

Ecosystem service markets that provide a predictable cash flow have the potential to help landowners bridge the gap between immediate

financial requirements and the desire to manage forests with a long-term perspective.

Current ecosystem service markets are in the formative stages and seem slow to gain traction. A state-level effort to define, develop, encourage and promote such markets could help accelerate progress and encourage participation.

## Appendices

## Appendix I — Abbreviations and Acronyms

**ARRA:** American Recovery and Reinvestment Act  
**ATFS:** American Tree Farm System  
**B.C.:** British Columbia  
**BBF:** Billion board feet  
**BDT:** bone dry tons  
**BEA:** U.S. Bureau of Economic Analysis  
**BETC:** Oregon Business Energy Tax Credit  
**BLM:** U.S. Bureau of Land Management  
**BLS:** U.S. Bureau of Labor Statistics  
**BOFL:** Board of Forestry Lands  
**BPC:** Biomass Producer and Collector tax credit (Oregon)  
**Btu:** British thermal units  
**CSFL:** Common School Forest Lands  
**FAO:** Food and Agriculture Organization of the United Nations  
**FBWG:** Forest Biomass Working Group (Oregon)  
**FIA:** Forest Inventory and Analysis (program of the USFS)  
**FPA:** Forest Practices Act (Oregon)  
**FRCC:** Fire Regime Condition Class  
**FSC:** Forest Stewardship Council  
**GDP:** gross domestic product  
**GHG:** greenhouse gas  
**HB:** House Bill (Oregon)  
**IMPLAN:** Impact Analysis for Planning Software  
**LQ:** location quotient  
**MBF:** thousand board feet  
**MBM:** thousand board measure  
**MMBF:** million board feet  
**MMBM:** million board measure  
**MMCM:** million cubic meters  
**MMSF:** million square feet  
**MPB:** Mountain pine beetle  
**NAICS:** North American Industry Classification System  
**NARA:** Northwest Advanced Renewables Alliance  
**NASS:** National Agricultural Statistical Service  
**NIPF:** non-industrial private forestlands  
**ODF:** Oregon Department of Forestry  
**ODOE:** Oregon Department of Energy  
**OFRI:** Oregon Forest Resources Institute  
**OLMIS:** Oregon Labor Market Information System

**ORS:** Oregon Revised Statute

**OSB:** oriented strand board

**OSU:** Oregon State University

**OWIC:** Oregon Wood Innovation Center

**REIS:** Regional Economic Information System

**RPS:** Renewable Portfolio Standard (Oregon)

**SB:** Senate Bill (Oregon)

**SFI:** Sustainable Forestry Initiative

**SRS:** Secure Rural Schools

**STF:** Small Tract Forestland program of Oregon

**tBtu:** trillion British thermal units

**U.S.:** United States

**UM-BBER:** University of Montana Bureau of Business and Economic Research

**USDA:** U.S. Department of Agriculture

**USFS:** U.S. Forest Service

**WTO:** World Trade Organization

## Appendix II — Oregon Forest Sector Economic Impact Modeling

### General approach

Economic impact models allow for estimating and displaying economic conditions and impacts at the community, county and regional level. Accurate impact modeling, however, requires considerable fieldwork to develop base data for each model area, thereby ensuring the accuracy of model components.

Economic impact models are based on input-output analysis, which is a means of examining relationships within an economy, both between businesses and between businesses and final consumers. Input-output analysis captures all monetary market transactions in the local economy in a given time period. As such, the models are static and do not incorporate estimates of changing conditions, such as local population growth.

The economy is first modeled in an equilibrium (or baseline) condition, and then a change is introduced. The change propagates through the economy and causes it to adjust to changing sales, income and employment conditions. Successive rounds of re-spending, referred to as the multiplier effect, continue to stimulate the economy until it eventually reaches a new equilibrium. The community-level models estimate the total magnitude of this change in sales, earnings and employment. The difference between the baseline condition and the new equilibrium is the economic impact associated with a change in the local economy.

### Data sources

IMPLAN data for the most current available year (2010) were obtained from the Minnesota IMPLAN Group (Minnesota IMPLAN Group, 2010) and used as control data for developing community model employment, earnings and sales totals. These data are used as a starting point for model development. Initial draft models are developed with this database and are taken into the field for field verification or “ground-truthing.” Field data are used to modify important model parameters such as industry exports.

Additional published and online data sources that are used include the U.S. Department of Commerce, BLS, BEA, U.S. Census Bureau, USDA’s Census of Agriculture, Oregon Department of Employment (OLMIS online database), County Business Patterns and National Agricultural Statistical Service (NASS) websites. BLS and BEA data, found in the Regional Economic Information System (REIS), are used for employment and earnings data estimates. These data are published in the County Business Patterns and ZIP Code Business Patterns files that are available online at the U.S. Census Bureau website. Census data will be used for population and income variables at the county and sub-county levels. Because agriculture is not covered by unemployment insurance, data from the Census of Agriculture and NASS are used to develop control totals for agricultural sales, earnings and employment.

Economic model development process

1. Identify geography of functional economies and establish model geography

Initial investigations and meetings with community and business leaders, academics and agency staff are used to identify modeling geography. Models encompass trade areas and labor market areas as identified by the Oregon Department of Employment. For natural resource issues, other geographic considerations are timbersheds (working circles of primary wood products manufacturers), BEA economic areas, metropolitan statistical areas boundaries and identified commuting patterns (Journey to Work data). It is important to note that models that are built using a geographic area that is not a functional economic unit do not correctly calculate the multiplier effect.

2. Develop a community-level database using secondary sources

To develop an initial modeling database, a data engine similar to that used to generate IMPLAN data is used. A supplemental database for each of the models is assembled from published and online data sources. The databases include employment, wage and salary earnings, regional output, unearned income, seasonal home spending, population, households, commuting patterns, income level, residency, employment status, tax rates, and savings and consumption rates.

Initial employment and wage and salary earnings data are derived from BEA (REIS) data. These data are adjusted based upon field surveys of each of the three communities. Field surveys are used as a basis for developing a community modeling database that accurately reflects local conditions as indicated by community and business leaders in each community.

Regional output data are estimated based on county-level earnings/output ratios obtained from IMPLAN. Data on unearned income, including transfer payments and property income (dividends, interest, and rent), are obtained from the U.S. Census Bureau's American fact-finder website. Data on the number of seasonal homes in the study area also are obtained from the U.S. Census Bureau website, and estimates of seasonal home spending are developed from data from large-sample studies in other states. Population and household data are obtained from the U.S. Census Bureau website.

Initial commuting patterns are developed from journey-to-work data from the U.S. Census Bureau website, augmented with data from interviews with local transit providers, transportation planning officials, major employers in the community and staff at the Oregon State Department of Transportation. Population/labor ratios are developed based on BEA employment data and U.S. Census Bureau population data. Data on the population of working and non-working families, population in the armed services and resident population are obtained from the U.S. Census Bureau website. Taxation, savings and consumption rates for communities in the study area are obtained from the IMPLAN database.

### 3. Construct preliminary community-level models and ground-truth results

Preliminary models for counties and labor market areas are constructed from available secondary data sources. Initial employment and earnings are derived from REIS data. Industrial output by industry for each of the four models is derived using employment/earnings ratios obtained from IMPLAN and other sources. Initial estimates of exports for these models, which play an important role in explaining sources of capital and income for the local economy and in determining the multiplier or “re-spending” effect, are developed using mechanical techniques (supply demand pool and RPC estimates).

The following factors used in constructing the models are derived from national data:

- Endogenous business investment
- Household share of investment
- Average propensity to consume
- Marginal propensity to consume
- Average propensity to save
- Average federal income tax rates
- Average state and local income tax rates
- Average state and local government propensity to consume locally

Developing the community-level models also allows for adjusting absentee claims on profits on an industry-by-industry basis. Overall profits (generated by place of work) are classified as either claimed in-community or absentee claimed based on the size of the industry. Businesses in sectors with relatively few jobs are assumed to be locally owned and profits are assumed to remain in the community. Large industries and chain stores are assumed to be owned primarily by absentee owners with profits allowed to leak out of the community. This is an important feature not included in IMPLAN, which “absorbs” all proprietors’ income locally.

Each of the community-level models are constructed using a combination of spreadsheet programs and a mathematical software program that handles complex mathematical operations. Once a preliminary database and model are constructed using this software, the model can be adjusted and “rerun” with several spreadsheet macros. After a preliminary model is constructed, various worksheets in the model can be “pulled out” of the model for analyzing and displaying aspects of the local economy. These include detailed estimates of employment and earnings in each industrial sector of the economy (with up to 528 sectors shown). Export base analysis is integrated in the preliminary model, which displays the percent of total export income that is derived from each sector of the economy. Cluster analysis and social accounting are also integrated into the model.

The secondary data used to construct a community-level models are then ground-truthed by conducting extensive fieldwork to ensure that county representatives have generally recognized the data as accurate. The detailed worksheets that comprise a model include information that is reviewed with local officials to determine whether the model accurately depicts the community’s economy. Data are not collected on all industries in the economy — only on the key industries in each county’s economy.

#### 4. Collect primary data for key economic sectors and revise community-level model databases

Because of the importance of natural resource-based industries in the study communities, data for resource-based industries that constitute important components of the industrial base are carefully examined, and primary data are collected through interviews and surveys of local businesses to revise the databases. For example, chips and log exports are important to the Coos County economy. Field data have been collected on these important Coos County industries.

Primary data are also collected on employment and exports for large employers and industries that are significant components of the economic base. The Chambers of Commerce in each of the study communities are contacted to obtain information on large employers in their respective areas. Government employers also are surveyed to update employment data. Generally, government employment reported by secondary sources is accurate. Secondary data on major employers are reviewed with staff at the Chambers of Commerce and at city governments. Primary data are collected on state and federal natural resource management agencies (ODF, BLM and USFS). This includes a variety of employment, budget, permitting and contracting data.

Adjustments to the initial databases for each community-level model are then made using the “selective precision” approach described by Jensen (1980). In general, data and relationships for sectors that play an important role in the local economy and are a key component of the economic base are adjusted with field data as appropriate. Adjustments also included deleting industrial sectors that are no longer present in the local economy (because of inherent lags in reporting changes in economic activity) and adjusting levels of employment to reflect recent changes in an industrial sector. Employment and earnings totals are adjusted to reflect field data, and regional outputs are adjusted using employment/output ratios.

During 2006-10, natural resources sectors in Oregon underwent a major contraction in employment, output and payroll. County models are updated with current data to accurately portray these changes in the natural resource sectors. Data lag during a major recession can severely impact model accuracy, so we use current survey data whenever possible.

#### 5. Modify export base in key economic sectors

Economic base analyses are initially used to determine the proportion of output (or sales) of each sector of the local economy that is exported. Analysis of the economic base of an area identifies the industries that bring money into the region, which are critical to the economic growth and sustainability of a region.

The amount of exports in the preliminary community-level models are estimated based on mechanical techniques including supply-demand pool analysis, LQ analysis and regional purchase coefficients. Supply-demand pool analyses evaluate whether local production of goods and services meets local demand, as indicated by national input-output technical coefficients; if the local supply falls short of

demand, then the deficiency is assumed to be imported into the region. Location-quotient analyses compare the ratio of output of an industry in the local economy to output of the same industry in a reference economy (e.g., national economy). Regional purchase coefficients use econometrics to calculate what portion of a region's supply is purchased locally. Economic studies of other communities have shown that these mechanical techniques tend to overstate the re-spending in the local economy (Richardson, 1972; Leontief, 1986); consequently, the lower estimates of spending in the local economy derived by supply-demand pool analysis and location-quotient analysis are used as a default value.

Use of mechanical techniques typically results in local absorption of the output of a variety of local industries that export all their output (i.e., an extreme case of underestimating exports). Most of these industries, however, are typically in "background sectors," which are sectors that do not play a significant role in this type of analysis. Because these sectors do not have a significant role in the analysis, changes to exports in these sectors by overriding the data are not critical.

The estimates of exports using the mechanical techniques are then adjusted based on survey data obtained from interviews within the region. For example, survey data in Oregon indicated that most dimension lumber mills (sawmills) export all of their production from the local area, so exports for sawmills in most cases are set at 100 percent. The exceptions are mills that sell to remanufacturing industries and the sales of residuals. Models are adjusted to reflect these local sales based on a mill survey conducted in 2012.

#### 6. Conduct sensitivity analyses and revise the community-level models

Preliminary runs of the models using a wide range of input variables were undertaken to determine whether the model's projections of impacts were reasonable. Multipliers for each of the four community-level models were analyzed and compared, both to each other and to "off-the-shelf" IMPLAN models and any other economic models available for the study areas.

#### 7. Model graphics and outputs

Models developed in a spreadsheet format incorporate graphics and built-in economic analysis. Types of "downstream analysis" built into the models include cluster analysis of all industries in the economy. This entails grouping industries into clusters such as the wood products cluster, and comparing the cluster to national data. This shows how strong the local economy is in each industry cluster and how specialized each county's economy is.

Models also perform economic base analysis using the export base approach described above. This is charted graphically to show how each model area derives its outside income. Counties are grouped into different categories based on their economic base, which includes timber-dependent counties, agricultural-based counties and high-technology-based counties.

Social accounting is also examined in separate spreadsheets and graphics. This includes the proportion of income derived from wage and salary income, transfer payments, investment income, property income and commuting. A separate sheet also examines jobs by wage level and projects changes in the types of jobs created by direct impacts. For example, a scenario model run would show how a change in timber supply creates different wage level jobs than a change in recreation management.

Shift-share analysis is also used to document changes in the structure of the local economy over the past recession. This shows how the local area has fared compared to the national economy during the recession.

Additional graphics are built into each model to graphically display the impacts of changes associated with each model run. Used in a meeting format, these allow policymakers to see how a direct impact scenario affects the local economy.

#### 8. Model documentation

Each of the community-level models are delivered with full documentation of data sources and survey results. A detailed description of the models, including each of the spreadsheet worksheets, will also be provided.

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## Appendix III — Field Data Collection for Recalibrating Economic Models

As part of the project, we recalibrated economic models for every county in Oregon. We started with IMPLAN models, which are constructed from secondary source data. IMPLAN uses data from the:

- BEA — REIS
- Bureau of Labor Statistics — labor market information
- U.S. Census Bureau — County Business Patterns
- BEA — National Economic Accounts and National Input-Output accounts
- U.S. Census of Agriculture
- BEA Annual Survey of Manufacturers
- BEA Regional Economic Accounts
- U.S. Census of Employment and Wages
- Department of Commerce Survey of Exports

Data from these sources are suppressed whenever individual firm data might be disclosed. IMPLAN used a data engine that estimates the actual employment, income or industrial output using mechanical estimation techniques. We have replicated this data engine and tested it against field data. We recognize that it not particularly accurate, particularly for small geographic areas where anomalies are most apparent.

Industry output in IMPLAN is estimated from national employment/output ratios that do not reflect regional difference in productivity. For example, Oregon loggers on the west side have different logging conditions than Oregon loggers on the east side.

In past projects for the USFS in Regions I, IV and V, we have tested this data against field data. In a project for the Oregon Department of Forestry, we surveyed all the businesses in more than 30 small communities and compared the data to IMPLAN data and other secondary data sources. We found significant data errors in the IMPLAN data and other secondary data sources.

As a result of this work, all of our models are “ground-truthed” with field data on key model variables.

Our work indicated the following inaccuracies are common to IMPLAN models:

- Employment is inaccurate in some sectors due to miscoding of data by employers, as well as geographic miscoding. For example, workers who actually work in one community may be payrolled and coded into another community. This is common in forest-sector industries. Another example is workers who are coded in the wrong industry. For example, sawmill workers may be hired and payrolled for up to six months through an employment agency. These workers are often miscoded as working for an employment agency when they are actually working in a local sawmill.

- Industry output is estimated from national productivity data, and it is important to re-calibrate output for key industries such as sawmills to actual production.
- IMPLAN creates spurious linkages in the inter-industry transactions matrix. The production function of Oregon forest-sector industries is different than national technology, and it is important to adjust data to real industry production functions.
- Industries in which independent contractors fill many of the jobs are misrepresented in secondary data. Logging and construction are two good examples of industries in which a large proportion of the workforce is independent contractors. Secondary data does not report all these independent contractors.
- Industry exports are inaccurate because they are based on national functions. Nationally, sawmills sell lumber to new-housing construction industries. Locally, sawmills typically sell most of their lumber to wholesale trade. Some lumber is also wholesaled directly to “big-box” stores such as Home Depot. In IMPLAN, most manufacturing industries show output linkage to other local manufactures. In reality, most manufactures export their production from the local economy.

In summary, data for the following forest-sector industries is inaccurate in IMPLAN and the secondary data sources that it reflects.

- Forestry support — Secondary data does not include many of the contract employees who perform forest silvicultural work and firefighting.
- Forest gathering — Most workers who collect and sell firewood, mushrooms, berries and floral products are not reported in any secondary data.
- Logging — Many loggers are independent contractors who work seasonally, and their jobs and income are inaccurately reported. Wages for loggers are relatively accurate, but proprietors’ earnings are not accurately reported.
- Log trucking — Many log truckers are also independent contractors who are seasonally employed, and their jobs and income are also inaccurately reported. Wages and proprietor earnings are not accurate.
- Timber tracts — Owners of timber tracts harvest timber infrequently, and their contribution to the Oregon economy is not reflected in secondary data. Timber tract owners (industrial forestlands and non-industrial forestlands) provide most of the timber than drives the rest of the wood products economy. Oregon has 148,000 owners of private forestlands.

- Primary wood products — Employment, wages and salary earnings on most of the primary wood products industries is accurately reported in secondary data. The exceptions are county-level data that are suppressed and have to be estimated by IMPLAN. We conducted a mill survey to more accurately report these data. Most of the data on paper production are suppressed data due to the small number of operators. IMPLAN was inaccurate in the pulp and paper sector, recording no employment in pulp mills in the entire state.
- Wood chips and residuals — Oregon has a number of mobile and stationary chipping operations and significant employment linked to handling of residuals. None of this employment, income or output was reflected in IMPLAN.
- Foreign exports and shipping — Data on jobs linked to foreign exports of wood products were not accurately reported in IMPLAN. We interviewed port staff and obtained shipping data. This is a very efficient industry, so employment and earnings linked to these activities is not very significant.
- Other wood products or miscellaneous wood products — Oregon has many small businesses that manufacture decorative and furniture items from wood. Myrtle, juniper, and other hardwood resources provide an income for a significant number of people who sell these items through gift stores and other retail outlets. They are by and large self-employed, and their jobs and earnings are not reported accurately in any secondary data.
- Wood kitchen cabinets — Large manufacturers of cabinets are accurately reflected in secondary data. Most counties in Oregon have independent businesses that manufacture cabinets. Their earnings are not accurately reported in secondary data.
- Wood furniture — Most Oregon wood furniture businesses are small, independent businesses, and secondary data do not capture their earnings. Secondary data accurately report larger furniture manufacturing businesses, but most factory-built wood furniture is now imported from Asia.
- Machinery manufacturing — Forest-sector industries use a variety of specialized machinery. The coding system (NAICS) used for secondary data makes it difficult to locate many of these manufacturers. For example, Oregon Chain (Blount Industries) is coded under NAICS 332216 (Saw Blade and Hand Tool Manufacturing).
- Rail transport — Secondary data on rail transport is highly suppressed and geographically coded to areas where there is a switching operation. IMPLAN data were very inaccurate on all transportation sectors.

- Water transport — In general, cargo shipping data are more accurate than secondary employment and earning data for water transport. Cargo shipping reflects the actual economic contribution of water transport of wood products. A significant amount of the employment in ocean shipping is on board the vessel and is not reported in any secondary data.
- Warehousing, distribution and wholesale — Industries where forest product handling is a small proportion of the total trade, such as warehousing, distribution and wholesale industries, are “lost in the shuffle.”
- Management of forest-sector industries — Oregon has the headquarters and regional offices of a number of large forest products firms. These forest jobs are reported in sectors such as “management of companies and enterprises.” It is difficult to account for the number of forest-related jobs in these sectors, so we surveyed forest industries to get accurate data.
- Federal government — Data on federal government employment is accurately reported in OLMIS. For some reason, we found that IMPLAN data did not accurately reflect actual USFS employment in some counties. We collected data directly from the Albuquerque Service Center on USFS employment and budgets. We did not collect data on the BLM, because part of its mission is not forest related. In future studies, we will collect data on the BLM western Oregon operations (O&C lands), because these operations are primarily forest-based.
- State government — We collected data directly from the Oregon Department of Forestry. Secondary data sources do not separate this data from all other state employment.
- Fire expenditures — Forest fires cause billions of dollars of damage and also result in millions of dollars of expenditures in Oregon every year. We collected data on a very wet year and found \$89 million was spent in Oregon on fire suppression costs. Typically, this figure would be much higher. Most of these expenditures are through contracts (more than half is for aircraft operations). These expenditures are not reported in IMPLAN. Other secondary data sources miss most of these earnings.
- Forestry and environmental consulting — A significant amount of earnings are tied to consulting work and other professional services linked to forest policy and forest management. IMPLAN and other secondary data sources do not capture much of this income. Some of this income is reported in a variety of professional services industries that include services not related to forest policy or management. As more USFS and state agency operations are contracted out, it will be even more difficult to track these jobs, earnings and expenditures.

## Appendix IV — Economic Impact Summary Table

The following table presents the detailed results of our economic impact modeling of Oregon's forest sector. The tables show, for each sector group, total employment, industrial output and income (wage, proprietor, property and other income), along with the indirect and induced effects. In addition, we show the economic multipliers associated with each sector.

Multipliers are a means of calculating the economic impacts of changes in economic activity. They allow policymakers to understand and predict the secondary impacts of a direct or primary change in the economy. They show how an initial change causes spending to propagate through the economy. They predict both the geographic and structural aspects of these associated impacts. In so doing, they demonstrate the interdependence of industries in the economy for goods and services. Their use and application has helped educate businesses and the general public about the nature of vertical and horizontal integration of the economy.

Multipliers that only show indirect impacts are called Type I multipliers. For example a Type I multiplier shows how changes in sawmill production affect the logging sector and entire chain of suppliers linked to the mill either on the input side (via the production function) or the output side (via sales to other industries). Type I multipliers are useful because they show the adjustment the economy makes over a short time horizon. For example, when a sawmill closes, logging jobs are lost almost immediately.

Type II multipliers include "induced effects" of payroll spending of workers employed in the industries linked to a sawmill. When a mill is closed, sawmill workers, loggers and all other workers tied indirectly to the mill curtail their spending. This payroll is lost from the income structure of the local economy. Industries that supply goods and services associated with that payroll spending feel the effects of that lost payroll income fairly immediately. It may take them economy months or years to make the adjustment to this lost income, so Type II multipliers describe more intermediate-range changes in the economy. Type II multipliers assume a linear relationship between spending and economic change, so as spending increases, economic growth or contraction responds in a linear fashion.

Economists have noted that this type of multiplier ignores a large portion of the income in the economy. In particular, a large share of income in the economy comes from unearned income. Unearned income includes investment income, retirement income, and transfer payments such as social security and public assistance.

Other types of outside income are important to understanding the economy of certain areas. Commuting is a major factor in outlying counties of major metropolitan areas like Portland. For example, residents of Columbia County receive more than half their earned income from commuting to the Portland metro area. Commuting brings millions of dollars of labor income into the counties surrounding Portland.

**Economic Impact of Oregon’s Forest Sector — Summary Table**

IO Code	Industry Description	Jobs	Industry Output	Employee Compensation	Proprietor Income	Other Property Income	Total Income	Indirect Effects	Induced Effects	Type I Multiplier	Type II Multiplier
<b>Forestry Support</b>		<b>Millions of Dollars</b>									
6	Forest nurseries, greenhouses and forest gathering	536	40.13	17.49	2.84	4.82	25.15	0.306	0.598	1.306	1.904
15	Timber tract production	2,117	264.18	1.00	135.89	29.83	166.72	0.145	0.746	1.145	1.891
16	Commercial logging	8,054	1,136.46	371.50	329.99	-	701.49	0.314	0.738	1.314	2.052
205	Construction machinery manufacturing	466	255.12	29.15	0.08	22.91	52.14	0.389	0.231	1.389	1.621
207	Other industrial machinery manufacturing	1,449	305.72	84.96	0.28	12.04	97.28	0.457	0.414	1.457	1.872
19	Support activities for agriculture and forestry	6,433	202.15	128.38	26.33	(7.62)	147.09	0.214	0.776	1.214	1.990
<b>Total Forestry Support</b>		19,055	2,203.76	632.48	495.41	61.98	1,189.87				
<b>Primary Forest Products Manufacturing</b>											
95	Sawmills and wood preservation	6,340	1,447.50	312.71	5.85	37.38	355.94	0.742	0.536	1.742	2.278
96	Veneer and plywood manufacturing	4,899	851.39	270.02	5.78	0.91	276.71	0.669	0.588	1.669	2.257
104	Pulp mills	1,603	1,247.56	166.58	9.61	116.59	292.78	0.610	0.354	1.610	1.964
105	Paper mills	815	592.06	74.89	4.14	97.16	176.19	0.468	0.286	1.468	1.754
106	Paperboard mills	917	716.58	91.61	4.99	100.78	197.38	0.507	0.309	1.507	1.816
107	Paperboard container manufacturing	910	343.47	64.45	3.13	15.38	82.96	0.617	0.352	1.617	1.969

IO Code	Industry Description	Jobs	Industry Output	Employee Compensation	Proprietor Income	Other Property Income	Total Income	Indirect Effects	Induced Effects	Type I Multiplier	Type II Multiplier
<b>Primary Forest Products Manufacturing (con't)</b>		<b>Millions of Dollars</b>									
108	Coated and laminated paper, packaging paper and plastics film manufacturing	340	144.47	24.14	1.47	17.48	43.09	0.453	0.292	1.453	1.745
109	All other paper bag and coated and treated paper manufacturing	360	119.95	19.43	0.88	5.81	26.12	0.511	0.297	1.511	1.809
110	Stationery product manufacturing	80	27.80	6.06	0.26	2.33	8.65	0.529	0.365	1.529	1.894
111	Sanitary paper product manufacturing	300	249.30	28.47	1.63	72.44	102.54	0.340	0.210	1.340	1.550
112	All other converted paper product manufacturing	62	19.38	4.25	0.14	1.83	6.22	0.509	0.374	1.509	1.882
31	Electric power generation, transmission and distribution	62	2.55	3.00	-	-	3.00	0.071	0.231	1.071	1.302
<b>Total Primary Forest Products Manufacturing</b>		16,688	5,762.01	1,065.61	37.88	468.09	1,571.58				
<b>Secondary and Tertiary Wood Products Manufacturing</b>											
	Wood chips, bark and residuals	973	109.75	45.73	-	-	45.73	-	-	-	-
97	Engineered wood member and truss manufacturing	1,258	196.12	56.38	0.15	0.73	57.26	0.703	0.507	1.703	2.210
98	Reconstituted wood product manufacturing	1,567	510.37	91.03	2.15	144.98	238.16	0.364	0.298	1.364	1.661

IO Code	Industry Description	Jobs	Industry Output	Employee Compensation	Proprietor Income	Other Property Income	Total Income	Indirect Effects	Induced Effects	Type I Multiplier	Type II Multiplier
<b>Secondary and Tertiary Wood Products Manufacturing (con't)</b>		<b>Millions of Dollars</b>									
99	Wood windows and doors and millwork manufacturing	5,078	808.75	236.81	5.44	28.44	270.69	0.621	0.495	1.621	2.115
100	Wood container and pallet manufacturing	622	76.85	23.81	0.52	7.06	31.39	0.454	0.455	1.454	1.909
101	Manufactured home (mobile home) manufacturing	1,330	186.74	58.34	1.11	(1.92)	57.53	0.396	0.421	1.396	1.816
102	Prefabricated wood building manufacturing	260	36.82	11.68	0.27	1.90	13.85	0.566	0.495	1.566	2.061
103	Miscellaneous wood product manufacturing	754	116.89	29.45	0.66	1.87	31.98	0.742	0.508	1.742	2.251
295	Wood kitchen cabinet and countertop manufacturing	2,649	294.52	89.02	1.68	(10.77)	79.93	0.667	0.506	1.667	2.174
296	Upholstered household furniture manufacturing	256	33.95	6.65	0.13	2.99	9.77	0.404	0.314	1.404	1.718
297	Nonupholstered wood household furniture manufacturing	366	40.66	11.99	0.27	5.03	17.29	0.427	0.420	1.427	1.846
300	Wood television, radio and sewing machine cabinet manufacturing	313	67.02	12.96	0.45	15.83	29.24	0.534	0.361	1.534	1.894
301	Office furniture and custom architectural woodwork and millwork manufacturing	433	48.14	16.39	0.32	2.39	19.10	0.477	0.474	1.477	1.951
<b>Total Second and Tertiary Forest Products Manufacturing</b>		<b>15,858</b>	<b>2,526.58</b>	<b>690.24</b>	<b>13.15</b>	<b>198.53</b>	<b>901.92</b>				

IO Code	Industry Description	Jobs	Industry Output	Employee Compensation	Proprietor Income	Other Property Income	Total Income	Indirect Effects	Induced Effects	Type I Multiplier	Type II Multiplier	
<b>Transportation and Distribution of Forest and Wood Products</b>			<b>Millions of Dollars</b>									
333	Transport by rail	110	33.26	10.22	0.11	6.59	16.92	0.439	0.453	1.439	1.892	
334	Transport by water	263	169.07	24.26	16.59	41.17	82.02	0.339	0.361	1.339	1.700	
335	Transport by truck and helicopter	3,421	410.25	137.08	46.17	32.38	215.63	0.354	0.579	1.354	1.933	
340	Wholesale trade, warehousing and storage	3,039	21.12	11.84	0.84	-	12.68	0.317	0.594	1.317	1.911	
<b>Total Transportation and Distribution of Forest and Wood Products</b>		<b>6,833</b>	<b>633.70</b>	<b>183.40</b>	<b>63.71</b>	<b>80.14</b>	<b>327.25</b>					
<b>Forestland Management</b>												
381	Management of companies and enterprises (forest products)	1,304	24.00	258.40	c	c	258.40	0.375	0.628	1.375	2.003	
<b>Government Forestry Operations</b>												
	USFS	4,046	325.34	191.29	-	-	191.29	0.551	0.275	1.551	1.825	
	ODF	616	25.87	38.81	-	-	38.81	0.675	0.532	1.675	2.207	
<b>Private Consultants</b>												
	Forest share of consulting	6,647	718.83	289.54	133.10	4.17	426.81	0.443	0.643	1.443	2.086	
<b>Total Forestland Management</b>		<b>12,613</b>	<b>1,094.04</b>	<b>778.04</b>	<b>133.10</b>	<b>4.17</b>	<b>915.31</b>					
<b>Forest Dependent Industries</b>												
	Forest recreation share	5,026	432.23	162.82	61.70	32.99	257.51	0.316	0.695	1.316	2.011	
<b>Total Forest-Dependent Industries</b>		<b>5,026</b>	<b>432.23</b>	<b>162.82</b>	<b>61.70</b>	<b>32.99</b>	<b>257.51</b>					
<b>Grand Total</b>		<b>76,072</b>	<b>12,652.32</b>	<b>3,512.59</b>	<b>804.95</b>	<b>845.90</b>	<b>5,163.44</b>					

Source: Forest Econ Inc., (input-output models)

## Appendix V – Acknowledgements

The Oregon Forest Resources Institute gratefully acknowledges the support, participation, counsel and expert advice of the following people who contributed to this report:

### **OFRI Board of Directors**

Ray Jones, Board Chair, Stimson Lumber Co.  
Calli Daly, Board Vice Chair, Georgia-Pacific, LLC  
Jennifer Allen, Portland State University  
Jennifer Beathe, Starker Forests, Inc.  
Dave Furtwangler, Cascade timber Consulting, Inc.  
Anne Hanschu, Little Beaver Creek Tree Farm  
Bill Kluting, Carpenters Industrial Council  
Greg Miller, Weyerhaeuser Company  
Wade Mosby, The Collins Companies  
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Bobby Brunoe, Confederate Tribes of the Warm Springs Reservation  
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Kent Connaughton, Region 6 United States Forest Service  
Bruce Daucsavage, Ochoco Lumber Company  
Doug Decker, Oregon Department of Forestry  
Jim Geisinger, Associated Oregon Loggers  
Eric Hansen, Oregon State University College of Forestry  
Betsy Johnson, Oregon State Senator  
Bryan Johnson, DR Johnson Lumber Company  
Ray Jones, Stimson Lumber Company  
David Koch, Oregon International Port of Coos Bay  
Mark Labhart, Tillamook County Commissioner  
Greg Miller, Weyerhaeuser Company  
Gary Moore, Cascade Wood Products  
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Bettina Von Hagen, Ecotrust Forest Management, Inc.  
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## Endnotes

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<sup>1</sup> A polygon of land in forest use of at least 640 acres. The polygon has fewer than five structures per 640 acres, and these structures are scattered generally across the polygon. Forestland occupies more than 80 percent of the polygon, and the remainder is agricultural or “other” (naturally non-vegetated) land. In eastern Oregon, the remainder can also include rangeland.

<sup>2</sup> Derived from FIA plot data for 2001-09 remeasurements.

<sup>3</sup> See the FRCC website for details: [www.frames.gov/portal/server.pt/community/frcc/309/about\\_frcc/1793](http://www.frames.gov/portal/server.pt/community/frcc/309/about_frcc/1793)  
Based on: Schmidt et al., 2002

<sup>4</sup> [www.democratherald.com/news/local/article\\_1e11d8c4-110a-11df-b04b-001cc4c03286.html](http://www.democratherald.com/news/local/article_1e11d8c4-110a-11df-b04b-001cc4c03286.html)

<sup>5</sup> Estimated to be about 15 percent between 1990 and the market peak in 2005.

<sup>6</sup> For further analysis of timber supplies in western Oregon, see Schillinger et al., 2003; Adams and Latta, 2007; and Adams et al., 2002.

<sup>7</sup> See Gale et al., 2012, for a review of these trends.

<sup>8</sup> Wages and benefits as reflected in The Beck Group benchmarking study. The B.C. figure is based on a small sample, but it is probably representative of the industry in that region.

<sup>9</sup> Average lumber output as reflected in The Beck Group benchmarking studies.

<sup>10</sup> The Beck Group has limited output data from the interior of B.C., and so cannot provide an approximate figure.

<sup>11</sup> Sources: U.S. Census Bureau (housing starts, home prices); Western Wood Products Association Statistical Yearbooks (lumber volume); Random Lengths (lumber price).

<sup>12</sup> A #2 sawlog is at least 12 inches in diameter on the small end; a #3 sawlog is between 6 and 12 inches on the small end. Significant premiums still exist for larger logs.

<sup>13</sup> We use a factor of 4.53 m<sup>3</sup>/1 MBF to convert cubic meters for this discussion. Actual conversions are variable depending on species and log size.

<sup>14</sup> FAO of the United Nations (FAOSTAT Forestry Trade Flows)

<sup>15</sup> U.S. Energy Information Administration (1 Oregon home = 11.6 MWh/yr)

<sup>16</sup> U.S. Energy Information Administration (1 Pacific Northwest home = 44.1 thousand Btu/year)

<sup>17</sup> Forest Biomass Working Group Strategy Presentation, 2012.

<sup>18</sup> Oregon’s Renewable Portfolio Standard (ORS 469A), 2011.

<sup>19</sup> ORS 469A.205 (2)(c) and (2)(d).

<sup>20</sup> ORS 469A.205 (3).

<sup>21</sup> As of the date of this report, the governor has not signed the bill.

<sup>22</sup> HB 3672 Summary (ODOE).

<sup>23</sup> Nameplate capacity refers to the intended technical full-load sustained output of a facility, usually expressed in Megawatts.

<sup>24</sup> ODF Data Information and Reporting for Sustainability Indicator A.c. ODF's Sustainable Forestry Indicators provide the Board of Forestry, policymakers and the public with information describing the environmental, economic and social conditions of the state's public and private forests.

<sup>25</sup> ODF Data Information and Reporting for Sustainability Indicator C.a.

<sup>26</sup> The BEA data have paper manufacturing as NAICS code 322, Paper Manufacturing. It is not broken down further. This category comprises two manufacturing industries: 1) Pulp and Paper, and 2) Converted Paper Product. It is the presence of Converted Paper Product that is associated with manufacturers that use Pulp and Paper in their production process. We have some of both these industries in Oregon, being vertically integrated. But Converted Paper Product manufacturers can be in various locations, even states without a forest industry. This spreads output across more U.S. states, but the ratio has at times been slightly above two.

<sup>27</sup> OFRI informal research and estimation.

<sup>28</sup> Personal communication, OFRI.

<sup>29</sup> SAF Western Forester, Volume 57, Number 2, March/April/May 2012.

<sup>30</sup> Oregon State University's Oregon Wood Innovation Center: [owic.oregonstate.edu/about-owic](http://owic.oregonstate.edu/about-owic)

<sup>31</sup> Softwood Lumber Board: [www.softwoodlumberboard.org/?page=Check\\_Off](http://www.softwoodlumberboard.org/?page=Check_Off)

<sup>32</sup> Forest2Market, January 2011 Forest2Mill Newsletter

<sup>33</sup> WoodWorks: [www.woodworks.org](http://www.woodworks.org)

<sup>34</sup> Funding of these programs includes direct financial support, technical assistance and related administrative costs. Dollar amounts refer to actual expenditures unless otherwise noted.

<sup>35</sup> The Forest Legacy Program and the Forest Stewardship Program were suspended in 2010. The programs provided a combined \$33,278 in 2009. Starting in 2010, ARRA funds offset the suspension of the program. ARRA funds provided \$898,440 in 2010 and \$3,611,237 in 2011. ARRA funds are one-time only.

<sup>36</sup> ATFS — State Fact Sheet: [www.treefarmssystem.org/stuff/contentmgr/files/1/dc9182c558481b08b8d1e65c769dd95f/files/or\\_factsheet.pdf](http://www.treefarmssystem.org/stuff/contentmgr/files/1/dc9182c558481b08b8d1e65c769dd95f/files/or_factsheet.pdf)

<sup>37</sup> FSC US: [www.fscus.org](http://www.fscus.org)

<sup>38</sup> SFI: [www.sfiprogram.org](http://www.sfiprogram.org)

<sup>39</sup> [www.oregon.gov/dor/TIMBER/Pages/tax-receipts.aspx](http://www.oregon.gov/dor/TIMBER/Pages/tax-receipts.aspx)

<sup>40</sup> [www.oregon.gov/dor/TIMBER/Pages/2004\\_choosing.aspx](http://www.oregon.gov/dor/TIMBER/Pages/2004_choosing.aspx)

<sup>41</sup> The specially assessed values are the Oregon Department of Revenues determination of the real market values of land in Oregon that has as its “highest and best use” the growing and harvesting of marketable trees.

<sup>42</sup> The maximum specially assessed values are determined by the 1997 Measure 50 limitation, which allows for a maximum increase of 3 percent over the past year’s values.