

**Case Study: Market Opportunities for Commercially Thinned Small Diameter Douglas-Fir  
Trees**

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## **ABSTRACT**

Small Diameter logs are becoming a regular occurrence in the forests of Interior British Columbia. This disturbance is caused by a decrease of forest fires and an increase of trees competing for water and soil. Historical records show that forest fires, used to create more space for young trees to grow by burning vast amounts of forest undergrowth, thereby produce nutrients for the soil in the form of fertilizers and minerals. Moreover, rainstorms required to diminish forest fires, contributed to the soil absorbing moisture for trees. However, due to global warming, changes in land use and settlement patterns, vast hectares of forest land are being exposed to dry weather. This meteorological behaviour is spreading across the Pacific Northwest from Canada to the USA. Regarding the ecological environment, Mule Deer winter ranges, which cover approximately 275,000 hectares in the Cariboo Forest Region are being affected by the small diameter Douglas Fir logs. In the past, large diameter Douglas Fir trees provided cover and forage for mule deers. Therefore this case study will focus on marketing small diameter Douglas Fir logs in established market niches that require a value-added product

**CASE STUDY: MARKET OPPORTUNITIES FOR COMMERICALLY  
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## 1.0 INTRODUCTION

Over the past decades, significant parts of the forestland in the province of British Columbia and the Pacific Northwest of the United States, were facing a precarious condition. Many of the forested ecosystems were overstocked with large hectares of small diameter trees that were subject to frequent attack by beetles and fungi infestation. Moreover, as a result of the heavy fuel load caused by the overstocked small diameter lumber, total destruction by fire was an increased risk. A solution was proposed to suppress the heavy fuel load, by thinning the trees, before a prescribed fire would clear the surrounding vegetation that competes with the trees for sunlight, water and minerals. However, the cost of mechanical thinning of small diameter trees was increasing over time. A tentative solution has been placed in which the small diameter trees are being sold as biomass or fuel to produce energy. This solution is short-sighted in cost effectiveness and profit maximization, since revenue from the biomass is less than the costs of chipping the tree to smaller particles.

Another recommendation was proposed to promote value-added structural uses for the small diameter round timber, and generate revenue to cover future thinning costs and promote rural economic development. This paper is an overview of the market research options for round structural applications and contains recommendations needed for firms wishing to sell small diameter logs as a value-added product.

## 2.0 METHODOLOGY

An extensive set of published and non-published data was used to obtain baseline information related to market research of small diameter Douglas Fir logs at the UBC/Alex Fraser Research Forest: “Markets and Processing Options for Small Diameter Trees” commissioned by The Central Oregon Inter-government Council, “Round Small Diameter Timber for Construction Market in Finland” commissioned by Technical Research Center of Finland, “Research Challenges for Structural use of Small-Diameter Round Timbers” published by the Forest Products Journal and Statistics Canada website of Furniture sales from 1992-1996.

Information on new technologies for small log processing and innovative small scale manufacturing technologies was obtained from firms that worked with the Central Oregon Inter-government Council.

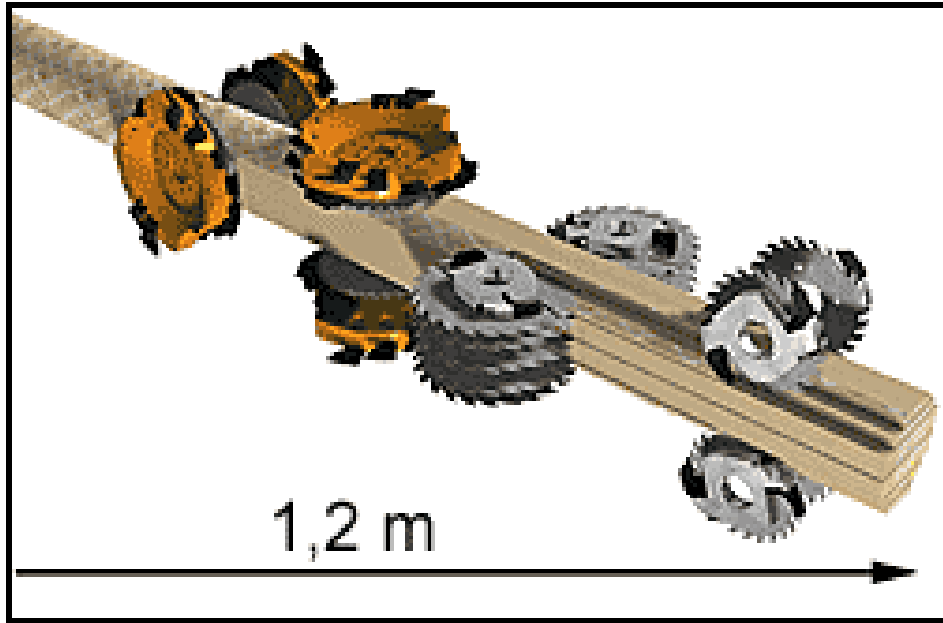
Information and statistics on growth markets for wood products and new product types was obtained from Statistics Canada, and some forest industry news sources.

### **3.0 SUMMARY OF NEW TECHNOLOGICAL PROCESSES OF SMALL DIAMETER LOGS**

The Central Oregon Inter-government Council identified new processing technologies, that can reduce the cost of processing small timber and increase the value of products manufactured from solid wood and residual derived from small log processing. The five processes were discussed in detail in the section below:

#### **3.1 High-speed, single-pass, small log processing:**

The High-speed, single-pass, small log processing is designed to efficiently process small logs with a small end diameter of 4” to 11” and lengths ranging between 4’ to 20’. The log breakout occurs in one single-pass, compared to traditional sawmills that require multiple steps to produce the lumber. This process is specifically designed for small logs and has enjoyed success in some sawmills in the state of Washington, which have reported significant increases in lumber recovery factor between 5%-30%. Furthermore, production speeds can range from 300 to 500 feet/min. The only drawback to this process is its inability to process large end diameter logs greater than 10” and the requirement of a continuous supply of logs to be cost effective. The complete machine purchase price ranges between \$750,000 US to \$1 millions US, excluding installation costs. HewSaw Machines Inc-BC Division located in Abbotsford sells the HewSaw R200 that meets the requirements stated above. Figure 1 shows the Hewsaw R200 process



**Figure 1:** Hewsaw R200  
*Source:* <http://www.hewsaw.com/r200.htm>

### 3.2 Wood glulam beams made with fiber-reinforced polymer (FiRP)

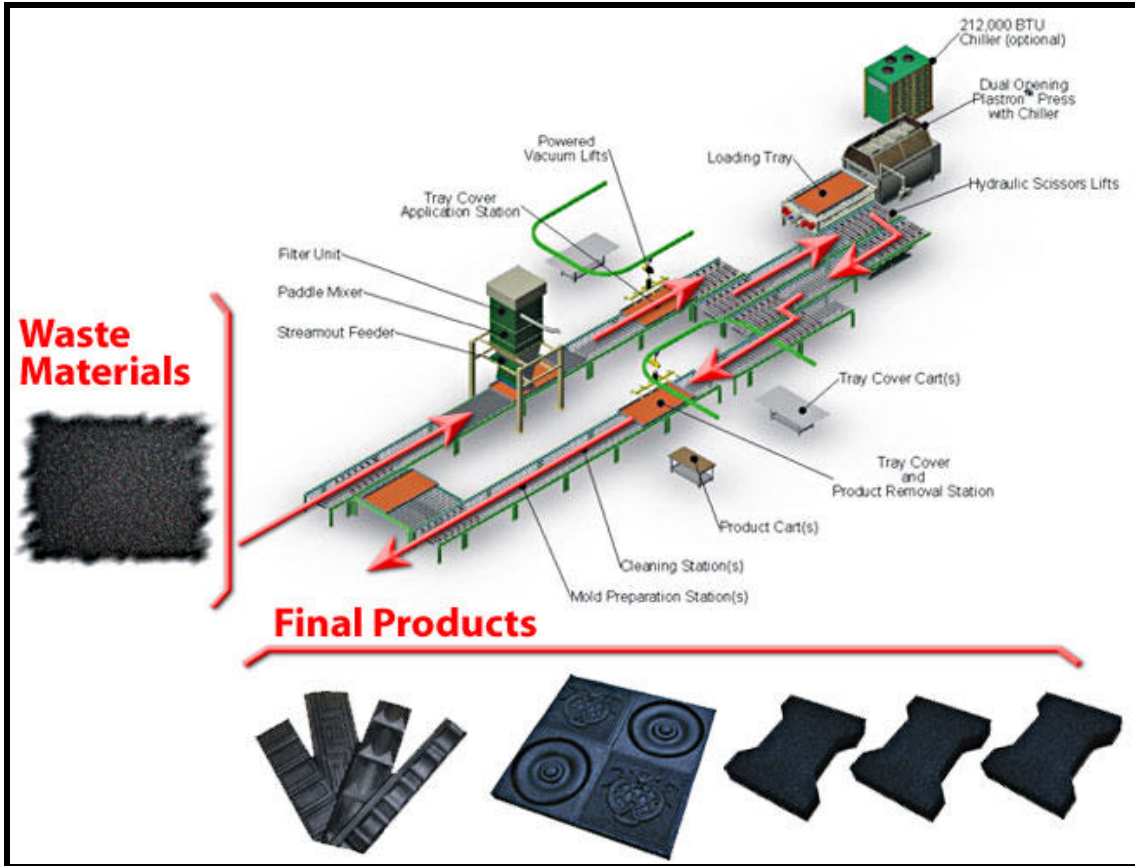
Wood glulam beam made with fiber-reinforced polymer (FRP) increases the strength of wood beams made from standard lumber of the grade produced from small diameter logs. With a fiber-reinforced polymer layer, the size of the wood beam can be reduced using up to 40% less wood resource to produce marketable beams. The result is less costly, but higher value-added product with lighter weight and smaller cross sectional profile. FiRP Inc located in Corvallis, Oregon licenses the technology and materials for reinforcing wooden structural components or engineer wood used in construction. The FiRP technology allows the use of less expensive, lower grade material for manufacture into high value end products. The

Greenweld resin is also used in manufacturing, further speeding up the process and reducing manufacturing time.

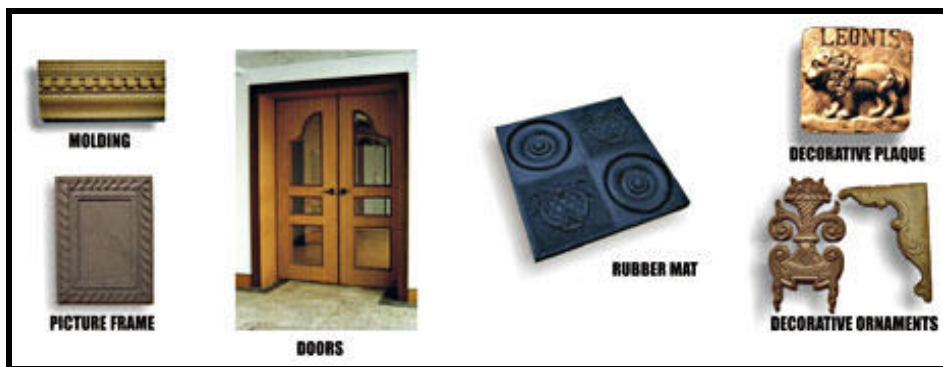
### **3.3 High-compression moulding system using wood residual**

Sorbilite's Plastron technology is a high pressure moulding system that can make three-dimensional value-added components from wood fiber and a recycled thermoplastic binding agent such as plastic milk jugs. The Sorbilite system can utilize wood residual/fiber, agricultural fiber, shredded tires, etc. The high compression process allows for up to 85% reduction in energy use. This system may prove advantageous not only for residual from small log processing but also for other wood species biomass that is abundant in the BC region. The benefits associated with this process is the high quality value-added parts that can be made from the lowest value fibre, the final product being easy to sand, cut and shape during the production process, the range of products and intricate shapes that could be produced, and Sorbite's brand-name recognition by Home Depot do-it-yourself consumer base as "sustain ably-produced." Figure 2 shows the Sorbite Production Process and Figure 3 shows Sorbite end products





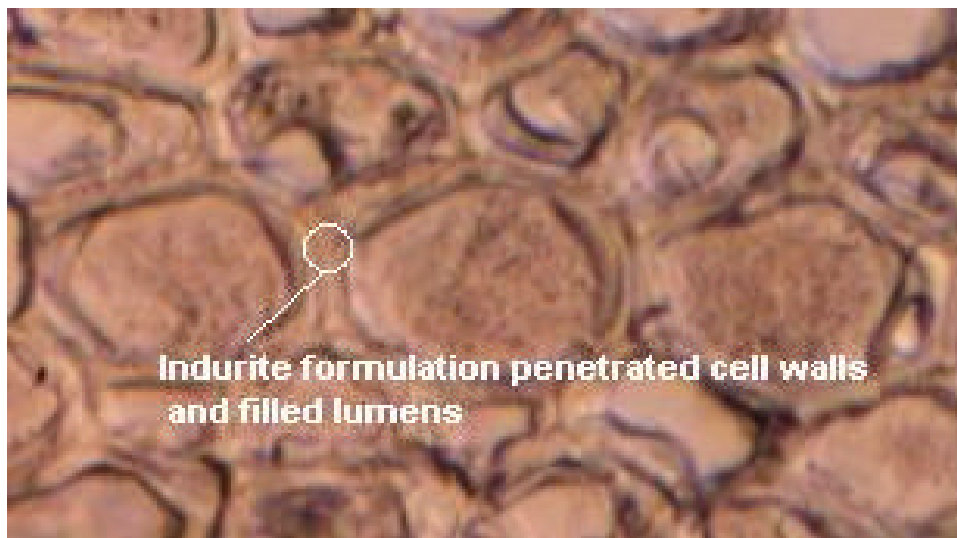
**Figure 2:** Sorbite Production Process  
 Source: [www.sorbilite.com/RubberProcess.php#](http://www.sorbilite.com/RubberProcess.php#)



**Figure 3:** Sorbite End Products  
 Source: <http://www.sorbilite.com/Work.php#TM>

### 3.4 New lumber hardening process

Engineered Wood Solution Ltd. has developed the Indurite system. This system employs a non-toxic (soy and corn starch), wood-infusion process to turn “softwood” into “hardwood,” e.g. Radiata pine can be hardened to the equivalent of Red Oak, and used for high traffic flooring. Indurite treated veneer can be used, similarly, to harden a panel surface and provide strength to inner core veneers. Indurite treated wood performs well during machining and has characteristics of a much harder wood. Indurite treated wood can be glued and finished, and takes water-based finishes better than oil based finishes. Figure 4 shows the Indurite® solution penetrating the cell walls of the timber and filling the lumens.



**Figure 4:** Indurite® solution penetrating the cell walls of the timber and filling the lumens.

Source: <http://www.ew.co.nz/Indurite/FrameIntro.html>

### 3.5 New lumber stress grading technology (E-grader)

The E-grader individually stress tests a lumber products and certifies it for use as a structural member. This grading step improves the grading of lumber over traditional visual grading practices to meet structural specifications by mechanically testing the strength fro truss or laminate stock. The benefits of using the E-grader are it's low purchase cost, high test rate and accurate pass/fail testing procedure of low-grade wood based on structural integrity. The E-grader's purchase cost according Advanced Resin Technologies and Engineered Wood Solutions is approximately \$100,000 US compared to similar machine stress-grading equipment that sells between \$350,000 US to \$500,000 US. Figure 5 shows the E-grader in production.



**Figure 5:** Model E-grader®-100

Source: <http://www.ew.co.nz/Egrader/FrameIntroE.html>

## **4.0 POTENTIAL GENERAL MARKETS FOR SMALL DIAMETER DOUGLAS FIR LOGS**

### **4.1 United States Market Demand for Small Diameter Logs**

According to market studies commissioned by the Central Oregon Inter-government Council, the remodeling and home improvement industries are major consumer markets for wood products that could be built from small diameter timber.

According to the U.S. Census Bureau, between 36% to 57% of the \$102 billion US that is spent per annum on remodeling are spent on products that could be made from small diameter timber. The largest demand for wood products comes from the preference for kitchen and bath remodels, followed by room additions, window and door replacement, and other projects. Remodeling has a tendency to lead to the purchase of residential furniture. Some market trends and news updates favoured the remodeling market in the USA. For example, the National Association of Homebuilders, 2001 stated “the US’s homeownership rate reached a record average high of 67.4% in 2000. This surge in demand in led by the baby-boom generation who are between the age groups of 55-65. They are divided into two categories: Do-it-yourselfers and Build-it-youselfers-the latter hire builders and contractors to do the work for them and are usually older and higher income owners. Figure 6 below shows the Homeownership rates by age of owners, the baby-boom generation makes up the majority of the homeownership rates, thus providing market niche that could be targeted.

**Table 1:** Five- Year History of U.S. Homeownership Rates By Age of Owner, 1996-2000, %

Year	<25	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	>75
1996	18.0%	35.0%	53.0%	62.0%	70.0%	74.0%	77.0%	79.0%	81.0%	82.0%	81.0%	75.0%
1997	17.7%	35.0%	52.6%	62.6%	69.7%	74.2%	77.7%	79.7%	80.5%	81.9%	82.0%	75.8%
1998	18.2%	36.2%	53.6%	63.7%	70.0%	73.6%	77.8%	79.8%	82.1%	81.9%	82.2%	76.2%
1999	19.9%	36.5%	53.8%	64.4%	69.9%	74.5%	77.8%	80.7%	81.3%	82.9%	82.8%	77.1%
2000	21.7%	38.1%	54.6%	65.0%	70.6%	74.7%	78.5%	80.4%	80.3%	83.0%	82.6%	77.7%

Source: U.S. Census Bureau. 2000

At present, some specific product trends that small diameter timber could be used are in structural products, green building products, and furniture. The Engineer Lumber Trends Magazine stated that structural glulam beams with fiber reinforcement layer are a rapidly expanding market that is forecast to “grow by over 500% between 2000 and 2010. This was due to global civic structures deteriorating due to age, corrosion, accidents, weather, under-design, and damaging events like earthquakes, all of which leads to “increased opportunities for new materials and structures as part of a major thrust towards Infrastructure Renewal.

Green building products, are considered to be natural or non-toxic environmentally friendly wood products. Green products could be made from recycled or reused materials, or sustain ably-produced materials that didn’t cause harm to the environment. The “green” building is a new concept endorsed by architects and builders to design and build homes and commercial buildings that are environmentally friendly. This movement is rapidly growing across the United States among do it yourselfer’s and builders’ supply firms. Cahners Residential Group conducted a survey in September 2000 that supports evidence that homeowners are driving the growth. Table 2 and Table 3 shows some results of the survey

**Table 2:** Home and Builder's Green Building Material Preferences

<b>Home and Builder's Green Building Material Preferences</b>	
<b>Homebuyers:</b>	<b>Builders</b>
<p>Homeowners' four most important environmental aspects, by rank:</p> <ol style="list-style-type: none"> <li>1) Energy efficiency</li> <li>2) Building products with recycled content</li> <li>3) Products that won't affect indoor air quality</li> <li>4) Products that don't use old growth trees</li> </ol>	<p>Some green features are becoming standard in the industry, and builders are now purchasing the following types of materials</p> <p>-98.6% consider energy-efficiency</p> <p>-45% considers materials with recycled content, renewable resources, reduced off gassing, and durability</p>

Source: Cahners Residential Group, September 2000

**Table 3:** Evidence of a Consumer Driven Market for Green Buildings

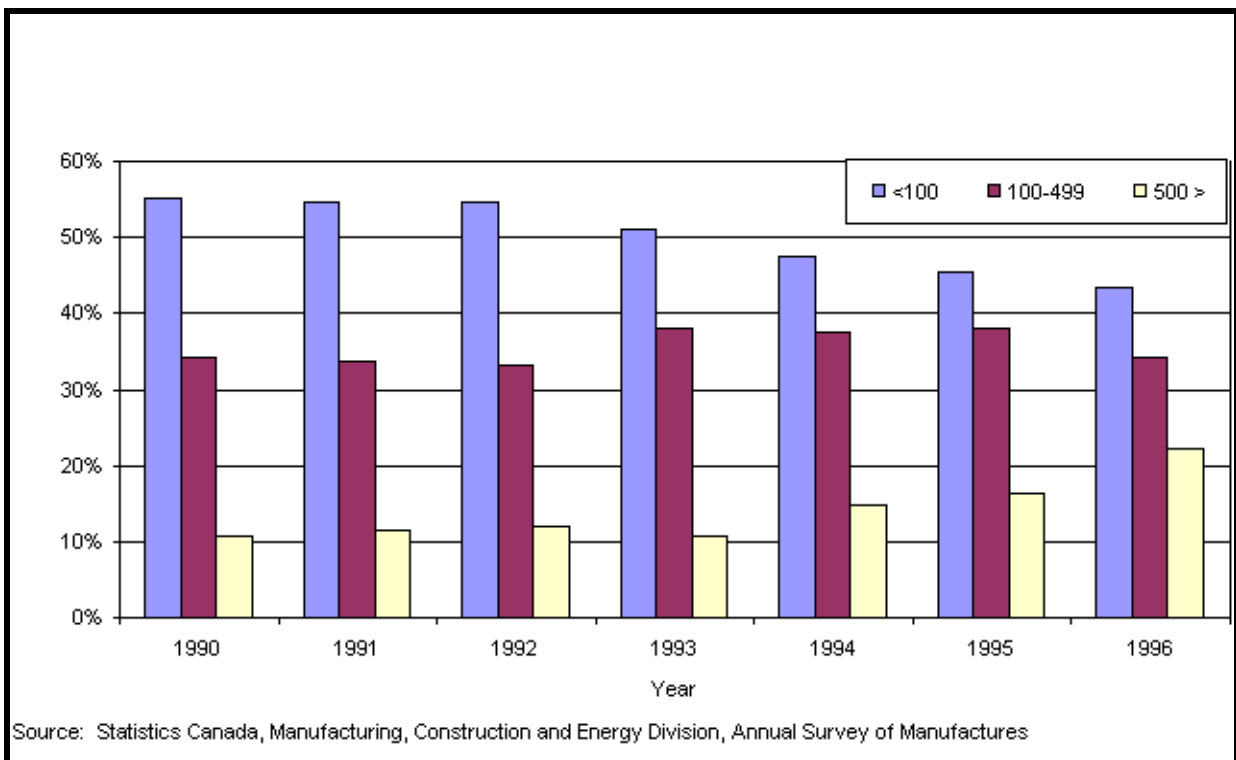
<b>Evidence of a Consumer Driven Market for Green Buildings</b>		
	<b>Homeowners:</b>	<b>Builders</b>
Willingness to pay:	<b>89% of buyers say they are willing to pay more for lower utility bills and better indoor air quality.</b>	<b>95% of builders say the greatest constraint is cost and local availability</b>
Cost of green building features:	<b>56% say they will pay an additional \$2,500 to \$5,000 US for a green upgrade to their home.</b>	<b>Builders claim green products are 5% to 15% more expensive and don't believe most customers are willing to pay the difference.</b>

Source: Cahners Residential Group, September 2000

Regarding Furniture, the Sorbolite technological process discussed above, was recommended by Mater Engineering Group Ltd as a strong potential for making a highly competitive components manufacturing process. The sorbolite process does not require high quality lumber to make a product, since waste wood and residue can be used.

## 4.2 Canadian Market Demand for Small Diameter Logs

According to Statistics Canada, more and more larger companies are dominating the market share in the furniture industry. This increasing market share by large firms, shows the potential of small diameter logs to be used in furniture applications based on some technological recommendations proposed by Central Oregon Inter



**Figure 6:** Market Share by Size of Establishment (by number of employees), Furniture and Fixture Industries, 199-1996

*Source:* Statistics Canada, Manufacturing, Construction and Energy Division, Annual Survey of Manufactures

The Canadian Furniture Industry has recorded increased profit and revenue over the past years. In particular the Residential and Office furniture industry have recorded more shipments and revenue compared to other sectors of the furniture industry. This could

present an opportunity to process small diameter logs in BC by using the technological recommendations made by Mater Engineering Ltd. to the Central Oregon Inter-government Council, which could open new market niches for BC to expand the secondary wood industry and market share. Table 4 shows the growth of the Canadian Furniture industry from 1992 to 1996

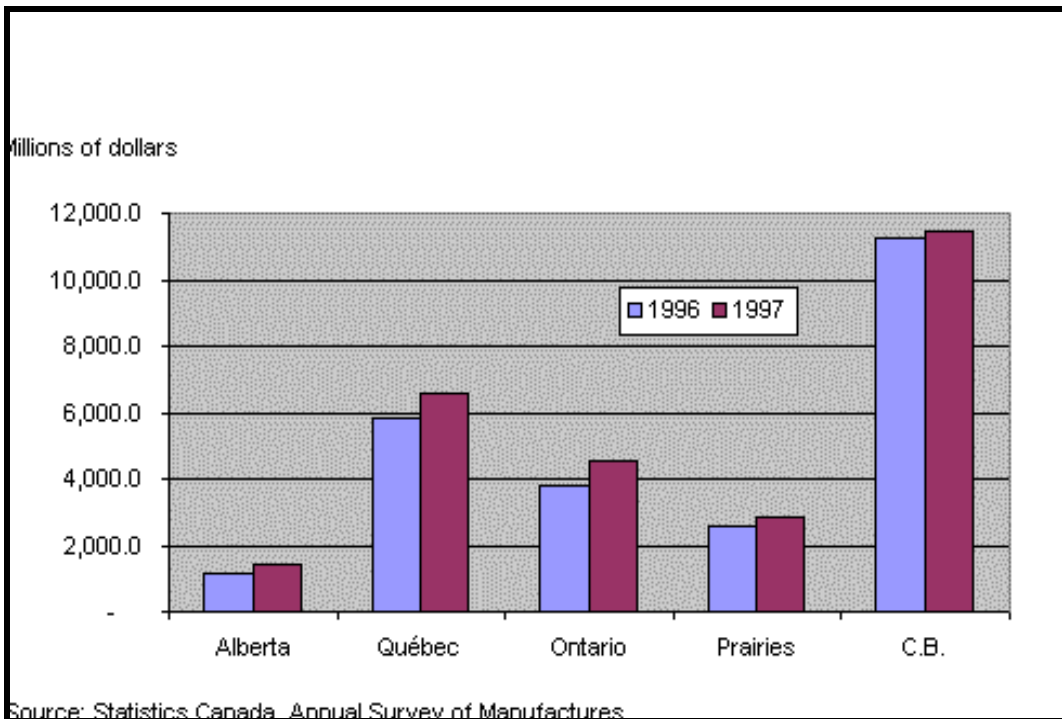
**Table 4:** Growth of the Canadian Furniture industry from 1992 to 1996

<b>Industry Groups</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>
<b>Household Furniture Industries</b>					
Establishments (#)	659	620	578	640	676
Employees	18,721	19,258	19,536	20,134	20,786
Shipments (\$,000,000)	1,496	1,592	1,717	1,833	2,019
<b>Office Furniture Industries</b>					
Establishments (#)	182	179	169	172	172
Employees (#)	9,763	9,215	10,418	11,245	10,959
Shipments (\$,000,000)	885	889	1,083	1,288	1,512
<b>Bed spring and Mattress Industry</b>					
Establishments (#)	90	90	83	87	98
Employees (#)	3,039	3,212	3,251	3,173	3,045
Shipments (\$,000,000)	368	391	418	424	446
<b>Hotel, Restaurant and Institutional Furniture and Fixture Industry</b>					
Establishments (#)	289	268	246	251	268
Employees (#)	8,046	7,943	8,616	9,037	9,398
Shipments (\$,000,000)	653	682	836	917	1,018
<b>Other Furniture and Fixture Industries, n.e.c.</b>					
Establishments (#)	189	174	162	184	192
Employees (#)	4,369	5,026	5,139	5,578	5,110
Shipments (\$,000,000)	368	435	468	538	588
<b>TOTAL</b>					
<b>Establishments (#)</b>	<b>1,409</b>	<b>1,331</b>	<b>1,238</b>	<b>1,334</b>	<b>1,406</b>
<b>Employees (#)</b>	<b>43,938</b>	<b>44,654</b>	<b>46,960</b>	<b>49,167</b>	<b>49,298</b>
<b>Shipments (\$,000,000)</b>	<b>3,771</b>	<b>3,988</b>	<b>4,523</b>	<b>5,000</b>	<b>5,584</b>

*Source:* Statistics Canada 1992 to 1996



Figure 7 shows Regional Distribution of Shipments in the Wood Industries from 1996-1997. As you can see, BC's shipment of wood products is twice the amount of it's nearest competitor, however the data reveals that BC's shipments are primarily commodity wood products and not value-added wood products that would be beneficial for small diameter logs to enter the market share. This statistics reveals that BC is underutilizing their wood products to make commodity products in a market segment that is saturated with selling price diminishing, compared to the opportunity of expanding their market share to other value-added wood sectors.



Source: Statistics Canada, Annual Survey of Manufactures

**Figure 7:** Regional Distribution of Shipments in the Wood Industries from 1996  
 Source: Statistics Canada

## **5.0 CONCLUSION**

Small Diameter logs have the potential to gain a huge market share and revenue in the value-added wood industry compared to being sold as a commodity product at a low price or fuel source. The study commissioned by the Central Oregon Intergovernmental Council reveals that new technologies would make small diameter logs a valuable resource in the Remodeling and general furniture industry. However, the high capital costs of investment in these new technologies makes it impossible for small to medium-sized companies to process the small diameter log into a value-added wood product. I would recommend that more research would be needed to fully assess the recommendations made by the Central Oregon Intergovernmental Council and perhaps be implemented in the forests of BC, based on the close proximity and similar wood species found in Oregon and BC.

## REFERENCES

- Mater Engineering Ltd. “*Markets and Processing Options for Small Diameter Trees*” commissioned by The Central Oregon Inter-government Council. 2002
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