ABSTRACT. Researchers involved with the Pacific Northwest Research Station Sustainable Wood Production Initiative have summarized some of the opportunities and barriers for sustainable wood production in the region. Sustainable wood production is defined as the capacity of forests to produce wood, products, and services on a long-term basis and in the context of human activity and use. Preliminary research suggests that in the future, the region’s wood supply will primarily come from private land, and that sustainable wood production will have more to do with future markets, harvest potential, land use changes, and sustainable forestry options than with traditional sustained growth and yield. Private lands in the Pacific Northwest should be able to sustain recent historical harvest levels over the next 50 years, but changes in forest products operations and uncertain market conditions may affect wood production in the region. Public perceptions of forestry practices, land use changes, and alternative forestry options will also be important considerations for sustainable forest management.

KEYWORDS. sustainable forestry, wood production, Pacific Northwest, markets, land use changes.
Introduction
The Pacific Northwest is a highly productive timber-growing region, and the regional capacity to produce wood on a sustained yield basis is widely recognized, however, issues relating to the ecological, social and economic frameworks of sustainable forestry will play a major role in future wood production of the region. The near elimination of harvest on federal lands in the 1990s has put more pressure on future timber supply from private ownerships in the Pacific Northwest (Haynes 2003). Sustainable forestry is related to, but different from sustained yield—the amount of wood that a forest can produce continually. The Society of American Foresters (Helms 1998) defines sustainable forestry as “the capacity of forests ranging from stands to ecoregions, to maintain their health, productivity, diversity and overall integrity, in the long run, in the context of human activity and use.” Sustainable wood production is further defined as the capacity of forests to produce wood, products and services on a long-term basis, in the context of human activity and use.

To address concerns about sustainable forestry in the region, the PNW Research Station is sponsoring a 3-year Sustainable Wood Production Initiative (SWPI). To identify and understand important issues for sustainable wood production, we conducted a series of client meetings and invited a wide array of forest landowners and managers representing forest industry, small private forests, state forestry, and others interested in growing and producing wood. The most pressing need mentioned by almost all forest landowners and managers was the need to identify and understand barriers to sustainable forestry (Deal and White 2005).

Major Issues for Sustainable Wood production in the Pacific Northwest
Based on information gathered from client meetings for the SWPI, our focus groups identified six major topics that affect the ability of landowners to sustainably produce wood in the region. These topics included:

1. Identify and understand the major economic, ecological, and social issues relating to wood production in the PNW in the broad context of sustainable forestry.
2. Identify barriers to sustainable forestry and assess the impacts of market incentives and environmental regulations on sustainable forest management.
3. Develop a regional assessment of resource trends and market conditions including the long-term economic viability of forestry in the region.
4. Identify and assess niche market opportunities for small woodland owners in the PNW.
5. Identify emerging technologies for wood products and summarize and synthesize new and existing information on wood technology.
6. Develop a comprehensive communication strategy for reporting findings to a broad client base of land managers, researchers, and the general public.

These topic areas were divided into three broad categories including sustainable markets, sustainable land use, and sustainable forestry options.
Sustainable Markets
The Pacific Northwest region of the United States contains the states of Washington and Oregon and is divided into a coastal and interior region (figure 1) known as the PNW east and west sides. The division between east and west is formed by the Cascade Mountain range with distinctly different forest types, productivity and timber volume between the east and west. Westside forests contain primarily Douglas-fir, western hemlock and red alder, and eastside forests are dominated by Ponderosa pine, lodgepole pine, grand fir and interior Douglas-fir. Westside forests are more intensively managed and produce more timber than the less productive eastside forests of Washington and Oregon.

With the near elimination of harvest on federal lands in the 1990s, private and state forests became the primary source of timber in the region (figure 2). The region’s future timber supply will depend heavily on the private industrial and nonindustrial forests. Future harvest volume projections on private lands suggest that the Pacific Northwest should be able to maintain harvests at recent historical levels for the next 50 years (Adams and Latta 2005, figure 3). These results could be achieved with stable to rising inventories and nearly stable real prices. Adams and Latta (2005) also suggest that concentration of lands in younger age and tree size classes will continue in some cases for industrial owners and to a lesser extent on nonindustrial private forest lands. The pace of the shifts to more intensive management will slow in coming decades, but the proportion of harvest coming from more intensively managed stands will increase.

Market prices could have an important role in influencing forest management decisions in the Pacific Northwest. Haynes (2005) has suggested that in the Douglas-fir region landowners and managers have relied on sustained increases in timber prices to provide incentives for intensive forest management practices. With a projected future of relatively stable prices and lower returns to various forestry practices, landowners may respond to markets in ways that are not supportive of sustainable forest management.

Forest products operations in the Pacific Northwest have significantly changed over the last few decades. Observed trends include an overall decline in sawmill numbers and an increase in the largest sized mills (Perez-Garcia 2005, figure 4) and a decline in sawmill capacity in eastern Oregon. Other changes include less dependence on timber from public lands, greater use of out-of-state logs by sawmills, and a decline in log exports in the last decade.

Sustainable Land Use
The United States is expected to add around 120 million people, an additional 40 percent, to its population in the next 50 years. The Pacific Northwest is expected to experience above-average population growth, including some people moving in from other regions and an increase in new forest owners (Birch 1997). New owners sometimes bring different land management attitudes compared to traditional owners, with different perspectives on forest management as urban residents move into rural and forest settings. Human populations in Oregon and Washington have increased faster than the national average in recent years, and projections suggest that the population of Pacific Northwest
will continue to grow substantially (Alig 2005). This will likely intensify land use pressures with more conversion of forest land to developed uses.

This land use change may affect the region’s progress toward sustainable forestry. In the most recent national comprehensive survey, the rate of conversion of rural land to developed land increased, with forest land being the largest source of conversion (USDA NRCS 2001). Some of this land was used for urban and infrastructural developments, and other areas were cleared and converted to agriculture. In the most recent USDA surveys, the largest use for converted forests has been urban and developed use (Smith et al. 2001, USDA NRCS 2001).

This land conversion often leads to forest parcelization or fragmentation. Forest fragmentation poses threats to wildlife, particularly birds, in many parts of the United States (Robinson 1995). Along with this, forest fragmentation and parcelization and other factors may result in more noncorporate individual owners (Sampson 2000, Alig 2005, Lewis and Plantinga 2005), and they are likely to have smaller tract sizes on average. More people on the national and regional landscapes and increased forest fragmentation will reduce options for agriculture, forestry, residential communities, biodiversity, and other land-based goods and services.

**Sustainable Forestry Options**

Forest management involves meeting the demands of multiple forest values including human perceptions of forest treatments. Visual impacts of alternative timber harvest practices are important considerations when developing forest management plans. Determining visual preferences for alternative timber harvest practices is one means of identifying the visual effects of alternative patterns. A recent study at Capitol State Forest in Washington provided a comprehensive look at visual preferences for six alternative harvest patterns (figure 5) by various interest groups (Bradley et al. 2004). These groups include foresters, recreationists, environmentalists, educators and the general public. In general, all groups preferred less intensive treatments that were closer to what they considered natural conditions, but foresters had a higher preference for more intensive treatments than other groups.

These findings suggest that preferences are generally similar for different groups of people for most timber harvest practices. However, there is a significant difference between foresters and all other groups as it relates to the most intensive timber harvest practices. This is especially true for clear cutting. Also, practices that minimize the visual impact of forest management are not necessarily required uniformly across the forest landscape. The practice of applying visual impact mitigation should focus on visually sensitive landscapes. These typically are landscapes where the full impact of an intensive harvest practices would be in full view of the public traveling along a main highway corridor. These findings suggest that in visually sensitive landscapes, practices that result in greater tree retention, smaller openings and rapid green-up will serve to reduce the visual impact of timber harvest practices. By knowing people’s preferences for forest scenes, managers can incorporate the value of human perceptions in their forest plans and management activities.
Sustainable forestry means different things to different people, but it is generally understood to include forest benefits and uses other than wood production. Dwindling area of old-growth forest has been of particular concern in the Pacific Northwest and has been an important driver of federal forest policy in the region. The Northwest Forest Plan was developed in response to concerns about old-growth forests, and establishes extensive areas of late-successional reserves in which it is expected old-growth forest will develop over time (Thomas 1993). In comparison with forest management that focuses on commercial timber production, active management for older forest structural attributes does reduce income for landowners who undertake it, albeit by a lesser amount than a reserve-based approach would. It also reduces the supply of wood to manufacturers and the supply of wood products to consumers. Compensating forest landowners for lost income in wood production and minimizing the cost of conservation in general are in the interest both of landowners and a society that values both wood and conservation.

If private lands are to be managed to meet regional conservation objectives, it will be necessary to induce private landowners to do so. There are many strategies that can be considered for implementing older forest structural management including further regulation, market-based incentives, and direct payments to landowners. Each has its merits and drawbacks. A systematic comparison of outcomes under each of the strategies would help policymakers design policies that are effective and economical. Montgomery (2005) is evaluating cost-effective management strategies to increase the area of private forest in western Oregon that has structural attributes associated with old-growth forests.

Riparian forest management is another important element of sustainable forestry in the Pacific Northwest and one that is the focus of forest practices regulations. These regulations have often resulted in financial disincentives for many small, family forest owners and may lead to unintended consequences such as increased land-use conversion. Alternate plans that are easy to implement are a potential solution (Zobrist et al. 2005). An integrated approach that combines forest structure and economic criteria to develop a riparian management plan for overstocked stands could provide better protection of riparian forests, sustainable economics and easier implementation.

Numerous small diameter trees could potentially be available for utilization from thinning forests to reduce fire hazard. However, mean lumber recovery from these logs has been reported to be very low. The wood fiber-plastic industry is ideally suited for forest-based rural communities with plenty of available small diameter trees (Yadama and Shook 2005). Extruded wood-plastic components for such end uses as decking, molding, siding, and other pertinent structural and non-structural components is one emerging technology and process where low quality, small diameter timber could be used to manufacture value-added products.

**Summary**

As one of the principal timber producing regions in the United States, there has been both public interest in assuring that forests are being sustainably managed as well as a desire by landowners and forest managers to demonstrate their commitment to responsible
stewardship. Private lands in the PNW should be able to maintain or exceed recent historical harvest levels over the next 50 or more years given unchanged policies and anticipated levels of private management investment. Forest products operations in the region have recently changed with fewer and larger sawmills that primarily use smaller diameter logs. However, relatively stable prices and expectations of low returns for various forestry practices may lead landowners to respond to various market signals in ways that are not supportive of sustainable forest management. Public perceptions of forestry practices, land use changes, and alternative forestry options will also be important considerations for sustainable forest management. The Sustainable Wood Production Initiative was developed to create a forum for discussion about these issues and provide future guidance for landowners and managers in the Pacific Northwest.

Literature Cited


Figure Captions

Figure 1—The Coastal and Interior Regions of the Pacific Northwest.

Figure 2—Change in timber harvest level in Private and Public lands between 1984 and 1999. Public lands include both Federal and State lands in Washington and Oregon. Private lands include both Industrial and Non-Industrial ownerships.

Figure 3—Projected private softwood growing-stock removals for Pacific Northwest west and east from 5th RPA timber assessment (from Haynes 2003, Adams and Latta 2005).

Figure 4—Number of sawmills by class in four Washington Department of Natural Resources mill surveys (from Perez-Garcia 2005).

Figure 5—The upper left scene is a thinning (respondents had a high preference), upper right is a patch cut (medium low preference), lower left is a clearcut (low preference), and lower right is a two-age stand (medium preference). Photos courtesy of Gordon Bradley.