SPRING 2006 • VOLUME 22 • NO. 2

Northwest Woodlands

A Publication of the Oregon Small Woodlands, Washington Farm Forestry, Idaho Forest Owners & Montana Forest Owners Associations

THE FUTURE OF FAMILY FORESTS

The Future of Wood Products

Biomass: Fuel for Change

Marketing Cooperatives

Climate Change and Forests

Northwest Woodlands
4033 S.W. Canyon Rd.
Portland, OR 97221

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Is biomass utilization in your future? The cost of biomass harvesting can range widely, depending on equipment used and other factors. See article on page 12 for a discussion on biomass utilization. Photo courtesy of Tom Iraci, USDA Forest Service.

Inset photo: Friends check out the summer's log deck at Hyla Woods in the northern Oregon Coast Range. Photo courtesy of Peter Hayes.

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Northwest Woodlands is published quarterly by the World Forestry Center for the Oregon Small Woodlands Association, Washington Farm Forestry Association, Idaho Forest Owners Association and Montana Forest Owners Association.

The Future of Wood Products and How this May Affect Small Woodland Owners

By DAVID BRIGGS AND LARRY MASON

David Briggs

Larry Mason

Anyone driving by a new construction site or visiting a large building materials center is confronted with a broader range of wood products than was available even 10 years ago. Many of these newer products are commonly referred to as "composites" or "engineered wood products" or EWPs.

EWPs are created from an assemblage of wood elements (lumber, veneer, strands, wood flour), adhesives and other materials (cement, plastic) to produce a new product engineered for specific appearance or strength characteristics. For many applications, EWPs are manufactured using wood elements from small-diameter logs, mill residuals or recycled wood, and are designed to replace structural products such as sawn joists and beams and plywood that historically have been made from large-diameter and high-quality logs.

What are the silvicultural implications of market shifts in raw materials associated with these product changes? The end-use performance characteristics designed into EWPs have resulted in changes to manufacturer log and timber purchase preferences with respect to species, range of tree and log sizes, and wood quality. Forest managers must consider how changes in log specifications and related market values will affect present and future choices of harvest methods, rotation and other forest management decisions. Traditional methods of growing and marketing timber that worked well in the past to generate logs for products such as sawn lumber, plywood and pulp may be inappropriate for log markets of the future.

This article focuses on softwood timber products used in residential/nonresidential construction and associated repair/remodel markets. We start with a discussion of changes in the traditional sawn lumber, plywood and pulp sectors. This section is followed by a discussion of EWPs and how product transitions may affect log and timber specifications and prices, with subsequent influence on forest management practices and revenues. Finally, specialty niche markets that forest managers might consider to diversify their product strategies, create environmental benefits and improve financial returns will be discussed.

How are the traditional manufacturing industries changing?

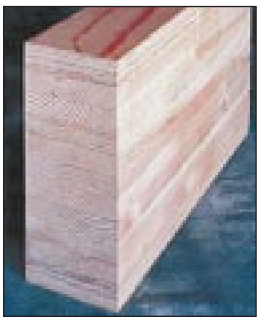
As a result of dramatic drops in public timber harvests since 1988, many sawmills, pulp mills and veneer mills in the Pacific Northwest were unable to secure sufficient log supplies or respond to rapidly shifting markets and subsequently closed operations. Paul Ehringer, long-time industry consultant, reports that 378 Pacific Northwest mills closed between 1989 and 2002. However, the consequences were more profound than closed businesses and lost jobs—a total restructuring of the forest products industry occurred.

Many surviving mills retooled for small-diameter logs and higher production. One 2005 study found that many of the closed sawmills in Washington were small (production capabilities less than 30 million board feet annually), while there was little drop in the number of larger capacity mills. Other surveys provide similar reports: larger mills survived and smaller mills closed. Some large mills actually increased levels of production, so total lumber production for the region actually increased as mills closed.

The implications of such infrastructure adjustments are likely to be lasting. Most of the remaining sawmill capacity has focused on purchase and conversion of second-growth logs available from private forests with a maximum large-

ENGINEERED WOOD PRODUCTS

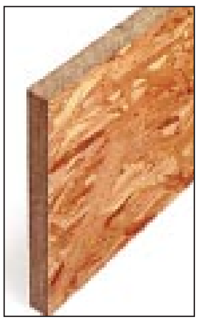
Glulam



Glued laminated timber, or glulam, is composed of wood laminations, or "lams," bonded together with strong, waterproof adhesives. Lams are typically lumber two inches or less in thickness and can be a variety of species.

PHOTO COURTESY OF APA-THE ENGINEERED WOOD ASSOCIATION

OSL, PSL



Oriented strand lumber (OSL) and parallel strand lumber (PSL) are manufactured from waterproof heat-cured adhesives and long, rectangularly shaped wood strands that are arranged in parallel to the length of the product. Strand products are made as large, continuous mats or billets that are sawn into various dimensions.

PHOTO COURTESY OF APA-THE ENGINEERED WOOD ASSOCIATION

end diameter of 20-24 inches and a minimum small-end diameter of six inches. Little production of the high-grade lumber that came from larger logs remains. Subsequently, price premiums for large logs have disappeared as did many markets for Northwest lumber products. Industrial timber managers responded by shortening harvest rotations to produce uniform second-growth logs most in demand.

While Pacific Northwest lumber production has increased, this has not been the case for other forest products manufacturing sectors. The plywood industry in the west lost 54 percent of capacity between 1990 and 2004. As large Douglas-fir peeler logs became scarce, southern pine plywood gained market share. Projections indicate that capacity decline will continue into the future at rates higher for the west than for the rest of the United States. During this period, production of oriented strand board (OSB) increased throughout North America, further eroding market share of western plywood. OSB, which now claims more than one-half of the structural panel market, can be manufactured from small-diameter, low-quality logs. Ironically, there are currently no OSB manufacturing facilities in the western United States.

PHOTO COURTESY OF STAND MANAGEMENT COOPERATIVE

Nondestructive testing of wood products, such as lumber and veneer, for stiffness and strength evaluation has been proven and commercialized for many years. More recent developments have extended acoustical resonant testing to evaluation of log stiffness and decay qualities. With tools for non-destructive testing for wood strength now becoming available for standing timber and logs, premium markets will develop for small-diameter logs with greatest strength characteristics.

Particleboard, which is made from mill residuals unsuitable for pulp (sawdust, planer shavings, dry trim and sander dust) and recycled wood, and medium-density fiberboard (MDF), made from pulp fiber, have taken market share from plywood for some applications such as underlayment. The raw materials used in these products are inexpensive, making roundwood an unlikely raw material for their manufacture. Furthermore, substitution of these products for those based on logs reduces log demand.

Large log scarcities created by federal harvest reductions in the 1990s helped spur market entry of EWPs as replacements for wide-dimension lumber and structural joists and beams. Structural EWPs include laminated lumber beams (glulams), oriented- and parallel-strand lumber (OSL, PSL), laminated veneer lumber (LVL), I-beams and joists. A subsequent reduction of market premium for larger dimension solid wood products has been the result. One manifestation of this value shift is likely a permanent reduction in price premium for larger logs. Structural EWP markets are projected for continued growth. Currently, there are 12 EWP producers in Oregon, three in Washington and three in Idaho.

Between 1989 and 2001, the number of Pacific Northwest pulp and paper mills dropped from 35 to 23. Between 1988 and 2003, the number of Washington pulp and paper mills dropped from 26 to 15 with an accompanying 45 percent loss in production and 71 percent loss in exports. Most remaining capacity is located in western Washington and just three operate in eastern Washington. Flat product prices, strong international competition and high production costs have resulted in cuts in capital spend-

ENGINEERED WOOD PRODUCTS

MDF

Medium-density fiberboard (MDF) is a grainless composite panel product made from extremely fine wood fibers and manufactured in sheets of various dimensions. This product is ideally suited for a variety of woodworking applications such as cabinets, molding and flooring.

PHOTOS COURTESY OF TEMPLE-INLAND

ing by the U.S. pulp and paper industry that have fallen below the point required to maintain facility competitiveness. Kraft pulping is the dominant pulping technology used in the United States and worldwide. However, Kraft pulping is extremely capital intensive; new mills cost in excess of $1 billion and must process between 1,000-2,000 tons of dry wood chips per day to be economically viable. No investments in new capacity for the Pacific Northwest are anticipated and future closures of existing facilities may be expected.

Implications of EWPs

Some EWPs, such as plywood, glulam beams and OSB, are well known. Others, such as LVL, OSL, PSL, and I-beams and joists are newer and the market is growing rapidly. Currently, wood-plastic composites are appearing in decking, and panel and siding applications, so expect more EWP developments in the future.

Advantages of EWPs

1. *EWPs allow independence of product size from the original tree or log size limitations and offer the opportunity to obtain higher product yield.* In fact, the smaller wood elements for some EWPs can be derived from mill residuals and recycled wood instead of logs—logs from large trees are not needed to produce the wood elements used in EWPs.

A solid-sawn 4x20 beam that was 24 feet long would require sawing a log at least 24 feet long with a small-end diameter of at least 20 inches. This log would necessarily come from a large, fairly old tree, and due to the round cross-section, would yield a number of smaller pieces along with the beam size of interest. Alternatively, one could easily saw an equivalent volume of small logs into 2x4s and create several 4x20x24 glulam beams. However, sawing logs into lumber results in a net product yield that is only 45-50 percent of log volume. The same log volume could be converted into strands with nearly 90 percent yield and make twice as many strand lumber beams.

2. *EWPs can reliably produce large quantities of product with the exact structural properties required by building designers, which allows architects and engineers to design structures more efficiently.* The wood elements can be individually stress rated for their mechanical properties by non-destructive methods. Stress rating is commonly required to assure proper strength characteristics of lumber or veneer used in EWPs. Glulam beams, plywood or LVL can be designed to meet an engineering or architectural specification by selecting and organizing the stress-rated elements. This approach also allows the EWP manufacturer to produce many items with the same properties and to quickly shift to a new specification.

For other EWPs such as OSL and PSL, the original wood structure is fragmented into strands and smaller sizes that can be thoroughly mixed, thereby homogenizing and largely eliminating strength variation caused by grain, ring width and knots. By using either the stress rating or fragmenting/mixing approaches, products can be created with specific properties with low variation from piece to piece.

3. *As the pulp and paper industry declines, EWPs may provide manufacturing capabilities needed to utilize chips and pulpwood, mill residuals and recycled wood.*

Disadvantages of EWPs

1. *Logs utilized for EWP production may bring low returns.* Current log grades and sorts are based on log dimensions and visual surface features, which provide little basis for predicting the physical and mechanical properties of lumber, veneer and other wood elements they could yield. With no basis for measuring wood properties in logs important to the manufacture of EWPs, there is no foundation for sorting logs according to properties and establishing price premiums.

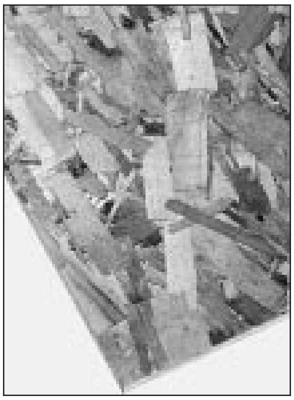
2. *Consumer acceptance of EWPs means premiums for larger logs and longer rotations have been permanently lost with subsequent reductions in forest diversity and landowner returns on investment.*

How will EWPs affect timber marketing and forest management?

Today, techniques used for non-destructive testing of wood elements have been extended into the area of new technologies for testing of logs and standing trees, making it possible to predict the properties of products

ENGINEERED WOOD PRODUCTS

OSB



Oriented-strand board is manufactured from waterproof heat-cured adhesives and rectangularly shaped wood strands that are arranged in cross-oriented layers, similar to plywood. This results in a structural engineered wood panel that shares many of the strength and performance characteristics of plywood. Produced in huge, continuous mats, OSB is a solid panel product of consistent quality with no laps, gaps or voids.

PHOTO COURTESY OF APA-THE ENGINEERED WOOD ASSOCIATION

I-Joist

I-Joists are comprised of top and bottom flanges of various widths united with webs of various depths. The flanges resist common bending stresses and the web provides outstanding shear resistance. Flanges may be solid-sawn lumber or structure composite lumber. Web may be plywood or oriented-strand board.

PHOTO COURTESY OF APA-THE ENGINEERED WOOD ASSOCIATION

that a log or tree will yield. These tree and log testing methods will likely change the approach by which logs and trees are graded, sorted and marketed.

As EWPs and new methods for evaluating properties of wood within trees and logs continue to emerge and increase market shares, the need for older trees to achieve the size and quality needed for traditional products will diminish. A trend toward shorter rotations and smaller trees can already be seen. Studies have found that without premium prices for higher-grade older logs, the optimal rotation to maximize net present value for good site western Washington Douglas-fir is 40 years. Under such market circumstances, if the rotation age is extended to 70 years, 50 percent of the maximum net present value is sacrificed. Improvements in genetics and early stand silviculture may lead to further reductions in rotation length with relatively little drop in diameter and stand yield.

As rotations shorten, concerns with the juvenile wood content of trees and logs become increasingly important. Juvenile wood forms as the crown produces the first-growth rings along the center of the tree stem. After five to 20 years, depending on species, a transition to mature wood occurs. For many properties (wood density, strength, stiffness, dimensional stability), juvenile wood is inferior to mature wood; hence, as the juvenile wood content of a product increases, product performance is adversely affected. As rotation age decreases, the time allowed for trees to add mature wood is decreased and, as a consequence, young stands have very high juvenile wood content.

Currently, tree improvement programs around the world are focusing on genetic improvement of wood properties of such short rotation, high-juvenile, wood-content trees. The goal is to grow better quality timber in as short a time as possible. Successful improvement of the quality of young trees will make short rotations more attractive in the future. With non-destructive testing, premium markets will develop for small-diameter logs with minimum juvenile wood and greatest strength characteristics.

However, there is growing concern that as logs become less valuable and mills more distant, tree farmers can less afford to practice forestry—especially as real estate conversions become increasingly lucrative. Many industry professionals, policy makers, environmentalists and others are discussing this question. Without a strong manufacturing infrastructure creating attractive financial returns for forestry investments, forestland conversions will likely increase at the urban interface and forest health declines in the uplands will continue.

What can a forest owner do?

Shorter rotations for working forests that minimize early investments such as precommercial thinning or pruning will generally be most effective for generating acceptable financial returns from westside, good-site conifer forests. However, there are specialty niche markets for softwood and hardwood lumber (appearance beams, millwork, furniture and cabinets) and veneer (overlays, signs, decorative sliced veneers) that some small tree farmers may be well suited to serve while augmenting their forest earning capability.

Red alder and western redcedar have long been recognized by tree farmers as good species to plant in areas that are wet, nutrient poor, infected by Swiss needle cast or root rot, or in other ways is unsuitable for Douglas-fir. However, stable and strong performance by both alder and cedar log prices when compared to Douglas-fir prices may lead some to consider planting alder and cedar on their best sites as well. Alder prices surpassed Douglas-fir for the first time in history in 2000 and continue to increase. Cedar logs are currently worth twice the value of Douglas-fir logs.

Interestingly, while Douglas-fir production is largely dedicated to commodity lumber products that compete unfavorably with other alternatives such as non-species-specific EWPs, both alder and cedar are niche species in relative short supply that are manufactured to produce solid wood products unique to the Northwest. Unlike Douglas-fir, larger alder and redcedar logs still retain price premiums. Of interest as well, alder can be grown on shorter rotations than Douglas-fir, providing comparatively quick return on investment.

–Continued on page 28–

ENGINEERED WOOD PRODUCTS

LVL

Laminated veneer lumber (LVL), also called structural composite lumber (SCL) is created by layering dried and graded wood veneers with waterproof adhesive into blocks of material known as billets that are cured in a heated press. The billet is then sawn to various dimensions. In LVL, the grain of each layer of veneer runs the same direction. LVL outperforms conventional lumber when either face- or edge-loaded and is virtually free from warping and splitting.

PHOTO COURTESY OF APA-THE ENGINEERED WOOD ASSOCIATION

Plywood

Plywood is manufactured from thin sheets of cross-laminated veneer and bonded under heat and pressure with strong adhesives.

PHOTO COURTESY OF APA-THE ENGINEERED WOOD ASSOCIATION

The Future of Wood Products

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However, it is important for forest managers targeting specialty markets to have a good understanding of species characteristics and market preferences. Are there special concerns in terms of species, tree/log size and quality? How distant and stable are the markets? For future tree farmers and stock investors alike, once such questions are answered, there will be value in diversification so when one product weakens, another might be strong.

Canfor Corp. envisions a future where individual trees will have detailed data on their dimensions and growth history, quality characteristics and exact physical location in a stand. Imagine a 100 percent standing inventory with a bar code on every tree. This opens the possibility of direct global marketing of individual trees (or logs) on the internet to high-value niche markets—a phenomenon that is already occurring with high-value hardwood logs. Others suggest that tree farmers will someday receive

compensation for the non-market public benefits that they provide, such as habitat, clean water, hunting opportunities or carbon sequestration, and that forest economics in the future will be less reliant upon log sales.

Conclusions

While it is uncertain what mix of revenue sources might evolve to keep family forest owners solvent, it is logical that current trends in softwood markets and manufacturing transitions should be a concern. The wood products industry in the Pacific Northwest has undergone rapid adjustments in response to policy and market changes. Many large log markets have declined, resulting in shorter rotations and lower value returns for timber harvesters. This trend is expected to continue with resulting increased pressure for conversion of forests to more profitable land uses. Tree farmers wishing to continue in the forestry business may consider shortening rotations and diversifying management portfolios to include specialty products and other innovative sources of revenue. ■

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CALENDAR

Oregon SAF Annual Meeting: *What's Driving Oregon's Forest Economy: Market Forces, Silviculture Practices and Land Management Decisions,* April 26-28, Southwestern Oregon Community College, Coos Bay, OR. Contact: Shaun Harkins at 541-267-1855 or shaun.harkins@plumcreek.com.

Plant Disease Management, May 6, Chemeketa Community College, Salem, OR. Contact: Agriculture Program Office at 503-399-5139 or 503-589-7946.

Forestry Vegetation Management, May 18, Chemeketa Community College, Salem, OR. Contact: Agriculture Program Office at 503-399-5139 or 503-589-7946.

Private Applicator's License Training, May 20, Chemeketa Community College, Salem, OR. Contact: Agriculture Program Office at 503-399-5139 or 503-589-7946.

Using GPS, June 2, Moscow, ID; June 10, Coeur d'Alene, ID. Contact: Randy Brooks at 208-476-4424 or www.cnr.uidaho.edu/extforest.

Managing for Biological Diversity in Northwest Forests, June 5-7, Red Lion on the River, Portland, OR. Contact: OSU Outreach Office at 541-737-2329 or http://outreach.cof.orst.edu/.

Habitat Field Day, June 9, Coeur d'Alene, ID. Contact: Chris Schnepf at 208-446-1680 or www.cnr.uidaho.edu/extforest.

Thinning and Pruning Field Day, June 9, Orofino, ID; June 17, Sandpoint, ID. Contact: Chris Schnepf at 208-446-1680 or www.cnr.uidaho.edu/extforest.

WFFA Annual Meeting—Forests and Fire, June 8-10, Spokane Community College, Colville Campus. Contact: Ralph Ligouri at 509-276-6079 or ligouri.lazyl@att.net.

Pruning White Pine Blister Rust, June 16, Coeur d'Alene, ID. Contact: Chris Schnepf at 208-446-1680 or www.cnr.uidaho.edu/extforest.

Forestry Leadership Youth Summer Camp, June 18-24, Wilsonville, OR. Contact: Rick Zenn at 503-488-2103 or rzenn@worldforestry.org.

Managing Forest Organic Debris, July 21, Priest River, ID. Contact: Chris Schnepf at 208-446-1680 or www.cnr.uidaho.edu/extforest.

Forest Insects and Disease Field Day, July 21, Moscow, ID; August 4, Sandpoint, ID. Contact: Chris Schnepf at 208-446-1680 or www.cnr.uidaho.edu/extforest.

Tree Day and Family Adventure Day, August 18-19, Udell's Happy Valley Tree Farm, Lebanon, OR. Contact: Fay Sallee at sksallee@proaxis.com or 541-451-5322.

Meeting the Challenge: Invasive Plants in Pacific Northwest Ecosytems, Sept. 19-20, Seattle, WA. Contact: http://depts.washington.edu/urbhort/.

Space to publicize events of interest to family forest owners is available FREE OF CHARGE through this calendar column. Take advantage of this column by sending calendar items for the summer 2006 issue to the editor at rasor@safnwo.org by May 15. The issue will reach our readers by July 25, 2006.