



Conservation Plans for the Northern Spotted Owl and Other Forest Management Proposals in Oregon: The Economics of Changing Timber Availability

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Acknowledgements

We deeply appreciate the technical reviews provided by Dr. John Beuter of Mason, Bruce and Girard Inc., Ann Hanus of the Oregon Department of Forestry, and Dr. Richard Haynes of the USDA Forest Service's Pacific Northwest Research Station. Dr. Haynes was also instrumental in providing us with information underlying the Interagency Economic Effects report. In addition, suggestions provided by Dr. E.C. Meslow aided greatly in the drafting of this report, and we appreciate his willingness to participate. Technical accuracy and interpretation within the document are, of course, ultimately our responsibility.

Ralph McNees at the Forest Research Laboratory provided editorial assistance, Sue Gorecki provided word processing, Gretchen Bracher provided layout, and Judy Starnes checked literature citations; we appreciate their timely response. The Oregon Department of Forestry once again provided computer facilities and permitted Gary Lettman to play a key role in this analysis. State Economist Dr. Paul Warner and Oregon State University's Dr. John Sessions helped provide key data on a moment's notice several times during the preparation of this report.

The support provided by Dean George Brown, State Forester Jim Brown, and Governor Goldschmidt's office was critical in allowing us to see this report through.

Contents

- 1 Background
- 1 Executive Summary
- 4 Introduction to the Study
- 5 Oregon's Harvest History and Potential
- 5 Significance of Timber Industries in Oregon
- 6 Outlook for Oregon's Forest Land Base
- 7 Outlook for Oregon's Timber Harvest
 - 7 Data Sources, Assumptions, and Scenarios
 - 7 National Forests
 - 7 Bureau of Land Management
 - 7 State and Other Public Lands
 - 7 Private Lands
 - 7 No Private Response
 - 7 Private Price Response
 - 8 Private Conservation
 - 8 Harvest Levels
- 9 Outlook for Oregon's Economy
 - 9 Prices
 - 10 Employment
 - 10 How Will the State's Future Differ From Today?
 - 11 How Will the State's Future Differ When Harvest Levels Decline?
 - 11 Income
 - 12 Local Government Funding
- 13 Outlook for Oregon's Communities
- 15 Literature Cited
- 17 Tables
- 29 Figures
- 36 Appendix A. Revisions to "The 1989 Update" Harvest Levels
- 37 Appendix B. Derivation of Western Oregon's Harvest Levels Under the Private Price Response
- 38 Appendix C. Procedures Used in Simulating the "50-11-40 Rule" on Private Lands
- 39 Appendix D. Inventory and Harvest on Private Land in Western Oregon
- 50 Appendix E. National Economic Indicators Used in Forecast

Background

The recent report issued by Oregon State University, "Timber for Oregon's Tomorrow: The 1989 Update" (hereafter referred to as "The 1989 Update") suggested that Oregon will be confronted with declining timber availability in the next few decades (Sessions *et al.* 1990). "The 1989 Update" used the most recently available plans for public lands and projected harvest potential on private lands. Since the publication of "The 1989 Update," the northern spotted owl has been listed as threatened by the U.S. Fish and Wildlife Service and new information has become available for conservation plans for the northern spotted owl.

In response to concerns over the viability of the northern spotted owl, the heads of the National Park Service (NPS), U.S. Fish and Wildlife Service, USDA Forest Service, and the Bureau of Land Management (BLM) called for an Interagency Scientific Committee (ISC) to be formed to develop a scientifically credible conservation strategy for the northern spotted owl.¹ The committee released its findings in April 1990 and the ISC Conservation Strategy called for the establishment of a system of habitat conservation areas, "HCA's" (Figure 1). The committee recommended that no timber harvesting should be permitted on lands managed by the USDA Forest Service, BLM, or NPS within the habitat conservation areas (HCA's). In addition, it was strongly recommended that Oregon allocate state acreage to the HCA network. The committee also recommended changes in management actions on forest lands administered by the Forest Service and BLM outside the HCA's to provide for connectivity between habitat areas.

The Endangered Species Act and Oregon's Forest Practices Act will require that the state Board of Forestry draft conservation plans and management guidelines for state and private lands in Oregon. The ISC Conservation Strategy

¹ The report (Thomas *et al.* 1990) was released April 2, 1990, in a mimeograph form. The title was "A Conservation Strategy for the Northern Spotted Owl." The full title of the committee was the Interagency Committee to Address the Conservation of the Northern Spotted Owl. Committee members were Jack Ward Thomas (Chairman), Eric D. Forsman, Joseph B. Lint, E. Charles Meslow, Barry R. Noon, and Jared Verner.

recommends that "the management of suitable habitat on private and State lands should be carried out under the leadership of the States with the cooperation of private land owners. The States, with their cooperators should prepare habitat conservation plans ... that specify how an owl population can be managed." The final guidelines for the state conservation plans are not known at this time.²

As has been widely reported, the combination of the newly proposed national forest plans and the ISC Conservation Strategy for the northern spotted owl will lead to substantial changes in timber availability in the state. The goal of this study is to analyze how the ISC Conservation Strategy will influence Oregon's timber availability and economy in the context of overall changes in public land management. Our study refines the estimates of the timber harvest impacts, analyzes a range of potential outcomes for private lands, provides geographical detail for the harvests, and outlines the economic implications in terms of employment, income, and receipts to local governments.

Executive Summary

According to state and federal agency estimates, adoption of the ISC Conservation Strategy on state and federal lands will reduce their harvests 1,154 million board feet per year in the 1990's (3.9 percent of this reduction is in state harvests); this is in addition to a reduction of 674 million board feet that would accompany the most recently proposed public agency plans. In aggregate, public timber harvests in the state would decline 39 percent from levels of the mid-1980's.

² ISC member E. Charles Meslow has, however, stated that the public lands Conservation Strategy was intended to be sufficient for the protection of the northern spotted owl (personal communication, July 25, 1990).

Our study recognizes three potential scenarios for private owners in the 1990's; (1) No Private Response—harvest at sustainable levels (maximum levels sustainable for one rotation under owner-specified management guidelines and inventory constraints), (2) Private Price Response—increase harvests over sustainable levels in response to rising prices brought about by declines in public supplies, and (3) Private Conservation—adopt a conservation plan with guidelines similar to those outlined in the ISC Conservation Strategy. These scenarios provide a range of potential outcomes on private lands, from scenario (2), which assumes complete freedom for private owners to increase harvests above sustainable and recently observed levels, to scenario (3), which extends ISC Conservation Strategy guidelines to private lands with substantial reductions in harvests. Scenario 1 offers something of a middle ground.

Private owners in the state can sustain an annual level of harvest of approximately 3,421 million board feet. An Interagency Economic Assessment suggested that private harvests in the region might, if not affected by a conservation plan, rise by 19 percent in the 1990's.³ Our study confirms that while this course is possible, it would liquidate significant acres of young, rapidly growing private timber. The result would be that, in the early 21st century, private owners could maintain a harvest 7 percent lower than the 3,421 million board feet that are currently sustainable, and this harvest would be comprised of younger timber than projected under sustainable levels. The implementation of conservation guidelines similar to those in the ISC Conservation Strategy could reduce private harvests in the 1990's to one-half of the sustainable levels.

If the ISC Conservation Strategy is implemented with the proposed plans on state and federal lands, Oregon is apt to witness harvests in the 1990's declining 14 to 21 percent relative to the level of 1983-1987, depending upon the

³ The report (Hamilton et al., 1990) was released on May 3, 1990, in mimeograph form. The report was titled "The Economic Effects of Implementing a Conservation Strategy for the Northern Spotted Owl." The committee charged with the report was known as the Interagency Economic Effects Team. Members of the Committee were Tom Hamilton (Co-Leader), Joe Zimmer (Co-Leader), Phil Stanbro, Mel Berg, Dave Darr, Bill Levere, Richard Haynes, Bill Lange, Al Fox, Mike Skinner, Don Eagleston, and Bob Biesterfeldt.

outcome on private lands. Into the beginning of the 21st century, the decline will reach 21 to 24 percent of the mid-1980's level. If similar guidelines are used for private management, then harvest levels in the 1990's and into the beginning of the 21st century will be 57 percent of the 1983-1987 level.

All timbersheds outside of the North Coast will see drops in harvest levels from the recent past because of the proposed public plans, and the ISC Conservation Strategy will further reduce the harvest levels (see Figure 2 for timbershed definitions). The Willamette, Eugene, Roseburg, and Medford Timbersheds will see declines of over 20 percent, even if private owners accelerate the rates of harvest in response to the public sector adopting the ISC Conservation Strategy along with the proposed plans. If guidelines similar to the ISC Conservation Strategy are extended to private lands, declines in timber availability will be 47 to 65 percent in all western Oregon timbersheds except the North Coast, and even the North Coast would see a 23 percent decline from the harvest levels of the mid-1980's.

Timber industry employment will fall in all western Oregon timbersheds outside of the North Coast. The Willamette, Eugene, Roseburg, Medford, and South Coast Timbersheds could see timber industry employment decline by over 12 percent if the ISC Conservation Strategy is coupled with the proposed plans, even if private harvests increase as suggested in the Interagency Economic Assessment. Timber industry employment in western Oregon could decline as much as 30 percent if private lands are affected by guidelines similar to those in the ISC Conservation Strategy.

Growth is expected in Oregon's economy with or without the ISC Conservation Strategy. Compared to today's employment levels, Oregon's employment is anticipated to grow approximately 1.46 to 1.74 percent per year in the 1990's. Income growth, however, does not keep pace with employment growth; thus, real average income will decline for workers. The range in growth stems from the impacts on the economy of the changing timber availability associated with the proposed plans, the ISC Conservation Strategy, and different assumptions on private lands. However, as timber industry and its employees buy less of Oregon's goods and services,

the impact ripples through the Oregon economy. More than one other job will be displaced along with each timber job. While the job loss may be appropriately labeled as "lost growth opportunities," it will entail actual job changes and relocation by workers.

If we look at where the economy could be if the mid-1980's harvest level could be continued through the 1990's, the economy-wide job displacement associated with the proposed plans and the ISC Conservation Strategy could range from 12.1 to 23.4 thousand jobs in 1995, depending upon the outcome on private lands, and could be from 18.4 to 24.0 thousand jobs in 2005:

Year & public scenario	Private scenario		
	No Private Response	Private Price Response	Private Conservation
(Thousands of jobs displaced)			
1995			
Proposed Plans	7.4	7.4	7.4
ISC Conservation Strategy	<u>16.0</u>	<u>4.7</u>	<u>42.1</u>
Total displacement	<u>23.4</u>	<u>12.2</u>	<u>49.5</u>
2005			
Proposed Plans	6.4	6.4	6.4
ISC Conservation Strategy	<u>12.0</u>	<u>17.6</u>	<u>21.2</u>
Total displacement	<u>18.4</u>	<u>24.0</u>	<u>27.6</u>

The income displaced could range from \$515 million to \$1,002 million per year in 1995, and from \$1,163 million to \$1,258 million in 2005:

Year & public scenario	Private scenario		
	No Private Response	Private Price Response	Private Conservation
(Millions of 1988 dollars of wage and salary income displaced)			
1995			
Proposed Plans	316	316	316
ISC Conservation Strategy	<u>682</u>	<u>199</u>	<u>1,831</u>
Total displacement	<u>1,002</u>	<u>515</u>	<u>2,147</u>
2005			
Proposed Plans	366	366	366
ISC Conservation Strategy	<u>797</u>	<u>892</u>	<u>2,145</u>
Total displacement	<u>1,163</u>	<u>1,258</u>	<u>2,511</u>

This income effect would include both the effect of displacing workers and a further decline in real average worker wages for the remaining work force. If the ISC Conservation guidelines are extended to private lands, the displacement swells to 49.5 thousand jobs and \$2,147 million in income in 1995 and 27.6 thousand jobs and \$2,511 million in income in 2000.

Growth will likely be centered in the state's metropolitan and large recreational centers. Throughout western Oregon, many communities outside the U.S. Interstate 5 corridor and outside the coastal communities must be considered at risk when the ISC Conservation Strategy is coupled with the proposed public plans. The disruptions within these communities will extend beyond jobs and income. Despite growth in the state-wide economy, re-employment opportunities in the western rural communities are likely to be scarce in the foreseeable future. Relocation may be a necessity for many rural workers. The cost of relocation can be significant, particularly for homeowners. Large losses in home equity may be a reality in many of these communities, and relocation may place a heavy financial burden on rural families. Depressed property values and declining industrial bases will lessen the tax base and influence the ability to fund local services.

Needs for social services in the timber-dependent communities may be significant. The need for services related to unemployment will increase greatly in many communities, and worker retraining will likely be required in many instances, as lateral moves in manufacturing are going to be difficult in the state. Large-scale unemployment in communities can also bring with it social problems such as stress, crime, substance abuse, and family abuse. Because the impacts and the communities are widely dispersed, the mobilization of the social service forces to deal with the disruptions may be difficult and costly.

Raw material prices will certainly rise as a result of the decline in available timber. The USDA Forest Service estimates that western Oregon stumpage prices will rise more than 65 percent in the mid-1990's because of the proposed public plans and the ISC Conservation Strategy. National product prices are not apt to respond to the same degree. The USDA Forest Service estimates that national forest product prices will go up less than 10 percent in response to the ISC Conservation Strategy and the public plans. It thus will become more difficult for Oregon's forest product manufacturers to compete, and wage pressures will probably be felt by workers. At the same time that prices are increasing, the large high-quality logs that have given manufacturers of Oregon's timber products a competitive edge in the market place will

be largely eliminated from the near-term harvest. These are the same logs that produce the lumber for much of Oregon's secondary manufacturers.

State-wide, the economic outlook for Oregon is good. Nevertheless, the changing timber availability associated with the changing management of the public lands may be termed an economic crisis for many individuals, households, businesses, and communities throughout western Oregon. State-wide growth in metropolitan areas will, however, diminish the overall economic impact. While the implications for the state in aggregate may not be alarming, many rural communities may face a bleak future, and the social implications have state-wide ramifications.

Introduction to the Study

The goal of this study is to analyze how the ISC Conservation Strategy may influence Oregon's timber availability and economy in the context of overall changes in public land management. Two themes are important: first, how the state's future will differ from today and second, how the state's future will be affected by reductions from recently observed harvest levels.

This report summarizes the history of timber harvests in Oregon, the role of the timber industry in Oregon's economy, and the implications of changing timber availability for (1) Oregon's forest land allocation, (2) Oregon's harvests by owner and region, (3) Oregon's state economy in terms of jobs and payrolls in timber industries and other sectors of the economy, receipts to local governments, and regional timber product prices, and (4) Oregon's communities in terms of jobs, wage and salary income, receipts to local governments, and potential dislocation of local citizens.

All implications of the changing timber availability are discussed through the year 2005

and are relative to the options of continuing to harvest at the levels of 1983-1987. The 1983-1987 period provides a frame of reference as a period representing "average" conditions of the recent past. During this period, harvests were at a scale that supported the timber industry as it was in 1988: the most recent year for which a complete set of economic data was available.

Often in the report we outline the difference in the impacts of the ISC Conservation Strategy and those of the most recently proposed national forest plans. It must be recognized, however, that the ISC Conservation Strategy guidelines were drafted around the land allocations implied in these plans. As stated in the ISC Conservation Strategy, "The validity of the proposed strategy depends as much on the condition of the habitat between HCA's as it does on the status of the HCA's themselves." Further in the ISC report it is stated that "If forest management plans are altered significantly to shorten rotations or to reallocate areas currently reserved from timber harvest for other purposes, the need for dedicated corridors between HCA's must be re-examined." The use of the proposed national forest land allocations (except for the dismissal of their allocations for Spotted Owl Habitat Areas as being insufficient) as requisite and complementary to the ISC Conservation Strategy makes it difficult to fully segregate the harvest impacts of the ISC Conservation Strategy alone.

This report is not an exhaustive benefit/cost analysis. The scope is narrowed to the implications for the sectors of the economy that process timber or use wood products as a raw material and the subsequent implications for other sectors of the economy. The implications for the forestry services sectors (e.g., tree planting, fertilizer services, and consulting foresters) and the public agencies are beyond the scope of this study. Also excluded was the relation between reduced timber harvests and accelerated growth of the tourism and fisheries components of the economy, principally because quantitative studies in those areas were lacking. We also recognize the importance of psychological and ecological values in "balancing the ledger," but we must defer to others for the quantification of these values.

Oregon's Harvest History and Potential

Since the publication of "The 1989 Update," proposed national forest harvests have been revised downward an additional 228 million board feet (see Appendix A for revisions by forest). In addition, since the publication of that study, we have revised upwards our estimates of nonindustrial private harvests so that they will be closer to their sustainable levels in the future; the new levels are approximately those that this owner group maintained through 1988 and 1989. This revision was based on the assumption that contractions in supply (primarily from the proposed federal plans) will keep Pacific Northwest stumpage prices at higher levels than in the mid-1980's. The nonindustrial private harvest therefore rises from the prior level of 360 million board feet per year to 666 million board feet per year (see Appendix A for the allocation of this harvest to timbersheds within Oregon).

The outlook for timber availability under currently proposed plans for land management is referred to as our Proposed Plans scenario. This scenario is based on national forest sales levels from the latest proposed plans (draft, interim, or final) by the USDA Forest Service, on BLM and state sales levels from existing forest plans, on harvest levels from other public lands as determined by extrapolating state harvest rates to other public owners, and on harvest levels from private lands as determined by simulating the sustainable harvest levels of each landowner group. As discussed in "The 1989 Update," a sustainable harvest simulation for the industrial owner group was the most likely projection because of their relatively stable, historic harvests and the resultant forest structure.

With the Proposed Plans scenario, we project the state-wide harvest potential for the 1990's at 7,455 million board feet per year: a 7.0 percent reduction from the 1983-1987 harvest level and a 13.5 percent reduction from the 1988 harvest level (Table 1).

The 1988 and 1989 harvests are presented as evidence of the more recent past. In 1988, higher harvests were the result of greatly increased BLM harvests resulting from the liquidation of sales volumes that had accumulated during the recession years of the early 1980's and of greatly increased harvests of nonindustrial private timber. Preliminary data for 1989 indicate that total harvest levels had returned to the levels of 1983-1987 but that nonindustrial private harvests continued to increase.

The Proposed Plans scenario's reduction in timber availability by 565 million board feet in the 1990's from levels of 1983-1987 results from (1) a proposed allowable sale reduction on national forests of 795 million board feet, (2) a BLM increase in realized sales of 68 million board feet, (3) increases in state and other public harvests of 53 million board feet, (4) a reduction of 197 million board feet in industrial harvests, and (5) an increase of 306 million board feet in nonindustrial private harvests.

The reduction in timber availability in the Proposed Plans scenario is not felt equally throughout the state. To address regional implications, the authors of "The 1989 Update" divided the state into nine, somewhat self-sufficient timbersheds (Figure 2). For the current study, we merged the three eastern Oregon timbersheds. Comparing potential harvests within regional timbersheds to historic harvest levels shows the disparate nature of the changing availability of timber for harvest in Oregon (Table 2).

Significance of Timber Industries in Oregon

The timber industries of Oregon are diverse. Included are primary manufacturing companies involved with logging, sawmilling, veneer and plywood, and pulp and paper, as well as secondary manufacturing companies involved

with moulding and millwork, wood treating, pallets, laminated beams, and a variety of miscellaneous wood products. These industries have played a major role in the Oregon economy in terms of jobs, income, and support of local governments. In order to address the contributions of the industries to the economy of the state, it is important to segregate the large Portland and Salem metropolitan areas from the rest of the state. Thus, for discussions of economics, the state was broken into eight economic regions that differ somewhat from the timberheds (Figure 3).

In 1988, wage and salary employment in the timber industries totaled 77,400 of the 1,140,700 jobs in Oregon (Table 3). This represents 6.8 percent of the total wage and salary employment and 36.7 percent of the manufacturing employment in the state. In the nonmetropolitan counties, employment in the timber industries can account for as much as 29.4 percent of total wage and salary employment and 92.3 percent of the manufacturing employment. Reports for 1989 show that employment in the timber industries dropped slightly to a level of 76,000 wage and salary employees, while state employment rose to 1,206,600 wage and salary employees.

The role of timber in the Oregon economy has been changing over the past 12 years. From 1976 to 1988, employment in Oregon's timber industries declined by 10 percent because of declining harvests and technological change while overall employment rose by 30 percent (Table 4), a trend that has been common to most of Oregon's economic regions. Real wage and salary income, however, rose only 22.5 percent, indicating declines in average worker earnings.

Payrolls in the timber industries totaled 2,014 million dollars in 1988 (Table 5). This represents 9 percent of state-wide payroll income. In certain nonmetropolitan regions in the state, as much as 40 percent of the payroll income is paid to timber industry employees.

The harvesting of timber directly contributes to the budgets of local taxing districts in Oregon. The receipts from national forest and state forest harvests are shared with counties and school districts, while the BLM administers lands whose revenue shares are primarily allocated to counties (Hackworth and Greber 1988). Severance taxes are also collected on private

timber harvests and serve as property-tax offsets for local taxing districts. In addition, many counties own forest lands, which generate income for them. The 1987 harvests from these sources directly contributed over 24 percent to the counties' 1988 budgets and approximately 2 percent of the school and educational service districts' 1988 budgets (Table 6). In nonmetropolitan areas, the reliance ran as high as 65 percent of county government budgets and 8.5 percent of school and educational service budgets.

Outlook for Oregon's Forest Land Base

Oregon contains 23,953 thousand acres of forest land. Public ownership comprises 65 percent of the total. Under the proposed forest plans, 4,585 thousand acres (19 percent of the forest lands) are unavailable for timber harvesting because of either mandatory restrictions (such as in wilderness areas) or discretionary restrictions (Table 7). Approximately 2,500 thousand acres of public forest land lie in the ISC Conservation Strategy's HCA's. About 1,622 thousand acres of these lands would have been available for timber harvest under the plans of the public agencies. Thus, the forested public land unavailable for timber harvest would increase from 4,585 thousand to 6,207 thousand acres (from 19 to 26 percent of the total forested acreage).

The HCA's in western Oregon encompass 132,000 acres of state timber lands and 463,000 acres of private timber lands whose status depends on state conservation plans. It is estimated that 45,000 of these private acres would not be available for timber harvest given current practices, i.e., because they are in riparian corridors, taken up by roads or landings, or in another nontimberland classification. Thus, the change in private acres available is 418,000 (Table 7). The ISC Conservation Strategy strongly recommends the inclusion of the state

timber lands in the HCA system, where harvesting is prohibited.

Most of the HCA's lie west of the Cascade Mountains. In that region, there are 13,569 thousand acres. The public forested lands unavailable for timber harvest would rise from 2,450 thousand acres to 4,015 thousand acres (from 18 to 30 percent of the total acres) (Table 8). The distribution of the HCA's is such that significant declines in available forest lands would occur in all western Oregon timberheds (Table 9).

Outlook for Oregon's Timber Harvest

Conservation plans for the northern spotted owl have implications for timber harvest that require differing assumptions and data sources for each owner group.

Data Sources, Assumptions, and Scenarios

National Forests — The impacts on National Forest Allowable Sale Quantities (i.e., allowable cuts) were calculated from statistics provided by the national forests to the interagency team assessing the economic effects of the conservation strategy (Hamilton et al. 1990). These effects were assessed on a forest-by-forest basis and apportioned by determining the percentage of the HCA's lying within each timbershed.

Bureau of Land Management — The impacts on the Allowable Sale Quantities from lands administered by the BLM were taken from BLM estimates provided to the interagency team assessing the economic effects of the conservation strategy. Volumes were converted from short-log

scale volumes to long-log scale volumes to make them comparable with other information such as historic harvest statistics. Effects on volume were assessed on a district-by-district basis and apportioned by determining the percentage of the HCA's lying within each timbershed.

State and Other Public Lands — It was assumed that the state would abide by suggestions in the ISC Conservation Strategy and establish the recommended HCA's. Where pertinent, this assumption is noted in the discussion. Current management practices on state lands were felt to be compatible, for the most part, with ISC Conservation Strategy guidelines for lands outside of HCA's. The impacts on the Allowable Sale Quantities from lands administered by the state and other public agencies were estimated by withdrawing the acres contained within HCA's from the timber base and adjusting Allowable Sale Quantities by a percentage based on the proportion of productive acres removed from the land base. Long-run harvest effects, however, would be more than double those reported for the 1991-2000 period.

Private Lands — Impacts of conservation plans on private harvests depend upon (a) whether private owners will respond to reduced public timber supplies and increased prices by harvesting more timber in the short-run and (b) whether a conservation plan for private lands will be drafted that significantly alters private owners' management practices. We consider three scenarios that define the range of potential outlooks on private lands.

(1) **No Private Response** — This scenario assumes that management plans for private lands in the HCA's are not altered and that industrial and nonindustrial private owners harvest at sustainable levels (maximum levels sustainable for one rotation under owner-specified management guidelines and inventory constraints). This harvest level is identical to that used in the Proposed Plans scenario.

(2) **Private Price Response** — This scenario was provided in the interagency assessment of the economic effects of the ISC Conservation Strategy. The Interagency Economic Assessment assumed that private land would not be subjected to conservation practices and estimated that the private harvest would increase because

of price increases brought about by changing forest plans and the conservation strategy. Appendix B summarizes the Interagency Economic Assessment's Pacific Northwest-West Side harvest levels and our computed levels for Oregon. This scenario should be viewed as providing an upper boundary on timber availability because it contains no provisions for the northern spotted owl on private lands.

(3) Private Conservation — In this scenario it is assumed that private acres within the HCA's are withdrawn from the timber base and that the "50-11-40 rule" is adopted on private lands. This rule (Thomas *et al.* 1990) states:

"For every quarter township, timber harvest shall be permitted only when 50% of the forest landscape consists of forest stands with a mean (diameter breast height) of 11 inches and a canopy closure of 40%...Where the quarter township contains multiple ownerships, the percentage is computed separately for each owner...."

Appendix C provides the details for how this scenario was simulated. This scenario should be viewed as providing a lower boundary on timber availability because of the severity of the guidelines imposed on the private lands.

Harvest Levels

The implementation of the ISC Conservation Strategy on public lands along with proposed public plans will have significant impacts on Oregon's timber harvests in the 1990's. If federal and state owners do implement them, annual average harvests are projected to fall 1,086 million (13.5 percent) to 1,719 million (21.4 percent) board feet from 1983-1987 levels (Figure 4), depending upon the private scenario. Annual average harvests for all owners in Oregon are anticipated to drop 565 million board feet (7.0 percent) as a result of the proposed plans and related changes in private harvests, leaving 1,154 million board feet directly attributable to the ISC Conservation Strategy on public lands. If guidelines similar to those in the ISC Conservation Strategy are adopted for private

lands, then the annual average harvests would decline 3,421 million board feet (42.7 percent).

Public harvests could decline 1,828 million board feet (38.8 percent of the mid-1980's level) as a result of proposed plans coupled with the conservation strategy (Table 10). The proposed public plans themselves account for a 674-million-board-foot decline (14.3 percent) from the public harvest level of the mid-1980's; thus, 1,154 million board feet are attributable to the ISC Conservation Strategy. Changes in the state forest harvest as a result of the ISC Conservation Strategy comprise 45 million board feet (Table 11).

Average annual private harvests are projected to range from a low of 1,719 million board feet if guidelines similar to those in the ISC Conservation Strategy are adopted to a high of 4,054 million board feet if the projection in the Interagency Economic Assessment is realized. Adoption of the conservation guidelines results in approximately a 50 percent decline from historic and sustainable levels; most of this impact is due to the "50-11-40 rule" (Table 12). The Private Price Response scenario represents an average harvest 19 percent higher than the 1983-1987 levels.

The increased harvest on private lands as a result of the Private Price Response must be viewed as temporary. This increase would be brought about through liquidating much of the private inventory more than 40 years old and outside the North Coast Timbershed (see Appendix D for details on age class). Figure 5 demonstrates the long-run impact of the increased harvest level on private lands in western Oregon; these graphs show the harvest through time with each of the private scenarios. (Cubic instead of board feet were chosen as more appropriate for long-term analyses.) Attempts to increase the harvest in the 1990's result in private owners being able to harvest less in future years than if they had made no such response.

Figure 5 also demonstrates that the Private Conservation scenario entails long-run harvests that recover to or exceed the levels of the other projections as this scenario forces the rotation to ages that generate greater volumes. If the private lands within the HCA's are not withdrawn, the industrial harvests would be 10 percent higher than those shown in Figure 5 and

the nonindustrial harvests would be 2 percent higher.

The cost of the harvest increase in terms of board feet will be significant in the early part of the 21st century, as sustainable harvests by industry drop to 2,607 million board feet (a 14.7 percent decline from the 1991-2000 level) and those by nonindustrial owners drop to 570 million board feet (a 42.8 percent decline from the 1991-2000 level). Many decades pass before the forest inventory allows harvests under the Private Price Response scenario to return to the levels of the No Private Response scenario.

The outlook for timber availability will differ greatly by timbershed. Relative to historic levels, harvests are expected to decline under all scenarios in the 1990's in each western Oregon timbershed except the North Coast, which is likely to undergo a surge in private harvests if the ISC Conservation Strategy guidelines are not adopted on private lands (Table 13 and Figure 6). If the proposed plans and the ISC Conservation Strategy are adopted on public lands, western Oregon would see overall declines from historic levels of 12.3 to 22.7 percent, depending upon the private scenario (an 0.1 percent decline is due to inclusion of state lands under the Strategy). The proposed public plans themselves account for an 8.4 percent decline from historic levels in western Oregon, leaving 3.9 to 14.3 percent attributable to the ISC Conservation Strategy. If guidelines such as those in the ISC Conservation Strategy are extended to private lands, then the total decline would grow to 50.6 percent in western Oregon.

Outlook for Oregon's Economy

Changing timber availability has many implications for Oregon's economy. In this report we focus on four facets of that economy: (1) timber product prices, (2) employment, (3) worker

income, and (4) local government receipts. Prices are important not only because they affect the ability of the timber industry to compete in U.S. and global markets but also because they influence severance taxes and revenue shares from public forests to counties and schools.

Prices

In determining how timber availability affects prices, we borrow from the Interagency Economic Assessment. That Assessment separated softwood prices for the west side of the Cascades in Oregon and Washington from those for the east side of the Cascades in those states. Rapidly rising stumpage prices are anticipated in the Pacific Northwest, and that trend is heightened by the implementation of the proposed plans in the scenario of that name and further heightened by the withdrawal of timber in the implementation of the ISC Conservation Strategy (Table 14).

In Table 14, the "Current Management Plans," as defined by the Interagency Economic Assessment, correspond roughly with the continuation of the 1983-1987 aggregate harvest in Oregon (the Assessment is 2 percent higher than the 1983-1987 level). The Assessment, however, allocates more harvest to western Oregon—6 percent more than historic levels. The price indexes under "Current Management Plans" in the table are a continuation of historic harvest levels, which in themselves could result in somewhat higher prices.

The harvest volume projected by the Assessment for Oregon under their "Proposed Plans" is 1.6 percent greater than that projected by our Proposed Plans scenario, and private harvests in western Oregon are 6 percent greater with the Assessment. Again, we adopt the price indexes in Table 14 as conservative estimates of prices under our Proposed Plans scenario, recognizing that holding harvests to levels set in that scenario could further inflate prices.

The "ISC Conservation Strategy" in Table 14 corresponds to implementing the proposed plans plus the ISC Conservation Strategy on public lands, while private owners harvest at the level that corresponds to the Private Price Response scenario. If either of the other scenarios

for private owners is coupled with the proposed plans and the ISC Conservation Strategy, then the effect on prices could be far greater.

While implementation of the proposed forest plans and of the ISC Conservation Strategy places great pressures on stumpage prices in the region, the products of Oregon's forest industries must compete in national markets. Oregon accounted for approximately one-fifth of U.S. lumber production and one-third of structural panel production in 1983-1987. Oregon is unlikely to be able to pass on the full stumpage price increases to the product market because of competition from other regions in the United States and from imports. Product prices are therefore not affected as greatly as raw material prices (Table 15). While west-side stumpage prices are forecast in the Interagency Economic Assessment to increase by 67 percent in 1995 and 59 percent in 2000 over those resulting from "Current Management Plans," national lumber and plywood prices are not forecast to increase even 10 percent over "Current Management Plans" prices. It should be noted that underlying these projections is a national recession predicted for 1994 and a strong recovery for 1995; this fluctuation gives rise to the unusually high prices in 1995.

At the same time that raw material prices are increasing at rates greater than those of product prices, many mills may have to go greater distances to obtain logs. The pressures on profitability and workers' wages in Oregon's timber industry are going to be great with the implementation of the proposed plans and the ISC Conservation Strategy. Mill closures and business failures are likely.

Employment

The harvest reductions resulting from implementing the proposed forest plans and the ISC Conservation Strategy will have implications for employment in the timber industries, and ripple effects will be felt throughout the economy. The ripple effects stem from changes in the purchases of the industries and their workers. Using a labor market model developed for the study described in "The 1989 Update," we estimated employment in timber industries and all

other sectors of the Oregon economy. The most recent national forecasts by Wharton Economic Forecasting Associates (1990) were incorporated into the model (see Appendix E for the critical indicators).

How will the state's future differ from today? — In all simulations, declines were projected in timber industry employment while growth was projected in the state-wide economy (Table 16). Significant growth was modeled in the service and wholesale and retail trade sectors of the economy. The model calibrates well with the results obtained by the State Economist and the Office of Economic Analysis's forecasting model and actually shows slightly less growth than the state's model. For example, the state forecast issued in June 1990 estimated that despite timber industry employment dropping in 1995 to 64,900 employees, total wage and salary employment will rise to 1,354,300 (Oregon Office of Economic Analysis 1990).

If harvest levels could be maintained at 1983-1987 levels, some displacement of timber industries employment would still take place. By 1995, secondary wood products would be expected to add some 1,300 employees, while technological change would displace approximately 2,800 employees in primary manufacturing; an additional 1,600 jobs would be displaced from 1988 levels because the 1988 jobs were in part supported by a surge in harvests above the 1983-1987 average. The net result of the growth in secondary wood products and the decline in primary wood products would be approximately 3,100 less people employed in timber industries in the mid-1990's than in 1988, if we assume that harvests continue at their 1983-1987 levels.

By 2000, if 1983-1987 harvest levels could be maintained, growth in secondary wood products is estimated at 3,600 jobs, while technological change would displace approximately 4,900 employees in primary manufacturing; 1,600 jobs would be displaced from 1988 levels because the 1988 levels were in part supported by a surge in harvests above 1983-1987 levels. The net result of the growth in secondary wood products and the decline in primary wood products would be approximately 2,900 less people employed in timber industries in 2000 than in 1988.

The declines in timber industry employment in the other four scenarios range from

6,100 to 23,600 by 1995 (the lowest being those estimated under the Proposed Plans scenario); these figures can be calculated from the data in Table 16. By 2000, the range becomes 6,100 to 23,700 timber jobs displaced (relative to 1988).

Growth in overall employment by 1995 ranges from 115,100 to 164,600 jobs, depending upon the forecast scenario (the highest growth being under the continuation of 1983-1987 harvest levels): thus by 1995, there would be from 10 to 14 percent more people employed in Oregon than there were in 1988. By the year 2000, overall growth in employment (relative to 1988) ranges from 263,300 to 306,000 jobs: thus by 2000, there would be from 22.8 to 26.6 percent more people employed than in 1988. This 12-year forecast can be contrasted to the increases from 1976 to 1988 as portrayed in Table 4.

In discussing the implications of the ISC Conservation Strategy, we must distinguish between the short-term (through 1995) and long-term (after 1995) impacts, because the Private Price Response scenario has harvests that are high in the early 1990's but tail-off to levels below those of the No Private Response scenario by 2000 (see Appendix B for yearly harvests under the Private Price Response scenario). In the short-term (1995), the No Private Response scenario generates higher displacement of timber industry jobs and lower growth than does the Private Price Response. In the longer term, however, this ranking is reversed as the impacts of the Private Price Response scenario on the economy are more severe than those of the No Private Response scenario.

How will the state's future differ when harvest levels decline? — As reduced timber activity spreads throughout the economy, more than one job in other sectors of the economy will be displaced for each timber job displaced. This may be termed "lost growth opportunities" at the state level but may entail very real job displacement at the local level. We set the continuation of the 1983-1987 level as our benchmark for assessing lost growth opportunities.

In the short-term (1995), the ISC Conservation Strategy coupled with the proposed plans could result in the displacement of 5,200 to 9,600 jobs in the timber industry and 12,100 to 23,400 throughout the economy, relative to

where the economy would be if 1983-1987 harvest levels were maintained. The Proposed Plans scenario would account for 3,000 timber industry jobs and 7,400 jobs displaced throughout the economy. Extension of the guidelines in the ISC Conservation Strategy to private lands, along with implementation of the ISC Conservation Strategy and the proposed plans on public lands, would account for the displacement of 20,500 jobs in the timber industry and 49,500 jobs throughout the economy.

By the year 2000, impacts of coupling the proposed plans with the ISC Conservation Strategy include the displacement of from 8,000 to 9,600 jobs in the timber industry and 17,600 to 20,300 jobs throughout the economy. The Proposed Plans scenario would account for 3,100 of the timber industry jobs and 7,600 of the jobs throughout the economy. Extension of the guidelines in the ISC Conservation Strategy to private lands, along with the implementation of the ISC Conservation Strategy and the proposed plans on public lands, would displace 20,500 jobs in the timber industry and 42,700 jobs throughout the economy.

Income

The results for payroll income mirror those for employment, except that the growth in income does not keep pace with the growth in employment (Table 17). This disparity indicates declining real average income for workers. The projected payroll incomes for the timber industry are apt to be optimistic because wages and salaries in the timber sectors are forecast to follow historic trends, but, as noted in a prior section, increasing prices for raw materials are apt to "squeeze" wages in the timber industry.

For analysis of income, it must be noted that dividing the income changes associated with different harvest levels in a year by the corresponding employment changes will yield values greater than the average for that year. For example, in 1995 the change in total employment when the scenario of continuing with the 1983-1987 harvest is contrasted with the No Private Response scenario is 23,400, while the change in income is \$1,002 million. The displaced income per displaced worker would thus

be \$42,800 per year. The average worker income in that year, however, is \$18,900. The reasons for this higher income are that the income displaced includes both displaced worker income and the fact that (1) many workers who lose their jobs are reabsorbed into the economy at lower wage rates and (2) diminished manufacturing results in some restructuring of the economy, with many wage ramifications.

Local Government Funding

Receipts to Oregon's county governments and school and educational service districts were estimated according to the price indices in Table 14. Analyses of all conservation plans (public and private) followed the same index series, even though this series is truly appropriate only for the Private Response scenario.

The base prices used for 1988 were prices paid for harvested timber according to the Interagency Economic Assessment and equaled \$136/thousand board feet average for all species on the west side and \$88/thousand board feet average for all species on the east side. These figures are not meant to imply that the bid prices were at these levels in 1988, as 1988 was an abnormal market year with unusual market conditions in Oregon. Instead, these prices represent the appropriate starting points for applying the indexes for future bid prices. As noted before, the prices in 1995 are an anomaly because 1995 is forecast to be a year of strong recovery from a brief recession.

In determining revenues, we applied the same stumpage price to all owners in all regions. All BLM harvests were treated as if they were eligible for 50 percent revenue sharing; however, in actuality, Coos Bay Wagon Road Lands are treated under the severance tax program with annual in-lieu payments made to counties.

In each economic region, receipts from harvests of state forests were apportioned to state trusts and common school funds according to the percentage of acres allotted to each category. The harvests allotted to the common school funds will have a significant impact on school revenues in the long run, as only interest earnings on revenues are distributed; hence, the portion of the harvest for the common school

funds was omitted from revenue calculations. Of the state trust revenues, 67.5 percent was allocated to counties and 22.5 percent to schools in accordance with legislative mandate (the remaining 10 percent is used for management).

The harvest-related receipts to county governments were far more affected by the conservation strategy than were the receipts to schools (Tables 18 and 19). This disparity arises because 100 percent of the BLM revenue shares are distributed to county general funds and 75 percent of the national forest revenue shares are distributed to county road funds. Schools, on the other hand, receive directly only 25 percent of the national forest revenue shares. However, the schools receive a larger portion of the severance tax than do the counties. Under the Private Price Response scenario, the contribution from timber harvests to schools actually rises under the ISC Conservation Strategy because of increased prices and increased private harvests. It must be noted, however, that these are only the direct contributions of timber harvests. Payments from the counties to the schools may be reduced because of lower general funds; property values may decline in areas heavily dependent on timber, eroding the tax base; property taxes paid by forestry firms on plant and equipment may also decline; and income taxes cycled through the state may also change.

Under the price structure predicted by the Interagency Economic Assessment, adoption of the proposed plans would cause receipts to counties to increase over the 1988 levels and over the future receipts that would be realized with 1983-1987 harvest levels (see Proposed Plans scenario, Table 18). Coupling the ISC Conservation Strategy with proposed public plans results in declines in county receipts for most years in the projection. The shortfalls in the latter years of the 1990's would total approximately \$14 million (3.8 percent of the \$924.9 million shown in Table 6). If the guidelines of the ISC Conservation Strategy are extended to private lands, this figure increases to about \$17 million (4.2 percent of the above value in Table 6).

Under all projections, direct timber receipts to schools would increase from 1988 levels. As can be calculated with the school budgets shown in Table 6, these increases could constitute as much as 1.3 percent of the 1988 school budgets. Again, it must be noted that these are

only the direct contributions of the timber harvests. In general, aggregate revenues to local governments from timber sources in the 1990's will fall below the 1988 level if the proposed plans and the ISC Conservation Strategy are implemented.

Outlook for Oregon's Communities

Projections for the state were divided among local economic regions (Figure 3). Harvests were reapportioned from timbersheds to economic regions on the basis of acres of available timber land. Regional projections were made for employment and receipts to local governments, but not for prices or income.

In apportioning timber industry employment, we took into account the size of the industries in each region, anticipated changes in technology, and projected changes in regional timber availability.

The regional shares of employment in the various economic sectors of the state have been remarkably stable through time. Employment in nontimber sectors was computed with regional shares equations. These equations calculated nontimber employment as a function of time, the prior year's share of manufacturing employment, the prior year's share of nonmanufacturing employment, and total employment in that sector. In the case of the government sector, nonmanufacturing and manufacturing employment were pooled. Regional shares equations were estimated yearly and applied to the state-wide estimates.

The results of the regional apportionment of employment are shown in Table 20. These numbers are decade averages and mask the fact that in many economic regions there may be

short-run downfalls followed by economic recovery. Timber industry employment is greatly affected by the proposed plans and the ISC Conservation Strategy in the Linn/Lane, Roseburg, and Medford regions. Timber industry employment in the Northwest and South Coast regions can hold its own or even grow if the Private Price Response is realized. If the state were not to adopt the HCA concept, then the Northwest region's growth would be even higher.

From Table 20 it is evident that the Portland and Salem metropolitan areas will absorb most of the economic growth. In the projections, all economic regions except Roseburg and South Coast show some growth potential. Even these two timbersheds show growth potential except that the Roseburg region shows declines under the No Private Response and Private Conservation scenarios, while the South Coast region shows declines under the Private Conservation scenario. Figure 7 contrasts changes in employment in each region under two of the projections: continuing with the 1983-1987 harvest and No Private Response.

Growth in the Medford region is fueled by a burgeoning service industry in the metropolitan area. In Linn/Lane, growth will be focused in the Eugene area, Albany, and the Coast. In the South Coast, the recreational centers will see most of the growth. In eastern Oregon, growth is centered in the Bend area.

The impacts on local government revenues mirror the results for employment (Tables 21 and 22). State-wide BLM receipts were apportioned by adopting the distribution percentages for 1988. National forest harvests and receipts were allocated according to the proportion of national forest acres in each timbershed. Western Oregon severance taxes were allotted according to the proportion of harvest in each western timbershed. On the average, in the 1990's, county government revenues would remain fairly stable if 1983-1987 levels could be maintained in many of the economic regions (Tables 6 and 21). Under the Proposed Plans scenario, receipts in most regions actually increase because of escalating prices and BLM harvests that exceed historic levels.

County government receipts under the ISC Conservation Strategy decline in all western regions and are affected substantially in the Linn/

Lane, Roseburg, South Coast, and Medford regions. Smaller negative impacts will also be felt in the other western economic regions. County revenues in eastern Oregon will gain under the conservation strategy because of escalating prices.

Direct receipts from timber harvests to schools will rise in most economic regions under all projections except adoption of the ISC Conservation guidelines on private lands. Again, we must caution that these are only the direct contributions of the timber harvests.

The economic regions are defined on the basis of county borders, which to some extent are artificial boundaries. Each of these regions has some large cities or metropolitan areas that will absorb much of the economic growth. Throughout western Oregon, many communities outside the Interstate 5 corridor and outside the coastal areas must be considered at risk when the ISC Conservation Strategy is coupled with the proposed public plans. The disruptions within these communities are apt to extend beyond jobs and income.

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Tables

Table 1. Oregon's historic harvest and that projected in the Proposed Plans scenario, by owner class.

Owner class	Historic harvest ¹			Harvest under Proposed Plans
	1983-1987	1988	1989	1991-2000
	(Million board feet per year, Scribner log rule)			
Public				
National forest	3,370	3,487	3,307	2,575
BLM	951	1,439	1,025	1,019
State and other public	<u>387</u>	<u>430</u>	<u>361</u>	<u>440</u>
Class total	<u>4,708</u>	<u>5,356</u>	<u>4,693</u>	<u>4,034</u>
Private				
Industrial	2,952	2,673	2,724	2,755
Nonindustrial	<u>360</u>	<u>586</u>	<u>709</u>	<u>666</u>
Class total	<u>3,312</u>	<u>3,259</u>	<u>3,433</u>	<u>3,421</u>
All owners	8,020	8,615	8,126	7,455

¹ From Oregon State Forestry Department (1983-1989). 1989 data are preliminary.

Table 2. Oregon's historic harvest and that projected in the Proposed Plans scenario, by region and timbershed.

Region & timbershed	Historic harvest ¹			Harvest under Proposed Plans
	1983-1987	1988	1989	1991-2000
	(Million board feet per year, Scribner log rule)			
Western Oregon				
North Coast	1,289	1,626	1,535	1,684
Willamette	1,165	1,048	938	874
Eugene	1,247	1,432	1,128	1,104
Roseburg	1,331	1,323	1,202	1,140
Medford	496	609	595	461
South Coast	<u>568</u>	<u>684</u>	<u>583</u>	<u>588</u>
Regional total	<u>6,096</u>	<u>6,722</u>	<u>5,981</u>	<u>5,851</u>
Eastern Oregon	<u>1,924</u>	<u>1,892</u>	<u>2,145</u>	<u>1,604</u>
State	8,020	8,615	8,126	7,455

¹ From Oregon State Forestry Department (1983-1989). 1989 data are preliminary.

Table 3. Oregon's wage and salary employment by economic region in 1988.¹

Region & economic region	Total	Timber industries	Other manufacturing	Non-manufacturing
----- (Thousands of employees) -----				
Western Oregon				
Portland	590.0	12.0	87.6	490.4
Salem	101.6	3.9	11.5	86.2
Northwest	70.4	6.7	6.7	57.0
Linn/Lane	140.1	17.8	12.5	109.8
Roseburg	32.7	9.6	0.8	22.3
Medford	69.6	8.4	3.7	57.5
South Coast	<u>25.0</u>	<u>4.6</u>	<u>1.1</u>	<u>19.3</u>
Regional total	<u>1029.4</u>	<u>63.0</u>	<u>123.9</u>	<u>842.5</u>
Eastern Oregon	<u>111.3</u>	<u>14.4</u>	<u>9.7</u>	<u>87.4</u>
State	1140.7	77.4	133.6	929.9

¹ From Department of Human Resources (1988).

Table 4. Percent change in Oregon's wage and salary employment by economic region from 1976 to 1988.¹

Region & economic region	Total	Timber industries	Other manufacturing	Non-manufacturing
----- (Percent) -----				
Western Oregon				
Portland	+35	-22	+21	+41
Salem	+38	+11	+24	+42
Northwest	+31	-19	+81	+35
Linn/Lane	+20	-16	+36	+28
Roseburg	+14	+3	-27	+22
Medford	+41	+9	+23	+49
South Coast	<u>+7</u>	<u>-27</u>	<u>+83</u>	<u>+18</u>
Regional total	<u>+32</u>	<u>-12</u>	<u>+25</u>	<u>+38</u>
Eastern Oregon	<u>+14</u>	<u>-2</u>	<u>+20</u>	<u>+17</u>
State	+30	-10	+24	+36

¹ From Department of Human Resources (1976 and 1988).

Table 5. Oregon's wage and salary income by economic region in 1988.¹

Region & economic region	Total	Timber industries	Other manufacturing	Non-manufacturing
----- (Millions of dollars) -----				
Western Oregon				
Portland	12,443	345	2,377	9,633
Salem	1,790	98	206	1,484
Northwest	1,232	192	170	869
Linn/Lane	2,572	470	322	1,780
Roseburg	630	252	22	356
Medford	1,190	204	101	884
South Coast	<u>443</u>	<u>112</u>	<u>17</u>	<u>314</u>
Regional total	<u>20,298</u>	<u>1,674</u>	<u>3,216</u>	<u>15,409</u>
Eastern Oregon	<u>1,971</u>	<u>341</u>	<u>190</u>	<u>1,441</u>
State	22,269	2,014	3,405	16,850

¹ From Lux *et al.* (1988).

Table 6. Oregon's funding of local governments by economic region in 1988.¹

Region & economic region	Schools and Educational Service Districts ²			County Government ³		
	Total funding	Timber-derived funding	Timber-derived as proportion of total	Total funding	Timber-derived funding	Timber-derived as proportion of total
	---- (\$Million) ----		(Percent)	---- (\$Million) ----		(Percent)
Western Oregon						
Portland	1153.8	3.1	0.3	374.8	26.8	7.1
Salem	250.4	1.7	0.7	62.6	6.8	10.8
Northwest	200.0	6.8	3.4	56.1	16.1	28.7
Linn/Lane	343.7	12.6	3.7	134.2	48.0	35.8
Roseburg	85.7	7.3	8.5	56.7	36.9	65.0
Medford	165.5	2.8	1.7	57.4	27.1	50.7
South Coast	<u>64.8</u>	<u>2.9</u>	<u>4.5</u>	<u>27.3</u>	<u>13.8</u>	<u>47.2</u>
Regional total	<u>2263.5</u>	<u>37.2</u>	<u>1.6</u>	<u>769.1</u>	<u>175.5</u>	<u>22.8</u>
Eastern Oregon	<u>316.3</u>	<u>12.3</u>	<u>3.9</u>	<u>155.8</u>	<u>48.4</u>	<u>31.1</u>
State	2579.8	49.5	1.9	924.9	223.9	24.2

¹ Corresponds to fiscal year 1988-1989.

² From data supplied by Oregon Department of Education, Office of School District Services, School Finance and Data Information Services. Severance tax information provided by county tax offices.

³ From data supplied by county tax offices.

Table 7. Oregon's forest land area by owner class according to the Proposed Plans scenario and implementation of the ISC Conservation Strategy.

Owner class	<u>Proposed Plans</u> <u>Forest land area</u>		<u>ISC Conservation Strategy</u> <u>Forest land area</u>		Change in available acres
	Available	Not available	Available	Not available	
----- (Thousand acres) -----					
Public					
National forest	8,171	4,107	7,291	4,987	-880
BLM	1,745	381	1,135	991	-610
State and other public	<u>1,089</u>	<u>97</u> ¹	<u>957</u>	<u>239</u> ²	<u>132</u> ²
Class total	<u>11,005</u>	<u>4,585</u>	<u>9,383</u>	<u>6,207</u>	<u>1,622</u>
Private					
Industrial	5,572	(³)	5,207	365 ²	-365 ²
Nonindustrial	<u>2,791</u>	(⁴)	<u>2,738</u>	<u>53</u> ²	<u>-53</u> ²
Class total	<u>8,363</u>		<u>7,945</u>	<u>418</u>	<u>-418</u>
All owners	19,368	4,585	17,328	6,625	2,040

¹ Excludes 1,143 thousand acres with low productivity (biomass of less than 20 ft³/acre/yr) and 170 thousand acres of reserved lands in eastern Oregon.

² Status dependent upon state-initiated conservation plan.

³ Excludes 260 thousand acres with low productivity (biomass of less than 20 ft³/acre/yr).

⁴ Excludes 1,777 thousand acres with low productivity (biomass of less than 20 ft³/acre/yr).

Table 8. Western Oregon's forest land area by owner class according to the Proposed Plans scenario and implementation of the ISC Conservation Strategy.

Owner class	Proposed Plans Forest land area		ISC Conservation Strategy Forest land area		Change in available acres
	Available	Not available	Available	Not available	
----- (Thousand acres) -----					
Public					
National forest	2,900	1,972	2,077	2,795	-823
BLM	1,623	381	1,013	991	-610
State and other public	<u>689</u>	<u>97</u>	<u>557</u>	<u>229¹</u>	<u>-132²</u>
Class total	<u>5,212</u>	<u>2,450</u>	<u>3,647</u>	<u>4,015</u>	<u>-1,569</u>
Private					
Industrial	4,049	(²)	3,684	365 ¹	365 ¹
Nonindustrial	<u>1,858</u>	(³)	<u>1,805</u>	<u>53¹</u>	<u>53¹</u>
Class total	5,907		5,489	418	418
All owners	11,119	2,450	9,136	4,433	1,983

¹ Status dependent upon state-initiated conservation plan.

² Omits 51 thousand acres with low productivity (biomass less than 20 ft³/acre/yr).

³ Omits 290 thousand acres with low productivity (biomass less than 20 ft³/acre/yr).

Table 9. Oregon's forest land area by timbershed and owner class according to the Proposed Plans scenario and implementation of the ISC Conservation Strategy.

Region & timbershed	Proposed Plans Forest land area				ISC Conservation Strategy Forest land area				Change in available acres	
	Available		Not available		Available		Not available		Public ³	Private ⁴
	Public	Private	Public ¹	Private ²	Public	Private	Public ³	Private ⁴		
----- (Thousand acres) -----										
Western Oregon										
North Coast	825	1,766	214	---	518	1,670	521	96	307	96
Willamette	925	936	591	---	708	920	808	16	217	16
Eugene	985	788	575	---	668	705	892	83	317	83
Roseburg	1,172	1,037	371	---	811	902	732	135	361	135
Medford	792	611	471	---	571	546	692	65	221	65
South Coast	<u>513</u>	<u>769</u>	<u>228</u>	---	<u>371</u>	<u>746</u>	<u>370</u>	<u>23</u>	<u>142</u>	<u>23</u>
Regional total	<u>5,212</u>	<u>5,907</u>	<u>2,450</u>	---	<u>3,647</u>	<u>5,489</u>	<u>4,015</u>	<u>418</u>	<u>1,565</u>	<u>418</u>
Eastern Oregon	<u>5,793</u>	<u>2,456</u>	<u>2,135</u>	---	<u>5,736</u>	<u>2,456</u>	<u>2,192</u>	---	<u>57</u>	<u>0</u>
State	11,005	8,363	4,585	---	9,383	7,945	6,207	418	1,622	418

¹ Excludes 1,143 thousand acres with low productivity (biomass less than 20 ft³/acre/yr) and 170 thousand acres of reserved land in eastern Oregon.

² Excludes 1,696 thousand acres with low productivity (biomass less than 20 ft³/acre/yr) in eastern Oregon and 341 thousand such acres in western Oregon.

³ Includes 123 thousand acres of state lands in North Coast, 6 thousand acres of state lands in Willamette, and 3 thousand acres in Roseburg. Allocation decision will be made in state conservation plans.

⁴ Dependent upon state-initiated conservation plan.

Table 10. Oregon's historic and projected harvest levels by owner class according to the Proposed Plans scenario and implementation of the ISC Conservation Strategy.

Owner class	Annual average harvest levels, 1991-2000				
	'83-'87 Harvest	Pro-posed Plans	ISC Conservation Strategy on public lands with --		
			No Private Res-ponse	Private Price Res-ponse	Private Conser-vation
	(Million board feet Scribner log rule)				
Public					
National forest	3,370	2,575	2,088	2,088	2,088
BLM	951	1019	397	397	397
State and other public	<u>387</u>	<u>440</u>	<u>395</u>	<u>395</u>	<u>395</u>
Class total	<u>4,708</u>	<u>4,034</u>	<u>2,880</u>	<u>2,880</u>	<u>2,880</u>
Private					
Industrial	2,952	2,755	2,755	3,057	1,364
Nonindustrial	<u>360</u>	<u>666</u>	<u>666</u>	<u>997</u>	<u>355</u>
Class total	<u>3,312</u>	<u>3,421</u>	<u>3,421</u>	<u>4,054</u>	<u>1,719</u>
All owners	8,020	7,455	6,301	6,934	4,599

Table 11. Harvest reductions from levels proposed in recent forest plans when the ISC Conservation Strategy is implemented, by timbershed and management agency.

Region & timbershed	Management agency				Total
	USDA Forest Service	Bureau of Land Management		Oregon Dept. of Forestry	
	(Million board feet per year, Scribner log rule)				
Western Oregon					
North Coast	75	104	40		219
Willamette	89	46	5		140
Eugene	123	139	--		262
Roseburg	108	188	--		296
Medford	40	71	--		111
South Coast	<u>36</u>	<u>74</u>	<u>--</u>		<u>110</u>
Regional total	<u>471</u>	<u>622</u>	<u>45</u>		<u>1,138</u>
Eastern Oregon	<u>16</u>	<u>--</u>	<u>--</u>		<u>16</u>
State	487	622	45		1,154

Table 12. Harvest reductions from levels proposed in recent forest plans when the ISC Conservation Strategy is implemented, by owner class and management guideline.¹

Owner class	Reduction with--	
	HCA Allocation	"50-11-40"rule
	----- (Percent) -----	
Public		
National forest	100	0
BLM	78	22
State and other public	100	0
Private		
Industrial	10	90
Nonindustrial	2	98

¹ For BLM, reductions were calculated by first removing acres and HCA's from the timber base and then applying the "50-11-40 rule" to the remainder. For private lands, the sequence was reversed.

Table 13. Oregon's historic and projected harvest levels by timbershed according to Proposed Plans scenario and implementation of the ISC Conservation Strategy.

Region & timbershed	Annual average harvest levels, 1991-2000				
	'83-'87 Harvest	Pro-posed Plans	ISC Conservation Strategy on public lands with --		
			No Private Res-ponse	Private Price Res-ponse	Private Conser-vation
	(Million board feet Scribner log rule)				
Western Oregon					
North Coast	1,289	1,684	1,465	1,527	992
Willamette	1,165	874	734	905	498
Eugene	1,247	1,104	842	982	522
Roseburg	1,331	1,140	844	1,008	469
Medford	496	461	350	384	262
South Coast	<u>568</u>	<u>588</u>	<u>440</u>	<u>541</u>	<u>268</u>
Regional total	<u>6,096</u>	<u>5,851</u>	<u>4,713</u>	<u>5,346</u>	<u>3,011</u>
Eastern Oregon	<u>1,924</u>	<u>1,604</u>	<u>1,588</u>	<u>1,588</u>	<u>1,588</u>
State	8,020	7,455	6,301	6,934	4,599

Table 14. Oregon's historic and projected stumpage price index¹ (real) by broad geographic region and public lands scenario.

Year	Pacific Northwest -- West side			Pacific Northwest -- East side		
	Current management plans ²	Proposed plans ³	ISC Conservation Strategy ⁴	Current management plans ²	Proposed plans ³	ISC Conservation Strategy ⁴
(1988 = 100)						
1988	100.0	100.0	100.0	100.0	100.0	100.0
1991	124.3	134.2	150.3	132.6	183.5	192.3
1995	130.7	168.8	218.7	120.4	225.9	252.6
2000	115.7	155.2	184.0	157.0	186.3	194.5
2005	130.3	169.7	181.2	208.7	241.8	253.8

¹ From the interagency team's assessment of the economic effects of the conservation strategy.

² The harvest levels underlying these price-index projections correspond roughly to continuing with 1983-1987 levels. (See "Prices" section of report.)

³ The harvest levels underlying these price-index projections are slightly higher than the levels computed in our study. (See "Prices" section of report.)

⁴ Implementing the Proposed Plans scenario plus the ISC Conservation Strategy on public land, while private owners operate according to the Private Price Response scenario.

Table 15. U.S. historic and projected forest product price indices¹ (real) by public lands scenarios in Oregon.

Year	U.S. Lumber Price Index			U.S. Plywood Price Index		
	Current management plans ²	Proposed Plans ³	ISC Conservation Strategy ⁴	Current management plans ²	Proposed Plans ³	ISC Conservation Strategy ⁴
(1988 = 100)						
1988	100.0	100.0	100.0	100.0	100.0	100.0
1991	110.3	111.5	112.8	104.4	105.4	107.4
1995	117.7	123.6	128.2	122.9	125.1	123.5
2000	115.8	120.5	119.6	108.4	114.3	118.2
2005	117.0	121.4	126.0	115.8	123.6	124.7

¹ From the interagency team's assessment of the economic effects of the conservation strategy.

² The harvest levels underlying these price-index projections correspond roughly to continuing with 1983-1987 levels. (See "Prices" section of report.)

³ The harvest levels underlying these price-index projections are slightly higher than the levels computed in our study. (See "Prices" section of report.)

⁴ Implementing the Proposed Plans scenario plus the ISC Conservation Strategy on Oregon's public land, while private owners in the state operate according to the Private Price Response scenario.

Table 16. Historic and projected number of Oregon's wage and salary employees in timber and other industries by projection scenario.

Year & economic sector	Continuing with '83-'87 harvest	Proposed Plans	ISC Conservation Strategy on public lands with--		
			No Private Response	Private Price Response	Private Conservation
----- (Thousands of employees) -----					
1988 ¹					
Timber	77.4	--	--	--	--
Other	<u>1074.8</u>	--	--	--	--
Total	<u>1152.2</u>	--	--	--	--
1991					
Timber	74.9	71.9	65.3	69.5	54.5
Other	<u>1173.4</u>	<u>1170.2</u>	<u>1163.3</u>	<u>1167.2</u>	<u>1151.8</u>
Total	<u>1248.3</u>	<u>1242.1</u>	<u>1228.6</u>	<u>1236.7</u>	<u>1206.3</u>
1995					
Timber	74.3	71.3	64.7	69.1	53.8
Other	<u>1242.5</u>	<u>1238.1</u>	<u>1228.7</u>	<u>1235.6</u>	<u>1213.5</u>
Total	<u>1316.8</u>	<u>1309.4</u>	<u>1293.4</u>	<u>1304.7</u>	<u>1267.3</u>
2000					
Timber	74.5	71.4	64.9	66.5	54.0
Other	<u>1383.7</u>	<u>1380.3</u>	<u>1373.0</u>	<u>1375.1</u>	<u>1361.5</u>
Total	<u>1458.2</u>	<u>1451.7</u>	<u>1437.9</u>	<u>1440.6</u>	<u>1415.5</u>
2005					
Timber	73.7	70.6	64.2	62.7	53.5
Other	<u>1541.4</u>	<u>1538.9</u>	<u>1533.3</u>	<u>1529.2</u>	<u>1524.8</u>
Total	1615.1	1609.5	1597.5	1591.9	1578.3

¹ Actual data.

Table 17. Oregon's historic and projected wage and salary income in timber and other industries by projection scenario.

Year & economic sector	Continuing with '83-'87 harvest	Proposed Plans	ISC Conservation Strategy on public lands with--		
			No Private Response	Private Price Response	Private Conservation
----- (Millions of 1988 dollars) -----					
1988 ¹					
Timber	2,014	--	--	--	--
Other	<u>20,255</u>	--	--	--	--
Total	<u>22,269</u>	--	--	--	--
1991					
Timber	2,192	2,107	1,924	2,040	1,621
Other	<u>22,662</u>	<u>22,543</u>	<u>22,282</u>	<u>22,425</u>	<u>21,846</u>
Total	<u>24,854</u>	<u>24,650</u>	<u>24,206</u>	<u>24,465</u>	<u>23,467</u>
1995					
Timber	2,176	2,090	1,906	2,031	1,602
Other	<u>22,769</u>	<u>22,539</u>	<u>22,037</u>	<u>22,399</u>	<u>21,196</u>
Total	<u>24,945</u>	<u>24,629</u>	<u>23,943</u>	<u>24,430</u>	<u>22,798</u>
2000					
Timber	2,175	2,091	1,909	1,951	1,610
Other	<u>24,400</u>	<u>24,132</u>	<u>23,548</u>	<u>23,779</u>	<u>22,557</u>
Total	<u>26,575</u>	<u>26,223</u>	<u>25,457</u>	<u>25,730</u>	<u>24,167</u>
2005					
Timber	2,154	2,072	1,895	1,856	1,602
Other	<u>26,922</u>	<u>26,638</u>	<u>26,018</u>	<u>25,962</u>	<u>24,963</u>
Total	29,076	28,710	27,913	27,818	26,565

¹ Actual data.

Table 18. Oregon's historic and projected timber receipts to county governments by projection scenario.

Year	Continuing with '83-'87 harvest	Proposed Plans	ISC Conservation Strategy on public lands with--		
			No Private Response	Private Price Response	Private Conservation
----- (Receipts in million 1988 dollars) -----					
1988 ¹	223.9	--	--	--	--
1991	208.4	221.9	157.1	158.2	154.7
1995	214.5	278.2	225.3	226.8	221.8
2000	202.1	251.9	187.8	188.2	184.8
2005	235.2	282.4	197.0	196.7	194.1

¹ Actual data.

Table 19. Oregon's historic and projected timber receipts to school and educational service districts by projection scenario.

Year	Continuing with '83-'87 harvest	Proposed Plans	ISC Conservation Strategy on public lands with--		
			No Private Response	Private Price Response	Private Conservation
----- (Receipts in million 1988 dollars) -----					
1988 ¹	49.5	--	--	--	--
1991	66.8	68.9	68.1	77.7	48.9
1995	68.5	86.3	97.1	109.6	69.3
2000	65.3	77.7	80.4	83.5	57.0
2005	76.5	87.8	83.6	80.2	60.6

¹ Actual data.

Table 20. Oregon's projected wage and salary employment by economic region and by projection scenario.

Region, economic region, & economic sector	Annual average employment levels 1991-2000				
	Continuing with '83-'87 harvest	Proposed Plans	ISC Conservation Strategy on public lands with--		
			No Private Response	Private Price Response	Private Conservation
----- (Thousands of employees) -----					
Western Oregon					
Portland					
Timber	12.1	11.9	11.3	12.0	9.6
Other	<u>709.7</u>	<u>708.1</u>	<u>704.2</u>	<u>707.1</u>	<u>697.4</u>
Total	<u>721.8</u>	<u>720.0</u>	<u>715.5</u>	<u>719.1</u>	<u>707.0</u>
Salem					
Timber	3.5	3.3	3.0	3.3	2.4
Other	<u>105.4</u>	<u>106.2</u>	<u>107.4</u>	<u>106.6</u>	<u>109.0</u>
Total	<u>109.2</u>	<u>109.5</u>	<u>110.4</u>	<u>109.9</u>	<u>111.4</u>
Northwest					
Timber	6.3	6.7	6.2	6.4	5.3
Other	<u>78.7</u>	<u>78.6</u>	<u>78.1</u>	<u>78.3</u>	<u>77.0</u>
Total	<u>85.0</u>	<u>85.3</u>	<u>84.3</u>	<u>84.7</u>	<u>82.3</u>
Linn/Lane					
Timber	17.0	15.7	13.8	14.9	10.8
Other	<u>145.3</u>	<u>144.2</u>	<u>142.2</u>	<u>143.4</u>	<u>139.2</u>
Total	<u>162.3</u>	<u>159.9</u>	<u>156.0</u>	<u>158.3</u>	<u>150.0</u>
Roseburg					
Timber	9.2	8.6	7.5	8.1	5.7
Other	<u>26.2</u>	<u>25.8</u>	<u>24.9</u>	<u>25.4</u>	<u>23.7</u>
Total	<u>35.4</u>	<u>34.4</u>	<u>32.4</u>	<u>33.5</u>	<u>29.4</u>
Medford					
Timber	7.8	7.6	6.6	6.9	5.5
Other	<u>76.0</u>	<u>75.8</u>	<u>74.2</u>	<u>74.7</u>	<u>72.9</u>
Total	<u>83.8</u>	<u>83.4</u>	<u>80.8</u>	<u>81.6</u>	<u>78.4</u>
South Coast					
Timber	4.1	4.2	3.7	4.0	2.8
Other	<u>23.4</u>	<u>23.3</u>	<u>22.9</u>	<u>23.1</u>	<u>21.8</u>
Total	<u>27.5</u>	<u>27.5</u>	<u>26.6</u>	<u>27.1</u>	<u>24.6</u>
Region-wide					
Timber	60.0	58.0	52.0	55.5	42.0
Other	<u>1165.0</u>	<u>1162.0</u>	<u>1154.0</u>	<u>1158.7</u>	<u>1140.9</u>
Total	<u>1225.0</u>	<u>1220.0</u>	<u>1206.0</u>	<u>1214.2</u>	<u>1182.9</u>
Eastern Oregon					
Timber	14.8	13.7	13.1	13.4	12.2
Other	<u>106.7</u>	<u>105.7</u>	<u>105.2</u>	<u>105.3</u>	<u>104.5</u>
Total	<u>121.5</u>	<u>119.4</u>	<u>118.3</u>	<u>118.7</u>	<u>116.7</u>
State					
Timber	74.8	71.7	65.1	68.9	54.2
Other	<u>1271.7</u>	<u>1267.7</u>	<u>1259.2</u>	<u>1264.0</u>	<u>1245.4</u>
Total	<u>1346.5</u>	<u>1339.4</u>	<u>1324.3</u>	<u>1332.9</u>	<u>1299.6</u>

Table 21. Oregon's projected receipts to county governments by economic region and by projection scenario.

Region & economic region	Annual average receipts 1991, 1995, 2000				
	Continuing with '83-'87 harvest	Proposed Plans	ISC Conservation Strategy on public lands with--		
			No Private Response	Private Price Response	Private Conservation
----- (Receipts in million dollars) -----					
Western Oregon					
Portland	20.1	23.8	19.4	19.6	19.0
Salem	6.8	8.0	5.8	5.9	5.6
Northwest	29.2	38.4	33.4	33.4	32.4
Linn/Lane	43.0	46.6	32.4	32.7	31.9
Roseburg	33.3	41.6	27.1	27.3	26.7
Medford	29.0	38.0	22.1	22.2	21.9
South Coast	<u>14.1</u>	<u>18.1</u>	<u>13.2</u>	<u>13.3</u>	<u>12.8</u>
Regional total	<u>175.5</u>	<u>214.5</u>	<u>153.4</u>	<u>154.4</u>	<u>150.3</u>
Eastern Oregon	<u>32.9</u>	<u>36.2</u>	<u>36.7</u>	<u>36.7</u>	<u>36.7</u>
State	208.4	250.7	190.1	191.5	187.0

Table 22. Oregon's projected receipts to school and educational service districts by economic region and by projection scenario.

Region & economic region	Annual average receipts 1991, 1995, 2000				
	Continuing with '83-'87 harvest	Proposed Plans	ISC Conservation Strategy on public lands with--		
			No Private Response	Private Price Response	Private Conservation
----- (Receipts in million dollars) -----					
Western Oregon					
Portland	5.3	5.9	6.6	7.8	4.4
Salem	1.8	2.0	2.1	2.4	1.6
Northwest	12.8	19.7	20.5	20.9	15.5
Linn/Lane	16.7	16.9	17.1	20.0	10.7
Roseburg	10.3	10.1	11.0	13.2	5.5
Medford	3.4	3.7	3.8	4.1	2.8
South Coast	<u>4.0</u>	<u>4.9</u>	<u>5.6</u>	<u>6.3</u>	<u>2.5</u>
Regional total	<u>54.3</u>	<u>63.2</u>	<u>66.7</u>	<u>74.7</u>	<u>43.0</u>
Eastern Oregon	<u>12.6</u>	<u>14.4</u>	<u>15.2</u>	<u>15.2</u>	<u>15.2</u>
State	66.9	77.6	81.9	89.9	58.2

Figures

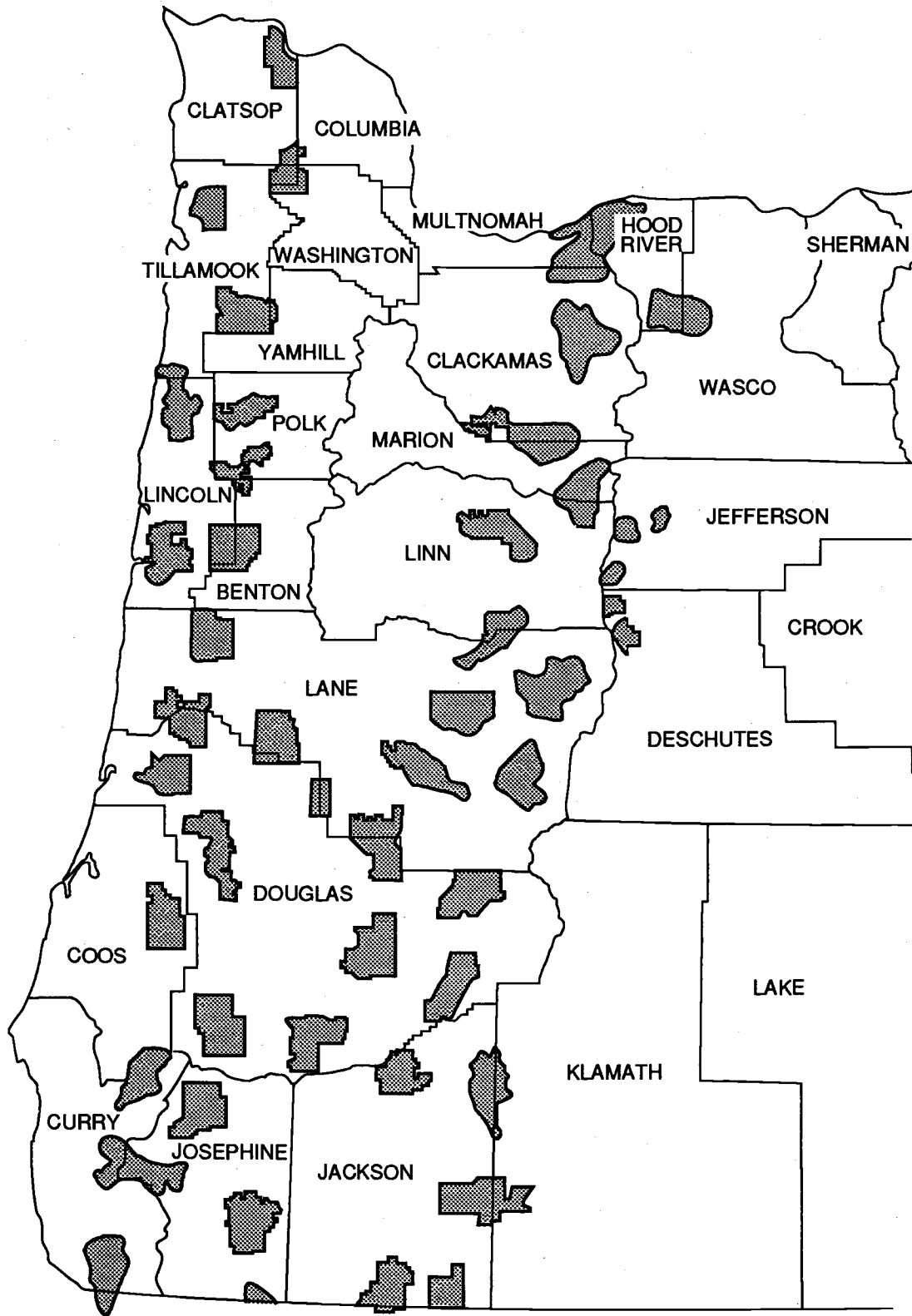


Figure 1. Oregon's northern spotted owl habitat conservation areas (HCA's) as delineated in the ISC Conservation Strategy (Thomas *et al.* 1990).

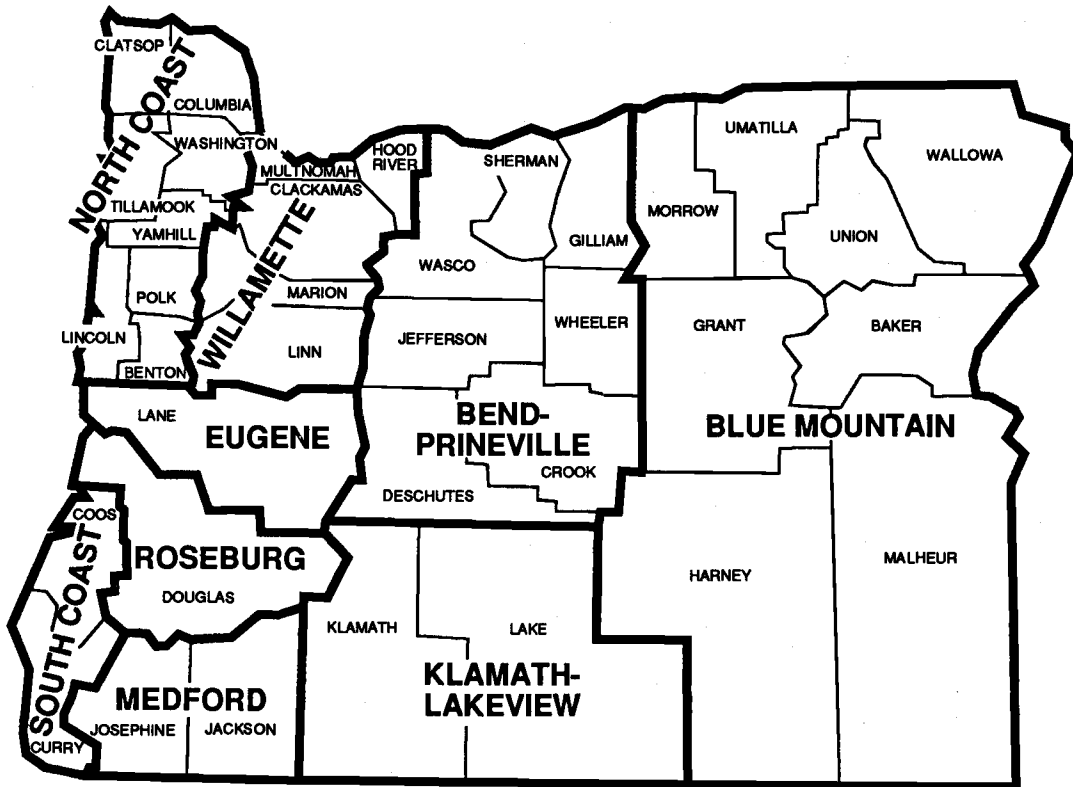


Figure 2. Geographic timbersheds used for assessing timber availability in Oregon.

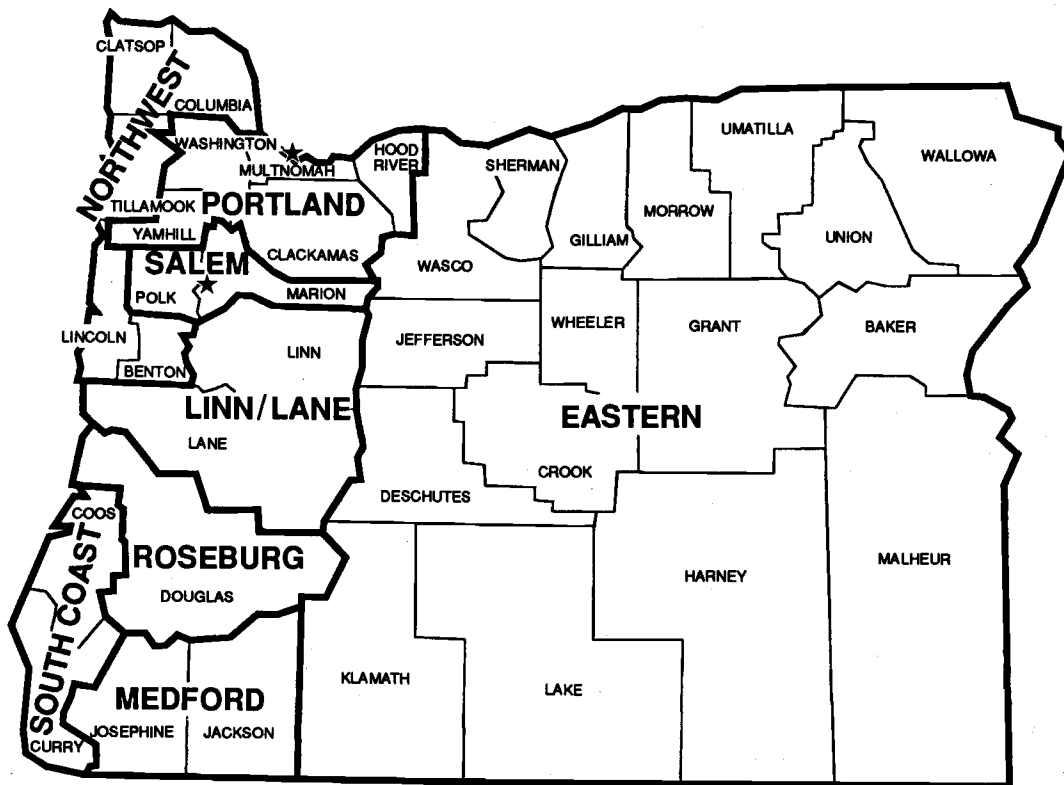


Figure 3. Economic regions used for assessing economic impacts of changing timber availability in Oregon.

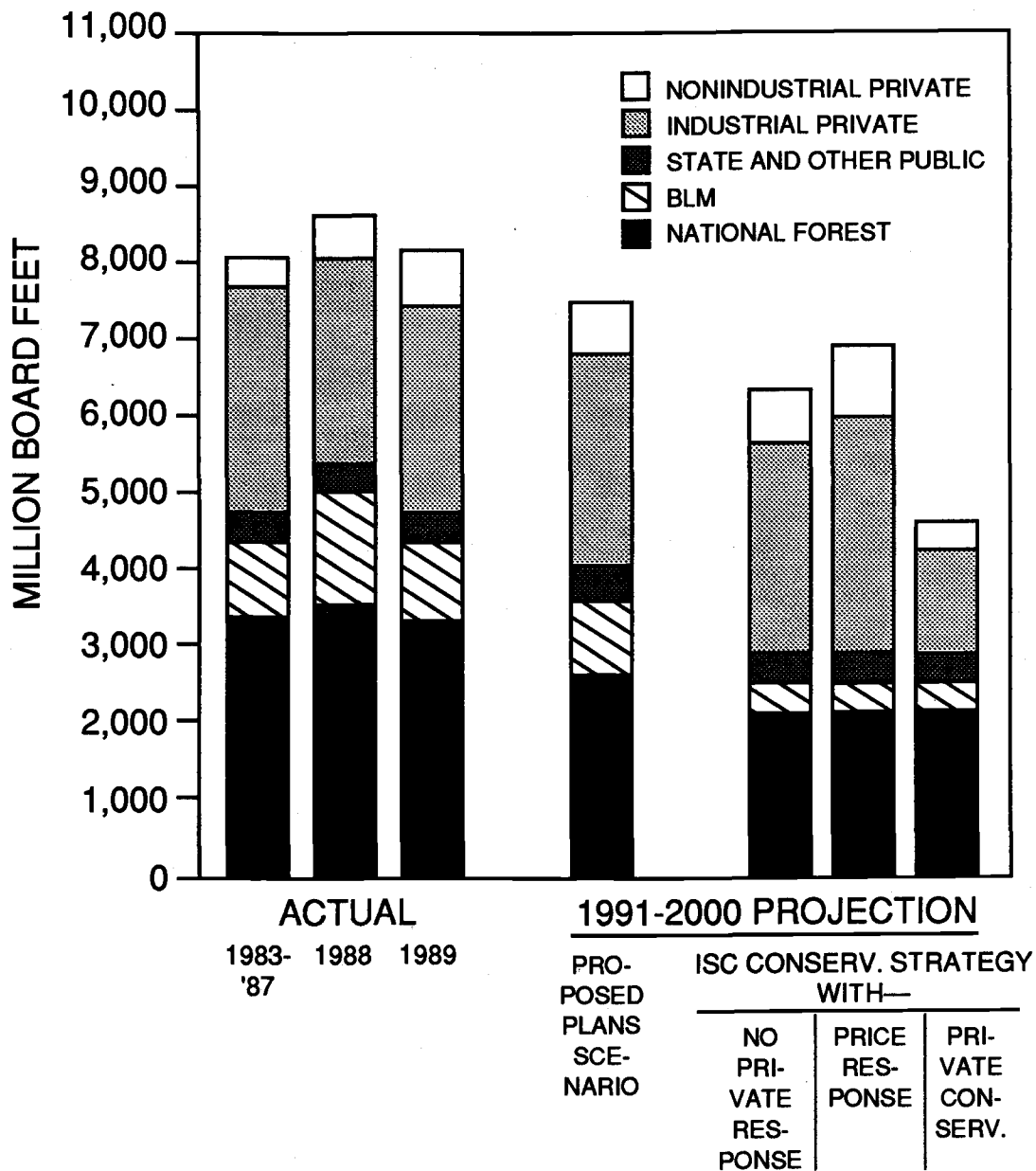


Figure 4. Oregon's annual harvests by owner group: historic (1983-1987 average, 1988, 1989) and projected (1991-2000 average) under differing scenarios on public and private lands.

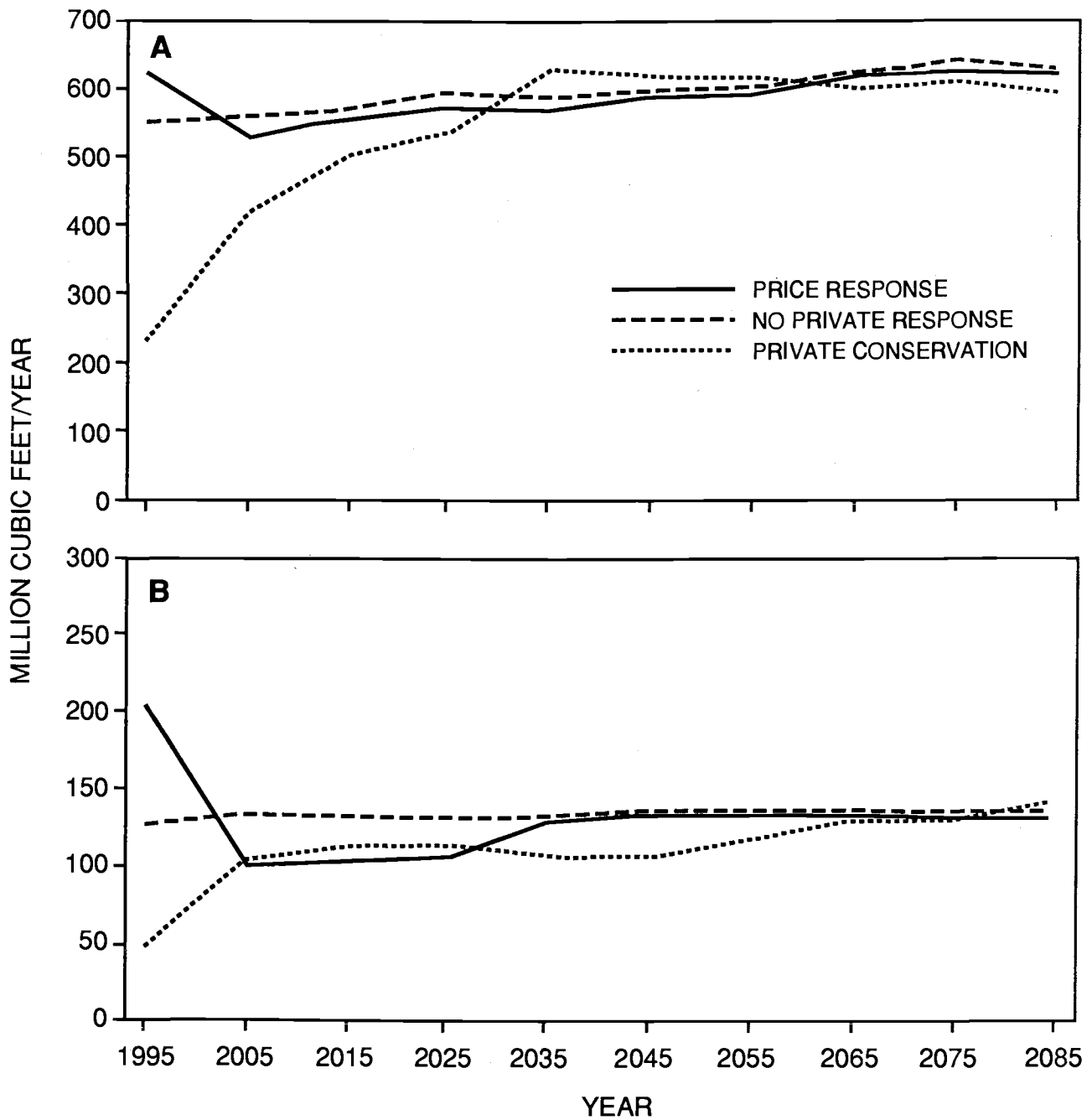


Figure 5. Long-term projections (1991-2090) of timber harvest in western Oregon under differing scenarios for (A) forest industry lands and (B) nonindustrial private lands. Volumes plotted at decade mid-points.

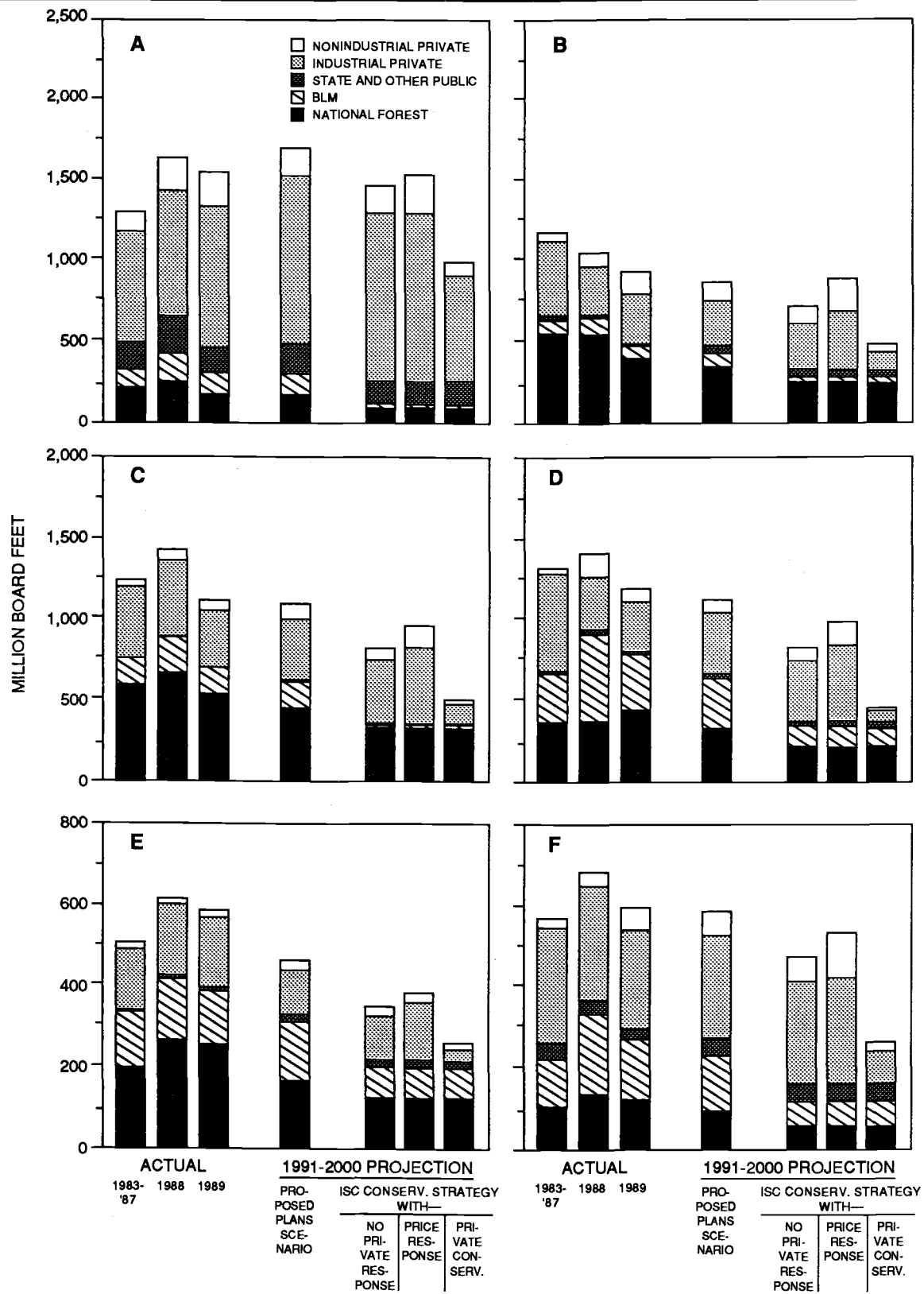


Figure 6. Regional annual harvests by owner group: historic (1983-1987 average, 1988, 1989) and projected (1991-2000 average) under differing scenarios on public and private lands for (A) North Coast, (B) Willamette, (C) Eugene, (D) Roseburg, (E) Medford, and (F) South Coast Timbersheds.

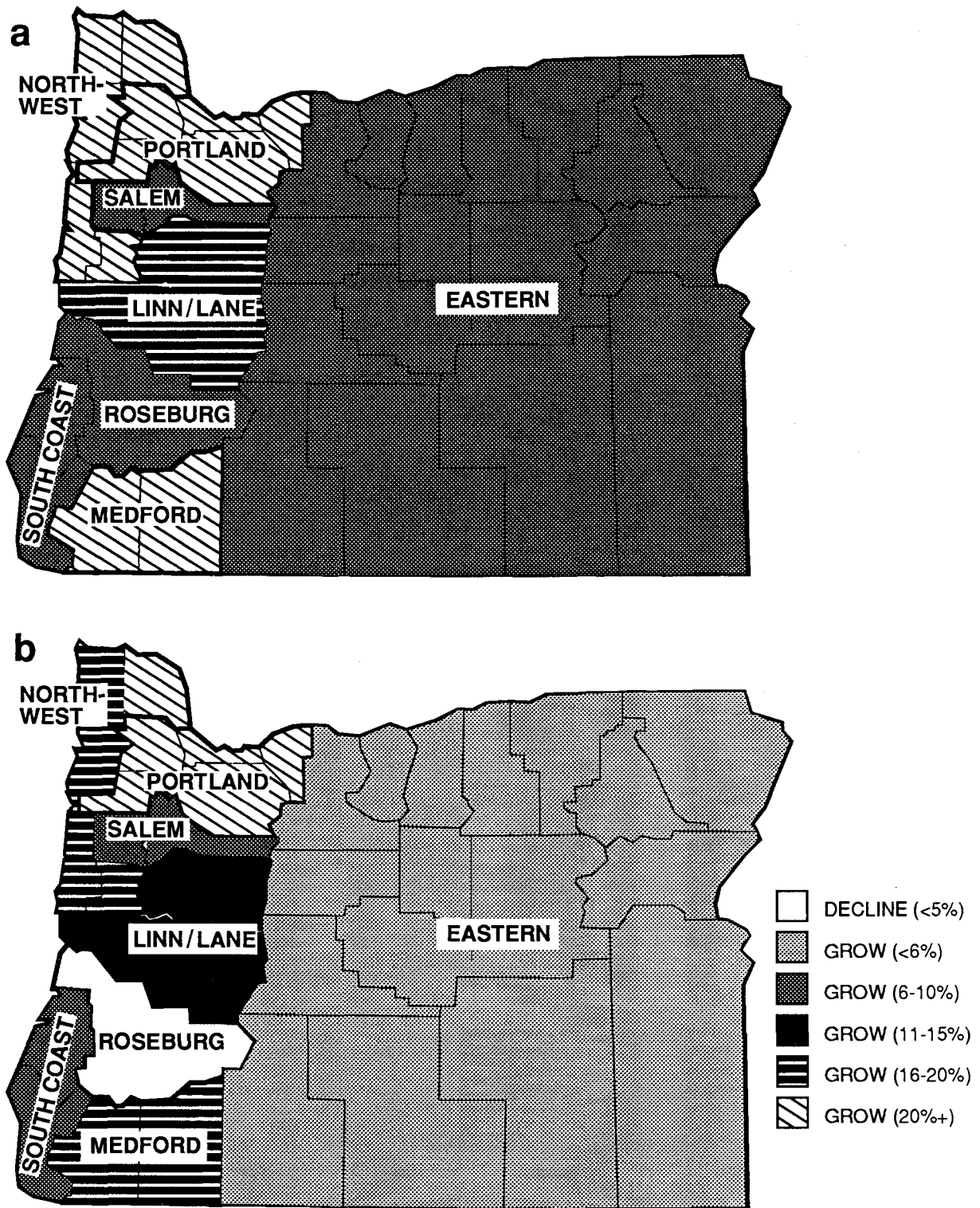


Figure 7. Average change in employment from 1988 to 1991-2000 by economic region under two scenarios: (a) continuing with 1983-1987 harvests and (b) No Private Response.

Appendix A

Revisions to "The 1989 Update" Harvest Levels

Table A1. Changes in harvest levels on selected national forests from those reported in "The 1989 Update."

Annual Allowable Sale Quantities			
National forest	Reported in "The 1989 Update"	Revised level, this study	Difference
(Million board feet per year, Scribner log rule)			
Deschutes	200	115	-85
Winema	187	130	-57
Mt. Hood	236	193	-43
Willamette	530	491	-39

Table A2. Changes in harvest levels on nonindustrial private lands from those reported in "The 1989 Update."

Projected harvest quantities			
Region & timbershed	Reported in "The 1989 Update"	Revised level, this study	Difference
(Million board feet per year, Scribner log rule)			
Western Oregon			
North Coast	123	167	44
Willamette	45	108	63
Eugene	40	82	42
Roseburg	35	81	46
Medford	10	22	12
South Coast	22	60	38
Eastern Oregon	86	147	61

Appendix B

Derivation of Western Oregon's Harvest Levels Under the Private Price Response

The Interagency Economic Assessment summarizes cubic-foot harvest levels for Washington and Oregon combined; the cubic-foot harvest was apportioned to Washington and Oregon on the basis of available growing stock in the two states, then converted to board feet. Our

Proposed Plans scenario for private owners in eastern Oregon equaled the Interagency Economic Assessment's price response level; hardwoods were treated as a developing product in the course of softwood management.

Table B1. Allotment of harvest levels of private owners during 1990-2000 under the Interagency Economic Assessment of Private Price Response to the ISC Conservation Strategy on public land in the Pacific Northwest-Westside.

Year	Pacific Northwest-West side				Oregon	
	Roundwood sawtimber ¹		Roundwood Nonsawtimber ²		Total timber	
	Industrial	Nonindustrial	Industrial	Nonindustrial	Industrial	Nonindustrial
	----- (million cubic feet) -----				----- (million board feet) -----	
1990	1,093	237	294	64	2,790	589
1991	1,204	280	336	78	3,092	700
1992	1,225	307	360	90	3,172	774
1993	1,140	320	409	115	3,060	835
1994	1,030	321	442	138	2,871	871
1995	993	327	456	150	2,810	901
1996	933	325	427	149	2,639	896
1997	903	324	418	150	2,560	893
1998	849	314	428	158	2,458	885
1999	799	303	461	175	2,398	884
2000	741	286	486	188	2,309	868

¹ A board foot/cubic foot ratio of 4.6 was used; 46.99 percent of the industrial harvest and 45.72 percent of the nonindustrial harvest were allocated to Oregon. Allocation was done on the basis of available growing-stock statistics in the Forest Service's data sets compiled in accordance with the Resource Planning Act.

² A board foot/cubic foot ratio of 3.1 was used; 46.99 percent of the industrial harvest and 45.72 percent of the nonindustrial harvest were allocated to Oregon. Allocation was done on the basis of available growing-stock statistics in the Forest Service's data sets compiled in compliance with the Resources Planning Act.

Appendix C

Procedures Used in Simulating the "50-11-40 Rule" on Private Lands

The "50-11-40 rule" was simulated by using the data set from "The 1989 Update" and the TREES model (Gourley et al. 1980, Schmidt and Tedder 1980, Tedder et al. 1980a and 1980b). The procedures used were as follows:

1. Determine the rotation age (by site, management intensity, and region) at which stands with an average dbh of 11 inches were generated; then double this value and use it as a minimum harvest age and target rotation age in the TREES simulation of sustainable harvest levels by owner group

and timbershed. This procedure would fulfill the long-run goal of the "50-11-40 rule," as it would eventually generate a regulated forest with half of the stands older and half of them younger than the age that yields the 11-inch-dbh stands. Given current forest structure, however, this procedure could overestimate the short-term harvest because it would permit harvest of stands before 50 percent of the acreage was greater than 11 inches dbh.

2. Calculate the number of acres with a stand diameter averaging 11 inches dbh or greater within each timbershed for each private owner group. In the first decade, harvest only those acres of large-diameter stands that are in excess of the 50 percent required by the "50-11-40 rule." This procedure will underestimate the short-term harvest unless the distribution is homogeneous across private owners and across townships.

3. Average the first-decade results by owner group and timbershed in an attempt to correct for the inherent biases, and use this average as the first-decade harvest level. For harvests beyond the first decade of simulation, use the procedures in step 1.

Appendix D

Inventory and Harvest on Private Land in Western Oregon

Data and Methods

The information on private land comes from "The 1989 Update." That study obtained timber inventory and management intentions for forest industry and management intentions for forest industry from a confidential survey of firms. Information on nonindustrial inventory came from the Forest Service's plot data, and information on management intentions of nonindustrial owners came from a survey of Service Foresters and Forest Practice Foresters. Both inventories were up-to-date as of late 1985 and early 1986.

"The 1989 Update" simulates the likely harvest on private lands for the next 100 years starting in 1991. Tables D1 and D2 show the starting inventory in each timbershed for each owner group as of 1995—the middle of the first decade of the simulation. This inventory was obtained by taking a half-period harvest (to represent harvest from 1986-1990) and simulating the growth of the stands for a full period (from 1986-1995). The harvest is taken in our simulations at the decade midpoint; thus, these tables show the inventory just before the first period's cutting occurs—just before the inventory is reduced for the 10-year harvest of 1990-1999.

In "The 1989 Update," private harvest for 1986-1990 was approximated by the average yearly harvest that occurred in the reference period (1983-1987). Because the nonindustrial harvest in 1988-1989 was considerably above this average, we re-estimated the harvest for the 1986-1990 half-period by using these actual harvests and also extrapolating them to obtain

the 1990 harvest level. Forest industry harvest for the last 2 years, on the other hand, has been within 10 percent of the 1983-1987 level; therefore, we did not re-estimate it.

Total forest industry acres shown here equal the acres shown in Table 8 of the text. Total nonindustrial acres are less than the acres shown in that table by 8 percent. The nonindustrial acres shown in Table 8 equal the acres of commercial forest land that the USDA Forest Service reported as existing on nonindustrial land in 1986. We have reduced that number for two reasons: (1) continued erosion of the land base from 1986-1995 to reflect conversion of this land to other uses; (2) recognition that some land on the urban fringe will not be available for timber production. These latter estimates, based on a survey of Service Foresters and Forest Practice Foresters, included a 5 percent reduction for all lands except those around the Portland area, which were reduced by 15 percent.

Current Inventory on Private Lands in Western Oregon

Figures D1 and D2 show the timber inventory by age class on private lands in western Oregon as of 1995. These graphs portray the acres and volume that we believe will be available, on the average, for harvest on private lands in western Oregon in the years 1991-2000.

In the figures, we have highlighted the contribution of the North Coast Timbershed to the age class structure of private forests for three major reasons. First, that timbershed contains the largest acreage of private land among any of the western Oregon timbersheds. Second, the North Coast Timbershed contains a disproportionately high acreage and volume of stands over 50 years of age on forest industry land. Third, the timbershed is somewhat remote from where the most severe reductions in harvest will occur under the different scenarios. These figures reveal some major points:

1. Nonindustrial private owners (NIP) have a much higher proportion of their acres above 60 years of age than does the forest industry (FI): 40 percent as opposed to less than 10 percent.

2. Little timber over 85 years of age exists on private land in western Oregon. Few of these acres over 85 years of age would qualify as old growth.

3. The age-class distribution of forest industry lands in western Oregon comes close to portraying a regulated forest on a 50- to 60-year rotation: each of the 10-year age classes through age class 55 has approximately equal acreage if one counts the acres over 60 years of age in the 50-60 age class. Thus, forest industry in western Oregon has cut its lands at an approximately even rate for the last 50 years and harvested one-fifth to one-sixth of them in each decade.

4. FI lands contain over 53 billion board feet of timber, while NIP lands contain over 16 billion, with most of that volume in softwoods (Table D3). Nonindustrial volume peaks at 65 years of age, while that of the FI peaks at 45 years.

5. NIP owners have a much higher proportion of their acres in an unproductive condition (very low stocking) than does the FI: more than 25 percent as compared to less than 5 percent. These lands are often covered by dense stands of brush or small hardwoods. We do not expect them to produce much merchantable volume without additional investment.

Our No Private Response scenario assumes that almost all the unproductive acres on FI land will be converted to conifer stands over the next 20 years but that very little of the NIP land in this condition will be converted. Thus, 20 years from now, under continuation of current management intentions, the FI would have very few unproductive acres, while the NIP owners would have close to the same acreage in an unproductive condition as now. Oregon's Forest Practice Rules should ensure that additions to this class of acres do not occur over time.

If landowners follow the Private Price Response scenario, then NIP owners will increase

their harvest above their sustainable capacity at the current management intensity over the next 10 years. One way to raise that capacity would be to actively manage these 400,000 unproductive acres for timber production.

Implications of Scenarios for Private Lands in Western Oregon

Over the next decade, scenarios vary widely in how much of the available softwood volume will be harvested (Table D4). The No Private Response scenario calls for a higher proportion of FI volume than of NIP volume to be harvested, just as the higher management intensities on FI land allow for a faster rate of inventory turnover. On the other hand, the Private Price Response scenario calls for a higher proportion of NIP volume—in part because of the older age classes that now exist on NIP land.

The No Private Response scenario results in the industry cutting most timber over 55 years of age in the next decade (1991-2000) (Figures D3 and D4). The minimum final harvest age varies by timbershed, with the Willamette and Roseburg Timbersheds dipping down the farthest into the younger age classes (35- and 45-year).

Under the Private Price Response scenario, the industry outside the North Coast Timbershed would generally cut through their 55-year-old age class in the first decade and proceed through much of the 45-year-old class (Figure D5). The Private Price Response scenario only affects the timbersheds outside the North Coast in our simulations of forest industry, as we project that the accelerated cutting under this scenario would be concentrated in the timbersheds where timber availability will diminish the most.

Under the Private Conservation scenario, all timber is drawn from the timber stands older than 50 years of age, with the majority from stands over 60 years old (Figure D6).

Table D1. Timber inventory on industrial private lands in western Oregon in the 1990's (1995 estimates prior to removing decade's harvest).¹

Timbershed or region	Age class midpoint ²	Area	Diameter	Cubic-foot volume			Board-foot volume (Scribner)		
				Softwood	Hardwood	Total	Softwood	Hardwood	Total
	(Years)	(Thousand acres)	(Inches)	----- (Millions) -----					
North Coast	L.S.	54.0	--	--	--	--	--	--	--
	5.0	169.9	--	--	--	--	--	--	--
	15.0	170.4	--	--	--	--	--	--	--
	25.0	186.7	9.5	320.0	33.5	353.5	992.1	100.4	1092.4
	35.0	135.1	14.0	580.3	233.3	813.6	2274.8	816.4	3091.2
	45.0	221.1	17.1	1350.8	263.9	1614.7	6213.6	923.7	7137.3
	55.0	186.7	17.9	1194.0	214.8	1408.8	5492.2	751.8	6244.0
	65.0	114.5	20.1	858.4	88.0	946.4	4291.8	308.1	4599.9
	75.0	26.2	21.4	206.6	19.9	226.6	1033.2	69.8	1102.9
	85+	1.6	16.6	12.7	0.5	13.2	63.6	1.6	65.2
Total		1266.2	--	4523.0	853.8	5376.8	20361.2	2971.6	23332.9
Willamette	L.S.	28.0	--	--	--	--	--	--	--
	5.0	111.7	--	--	--	--	--	--	--
	15.0	85.5	--	--	--	--	--	--	--
	25.0	89.5	8.5	94.7	6.8	101.4	293.4	20.3	313.7
	35.0	85.7	13.0	309.1	64.6	373.7	1211.6	226.1	1437.7
	45.0	80.3	16.4	394.7	70.3	465.0	1697.4	245.9	1943.3
	55.0	45.6	16.8	220.9	25.1	246.0	950.0	87.9	1037.8
	65.0	7.4	16.4	38.7	1.9	40.6	166.5	6.5	173.0
	75.0	6.5	17.5	33.6	2.0	35.5	154.5	6.8	161.3
	85+	30.6	19.5	230.5	12.1	242.6	1060.5	42.3	1102.8
Total		571.0	--	1322.4	182.7	1505.0	5533.8	635.9	6169.7
Eugene	L.S.	27.9	--	--	--	--	--	--	--
	5.0	93.8	--	--	--	--	--	--	--
	15.0	80.9	--	--	--	--	--	--	--
	25.0	81.8	9.0	102.2	8.2	110.4	316.7	24.6	341.3
	35.0	72.6	13.5	294.4	117.3	411.6	1153.9	410.4	1564.3
	45.0	91.7	16.9	507.7	64.5	572.2	2183.3	225.7	2409.0
	55.0	78.5	18.0	515.4	45.1	560.5	2370.7	157.9	2528.6
	65.0	31.7	20.1	235.5	14.8	250.3	1177.7	51.7	1229.4
	75.0	3.5	20.8	24.2	2.0	26.2	121.0	6.9	127.9
	85+	5.7	16.7	49.2	1.8	51.0	245.8	6.4	252.2
Total		568.0	--	1728.6	253.7	1982.3	7569.1	883.6	8452.7
Roseburg	L.S.	31.0	--	--	--	--	--	--	--
	5.0	100.6	--	--	--	--	--	--	--
	15.0	106.1	--	--	--	--	--	--	--
	25.0	169.9	8.7	159.2	13.5	172.7	493.6	40.4	534.1
	35.0	159.3	12.1	413.4	71.3	484.7	1620.5	270.9	1891.4
	45.0	89.4	15.8	364.9	78.3	443.2	1568.9	297.7	1866.5
	55.0	38.8	17.2	180.9	35.6	216.5	832.2	135.3	967.5
	65.0	22.4	18.3	128.1	18.6	146.7	589.2	70.7	659.9
	75.0	7.5	19.9	49.5	4.3	53.8	227.9	16.2	244.1
	85+	24.7	23.6	179.8	17.9	197.7	898.8	68.1	966.8
Total		749.5	--	1475.9	239.5	1715.4	6231.0	899.3	7130.3

Continued

Table D1 (cont.). Timber inventory on industrial private lands in western Oregon in the 1990's (1995 estimates prior to removing decade's harvest).¹

Timbershed or region	Age class midpoint ²	Area	Diameter	Cubic-foot volume			Board-foot volume (Scribner)		
				Softwood	Hardwood	Total	Softwood	Hardwood	Total
South Coast	L.S.	75.4	--	--	--	--	--	--	--
	5.0	99.9	--	--	--	--	--	--	--
	15.0	86.2	--	--	--	--	--	--	--
	25.0	106.9	9.7	127.5	44.1	171.7	395.3	132.4	527.7
	35.0	73.9	12.8	286.3	138.3	424.6	1122.2	525.5	1647.7
	45.0	42.6	16.3	296.6	157.0	453.6	1275.4	596.7	1872.1
	55.0	19.1	17.0	82.8	45.5	128.3	380.8	172.9	553.7
	65.0	10.6	17.7	74.2	8.5	82.7	341.3	32.1	373.4
	75.0	5.9	19.9	29.3	2.8	32.1	134.9	10.6	145.4
	85+	<u>30.1</u>	20.9	<u>201.3</u>	<u>28.1</u>	<u>229.4</u>	<u>1006.6</u>	<u>106.7</u>	<u>1113.3</u>
Total		<u>550.7</u>	--	<u>1098.1</u>	<u>424.3</u>	<u>1522.4</u>	<u>4656.5</u>	<u>1576.9</u>	<u>6233.4</u>
Medford	L.S.	13.6	--	--	--	--	--	--	--
	5.0	54.3	--	--	--	--	--	--	--
	15.0	43.8	--	--	--	--	--	--	--
	25.0	46.7	8.8	39.5	1.9	41.4	122.6	5.6	128.2
	35.0	86.1	10.2	149.0	18.4	167.5	462.0	55.3	517.3
	45.0	31.7	11.8	115.1	6.1	121.2	356.7	18.3	375.0
	55.0	13.5	15.1	41.9	4.2	46.2	180.3	16.1	196.5
	65.0	8.3	16.8	27.8	1.5	29.4	119.6	5.9	125.4
	75.0	35.3	14.7	127.6	46.3	174.0	500.3	176.1	676.4
	85+	<u>9.4</u>	18.8	<u>45.4</u>	<u>5.4</u>	<u>50.8</u>	<u>208.7</u>	<u>20.5</u>	<u>229.2</u>
Total		<u>342.8</u>	--	<u>546.5</u>	<u>83.9</u>	<u>630.4</u>	<u>1950.2</u>	<u>297.7</u>	<u>2248.0</u>
Western Oregon	L.S.	229.9	--	--	--	--	--	--	--
	5.0	630.2	--	--	--	--	--	--	--
	15.0	572.9	--	--	--	--	--	--	--
	25.0	681.5	9.2	843.1	107.9	951.0	2613.7	323.7	2937.4
	35.0	612.8	13.0	2032.5	643.1	2675.6	7845.0	2304.5	10149.6
	45.0	556.9	16.5	3029.8	640.1	3669.9	13295.3	2308.0	15603.2
	55.0	382.2	17.7	2235.9	370.4	2606.2	10206.2	1321.8	11528.0
	65.0	194.9	19.6	1362.7	133.3	1496.0	6685.9	475.1	7161.0
	75.0	85.0	18.8	470.9	77.2	548.1	2171.7	286.4	2458.0
	85+	<u>102.1</u>	20.7	<u>718.9</u>	<u>65.8</u>	<u>784.7</u>	<u>3483.9</u>	<u>245.7</u>	<u>3729.6</u>
Total		4048.2	--	10694.4	2037.9	12732.3	46301.8	7265.1	53566.9

¹ The modeling of inventory and harvests is done by decade. With the model, forest stands are grown to the midpoint of each decade without any volume being removed; then one decade's harvest removals are simulated.

² L.S. = low stocking.

Table D2. Timber inventory on nonindustrial private lands in western Oregon in the 1990's (1995 estimates prior to removing decade's harvest).¹

Timbershed or region	Age class midpoint ² (Years)	Area (Thousand acres)	Diameter (Inches)	Cubic-foot volume			Board-foot volume (Scribner)		
				Softwood	Hardwood	Total	Softwood	Hardwood	Total
				----- (Millions) -----					
North Coast	L.S.	118.2	--	--	--	--	--	--	--
	5.0	50.4	--	--	--	--	--	--	--
	15.0	56.2	--	--	--	--	--	--	--
	25.0	22.4	6.6	17.3	25.6	42.9	53.6	76.9	130.5
	35.0	35.8	13.5	60.6	39.3	99.9	237.7	137.5	375.2
	45.0	49.7	15.3	227.8	29.8	257.6	979.5	104.3	1083.8
	55.0	23.1	16.0	172.4	18.7	191.1	741.3	65.6	806.9
	65.0	62.4	18.9	263.4	82.5	345.9	1211.8	288.8	1500.6
	75.0	39.1	19.1	147.0	73.2	220.2	676.1	256.1	932.2
	85+	4.2	29.8	45.9	6.9	52.8	229.7	24.0	253.7
Total		461.4	--	935.4	280.0	1215.4	4129.7	953.1	5082.8
Willamette	L.S.	100.0	--	--	--	--	--	--	--
	5.0	37.4	--	--	--	--	--	--	--
	15.0	14.2	--	--	--	--	--	--	--
	25.0	18.8	6.3	17.0	7.4	24.4	52.5	22.2	74.8
	35.0	11.1	8.0	4.4	22.1	26.4	13.5	66.2	79.8
	45.0	9.8	16.2	50.8	0.0	50.8	218.4	0.0	218.4
	55.0	42.7	19.4	223.2	50.9	274.1	1026.8	178.1	1204.9
	65.0	39.6	18.3	216.6	35.1	251.7	996.4	122.8	1119.2
	75.0	29.5	22.1	94.0	45.2	139.3	470.1	158.3	628.4
	85+	21.3	16.5	76.4	0.0	76.4	328.4	0.0	328.4
Total		324.3	--	682.4	160.7	843.1	3106.1	547.7	3653.8
Eugene	L.S.	44.8	--	--	--	--	--	--	--
	5.0	15.2	--	--	--	--	--	--	--
	15.0	21.8	--	--	--	--	--	--	--
	25.0	5.3	5.6	2.4	0.2	2.6	7.4	0.7	8.1
	35.0	24.6	9.3	46.2	11.4	57.6	143.3	34.2	177.5
	45.0	18.2	11.9	74.7	2.8	77.5	231.7	9.8	241.5
	55.0	22.1	13.6	98.8	5.5	104.3	387.4	19.1	406.6
	65.0	40.8	15.7	183.7	4.2	187.9	790.0	14.7	804.7
	75.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	85+	13.5	16.4	62.1	1.1	63.2	243.6	3.7	247.3
Total		206.3	--	468.1	25.2	493.3	1803.4	82.2	1885.7
Roseburg	L.S.	54.5	--	--	--	--	--	--	--
	5.0	8.9	--	--	--	--	--	--	--
	15.0	5.3	--	--	--	--	--	--	--
	25.0	56.6	5.4	29.2	27.7	56.9	90.6	83.0	173.7
	35.0	27.8	13.8	41.4	22.4	63.8	162.4	85.0	247.4
	45.0	53.7	14.1	217.1	34.0	251.1	851.2	129.0	980.2
	55.0	21.9	12.8	51.5	17.8	69.3	202.0	67.5	269.4
	65.0	26.1	14.9	149.4	10.9	160.3	585.7	41.4	627.1
	75.0	2.4	18.7	13.1	9.9	22.9	60.1	37.5	97.6
	85+	10.0	13.2	32.0	9.6	41.6	125.3	36.6	161.9
Total		267.1	--	533.8	132.1	665.9	2077.3	480.0	2557.3

Continued

Table D2 (cont.). Timber inventory on nonindustrial private lands in western Oregon in the 1990's (1995 estimates prior to removing decade's harvest).¹

Timbershed or region	Age class midpoint ²	Area	Diameter	Cubic-foot volume			Board-foot volume (Scribner)		
				Softwood	Hardwood	Total	Softwood	Hardwood	Total
South Coast	L.S.	91.3	--	--	--	--	--	--	--
	5.0	30.7	--	--	--	--	--	--	--
	15.0	15.5	--	--	--	--	--	--	--
	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	35.0	16.5	12.1	19.7	8.8	28.5	61.2	33.3	94.4
	45.0	15.9	16.1	65.3	24.0	89.2	280.7	91.1	371.7
	55.0	13.3	12.4	96.1	1.7	97.9	376.8	6.6	383.4
	65.0	19.2	21.0	74.7	7.9	82.5	373.3	29.8	403.1
	75.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
85+	<u>0.0</u>	0.0	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
Total		<u>202.4</u>	--	<u>256.0</u>	<u>44.2</u>	<u>300.2</u>	<u>1091.9</u>	<u>160.8</u>	<u>1252.6</u>
Medford	L.S.	38.8	--	--	--	--	--	--	--
	5.0	4.7	--	--	--	--	--	--	--
	15.0	18.3	--	--	--	--	--	--	--
	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	35.0	0.8	7.7	0.6	1.5	2.1	2.0	4.5	6.5
	45.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	55.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	65.0	61.8	11.1	86.7	43.6	130.4	268.9	130.9	399.8
	75.0	115.8	11.5	329.4	100.8	430.2	1021.1	302.4	1323.5
85+	<u>13.5</u>	13.5	<u>58.3</u>	<u>4.5</u>	<u>62.7</u>	<u>228.4</u>	<u>16.9</u>	<u>245.3</u>	
Total		<u>253.7</u>	--	<u>490.2</u>	<u>150.4</u>	<u>640.6</u>	<u>1520.3</u>	<u>454.7</u>	<u>1975.0</u>
Western Oregon	L.S.	447.6	--	--	--	--	--	--	--
	5.0	147.2	--	--	--	--	--	--	--
	15.0	131.2	--	--	--	--	--	--	--
	25.0	103.1	6.0	65.9	61.0	126.8	204.2	182.9	387.1
	35.0	116.6	12.0	173.0	105.4	278.4	620.1	360.6	980.7
	45.0	147.3	14.7	635.7	90.5	726.3	2561.4	334.2	2895.6
	55.0	123.0	16.1	642.1	94.6	736.7	2734.3	336.9	3071.2
	65.0	249.8	17.0	974.5	184.2	1158.7	4225.9	628.4	4854.3
	75.0	186.8	15.6	583.5	229.1	812.5	2227.4	754.3	2981.7
85+	<u>62.4</u>	17.7	<u>274.7</u>	<u>22.0</u>	<u>296.7</u>	<u>1155.3</u>	<u>81.3</u>	<u>1236.6</u>	
Total		1715.2	--	3365.9	792.6	4158.4	13728.7	2678.6	16407.3

¹ The modeling of inventory and harvests is done by decades. With the model, forest stands are grown to the midpoint of each decade without any volume being removed; then one decade's harvest removals are simulated.

² L.S. = low stocking.

Table D3. Growing stock inventory by private landowner in western Oregon, 1995.

Owner class	Softwood	Hardwood	Total
	(Billion board feet, Scribner)		
Forest industry	46.3	7.3	53.6
Nonindustrial private	13.7	2.7	16.4

Table D4. Removal of softwood growing stock in western Oregon by private lands scenario.

Owner class	1995 softwood inventory (Billion board feet)	Proportion of inventory harvested, 1991-2000		
		No Private Response	Private Price Response	Private Conservation
		----- (Percent) -----		
Forest industry	46	45	53	20
Nonindustrial private	14	35	57	14

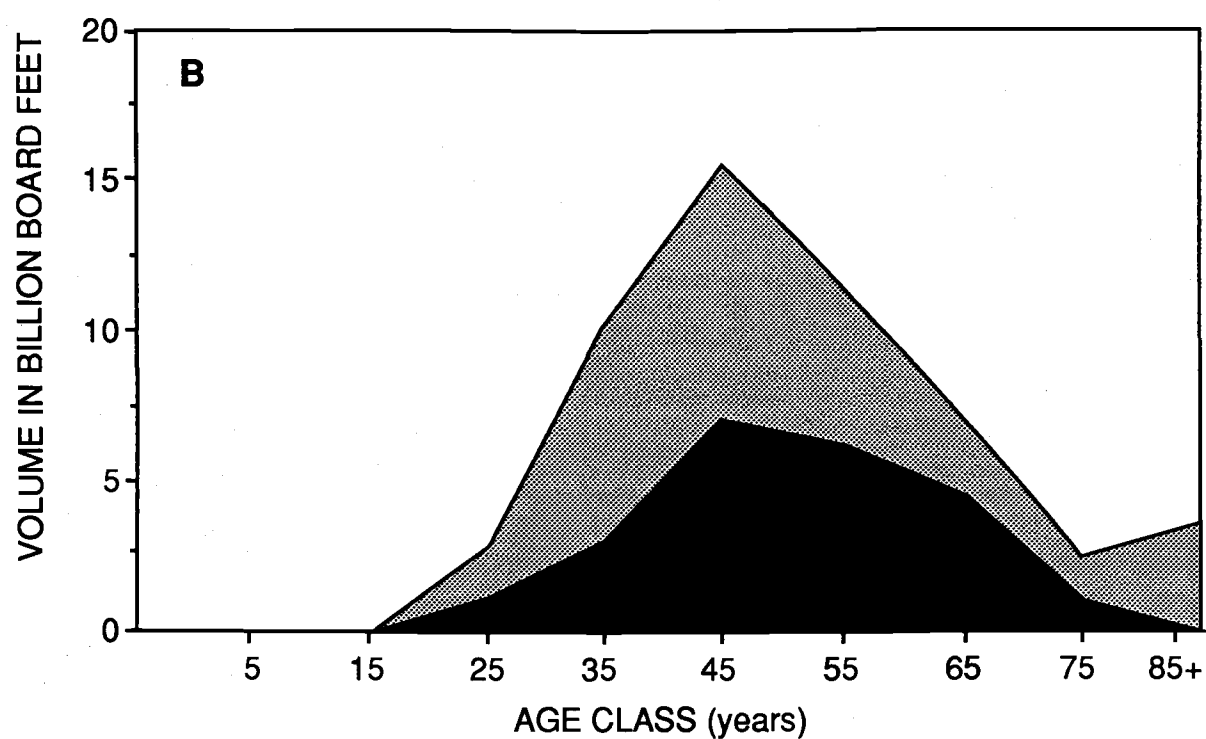
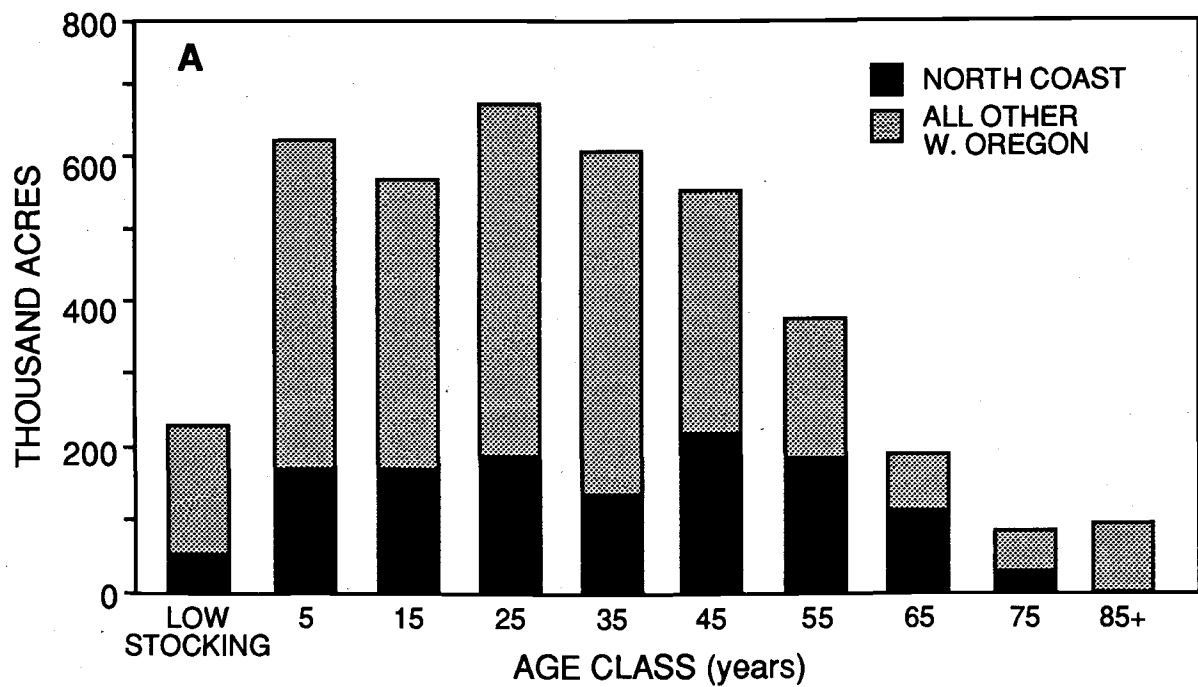


Figure D1. Inventory of forest industry's growing stock in western Oregon by age class in 1995 in terms of (A) acres and (B) volume; summarized prior to removal of decade's harvest.

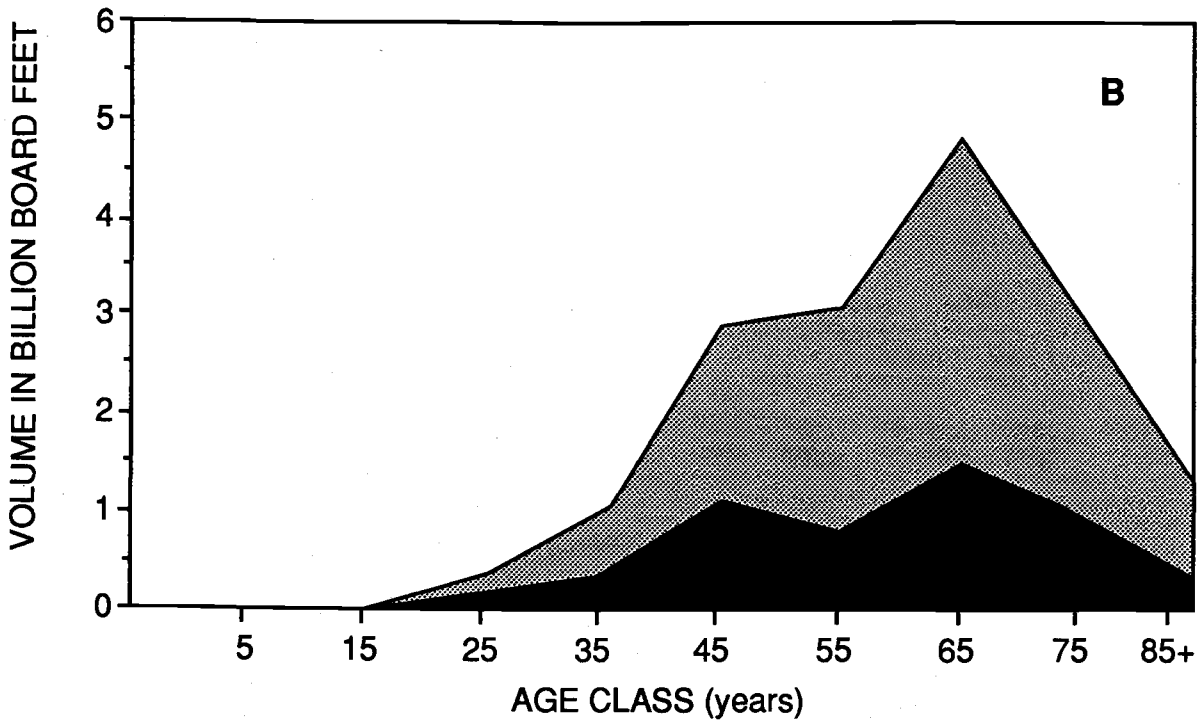
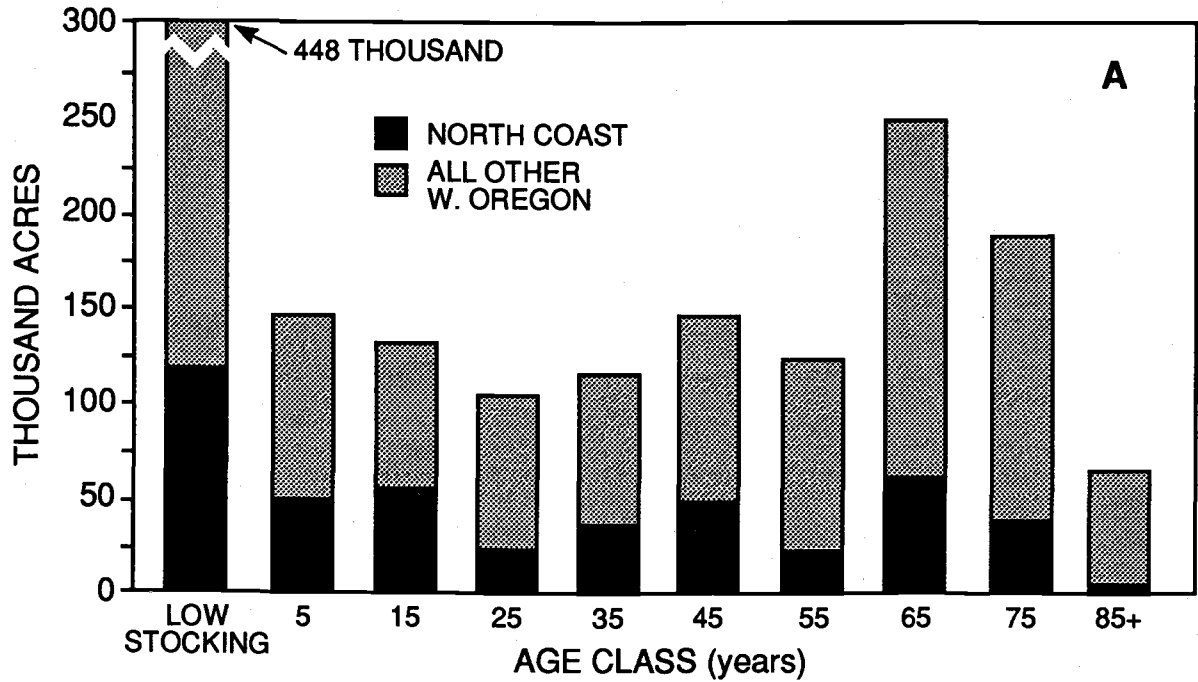


Figure D2. Inventory of nonindustrial private owner's growing stock in western Oregon by age class in 1995 in terms of (A) acres and (B) volume; summarized prior to removal of decade's harvest.

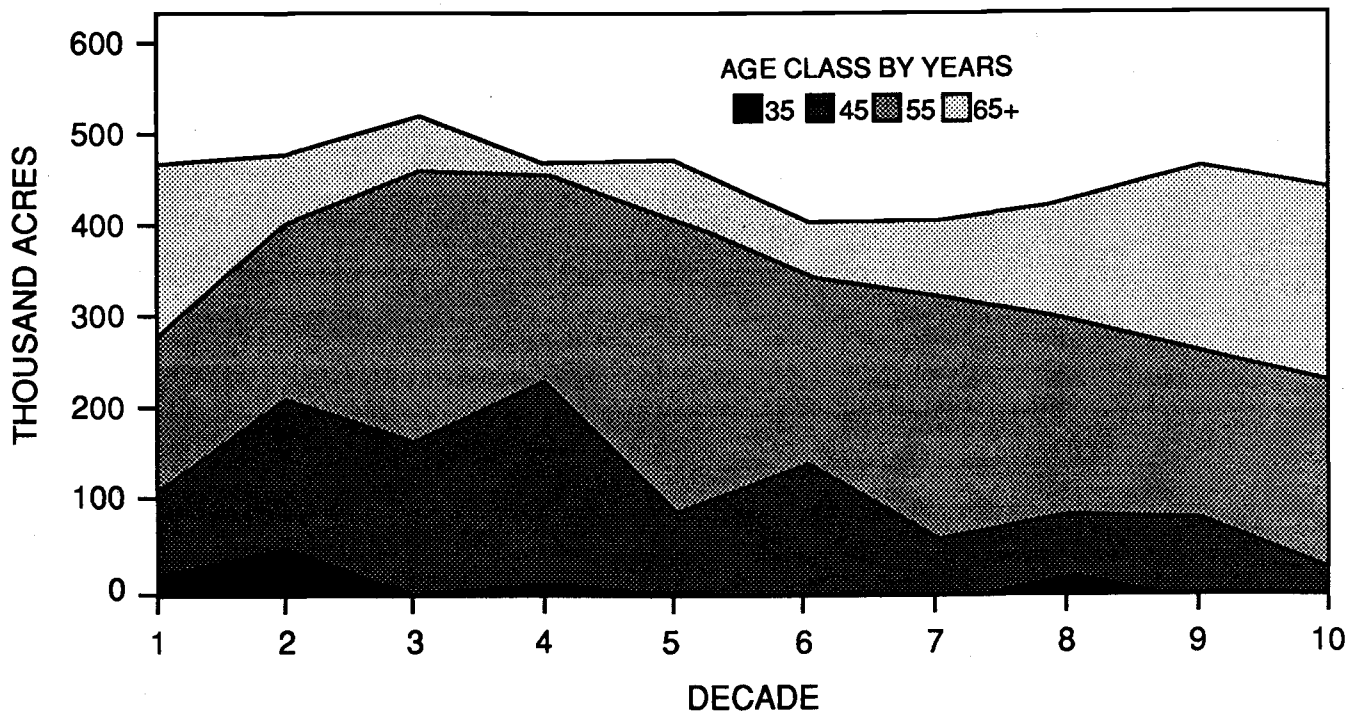


Figure D3. Acres of industrial timber cut per decade in 1991-2000 by age class in western Oregon excluding the North Coast if the No Private Response scenario (which is the same as the Proposed Plans scenario) is realized.

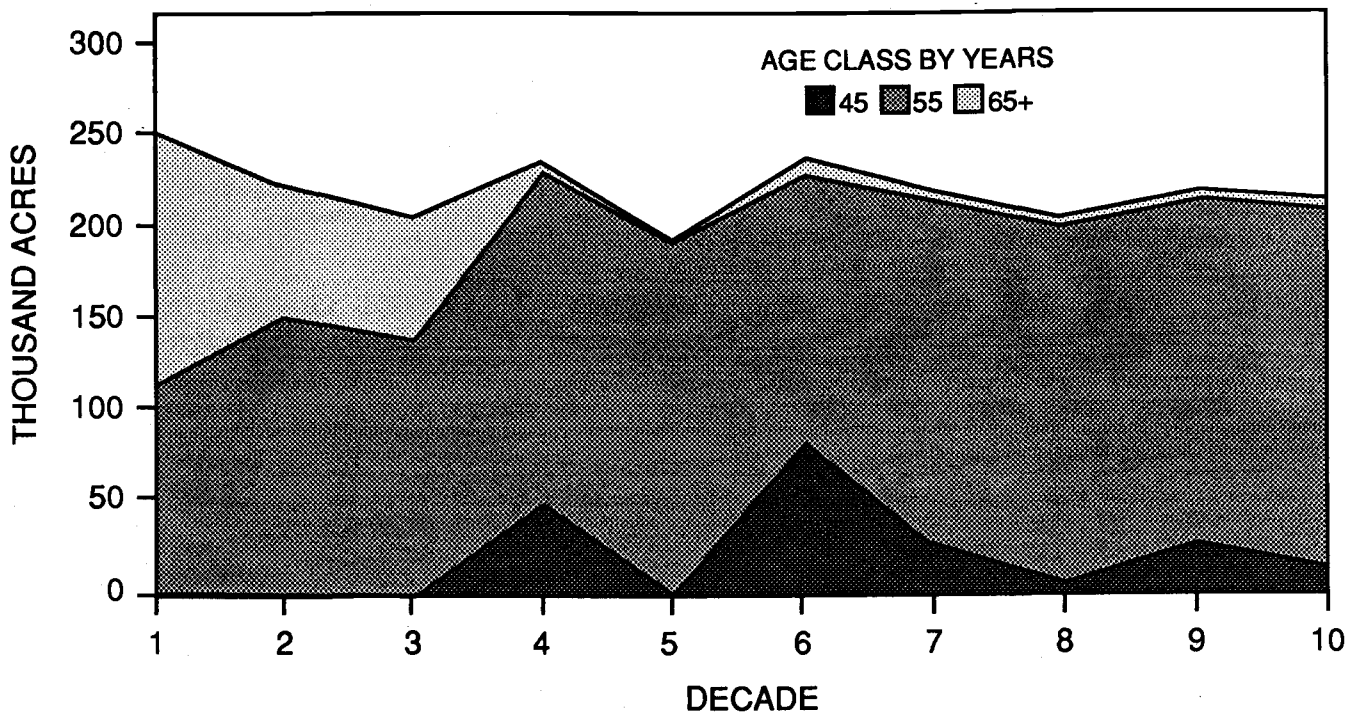


Figure D4. Acres of industrial timber cut per decade in 1991-2000 by age class in the North Coast timbershed if the No Private Response scenario (which is the same as the Proposed Plans scenario) is realized.

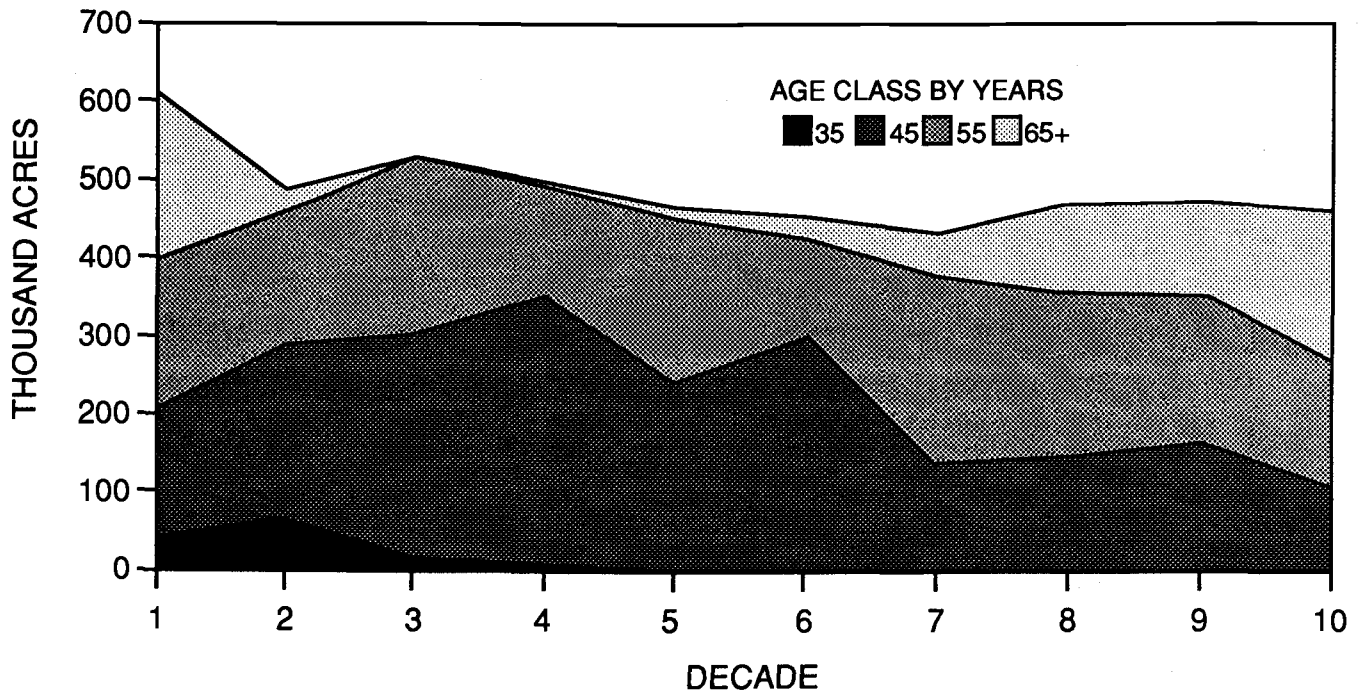


Figure D5. Acres of industrial timber cut per decade in 1991-2000 by age class in western Oregon excluding the North Coast if the Private Price Response scenario is realized.

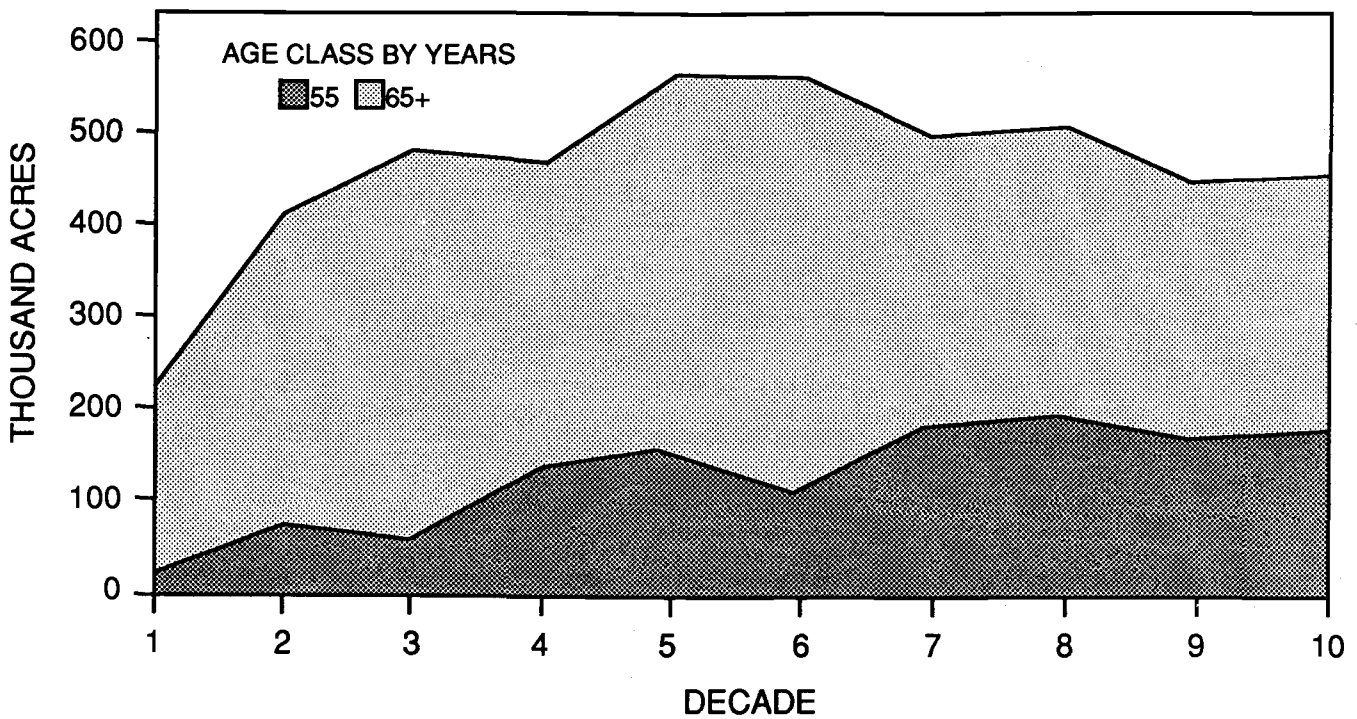


Figure D6. Acres of industrial timber cut per decade in 1991-2000 by age class in western Oregon if the Private Conservation scenario is realized.

Appendix E

National Economic Indicators Used in Forecast

Table E1. National economic indicators used in Oregon Forecast.¹

Year	Index of Industrial Production (1977=100)	U.S. Housing Starts (Millions)	U.S. Population (Millions)	Consumer Price Index (1982-'84=100)	Gross National Product (Billion '82 \$)
1989	141.7	1.4	248.8	124.0	4143.6
1990	143.8	1.4	251.3	129.2	4220.3
1991	148.5	1.4	253.8	134.1	4320.5
1992	153.6	1.4	256.2	140.1	4430.8
1993	158.2	1.5	258.5	148.3	4551.6
1994	151.5	1.1	260.7	156.4	4505.4
1995	160.0	1.7	262.8	163.0	4724.9
1996	169.0	1.6	264.8	169.9	4870.6
1997	178.4	1.6	266.9	177.7	5062.1
1998	186.7	1.6	268.8	187.5	5200.1
1999	177.4	1.2	270.8	197.0	5128.5
2000	185.9	1.6	272.7	205.6	5339.7
2001	194.6	1.6	274.6	215.1	5491.5
2002	203.9	1.6	276.4	224.8	5678.5
2003	212.7	1.6	278.3	234.3	5816.2
2004	219.2	1.7	280.2	246.7	5953.8
2005	206.1	1.3	282.1	260.0	5856.0

¹ Indicators from Wharton Economic Forecasting Associates (1990).

Greber, B.J., K.N. Johnson, and G. Lettman. 1990. CONSERVATION PLANS FOR THE NORTHERN SPOTTED OWL AND OTHER FOREST MANAGEMENT PROPOSALS IN OREGON: THE ECONOMICS OF CHANGING TIMBER AVAILABILITY. Forest Research Laboratory, Oregon State University, Corvallis. Papers in Forest Policy 1. 50 p.

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