Carbon Storage

Key Points

- Carbon stored on BLM-administered lands in the planning area and in wood harvested from BLM-administered lands in the planning area currently totals 427 million tonnes. This represents 1% of the total carbon stored in forests and harvested wood in the United States, and 0.02% of the global carbon storage in vegetation, soil, and detritus.

Forests store carbon, which affects atmospheric concentrations of carbon dioxide, and thereby affects global climate (Forster et al. 2007, p. 135; and Denman et al. 2007, pp. 514-518). Forest management can provide a source of carbon dioxide (e.g., through deforestation and conversion to non-forest land uses), or it can provide a sink of carbon dioxide (e.g., through forest growth or afforestation). In the United States, forests have represented a carbon sink throughout the last century (Birdsey et al. 2006). Forests and harvested wood in the United States currently represent a carbon pool of 43.9 billion tonnes (U.S. EPA 2007, p. 7-7). (Note: Most scientific literature on carbon storage at the scale of this analysis reports carbon amounts in tonnes [also known as metric tons, which are equal to approximately 2,205 pounds]. See, for example, DOE 2007, Smith et al. 2006, and Brown et al. 2004a.)

Forest management in the United States currently represents an annual accumulation of 191 million tonnes of carbon, which represents an offset of approximately 11% of total carbon emissions in the United States (U.S. EPA 2007). Globally, the vegetation, soil, and detritus currently store 2.3 trillion tonnes of carbon (Denman et al. 2007, p. 515). Atmospheric carbon in the form of carbon dioxide is increasing at a rate of 3.2 to 4.1 billion tonnes of carbon per year (Denman et al. 2007, p. 512).

It is not possible to describe precisely and accurately the total storage of carbon in forests on BLM-administered lands or in wood harvested from BLM-administered lands, because there is incomplete and unavailable information on the current inventory of carbon storage and the effect of forest management on carbon storage, as described below. However, it is possible to approximate the current condition of these pools of carbon storage using some broad generalizations and assumptions that are consistent with current theoretical approaches. Additional information on this analysis is provided in *Appendix C- Carbon Storage Modeling*.

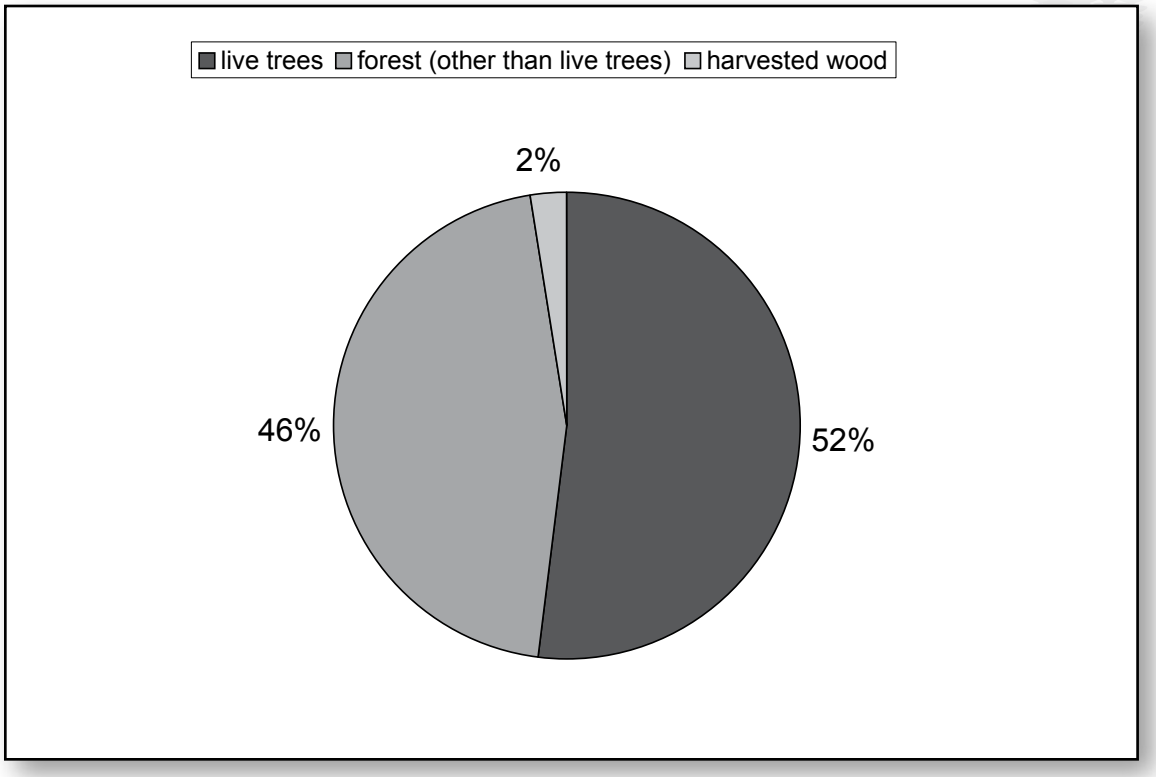
Currently, a total of 427 million tonnes of carbon is stored in BLM-administered lands in the planning area and wood previously harvested from BLM-administered lands in the planning area. This represents 1% of the total carbon currently stored in forests and harvested wood in the United States, and 0.02% of the total carbon stored in vegetation, soil, and detritus globally.

Carbon storage related to forest management can be divided into three pools:

- live trees
- forest carbon other than live trees
- harvested wood

Live trees include the carbon in foliage, branches, stems, bark, and live roots of all trees, regardless of whether the trees are merchantable as timber. Live tree carbon is derived in this analysis using outputs from the OPTIONS model (described in *Introduction, Analytical Methodologies and Models* in *Chapter 4*) for tree volume over time for each alternative. Species-specific conversion factors convert cubic-foot tree volume to carbon mass. An expansion factor is then applied to the carbon mass to account for the entire tree, including branches, bark, and roots. See *Appendix C - Carbon Storage Modeling*.

Figure 3-17. Current Carbon Storage



Estimations of carbon in live trees generally involve the least uncertainty of all carbon pools associated with forest management. Forest inventory data on live trees is more detailed and reliable than data on other forest carbon pools. This analysis derives live tree volumes from the OPTIONS modeling results, which are based on detailed forest inventory data specific to the planning area and site-specific growth and yield curves (see *Appendix R – Vegetation Modeling*). The site-specific data yields results with greater precision and accuracy than the regional averages in Smith et al. (2006), which provided confidence intervals for the values for live trees carbon of plus or minus 1.7% (Smith et al. 2006, p. 41). Using an expansion factor to account for the entire tree introduces more uncertainty into the estimations. The correlation between above-ground and below-ground biomass in trees is variable among species, stand age, and stand structure (Litton et al. 2007, Lehtonen et al. 2004). For example, carbon inventories in a series of stands in the Coast Range and West Cascades (Smithwick et al. 2002) reported carbon values in different tree components that would reflect expansion factors ranging from 1.66 to 2.00 (with a median average of 1.85, which is consistent with the expansion factor used in this analysis). However, there is no inventory information on which to base more refined expansion factors for trees in the planning area.

There are 222 million tonnes of carbon currently stored in live trees on BLM-administered lands in the planning area. Live trees represent the largest pool of carbon in forests. See *Figure 3-17 (Current carbon storage)* and *Figure 3-18 (Historical and current carbon storage)*.

The amount of carbon stored in live trees calculated in this analysis is lower than if calculated from the regional averages in Smith et al. (2006). Although the values in Smith et al. (2006) are generally consistent with the values in this analysis for future development of managed stands on highly productive sites, they are much higher than the values in this analysis for unmanaged stands or stands on low productivity sites, which cover the majority of the planning area. As explained above, the values derived from the OPTIONS modeling in this analysis provide a more reliable analysis of carbon stored in live trees than the regional average values in Smith et al. (2006).

Table 3-6. Carbon In Forests (Other Than Live Trees) By Structural Stage

Structural Stage	Tonnes of Carbon/Acre
Stand establishment	67.8
Young	70.3
Mature	88.2
Developed Structurally Complex	94.8
Existing Old Forest	130.9

The pool of forest carbon other than live trees includes:

- dead wood (snags, coarse woody debris, stumps, and dead roots)
- plants other than trees (shrubs and other plants)
- litter (fine organic debris on the soil surface)
- soil organic carbon

The biomass in dead wood, shrubs and other plants, and litter, and soil organic carbon likely vary tremendously within the planning area (Page-Dumroese and Jurgensen 2006, Smithwick et al. 2002, Harmon 2001). However, inventory information for dead wood is poor, and inventory information for shrubs and litter levels and soil organic carbon on BLM-administered lands is unavailable.

Smith et al. (2006) and DOE (2007) provide regional averages for carbon stored in dead wood, plants other than trees, litter, and soil organic carbon. These values quantify the amount of carbon in each of these pools for Pacific Northwest Douglas-fir forests of different ages. This analysis uses these regional average values to calculate a total amount of carbon for forests (other than live trees) for each of the following structural stages: stand establishment, young, mature, and developed structurally complex. The values in Smith et al. (2006) and DOE (2007) only estimate carbon pools for stands up to 125 years of age. The values for a 125-year old forest would likely under-estimate the carbon in older forests (Harmon et al. 2004, Smithwick et al. 2002). Therefore, this analysis uses values for existing old forest from Smithwick et al. (2002) derived from empirical measurements in old-growth stands. The values from Smithwick et al. (2002) for stands in the Oregon Coast Range and Oregon West Cascades were averaged to obtain a value for forests classified in this analysis as existing old forest. See *Table 3-6 (Carbon in forests [other than live trees] by structural stage)*.

The carbon storage on BLM-administered non-forest lands is calculated using regional average carbon values from Brown et al. (2004b) for shrublands and woodlands. Carbon storage in forests on BLM-administered lands in eastern Klamath Falls Resource Area is calculated using regional average carbon values from Smith et al. (2006) for Pacific Northwest east-forest types.

There are 195 million tonnes of carbon currently stored in forests (other than live trees) on BLM-administered lands in the planning area.

As noted by Smith et al. (2006), estimates of these carbon pools are based on regional averages and reflect the current best available data for developing regional estimates. These values do not account for variation among forest stands within these structural stages. Empirical data from Smithwick et al. (2002) demonstrates the high variability of carbon amounts among stands that would be classified with the same value in this analysis. Quantitative expressions of uncertainty are not available for most of these estimations (Smith et al. 2006, p. 17). However, Smith et al. (2006) provided confidence intervals for the values for carbon in standing dead trees of plus or minus 18.5% (Smith et al. 2006, p. 41). Uncertainty associated with soil carbon is not quantifiable, but is likely higher than the uncertainty associated with standing dead trees.

Carbon is also stored in harvested wood (Ruddell et al. 2007). Quantifying the storage of carbon in harvested trees is challenging because of the variability in the product life of harvested wood, the amount of product recycling, and the fate of disposed harvested wood (Skog and Nicholson 2000). Some of the

carbon in harvested wood is lost in processing and some is lost through disposal, such as burning and decay. However, disposal in landfills results in only partial loss of carbon, and some portion of the carbon in landfilled products continues to be stored (U.S. EPA 2007, Smith et al. 2006). Calculating the carbon stored in wood products from previous harvests is even more challenging than calculating the carbon stored in wood products from current harvests, because all of the variables described above have changed over time. For example, harvesting and processing have become more efficient, resulting in a greater portion of harvested wood in products. Disposal in open dumps previously resulted in rapid decay and loss of carbon, whereas current disposal in landfills results in slower decay and longer carbon storage (Woodbury et al. 2007, U.S. EPA 2007). Considering these factors, the currently published values for the portion of carbon in harvested wood that is in products in use, landfills, burned for energy, and emitted that are derived from DOE (2007) and Smith et al. (2006) may not be accurate for past harvesting. Because of incomplete and unavailable information on the product life of harvested wood, the amount of product recycling, and the fate of disposed harvested wood from past harvests, it is not possible to quantify precisely or accurately the amount of carbon currently in storage from past harvests on BLM-administered lands in the planning area. Some estimation can be made using very broad generalizations, including the following three assumptions:

- using values from DOE (2007) and Smith et al. (2006) for the carbon stored in wood harvested from 1962 – 2005 (which over-estimates current storage from the harvests in the early part of that period)
- no carbon storage in wood harvested before 1962 (which under-estimates current storage from those harvests)
- no carbon storage from past harvest of pulpwood or chips (which under-estimates current storage from those harvests), because the fate of carbon in pulpwood or chips from past harvests is speculative, given the changes in disposal over the past decades (Woodbury et al. 2007, U.S. EPA 2007)

There are 11 million tonnes of carbon currently stored in wood harvested from past timber harvests on BLM-administered lands in the planning area. This represents approximately 2% of the amount of total carbon currently stored in forests and harvested wood in the planning area, which is lower than the national proportion. Carbon stored in harvested wood represents 5% of the total carbon currently stored in forests and harvested wood and forests nationally (U.S. EPA 2007, p. 7-7). The proportion in this analysis may be lower than the proportion nationally because of the following:

- This analysis may under-estimate the carbon stored in wood products from past harvests, as explained above.
- There is more unharvested forest in the planning area than nationally (Moeur et al. 2005).
- Forests in the planning area typically accumulate more carbon than forests nationally (Smith et al. 2006, Smithwick et al. 2002).

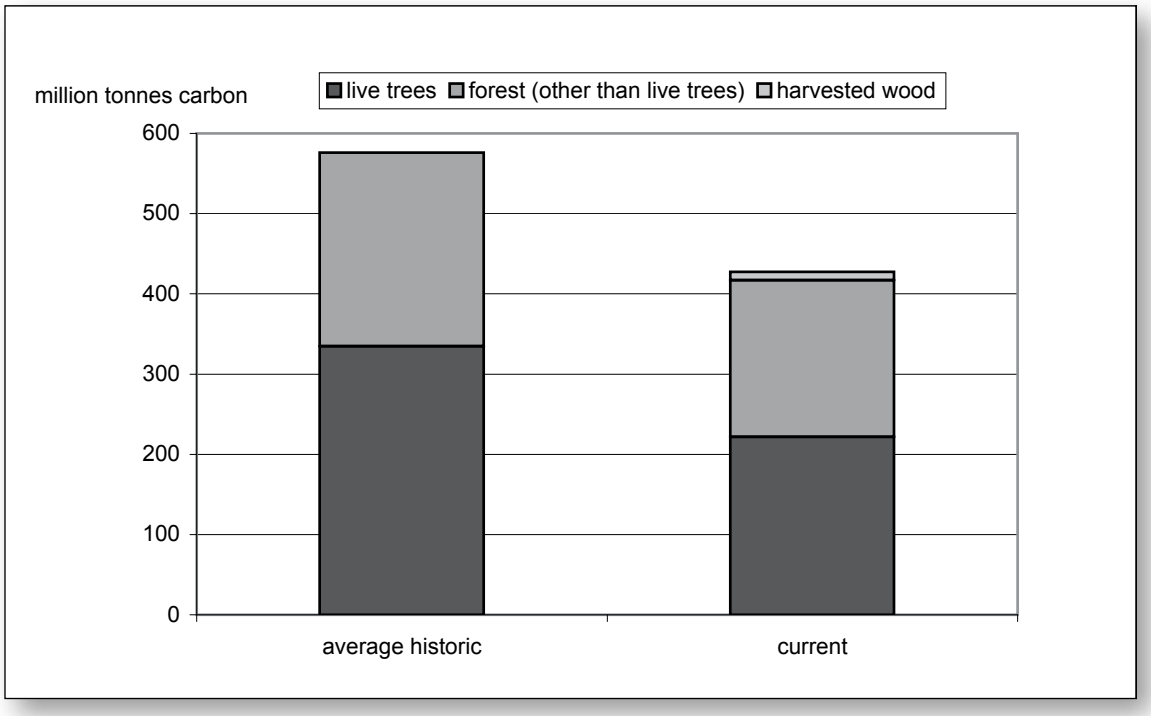
Quantitative expressions of uncertainty are not available to estimate carbon stored in harvested wood using the regional values from Smith et al. (2006, pp. 17-18). As noted by Smith et al. (2006, p. 18), the variabilities over time and within a region are more important sources of uncertainty than the values for partitioning the carbon in harvested wood into different pools. The Environmental Protection Agency (U.S. EPA 2007) calculated the uncertainty associated with analyzing the change in carbon stored in harvested wood products nationally at 24% to 26%.

Current carbon storage can be compared to the carbon stored in forests on BLM–administered lands under average historic conditions. Unlike current conditions, live tree carbon under average historic conditions cannot be modeled directly using inventory data and OPTIONS outputs. However, live tree carbon values from DOE (2007) and Smith et al. (2006) over-estimate carbon in live tree for the planning area based on comparison to site-specific inventory data. The values from DOE (2007) and Smith et al. (2006) would be particularly inappropriate for calculating live tree carbon under average historical conditions, because those

values are intended to represent managed stands (Smith et al. 2006, p. 11). For this analysis, live tree carbon values for each structural stage are based on average values of carbon stored in live trees per acre for each structural stage in current inventory. The values for carbon stored in forests (other than live trees) for each structural stage are derived from DOE (2007) and Smith et al. (2006) as described above. The abundance of structural stages under average historic conditions is derived from Nonaka and Spies (2005), as described in *Forest Structure and Spatial Pattern* in *Chapter 3*.

Under average historic conditions, BLM-administered lands in the planning area stored 576 million tonnes of carbon, which is 35% more carbon than is currently stored in forests and harvested wood in the planning area. See *Figure 3-18 (Historical and current carbon storage)*. These results are consistent with other studies that found the harvest of mature and structurally complex forest in this region would generally result in a net loss of carbon storage that would not be offset by storage in harvested wood or regained by forest growth for more than a century (Krankina and Harmon 2006, Janisch and Harmon 2002).

Figure 3-18. Historical And Current Carbon Storage



Socioeconomics

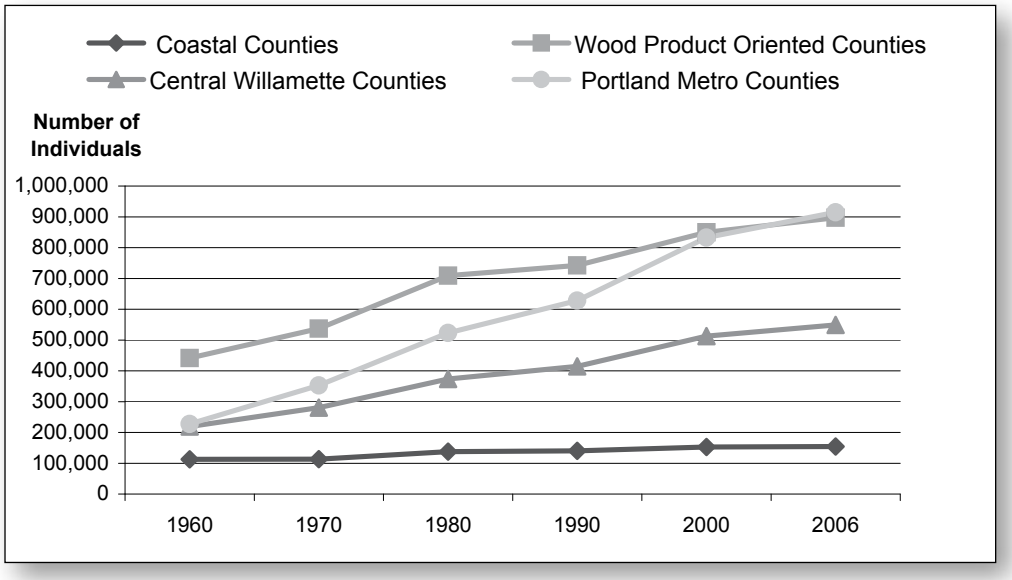
Key Points

- A comprehensive measure of community health and resiliency does not exist.
- The Oregon primary wood products sector employs 51,900 workers who earn $1.9 billion annually, which is about 3.2% of Oregon's total wages.
- In total, the counties rely on BLM-associated revenues for about 2.7% of their budgets. The BLM revenues, however, account for 9.2% of their discretionary revenue ranging from less than 1% for larger metropolitan counties, to up to 70% for rural counties.
- Without funding under the Secure Rural Schools Act, the BLM payments to counties would fall about 90%.
- There is currently a strong market for wood products in western Oregon. There is adequate capacity to process larger logs that would come from BLM-administered lands.

Management of BLM-administered lands contributes to the economic activity in western Oregon communities and can be measured. For example, timber harvesting and manufacture of wood products creates jobs and income in these sectors, which in turn stimulates economic activity in other sectors of local and regional economies. The BLM employees and BLM management expenditures also contribute to local economies. Approximately 50% of revenues received from timber harvesting on O&C lands, furthermore, flow directly to the county governments and is used to fund a variety of social services and investments.

The BLM-administered lands contribute to employment and income in industries other than those related to lumber and wood products. Dispersed and developed recreation, commercial fishing, hunting, special forest products, mining, and grazing all contribute to the region's economies. The BLM's receipts from these activities in western Oregon are relatively minor compared to the timber program. Annual receipts from recreation are $1,200,000, from special forest products are $300,000, and from grazing are $30,000 to $40,000. Except for leasable minerals, non-timber resources and programs are not based on what the market will pay for these goods, opportunities, or services but are rather meant to augment appropriated funds to

Figure 3-19. Oregon Population Growth By County Group



support the administration of the programs. Recreation on BLM-administered lands in western Oregon provides economic benefits to the planning area. However, detailed information regarding the economics of recreation is not provided here because none of the alternatives would have a material effect on recreation.

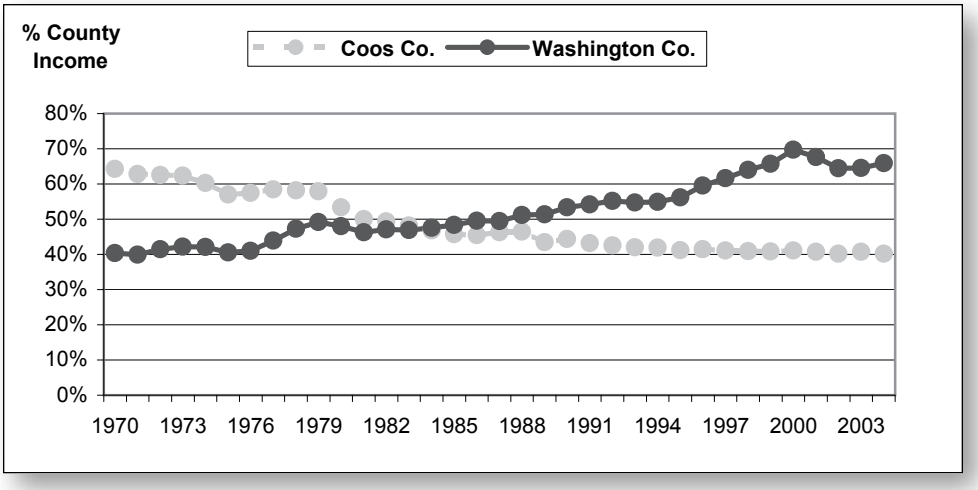
Oregon is a growth state with a history of relatively steady in-migration. The 2006 state population of 3.7 million has slightly more than doubled (109%) since 1960. In western Oregon, population growth is spatially concentrated and rates vary considerably by the nature of the economic base. See *Figure 3-19 (Oregon population growth by county group)*. Portland's metro counties (Clackamas, Columbia, and Washington, excluding Multnomah) started from a relatively low base, but grew three times more rapidly than the state (302%) during the same era. The central Willamette Valley counties (Benton, Marion, Polk, and Yamhill) grew 151%. Counties focused on wood products (Douglas, Jackson, Josephine, Klamath, Lane, and Linn) kept pace with state growth (103%). Only the coastal county group (Coos, Curry, Lincoln, and Tillamook) had population growth (37%) that was significantly below the state average.

County Economies

The economies of counties within the planning area typically had a resource-based history (agriculture and wood products). A dominance of public land ownership gave federal forest policy shifts large influences over the evolution of those economies. Through most of the twentieth century, increasing federal harvests expanded local wood products industries. Since World War II, technological progress gradually decreased worker/output ratios. During the 1990s, federal harvest reductions under the Northwest Forest Plan led to a reduction in wood products sector jobs, wages, and salaries in most of the county economies.

Changes in county economies vary by county. There are differences in timber substitution capacity, contemporary economic diversity, and opportunities for alternative economic development. See *Figure 3-20 (Coos and Washington county wage and salary income as a percent of total income)*. Both Coos and Washington counties experienced declining wage and salary income from the wood products sector but differed in the nature of income replacement. In Coos County, the percentage of income attributable to wages and salaries declined continuously due to decreasing wood products manufacturing and an increasing share of unearned income derived from retirement. Growth in the diversified Washington County economy, on the other hand, replaced resource sector incomes with increased wages in other developing sectors. The comparison in *Figure 3-20* is presented in proportional terms to normalize the fact that the Washington County economy is 25 times larger than that of Coos County.

Figure 3-20. Coos And Washington Counties' Wage And Salary Income As A Percent Of Total Income



In most cases, these new trajectories become permanent redirections. Because returning these economies to their historic structures is unlikely, this analysis considers the 2005 base year structure as a stable reference point for evaluating any new economic changes.

The economies of the O&C counties vary in the magnitude, type, and diversity of their economic activity. These differences influence how new external effects might change the patterns of each economy. The initial size of each county economy can be profiled with three primary indicators: industrial output, total employment, and earnings. See *Table 3-7 (2005 county economy indicators)*.

These measures show a wide range of differences between the county economies. Curry County has a small economy with the region's lowest output, employment, and earnings. Washington County, on the other hand, has 49 times more industrial output, 25 times more employment, and 45 times more earnings than Curry County. More detailed indicators (not shown) reveal quality-of-life implications as well. For example, Curry County's average annual wage is $26,200 compared to $46,400 for Washington County.

The economic impact analysis (see *Chapter 4*) estimates the implications of three large external effects on each county economy between the base reference year of 2005 and the impact year of 2009.

These large external effects on each county are (Adams and Latta 2007):

- loss of Secure Rural School payments to counties
- the BLM's selection and implementation of one of the management alternatives in the plan revision
- structural changes in the plywood industry projected by the Western Oregon model described in *Chapter 4*.

Table 3-7. County Economy Indicators (2005)

County	Industrial Output ($1,000)	Employment (total jobs)	Earnings ($1,000)
Benton	4,208,367	37,603	1,416,139
Clackamas	19,046,826	197,405	6,994,767
Columbia	1,708,099	14,182	390,413
Coos	2,171,795	28,792	797,151
Curry	762,355	10,726	281,937
Douglas	4,732,462	52,770	1,469,009
Jackson	8,364,619	103,612	3,247,024
Josephine	2,676,289	37,253	1,033,446
Klamath	2,719,816	34,179	1,024,239
Lane	15,445,518	178,924	5,729,986
Lincoln	1,797,597	21,560	606,118
Linn	5,010,081	50,568	1,619,544
Marion	14,249,826	157,199	5,782,895
Polk	1,682,760	22,499	624,709
Tillamook	1,170,965	10,985	306,070
Washington	37,563,913	272,210	12,626,678
Yamhill	3,492,580	37,928	1,129,303
Region Total	**126,803,868**	**1,268,395**	**45,079,428**

By artificially isolating the first two policy-driven effects, the county-level input-output models can estimate the roles of each effect in these county economies. *Table 3-8 (2005 county economy dependence on Secure Rural Schools and BLM effects)* shows the relative influence of combined Secure Rural School payments and current BLM harvest levels as of 2005. Using current employment as an indicator of impact, *Table 3-8 also* shows that the Secure Rural School funding and BLM expenditures account for a very small portion of the jobs in Washington County and up to 4.18% of the jobs in Douglas County. Counties with small portions of their economies dependent on Secure Rural School and BLM activities (less than 0.5%) would likely experience little overall impact from projected changes.

Higher percentages in *Table 3-8* typically reflect a higher dependence on Secure Rural Schools funding, an economic concentration in woods products industries, and the location of BLM administrative units. Even though influence percentages appear small, their effects would be concentrated in specific sectors, which could intensify the effects of any changes.

Together, the three external effects are expected to cause somewhat countervailing impacts spread to different sectors. The loss of the Secure Rural School payments would reduce jobs and income in county government. Increased BLM timber harvesting would increase wood products employment, but industrial contractions in the plywood sector would reduce jobs there. As a result, the economic response in any county depends as much on the internal economic structure of the county as well as its overall size. *Table 3-9 (2005 county economy grouped income patterns)* classifies each county into one of four indicative types defined by their general economic structure and diversity. Each type would react to changes differently.

The indicative types that the counties fit into are described as follows:

- **Coastal.** Counties on the coast have a relatively small percent of income derived from wage and salary employment. Seasonal home spending is proportionately larger than the rest of Oregon, particularly nearer Portland on the northern coast. Curry County has relatively larger property income and transfers, indicating retirees with higher incomes.

Table 3-8. 2005 County Economy Dependence On Secure Rural Schools And BLM Effects

County	Industrial Output (%)	Employment (%)	Earnings (%)
Benton	0.23	0.31	0.28
Clackamas	0.18	0.13	0.16
Columbia	0.29	0.37	0.46
Coos	1.63	1.42	1.80
Curry	1.83	2.19	2.39
Douglas	4.33	4.18	4.70
Jackson	1.69	1.56	1.70
Josephine	1.40	1.26	1.57
Klamath	2.12	1.67	2.13
Lane	1.18	1.11	1.35
Lincoln	0.50	0.66	0.70
Linn	0.84	0.78	0.99
Marion	0.20	0.17	0.23
Polk	0.24	0.24	0.30
Tillamook	0.49	0.72	0.81
Washington	0.01	0.01	0.01
Yamhill	0.23	0.16	0.21
Region Total	**0.65**	**0.71**	**0.71**

Table 3-9. 2005 County Economy Grouped Income Patterns

Counties by Indicative Type	Sources of Income (%)					
	Wage and Salary	Business Profits	Unearned DIR	Unearned Transfers	Commuting	Seasonal Homes
Coastal Counties						
Coos	46	13	16	22	1	2
Curry	26	9	31	27	5	3
Lincoln	31	11	17	30	2	10
Tillamook	38	13	16	16	3	14
Wood Products						
Douglas	49	17	7	22	4	1
Jackson	53	13	16	16	2	0
Josephine	45	13	14	22	5	1
Klamath	39	19	19	28	2	2
Lane	53	16	14	15	3	1
Linn	44	13	10	16	17	0
Central Willamette						
Benton	47	17	18	8	8	0
Marian	53	13	11	13	10	0
Polk	30	7	16	13	33	0
Yamhill	40	12	12	12	23	0
Portland Metro						
Clackamas	41	14	12	8	25	0
Columbia	22	10	19	23	25	0
Washington	48	26	8	6	11	0

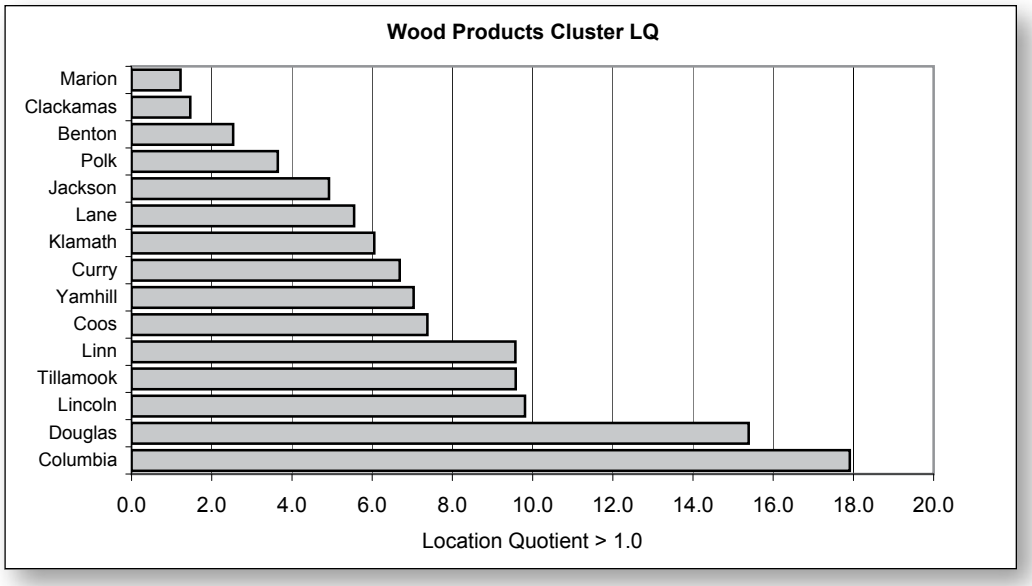
- **Wood Products.** Counties based on wood products combine the highest proportions of wage and salary income with lower property incomes. Linn County is a bit of anomaly because of its high commuting rates--presumably to high wage jobs in Salem, Corvallis, and Eugene.
- **Central.** Counties in the central Willamette Valley have significantly more commuting and earned income proportions (wage and salary income plus commuting). Earned income accounts for more than 60% of total income in these counties. These counties have the lowest overall percent of retirees and the lowest proportion of social security income.
- **Portland Metro.** Counties surrounding the Portland metropolitan area have very high commuting. Washington County has the lowest commuting, because its high tech jobs cluster is itself a job magnet. Retirement income (transfers) tends to be low except for Columbia County, which has a significant retiree population.

Another way of describing county economic structures is through location quotients. This index measures how the economic concentration for one economic sector in a county compares to the national average concentration for that same sector. A location quotient much larger than 1.0 in the wood products sector, for example, indicates that the county has a higher than average concentration in that sector, and may reflect a relatively specialized economic base that is more sensitive to changes.

Location quotients reveal that western Oregon is still a wood products region. County wood products cluster location quotients are very large for 15 of the O&C counties. See *Figure 3-21 (County economies with high wood products sector location quotients [LQ]*). The large number of high location quotients indicates how sensitive those county economies might be to BLM harvest changes.

Although several measures of socioeconomic well-being, community capacity, and community resiliency have been developed, no universally accepted measures exist. Community capacity and community

Figure 3-21. County Economies With High Wood Products Sector Location Quotients (LQ)

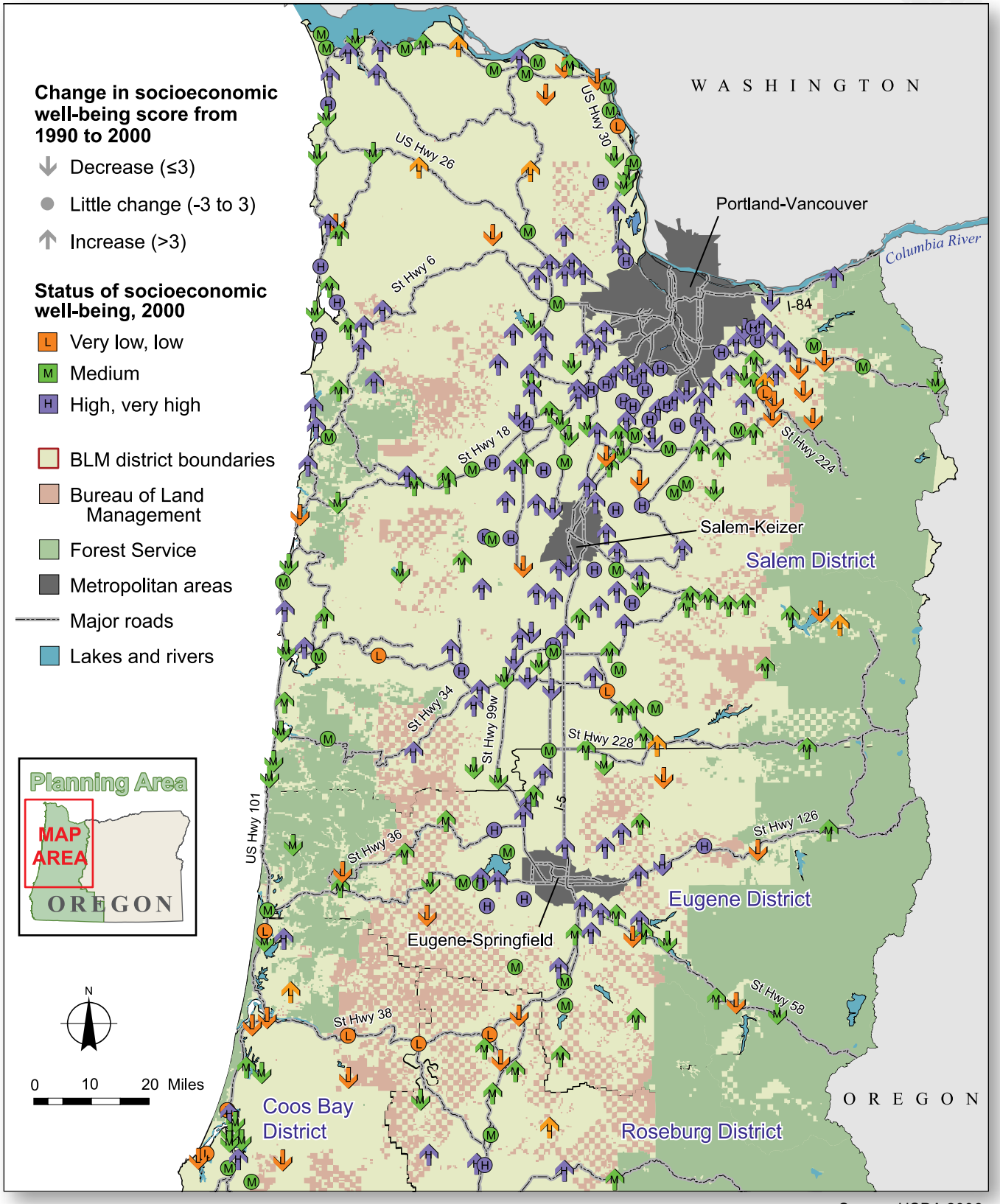


resiliency are fundamentally about dynamic processes that involve the actions of community leaders and residents. Leadership, social cohesion, and decision-making are important factors in how a community adapts to change and betters the lives of its residents, but they are not attributes that can be easily measured. Causality between changes in forest management policy and some community socioeconomic conditions is difficult to demonstrate. The social and economic well-being index and scores for western Oregon communities were developed as part of the Northwest Forest Plan Socioeconomic Economic Monitoring report (USDA USFS 2006a). The index consists of six indicators:

- diversity of employment by industry
- percentage of population that is 25 years and older with a bachelor's degree or higher
- percentage unemployed
- percentage of persons living below the poverty level
- household income inequality
- average travel time to work

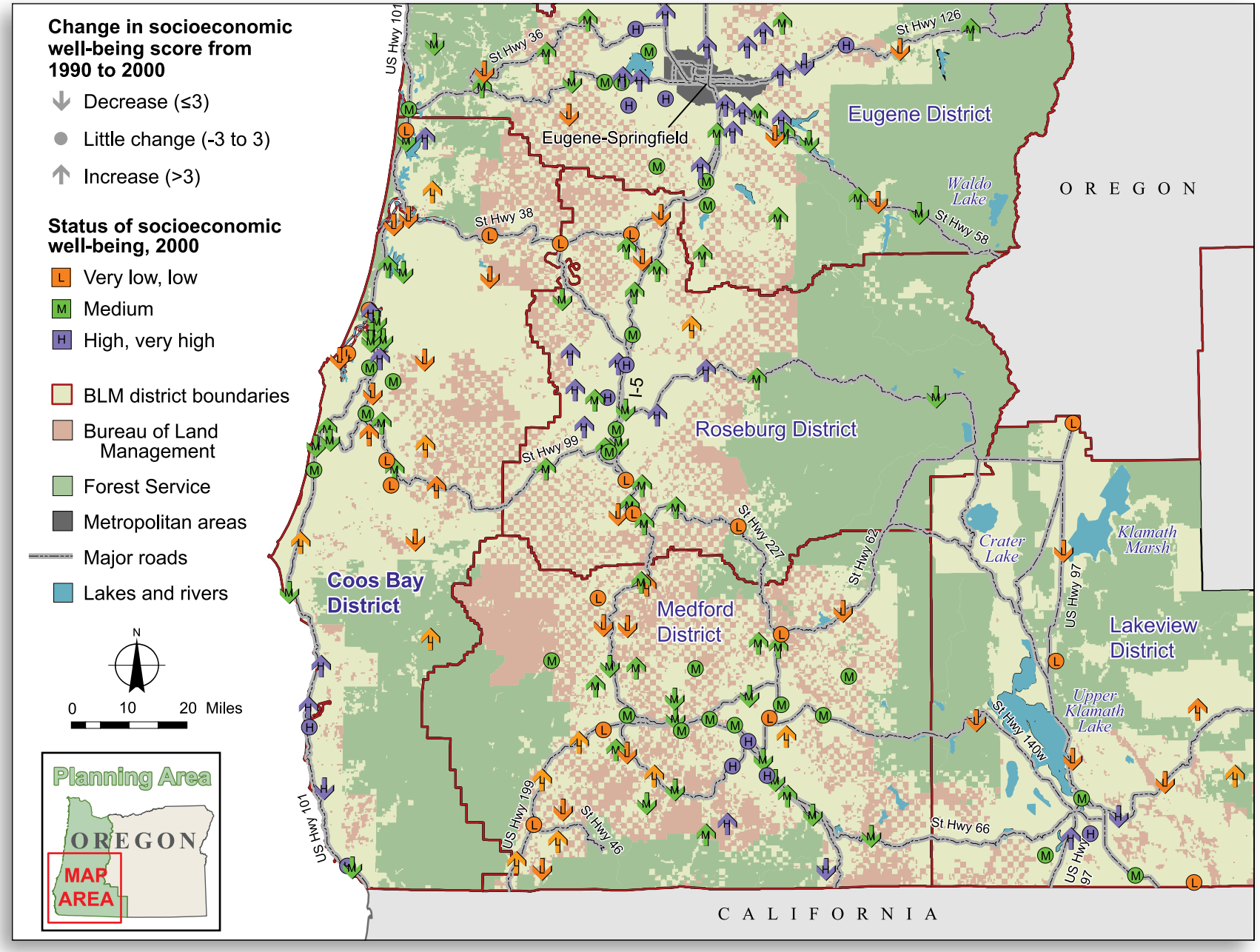
Many communities in western Oregon either increased or decreased in their social and economic well-being score between 1990 and 2000. See *Figure 3-22 (Change in socioeconomic well-being scores from 1990 to 2000 in the northern portion of the planning area)* and *Figure 3-23 (Change in the socioeconomic well-being scores from 1990 to 2000 in the southern portion of the planning area)* for a summary of the direction and magnitude of change in this index. The communities were examined by population size class: small, medium, and large communities. The smaller community size classes of 501 to 2,000 people had proportionately more communities with relatively lower social and economic well-being scores, whereas the larger population size classes of 2,001 to 5,000 people and 5,001 to 50,000 people had proportionately more communities with higher scores. Recent regional social assessments suggested that the higher the population in a rural community, the greater the infrastructure and the higher the socioeconomic resilience (Harris et al. 2000).

Figure 3-22. Change In The Socioeconomic Well-Being Scores From 1990 To 2000 In The Northern Portion Of The Planning Area



Source: USDA 2006a

Figure 3-23. Change In The Socioeconomic Well-Being Scores From 1990 To 2000 In The Southern Portion Of The Planning Area



Source: USDA 2006a

O&C Revenues and County Budgets

The O&C Act specifies that counties with O&C lands will receive 75% of the revenue generated from these lands. In 1953, the O&C counties agreed to receive 50% of the revenue, and that the other 25% would be used by the BLM for roads, reforestation and silvicultural treatments, recreation sites, fire protection, and other forest management. Historically, the bulk of the revenue generated from the BLM has been and continues to be associated with timber harvesting and is the focus of this discussion.

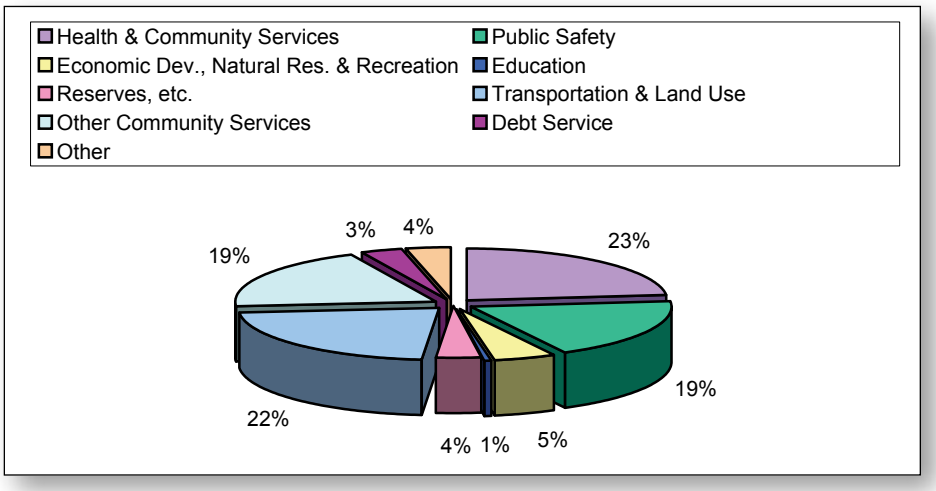
County governments provide a variety of public services. A survey of the O&C counties was conducted to understand the source and use of county revenues. See *Appendix D - Socioeconomics*. See *Table 3-10 (Public services that county revenues support)* for a list of service categories and the services within each category. Also see *Figure 3-24 (Fiscal year 2005 county expenditures)* for a summary of the $3.9 billion spent in fiscal year 2005 by the O&C counties.

County governments are funded from sources such as local taxes, transfers from federal and state governments, and fees and charges for services. In addition, the O&C counties receive 50% of the revenue

Table 3-10. Public Services That County Revenues Support

Service Categories	Types of Services	
Health and Community Services	Aging services	Veterans services
	Alcohol and drug addiction services	Public health services
	Services for children and families	Environmental health services
	Developmentally disabled	Housing services
	Mental health services	Medical examiner
	Oregon health plan services	Solid waste disposal/recycling
Public Safety	Trial courts	Community corrections
	District attorney	Court security
	County jail	Juvenile services
	911/emergency communications	County law library
	Emergency management	Sheriff patrol
	Homeland security	Animal control
Economic Development, Natural Resources, and Recreation	Oregon plan implementation	Watermaster
	State forest management	County forests
	Federal land policy	County library
	Extension services	County parks
	Telecommunications	County museums
	County fair	
Transportation and Land Use	Highway and road systems	Engineering
	Land use planning and coordination	Building permitting and inspections
	Senior and disabled transportation	Surveying
	Development services	Capital projects
Other Community Services	Management and administration	
	Elections	Property and facilities management
	Assessment and taxation	Procurement
	Human resources and employee relations	Recording public documents

Figure 3-24. Fiscal Year 2005 County Expenditures



generated by the sale of timber and other goods and services produced from the O&C lands. See *Figure 3-25 (Fiscal year 2005 revenues for the O&C counties)* for the source of the $4.2 billion in revenues received by the O&C counties in the 2005 fiscal year.

In fiscal year 2005, the O&C-related revenues accounted for about $115 million (or about 2.7% of the total funds available to the O&C counties). (Note: In the survey, the counties reported receiving $103 million from the BLM, whereas the BLM reports a total of about $115 million. Most of the difference is accounted for as Title II funds, which are expended by the agency under the direction of the county-level resource advisory committee. Title II funds do not go directly through the county budgets.)

The importance of O&C revenues varies by county. See *Table 3-11 (Total revenue, discretionary revenue, and O&C funding)*. For example, the O&C revenues account for more than 20% of Douglas County revenue, but only 0.1% of the metropolitan Multnomah and Washington county revenues.

The counties also reported receiving about $99 million of Secure Rural Schools funding that was associated with land managed by the U.S. Forest Service. The U.S. Forest Service reports a distribution of $123.3

Figure 3-25. Fiscal Year 2005 Revenues For The O&C Counties

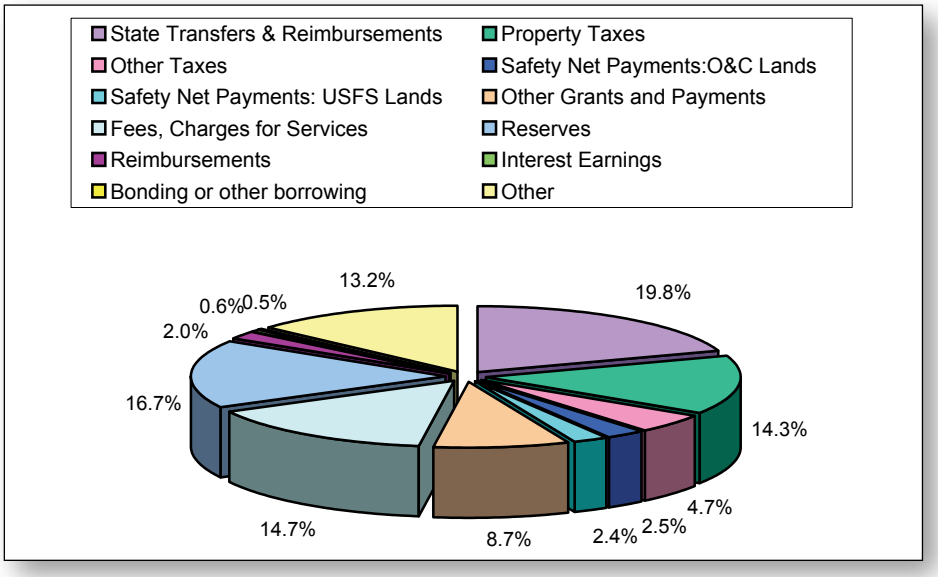


Table 3-11. Total Revenue, Discretionary Revenue, And O&C Funding For Fiscal Year 2005

County	Revenue ($)			O&C Revenue as % of:	
	All Sources		BLM		
	Total	Discretionary	Total O&C	Total %	Discretionary %
Rural Counties					
Benton	72,288,316	24,114,009	2,920,490	4.0	12.1
Columbia	47,303,696	9,881,991	2,250,622	4.8	22.8
Coos	45,315,118	13,113,030	6,537,510	14.4	49.9
Curry	54,959,478	6,920,829	3,424,000	6.2	49.5
Douglas	136,784,970	39,942,546	28,105,526	20.5	70.4
Jackson	290,614,408	77,040,445	15,145,237	5.2	19.7
Josephine	109,802,550	29,278,099	12,092,595	11.0	41.3
Klamath	160,315,525	15,522,030	2,206,000	1.4	14.2
Lane	466,328,935	56,786,868	14,583,629	3.1	25.7
Lincoln	74,031,888	32,218,773	388,968	0.5	1.2
Linn	83,070,524	25,287,488	2,518,846	3.0	10.0
Marion	314,833,911	70,333,962	1,360,000	0.4	1.9
Polk	60,207,240	13,956,261	2,385,000	4.0	17.1
Tillamook	57,560,514	14,622,039	730,820	1.3	5.0
Yamhill	82,504,377	13,211,916	807,500	1.0	6.1
Rural Subtotals	**2,055,921,450**	**442,230,286**	**95,456,743**	**4.6**	**21.6**
Metropolitan Counties					
Clackamas	406,647,713	82,829,267	5,890,071	1.4	7.1
Multnomah	1,092,793,083	409,015,566	1,000,000	0.1	0.2
Washington	607,731,836	121,402,176	707,861	0.1	0.6
Metro Subtotals	**2,107,172,632**	**613,247,009**	**7,597,932**	**0.4**	**1.2**
Totals - All Counties	**4,163,094,082**	**1,055,477,295**	**103,054,675**	**2.5**	**9.8**

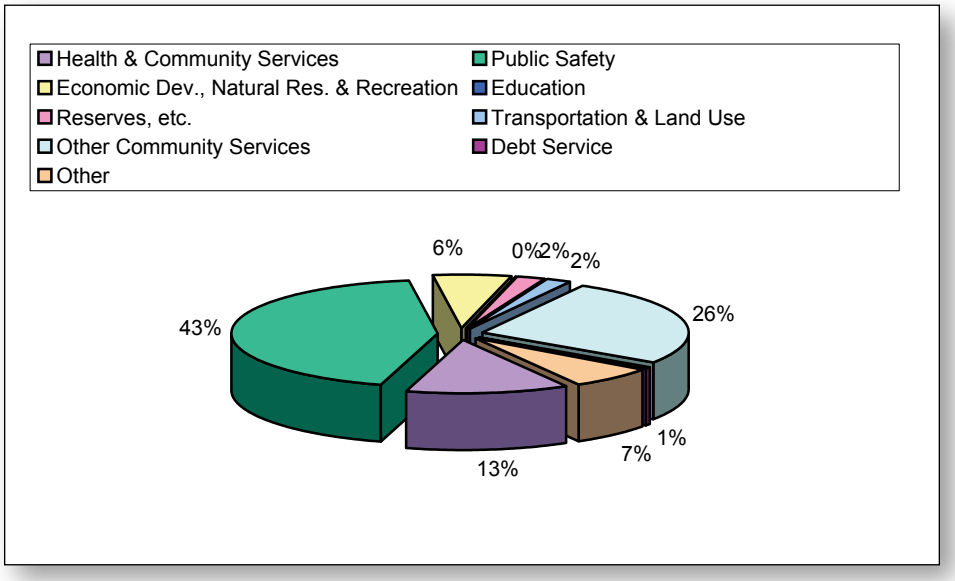
million for western Oregon counties. (Note: The difference could be related to the fact that U.S. Forest Service funding is distributed through the state rather than directly to the counties.) The U.S. Forest Service funds are typically not considered discretionary in that they are earmarked for schools and roads.

Much of the funding received by county governments is directed to specific programs. For fiscal year 2005, the O&C counties reported that only about 25% of total revenue received was discretionary. The rest of the revenue received by the county governments is earmarked for specific programs. Counties consider most of the BLM revenue as discretionary in that it can be used for whatever purpose the county commissioners deem suitable.

See *Figure 3-26 (Fiscal year 2005 discretionary spending for the O&C counties)* lists how the O&C counties spent the funds considered discretionary. About 43% of the discretionary budget is spent on public safety. The next largest category is for other community services, which includes such services as management, administration, and elections.

Table 3-11 (Total revenue, discretionary revenue, and O&C funding for fiscal year 2005) shows that across the O&C counties, O&C revenues accounted for 9.8% of the discretionary funding. Some counties, however, rely on O&C revenues much more to fund discretionary programs than others. For example, more than

Figure 3-26. Fiscal Year 2005 Discretionary Spending For The O&C Counties



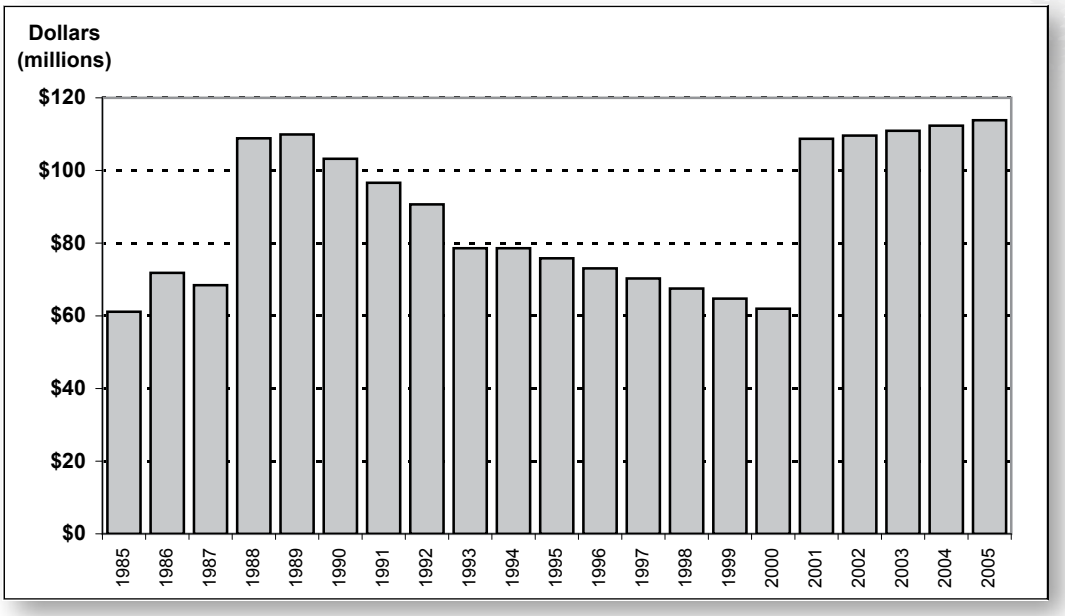
70% of the discretionary funding in Douglas County is based on O&C revenues. A number of counties rely on O&C revenues for more than 20% of discretionary funding. The O&C revenues comprise only a small portion of discretionary funding for the larger metropolitan counties.

Timber harvesting from O&C lands began declining in the 1990s as a result of the listing of the northern spotted owl and the adoption of the Northwest Forest Plan. In response, Congress established safety net payments for 72 counties in Oregon, Washington, and California through the Omnibus Budget Reconciliation Act of 1993. This provided a stabilized income flow to timber-dependent communities through the remainder of the 1990s.

In 2000, Congress repealed the safety net payments and passed the Secure Rural School and Community Self Determination Act (P.L. 106-393). This law established a stable level of payments to counties at an amount equal to the average of their three highest timber receipts from 1986 through 1999. Under the Act, counties elect the percentage of payment (80 to 85%) to be distributed directly to the county (Title I), and the percentage (15 to 20%) to be allocated between Title II projects and Title III projects. Title I, II, and III funds are described below:

- **Title I.** These are funds that are distributed to the county and may be used for any purpose the previous 50% revenue-sharing funds were used for, as a supplement to other county funds. Typically, these revenues go to county general fund budgets.
- **Title II.** These are funds that are used to support cooperative projects under the guidance of a resource advisory committee to restore healthy conditions on public lands, or on private lands for the benefit of public land resources. Such projects include wildfire hazard reduction, stream and watershed restoration, forest road maintenance, road decommissioning or obliteration, control of noxious weeds, and improvement of fish and wildlife habitat.
- **Title III.** Under Title III of the Act, counties may use funds for search, rescue, and emergency services; community service work camps; purchase of easements for recreation or conservation; forest-related educational programs; and fire prevention activities.

Figure 3-27. BLM Payments To Counties For Fiscal Years 1985 To 2005



See *Figure 3-27 (BLM payments to counties for fiscal years 1985 to 2005)* for the trend in BLM payments to counties since 1985. In fiscal year 2005, the BLM payments to counties totaled about $115 million.

Historically, payments authorized under the O&C Act accounted for the bulk of the total BLM payments to counties. Counties do, however, receive revenue associated with other BLM funding sources. Douglas and Coos Counties receive payments from the Coos Bay Wagon Road grant fund. There are 15 counties that receive payments in lieu of taxes (PILT) from public domain lands located within their county. A few counties also receive grazing and mineral lease income. Altogether, these other sources of payments averaged just over $1.0 million annually over the last five years.

Table 3-12 (BLM payments to counties within the planning area for selected years) summarizes the total payments to counties from western Oregon BLM-administered lands. Those payments include timber receipts, safety net payments, and Secure Rural Schools Self Determination Act payments under Title I, II and III; Coos Bay Wagon Road grants; payments in lieu of taxes; and mineral and grazing income. The average annual BLM payment to all counties since implementation of the Secure Rural Schools legislation has been $112 million.

The O&C revenue is allocated between counties based on an acre-weighted pro-ration formula. The largest recipients of payments from western Oregon BLM-administered lands are Douglas, Jackson, Lane, and Josephine counties, which together received 68% of the total payments in 2005.

The Secure Rural Schools legislation was not reauthorized for 2007. Absent a reauthorization or new legislation, the size of the BLM payment to counties will be highly dependent on the amount and price of timber sold from O&C lands. For example, without the Secure Rural Schools legislation, the fiscal year 2005 BLM payment to counties would have totaled about $12.2 million, which is a reduction of about 90% from the total with the legislation.

In addition, many of the O&C counties would also lose Secure Rural School funding attributable to land that is managed by the U.S. Forest Service. For fiscal year 2005, such funding totaled $123.3 million.

Table 3-12. BLM Payments To Counties Within The Planning Area For Selected Years ($ Million)

County	1985	1990	1995	2000	2001	2002	2003	2004	2005
Benton	1.7	2.9	2.1	1.7	3.1	3.1	3.1	3.2	3.2
Clackamas	3.4	5.8	4.2	3.4	6.0	6.1	6.2	6.2	6.3
Columbia	1.3	2.1	1.6	1.3	2.2	2.3	2.3	2.3	2.3
Coos	4.0	6.8	5.0	4.1	7.2	7.3	7.4	7.5	7.6
Curry	2.2	3.8	2.8	2.3	4.0	4.0	4.1	4.1	4.2
Douglas	15.4	26.0	19.1	15.6	27.4	27.6	27.9	28.3	28.7
Jackson	9.6	16.2	11.9	9.7	17.0	17.2	17.4	17.6	17.8
Josephine	7.4	12.5	9.2	7.5	13.1	13.2	13.4	13.6	13.8
Klamath	1.5	2.4	1.8	1.5	2.6	2.6	2.6	2.7	2.7
Lane	9.3	15.8	11.6	9.5	16.6	16.7	16.9	17.2	17.4
Lincoln	0.2	0.4	0.3	0.2	0.4	0.4	0.4	0.4	0.4
Linn	1.6	2.7	2.0	1.6	2.9	2.9	2.9	3.0	3.0
Marion	0.9	1.5	1.1	0.9	1.6	1.6	1.6	1.6	1.7
Multnomah	0.7	1.1	0.8	0.7	1.2	1.2	1.2	1.2	1.2
Polk	1.3	2.2	1.6	1.3	2.3	2.4	2.4	2.4	2.5
Tillamook	0.3	0.6	0.4	0.3	0.6	0.6	0.6	0.6	0.6
Washington	0.4	0.7	0.5	0.4	0.7	0.7	0.7	0.7	0.7
Yamhill	0.4	0.7	0.5	0.4	0.8	0.8	0.8	0.8	0.8
Totals	**61.7**	**104.2**	**76.5**	**62.5**	**109.8**	**110.6**	**112.0**	**113.4**	**114.9**

The O&C counties have a limited ability to replace BLM revenues with other sources of revenue. Oregon income taxes are paid to the state, not the counties. As a result of several ballot measures, Oregon counties are not able to raise tax rates and the growth in taxable property value is capped at 3% a year. The federal government, furthermore, owns a large portion of the land in some of the O&C counties. See *Table 3-13 (Percent of public land in O&C counties)*. These lands are not on the tax rolls. The O&C counties believe that neither economic growth nor tourism can reasonably be expected to offset a shortfall in O&C-related revenues (Davis 2006). See *Appendix D - Socioeconomics*.

The economics of BLM timber harvesting are directly linked to western Oregon's timber economy and market.

The counties in western Oregon comprise the relevant market area for this analysis. Although some of the BLM timber may be shipped outside of this area for primary processing, the most recent information about log flow suggests that the bulk of BLM timber will likely be processed within the market area. As shown below, western Oregon is a net importer of logs—more timber is processed than harvested in the area.

There are 413 bbf of sawtimber on 16.3 million acres of timberland within the planning area of western Oregon (Miles 2006). (Note: Not all of the 2.6 million BLM acres within the planning area are classified as timberland.) See *Table 3-14 (2005 timberland area and inventory within the planning area)*. The BLM administers about 13% of the timberland and 16% of the sawtimber in western Oregon.

See *Figure 3-28 (Harvest by landowner within the planning area)* for the western Oregon harvest by owner. Since 2000, western Oregon harvests have averaged about 3.4 bbf (billion board feet, scribner log scale)—a 47% reduction from the average 6.4 bbf average harvest prior to the 1990 listing of the northern spotted owl. Most of the reduction came from federal timberlands (U.S. Forest Service and BLM).

Table 3-13. Percent Of Public Land In O&C Counties

O&C County	Total (acres)	BLM (acres)	BLM (%)	Government (acres)	Government (%)
Benton	433,500	58,100	13.4	106,300	24.5
Clackamas	1,205,000	75,400	6.3	632,200	52.5
Columbia	440,800	10,800	2.5	32,100	7.3
Coos	1,041,000	162,900	15.6	261,100	25.1
Curry	1,047,100	67,600	6.5	688,700	65.8
Douglas	3,244,500	655,100	20.2	1,670,500	51.5
Jackson	1,792,700	449,700	25.1	914,200	51.0
Josephine	1,050,200	299,800	28.5	714,900	68.1
Klamath	3,137,900	224,900	7.2	1,651,300	52.6
Lane	2,957,900	288,100	9.7	1,740,400	58.8
Lincoln	635,600	20,200	3.2	216,800	34.1
Linn	1,477,000	87,200	5.9	581,400	39.4
Marion	762,600	20,900	2.7	258,800	33.9
Multnomah	297,500	4,200	1.4	88,400	29.7
Polk	476,000	40,200	8.4	53,100	11.2
Tillamook	719,500	48,500	6.7	450,200	62.6
Washington	465,000	11,500	2.5	67,700	14.6
Yamhill	459,700	32,600	7.1	65,100	14.2
Totals	**21,643,500**	**2,557,700**	**11.8**	**10,193,200**	**47.1**

Table 3-14. 2005 Timberland Area And Inventory Within The Planning Area

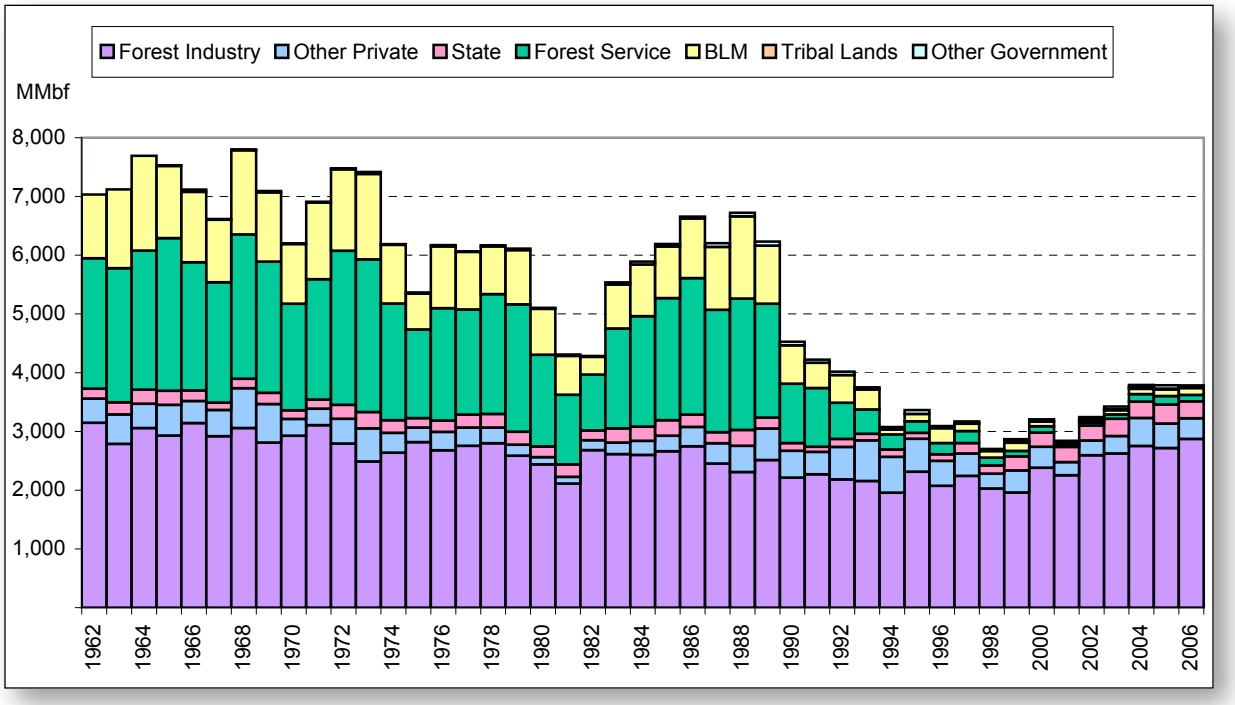
Ownership class	Timberland Area (acres)	Sawtimber Inventory (bbf)
National Forest	5,937,000	210
Bureau of Land Management	2,068,000	66
Other federal	27,000	1
State	839,000	29
County and Municipal	116,000	2
Other local government	10,000	-
Private	7,323,000	105
Totals	**16,320,000**	**413**

During the 1970s, the BLM harvests averaged 1.05 bbf, which is about 16% of the total. The BLM harvests averaged 0.87 bbf in the 1980s, which is about 15% of the total. Under the Northwest Forest Plan (since 1994), the BLM harvests have averaged about 0.11 bbf annually, which is about 3.4% of the total harvest.

(Note: In this discussion, the BLM timber volumes have been converted from the 16-foot log scale used by the BLM, to the 32-foot log scale used by other western landowners. The conversion factor varies with timber species and log size. Generally, a factor of 0.80 can be used to convert BLM 16-foot log volumes to 32-foot log volumes.)

Harvests from private lands trended down slightly through the 1990s (3.08 bbf in the 1970s, 2.79 bbf in the 1980s, and 2.61 bbf in the 1990s). Private harvests have been trending up since 1995 and have averaged 2.89 bbf since 2000. Currently, private lands provide about 85% of the harvest within the planning area.

Figure 3-28. Harvest By Landowner Within The Planning Area



See *Figure 3-29 (Willamette Valley Douglas fir delivered log prices and BLM volume and average stumpage)* for log price trends since 1989 (Log Lines 1989-2006). (Note: Log Lines is a log price reporting service that began reporting log prices in 1988.) Log prices rose dramatically in the early 1990s, due primarily to a reduction in federal harvests during a time of strong demand for lumber and wood products. High log prices and increased penetration of U.S. markets by Canadian lumber manufacturers led to a reduction in mill capacity in western Oregon. Log prices declined through the 1990s. Log prices began trending up again in 2003 as housing markets strengthened. Western Oregon mills added capacity with the sawmills still operating in 2005 and producing about 37% more wood in 2005 than they did in 2001 (Ehinger 2006). In Western Washington, mills added about 1.0 bbf in net capacity between 1999 and 2006, which further strengthened log prices (Ehinger 2005.)

Figure 3-29 (Willamette Valley Douglas fir delivered log prices and BLM volume and average stumpage) also shows that the premium for higher grade logs has been shrinking (2S and 3S logs sell for about the same price, and 3P log margins are narrowing). (Note: 3P, 2S, and 3S are log grades reflecting size and quality.) This data reflects recent investment in smaller log mills and the ongoing shift toward dimension lumber.

Figure 3-29 also shows the total volume and average stumpage price of the BLM timber sold in western Oregon. Since 1995, when the BLM began selling smaller timber under the Northwest Forest Plan, stumpage prices have followed a trend similar to the current market for 2S and 3S logs.

Logs harvested in one area are often manufactured into wood products in another area. Understanding how logs flow helps to establish the geographic extent of the market area. Predicting future log flows, furthermore, is important to establishing impact at the county level.

See *Table 3-15 (2003 mill study log flows)* for a summary of log flows reported in the 2003 mill study (Brandt et al. 2006, USDA USFS 2006a). About 3.757 bbf was consumed by western Oregon mills in 2003. About 8% of the total was imported into western Oregon from outside the state and another 4% was imported from eastern Oregon.

Figure 3-29. Willamette Valley Douglas Fir Delivered Log Prices And BLM Volume And Average Stumpage

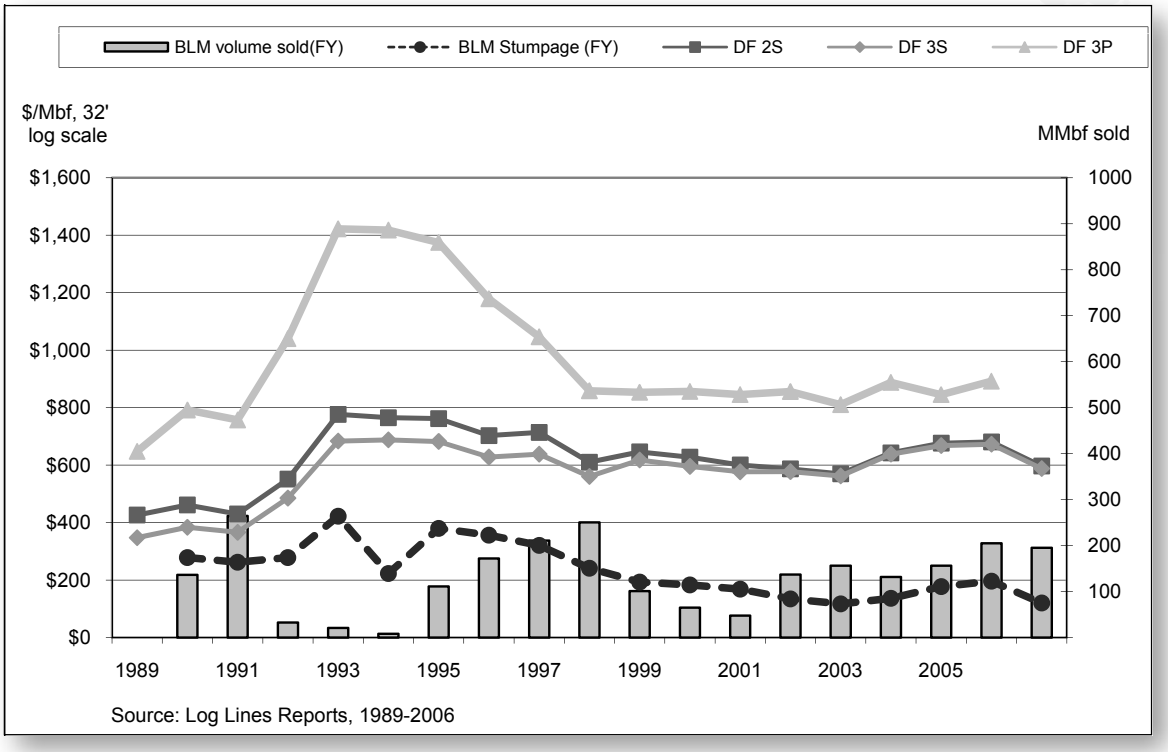


Table 3-15 (2003 mill study log flows) also suggests that the difference between local log supply and local log demand is greatest in southwest Oregon. These mills imported 412 mmbf from northwest Oregon, whereas only 58 mmbf went from southern Oregon to northwest Oregon.

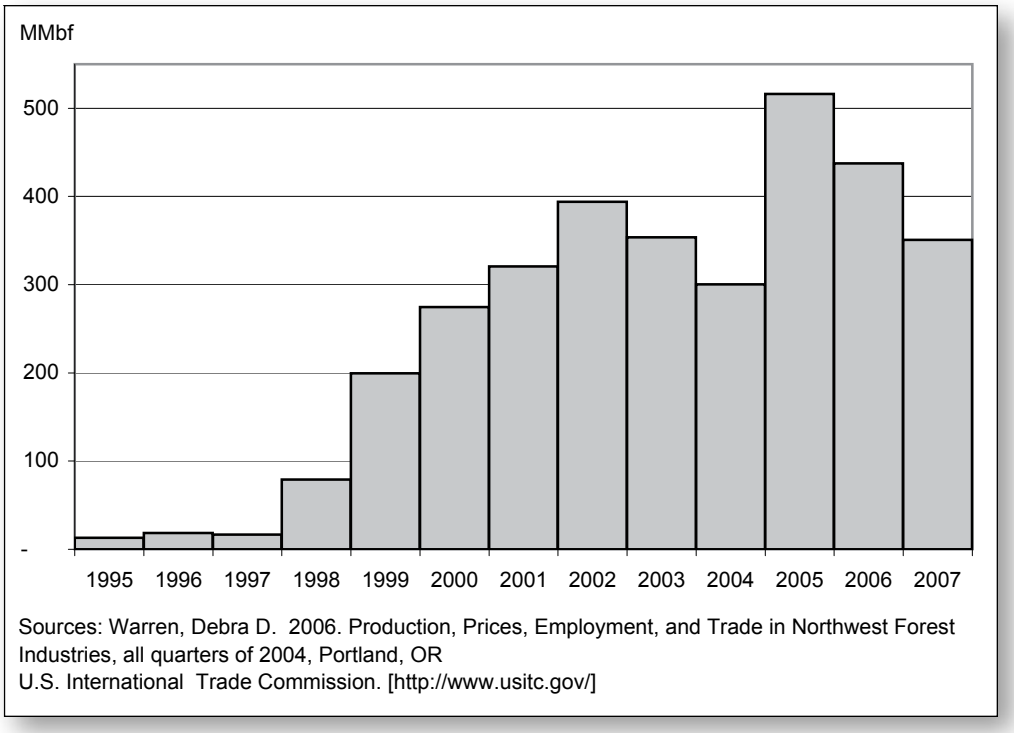
Current estimates are that log imports into western Oregon have increased since the 2003 mill study. *Figure 3-30 (Log imports from Canada to Washington and Oregon ports)* shows that Canadian logs imported into western ports exceeded 500 mmbf in 2005 and are on a similar track in 2006. Oregon log buyers expect that about 500 mmbf is currently flowing into Oregon from Washington and Canada. Many consider the Canadian volume to be subject to intense competition by more favorably located mills in Washington, or by new in ventures in Canada (Rasmussen, pers. comm. 2006).

The log market in western Oregon is competitive. In 2005, for example, only 28% of the timber used by Oregon's sawmills was fee timber (timber owned by the manufacturing company). The rest of the timber harvested was purchased by manufacturers from timberland owners (Western Wood Products Association

Table 3-15. 2003 Mill Study Log Flows

Destination	Log Volume (mmbf)				
	Total Utilization	Source			
		Northwest Oregon	Southwest Oregon	Eastern Oregon	Other States
Northwest Oregon	1,667	1,378	58	0	231
Southwest Oregon	2,090	412	1,460	158	60
Total Western Oregon	**3,757**	**1,790**	**1,518**	**158**	291

Figure 3-30. Log Imports From Canada To Washington And Oregon Ports



Sources: Warren, Debra D. 2006. Production, Prices, Employment, and Trade in Northwest Forest Industries, all quarters of 2004, Portland, OR
U.S. International Trade Commission. [http://www.usitc.gov/]

2006). Much of this timber is sold in an open, competitive market to the highest bidder. BLM timber is appraised and sold at auction to the highest qualified bidder, which ensures that the agency receives fair market value.

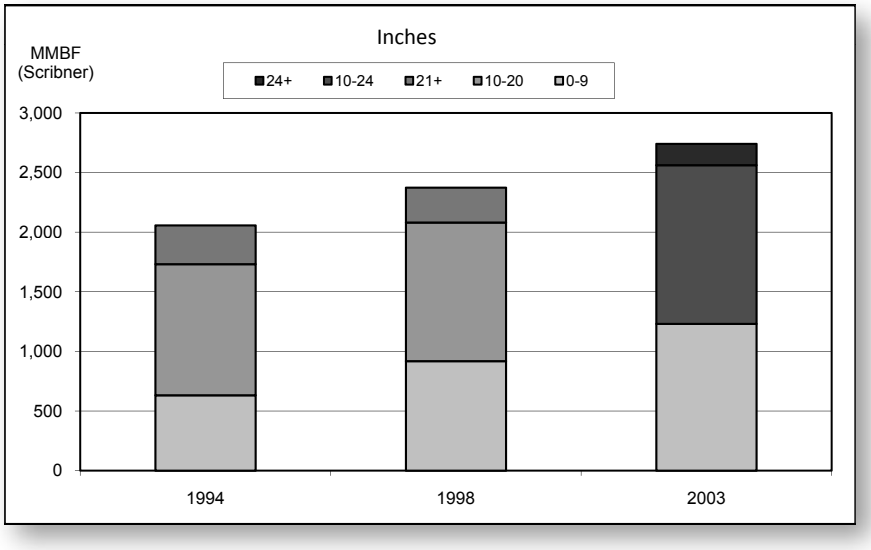
Mills are typically optimized to process certain species and sizes of logs. The log market allocates logs to the mills that can most efficiently and effectively process particular types of logs. Prior to the Northwest Forest Plan, the U.S. Forest Service and the BLM were key suppliers of large, high-quality logs. Decisions made in the Northwest Forest Plan substantially reduced the volume of large logs available to Oregon mills. Much of the recent investment made in Oregon mills focused on more efficient processing of the smaller logs harvested from private lands. *Figure 3-31 (Oregon sawmill consumption by diameter class)* shows that logs that are less than 9 inches DIB (diameter inside the bark at the small end of the log) being processed by Oregon mills have doubled from 632 mmbf in 1994 to 1,230 mmbf in 2003.

Even with the investment in smaller log processing, there remains in Oregon a sizeable capacity for the larger logs that could be harvested from BLM-administered land.

- *Figure 3-31 (Oregon sawmill consumption by diameter class)* shows that about 300 mmbf of logs greater than 21 inches DIB were processed in 1994 and 1998. The 2003 study changed the classification—179 mmbf of logs greater than 24 inches DIB were processed in that year.
- Ehinger (2006) defines large logs as those over 48 inches DIB, lists 11 mills that process large logs, and reports that 10% of western Oregon mill capacity is capable of handling large logs (about 450 mmbf), and that more large log capacity is being added.
- An Oregon State University study defined large logs as those over 30 inches DIB and found 18 mills that handle large logs (Wagner et al. 2003).

The primary wood products manufacturing sector is a large contributor to the Oregon economy. In 2003, there were 249 firms that used 4.3 bbf of wood to produce $6.7 billion of annual sales (Brandt et al. 2006). While this sector accounts for less than 0.1% of Oregon firms, it produces 14.6% of annual manufacturers'

Figure 3-31. Oregon Sawmill Consumption By Diameter Class



shipments (U.S. Census Bureau 2000-2004). This estimate does not include substantial secondary wood products sectors such as furniture and cabinetry.

The Oregon primary wood products sector employs 51,900 workers who earn $1.9 billion annually (OED OLMIS 2006), which is about 3.2% of total Oregon wages. Using a conservative employment multiplier of 2.5, the primary wood products sector accounts for about 130,000 nonfarm Oregon jobs, which is about 7.6% of the total.

Periodic surveys of wood product manufacturers show how the wood products manufacturing sector has changed (Brandt et al. 2006). This information, coupled with annual production data, suggests that the current manufacturing sector could absorb additional timber from BLM-administered lands.

Since the early 1990s, western Oregon's wood products manufacturing capacity has been shifting toward lumber production. See *Figure 3-32 (Log consumption by product in western Oregon)*. Lumber mills now account for about 75% of the wood consumed in western Oregon mills. Oregon's plywood and veneer mills were heavily dependent on larger logs, much of which came from federal forests. With the reduction in federal timber harvests, larger logs became more expensive at the same time that manufacturers in the Midwest and southern United States added lower cost panel capacity to oriented strand board mills. Very few logs are exported from Oregon's ports.

New investments in lumber mills have been concentrated in larger mills. *Figure 3-33 (Western Oregon sawmills by capacity)* shows that most of the remaining mills in western Oregon are larger mills that produce over 120 mbf per shift. The average production per mill for this largest class, in fact, is now over twice what it was in 1976. The apparent increase in the number of small mills in 2003 is due to a difference in survey techniques.

Figure 3-34 (Lumber production in Oregon and Washington) shows lumber production in Oregon and Washington (Western Wood Products Association 2006). Lumber production in western Oregon fell by about 45% between 1989 and 1995, primarily due to reduced federal log supplies. Production began increasing as mills invested in more equipment that could process smaller timber. A softening log export market, furthermore, resulted in a greater portion of the harvest becoming available to domestic mills.

Washington state production trends are important as western Oregon mills currently compete for Washington logs. Lumber production in western Washington did not decline as sharply as it did in Oregon,

Figure 3-32. Log Consumption By Product In Western Oregon

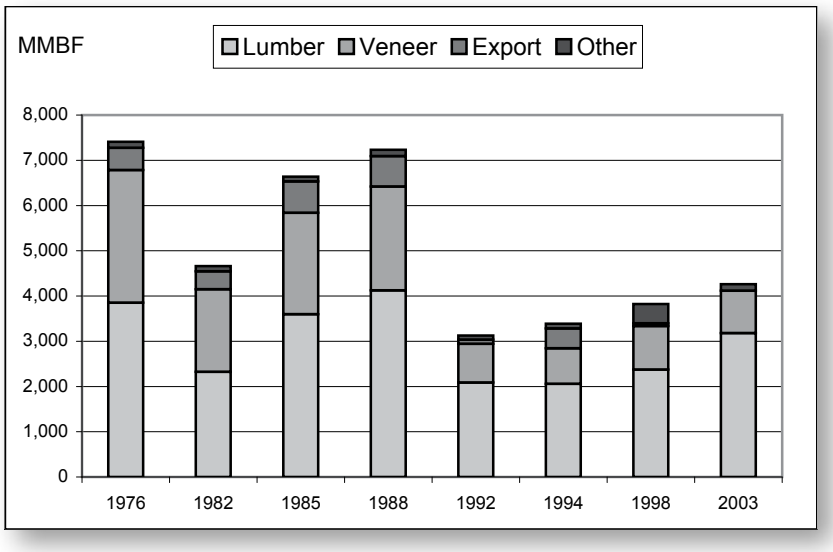
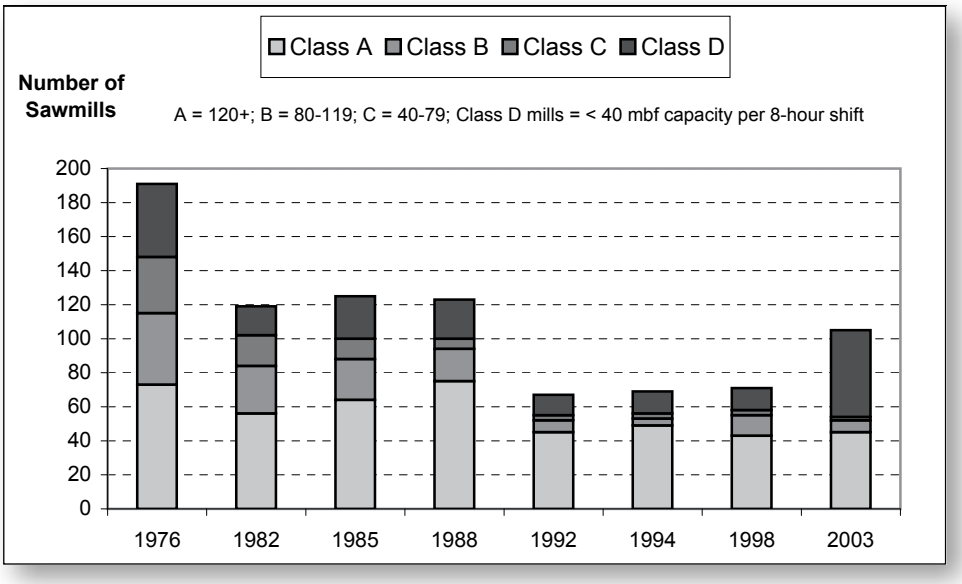


Figure 3-33. Western Oregon Sawmills By Capacity



primarily because much of the western Washington timber was exported as logs rather than sawn into lumber. The reduction in log exports made more timber available to sawmills in both states. Since 1999, western Washington mills have added 1.0 bbf of net new lumber production capacity (Ehinger 2005) and production has been increasing steadily.

Western plywood production began a downward trend in the early 1990s. See *Figure 3-35 (Western plywood production)*. At 3.04 billion square feet for 2005, Oregon plywood production is about 58% below the 1970 to 1990 average.

The reduction in federal timber harvest, which is a source of large clear veneer logs, created upward pressure on plywood prices. At the same time, panel manufacturers in the Midwest, the southern United States, and Canada were adding capacity to produce less expensive oriented strand board (OSB) panels from low cost

Figure 3-34. Lumber Production In Oregon And Washington

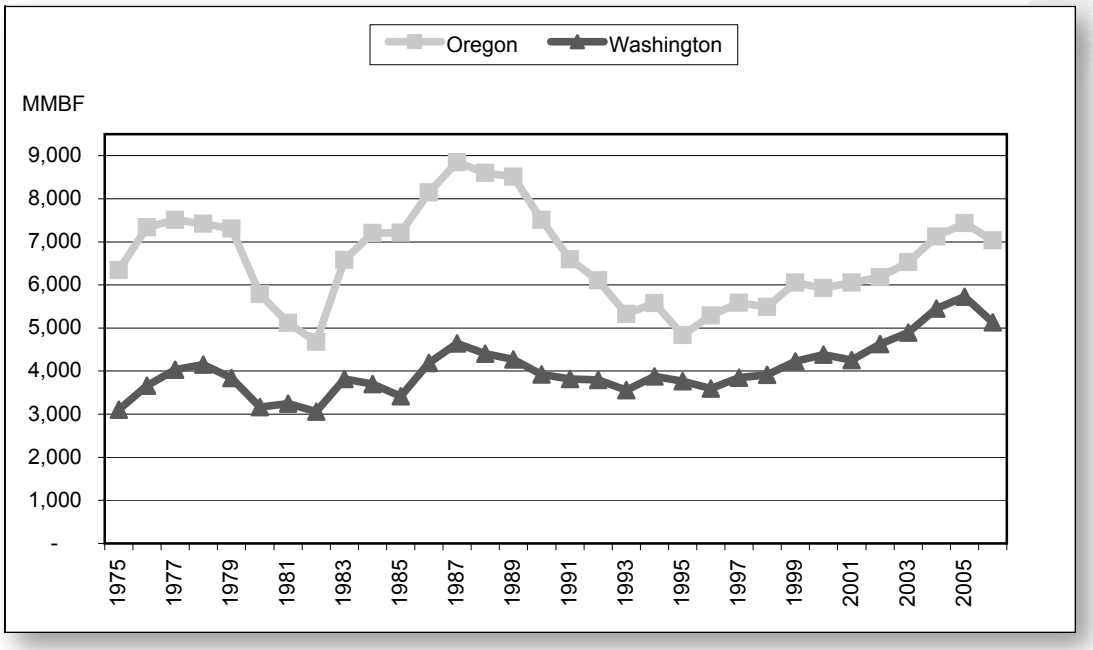
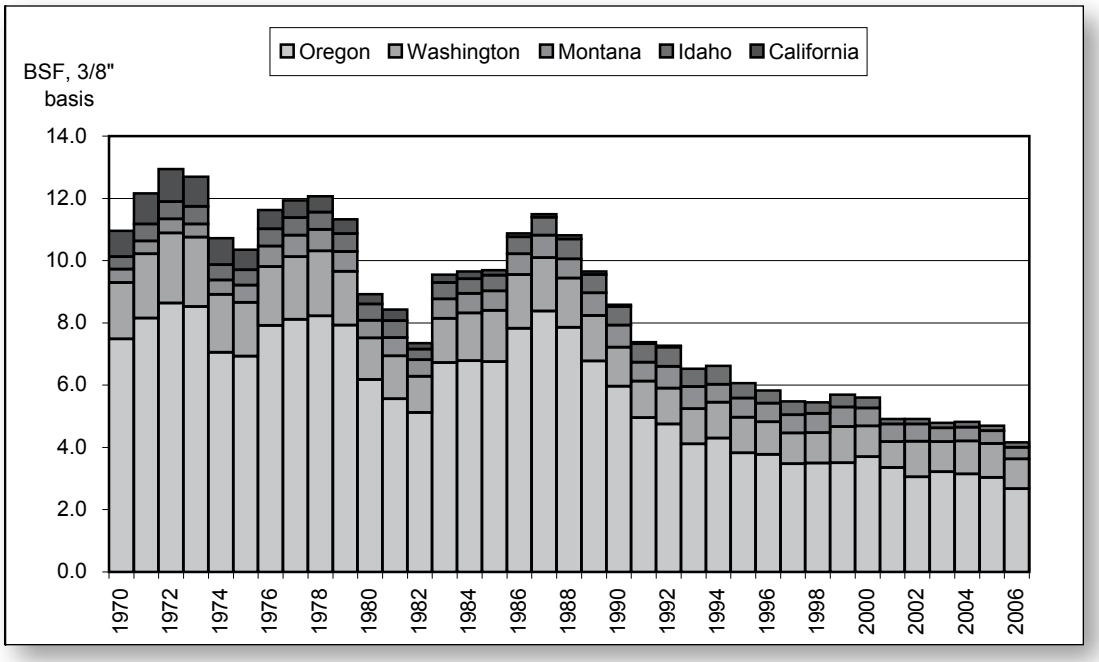


Figure 3-35. Western Plywood Production



timber. U.S. Forest Service projections suggest that plywood will lose additional market share to OSB. *Figure 3-36 (U.S. panel production)* shows U.S. plywood production at just half of current levels by 2020.

Figure 3-37 (Log exports from western United States ports) shows the volume and price of logs exported from western United States ports. Currently, about 800 mmbf of logs are exported, which is down 80% from the 4.4 bbf peak in 1989. The Asian financial crisis, the weakening of the Yen against the United States dollar, a shift toward Asian log suppliers, and stronger U.S. domestic log markets account for most of the change.

Figure 3-36. U.S. Panel Production

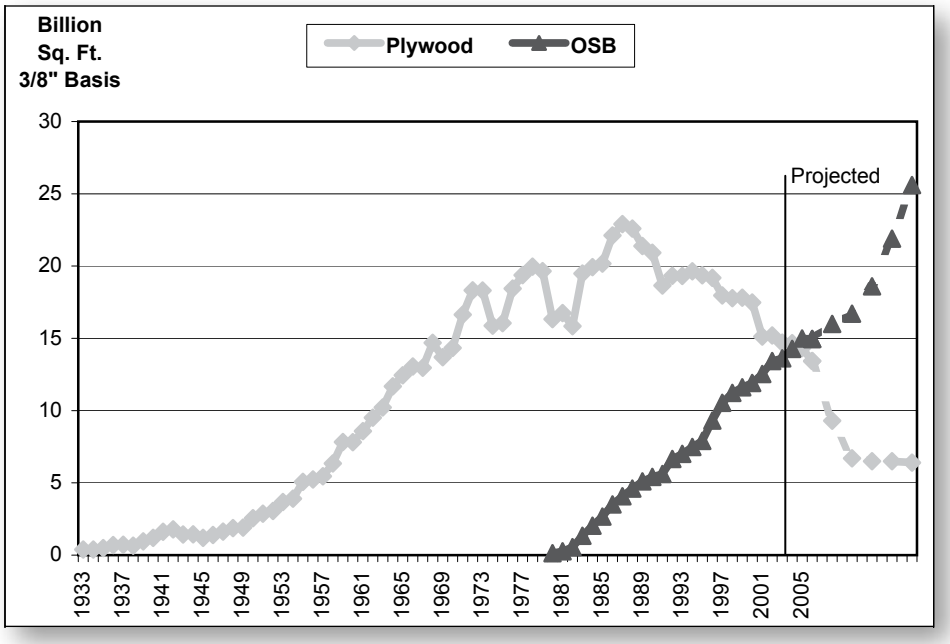
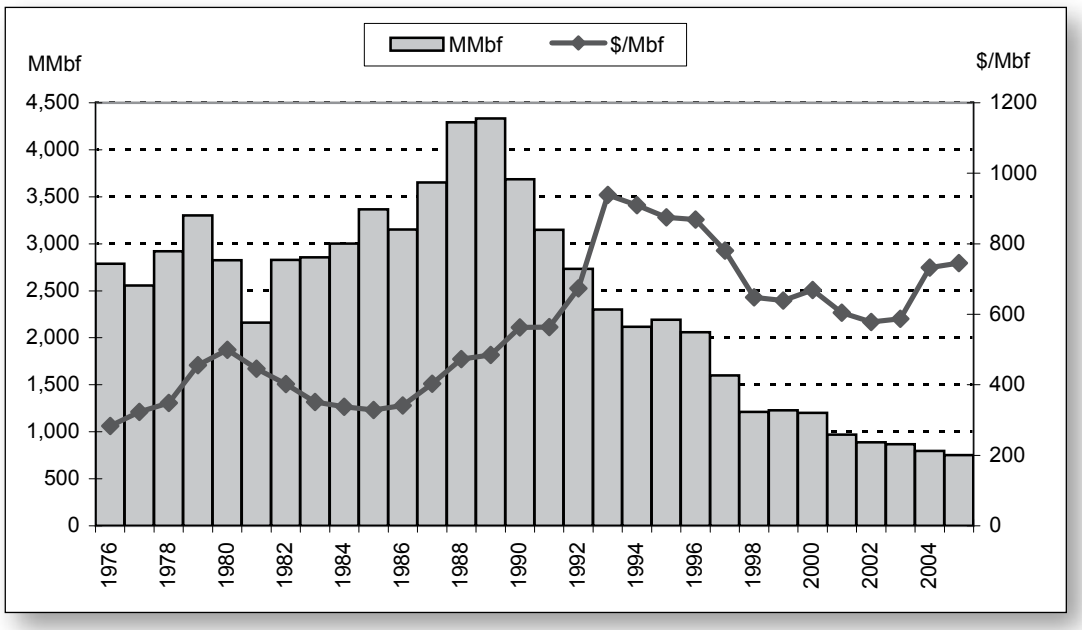


Figure 3-37. Log Exports From Western United States Ports



The BLM conducted a meeting in August 2008 with log buyers and timber industry representatives to gather information. There was a common concern that current western Oregon wood product production levels cannot be maintained without additional timber supplies. Current production relies on log imports from Canada and western Washington. Both of those supply sources are vulnerable to competition from new mills in Washington and to export restrictions in Canada (Rasmussen, pers. comm. 2006).

Changes in the level of employment in Oregon's forest product industry are indicated by U.S. Department of Commerce employment statistics, which tally forest products sector jobs into four sectors:

- forestry and logging (NAICS 113)
- forestry support activities (NAICS 1153)
- wood products manufacturing (NAICS 321)
- paper manufacturing (NAICS 322)

North American Industry Classification System (NAICS)

System used by business and government to classify and measure economic activity.

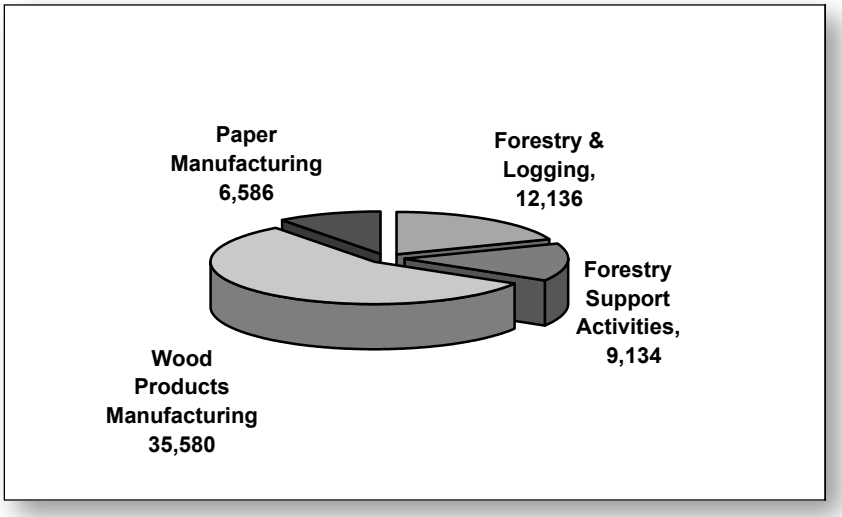
These sectors include both primary and secondary manufacturers along with the infrastructure (forestry workers, loggers, etc.) required to manage the growing and harvesting of timber crops. (Note: The previous discussion of the economy of the wood products sector in western Oregon is based on research conducted for this EIS, and resulted in adjustments to the U.S. Department of Commerce figures. However, such adjustments are not available for previous periods. The U.S. Department of Commerce data, therefore, are used for the purpose of analyzing historic employment trends.)

Primary manufacturing includes logging, processing of logs into lumber and other wood products, processing wood residues from timber-processing plants into such outputs as paper or electricity, and managing of private sector forest services. The secondary industry includes firms processing outputs from the primary industry. These outputs may come from mills in Oregon or elsewhere. Secondary products include prefabricated buildings, molding, millwork and cut stock, doors, windows, laminated veneer lumber, and other products (Brandt et al. 2006).

Employment in Oregon in these four sectors totaled nearly 63,400 workers in 2005 (U.S. Department of Commerce 2006). Wood products manufacturing represents the largest sector, which comprise 56% of the jobs. See *Figure 3-38 (Employment in Oregon's forest products sector [2005])*.

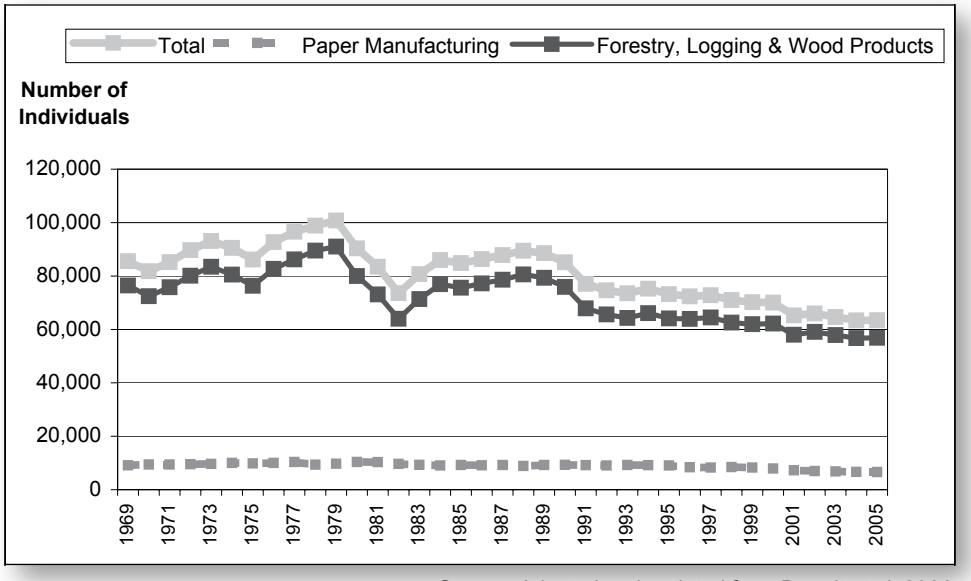
Employment in 2005 was down 37% from peak employment of more than 100,700 workers in 1979. See *Figure 3-39 (Employment in Oregon's forest products industry [1969 to 2005])*. The decline in forest sector employment is due to the reduction in total timber harvest and technological change (Brandt et al. 2006, USDA USFS 2006a). Oregon's forest sector job loss might have been greater, but was offset to some degree by a concurrent decrease in log exports, an increase in log imports from surrounding states, and an expansion of secondary wood products manufacturing (Brandt et al. 2006).

Figure 3-38. Employment In Oregon's Forest Products Sector (2005)



Source: USDC 2006

Figure 3-39. Employment In Oregon's Forest Products Industry (1969 To 2005)



Source: Adapted and updated from Brandt et al. 2006

Forest industry employment trends for the coastal Pacific Northwest were recently studied as part of a 10-year review of the implementation of the Northwest Forest Plan. Across the region included in the Northwest Forest Plan—western Oregon, western Washington, and northern California—it has been estimated that 45,000 direct, indirect, and induced jobs were affected by reduced timber harvesting between 1990 and 2000. Of that, 30,000 were direct jobs including 7,500 in the logging industry and 22,500 in other primary wood industries.

About 19,000 jobs were lost in the region between 1990 and 1994 as the volume of timber harvested but not exported fell from 10.1 bbf to 7.4 bbf. An additional 11,000 direct job losses occurred between 1994 and 2000, even though the volume of wood available for manufacture stabilized and even rose slightly. These latter job loses are attributable largely to additional industry restructuring and changes in technology (USDA USFS 2006a).

Technological change has also impacted employment in the logging industry. In Oregon, for example, increased mechanization of harvest operations has increased annual productivity per worker from 544,000 board feet harvested per worker in 1990 to 592,000 board feet per worker in 2004, which is an 8% increase (Rooney 2006).

Oregon employment in the solid-wood industry was hit disproportionately hard compared to Washington and California. Oregon represented approximately 50% of solid-wood employment in the region. However, about 61% of the decline in jobs occurred in Oregon. The reverse is true of paper manufacturing—Oregon represented 30% of primary pulp and paper industry employment during the 1990s, but only 21% of the job losses in that sector (USDA USFS 2006a).

In addition to timber harvest, the western Oregon BLM budget contributes to local economic activity. The western Oregon BLM budget for 1995 to 2005 is summarized in *Figure 3-40 (Western Oregon BLM budget for selected fiscal years)*. The largest expenditure of funds, representing 64% of the current budget, is for the O&C land grants and management of lands and resources programs. These programs provide for forest management, reforestation and forest development, rangeland, recreation, soil, water and air, and wildlife and fish habitat on the O&C grant lands and public domain lands in western Oregon.

The wildland fire management program, which is 18% of the current budget, provides for fire preparedness, fire suppression, and other operations. Funding for hazardous fuels reduction and burned area rehabilitation

is included in the latter category. Other appropriations represent another 18% of the total budget. This includes funding for acquisitions, construction projects, and other needs.

Over the past few years, the BLM budget for western Oregon has been relatively constant (averaging about $141 million annually). See *Figure 3-41 (BLM budget by district and state office for selected fiscal years)*.

In addition to employment in the forest products industry, the management of the BLM-administered lands in western Oregon requires employment of a staff of natural resource specialists, managers, and administrative personnel. *Figure 3-42 (Full-time equivalent positions by BLM district and state office)* shows that BLM staffing has been relatively constant. The BLM's Oregon/Washington state office in Portland provides administrative oversight and support for all BLM-administered lands in Oregon and Washington. The full-time employee data shown on *Figure 3-42* includes all positions at the BLM state office.

Figure 3-43 (Number of BLM full-time equivalent positions by county) shows the number of BLM full-time equivalent positions by the county in which the position is based for the fiscal year 2004. The jobs shown for Multnomah County are in the BLM's Oregon/Washington state office in Portland.

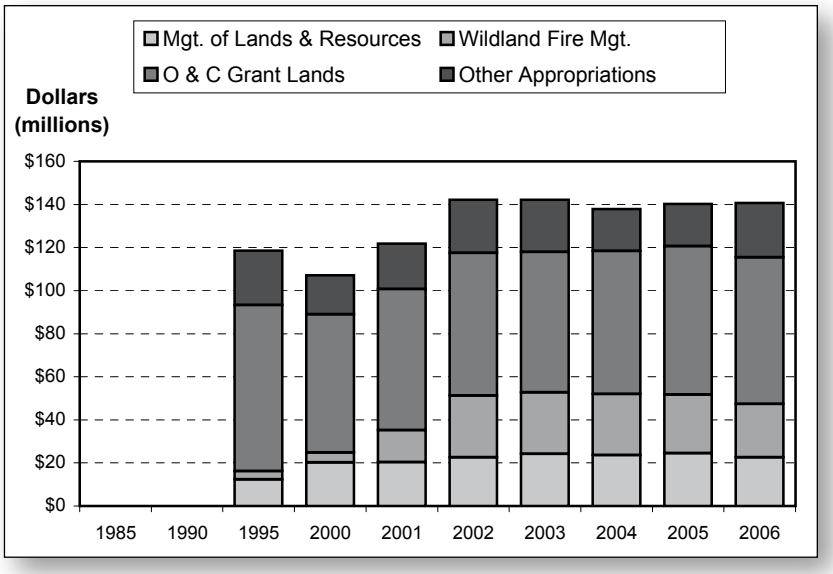


Figure 3-40. Western Oregon BLM Budget For Selected Fiscal Years

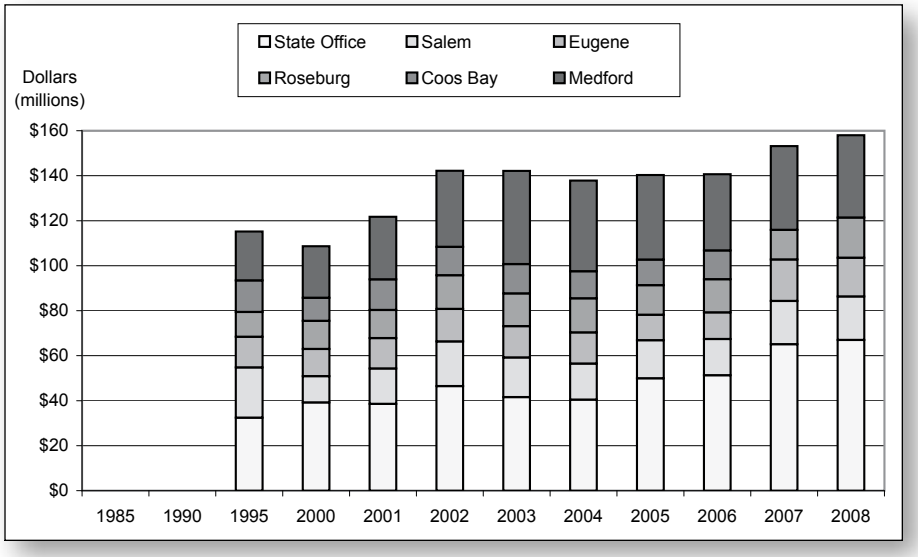


Figure 3-41. The BLM Budget By District And State Office For Selected Fiscal Years

Figure 3-42. Full-Time Equivalent Positions By BLM District And State Office

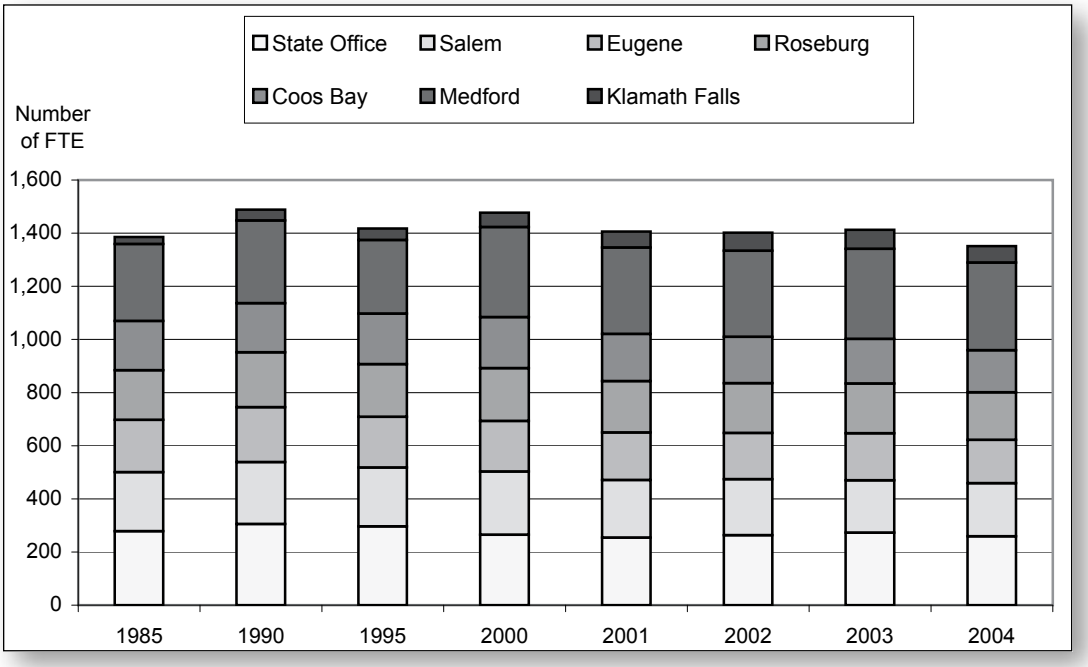
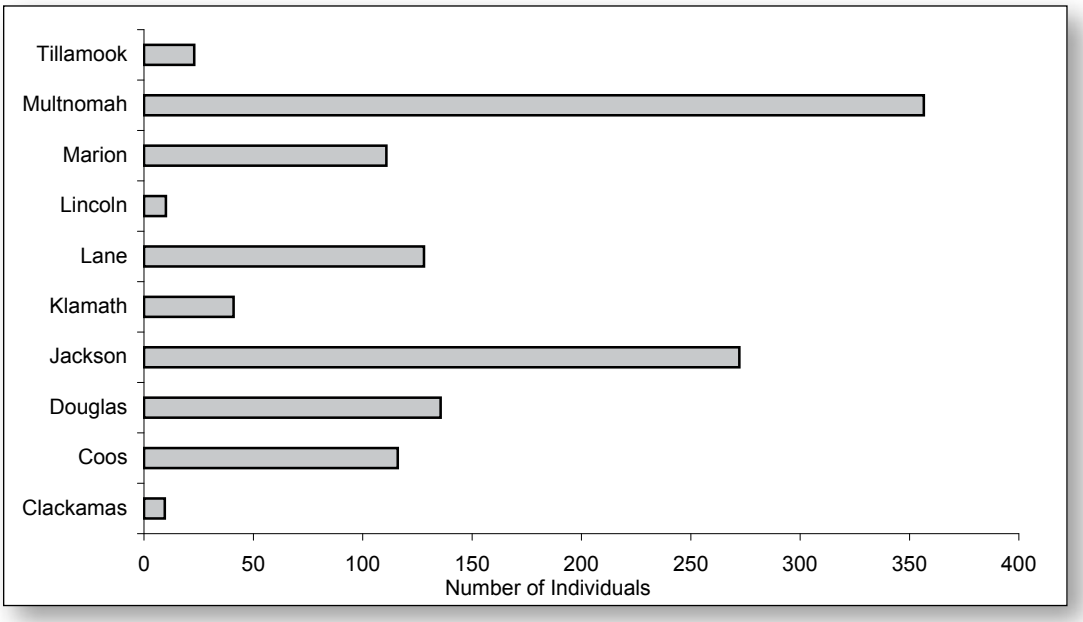


Figure 3-43. Number Of BLM Full-Time Equivalent Positions By County



Timber

Key Points

- Recent inventories indicate an increase in the standing inventory on BLM-administered lands.
- The BLM-administered lands contain a substantial amount of large, high-grade logs in older stands (i.e., mature and structurally complex forests).
- The majority of the younger stands (i.e., stand establishment and young forests) within the planning area have resulted from harvesting and the application of intensive forestry practices on the reforested acres.
- Stands with a management history comprise approximately 46% of the BLM forested lands that are classified as suitable for a sustained harvest of timber.

Forests on BLM-administered lands can be characterized by their standing volume and their acres of existing age classes. The current standing volume is shown in *Table 3-16 (Current standing volume and acres of forested lands)*

The volume figures in *Table 3-16* are based on current vegetative survey plots. See *Appendix R - Vegetation Modeling* for further information on the continuous vegetative survey inventory system. The Eastern Management Lands of the Klamath Falls Resource Area are not included in the above inventory. Acres are rounded to nearest thousands.

See *Table 3-17 (Historic timber volume estimates)* for previous estimates of the volumes on portions of the BLM-administered lands. These figures are the best estimate of merchantable volume for the acreage and include definitions of use at the time period indicated. Note that the definitions of use changed over time.

The large increase between the 1990 and the current timber volumes is mostly explained by the difference in acres included in the determination of volume. In addition to the difference in acres, there is the increase in growth and volume resulting from the increase in faster growing, younger stands, and harvest levels below the annual productive capacity. Although these inventories were conducted using different inventory systems, different assumptions, and different portions of the BLM-administered lands, the inventories provide the basis for broad comparisons and general trends. These inventories show that overall growth on the BLM-administered lands has kept pace with harvesting, and that there is no evidence that cutting has exceeded growth.

Table 3-16. Current Standing Volume And Acres Of Forested Land

BLM Districts	Forested Lands[a] (acres)	Standing Volume (bbf[b])
Salem	365,000	16.8
Eugene	296,000	13.4
Roseburg	399,000	15.5
Coos Bay	302,000	12.8
Medford	788,000	14.8
Klamath Falls Resource Area of the Lakeview District (west)	47,000	--[c]
Totals	**2,197,000**	**73.3**

[a] See Glossary for definition.
[b] Billion board feet.
[c] Included in the Medford District inventory.

Table 3-17. Historic Timber Volume Estimates

Historic Estimates	1940[b]	1960[c]	1970[d]	1980[e]	1990[e]
Timber volume (mbf[a])	46,000,000	49,059,900	50,308,000	46,856,721	49,865,870
Acres	2,165,900	2,145,072	2,391,172	1,771,657	1,794,420
Diameter at breast height (dbh)	≥ 16 inches	≥ 11 inches	≥ 11 inches	≥ 7 inches	≥ 7 inches

[a]Thousand board feet.
[b]Andrews and Colvin 1940
[c]USDI BLM 1960
[d]USDI BLM 1970
[e]USDI BLM 1991

In addition to the total standing volume, the forest can be characterized by the acres of existing age classes. The age class distribution is shown in *Figure 3-44 (Acres of forested lands within the planning area for 2006 by 10-year age class)*.

Figure 3-44 does not include Eastern Management Lands of the Klamath Falls Resource Area (of the Lakeview District) since no starting age class was assigned to these acres. The Salem, Eugene, Roseburg, Coos Bay, and Medford Districts contain predominately Douglas fir by volume. Historical volume harvested by species shows that for most districts, forest stands average about 80% of their volume harvested from Douglas fir. See *Appendix E - Timber*. The Klamath Falls Resource Area of the Lakeview District has white fir as the primary commercial species along with ponderosa pine.

The inventory systems that BLM maintains are not designed to record log quality by level of expected size and grades. Therefore, only general information is available. Log sizes and grades are highly variable depending on the stand type that is harvested. This is particularly true in older stands where substantial peeler grade logs might be expected. Some general information can be derived from examining the historical level of peeler versus sawlogs as a percent of volume in past harvesting actions. This historic information can then be used to predict future levels from different types of stands using the structural stage of stands as a classification with anticipated levels of peeler grade for each structural stage. See *Appendix*

Figure 3-44. Acres Of Forested Lands Within The Planning Area For 2006 By 10-Year Age Class

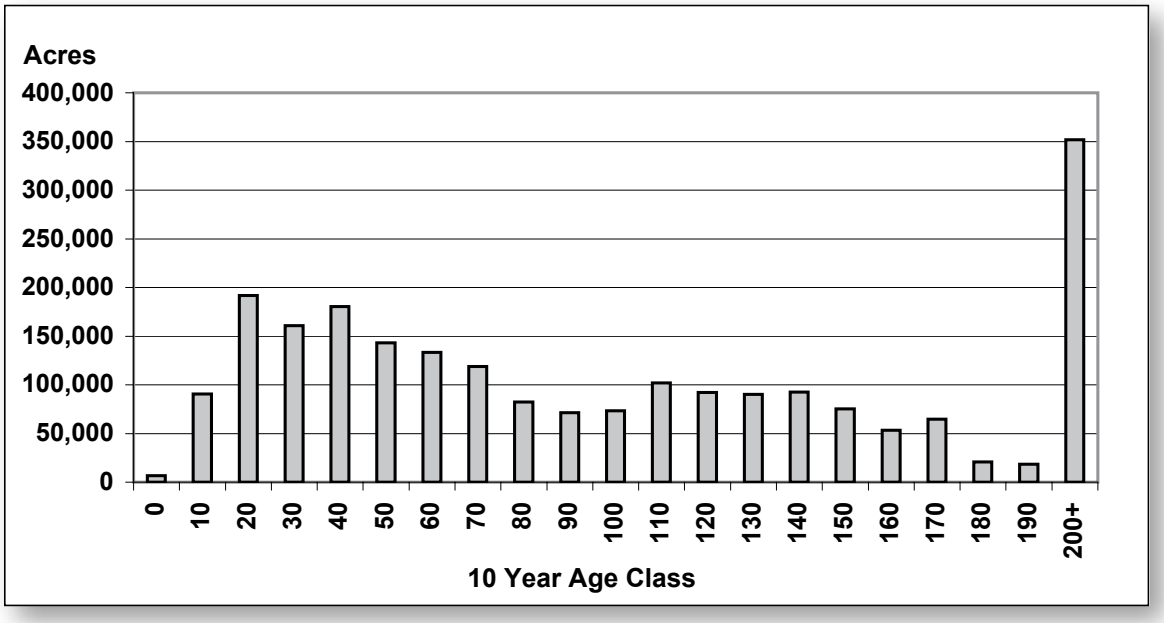
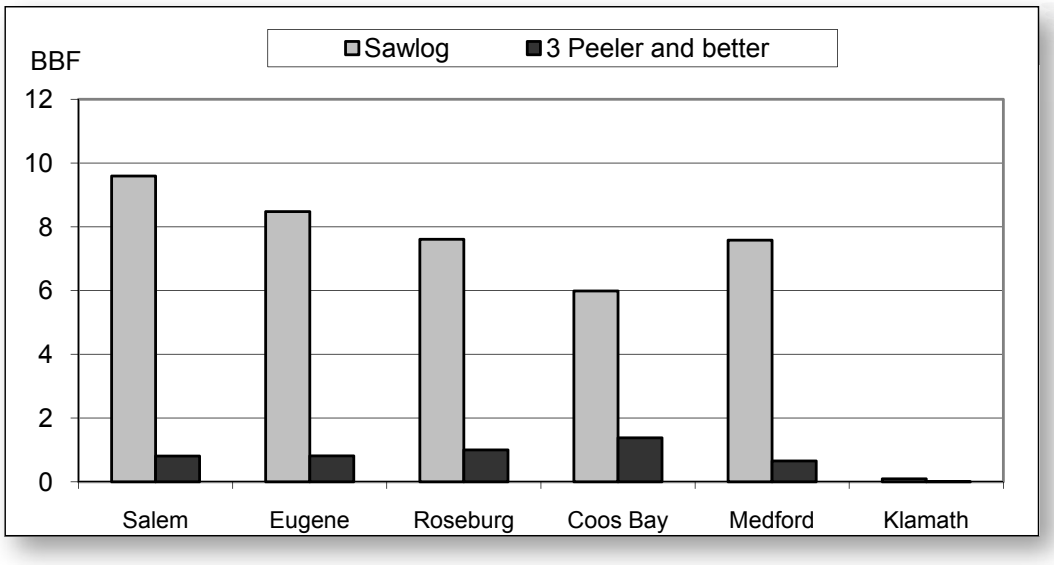


Figure 3-45. Peeler Versus Sawlog Grade Of Douglas Fir Logs By District Within The Planning Area



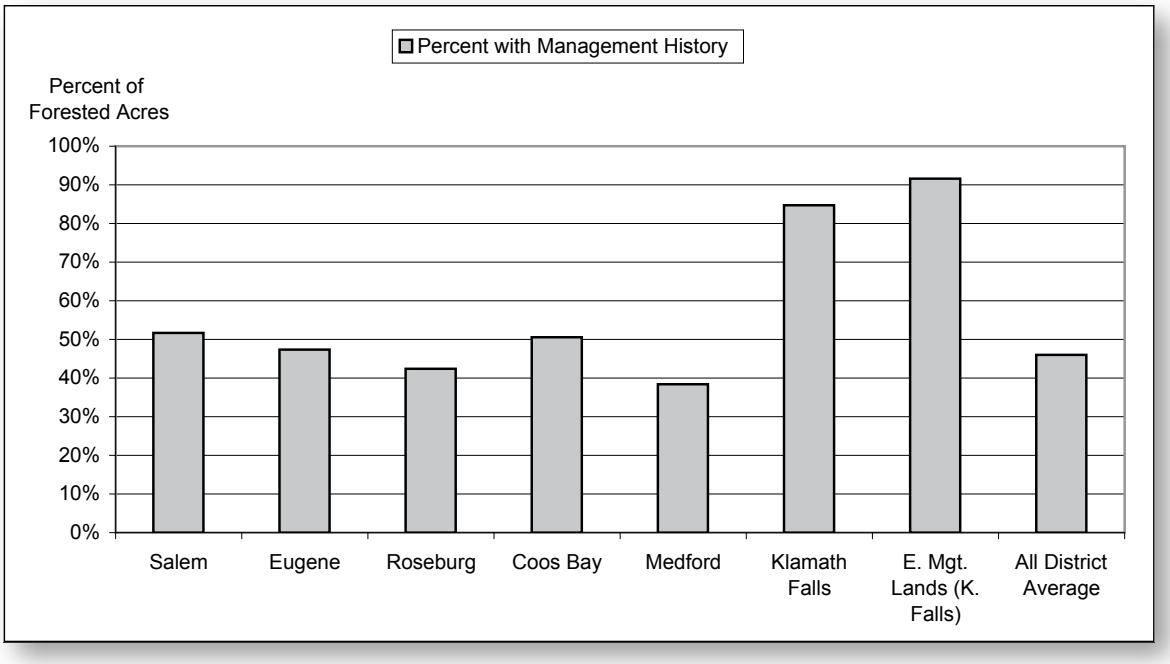
E - Timber. See *Figure 3-45 (Peeler versus sawlog grade of Douglas fir logs by district within the planning area)* for the level of anticipated peeler grades of Douglas fir on BLM-administered lands suitable for timber harvesting and not part of the National Landscape Conservation System.

Existing stand condition is a codified classification system for inventory that separates stands into classes with similar management histories and conditions. This system is used to predict future growth and development trajectories of stands. The future growth that is anticipated from stands can be affected by past management history and current stand density, for the following reasons:

- Managed stands are expected to have considerably higher volumes of timber per acre than natural stands of similar age due to more consistent spacing, changes in species composition, and use of improved genetic stock during reforestation.
- Young stands resulting from regeneration harvesting where a component of the original stand is left as a legacy often have lower growth rates for the understory component of those stands.

See *Figure 3-46 (Percent of BLM lands within the planning area with management history that are suitable for sustained timber production)* for the percentage of BLM-administered lands within the planning area that have a management history suitable for sustained timber production. In general, the BLM-administered lands have had a substantial amount of past management from either regeneration harvesting or thinning.

Figure 3-46. Percent Of BLM Lands Within The Planning Area With Management History That Are Suitable For Sustained Timber Production



Special Forest Products

Key Points

- Over the past seven years, 91 forest products in 10 categories were harvested or collected on BLM lands.
- Wood products (including firewood), mushrooms, and floral and greenery are consistently the three special forest product categories of highest interest, based on the number of permits sold and revenue collected.
- Collectors normally focus harvesting efforts in areas where the commercial forest product is abundant and it is easy and economical to harvest.

Special forest products encompass a wide variety of wood, plant and fungi resources. These products are harvested, gathered, or collected for commercial or personal uses and have various social, economical, or spiritual values. American Indians, wildcrafters, harvesters, and woodcrafters are among those who regularly collect and harvest products throughout the year.

Public lands managed by BLM provide broad opportunities for special forest product collection and harvest. Even though there are no designated BLM management areas or activities designed specifically to manage special forest products, a wide variety of special forest products is available. Common examples include conifer boughs, Christmas trees, mushrooms, edibles and medicinals, floral and greenery, mosses and lichens, ornamentals, seed and cones, tree burls, transplants and wood products including posts, poles, firewood, shakes, and rails.

Special forest products are generally collected or harvested from common plants and fungi associated with conifer forests, hardwood, shrublands, and grassland plant communities throughout the Pacific Northwest, including BLM-administered lands. The distribution and abundance of special forest products vary within the planning area and by BLM district. Many special forest products such as firewood, Christmas trees, evergreen boughs, huckleberries, and some mushroom species have broad ecological amplitude and are spatially widespread, whereas others require a specific plant community, habitat, or even a specific host. In addition to spatial variance, there is temporal variability. For example, the abundance of mushrooms and berries vary considerably from year-to-year and by region, based on site conditions and yearly climate patterns.

Commercial, personal, and incidental uses are distinct categories for public users on BLM-administered lands, although the boundaries between personal and incidental use blend together. Commercial use of special forest products requires a permit and harvesters generally search for and harvest high value products from patches in a systematic and thorough method for high resale value. Many individuals enjoy harvesting or collecting special forest products for their own personal use and tend to harvest smaller quantities, searching less systematically and less thoroughly and at a smaller spatial scale. Some personal use special forest products require permits, such as Christmas trees and firewood. Incidental use includes collection and gathering of berries and mushrooms for immediate use and firewood for campfires (USDI BLM 1996). Although most commercial harvesters in the Pacific Northwest do not rely on special forest products for their sole source of income, these products do provide important supplemental or seasonal sources of income that contribute to household economies (Charnley 2006).

Recently the interest, types, and demand of special forest products have increased as the pharmaceutical industry, restaurants, entrepreneurs and others have developed new products and established new distribution and markets, both nationally and internationally, especially for herbal and floral products, edibles and specialty wood and craft products (Chamberlain et al. 1998, Jones et al. 2002).

The BLM organizes the 91 special forest products of public interest on BLM-administered lands into 10 categories. The product categories are generally similar to those discussed in other studies (McLain and Jones 2005, Vance et al. 2001, Jones et al. 2002). The past 7 years of BLM permit data, although limited in nature, provides a year-by-year summary of products and harvest amounts allowed by BLM districts. The data also provides the basis for a retrospective analysis of trends and demand for special forest products. The actual number of products and quantities harvested is unknown, but is likely larger than reported in permits, according to the limited amount of studies conducted in the Pacific Northwest (Jones and Lynch 2007).

Below are general descriptions of the 10 common special forest product categories and, in parenthesis, the number of different products in each category reported on BLM permits. Also included are examples of forest and plant communities and species from which these products are typically harvested. See *Table 3-18 (Special forest products by category)* for a complete list of the special forest products.

Boughs (12). The typical species from which boughs are collected are western red cedar and incense cedars, true firs, pines, juniper, and Douglas fir. Conifer boughs are used by individuals and the floral industry primarily during the Christmas season for seasonal decorations. Boughs are generally collected from young or mature forest stands. Western red cedars occur in riparian zones.

Burls (2). Burls are used for woodcrafting in manufacturing specialty items, such as clocks, tables, veneers, and other decorative items. Burls are found on either the bole (cluster burls) or on the stumps (stump burls) of trees. Burls are harvested from hardwood trees in mature and structurally complex forest stands of hardwood and mixed conifer and hardwoods forest types. Common species include maples, madrone, and myrtlewood.

Christmas trees (4). Christmas trees are sold as seasonal decorations for personal or commercial use. Christmas trees are harvested from young conifer plantations.

Edibles and Medicinals (11). Huckleberries are collected from mature forest stands, and elderberries are collected from stand establishment and young forest stands. Cascara and yew bark is peeled from the bole of trees and used to make laxatives and tonics. Since the majority of Cascara and yew is confined to streams or seasonally wet areas, their harvest is typically limited.

Floral and greenery (9). Floral and greenery products are used in decorative arrangements. Common plants include salal, evergreen huckleberry, sword fern, and beargrass that generally occur in the understories of conifer forests. Numerous floral and greenery products are harvested from upland areas in conifer forest types in mature and structurally complex forests stands. Manzanita is harvested for decorative greens and bird perches and occurs in woodland and shrubland communities, mostly in southern Oregon.

Mosses (3). Mosses are generally collected in the Coast Range and largely used in the florist/horticulture trade.

Mushrooms (12). Mushrooms that are commonly harvested include golden chanterelle, winter chanterelle (yellow foot), morels, matsutake, shaggy parasols, coral mushrooms, truffles, and hedgehogs. Each mushroom is associated with one or more specific hosts in forested conifer or mixed hardwood stands. Mushrooms are generally harvested from hardwood and conifer forest communities of mature and structurally complex forests stands. Morels appear to increase in abundance after disturbances such as timber harvest, insect infestations, and often immediately after a wildfire (Pilz et al 2007).

Seeds and cones (5). Cones are collected commercially for seed or harvested for ornamental purposes from mature and structurally complex forests.

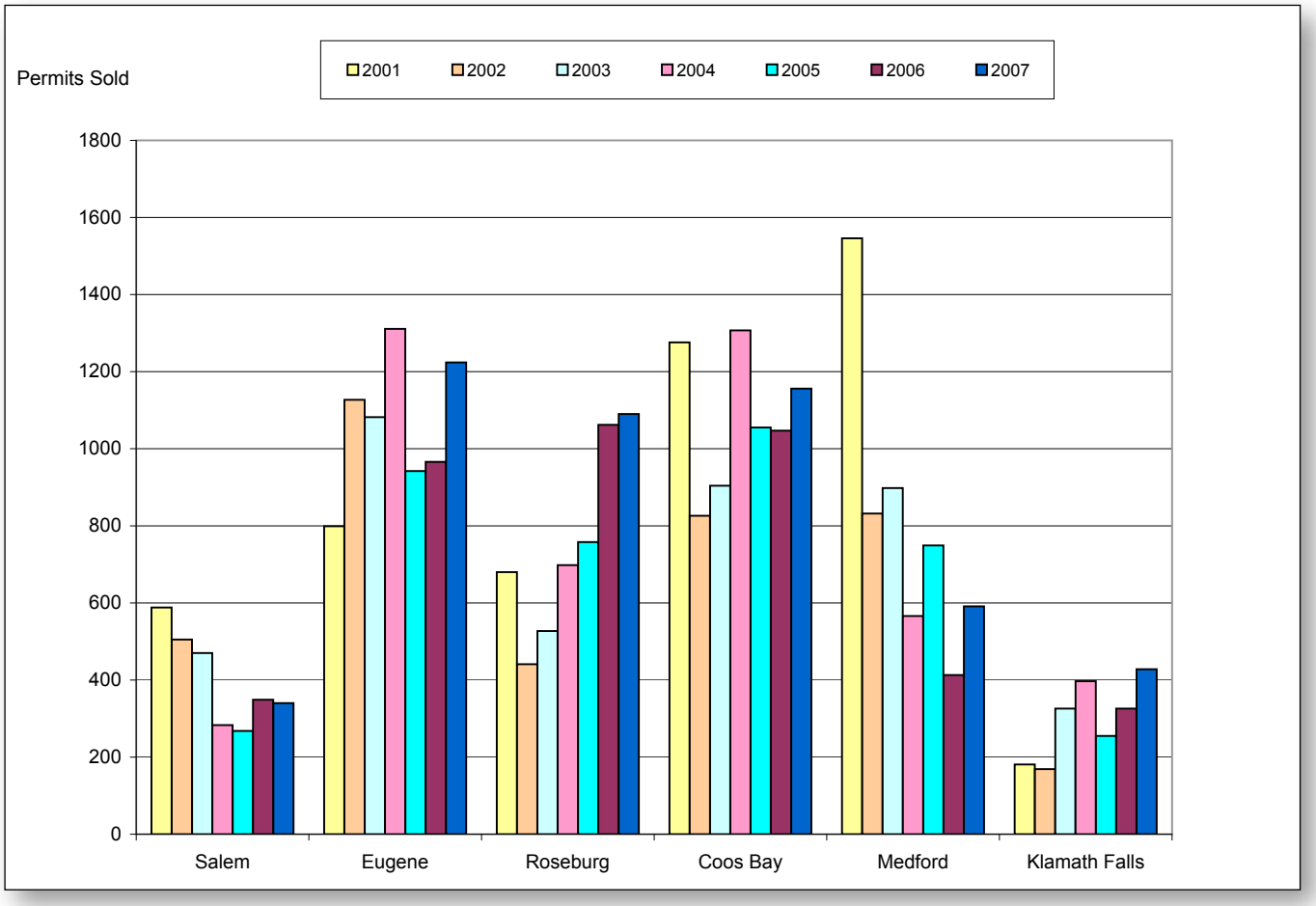
Transplants (14). Transplants include various native ground covers or shrubs, forbs, and tree species including root stock for medicinal purposes. These plant species are found in riparian and upland areas in all plant communities.

Wood products (19). Wood products include firewood, posts and poles, rails, cedar shake bolts, biomass, or pulp wood. Poles can be any length, but no more than 6 inches in diameter on the large end. Wood products are harvested from young, mature, and structurally complex forests. Wood products also include ornamental wood species such as red alder, big leaf maple, madrone, vine maple, and willows. These are used to construct furniture and cabinetry, veneers, and bow staves. Ornamental wood species also include cut sticks, generally red alder, or other hardwood species that measure less than 4 inches in diameter at the large end. Ornamental wood species are harvested from all forest communities, but generally from mature and structurally complex forests.

The types of special forest products vary across the planning area and their abundance can vary from year-to-year. The location of the commercial harvesting sites and the type of product and site conditions may change from year-to-year. These differences are reflected in the forest product permits issued by BLM district, although permit record data is inconsistent and may obscure other variables (USDI BLM 2007a). See *Figure 3-47 (Trend in the total number of permits issued over seven years by BLM district)*.

The total number of special forest product permits varies by approximately 20% between any two-year interval. The Eugene, Coos Bay and Roseburg districts sell the highest number of permits yearly. For 2007,

Figure 3-47. Trend In The Total Number Of Permits Issued Over Seven Years By BLM District



the combined total of permits for these three districts was approximately 3,500. (Note: The number of issued permits reported for the Medford District shows a decline of more than half over seven years, which is likely not an actual drop in the number of permits issued, but rather reflective of a change in accounting procedures.)

Permits for commercial use and some types of personal use for special forest products may include restrictions to help meet ecological and renewable resource standards and to protect other sensitive resource values. Permits may restrict the type of species, quantity harvested, harvest or collection method, location, access, and season.

Over-harvesting of special forest products is not known to occur on BLM administered lands to the extent that the amount of harvesting creates concern for sustainability of the product or species at either small or large spatial scales. Detailed special forest product specific studies and analysis have been conducted where concerns for over-harvesting and long-term sustainability existed in the past, such as moss harvesting in Eugene (Muir 2004) and yew wood harvesting (USDA USDI 1993a). However, only a few studies address the relationship between species ecology, abundance, and harvest patterns (Jones et al. 2007). Field inventories of special forest products that include distribution and abundance, harvest areas, and actual harvest amounts on BLM-administered lands are lacking. Although this information is lacking, the public regularly expresses concern about the apparent over-harvesting of popular products such as medicinals, mushrooms, mosses, and edibles. Whenever these anecdotal situations are validated through field investigations, harvesting permits are modified, discontinued, or issued for other areas.

Natural disturbances (e.g., wildfire, storms, and floods) affect the types and productivity of special forest products over time. Wildfires change vegetative and structural components of the landscape by consuming plant biomass, but can promote reproductive responses of some special forest products. For example, morel mushrooms respond quickly after wildfires. In other instances wildfires create conditions, in subsequent years that can be favorable for other vegetative products such as willow whips, beargrass, other floral and greenery products and medicinal forbs. Alternatively, wildfires diminish or eliminate the value of such special forest wood products as boughs, Christmas trees, firewood, and poles.

Floods alter the vegetation and special forest products in riparian plant communities. Although initially floods may appear to destroy the existing riparian vegetation, the changed conditions induce vigorous resprouting and reseeding of shrubs and forbs, and within a few years provide a new potential crop of alder, willow, and forb products along streams and wetland areas.

Timber harvesting changes the forest condition and, depending on the product, increases or decreases collecting and harvesting opportunities and quality. Forest stand characteristics such as species composition, age, distribution of age classes, growth rate, and density influence the type, productivity, and quality of special forest products. The road network (particularly forest roads that access patches of special forest products) and land use restrictions influence the location, availability, type of product, and amount for harvest.

Timber harvesting and associated fuels reduction treatments routinely alter forest stand structure and forest floor conditions. These two activities affect a larger area than all other planned activities combined. The method of timber harvesting has a particularly large influence on abundance and value of special forest products (Cocksedge 2006). Ground-based harvesting operations disturb more area with greater levels of disturbance to the understory vegetation (and associated special forest products, such as mushrooms and floral and greenery) than cable operations. Helicopter harvesting disturbs the least amount of the understory vegetation. Timber management activities, however, provide road access to harvest areas that would otherwise not be available.

Regeneration timber harvesting reduces suitable conditions for numerous special forest products, while at the same time providing abundant biomass, fiber, and firewood as commercial by-products. Timber harvest reduces suitable conditions for chanterelles, which do not fruit for the first 15 years after a regeneration harvest (Pilz et al. 2003), and matsutakes that rarely fruit in stands under 40 years of age (Vance et al. 2001). Some commercial floral and greenery products (e.g. moss, and boughs) may be lost for one or more decades from regeneration harvest units (Muir 2006). Commercial thinning generally provides conditions where understory greenery products can persist, and their commercial value may even improve within a short period of time. Abundance, availability and quality of many understory greenery products (for example, beargrass and salal) can increase within a short time after thinning harvests due to a rise in the light availability, whereas others (such as morels) increase in abundance from disturbances (Pilz et al. 2007).

Silvicultural treatments conducted after timber harvest generally cut evergreen vegetation and hardwoods. These activities create large amounts of impenetrable debris, retarding development of floral and greenery products and reducing their quality for years. At the same time, the quality of Christmas trees increases.

Fuels treatments target the pole component of forest stands, as well as the hardwood and shrub understory. Fuels treatments include broadcast burning, and manual and mechanical treatments. Broadcast burning disposes logging slash and other forest floor fuels; burns wood products, floral and greenery, and medicinals; and degrades product quality. Manual treatments have less impact on understory vegetation, the forest floor, and associated special forest products than mechanical treatments (such as slash-buster operations) due to the size of the equipment. Opportunities for pole harvest can be created in coordination with fuel reduction projects. Flora and greenery products and mushrooms generally respond quicker to manual operations than mechanical operations because manual operations are more selective and less damaging.

Permit sales provided revenues averaging over $200,000 per year and totaling nearly $1.5 million over the past seven years. Revenue from wood products exceeded that for all other special forest products combined. The other three special forest product categories that have provided high revenues over the years are floral and greenery, mushrooms, and boughs.

See *Table 3-18 (Special forest products by category)* for the 10 categories of 91 specific forest products found on BLM-administered land within the planning area.

Table 3-18. Special Forest Products By Category

Category	Special Forest Products		
Boughs (coniferous)	Douglas fir	Noble fir	Sugar pine
	Grand fir	Pacific silver fir	Western hemlock
	Incense cedar	Port Orford cedar	Western red cedar
	Juniper	Shasta red fir	White fir
Burls and miscellaneous	Big leaf maple		
	Pacific madrone		
Christmas trees	Douglas fir	Noble fir	
	Grand fir	Shasta red fir	
Edibles and medicinals	Bay leaves	Oregon grape root	Prince's pine
	Blue Huckleberries	Pacific yew bark	Quinine Conk
	Cascara bark	Pacific yew boughs	St. John's wart
	Elderberries		
Floral and greenery	Beargrass	Joshua Tree	Sword fern
	Bracken fern	Manzanita	
	Cactus species	Oregon grape	
	Huckleberry	Salal sp.	
Mosses (bryophytes)	Lichen sp.		
	Sheet moss		
	Tree moss		
Mushrooms (fungi)	Black picoa	Horn of plenty	Shaggy parasol
	Cauliflower	King bolete	Spreading hedgehog
	Coral tooth	Matsutake sp.	White chanterelle
	Golden chanterelle	Morel sp.	Yellowfoot mushroom
Seeds and seed cones	Douglas fir	Sugar pine	
	Noble fir	Western hemlock	
	Ponderosa pine		
Transplants	Bleeding heart	Oregon grape	Western hemlock
	Bracken Fern	Rhododendron	Western red cedar
	Douglas fir	Sword fern	Wild iris
	Huckleberry	Vine maple	Willow sp.
	Incense cedar		
	Mountain mahogany		
Wood products	Alder stick (large)	Grape stakes	Pulpwood
	Arrow stock	Hobby wood	Rails (split)
	Bolts and shakes	Large poles	Round wood
	Corral poles	Marginal logs	Small poles
	Fence stays	Pitchwood	Tepee poles (4 inches
	Fuel wood	Posts (corner)	x 16 feet)
		Posts (line)	Whip stock (miscellaneous)