

Highlights

Since 2018, Forest Opportunity Roadmap (FOR/Maine), a cross-sector collaboration, has focused on strategically adapting Maine's forest economy to increase prosperity in the state and compete in global markets.

As part of the FOR/Maine effort, a global market assessment was conducted, which identified veneer-based forest products as one of the top six market opportunities for the state. In response to this opportunity, the University of Maine developed a project to evaluate the feasibility of veneer peeling eastern spruce (*Picea rubens*) and balsam fir (*Abies balsamea*) harvested from Maine forests.

Within this project, veneer grade specimen logs were collected through commercial sawmills in three regions of state, rotary peeled through a commercial softwood veneer mill in North Carolina, and evaluated at UMaine for growth rate comparisons, veneer yields, visual grading and structural performance using stress wave timing.

It was determined that the evaluated spruce meets the performance requirements for common LVL grades, and both the spruce and fir evaluated provided high proportions of C-grade veneers commonly used for structural plywood.

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Maine Softwood Veneer Resource Evaluation

UMaine exploring the use of Maine-grown spruce and fir in structural plywood and laminated veneer lumber (LVL).

QUALIFICATION OF EASTERN SPRUCE AND BALSAM FIR

This research focused on the utilization of Maine eastern spruce and balsam fir for veneer production. Maine currently has no structural veneer manufacturers or engineered wood products using structural veneer. The diversification of markets for Maine's softwood resource has been identified as a route to increase the resilience of the forest-based economy. While the use of spruce for veneer was investigated in the later 1960's, veneer production technology has improved in recent decades, justifying the reinvestigation on the viability of the Maine spruce-fir resource as a veneer source. Additionally, veneer-based products; plywood and laminated veneer lumber (LVL) have been identified as attractive products (Figure 1) that Maine could produce to diversify its forest products economy¹. The primary objective of this research was to provide information on the volume and yield

of the veneer peeling process for the Maine spruce-fir resource. Additionally, the quality of the resource was assessed for use in the following products: structural softwood plywood, laminated veneer lumber (LVL), and inner plies of hardwood-faced plywood.

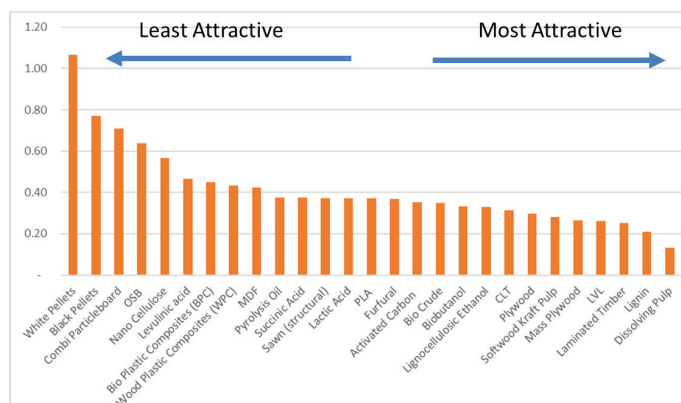


Figure 1. Attractiveness ranking for different wood products in Maine.

SAMPLING & MANUFACTURE

A representative sample of eastern spruce and balsam fir sawlogs were provided by three industrial partners: Timber Resource Group (Stratton), Pleasant River Lumber (Dover-Foxcroft), and J.D. Irving (Nashville Plantation). A sample size of 37 Eastern spruce and 38 balsam fir logs ranging in diameter (top end) from 6 to 14 inches were sampled from the mills, representing three separate regions of Maine's forest resource. Cross-section samples were obtained from the logs for ring growth characterization. Logs were peeled for veneer at a commercial facility in Old Fort, North Carolina by an industrial partner on this project, Columbia Forest Products (CFP). CFP has a facility in Presque Isle, Maine where hardwood is peeled for thin decorative face veneers exclusively. This mill was used to conduct an initial peeling feasibility assessment prior to transporting logs to the North Carolina facility.

¹: Indufor North America LLC, 2018. *FOR/Maine Global Market Analysis and Benchmarking Study. Phase 1: Global Market Analysis*. Report A18 11451. Washington, DC.

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Log sampling and procurement

- Timber Resource Group (Stratton, Maine)
- Pleasant River Lumber (Dover-Foxcroft Maine)
- J.D. Irving (Nashville Plantation, Maine)

Veneer Peeling and logistics

- Treeline, Inc. (Chester, Maine)
- Columbia Forest Products (Presque Isle, Maine; Old Fort, North Carolina)

ABOUT UMAINE

The University of Maine, founded in Orono in 1865, is the state's premier public university. It is among the most comprehensive higher education institutions in the Northeast and attracts students from across the U.S. and 65 countries. UMaine students directly participate in groundbreaking research working with world-class scholars. The University of Maine offers doctoral degrees in 35 fields, representing the humanities, sciences, engineering and education; master's degrees in nearly 70 disciplines; 90 undergraduate majors and academic programs; and one of the oldest and most prestigious honors programs in the U.S.

For more information about UMaine, visit umaine.edu

ABOUT THE SCHOOL OF FOREST RESOURCES

The Mission of the School of Forest Resources is to provide excellence in education, research, and public service that promotes the understanding, efficient use, and sustainable management of forest resources for the well-being of the people of Maine, the United States, and the World.

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RING GROWTH COMPARISON

Measurements on average rings per inch (RPI) were performed on log cross section samples allowing for growth rate comparisons. It was found that eastern spruce is slower growing than balsam fir, the average RPI counts for cross section samples were 14.8 and 8.8 respectively. A lower RPI count is associated with a faster growth rate (less annual rings per inch). The logs sampled for this project produced a total of 283 full sheets of eastern spruce veneer and 291 sheets of balsam fir veneer at a 1/7th inch thickness. Veneer sheets produced from each log sampled were tracked and labeled, allowing veneer yield and quality measurements to be tracked by log.

VENEER YIELD

The average veneer yield was calculated for the range of log diameters selected. The volume of dry (~ 6% moisture content) veneer per log was compared to total log starting volumes (green) to estimate yield. Resultant average yield values for species were 60% for eastern spruce and 63% for balsam fir. Yield losses included over 15% random width veneer that was full sheet width or length. This veneer accounted for over 15% of the total volume of the logs and can partially be recovered with composing operations within a veneer mill.

VISUAL GRADING

Veneers were visually graded in accordance with *U.S. Voluntary Product Standard PS 1-19, Structural Plywood*, which showed the resource is dominated by C-grade veneers for both spruce (at 84%), and fir (at 86%). This demonstrates that based on the sampling at UMaine, a majority of the spruce-fir resource in Maine is acceptable as feed-stock for a plywood operation where C grade veneer is the minimum requirement for core veneers.

MODULUS MEASUREMENT

Veneers were measured using stress wave timing methodology (Figure 2) to determine the modulus of elasticity (MOE). Average MOE values were calculated by species. Eastern spruce was found to have an average MOE of 1.66×10^6 psi and balsam fir an average of 1.39×10^6 psi. High MOE veneer could be found in the sample sizes of veneer, particularly for eastern Spruce which inherently has a higher density than balsam fir and therefore mechanical properties such as MOE. Common veneer grades for LVL are 1.5, 1.8, and 2.0×10^6 psi. High MOE values for the spruce veneer in the range of common LVL grades gives it potential as a feed stock for an LVL mill.



Figure 2. Stress wave timer setup on a sheet of veneer.

DEMONSTRATION MATERIALS

Both the eastern spruce and balsam fir veneers analyzed in this study were used to manufacture LVL billets (Figure 3) and plywood panels (Figure 4) at the Composites Center. The manufacturing process was used as a student training experience, and the manufactured materials will be used as demonstration materials for future business attraction activities with investors.



Figure 3. LVL billet from Maine veneer.



Figure 4. Plywood from Maine veneer.

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