

## **Enhancing Innovation in Oregon's Forest Cluster A Pre-Proposal to the Oregon Innovation Council – Oregon Established Industry**

### **Introduction**

Oregon has a strong reputation as a global leader in forestry and wood products. Despite significant challenges and changes in the industry over the last two decades, Oregon remains the nation's leader in softwood lumber and panel production. With over 86,000 employees, the forest sector is second only to high-tech as the state's largest employer. Further, forestry and high-tech are not disconnected sectors – adoption of high-tech innovations such as computer-based optimization and scanning systems have enabled dramatic increases in forest sector productivity. However, Oregon firms face increasing competition from other domestic regions such as the southeastern United States as well as from international producers. The competitiveness of the forestry sector in many regions that compete with Oregon is bolstered by collaborative research organizations such as the Wood Supply Research Institute in the southeastern U.S. or quasi-governmental research groups such as SCION in New Zealand, CRC Wood Innovations in Australia, FP Innovations in Canada, and Fundación Chile, in Chile. The future competitiveness of Oregon's forest cluster will require continued investments that enhance productivity as well as an increased emphasis on product and business systems innovations.

In late 2007, Oregon's Forest Cluster Economic Strategy Core Team was formed via a Joint Resolution among the Oregon Economic and Community Development Department, Oregon Board of Forestry, Oregon Forest Resources Institute Board, and the Forest Research Laboratory of Oregon State University's College of Forestry. The Core Team's goal is to develop a strategy "to create and maintain a favorable investment climate for environmentally sensitive, socially responsible, and globally competitive forest-based businesses throughout Oregon..." Participation in Core Team meetings (four thus far) has also included representatives from The Governor's Office, Oregon Forest Industries Council, Sustainable Northwest, and Region 6 of the U.S. Forest Service. The following proposal is the result of joint work among these organizations.

We are requesting \$3,800,000 over the two-year funding period to undertake three integrated projects linking key facets of Oregon's forest cluster: 1) the creation of a Center for Forest Transportation housed in the Department of Forest Engineering at Oregon State University; 2) strengthening of the commercialization support capabilities of the Oregon Wood Innovation Center; and 3) enhancing supply chain technology to extract the highest value from each stand, tree, and log, and developing comprehensive silvicultural technologies through the Center for Intensive Planted-forest Silviculture. Each project is described below.

### **Creation of a Center for Forest Transportation (CFT)**

Dr. John Sessions, Professor of Forest Engineering, Dr. Kevin Boston, Assistant Professor of Forest Engineering,  
and Dr. Marvin Pyles, Associate Professor of Forest Engineering, Oregon State University

### **Value Proposition**

The goal for this project is to establish a world leading center for forest transportation research and development in Oregon to support the competitiveness of the region's forest products industry. We believe that active forest sector collaboration with Department of Forest Engineering faculty at Oregon State University will yield innovative approaches and techniques to reduce costs associated with this key element of the forest products supply chain and improve the competitiveness of Oregon's forest sector.

The Oregon forest-to-mill transportation sector spends approximately \$160 million dollars per year and with rising fuel prices this cost will continue to increase. We believe that a collaborative transportation-focused research organization can prioritize and focus on a wide range of projects that can collectively save the industry between \$15 million and \$25 million annually through cost reductions and productivity improvements. Additional benefits to Oregonians may include improved air quality from reduced diesel emissions and improved forest health through more acres of cost-effective biomass utilization. We anticipate that these cost savings will be derived from changes to the woody material transport vehicles,

road maintenance practices, road construction practices, and changes to fleet management. Examples of projects that can be completed with an initial two-year investment of \$2 million include:

#### Changes to woody material transport vehicle configuration

1. Transporting longer logs to reduce transportation costs while improving value recovery, for example 48-56 ft versus 40 ft lengths. Researchable issues: axle configurations to minimize loads, increases in log value recovery, mill yard issues, regulatory environment, off tracking issues that may result in reconstruction of forest roads. Potential benefits estimated at \$3.0 million per year.
2. Increasing the efficiency of woody biomass transport. Researchable issues: chip packing technologies, improved trailer designs – steerable trailer axles. Potential benefits estimated at \$1.0 million per year.
3. Reducing fuel consumption in forest product transport. Researchable issues: trailer configurations, skirts, and deflectors specific to forest products transport. Potential benefits estimated at \$1 million per year.
4. Optimal load and trailer configurations for log and lumber transport using new generation truck engines. Researchable issues: energy and time savings with higher horsepower and higher capacity engine brakes. Potential benefits estimated at \$2.0 million per year.
5. Reducing road maintenance costs. Researchable issues: use of wide single tires (23 inch); effects on aggregate and paved roads, impact loadings, ruts, fuel consumption and tire life. Will potentially reduce sediment production from forest roads as well as maintenance costs, and increase safety through reduced dust. Potential benefits estimated at \$2.0 million per year.
6. Evaluating an exemption for catalytic converters in the forest industry. Researchable issues: fuel efficiency, truck costs, CO<sub>2</sub> emissions per ton hauled, particulate reduction. Potential benefits estimated at \$2.0 million per year.

#### Forest Road Construction Practices

7. Reducing road construction costs through strengthening of the subgrade. Researchable issues: compaction requirements, costs, road template, ditch depth. Lessen aggregate road demands and reduce maintenance costs as well as lower sediment production from roads. Potential benefits estimated at \$1.5 million per year in reduced rock and maintenance costs.
8. Reducing aggregate needs through recycling of rock from decommissioned or temporary roads. Researchable issues: rock quality, rock recovery methods, costs and environmental performance. Potential benefits estimated at \$0.5 million per year through reduced rock costs.

#### Forest Road Maintenance Practices

9. Developing decision support tools and implementing training for road maintenance managers to reduce road user and road maintenance costs. Researchable issues: technologies for monitoring road condition, optimal maintenance frequency, optimal allocation and use of maintenance equipment. Potential benefits estimated to be \$0.5 million per year through reduction in unnecessary maintenance.

#### Transportation and Fleet Management

10. Reducing moisture in logs and biomass before transport – 50% of the transport weight now is water. Researchable issues: water rate loss due to transpiration, effects on log quality, reductions in downstream energy requirements – kiln drying, transport of green lumber. Potential benefits estimated at \$5.0 million per year through increased hauling of wood and not water.
11. Truck scheduling within the industry to increase loaded miles. Researchable issues: truck location technology, convertible trailers, trip scheduling. Potential benefits estimated at \$5.0 million per year through improved utilization

#### **Request from the State**

We are seeking \$800,000 dollars per year, \$1.6 million in total for the 2009-2011 biennium, to establish this center and complete initial research projects, as prioritized by the Advisory Board of the Transportation Research Cooperative. These funds will be used to provide start-up funding for 2 research assistants to support the Cooperative, and to renovate and equip existing laboratory and field study infrastructure. Remaining funds will be used to recruit graduate students and provide research operating funds for project implementation and pilot studies. The Forest Engineering Department is investing

federal funding through its Center for Wood Utilization (2008-2009) to refine stakeholder interests and prioritize research and outreach information needs. The results will lay the groundwork for a rapid implementation of activities when funding is approved.

### **Strengthening the Commercialization Support Capabilities of the Oregon Wood Innovation Center**

Scott Leavengood, Director - Oregon Wood Innovation Center, Chris Knowles, Faculty Research Assistant - Oregon Wood Innovation Center, and Eric Hansen, Professor of Forest Products Marketing, Oregon State University

#### **Value Proposition**

The 2005 OFRI Forest Cluster Report, which included wide representation of Oregon's forest sector, highly recommended further investment in the Oregon Wood Innovation Center (OWIC) as a means for better supporting innovation in the forest cluster. Accordingly, we are proposing a multi-pronged strategy to enhance the assets and infrastructure of OWIC. The proposed investments will directly support new product and market development as well as enhance OWIC's ability to perform market research, thus enhancing the domestic and international competitiveness of forest sector companies in Oregon.

The Oregon Wood Innovation Center's mission is to improve the competitiveness of Oregon's wood products industry by fostering innovation in products, processes, and business systems. The Center has been actively involved in discussions with entrepreneurs and testing new product prototypes since it was created in early 2006. Despite the importance of product testing, this is only one of many steps in the overall commercialization process. We propose the creation of a new product commercialization and market research laboratory to be housed on the Oregon State University campus. The laboratory would serve all members of Oregon's forest cluster by providing a wide range of services including:

- Market assessment for new products or existing products into new markets
- Assessment for international market entry
- Feasibility studies
- User (consumer/customer) research for new product development and commercialization
- Prototype testing and optimization
- Connections to important industries in Oregon such as high-tech and green building
- Development of more efficient distribution systems
- Design for the environment

#### **Request from the State**

We are seeking \$900,000 dollars in the first year and \$300,000 in the second year, or \$1.2 million in total for the 2009-2011 biennium, to 1) renovate and equip an existing laboratory to be the permanent home for the new product commercialization and market research laboratory [year 1], 2) provide start-up funding for a research assistant with an MBA to manage the new product commercialization and market research laboratory [years 1 and 2], and 3) provide start-up funding for the new product commercialization and market research laboratory [years 1 and 2]. The laboratory would be designed with flexible spaces to allow for customer/consumer product testing, focus group sessions, and other end-user market research applications.

### **Developing comprehensive silvicultural technologies through the Center for Intensive Planted-forest Silviculture (CIPS)**

Dr. Doug Maguire, Associate Professor of Silviculture and Biometrics and Director of the Center for Intensive Planted-forest Silviculture; Dr. Robin Rose, Professor of Forest Regeneration; Dr. Glenn Howe, Associate Professor of Forest Genetics, Dr. Glen Murphy, Professor of Forest Engineering

#### **Value Proposition**

The mission of the Center for Intensive Planted-forest Silviculture is to develop and maintain a comprehensive, science-based decision-support system for intensive silviculture of planted forests in the Pacific Northwest. The general approach calls for coordinating, facilitating, conducting and synthesizing collaborative research between existing cooperatives, institutions, and researchers in a manner that addresses long-term and interactive effects of all possible treatments constituting a silvicultural regime.

Major emphasis is placed on identifying priorities for research from the perspective of current knowledge gaps, new technologies, and prediction sensitivities in the decision-support system representing the current state of our knowledge. The overall goal of the Center is to enhance the global competitiveness of Pacific Northwest forests and producers of forest products. The Center currently has 13 industrial members and 3 governmental agency members.

Limits to productivity are not well established for plantations in the Pacific Northwest. Other regions of the country and other parts of the world enjoy the competitive advantage of more precise technology for boosting productivity of plantations, in some cases doubling or tripling timber productivity. The proposed work will yield information essential to optimizing the biological and economic performance of Douglas-fir plantations, and plantations of other species such as western hemlock, western redcedar, and red alder. A very important facet of the economic performance of plantations is to ensure that logs with appropriate attributes are routed to manufacturing facilities that can derive maximum product value given these log attributes. Current technologies are under development to characterize and sort logs during harvest, loading, transport, and mill entry.

### **Request from the State**

We are seeking \$500,000 dollars per year, \$1.0 million in total for the 2009-2011 biennium, to support three types of projects: research, tools, and technology transfer. Industrial and agency cooperators will be making funding decisions for the first round of proposals by August 2008. Due to limited funding, many important projects will not be funded, and others will be more limited in scope that would be optimal. OIC-OEI funds would allow significantly greater progress to be made over the next three years. This period of time is shaping up to be a very critical period for improving the competitiveness of Oregon's forest industry.

### **Collaboration**

This proposal is an element of the comprehensive integrated forest sector initiative developed by the forest cluster economic development strategy committee comprised of representatives from Oregon State University, OECDD, ODF, and OFRI. The Oregon Forest Industries Council has expressed their support of the projects contained in this proposal. The underlying issues and potential benefits from the program of work, including both research and outreach, have been discussed with various stakeholders. It is supported in principle by the forest industry, logging and trucking associations. To implement this program of work, two existing Centers within the College of Forestry (CoF) and a new research cooperative will be chartered. The CoF has a long history of successful research and outreach collaborations via Centers and research cooperatives.

**CFT:** Projects will be guided by an Advisory Board consisting of the forest industry and state and federal agency representatives. The long-term goal is to have the members of the road cooperative prioritize, select, and fund projects to provide for continual improvement. In-kind contributions from partners will provide important leverage to State investments and include contributions of labor, equipment, and materials to conduct replicated experiments of innovative practices. Most experiments will be conducted on roads of participating industry and agency members.

**OWIC:** Established in 2005, baseline funding has been provided by Forestry Extension and the Forest Research Lab at OSU. The mission of OWIC is to improve the competitiveness of Oregon's wood products industry by fostering innovation in products, processes, and business systems. This portion of the proposal is a direct result of discussions among Oregon's Forest Cluster Economic Strategy Core Team.

**CIPS:** Baseline funding has been provided by the major companies and agencies who manage their Oregon forestland for timber production. Furthermore, the Center is designed to build on research conducted by the six other industry supported College of Forestry cooperatives. The Center was established in 2007 to synthesize the large amount of information generated by these cooperatives and projects, the problem being that tradeoffs and interactions among silvicultural practices implemented at different parts of the rotation are largely unknown. Optimal investments in silvicultural treatments are impossible to identify without synthesizing this information into state-of-the-art growth models and other decision-making tools.

*Productivity enhancement:* **CFT:** We estimate full implementation would result in the following productivity enhancements and cost savings by thematic area:

- Changes to woody material transport vehicle configuration -- \$11 million
- Forest Road Construction Practices -- \$2 million
- Forest Maintenance Practices -- \$500,000
- Transportation and Fleet Management -- \$10 million

**OWIC:** Strengthening OWIC's capabilities to conduct market research, new product and market development will enhance the productivity of Oregon's forest cluster measured by increased production of value added products (products with higher value output per dollar of input).

**CIPS:** Strengthening CIPS will allow growing timber in Oregon to remain competitive with returns from other land uses. Easing biophysical limits on productivity can significantly boost values and returns to forest landowners and ensure a reliable supply of timber for the forest products industry. Optimal sorting by manufacturing potential is critical to maximizing economic return.

*Leverage Return on Investment & Financial Self-Sufficiency:* The proposed projects will actively leverage the expertise of the faculty in OSU's College of Forestry who are actively engaged in cutting-edge research key to Oregon's forest sector.

**CFT:** Funds will be leveraged with in-kind support from the forest sector cooperators to supply standard and alternative vehicle configurations. Funds will permit implementation and initial investigation of alternative construction and maintenance practices, and other innovative methods to reduce transportation costs. Faculty salaries are typically provided by the FRL/CoF at Oregon State University. To leverage the State's investment and gain increasing financial self-sufficiency, the Cooperative will seek competitive funds from a variety of state and federal sources.

**OWIC:** This project will allow OWIC to do a better job of assisting companies with commercialization and market research as well as connecting the intellectual property created in the College of Forestry to appropriate partners in Oregon's forest industry. This project would also leverage several other recent proposals submitted by OWIC for a total of approximately \$1 million, including several proposals to Oregon's new Bio-Economy and Sustainable Technologies (BEST) Signature Research Center. Beyond the 2-year time horizon of the funding, user fees will ensure the lab is financially self-sufficient.

**CIPS:** Funds from the OIC-OEI will augment funds currently contributed by timber producers to cooperative research. Annual funding to these projects totals well over \$1 million, but the industry has struggled to fund work that collects new and old information together for a more comprehensive view of alternative silvicultural strategies.

*Building Business Base While Retaining or Increasing Jobs:* **CFT:** The goal will be to improve the profitability of forestry by lowering the costs of delivering woody materials to appropriate manufacturing facilities. The result will be to make Oregon's forest products more competitive in the global marketplace and will encourage landowners to keep their land in forest production and to expand the timber base.

**OWIC:** Increasing competitiveness of firms in Oregon's forest sector will serve to retain jobs, especially in rural communities. The new laboratory will increase the success of product commercialization by Oregon's forest sector firms and help create new jobs.

**CIPS:** Intensification of silviculture has frequently been proposed as one way to offset the loss of manufacturing jobs lost with the decline of federal harvests. New and better technology will demonstrate that a larger suite of silvicultural treatments are feasible and economically very attractive.

*Measurable Industry Impact in 2-3 Years with Ability to Sustain Growth:* **CFT:** This program of work has the potential to reduce forest transportation costs by \$10.0 million dollars within the first 3 years as initial research and outreach projects are completed and implemented.

**OWIC:** Measurable industry impacts include the number of new products launched, sales value of new products, and number of jobs retained and created.

**CIPS:** Baseline research projects have already been identified as those having the greatest potential for boosting plantation productivity and economic performance. These projects are all 3 years in duration.

*Leverage Oregon's Competitive advantage:* At the 2006 Oregon Leadership Summit, Michael Porter from the Harvard Business School stated that Oregon's competitive advantage in the global economy lies in the state's potential to combine unique assets in natural resources with high-tech, higher education, and environmental sustainability. Accordingly the proposed projects are designed to develop the synergy described by Dr. Porter across key sectors of Oregon's economy.

**CFT:** Work will be performed primarily by the Forest Research Laboratory (FRL) at Oregon State University, in collaboration with innovative and progressive forest sector partners. The FRL has outstanding capacity in this area with globally-recognized leadership in forest engineering research and extension. There is a 30 year track record of successful application of the research cooperative model by the FRL to complete projects and disseminate results that add value to the forest sector and Oregon's economy.

**OWIC:** We are currently working closely with an effort to create networking and synergies between the forest sector and the green building sector. Investments in OWIC will further strengthen this effort. Oregon is the largest producer of structural wood products in the U.S. and is widely recognized as being a leader in green building. Creating strong connections between these two industries will create synergies which will allow both industries to remain leaders in the U.S. Oregon's forest sector is in a unique position to become the global leader in the production of green building products. The new product commercialization and market research laboratory will be a valuable asset, helping forest industry companies with ideas for new products connect with lead users in the green building industry.

**CIPS:** OSU's College of Forestry is internationally known for its depth and breadth in intensive plantation silviculture. The expertise is currently in place to make a very significant impact.

*Multipliers in other economic sectors:* The forest sector supports approximately 86,000 direct jobs and 190,000 indirect jobs with an estimated multiplier of 2.2. Forestry impact in the rural communities is even larger. Forestry pays an above average wage and represents 25% of the employment base in 60% of Oregon counties and 50% of the employment base in 42% of the counties. Many of these counties have limited options to expand their economic base. The new product commercialization and market research laboratory would allow Oregon's forest industry to establish stronger connections to other key industries in the state including the green building sector as described above. Other sectors that will receive indirect economic impacts include the high-tech sector, particularly equipment manufacturers that produce scanning/optimization, processing machinery, and material handling systems for the forest industry. New forms of renewable energy from wood biomass may also be important products evaluated via this project. Lastly, the agriculture sector could be positively impacted in many ways. One example is successful commercialization of products from western juniper which would improve the economics of juniper thinning programs and improve the productivity of eastern Oregon rangelands.

*Broadly Engages Established Industry:* **CFT:** We believe that the cooperative will benefit the established forest industry through engagement with creative problem-solvers from the academic research and outreach community. The benefit will be innovative solutions to forest sector challenges associated with this important energy-related issue. This cooperative will engage state, federal and private forest owners.

**OWIC:** Improving capabilities would facilitate the provision of services relevant to all sectors of Oregon's forest cluster. Companies across the value chain including those that do not operate in Oregon such as wood-plastic and other bio-based composites would be engaged as well.

**CIPS:** Virtually every timber-growing company in western Oregon is a member of one or more CoF cooperatives which are highly valued for their past and potential research and development, as well as their excellent technology transfer. Likewise, timber growing agencies, including the Oregon Department of Forestry and the USDI-Bureau of Land Management, are fully engaged in CoF cooperatives.

## **Summary**

As the state's second most important economic sector in terms of employment, it is critical to provide continued support for Oregon's forest industry. As the sector continues to adapt to globalization and competitive threats from domestic and international companies, there is a need for a continued focus on cost competitiveness and an increased focus on product and business systems innovation. We strategically designed this project to provide support for Oregon's forest cluster in each of these key areas.