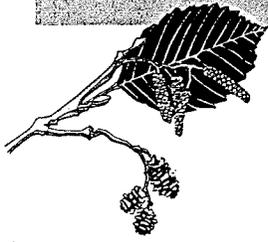


## Introduction



# Red Alder and the Pacific Northwest

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The alder, whose fat shadow nourisheth—  
Each plant set neere him long flourisheth.

William Browne, 1613  
*Brittania's Pastorals*, Book I, Song 2

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Alder (*Alnus* spp.) has long been observed to possess unique biological properties. Virgil (70—19 B.C.), author of the *Aeneid*, reported his observations on the ecology of alder, making particular reference to its occurrence in moist places (Kellogg 1882). In *Forest Trees of Britain*, Johns (1849) wrote, "It has been observed that their [alders'] shade is much less injurious to vegetation than that of other trees," and quoted Browne's jingle, above.

The first "modern" scientist to report on nodulated alder roots was Meyen (1829). Following this clue, Hiltner (1896) performed a classic study in which seeded black alder (*Alnus glutinosa* Gaertn.) grew vigorously in sterile, nitrogen-free soil inoculated with alder root materials while similar plants in uninoculated soil remained small and nitrogen-deficient. Other scientists then became interested and developed sufficient information to include alder in a list of "nitrogen-gathering" plants published in the *Yearbook of the United States Department of Agriculture 1910* (Kellerman 1911).

This early research was done with species of alder other than red alder (*Alnus rubra* Bong.), the major deciduous (hardwood) forest tree of the Pacific Coast of the United States and Canada. During the latter half of the twentieth century, however, great advances have been made in understanding the biology, management, and utilization of red alder (Trappe et al. 1968; Briggs et al. 1978), and there now are hundreds of published research findings (Heebner and Bergener 1983). Much of this information describes the significant role of red al-

der in ecosystem function, including documentation that the actinomycete endophyte (*Frankia* spp.) is responsible for nitrogen fixation in nodules on alder roots (Berry and Torrey 1979).

Only a few years ago, red alder was regarded by most Pacific Northwest forest managers as a weed to be eradicated with herbicides. Today, red alder provides the raw material for a thriving industry, producing fine furniture, cabinetry, specialized veneers and plywoods, shipping pallets, and paper products. Present markets for these products are limited primarily by the supply of alder logs.

Western Oregon has more than nine billion board feet (Scribner rule) of red alder sawtimber, almost two-thirds of which is in non-federal ownership as trees of 12 to 16 inches diameter; slightly more than one-third is in trees 18 inches or larger (Gedney 1990). In the state of Washington, the alder resource is even greater (Beachy and McMahon 1987), but there is very little young alder in either state because of "weed-control" programs of the past several decades. The scarcity of young alder is now a cause of concern to an industry that continues to grow.

A hardwood policy report being prepared by T. Raettig, G. Ahrens, and K. Connoughton (pers. com.) provides a good overview of the current role of the alder industry in the regional and global economy. In 1991, the harvest of hardwoods in Oregon and Washington was 635 million board feet. In Oregon, 76 percent of the hardwood harvest was red alder; the percentage in Washington is not

known but probably is similar or higher. Eighty-eight percent of this harvest came from private lands. The 1991 hardwood harvest level has risen 28 percent since 1987; during the same period, the softwood harvest decreased 31 percent.

Domestic markets for alder are diverse. In 1990, for example, 60 percent of the alder lumber produced in Washington was used in the manufacture of cabinets and furniture, both being products whose finished value is much higher than the value of raw materials they contain (high value-added products). In 1988, hardwood chips were produced from 8.6 million board feet of roundwood and 196,000 tons of mill residue. The market for both interior ply and face veneer has grown rapidly as softwood sources have declined, but no figures are available on the size of this industry which competes with both the chip and sawlog markets.

From 1982 to 1992, alder exports to Asia and Europe have grown from almost nil to over 65 million board feet. In 1991, alder accounted for 10 percent by volume of all U.S. hardwood lumber exports to Europe and Asia. These exports accounted for 15 percent of the total hardwood lumber volume produced in the Pacific Northwest. Including chips, the 1990 value of hardwood exports for Oregon and Washington was \$91 million.

The hardwood industry in Oregon and Washington employed 5600 people in 1990 and paid wages of over \$150 million, an increase over previous years. Nationwide, alder provided production-line jobs to 23,500 people in secondary manufacturing industries. The Pacific Northwest alder industry is dynamic and important. It has become global and continues to grow, providing an element of stability in the general forest industry.

But what about the bottom line: Does alder have the economic value of softwoods? Recent research concludes that although volume recovery from alder logs is less than that from softwoods, alder lumber value increases dramatically as log diameter increases. Alder log values compare favorably with those for Douglas-fir on a net scale basis (Plank et al. 1990). There have been a number of formal and informal economic comparisons of growing alder and Douglas-fir (e.g., Tarrant et al. 1983). Some analyses show Douglas-fir to be a superior investment; others reach the opposite

conclusion. Almost all, however, find little difference between the two options, in spite of the different assumptions of value and growth that each makes.

The market performance of red alder is also impressive (Western Hardwood Association 1992). Since 1980, alder prices have increased steadily, in contrast to fluctuating softwood prices. Alder logs are priced in the range of \$300 to \$350 per million board feet delivered to the mill. Select-and-Better grade alder lumber (4/4 kiln-dried) commands a price of \$1000 per million board feet in a market that has expanded to Pacific Rim and European countries. As a bonus, the domestic economy benefits because the hardwood industry is labor intensive, requiring ten times more jobs per unit of raw material than the softwood industry.

For many additional reasons, interest in managing and utilizing red alder is at an all-time high. One very basic reason is that 40 years of research by scientists in universities, public agencies, and private industry has paid off. In a rare instance in the history of forestry, biological information is available, *in advance of management*, as the basis for growing a biologically and economically valuable tree species in short-rotation systems.

Another reason is the change in how the world's forests are to be managed. These biological systems have been greatly altered by intensive harvesting under yesterday's technology. Like the people of central Europe (Plochman 1989), the U.S. public, especially in the Pacific Northwest, seriously questions current forest management practice and calls for new, better approaches to sustaining ecosystems.

The high incidence of laminated root rot in the Douglas-fir region offers another reason for interest. Douglas-fir growth is reduced by the fungus, and trees are eventually killed. Conifer tree species show varied levels of resistance to the disease, but all hardwoods are immune. On appropriate sites, red alder is the species of choice in reforesting lands infected with laminated root rot.

The motivating interest of small private forest land owners is often the shorter time to grow and harvest a crop of alder than is generally found with conifers. Most forest landowners are over 50 years old. Thus, a short 30-year alder rotation is often

much more appealing than a 60- to 70-year Douglas-fir rotation.

Finally, red alder enjoys significant political and scientific support in the Pacific Coast states. In 1987, the Oregon State Legislature created the Hardwood Forest Products Resources Committee to assess the future of the industry and work toward its best interests. In 1991, the Oregon Legislature directed that this committee present to the 1993 Legislative Assembly an operational plan for converting the committee to commodity commission status. In 1989, the Washington State Legislature authorized development of the Washington Hardwoods Commission. In full function now, this commission is supported by a small levy on hardwood processors to help support and expand their industry. In California, interest also is developing in forming a hardwood commission. The California Timber Industry Revitalization Committee and the Hardwood Foundation have joined forces to support hardwoods as an important resource in modern forest management.

The Western Hardwood Association, since 1955 a champion of hardwood resources, plays a strong role in all these developments. Along with providing a forum for hardwood interests, the Association disseminates technical information through an array of publications and sponsors technical meetings to advance knowledge in the field.

Red alder research is being strengthened. At Oregon State University, the Hardwood Research Cooperative coordinates and conducts research programs according to user needs. The USDA Forest Service, Pacific Northwest Forest Research Station provides excellent information on alder supply, management, and utilization. In western Washington, Weyerhaeuser Corporation has installed extensive field studies of regeneration and growth of alder. All this activity helps ensure that alder and associated hardwood forest tree species can continue to contribute their economic and biological values to sound forest management systems.

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Range shifts. Pacific Northwest of North America. abstract. We investigated the effects of climate on the growth of red alder across a broad latitudinal gradient and over a wide range of growing conditions in the Pacific Northwest of North America (PNW). Data for this study came from a study established in 1988 that includes 31 research installations located between the Pacific Coast and the Cascade Mountains in Oregon, Washington, and British Columbia. The growth-climate model developed includes: summer heat moisture index (SHM), mean warmest month temperature (MWMT), spring precipitation. The red alder has a unique symbiosis with a nitrogen-fixing bacteria that allow the soils that alder inhabits to become "fertilized" with nitrogen. Nitrogen is essential to the growth and function of plants, and without the red alder many ecosystems of the Pacific Northwest would be nitrogen deficient. Alder is to forestry as legumes are to agriculture. This report explores this concept through multiple examinations of experiments involving the nitrogen-fixing abilities of red alder. INTRODUCTION When European settlers arrived to the moody Pacific Northwest, they began to clear the forested la