

Timber Markets Update and Analysis of an Integrated Southeast Alaska Forest Products Industry

FINAL REPORT

***PREPARED FOR:
Southeast Conference***



Research-Based Consulting

Juneau
Anchorage

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PREPARED BY



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Table of Contents

Executive Summary	1
Introduction	4
Current Situation	4
A Potential Long Term Strategy	5
Integrated Wood Products Manufacturing.....	5
Core Operations.....	6
Key Issues.....	6
Study Design	7
Purpose.....	7
Methodology.....	7
Study Team.....	7
Status of Southeast Alaska Timber Supplies	8
Historical Overview	8
Types and Sources of Timber	9
Tongass National Forest Timber Supply	9
State of Alaska Timber Supply	14
State of Alaska Mental Health Trust Timber Supply	15
ANCSA Corporations Timber Supply	15
Other Potential Timber Supply Sources	16
Summary of Current Supply	16
Status of Southeast Alaska Timber Processing	18
Existing Mills	18
Installed Mill Capacity	20
Recent Mill Production.....	20
Current Markets and Trends.....	22
Recent and Planned Technological Improvements	24
Statewide and Southeast Alaska Regional Strategies.....	24
Mill Efficiency	24
New Species Designations	25
Other Technological Advances.....	25

A Sustainable Southeast Alaska Timber Industry 27

Components of an Integrated Industry 27

 Role of Existing Saw Mills.....28

 Uses for Low-Grade Logs and Sawmill Residuals.....28

 Waste Handling.....30

 Potential for an MDF Plant.....30

 Cost of Operations32

Timber Requirements for an Integrated Industry..... 33

Marketing Products from an Integrated Industry..... 36

 Legal, Regulatory and Policy Impediments to an Integrated Industry38

Potential Economic Impacts of an Integrated Industry..... 40

 Regional and Statewide Impacts40

 Community Impacts42

Appendix I – Characteristics of Key Products and Markets..... 44

Sawmill / Certified Glued Lumber (CGL)..... 44

Sawmill / Glulam Beams..... 45

Veneer and Laminated Veneer Lumber (LVL) 51

Medium Density Fiberboard (MDF) 57

Fiber 62

EXECUTIVE SUMMARY

This study is based on the premise that the Tongass timber resource has a role to play in fostering a diverse, healthy regional economy. If this role is to be realized, the forest products industry cannot continue on the uncertain path of the past decade. Many recent federal timber sales have failed to attract bidders. However, this does not indicate lack of markets for Tongass wood products. Rather it demonstrates a mismatch between the structure of the sales and that of the industry as it now exists.

Since Southeast Alaska's two pulp mills closed, the region's sawmills have been forced to bid on federal timber sales without an economical outlet for the low-grade timber that formerly was used to produce pulp. Since low-grade material makes up approximately 40 percent of most sales, the higher-grade portion of the sales must carry the cost of harvesting all the grades. Under many sales there simply is not sufficient value to support the harvesting costs. Therefore, a viable use for the lower grades must be found.

The study undertakes two tasks. First, it updates an analysis performed in 2000 of the timber supply in Southeast Alaska and the markets for this wood. Second, it examines the rationale for "integrated manufacturing," which includes a range of manufacturing operations that are matched to the mix of timber in the region. The study concludes that integrated manufacturing is a key element in a sustainable forest products industry of significant size in the region. Further, to support the necessary investment for an integrated industry, a consistent and long-term raw material supply, consisting principally of federal timber, must be demonstrated.

Based on preliminary analysis of a Medium Density Fiberboard (MDF) plant, the report identifies approximately 200 MMBF as the minimum harvest capable of sustaining an integrated industry. A more diversified industry that includes intra-regional competition among similar types of manufacturers could use twice that much timber.

Market Overview

Global trends remain similar to those of four years ago. They reflect intense competition among producing regions, with ongoing consolidation and modernization of production facilities and intensive management of timber stands. International companies are focusing on areas with low labor costs and the least restrictive regulatory environments.

Nevertheless, prices for Southeast Alaska forest products have shown dramatic recent improvement, fueled by an active US housing market combined with a strengthening Canadian dollar and forest fires in British Columbia. The competitive advantage of Southeast Alaska lies principally in the region's high-value Sitka spruce, Western red cedar, and Alaska yellow cedar. Prices for these species are currently strong and, because the timber is relatively rare, are expected to remain so. The larger sawmills in Southeast Alaska have found steady demand in the Lower 48, particularly for green lumber destined for additional manufacturing. Thanks in part to work by the Ketchikan Wood Technology Center, a program of the Juneau Economic Development Council, and the USDA Forest Service's Sitka Wood Utilization Center, mills are improving productivity and are beginning to experiment with producing planed, dried, graded

lumber for local lumber yards. Key to commercial success is effective targeting of niche markets both in the US and overseas.

Mill Production and Capacity

The past decade has seen numerous mill closures throughout the US and Canada, particularly in the West. Among the casualties were Southeast Alaska's two pulp mills. Between 2000 and 2002 four of the region's remaining 15 larger sawmills ceased operation, and annual production fell from 87 million board feet (MMBF) to less than 40 MMBF.¹

The double-shift capacity of the region's active mills is roughly 200 MMBF. But capacity utilization – actual production divided by capacity – fell from an average of 50 percent during the pulp mill years to 17 percent in 2000 and just 9 percent in 2002. By comparison, Pacific Northwest mills typically operate at about 70 percent of capacity.

Timber Supplies and Harvest Policy

The Tongass National Forest timber program has slowed significantly in recent years. In 1997 the annual average Allowable Sale Quantity (ASQ) of timber under the Tongass Land Management Plan was reduced from 520 MMBF to 267 MMBF. Since that time, less than half the ASQ has been offered each year, and less than half of what has been offered has been sold. Of those sales, approximately 100 MMBF will likely be cancelled because the trees are not economically worthwhile to harvest. The reason is partly the way the Forest Service has structured the sales and partly the fact that the industry, which consists only of sawmills, is unable to process effectively the lower grade timber. As of July 2004 Southeast Alaska mills had only about 70 MMBF under contract for domestic processing. Although the Forest Service says it aims to maintain a three-year supply of timber under contract, this 70 MMBF represents only about one-third of the annual double-shift capacity of the region's currently active mills.

	Allowable Sale Quantity (MMBF)	Quantity Offered (MMBF)	Quantity Sold (MMBF)
1998	267	187.1	24.1
1999	187	115.3	61.4
2000	187	85.3	170.3
2001	267	67.9	49.6
2002	267	56.9	24.2
2003	267	115.3	36.5

Source: USDA Forest Service documents and personal communication with the Forest Service Regional Economist.

¹ A board foot is a unit of wood one inch thick by one foot wide by one foot long. Timber yield per acre varies widely (from 8,000 to 90,000 board feet), but on average an acre of commercial timber in Southeast Alaska yields 28 to 34 thousand board feet (MBF). One million board feet of timber (1MMBF) is roughly the amount needed to build 120 houses. (USDA Forest Service, Southwest Timber Sale Environmental Assessment -- Glossary of Terms, page B-1).

Composition of an Integrated Regional Industry

Integrated manufacturing in Southeast Alaska would be composed of sawmills and at least one major processor of low-grade logs, chips and mill residuals. Had it continued to operate, the Gateway Forest Products veneer mill would have served this function to an extent. However, most desirable is a facility that can utilize virtually any form of wood fiber and does not require roundwood as a raw material, as veneer production does. Pulp, ethanol and medium density fiberboard (MDF) are examples. Preliminary indications are that an MDF facility in combination with the region's existing sawmills may be a viable industry structure with an annual Tongass timber harvest of as little as 200 MMBF. This amount of harvest is within the specifications of the 1997 Tongass Land Management Plan. However, the most efficient use of the Tongass timber harvest would likely also include other value-added manufacturing, such as a veneer mill. In theory, the industry would be most efficient with at least two of each type of manufacturing facility, as this would foster competitive bidding for materials and labor. Depending upon the types of facilities, this could require an annual harvest of 350 MMBF or more.

Benefits of an Integrated Industry

If it proves to be financially feasible, even at the relatively small scale permitted under the current ASQ, an integrated timber industry could support between 1,200 and 1,750 direct jobs in the region, helping to replace the 3,000 forest products jobs that have been lost since 1990.² Annual harvesting and processing of that amount of Tongass timber would generate direct payroll of between \$55 and \$80 million and induced payroll of \$35 to \$50 million for a total estimated employment impact of between \$90 and \$130 million, in addition to local property taxes, timber receipts, utility payments, and state transfer payments. By helping to preserve the economic and community diversity fostered by the forest industry, integrated processing would strengthen and enrich the region as a whole. A larger harvest would create additional jobs and could make the industry more resilient to competition and market cycles.

² These estimates for integrated industry employment include the fewer than 200 regional timber industry jobs that are currently supported by the Tongass timber harvest.

Current Situation

The Global Market for Timber from the Tongass National Forest (McDowell Group, 2000) analyzed market opportunities and challenges facing Southeast Alaska forest products manufacturers. This and other studies³ clearly demonstrated that Southeast Alaska species are appropriate for a wide variety of products for which established and growing markets exist. Since the study was published, a strong US construction market combined with a strengthening Canadian dollar to push lumber prices to five-year highs earlier this year. During this time, Southeast Alaska mills have produced mainly green shop lumber for secondary manufacturing in the Pacific Northwest, along with various products for local markets.

The industry has also pursued innovation in a number of areas. Mill efficiency has been improved; dry kilns, planers and other new equipment have been planned or installed in some mills; new species designations have been obtained to recognize the superior value in Alaska timber; new technologies have been analyzed, including lamination of yellow cedar and an environmentally friendly preservative treatment for green spruce and hemlock. New uses for mill residuals, such as wood/fish composting and plasma electrical generation have been explored, and niche markets have been developed for specialty products such as hot tubs.

However, as many analysts have pointed out and recent mill closures underscore, the Southeast Alaska forest products industry as it exists today is not sustainable. To survive, it must provide a consistent stream of products at competitive prices over the long term. This means access to a reliable timber supply. It also means developing the capacity to make the best economic use of the different species and grades that make up the timber supply.

Using the timber supply effectively requires “integrated processing,” whereby a variety of manufacturing facilities work in conjunction to process and market each timber component efficiently. Since closure of the region’s pulp mills in the 1990s, the primary missing processing component in Southeast Alaska is a facility to handle low-grade material. Without access to such a facility, regional saw mills are forced to bid, harvest, and process a mix of logs that often is not economically viable.

Technically it is possible to saw low-grade logs into lumber. Such logs, however, yield lumber of marginal quality and economic value. A system that force-feeds the sawmill industry, such as that that exists in Southeast Alaska, a mixture of low-grade logs may be the deathblow that destroys the industry. For this reason it is essential that an integrated industry be reestablished in the region...

Dr. Allen Brackley,
University of Alaska Forest Products Program
Sitka, Alaska

³ See, for example, Eastin, Ivan and Rosemarie Braden, *Survey of International Opportunities for Alaska Softwood Producers*, CINTRAFOR, September 2000.

A diversity of timber sources (with different management objectives) results in the most stable supply. But though, state and private holdings have a role, access to public timber is a necessary condition for revitalization of the region's timber industry. The largest private forestland owners in Southeast Alaska, the Native corporations, show limited interest in selling timber for local processing or in processing it themselves. They have found it more profitable to concentrate on the international market for round logs. Without access to large private tracts, existing mills must rely on timber from the Tongass National Forest.

Yet, "market demand" for Tongass timber, as it is defined by the USDA Forest Service, continues to decline in spite of positive trends in many wood products markets. One reason is that, without a profitable way to process low-value timber (i.e., the timber that used to be employed in making pulp), the viability of a timber sale depends heavily on its high-value sawlogs, mainly spruce and cedar. If there are not enough of these logs, or if they are too expensive to harvest, the sale is not "economic," i.e., cannot pay for itself and the sale is not purchased. Since the Forest Service defines the need for new timber sales largely in terms of recent mill production, this scenario tends to lead to smaller or fewer timber offerings. This, in turn, discourages new ventures and makes it difficult for existing companies to alter their operating strategies in any fundamental way. Businesses are subject to a chicken-and-egg scenario:

- Mills are often unable to respond to timber sale offerings with the production technology and delivered log cost available to them.
- The Forest Service interprets this as low market demand and reduces supply still further.
- With an uncertain supply, mills are unable to develop the new technology, complementary production capacity, and market relationships to break out of the cycle.

A Potential Long Term Strategy

This study begins with the premise that the Tongass timber resource has a role to play in a healthy, diverse regional economy. Since timber markets are highly variable relative to some other commodities, it follows that the industry must move beyond a condition of extreme economic tenuousness under which its workers, companies and communities are vulnerable to even small shifts in markets or forest management policy. The situation may be markedly improved by making the best economic use of a predictable annual harvest by means of integrated manufacturing.

Integrated Wood Products Manufacturing

An integrated industry is one that includes a spectrum of operations matched to the nature of the timber supply. In simplest terms, this means one or more sawmills and a process to utilize the roughly 40 percent of Tongass timber that is not suitable for lumber. However, other, more specialized components such as cedar mills, specialty products manufacturers, and a variety of engineered wood production, are potential components of an integrated industry. Specialization allows plants to minimize waste, focus on niche markets, and command premium prices. In turn, these businesses may

together attain enough critical mass to make inroads on transportation, energy, labor and other production costs.

In areas where timber supplies are more predictable, complementary manufacturing facilities evolve. However, the supply situation in Southeast Alaska over the past decade has made investment in wood manufacturing by private firms virtually impossible. It will therefore require a commitment of public timber over an extended period to enable the industry to realize its potential.

Core Operations

Because it is the major missing link for an integrated industry in Southeast Alaska, utilization of low-grade logs is referred to in this report as a “core operation.” For a variety of reasons discussed later, a facility that utilizes wood fiber is a good candidate for this core function. The type of operation most often discussed for the region is an MDF plant. The Alaska Forest Association reports that MDF potential was already being actively assessed when the Forest Service cancelled the long-term Tongass timber contracts.

MDF is a relatively new, high-value-added product with growing markets. MDF can be produced from mill residuals as well as from low-grade logs. Other products, including oriented strand board (OSB), veneer, and laminated veneer lumber (LVL) also have potential, but require roundwood as a raw material. Manufacturing of this type could provide some basis for regional integration, but would need to be combined with an economical use for mill residuals.

Other products are more speculative. Ethanol production can utilize a broad range of raw materials, but is reliant on untested technologies and government subsidies. More common commodity products such as particleboard would be very difficult to produce competitively in Southeast Alaska. Shifts in global markets make a return to pulp or large-scale chip production impractical. Therefore, in analyzing the implications of an integrated industry, this report uses an MDF facility as the theoretical core operation.

Key Issues

This report looks at several critical factors that must be addressed for a regional integrated industry to be sustainable:

- What trends in domestic and global markets are particularly relevant to the success of an integrated industry?
- What scale of operation is required in order to be responsive to the market in terms of delivery time and quantities?
- What scale of operation is required to achieve harvest, production and shipping economies needed to be price competitive?
- Is there a reliable supply of timber to support operations at the necessary scale?

Study Design

Purpose

The purpose of this study is to examine market trends, manufacturing options and timber supplies to identify operations and conditions that will satisfy the key issues noted above: market responsiveness, production efficiency, and timber supply. The study updates market analysis from *The Global Market for Timber from the Tongass National Forest* (McDowell Group, 2000) and describes the potential components of a sustainable, integrated Southeast Alaska timber industry and the major forces that will define those components. The study also discusses the economic impacts such a regional industry could have.

Methodology

The information and analysis in this document are based on published and unpublished reports by the USDA Forest Service, the State of Alaska, and a variety of private consulting firms and public interest groups. Secondary data has been supplemented by interviews with industry and Forest Service representatives.

Study Team

The McDowell Group is an Alaska research-based consulting firm with 30 years experience analyzing Alaska's economy, industries and socio-political issues. Walt Sheridan is an experienced forest management policy analyst who conducted much of the Alaska timber supply assessment for the original *Global Markets* study. Dr. Leonard Guss is an internationally recognized expert on global softwood markets, particularly those associated with engineered wood products.

STATUS OF SOUTHEAST ALASKA TIMBER SUPPLIES

Historical Overview

In our 2000 *Global Markets* study, we traced the legislative and administrative history of the Tongass timber supply from completion of the 1979 Tongass Land Management Plan (TLMP) through the April 1999 decision by then U.S. Department of Agriculture Under Secretary Jim Lyons. During this twenty-year period, the annual allowable sale quantity (ASQ)⁴ on the Tongass went from 520 million board feet (MMBF) in 1979 to 187 MMBF in 1999. On March 30, 2001, however, a ruling by Judge James K. Singleton of the United States District Court for the District of Alaska vacated Under Secretary Lyons' 1999 decision and returned the Tongass ASQ to 267 MMBF per year. The final legal status of the 1999 Record of Decision has not yet been determined. The 267 MMBF ASQ is the level established in the Record of Decision for the 1997 Revised Tongass Land Management Plan. Table 1 summarizes the key decision points in the decline of the Tongass ASQ of the past two decades.

Table 1.
Key Legislative and Administrative Actions Affecting
Tongass National Forest Timber Supplies
(MMBF sawlog plus utility)

Action	Effect
1979 Tongass Land Management Plan	ASQ of 520 MMBF established
1980 Alaska National Interest Conservation Act (ANILCA)	Designated approximately 5.5 million acres of wilderness
1990 Tongass Timber Reform Act (TTRA)	Additional withdrawals totaling some 1.3 million acres, including 300,000 acres of wilderness and 700,000 acres of legislated "LUD II" or roadless areas. Mandated stream buffers.
May 1997 Revised Tongass Land Management Plan ROD	ASQ of 267 MMBF established
April 1999 Modified Forest Plan	Reduced ASQ to 187 MMBF
March 2001 District Court Ruling	Returned ASQ to the 1997 level of 267 MMBF

Source: 1997 Tongass Land Management Plan Final Environmental Impact Statement and other USDA Forest Service documents

⁴ The Allowable Sale Quantity (ASQ) is defined in the 1997 Tongass Land Management Plan Revision FEIS as the maximum quantity of timber (net sawlog + utility volume) that may be sold in each decade from suitable lands covered by the Forest Plan. In practice, the ASQ is typically expressed as an average annual amount.

Types and Sources of Timber

The timber of Southeast Alaska consists primarily of old-growth Sitka spruce (*Picea sitchensis*), Western hemlock (*Tsuga heterophylla*), Western red cedar (*Thuja plicata*), and Alaska yellow cedar (*Chamaecyparis nootkatensis*).

Logs from the Tongass comprise the following species and grades:

- Peeler/Select/No.1 Spruce
- Peeler/Select/No.1 Hemlock
- No.2 and No.3 Spruce
- No.2 and No. 3 Hemlock
- Utility Spruce
- Utility Hemlock
- Cedar (western red cedar and Alaska yellow cedar)

Since industrial-scale timber harvesting began on the Tongass in 1954, virtually all of the harvesting has been in what is termed “old growth” stands, i.e., naturally occurring stands often in excess of 200 years in age.

The new stands established after the old growth is harvested are referred to as second growth stands. According the Forest Service, there are approximately 400,000 acres of second growth on the Tongass, of which about 30,000 acres is greater than 45 years of age. Second growth stands can be expected to contain as much as 33 to 50 percent more volume per acre than the old growth stands they replace. These stands will also contain a significantly smaller percentage of lower quality or defective logs than the old growth stands. The second growth stands on the Tongass are currently managed on an 80 to 100+ year rotation, which means most of these higher volume, more uniform stands will be suitable for harvest beginning in about the year 2034. Pre-commercial thinning of second growth stands is beginning now, and a phase-in of second growth harvest is planned beginning in the next 5 to 10 years. There are also about 210,000 acres of second growth on Native corporation lands in Southeast Alaska. These stands vary from 10 – 25 years of age.

Tongass National Forest Timber Supply

The 1997 Tongass Land Management Plan (TLMP) established an ASQ for the Tongass of 2.67 billion board feet per decade or an annual ASQ of 267 MMBF. Table 2 shows the approximate distribution of the Tongass ASQ by species and utility volume⁵. The ASQ is made up of 26% Sitka spruce sawlogs, 47% Western hemlock sawlogs, 7% Western red cedar and Alaska yellow cedar, and 20% utility volume.⁶

During the six years since implementation of the 1997 TLMP, the actual species distribution of the harvest has generally followed the plan prediction with respect to

⁵ Utility volume consists of logs that do not meet minimum requirements for sawtimber but are suitable for the production of useable chips.

⁶ USDA, Forest Service, Alaska Region, evaluating the demand for Tongass Timber, September, 1998, p 7

Sitka spruce and Western hemlock. The cedar component, however, has been considerably higher than projected at some 14%, while the utility component has been lower at about 12%.⁷ The reason for this difference is not entirely clear, but may be related to most of the sales coming from the southern half of the Tongass where cedar is a stronger component.

Economic Components of the Harvest

The allowable sale quantity on the Tongass is partitioned into two Non-Interchangeable Components, termed “NICs”, based on the type of logging required for harvest. NIC I is volume scheduled from lands suitable for existing logging systems. On average, sales from these lands are expected to be economic (i.e., profitable) to log under projected market conditions. NIC II, is volume scheduled from lands that require logging or silvicultural systems not in common use in Southeast Alaska. Most of these lands are currently considered economically and technologically marginal.

The purpose of partitioning the ASQ into two separate components is to maintain the economic sustainability of the timber resource by preventing over-harvest of the most valuable timber stands. The partitioning of the ASQ also serves to identify that portion of the timber supply that is less likely to be harvested because of marginal economic conditions. The 1997 TLMP sets the proportional mix of NIC I and NIC II categories.⁸ NIC I represents 80 – 82 percent of the ASQ. NIC II is the remaining 18 – 20 percent. These two economic components of the ASQ equate to an average of 220 MMBF NIC I and 47 MMBF NIC II per year for an average annual total of 267 MMBF, as shown in the table.

**Table 2.
Composition of the Allowable Sale Quantity
Projected Annual Average for Decade 1 of the
1997 Tongass Land Management Plan
(million board feet)**

Species	ASQ	%	NIC 1	NIC 2
Sitka Spruce	69.4	26%	57.2	12.2
Western Hemlock	125.5	47%	103.4	22.1
Cedar*	18.7	7%	15.4	3.3
Utility**	53.4	20%	44.0	9.4
Total	267⁹	100%	220.0	47.0

* Cedar: Western red cedar and Alaska yellow cedar

* Utility: Sitka spruce and Western hemlock

Source: USDA, Forest Service, Tongass National Forest, 2004 Forest Plan Monitoring Results and Evaluations

⁷ USDA, Forest Service, Tongass National Forest, Cut and Sold Reports, 1997 – 2003.

⁸ Ibid.

⁹ Totals may not add due to rounding.

At 18 to 20 percent, the 1997 ASQ allocation represents a higher reliance on the NIC II component than that found in the 1979 TLMP.¹⁰ While the NIC terminology was not in use prior to 1997, the Forest Service reports that typically about 7 percent of the pre-1997 harvest came from lands now classified as NIC II.

Since implementation of the 1997 Forest Plan, the percentage of NIC I harvest has varied greatly as can be seen from Table 3. Some of this variation, however, appears to be an aberration introduced by the low level of harvest during these years and the inordinate effect a given sale can have on the data from any one year. Overall, however, the 7 percent historical average is probably the most likely outcome and is used in this study to estimate the available timber from the Tongass.

Actual harvest in each of the NIC categories since 1997 is as shown in Table 3.

Table 3.
Comparison of NIC I and NIC II Harvest
by Fiscal Year and Percent of Total Harvest¹¹

Fiscal Year	NIC I Percent of Harvest	NIC II Percent of Harvest
1997*	No Data Collected	No Data Collected
1998	95% (estimated)	5%
1999	88%	12%
2000	77%	23%
2001	46%	54%
2002	90%	10%
2003	91%	9%

* The 1997 Forest Plan Monitoring and Evaluation Report did not analyze the NIC I and NIC II timber harvest categories.
Source: USDA, Forest Service, Tongass National Forest, 2004 Forest Plan Monitoring Results and Evaluations

Timber Sales under the 1997 Forest Plan

Timber Offered and Sold

Since adoption of the 1997 Forest Plan, only about half of the volume offered for sale has actually sold. Although the plan envisioned about 84 percent clear cutting, a majority of the sales in the past seven years have called for partial cutting and a high percentage of helicopter yarding. This made harvesting for some sales prohibitively expensive for potential purchasers.¹² Table 4 displays timber offered and sold on the Tongass for fiscal years 1998 through 2003.

¹⁰ USDA, Forest Service, Tongass National Forest, 2004 Forest Plan Monitoring Results and Evaluations

¹¹ Ibid

¹² Personal communication, Steve Brink, USDA Forest Service

**Table 4.
Timber Offered and Sold Under the 1997 Forest Plan**

Fiscal Year	Timber Offered for Sale	Timber Sold
1998	187.1	24.1
1999	115.3	61.4
2000	85.3	170.3
2001	67.9	49.6
2002	56.9	24.2
2003	115.3 ¹³	36.5

Volume of Timber Under Contract

A key measure of the Tongass timber program is the volume under contract at any given time. A backlog of uncut timber is necessary to allow the industry to operate efficiently. Since 1999 the Forest Service has sought to maintain a volume under contract equivalent to at least three years of production. However, this provides little flexibility for operators to respond to market trends. Further, uncertainty about what will happen beyond the three-year horizon is a barrier to long-term customer relationships and investment in new products and equipment.

As of May 31, 2004, the volume of Tongass timber that had been purchased but not yet harvested was approximately 191 MMBF, or nearly four times the average annual harvest over the past several years. Of this amount, 86 percent (165 MMBF) is under contract to the three largest regional mills. The remainder is spread among 15 or so other purchasers, with the bulk, 19.5 MMBF, under contract to Alcan Forest Products.

However, the current volume under contract is misleading because much of it is believed to be uneconomic to operate. The timber sales were purchased, according to the Alaska Forest Association, because mill owners had no other source for the raw materials needed to keep operating. In response to these concerns, the Congress at Section 339 of the 2003 Appropriations Act, authorized the cancellation of a number of sales awarded between October of 1995 and January of 2002. Contracts that may be eligible for cancellation have a combined remaining volume under contract of about 138.5 MMBF. Purchasers have until September 30, 2004 to exercise this option and many have already chosen to do so. According to Forest Service personnel all – or most - of this volume is likely to be cancelled. Another 26 MMBF under contract represents salvage timber from the Yakutat area that, under Forest Service rules, is eligible for export.

This left a “three-year” timber supply for domestic processing on May 31 of just 27 MMBF for active mills with a double-shift annual capacity of approximately 200 MMBF.

¹³ USDA, Forest Service, Alaska Region, Briefing Paper, October 2003. The paper states that a total of 118.53 MMBF was offered from 49 sales and permits during FY 03. Of this total, 32.3 MMBF was offered from the former Gateway Sales and 29.7 MMBF was from sales reoffered from previous years programs. Of the 118.53 MMBF offered, 6 sales totaling approximately 26.7 MMBF were offered and received no bids. Per personal communication with Forest Service Regional Economist Susan J. Alexander, the 118.53 MMBF has been adjusted to 115.3, net of re-offered sales, re-sold sales, and credit volumes, in order to make it consistent with the other values in the table.

Since that time three new sales totaling 43 MMBF have been offered and sold, but the three-year threshold remains remote.

Timber Harvest Levels on the Tongass

Table 5 traces the history of timber harvest on the Tongass from 1990 through 2003. The table clearly shows the precipitous decline in harvest levels – a decline that correlates with the loss of the two major integrated mills. Both mills were operating during the period of 1990 to 1993. During this period the average annual harvest from the Tongass was about 382 MMBF. The Alaska Pulp Corporation (APC) mill closed in 1993. The Ketchikan Pulp Company (KPC) mill continued operating until early 1997. During this period – 1994 through 1996 - the annual harvest level averaged about 181 MMBF. After closure of the KPC mill, and discounting the one-time effect of the 300 MMBF KPC settlement (see note below, Table 6) the average annual harvest from the Tongass has been in the range of 50 MMBF.

Table 5.
Timber Harvest on the Tongass Under the 1997 Forest Plan
(in MMBF)

Federal Fiscal Year	Sawlogs	Utility	Total Harvest
1990	398.0	71.7	470.7
1991	299.7	64.1	363.8
1992	303.1	66.6	369.7
1993	268.7	56.7	325.4
1994	226.8	48.0	275.8
1995	182.2	38.0	221.2
1996	97.4	22.8	120.2
1997	94.4	12.2	106.6
1998	107.6*	11.9*	119.5*
1999	132.8*	12.9*	145.8*
2000	133.6*	13.2*	146.9*
2001	39.8	7.0	47.8
2002	30.0	3.8	33.8
2003	44.1	7.2	51.3

*On February 21, 1997, an agreement was reached between the Ketchikan Pulp Co (KPC) and the Forest Service to cancel KPC's long-term contract. As part of the agreement, KPC received 300 MMBF of timber over a three-year period to be used for the continued operation of the company's sawmills. Harvest levels for 1998 – 2000 reflect this harvest, without which the average for the period would have been about 50 MMBF.

Factors Driving Timber Harvest

A broad range of explanations has been offered for the decline of the Tongass timber program including poor markets, uneconomic timber offerings by the Forest Service, Asian financial woes, overly strict environmental standards, excessive litigation, etc. All have their proponents and all of the explanations probably have some merit. An explanation, however, that may not have been given enough attention is the loss of an

integrated timber industry with the ability to utilize the full range of timber harvested from a typical old-growth timber stand.

Without the ability to effectively utilize lower quality material, the higher grade material has to “carry” the cost of harvesting all of the grades. The Forest Service has tried to address this problem by lowering utilization standards, even allowing some of these lower quality logs to be left in the woods. While helpful, these policy changes do not fully mitigate the costs.

The lower quality material still has to be cut and handled in some manner so that it does not affect the establishment of a new, high quality, second growth stand. All of these costs, and more, must be borne by the higher-grade material, and under many sales there simply is not sufficient value to support the added costs.

An integrated industry capable of efficiently utilizing the full range of timber is not the total answer to the establishment of a viable timber industry in Southeast Alaska. More needs to be done to improve the profit potential individual sales; new markets need to be explored; continuing improvement in operating and transportation efficiency must be pursued; etc. Some form of integrated industry, however, appears to be a key piece of the puzzle.

State of Alaska Timber Supply

During the four years since the *Global Markets* study was released, the State of Alaska has reorganized its Coastal Region and reduced the number of Area Offices from three to two. The reorganization eliminated the Juneau Area Office and divided the land area administered by the Juneau Area Office between the Haines Area Office (HAO) and the Ketchikan Area Office (KAO).

The Ketchikan Area Office administers an area of the Coastal Region designated as the Southern Southeast Area. It consists of about 156,708 acres of state owned lands. The Division of Forestry (DOF) estimates that out of this total acreage, 49,333 net acres can be considered for harvest. DOF further estimates that this acreage is capable of sustaining an ASQ of about 12.8 MMBF.

The current five-year schedule for the Southern Southeast Area is preliminary and covers the period from calendar years 2003 through 2007. It calls for an average annual volume of about 13.9 MMBF. About 3 MMBF of if this is expected to come from 15-20 very small sales each year while the remainder will come from sales averaging a little over 2.1 MMBF each.

The Haines Area Office administers the Haines State Forest as well as the islands and mainland areas of the northern part of the panhandle. Together, these lands constitute the Northern Southeast Area. Their current five-year plan, however, is limited to the Haines State Forest.

The Haines State Forest includes the Chilkat, Chilkoot and Ferebee River Valleys comprising about 286,208 acres, of which 41,652 acres are considered to be commercial forest land and available for timber harvest. DOT estimates the Forest capable of supporting an ASQ of 5.8 MMBF. However, the historic ability of the State to produce economic timber sales on the Haines State Forest has been limited. The reasons are the

poor quality of the hemlock and relative absence of Sitka spruce. The five-year schedule for the Haines Forest covers the period from calendar years 2004 through 2008. It envisions the annual harvesting of about 6.2 MMBF made up of one sale in the 3 -5 MMBF range and a number of very small sales.

In summary, the State of Alaska appears capable of producing from 15-18 MMBF of timber annually from its holdings in Southeast Alaska. However, the quality of Haines State Forest timber means that it is unlikely to be in demand by sawmills. It might, however, be utilized by a facility capable of making profitable use of low-grade timber.

State of Alaska Mental Health Trust Timber Supply

Over the past several years, the State of Alaska's Mental Health Trust has been a relatively active supplier of timber to Southeast Alaska purchasers. However, it is exported, rather than processed in the region. The largest of these sales was some 60 MMBF in the Thorne Bay region of Prince of Wales Island. This sale is now drawing to a close.¹⁴

Remaining timber volume on Trust lands is expected to be sold over the next several years. Total volume will be around 120 MMBF divided among three sales in the Wrangell/Petersburg area and the Ketchikan area.¹⁵

Overall, Mental Health Trust lands should not be considered a potential long-term supplier of timber to Southeast Alaska markets. Their limited timber assets and legally mandated fiduciary responsibilities to the Trust do not put them in a position to consider sustained timber output from their holdings.

ANCSA Corporations¹⁶ Timber Supply

Of the thirteen ANCSA Corporations in Southeast Alaska, only Sealaska – the Regional Corporation - has sufficient land holdings to maintain an annual-sustained-yield timber program. The timber holdings of the smaller Village Corporations were mainly liquidated in the 1980s and 1990s. Second growth on these stands is therefore only 10 to 25 years old. Sealaska, on the other hand, is anticipating continuing to harvest around 100 MMBF of timber on an annual basis from its lands for the foreseeable future.¹⁷

Much of the Sealaska timber is likely to go to the export market where selling values have typically been significantly higher than selling values in the local market. As much as 20 MMBF of lower grade utility volume, however, is likely to be available for local processing.

¹⁴ Steve Planchon, Executive Director, State of Alaska Mental Health Trust, personal communication, 2004.

¹⁵ Ibid.

¹⁶ ANCSA Corporations are corporations established by the 1971 Alaska Native Claims Settlement Act.

¹⁷ Rick Harris, Sealaska Corporation, personal communication, 2004.

Other Potential Timber Supply Sources

At various times in the past, Canadian timber has been available at attractive prices, but was limited by the Canadian government to utility volume. Further, the supply was never consistent and fluctuated as a result of currency rates, world timber markets and Canadian public policy. In more recent times, the Canadian government instituted a policy prohibiting round-log export. Nevertheless, a local firm, Alcan Forest Products, has explored importing some Canadian timber to Southeast Alaska.

Summary of Current Supply

The current situation is a timber supply dominated by federal timber and constrained by the 1997 Tongass Land Management Plan ASQ of 267 MMBF. Under the best of circumstances, about 220 MMBF of this volume is expected to be economically viable to process. Historically, about 7% of the uneconomic volume has also been harvested. Together, the economic and uneconomic components of the potential timber harvest from the Tongass National Forest could total as much as 237 MMBF annually. Of this, 42%, or about 100 MMBF could be expected to be No. 3 logs and utility volume – the raw material needed for a fiber based industry. At best, the current ASQ can produce only 130 to 190 MMBF of sawlogs annually, less than the double-shift capacity of the mills currently operating in Southeast Alaska.

Additional volume may also be available from Alaska Native Corporations and State of Alaska sales. The following tables 6 and 7 show the wood supply potentially available to develop an integrated forest products industry in Southeast Alaska. Table 6 assumes a strong market for sawn products where the No. 3 logs may be economic for processing into sawn products, while Table 7 assumes a weaker market where the No. 3 logs would likely be uneconomic for sawn products and would be appropriate only for fiber or chip-based products.

Table 6.
Summary of Potential Southeast Alaska Timber Supply
Under Strong Markets for Sawn Wood Products
(in MMBF)

Source	Volume	Sawlogs Domestic Processing	Sawlogs Export	Cedar	Utility/ Lower Grade Logs
Tongass National Forest	237.0	173.0	0	16.6	47.4
Alaska Native Corps	100.0		73.0	7.0	20.0
State of Alaska	18.0	13.1	0	1.3	3.6
Mental Health Trust	0	0	0	0	0
Canadian Imports	0	0	0	0	0
Total	355	186.1	73.0	24.9	71.0

Source: McDowell Group estimates

Table 7.
Summary of Potential Southeast Alaska Timber Supply
Under Weak Markets for Sawn Wood Products
(in MMBF)

Source	Volume	Sawlogs Domestic Processing	Sawlogs Export	Cedar	Utility/ Lower Grade Logs
Tongass National Forest	237.0	120.9	0	16.6	99.5
Alaska Native Corps	100.0		73.0	7.0	20.0
State of Alaska	18.0	9.2	0	1.3	7.6
Mental Health Trust	0	0	0	0	0
Canadian Imports	0	0	0	0	0
Total	355	130.1	73.0	24.9	127.1

Source: McDowell Group estimates

These tables show that, even under current harvest limits, Southeast Alaska has the potential for an integrated forest products industry consisting of a sawmilling industry processing from about 130 to 186 MMBF annually; an export industry processing up to 98 MMBF annually (Native Corporation and cedar exports); and a fiber based industry processing from about 71 to 127 MMBF annually. The chapter entitled “A Sustainable Southeast Alaska Timber Industry,” includes discussion of some of the legal, regulatory and policy changes needed to make this a truly viable alternative.

STATUS OF SOUTHEAST ALASKA TIMBER PROCESSING

Existing Mills

The existing wood products industry in Southeast Alaska consists of about 20 commercial mills, only a dozen or so of which have been active in recent years. Three of these mills process about half of the region's timber harvest. Green shop lumber is the primary product sold outside the region. It is reprocessed, mainly in the Pacific Northwest, into door and window components, molding, etc. Regional exports have also included chips, railroad ties, shingles, timbers, and siding. Cants/flitches have been an important export in the past, and spruce flitches remain a high-value product. Sales into the local lumber market include dimension lumber, house logs and timbers, decking, siding and specialty products such as hot tubs.

The table below is based on information from the USDA Forest Service publication, *Estimating Sawmill Processing Capacity for Tongass Timber*, May 2004 (Document # PNW-RN-545). The publication shows results of a regional mill inventory performed in 2000 and 2002 by the Forest Service. The Forest Service is currently collecting 2004 data, but that data is not yet available. The information below consists of estimates of 2004 mill status based on the published data for 2002 and modified per knowledgeable industry sources. It does not represent actual mill survey results.

**Table 8.
Sawmill Industry Capacity for Southeast Alaska**

Mill Name	Location	Description	Estimated Status in 2004	Estimated MMBF Capacity CY 2004 ¹⁸
Icy Straits Lumber Co	Hoonah	Conventional carriage, circle saw headrig, edger, trim saw, log debarker and merchandizer, dry kiln under construction	Active	20
Viking Lumber Co	Craig	Conventional carriage, band saw headrig, linebar and gang resaws, edgers, trim saw, log debarker and merchandizer, end-dogging circle saw scragg	Active	60
D&L Woodworks	Hoonah	Portable band saw mill and portable circle saw	Active	1.75
Northern Star Cedar	Thorne Bay	Portable circle saw mill and shake/shingle mills; additional heavy duty portable circle mill	Active	7.5

¹⁸ Estimated mill capacity is an estimate of the processing capability of the mill based on the amount of net sawlog volume (Scribner log scale) that could be processed by the mill, as currently configured, during a standard 250-day year, two shifts per day operating schedule, not limited by availability of employment, raw materials, or market.

Alaska Fibre	Petersburg	Portable circle saw mill, horizontal band resaw, edger	Active	1.5
Southeast Alaska Wood Products	Petersburg	Two portable circle saw mills, trim saw	Active	4.5
Thorne Bay Wood Products	Thorne Bay	Portable circle saw mill, trim saw, dry kiln under construction	Active	5
Porter Lumber Co.	Thorne Bay	Conventional carriage, circle saw headrig, gang resaw edger, trim saw and portable circle saw mill	Active	11
Silver Bay, Inc	Wrangell	Conventional carriages, band saw headrigs, linebar resaw edgers, trim saw, log debarker and merchandizer, planer mill	Active (Closure announced for fall 2004)	65
W.R. Jones and Son Lumber Co	Craig	Portable circle saw mill, dry kiln, planer mill	Active	1
Pacific log and Lumber	Ketchikan	Two conventional carriage mills with circle saw headrigs, horizontal band resaw, edger, trim saw, log debarker and merchandizer, dry kiln under construction	Active	33.6
Gateway Forest Products (lumber)	Ketchikan		Closed	50
Gateway Forest Products (veneer)	Ketchikan	Rotary veneer mill, log debarker and merchandizer	Closed	30
Herring Bay Lumber	Ketchikan	Conventional carriage, circle saw headrig, resaw edger, trim saw	Closed	10
Metlakatla Forest Products	Metlakatla		Closed	25
Annette Island Sawmill (KPC)	Metlakatla	Conventional carriage, single cut band saw headrig, linebar resaw. Gang edger/resaw, edger, trim saw, log debarker and merchandizer	Idle	70
Thuja Plicata Lumber	Thorne Bay	Portable circle saw mill and shake/shingle mill	Idle	7.5
Kasaan Mountain Lumber and Log	Kasaan	Conventional carriage, circle saw headrig, circle saw linebar resaw, edger, debarker	Idle	15
The Mill	Petersburg	Four portable circle saw mills	Idle	8.5
Chilkoot Lumber Co	Haines	Conventional carriage, 8-ft band headrig, 6-ft and 7-ft band resaws, debarker, chipper, edger, etc.	Idle	75

Source: USDA Forest Service *Estimating Sawmill Processing Capacity for Tongass Timber*, May 2004 (Document # PNW-RN-545) and McDowell Group estimates.

Installed Mill Capacity

In CY 2000 the Forest Service estimated mill capacity in Southeast Alaska in CY2000 to be 501,850 MBF, and that is approximately the total capacity today. Of that amount, 70 MMBF represents a Haines sawmill that has not been active in about a decade.

Recent changes include closure of Herring Bay Lumber in Ketchikan, which had an installed capacity of approximately 10 MMBF. The mill is now a museum. If Silver Bay Logging ceases operation and liquidates its equipment this fall, as was recently announced, it would remove another 65 MMBF of capacity from the region. Finally, one mill reportedly has increased its capacity by approximately 1 MMBF since the 2002 study was released.

While installed capacity is an indicator of production potential, sustained timber harvest at that level is not required to provide the basis for a healthy regional industry. The authors of the Forest Service study defined the industry annual mill capacity as the potential log volume consumption during 500 eight-hour operating shifts (i.e., double shifts). However, this may not be a sustainable production level for all mills. According to a representative of the Forest Service's Forest Products Laboratory in Madison, Wisconsin, no single, standardized methodology for computing mill capacity provides an accurate estimate for all mills.¹⁹ When preparing national and regional mill capacity estimates, the Forest Service tries to take into account the particular production situation at each mill.²⁰

Between 1981 and 1997 regional capacity utilization – estimated mainly on the basis of double-shifts – ranged from 20 percent to 88 percent. The average was 51 percent, roughly the equivalent of all mills operating single shifts for 250 days per year. During approximately the same time period, mills in the Pacific Northwest operated at 70 percent capacity utilization on average.²¹

Recent Mill Production

The Forest Service estimated actual production for the 20 mills surveyed at 87.1 MMBF in 2000 and 39.7 in 2002. Production in 2002 consisted of approximately 37.4 MMBF of lumber and about 3 MMBF of other products.²² Nearly 80 percent, 30.8 MMBF, was shipped to the Lower 48, with nearly all of the remaining 7 MMBF going to the Pacific Rim.

In 2000, 15 of the mills were active, 4 inactive and 1 under construction. In 2002, there were 11 active mills and 7 mills idle. Based on the Forest Service's double-shift capacity estimates, this represents utilization of 17 percent in 2000 and 9 percent in 2002. Table 9 shows the disposition of mill production by species.

¹⁹ Henry Spelter, personal communication, June 2004.

²⁰ A study by the Forest Service (Morse 1998) estimated the capacity of Southeast Alaska mills at that time to be 281 MMBF, based on 250 eight-hour operating shifts per year (i.e., single shifts).

²¹ Morse, Kathleen, *Evaluating the Demand for Tongass Timber*, September 1998.

²² Kilborn, Kenneth, et al, *Estimating Sawmill Processing Capacity for Tongass Timber*, May 2004.

**Table 9.
Mill Production by Species (million board feet – MMBF)**

	CY 2000 Production	CY 2002 Production	Total Percent
Sitka Spruce	25.5	11.6	29%
Western Hemlock	50.0	21.4	56
Western Red Cedar	8.8	5.4	11
Alaska Yellow Cedar	2.8	1.2	3
Other	0.01	.2	0
Total	87.1	39.7	100%

Source: USDA Forest Service, Sitka Wood Utilization Center

Southeast Alaska mill production consists mainly of green shop lumber, as well as some dimension lumber, siding, decking, cabin beams and specialty cuts. Some is also sold for pressure treating at facilities in the Pacific Northwest. In 2000 approximately 22 MMBF, or one quarter of total production, was cut into cants. However, in 2002 cant production among the 20 mills surveyed had fallen to just 0.5 MMBF.

A key factor in mill production is that it would be very difficult for the existing Southeast mills to be competitive doing secondary manufacturing for export outside the region. For example, while there are at least a dozen dry kilns either operating or under construction in Southeast Alaska, including four of 15,000 BF capacity or larger, mills producing kiln dried, planed lumber are targeting local lumber yards and contractors, rather than large commodities brokers. Making finished lumber is attractive because lower quality logs can, with some care, be sawn into products that are competitive locally. However, scale of operations and transportation and operating costs currently preclude entering the intensely competitive finished lumber markets in Canada and the Lower 48.²³

The three mills representing the bulk of current production in Southeast Alaska are Pacific Log and Lumber (Ketchikan), Viking Lumber (Klawock, on Prince of Wales Island), and Silver Bay Logging (Wrangell). These three mills are operating on roughly half their target timber supply. It would require 100 to 110 MMBF of timber to allow these mills to operate at what their managements consider efficient production levels. The vast majority of this timber would need to come from the Tongass National Forest.

Pacific Log and Lumber has been operating the past four years on less than 10 MMBF of Tongass timber annually with a full-time crew of 23. The mill consists of two conventional carriage mills with circle saw headrigs, horizontal band resaw, an edger, a trim saw and a log debarker and merchandizer. It recently added a dry kiln. The mill's

²³ For a detailed discussion of why this is true, see the Forest Service publication *Assessment of the Competitive Position of the Forest Products Sector in Southeast Alaska* by Guy C. Robertson and David J. Brooks, 2001. PNW-GTR-504.

principal products are shop lumber for moldings and casings, yellow cedar lamination stock and lumber for local markets. The Forest Service estimates that the maximum capacity of the mill based on 500 shifts per year is 33.6 MMBF.

Viking Lumber is using 22 MMBF of timber annually to produce mainly shop lumber and some dimension lumber and chips. The mill employs 42 people. It consists of a conventional carriage, band saw headrig, linebar and gang resaws, edgers, trim saw, log debarker and merchandizer and end-dogging circle saw scragg. The Forest Service estimates that the maximum capacity of the mill based on 500 shifts per year is 80 MMBF. Viking recently installed a mill capable of processing second-growth timber.

The Silver Bay Logging mill is similar to that of Viking Lumber. The Forest Service estimates its capacity at 65 MMBF. Prior to filing for bankruptcy in January 2003, it was producing 12 to 15 MMBF. The company resumed operations in spring 2004. In June 2004 it announced it would liquidate its assets and cease operating after the end of the summer season, but it has since said it will try to remain open.

All three larger mills and several of the others saw red cedar. Most yellow cedar is shipped overseas, due to lack of established domestic markets. Icy Straits Lumber in Hoonah mills some yellow cedar for the local market and has had success with pre-cut cabin kits. The larger mills also have chipping capability and supply chips to British Columbia and the Pacific Northwest as commodity prices dictate.

Current Markets and Trends

Southeast Alaska lumber markets are in transition. Whereas markets once consisted mainly of shipping minimally processed lumber and cants to Japan, Southeast Alaska mills now ship product mainly to the Pacific Northwest in the form of shop lumber. Recent dramatic increases in cedar prices suggest another opportunity for Alaska producers. Overall, mills are tending to market a greater portion of production locally.

Japanese demand has begun to recover, but it is also evolving due to regulatory changes and new construction technologies. A major transition is from demand for primarily green to primarily kiln-dried product. However, Japan continues to have a preference for non-structural/decorative Sitka spruce, western red cedar and Alaska yellow cedar.

By the end of 2003, US housing starts had reached their highest levels since 1984. Since the beginning of 2004, continued growth in the US construction and remodeling markets have led to strong prices for products typically produced by Southeast Alaska mills. The most important product for these mills today is green shop lumber that is shipped mainly to the Pacific Northwest for additional processing. Shop lumber may be used for many different purposes, including windows, doors, molding and furniture. Southeast mills also supply material that is in demand for pressure treating, also in the Pacific Northwest. Some of this material is sold back into Alaska. In 1998 McDowell Group estimated that Alaska consumed about 13 MMBF of pressure treated lumber. The amount is likely substantially higher today, due in part to harbor revitalization projects and rapid growth in the Matanuska-Susitna region. Table 9 shows the average annual prices for typical products made with Southeast Alaska timber.

Table 10.
Average Annual Prices for Selected Wood Products 1993 – 2003
(Dollars per thousand board feet)

	Hem-Fir 2X6 Random Kiln-dried #2 & Better	Spruce-Pine-Fir 2X6 Random Kiln-dried #2 & Better	Western Red Cedar, Green 2X8 #2 & Better	Shop/Mldg & Better Composite Price	Medium Density Fiberboard 3/4" West
1993	364		534		
1994	362		462		
1995	295	275	447	737	
1996	385	373	564	795	411
1997	372	373	774	854	362
1998	301	304	699	728	342
1999	362	365	593	788	344
2000	283	287	573	674	358
2001	258	260	599	678	369
2002	263	265	744	702	366
2003	255	259	817	590	337
Aug 2004	480	503	920	897	450

Source: Random Lengths – *Yearbook 2003* and August 20, 2004 publication.

The table shows that Western red cedar prices have been extremely strong recently. The first half of 2004 has also seen a surge in prices for construction lumber. On July 9, 2004 hem-fir 2x6 was selling for \$390 per MBF and by the end of August, it had reached \$480; SPF 2X6 was \$340 per MBF on July 9 and reached \$503 by the end of August. In contrast, hemlock squares, a traditional Alaska export to Japan, fell by as much as half between highs in the mid 1990s and the end of 2003.

Rough, green lumber from Southeast Alaska is in demand for a variety of uses because it tends to be of higher quality than comparable product from other regions. The critical challenge for Southeast producers over the past decade has been to maintain customer relationships during an extended period of uncertain and increasingly inadequate supply. Market perception of quality together with recent breakthroughs in the uses and certification of Southeast lumber, described below, have set the stage for realizing more value from the resource.

The basis for this value is a kind of brand that sets Southeast products apart. However, the first requirement of branding is consistency. This effort cannot be accomplished unless supplies are predictable well into the future. Further, it will be greatly aided if Southeast Alaska can achieve a level of integrated processing that makes the best use of the different components of the timber harvest.

Recent and Planned Technological Improvements

Statewide and Southeast Alaska Regional Strategies

Faced with profound changes in traditional markets and sources of supply, Southeast Alaska's wood products industry has responded with potentially far-reaching strategies. Taking its cue from the Region 10 (Southeast Alaska) Timber Industry Task Force appointed in 1996 by then-Governor Tony Knowles, the industry has identified new markets and ways to serve them. Among the efforts in this regard have been the following:

- The Alaska Department of Community and Economic Development and the Forest Service have sponsored analysis of a wide range of market opportunities, including in-state, US and international markets for spruce, hemlock, cedar, birch, and specialty products.
- The Alaska Wood Utilization Research and Development Center at Sitka was established "to unify and enhance opportunities for economic assistance to workers, families, businesses, and communities affected by the changing timber industry in Southeast Alaska." The Center has been especially active in working to improve yields, efficiency and technical capability at Alaska sawmills. An important element has been to study and promote the use of dry kilns to add value to local wood products. Another major area for the Wood Utilization Center has been research, technology transfer and project development on marketing and consumer preferences with respect to underutilized Alaska species, including alder, birch and Alaska yellow cedar.
- During the past two years the Ketchikan Wood Technology Center, under the auspices of the Juneau Economic Development Council, has engaged in several projects of potentially great importance to the Alaska wood products industry. Projects undertaken by the Center include certified grading for lumber produced in Alaska mills, studies of Alaska veneer strengths and the effects of pre-commercial thinning, and other technological advancements.

Some specific advances are described below.

Mill Efficiency

A Forest Service study between 1997 and 1999 evaluated lumber recovery rates at 22 Alaska saw mills representing approximately 90 percent of the State's production capacity. Seven of the mills were located in Southeast Alaska. The study found lumber recovery factors (LRFs) for the Southeast mills averaging 6.2. These were significantly lower, i.e., less efficient, than for mills in British Columbia and the Pacific Northwest.²⁴ The study concluded that, if Alaska mills could match the estimated LRF for modern sawmills in the Pacific Northwest (9.0), it would increase the amount of saleable product obtained from current log consumption by nearly 50 percent.

²⁴ Kilborn, Kenneth, *Lumber Recovery Studies of Alaska Sawmills, 1997 to 1999*, USDA Forest Service, April 2002, PNW-GTR-544

As with any manufacturing operation, control over production tolerances is critical in the forest products industry, and the industry has recognized that more efficient production is an important factor in regional competitiveness. The Forest Service Study concluded that, statewide, statistical process control could improve recovery by 25 percent.

However, approaching Pacific Northwest recovery rates may be unrealistic. Part of the reason for lower recovery rates is the use of heavy duty saw rigs that create wider kerfs (i.e., more waste). Mill owners point out that the larger rigs are needed when the mills handle the region's larger old-growth timber. At current production levels, it is not practical for most mills to use multiple saw rigs to minimize waste. An integrated regional industry could foster improved efficiency by giving mills more control over the sizes and types of timber they cut, thereby allowing them to use more specialized equipment.

The Forest Service study identifies another source of lost recovery as the intentional oversizing of rough green lumber that is shipped south for further processing. Here again, mill owners are constrained by the nature of the market and timber supply. Limited and sometimes intermittent supply means the main markets available to larger Southeast Alaska mills are niche purchasers of relatively small quantities of green lumber intended for additional processing. Since they are not producing for the commodity lumber market, mill owners feel the cost reduction achieved by tighter tolerances is less important than maximizing the value of the higher grades for their customers. Further, the timing and conditions of shipment make it difficult to estimate shrinkage accurately at the time of milling. Typically, mills cut generously, since shipments that fail to meet buyer specifications could threaten future business relationships.

New Species Designations

Among the most important of the Ketchikan Wood Technology Center's accomplishments has been the designation of Alaska hemlock and Alaska yellow cedar as unique species with their own lumber grade stamps. The Center has shown that both species are substantially stronger than what was previously indicated in engineering design tables. Those tables grouped Alaska wood with a variety of other woods.

The new species designations are expected to create a price premium for Alaska hemlock and yellow cedar used in structural applications, particularly in engineered wood products. Prices for engineered products don't fluctuate to the extent that those of commodity lumber do. The Center is currently testing glulam beams produced with Alaska yellow cedar

Other Technological Advances

Machine Stress Rating

Machine Stress Rating (MSR) is a process by which individual wood components are tested both visually and mechanically (for strength) before being incorporated into an engineered product. Alaska lumber lends itself to MSR because it is typically stronger

than lumber of the same nominal species that is grown in other locations. A machine stress rated component is more valuable per board foot than unrated lumber. The Ketchikan Wood Technology Center has been testing the potential of an MSR program using local lumber.

Double Dip Diffusion Preservative Treatment

Since the middle of the last century, experiments have been conducted to treat green Alaska spruce (white spruce and Sitka spruce) and white birch to improve their preservative properties using a soaking process. Spruce does not respond well when treated using the standard industry pressure process. The soaking or “double dip diffusion process,” may use a number of different chemicals and works especially well for spruce and other Alaska species. Treated timbers have been tested as fence posts, railroad ties and in wooden bridges. All have shown good resistance to decay. An advantage of the process is that the necessary equipment can be installed at the construction site, for example in rural areas. Challenges to commercializing the process include the time required to treat – up to six days of soaking plus several weeks to thoroughly diffuse the solution – and the need to convince potential purchasers of effectiveness. Broad use of the product would be greatly aided by an official industry certification. This has been another interest of the Ketchikan Wood Technology Center and the Sitka Wood Utilization Center.

Plasma Gasification of Wood and Municipal Waste

This very high temperature process is effective on a wide variety of wastes including many hazardous materials. The by-products are a clean combustible gas that can be used to generate heat and power and a non-leachable glass-like slag that may be crushed and incorporated into concrete and other construction materials or disposed of in a land fill. A plasma process using wood waste and generating electricity has been identified as a potential solution to the increasing challenge of municipal waste disposal in Southeast Alaska.

A SUSTAINABLE SOUTHEAST ALASKA TIMBER INDUSTRY

This analysis addresses the conditions necessary for an economically viable timber industry in Southeast Alaska. It describes the general components and key capital and operating issues of an integrated mix of manufacturing facilities capable of profitably processing the range of timber that makes up typical Tongass National Forest timber sales. Since a number of facilities for sawing timber already exist in Southeast Alaska, the analysis focuses largely on the nature of a core operation designed to utilize no. 3 and utility grade logs and mill residuals.

The first section describes the role of existing mills, potential core operations that use low-grade material, the minimum efficient scale for core operations, and alternatives for dealing with residuals. Then the discussion turns to raw material needs for an integrated industry and issues of scale as they relate to the types, amounts and cost of logs of different species and grades.

The discussion also addresses how logs could be allocated to different facilities. If the industry were vertically integrated within a single company, production would be shifted in response to market prices and demands to maximize the economic benefit of each log. The situation is more complex with several independent firms competing for the raw material stream. An ideally configured industry without market constraints would find the “highest and best use” for each log. That might mean manufacturing everything from musical instruments to wood fiber while at the same time utilizing sawdust and other mill waste to produce energy or other saleable byproducts.

A situation clearly to avoid is a mismatch between the raw material stream and the scale of plant operations that forces a facility designed for low grade material to consume a significant portion of sawlogs. There are myriad practical limitations on what a regional industry can aspire to. Our analysis identifies some of the most promising industry components for Southeast Alaska.

Finally, the chapter describes the range of economic benefits that would accrue to the region from a stable, healthy forest products industry.

Components of an Integrated Industry

The first component needed is a supply of raw materials that is predictable over a long enough time to justify and secure investment in the integrated manufacturing infrastructure. The original integrated Alaska timber industry – based on the pulp mills – could not have developed without long-term timber contracts. Today, it is not necessary to return to 50-year sales. But some method of ensuring a timber supply is pre-requisite to any significant investment in the region so that businesses may plan, finance and install production equipment and then be able to operate it at minimum through a two or three-year start-up phase. A reasonable time horizon for mill upgrades and smaller businesses may be in the area of ten years, but financial institutions considering a loan for a major manufacturing plant may need something longer.

Role of Existing Saw Mills

Roughly half the Tongass timber harvest is suitable for sawn wood. Based on recent data, there are only three operating SE Alaska sawmills of any size that could provide this basic milling function, two, if Silver Bay Logging closes.²⁵ However there are other milling facilities in the region that might be revitalized.

In an integrated industry, with an MDF plant or other fiber-based factory in the region, an important role for sawmills would be providing a supply of sawdust and clean chips to the plant(s). Depending on the process used, MDF may be made with up to 100 percent mill residues, though the amount of sawdust is limited to 9 percent.

Uses for Low-Grade Logs and Sawmill Residuals

Wringing maximum value from a log becomes more challenging and often capital-intensive as log quality declines. For this reason, the core requirement of a regional integrated industry is one or more plants that can successfully process and market the 40 to 45 percent of Tongass timber that is not desirable or useable for sawn lumber. With the lower grade material accounted for, a variety of businesses can evolve to make the most advantageous use of the higher-grade logs.

In the past, the two regional pulp mills – one in Ketchikan and one in Sitka -- performed the function of using lower grade material. The Sitka mill closed in 1993. In 1996, as the Ketchikan mill prepared to close, the Southeast Alaska Timber Industry Task Force identified a number of options for using low-end wood:

Export of round logs that are “surplus to the needs of local manufacturers.” The Task Force suggested that Grade 3 and lower logs might be so declared by the Forest Service, making them officially eligible for export.

Chip export. The Task Force noted that this approach relies on the “notoriously volatile” chip market.

Construction grade lumber. This requires grading and drying and the ability to compete with Canadian and Pacific Northwest producers on price.

Medium Density Fiberboard (MDF). The Task Force noted the challenge of competing with plants that are able to utilize recycled (waste) fiber and estimated a minimum annual fiber requirement of 80 MMBF.

Acid Catalyzed Organosolv Saccharification (ACOS) and other cellulose conversion methods whose primary product is ethanol. The world’s first commercial manufacture of cellulose ethanol fuel was announced in April 2004 by Ottawa-based Iogen Corporation. The facility is a demonstration project. Future commercial sites are currently being identified. For the present, any commercial viability in the US is contingent on government bio-fuel subsidies.

²⁵ USFS PNW-RN-545, *Estimating Sawmill Processing Capacity for Tongass Timber*, Kilborn, Parrent & Housley, May 2004; also PNW-GTR-544, PNW-GTR-522

Laminated Veneer Lumber (LVL). LVL is an engineered wood product manufactured from peeled veneers. The veneers, alone, are also a saleable product, but since they are a lower-end product, they are somewhat more susceptible to commodity cycles. A long and strenuous effort to establish a veneer mill at the old pulp mill site in Ketchikan has so far been unsuccessful. However, there is renewed interest in the idea.

Laminated Strand (LSL) and Parallel Strand Lumber (PSL). These are proprietary engineered wood products made under license to Weyerhaeuser from strands of low-grade logs, often fast-growing, inexpensive trees. Oriented Strand Board (OSB) is a similar product, but in sheet form. OSB competes mainly with exterior grade plywood.

Fish/wood-waste compost. The composting technology is simple and the raw materials readily available. Commercial viability requires that substantial amounts of both wood and fish waste be available on site. Local prices for soil amendments are high, but the size of the market is limited.

Other uses for lower grade material include particleboard and a variety of engineered and manufactured products made from gluing together small pieces of milled lumber. Products made from solid lumber, veneers, and strand lumber require round logs as a raw material. MDF, ethanol, particleboard and compost may be made from wood fiber and, in some cases, sawdust. Mill residues may be burned to produce energy for mill operations and, in some areas, electricity is commercially produced in wood-fired power plants.

Market analysis for this report identified a set of core operations similar to those above as most viable for an integrated wood products manufacturing facility in SE Alaska. The analysis considered wood supply (species available, volumes, quality), markets and processing (labor, power, non-wood raw materials, etc.). These options are shown in Table 10. Some possibilities were deemed to have too many unknowns associated with them for study within the scope of this project. These include OSB, chemical extractions and power generation. The study also assumes a theoretical limit of available fiber of 400-500 million bd. ft.

**Table 11.
Integrated Wood Products Manufacturing Options for SE Alaska**

	Lumber*	CGL**	Lam stock	Glulam beams	Veneer	LVL	Fiber	MDF	Chips	Residue
Sawmill	X	X	X	X			X		X	X
Glulam beams	X									X
Veneer	X					X			X	X
LVL	X				X	X			X	X
Fiber	X							X	X	
MDF	X						X		X	X

*Dimension, cants, boards, timbers, planks, shop

** Certified glued lumber

These core operations are potential elements in a system of production. It is beyond the scope of this study to identify the precise processing facilities that would provide the best economic mix for Southeast Alaska. Those decisions must be a function of specific market and technological opportunities, site-specific conditions, operator expertise, availability of capital, etc. Similarly, it is impossible to give a firm estimate of the amount of timber needed to support an optimum processing network. Below we discuss some of the specific issues that must be considered.

Waste Handling

Modern sawmills typically have little or no unutilized waste. Mill residuals not useable as chips or fiber can often be burned for heat or electricity. A core manufacturing operation capable of using fiber from around the region would minimize the waste stream in Southeast Alaska. Location is a determinant of economical use for residuals, however. A core operation may find it advantageous to use residuals from some mills and not from others. Typically, milling and fiber-based manufacturing are co-located.

In addition to fiber-based manufacturing, a number of technologies are currently being explored in Southeast Alaska to produce saleable products from mill residuals. One would incinerate the residuals with municipal waste at a high temperature, using the heat to produce electricity. A study is currently underway to evaluate the commercial feasibility of such an operation. Wood waste may also be burned to produce the heat needed for lumber drying. As noted above, wood waste may also be composted and sold as an ingredient in soil amendments or used to generate electricity.

Potential for an MDF Plant

Our research indicates that an MDF plant may be the most economically viable user of low-grade material. Currently, a study is being conducted under the auspices of the University of Alaska to explore the financial feasibility of this alternative. Discussion in this report of furnish requirements for MDF manufacture should be considered theoretical and preliminary, pending the results of the feasibility study. Our focus here is on potential raw material quantities from the region and the policy, regulatory and legislative changes needed to ensure them.

Dr. Allen Brackley, Coordinator of the University of Alaska Forest Products Program, Sitka, Alaska and Eugene Davis, a forest products consultant, have developed a financial model to explore the technical and economic feasibility of selected plants to utilize lower grade logs. Their “Model to Evaluate the Technical and Economic Feasibility of Constructing a Board Plant (OSB or MDF) in Southeast Alaska” analyzes relationships among harvest levels, utilization patterns, fixed costs, production costs, mill capacity and product sale price.

The model is designed for use by students and to help knowledgeable individuals explore the implications of various capital and operating scenarios. It is not an optimization model. That is, it is not designed to find the best possible scenario. Rather, model output varies depending on the assumptions adopted for any particular analysis. No single set of outputs should be interpreted as a preferred strategy per se, and the margin of error for any particular output is potentially large. However, the analysis performed thus far with the model provides some useful guidelines.

Potential Scale of Operations

Efficiency is at the heart of economic sustainability, and this often means a large scale of operations. Around the world, the timber industry is moving toward larger and more automated production. Between 1996 and 2003 149 North American sawmills closed, representing an installed capacity of 17.6 million cubic meters. Only 25 new mills were constructed. Yet every timber producing region of the US and Canada increased total installed capacity during the period, including the US West, which was hardest hit by closures. The reason is that many existing mills expanded and the new ones tended to be large. In British Columbia, a single new mill (W. Chilcotin Forest Products) added 95 MMBF (224 thousand cubic meters) of capacity and mills of more than 125 MMBF (300 thousand cubic meters) opened in Ontario and Washington State.²⁶

However, while bigger tends to mean more efficient, production capacity must strike a balance between the raw material supply and market demand. Further, there is often more than one manufacturing process that may be used for a given product, and different processes have different scale requirements. For example, the Mende process for making MDF can be much smaller and cost much less in capital than continuous or multi-opening presses. (See Appendix I, page 53, for a discussion of the options for manufacturing MDF.)

While commercial MDF plants exist having as little as 36 million square feet capacity, requiring 22 to 25 MMBF of raw material, the industry trend is strongly toward larger facilities. A feasibility study for an MDF plant in New Hampshire concluded that a plant of between 125 and 150 MMSF "... was the only facility with a chance of being developed by any player in the North American MDF industry."²⁷

Simulations by Brackley/Davis suggest that the minimum efficient scale for an MDF plant located at an unspecified location in Southeast Alaska is roughly 140 million square feet capacity (3/4 inch basis) and would require a harvest sale quantity of between 140 and 150 MMBF of timber per year to supply the MDF plant with low-grade logs and residues from the sawmills in the region. The plant would process about 80 MMBF. The remaining 60 to 70 MMBF would be suitable for sawing, except for a portion that is inevitably lost in the logging process.

At this production level, the Brackley/Davis model identifies furnish for the plant as approximately 9 percent sawdust (the maximum for MDF), 27 percent sawmill chips and 64 percent roundwood. If there were more timber available and other uses for low-grade roundwood – for example, a veneer mill – then a larger portion of the MDF furnish could be chips and other residuals. A feasibility study currently being planned should pinpoint the minimum efficient scale of an MDF plant more closely. Multiple plants may have economic advantages. See "Effects of Harvest Size on Industry Strength," below.

²⁶ Spelter, Henry, *Sawmill Closures, Openings, and Net Capacity Changes in the Softwood Lumber Sector, 1996 – 2003*, USDA Forest Service FPL-RP-603

²⁷ Innovative Natural Resource Solutions LLC and Draper/Lennon, Inc. *Feasibility Analysis of Medium Density Fiberboard Manufacturing in New Hampshire*, July 2001. Produced for the New Hampshire Department of Resources and Economic Development.

Cost of Operations

An obvious and critical question is whether an MDF plant of any size in Southeast Alaska could operate profitably. More analysis is needed, but the Brackley/Davis model suggests that one might at least break even at market prices approximating those in recent years. Keys to this include keeping labor costs within industry norms and using sawmill residuals as furnish. Not surprisingly, the model projects profitable operation only when variable costs are similar to those in other regions. Although MDF has the advantage of being suitable for a variety of non-construction-related uses, the market for MDF is largely ruled by commodity pricing. There is little room for high-cost producers, mainly because there are more good potential sites for MDF plants than the size of the market can accommodate. There is little reason for a profit-driven company to construct a plant in a high-cost location. The New Hampshire study concluded that that state was not a viable location for MDF, largely because of local power and raw material cost.

The cost of capital is a factor if an MDF plant is privately developed. The Brackley/Davis model assumes that any Alaska plant would be built on an already developed site and would incorporate largely used equipment to keep capital costs low. (This assumes that used equipment can be found that does not place the operation at a competitive disadvantage). Still, no private developer, including Sealaska, which has the resources and a private timber supply, has yet pursued the idea. This indicates that a reasonable return on investment has not been demonstrated. The New Hampshire study estimated target internal rates of return for the industry at 14 to 16 percent in 2001.

Power Cost – MDF production is relatively power intensive. The New Hampshire feasibility study estimated annual electrical consumption at 88,000 MWh/year for a 130 MMSF facility and concluded that, for the facility to be viable, it would need a wood-fired power co-generation plant. Electrical rates in New Hampshire in 2001 were 11.75 cents per KWh, compared to a projected cost of 7.9 cents using wood cogeneration.²⁸ Industrial electricity cost in Southeast Alaska averaged 7.4 cents per KWh at that time and remains relatively low. The Brackley/Davis model uses published industry averages for power cost. These will bear more detailed analysis when assessing site-specific feasibility, as will the potential for power co-generation in Southeast Alaska.

Labor Cost – According to Dr. Brackley's research, labor is typically about 15 percent of variable cost for MDF production, the largest component after raw materials. This is in line with the New Hampshire study, which estimated operating labor at 9.3 percent and selling/administrative labor at 5.1 percent. With revenues of \$50 to \$55 million, roughly \$6 million to \$7 million would therefore be allocated to fully loaded labor cost (including employer taxes and benefits). The New Hampshire study estimates 83 production personnel and 32 administrative and sales positions for a total of 115 employees. Brackley Davis believe that by maintaining a flat organizational structure and serving only a single purchaser an Alaska plant might operate with a total of 80 to 85 employees. They assign an average salary of \$46,000 per year. In 2001, the average wage for timber fallers in Alaska was about \$61,000 per year compared to Oregon (\$47,740) and Georgia (\$21,870). Average sawyers wages in Alaska were about \$30,000, approximately 10 percent higher than in Oregon and 20 percent higher than the national average.²⁹ Dr.

²⁸ The New Hampshire MDF feasibility report devotes a good deal of time to discussing wood-fired power plants. This may be explained in part by the fact that it is part of a larger study that recommends expansion of wood-fired power generation as the state's best option to use low-grade wood.

²⁹ *Alaska Economic Trends* December 2003, Alaska Department of Labor and Workforce Development.

Brackley has emphasized the key role of labor cost in making an Alaska plant competitive.

Cost of Raw Materials – Both the Brackley/Davis model and the New Hampshire study indicate that using sawmill residuals is imperative for keeping raw material cost down. Many MDF plants operate entirely on chips and sawdust. The Brackley/Davis analysis adopts a delivered raw material cost target of \$180 per MBF. This figure was cited by a knowledgeable industry representative as the maximum raw material cost that would allow current Southeast sawmills to operate profitably.

The model indicates that a Southeast Alaska plant could break even on operations using 64 percent round logs. To do this, the plant would need to recover 220 cubic feet of product from each thousand board feet of raw material and the price for MDF would need to be approximately \$350 per thousand square feet of product. This price represents the three-year average for 2001 – 2003, but exceeds the average for 2003 of \$337.³⁰ Plant economics would improve if a higher proportion of mill residuals were used in place of round logs. This proportion is largely dictated by the composition and size of the timber harvest and the relative market prices for MDF and sawn lumber.

Shipping Cost – Shipping costs in Southeast Alaska, particularly southbound (“backhaul”) costs, are an amorphous target because they depend significantly on the volume and timing of cargo. Numerous studies have noted that shipping is an obstacle to industrial development in the region. Nevertheless, existing mills have been able to make a profit shipping to British Columbia and the Pacific Northwest when delivered log cost has been under the \$180 threshold and markets have been reasonably strong. The Brackley/Davis model currently assumes shipping costs of \$1.41 (ocean) and \$0.09 (freight inland) per cubic foot of product, about one-third of total variable costs. However, it is possible that economies of scale from an integrated industry and/or improvements in regional transportation systems could moderate shipping expense.

Timber Requirements for an Integrated Industry

Components of the Timber Supply

As noted earlier, the existing sawmilling capacity is sufficient to process any quantity of higher grade logs that is likely to be produced in the region. What is needed, is an outlet for the 42% of the timber that represents lower value logs and utility.

Table 12, shows the projected species and log grade composition of various harvest levels. Historically, No. 2 grade logs and better were processed into lumber while the cedar component was exported and the No. 3 grade logs and utility volume was chipped and processed by the pulp mills. This has changed in recent years. First, the loss of the pulp mills eliminated this outlet for the lower grade material forcing the sawmills to saw more of the lower grade material or attempt to sell it on the chip market. Second, the Forest Service tightened policies on cedar export with the objective of encouraging local processing of this material. Finally, changes in Forest Service utilization standards have allowed more of the lower quality material to be left in the woods.

³⁰ *Random Lengths Yearbook*, 2003.

Overall, about 58% of the wood coming from the Tongass is of the higher grades that would typically be made into sawn products while the remaining 42% would typically be processed into pulp products or other fiber based manufactured products such as medium density fiber board (MDF). However, it should be noted that market conditions can change this ratio significantly. In strong markets for sawn materials it may become economic to process No. 3 logs into sawn products. In addition, mills that have kilns and planers are beginning to compete in the local dimension lumber market using product from some lower grade logs.

The projected harvest composition in Table 12 was interpolated for this study from species and log grade distributions reported by the USDA, Forest Service in *Evaluating the Demand for Tongass Timber*, September 28, 1998.

Table 12.
Projected Species and Log Grade Composition
of Various Harvest Levels

Log Grade	Harvest Levels				
	100 MMBF	150 MMBF	200 MMBF	250 MMBF	300 MMBF
Peeler/Select/No.1 Spruce	5.0	7.5	10.0	12.5	15.0
Peeler/Select/No.1 Hemlock	7.0	10.5	14.0	17.5	21.0
No. 2 Spruce	15.0	22.5	30.0	37.5	45.0
No. 2 Hemlock	24.0	36.0	48.0	60.0	72.0
Cedar	7.0	10.5	14.0	17.5	21.0
No. 3 Spruce	6.0	9.0	12.0	15.0	18.0
No. 3 Hemlock	16.0	24.0	32.0	40.0	48.0
Utility Spruce	4.0	6.0	8.0	10.0	12.0
Utility Hemlock	16.0	24.0	32.0	40.0	48.0
Higher Value Logs	58.0	87.0	116.0	145.0	174.0
Lower Value Logs/Utility	42.0	63.0	84.0	105.0	126.0

Source: USDA, Forest Service in *Evaluating the Demand for Tongass Timber*, September 28, 1998 and McDowell Group.

Quantities of Timber Needed

While the proportion of Tongass timber that can be sawn varies from sale to sale and market to market, over time it cannot substantially exceed the proportion of higher value logs in Table 11. Regardless of the size of the harvest available to an integrated industry, therefore, something between 30 and 40 percent must be used by one or more core operations in the form of round logs. If they are able to utilize fiber, the core operations can lower their costs by supplementing those logs with mill residues. As the overall harvest goes up, mills are able to saw more logs and this, in turn, produces more residues.

The timber harvest needed to supply a medium sized MDF plant is well within the Tongass ASQ. Based on historical records, one thousand board feet (1MBF) of Southeast Alaska pulpwood yields 2.8 bone dry tons (BDT) of chips. Raw material needs for MDF manufacture vary somewhat depending on the process used, but an average is 1.6 BDT per thousand square feet (MSF) of product (3/4" thick). An MDF plant producing 140 MMSF would therefore need 1.6 divided by 2.8 or 0.57 MBF per MSF of product for a

total raw material supply of 80 MMBF (log scale). A Mende plant would use proportionally slightly more raw material than other processes.

Ideally, only the lowest quality 30 to 40 percent of the timber harvest would go directly to MDF manufacture in the form of logs. The rest of the MDF raw material would come in the form of mill residue resulting from sawing the higher quality logs into lumber. Total timber processed to produce that lumber and the 140 MMSF of MDF would be 140 to 150 MMBF, as described above.

However, a harvest between 140 and 150 MMBF is not enough to keep the mills that are currently active in the region operating at their most efficient levels. It is an oversimplification, but for illustrative purposes, we might consider 80 MMBF of harvest as the furnish for the plant and the balance – 35 to 60 MMBF as furnish for existing sawmills. The latter is similar to the harvests of the past few years and, taken alone, is not enough to support an industry, despite the fact that the MDF plant would improve the economics of timber sales by reaping value from low-grade material.

The regional harvest for a minimum-scale sustainable industry would probably need to approach the 200 MMBF levels shown in Table 11. This would provide enough higher value logs for the region's currently operating sawmills to function at efficient levels – 100 to 110 MMBF, as well as the 80 MMBF needed for MDF production. The harvest is within the upper limit of the average annual harvest that might be obtained under the current Tongass Allowable Sale Quantity of 267 MMBF. Morse (1998) estimated that under the Forest Service's "high demand case" average harvests between 2003 and 2007 would be 221 MMBF, gradually increasing over time.

Effects of Harvest Size on Industry Strength

Analysis for this study indicates that many of the benefits of an integrated industry may be obtained at harvest levels within the Tongass ASQ. However, this level would also impose limitations. At this scale, the industry would be too small to see truly competitive pricing among its constituent firms. The number of potential buyers for timber sales, logs and chips would be very limited. All sawmills likely would be dependent on a single MDF plant or other purchaser of low-grade material. Location would be a big factor in the value to a core operation of mill residues and low-grade timber. Of there is only one core operation, businesses would tend to group around it for efficiency at the expense of other timber-dependent communities in the region. Yet total operations might still be too small to, for example, minimize transportation costs.

A veneer mill would add diversification as well as jobs to an integrated industry. By using primarily medium-grade, number 2 logs, a veneer mill would help maximize the economic value of the raw material. However, it would require at least an additional 35 MMBF of harvest to support it.

The larger the available harvest, the more likely it is that a variety of businesses will evolve throughout the region. How this evolution would take place at different harvest levels and whether there is a "right" size industry for the region are impossible to say without knowing, for example, the actual type, capacity and location of any core operations.

Marketing Products from an Integrated Industry

In general, the major global trends described in the 2000 *Global Markets* report continue to develop. These include:

Consolidation and modernization of plants to minimize costs. The US West and British Columbia have been especially hard hit by lumber and plywood mill closures because plants there tend to be old and production costs higher than in the East and US South.

Shrinking of traditional export markets due to world economic trends as well as competition. Since 1989, US log exports have declined 40 percent. At the same time, exports from Oceania (mainly New Zealand) and Europe (mainly Scandinavian farm timber and Russian logs) have increased 200 percent and 80 percent respectively. A strong dollar has contributed to displacement of US logs and lumber in Asian markets.

Concentration of production in areas with low costs, particularly low labor cost. Labor cost in wood production is a function of both wages and ease of harvest. In areas with plantation forests, labor costs are low largely because timber is even age and size and generally located on level ground. A 2001 study by a former Canadian forestry professor³¹ reported that coastal British Columbia had softwood lumber production costs that were 2.7 times higher than those in Chile and double those in Brazil. Both these countries have intensive plantation programs. The Pacific Northwest was somewhat better, but still double Chile and two-thirds higher than Brazil. Labor as a percent of total cost was estimated at 25 percent in Chile, 30 percent in Brazil, 40 percent in British Columbia, and 28 percent in the Pacific Northwest. Alaska has been identified as having somewhat higher overall costs than the Pacific Northwest, with labor a substantially higher component at \$154 per MBF compared to \$99 per MBF in the Pacific Northwest (CINTRAFOR, 1998).

Intensive management of timber production, often in private forests and plantations. Plantations represent just 5 percent of forestland, but produce 35 percent of world industrial roundwood. By 2020, this is expected to reach 44 percent. New Zealand has become a major player in forest cultivation. Brazil is another fast-growing competitor.

Substitution of fiber-based and non-wood products for solid wood. This includes engineered materials like LVL, I-joists, MDF and OSB, as well as plastic decking and siding, steel components for residential construction, and a variety of products that use adhesives to join small wood components into larger ones, such as glulams, finger-jointed stock, and strand lumber.

Although the picture is one of intensifying competition and consolidation, Alaska has some unique advantages. The two main ones are:

- Access to timber with unique structural and aesthetic qualities, including old growth and cedar.
- The flexibility that comes with being a small, niche player.

³¹ Pearce, Peter, as reported in *Alaska Economic Trends*, December 2003.

An integrated industry is key on both counts. It is neither desirable nor necessary for Southeast Alaska to compete directly with huge industrial wood producers around the globe. The amount that could be produced under any potential Tongass timber harvest scenario is not enough to affect demand and supply in any major market. Rather, as Dr. Brackley has stressed, the key to profitability in the timber industry is understanding the value of what one has. This means processing each component of the timber supply for its highest and best use, and that, in turn, means an integrated industry. The combination of specialty products (i.e., engineered products or their components) and high-grade wood custom sawn for niche markets appears to be Southeast Alaska's best opportunity.

As has been noted many times in many reports the absolute essential for success in a specialty product is stability and assuredness of supply. This is not as important in commodity products or arts and crafts. However, the combination of high costs for wood, labor, power and other ingredients; distance from the lower 48; and especially competition from the many commodity wood products mills in the west coast of the US and western Canada make it highly unlikely that a commodity wood industry could flourish in Alaska. At the other extreme, arts and crafts do not form a basis for industrial development with consequent provision of jobs and taxes to the Alaskan economy.

Thus constancy and continuity of supply to selected target specialty markets is a sine qua non, whether these markets are in Japan or the US. This analysis shows only scattered potential for specialty Alaskan wood products in the US, notably yellow cedar lamina and beams. There is significantly more promise of markets in Asia (Japan, China, other countries) which takes advantage of Alaska's unique wood resources (especially yellow cedar) and closer shipping distance to Japan. We can state without reservation that any development of markets abroad without absolute fidelity of supply will fail.

Obviously, to guarantee a continuous supply of product to market requires in turn a continuous supply of raw material, in this case timber from public and private forests. Without a commitment of timber supply there can be no commitment of supply to markets.

Other obstacles inherent in Alaska can be overcome with selected products in target markets. Equipment can be purchased used, however a warning is in order. While used equipment is less expensive and often suitable, by definition it is sold because it failed or was replaced by better equipment elsewhere. Older used equipment almost always carries with it higher costs of production and maintenance.

Skills can be taught and skilled labor is available in Alaska, which has been the site of technically sophisticated pulp manufacture. Power can be generated although at higher cost than in many places. Note that some of the potentials outlined here do not require significant power (e.g. glulams, CGL) while others do (MDF, fiber, LVL). Appendix I contains market summaries for the most promising products that could be marketed by an integrated Southeast Alaska timber industry.

These are:

- Sawmill / Certified Glued Lumber (CGL)
- Sawmill / Glulam Beams
- Veneer and Laminated Veneer Lumber
- MDF
- Fiber

Legal, Regulatory and Policy Impediments to an Integrated Industry

Given the potential markets and the raw material supply base in Southeast Alaska, why hasn't an integrated industry developed? There are several reasons. Global demand for softwood timber products is steadily expanding, but so is the range and sophistication of competitors. Production and transportation costs in Southeast Alaska are not insurmountable barriers, but they do require innovation, investment and resiliency on the part of the local industry. In this regard, the short and long-term supply of federal timber is the primary impediment to the development of an integrated industry.

Opposition to timber harvesting on the Tongass National Forest has been a cause célèbre of the environmental movement for nearly three decades, during which time the timber harvest levels on the Tongass have dropped by about 90%. Sales are routinely appealed and litigated and federal legislation is introduced annually that would halt or significantly impede further timber harvest. Most recently, the US House of Representatives passed a bill that included language banning construction of any new permanent roads on the Tongass in connection with timber harvesting. The ultimate fate of this provision awaits action in the Senate. However, whether or not the provision is ultimately defeated its introduction and passage in the House is illustrative of the tenuous nature of the Tongass timber program.

Within this competitive, legal and political framework, it seems unlikely that anyone will step forward and invest the money needed to develop a processing facility for the lower grade materials. The same holds true for the sawmilling portion of the industry – much of which has been characterized as old, inefficient and in need of modernization in order to improve the economics of this sector of the industry.

What is needed is some certainty of supply. The long-term contracts of the 1950's provide one model though they turned out to be less certain than originally intended. Another model might be a clear and purposeful statement of Congressional intent enshrined in federal law stating unequivocally a federal intent to foster the reestablishment of an integrated forest industry in Southeast Alaska by mandating the offering of a specified level of economic timber from the Tongass on an annual basis. Even this, however, may not provide long-term certainty as the history of Section 705(a) of ANILCA so aptly illustrates.³²

³² Section 705 (a) of the 1980 Alaska National Interest Lands Conservation Act, (ANILCA), stated that "The Congress authorizes and directs that the Secretary of the Treasury shall make available to the Secretary of Agriculture the sum of at least \$40,000,000 annually or as much as the Secretary of Agriculture finds is necessary to maintain the timber supply from the Tongass National Forest to dependent industry at a rate of four billion five hundred million foot board measure per decade". Ten years later, this provision was repealed in the 1990 Tongass Timber Reform Act, (TTRA).

Other policy considerations that need to be examined include the efficacy of many of the standards and guidelines (S&Gs) in the current Forest Plan. These S&Gs have had a marked effect on increasing costs. Where necessary in order to protect the resource – fish, wildlife and water quality in particular – they should be retained. However, they should be modified to reduce costs where doing so will maintain adequate protection of the resources. While this is an area beyond the scope of this study, we believe it may hold promise for improving the economics of timber harvesting on the Tongass.

Another policy area that deserves exploring is the way the Forest Service appraises timber. For decades on the Tongass, the appraisal method was residual value appraising. In simple terms, a residual value appraisal looks at the value of the end product or products that can be manufactured from the mix of timber in a sale. The costs of producing those products are then deducted from the end product selling values. Costs include such items as manufacturing costs, transportation costs, logging costs and a reasonable margin for profit and risk. The result is a putative value for the tree in the woods.

The residual value system was replaced several years ago by a system known as transaction evidence appraisals. Transaction evidence appraisals have been used nationwide by the federal government for many years. They have a strong track record of being able to predict market value. Again, in simple terms, transaction evidence appraisals look at what purchasers have been willing to pay in the recent past for similar sales. Adjustments are made for differences between sales with respect to such value considerations as quality, quantity, logging systems, transportation costs, etc. The general system has much in common with appraisal systems used for real estate.

Transaction evidence appraisals work well in established markets with many buyers and sellers competing. They rely on well established market principles of willing buyers and sellers operating in a competitive market, and assuming neither the buyer or seller is under undue duress. This may not be the case for the timber market in Southeast Alaska.

The pool of reasonably likely purchaser for any given sale – particularly the larger sales is extremely small. Many sales in recent years have had only one bidder. Motivation for the purchase of a sale may also be problematic. Timber purchasers in Southeast Alaska wishing to process timber in local mills have little alternative to buying Forest Service sales. Further, their motivation for bidding on any given sale may not be market based but rather motivated by the need to cover fixed costs or maintain work for a qualified work force while awaiting improved market conditions.

Considerations of this nature are, of course, present in all markets. However, the small number of potential buyers in this market coupled with that lack of alternative suppliers may skew the transaction evidence and influence future minimum timber prices in unintended ways. As with the issue of S&Gs, the validity of timber values established using the transaction appraisal process is beyond the scope of this study. However, it seems to be a fertile area for further research that might shed additional light on why many sales of Tongass timber go wanting for bidders. In any event, the Forest Service has indicated that it will return to residual value pricing for Tongass timber.

Potential Economic Impacts of an Integrated Industry

Regional and Statewide Impacts

Employment

While the financial return on an MDF or other core operation calls for further analysis, the regional, statewide and community economic impacts of an integrated wood products industry clearly could be substantial. In 1990, when Southeast Alaska had an integrated pulp and milling industry, logging and processing employed 3,450 people in Southeast Alaska in relatively high-paying jobs. By 2002, total employment for the region's timber industry was 450. During the decade of the 1990s, Southeast Alaska lost more than \$100 million in direct forest products payroll. This decline and its associated population exodus was a significant contributor to economic hardship in timber-dependent communities and economic stagnation throughout most of the region during the past decade.³³

Table 13 shows the number of jobs related to harvesting and processing timber from the Tongass National Forest between 1982 and 2002. Since the last pulp mill closed in 1997, employment has dropped precipitously, from 1,325 to just 195. During the peak production years of 1989 and 1990, Tongass timber harvests were associated with more than 2,500 jobs in Southeast Alaska. The rate of employment per MMBF of Tongass harvest has averaged roughly six jobs in the past. In years following a precipitous drop in harvest – for example 1985, 1996 and 1997, and 2001 – employment temporarily peaks, probably due to retention of workers from the previous year.

³³ Alaska Economic Trends, March 2004. Alaska Department of Labor and Workforce Development

**Table 13.
Tongass Timber-related Logging and Sawmill Employment,
1982 – 2002**

	Tongass Harvest (MMBF)	Tongass-Related Employment	Employment per MMBF of Tongass Harvest
1982	370	1,850	5.0
1983	250	1,857	7.4
1984	281	1,608	5.7
1985	181	1,502	8.3
1986	290	1,795	6.2
1987	336	2,098	6.2
1988	396	2,370	6.0
1989	445	2,569	5.8
1990	471	2,522	5.4
1991	363	2,387	6.6
1992	370	2,236	6.0
1993	325	2,060	6.3
1994	276	1,669	6.0
1995	221	1,519	6.9
1996	120	1,558	13.0
1997	107	1,325	12.4
1998	120	959	8.0
1999	146	671	4.6
2000	147	623	4.2
2001	48	387	8.1
2002	34	195	5.7

Source: Alaska Department of Labor and Workforce Development

These historical figures suggest that an integrated industry using 200 to 250 MMBF of Tongass harvest could support the equivalent of between 6 and 7 year-round direct jobs per MMBF, or between 1,200 and 1,750 jobs. Since this harvest level is sustainable over the long term under the Tongass Land Management Plan, these jobs could provide an important and reliable component to the regional economy. In addition to jobs directly related to Tongass timber harvest, a stable, integrated industry would undoubtedly foster additional jobs related to processing of timber from other sources.

As described under “Labor Cost,” above, an MDF plant alone could contribute at least 80 jobs at an average salary of perhaps \$46,000.³⁴ This salary level is similar to that of the

³⁴ This is the estimate used in the Brackley/Davis model and represents a combination of production and administrative jobs.

construction industry and substantially above the average Alaska manufacturing wage of \$32,800, which is heavily influenced by fish processing wages.³⁵

Earnings and Induced Economic Impacts

For a general indication of overall economic impact, we can estimate earnings and secondary economic effects of this potential employment. The average wage in the Alaska forest products industry is approximately \$46,000 per year.³⁶ This would place the direct payroll of the integrated Tongass-timber-based industry described above at \$55 million to \$80 million. Forest products employment has been estimated to foster the equivalent of about 0.8 support (induced) jobs for each direct job³⁷. This would mean an additional 960 to 1,400 jobs. At the average Alaska wage of \$36,000 per year, these induced jobs would create an additional \$35 to \$50 million in payroll in various support sectors of the economy, for a total economic impact of between \$90 million and \$130 million per year from the timber harvested in the Tongass National Forest.

Cultural Effects

Though important, employment, spending and timber receipts tell only part of the story of Southeast Alaska's historically timber-based communities. From the days of the longhouse to the building of mines, shops, canneries, harbors, and homes, forest production has been an integral part of the character of Southeast Alaska communities. This character is being lost, and it cannot be saved by turning sawmills into museums, as has happened in Ketchikan. A viable, integrated processing industry is the only way to preserve the economic and cultural diversity that has been built in part on the region's timber supply. There is simply no comparable source of jobs in many timber-dependent communities, and these communities are at risk. Of course the health and diversity of the Tongass must also be preserved. However, economic and cultural diversity is important both to those that live here and those that visit. It helps to make the region a vital community rooted in its natural environment.

Community Impacts

When the pulp mills in Ketchikan and Sitka and the Alaska Pulp Company sawmill in Wrangell closed in the 1990s, those communities lost their largest private employers. More recently, closure of the Metlakatla and Haines sawmills eliminated the largest employers there, as well. In 1995 McDowell Group estimated that timber accounted for 20 to 25 percent of the basic economy of both Ketchikan and Sitka.³⁸ While growth in the tourism industry softened the blow in Ketchikan and Sitka, Wrangell, Metlakatla and other logging towns in the region did not experience as much tourism impact. The only larger community in the region that has been relatively immune to declines in the forest products industry is Juneau, which has been insulated by its high proportion of government jobs and rapid tourism growth. Virtually all the smaller communities of

³⁵ Alaska Economic Trends December 2003. Alaska Department of Labor and Workforce Development

³⁶ Alaska Department of Labor and Workforce Development Employment and Earnings Report, 2002, Forestry and Logging category.

³⁷ McDowell Group estimate. The economic "multipliers" used by economists to gauge secondary economic effects vary. This estimate is derived from the economic modeling software "IMPLAN," with adjustments based on McDowell Group's 30 years economic analysis in Southeast Alaska.

³⁸ Socioeconomic Effects of Declining Timber Supply from the Tongass National Forest, McDowell Group 1995.

Southeast have benefited from timber as a source of jobs and spending. This is particularly true on and around Prince of Wales Island.³⁹

Development of an integrated industry based on a Tongass harvest of 200 to 250 MMBF would not, of course, return timber to its earlier economic prominence. However, it would provide a valuable diversification to help balance the region's dependence on fishing, government and tourism, all of which are in some jeopardy. The Southeast fishing industry is undergoing dramatic changes in response to markets and competition from farmed fish. Government jobs are increasingly vulnerable to the State's budget gap and a growing political imbalance caused by rapid growth in the Southcentral/Railbelt region. Tourism has created a great many jobs, but they are often seasonal and lower paid than other regional employment; and tourism is increasingly concentrating under the auspices of a few multinational companies.

In addition to employment, payroll and cultural benefits, timber businesses generate direct financial benefits to local communities. These include property taxes and utility payments, federal stumpage receipts, and an increased share of State revenue programs.

³⁹ Those interested in a more detailed discussion of the relationship between the timber industry and Southeast Alaska communities may refer to the following McDowell Group reports:

Economic Impacts of Declining Tongass Timber Harvests, 2000

Impacts of the Forest Products Industry on Ketchikan, 1996

Southeast Alaska Public Opinion Survey: A Survey Measuring Public Opinion on the Tongass National Forest Timber Industry, 1995

Socio-Economic Effects of Declining Timber Supply from the Tongass National Forest, 1995

APPENDIX I – CHARACTERISTICS OF KEY PRODUCTS AND MARKETS

Sawmill / Certified Glued Lumber (CGL)

A sawmill is a necessary part of almost any integrated operation either as the basic element of an integrated operation or as an adjunct facility. The sawmill typically produces such standard items as cants, dimension lumber, timbers, planks and boards as well as chips and residues. It could be integrated with manufacturing certified glued lumber (CGL). A somewhat more sophisticated mill will also produce solid shop lumber, fingerjointed shop lumber, edge-glued panels or lamina for glulam beams (L1, L2 and/or L3 grades). The sawmill will also have a chipper (or a chipping edger) to produce chips suitable for pulp, MDF or export. Finally, the sawmill will generate residues: sawdust, bark and, if dry kilns and a planer are present, planer shavings

CGL is a product which, while consisting of lamina of glued lumber does not qualify as a glulam beam and is not subject to the same rigid evaluation. The laminas are usually 2x4 or 2x6, STD&btr, kiln dried, surfaced and sometimes finger-jointed. They differ from glulams in that they are not made to the glulam specification; i.e. they do not carry a 2400f rating. Instead, they are graded like, and considered as, one-for-one replacements of similar sized timbers. However, the mill making CGL conforms to West Coast Lumber Inspection Bureau (WCILB) procedures for gluing and glue bond testing. Member mills are checked once a month for adherence to grading rules and gluing procedures. While CGL is not widely known, it is used in construction as a replacement for on-site lamination of dimension lumber for headers and beams. CGL are priced at or a little above comparable timber prices. For example, as of June 11, 2004, 6"x8" Douglas fir green timbers, RL 8'-20' cost \$720 MBF Portland. CGL would sell for @ \$775-790, same basis. For comparison, #2&btr Douglas fir 2x8 RL costs \$475 MBF, fob mill, plus of course the costs of labor and adhesive to make a header or beam at the construction site.

There are no market data available for CGL specifically. The potential markets are local in Alaska. CGL is not an export item and a few mills on the west coast of the lower 48 also make this product. Based on the number of housing starts in Alaska in 2003 (3531 units)⁴⁰ and an average consumption per unit of 304⁴¹ bd. ft. of sawn timbers and glulams combined, we estimate that the total available market in which CGL would participate is 1.07 million bd. ft. Additionally, some of the framing used in house construction consists of doubled or tripled dimension lumber. Of the estimated total of 2.47 million bd. ft. of framing lumber used in Alaska new dwelling construction, we judge that 5 % or @ 126 MBF are doubled or tripled, making them candidates for CGL, for a total opportunity of 1.133 million bd. ft. Realistically, well manufactured CGL at a price no more than 10% above timbers should be able to acquire 25-33 % of this opportunity or 280-375 MBF, assuming appropriate transportation can be arranged.

⁴⁰ USDC Census

⁴¹ estimates derived from *Product Usage in Housing in the United States, 1998*, USFS & APA-The Engineered Wood Association

Sawmill / Glulam Beams

Glulam beam manufacturing is usually a stand-alone operation. While it may share a common site with a sawmill, it can use only a portion of a sawmill's output. Glulam beams may be made of laminating grades L1, L2 and L3⁴² which are both visually graded and Machine Stress Rated (MSR) graded, or of standard & better dimension lumber. MSR is considered essential to sort out the 2400f lamina. Lamina may be solid or fingerjointed. True glulam beams must be certified under the auspices of one or more of three organizations: APA-The Engineered Wood Association (APA; American Institute of Timber Construction (AITC); or, for export to Japan, Japanese Agricultural Standards (JAS). Glulams for the North American market must carry a 2400f rating.

Adhesives must conform to ASTM D2559-84 for US; C.S.A.; J.A.S. Three major adhesive companies supply the US industry: Chembond, Georgia-Pacific and Borden. Virtually all structural laminated beams manufactured in the USA are glued with resorcinol modified phenolic formaldehyde resin adhesives. There is a continuing effort to reduce formaldehyde emissions, which are of concern to the EPA, and to extend general phenolic resins with less expensive ingredients, such as lignin derivatives, various flours and fillers. However, recent concerns over the load carrying capacity of all wood products, including glulams, and several well publicized building failures, have made it too risky to use extended resins where a beam might delaminate. Melamine urea formaldehyde resin adhesives are standard in the U.S. for end gluing (fingerjointing) laminating stock. Phenolic formaldehyde resin glues are also in common use, especially for industrial grade beams. The melamine urea glues are clear and do not show up on beam surfaces. They are favored for architectural grades which are used in exposed places.

Douglas fir and southern pines are the predominant species used to manufacture stock beams. Some hem-fir stock beams are produced using a proprietary lay-up (Rosboro) with E-rated hem-fir lumber (Frank Lumber Co.). AITC has developed E-rated lay-ups for spruce-pine that can be used for stock beams. Stock beams can be made with any species or combination of species that the AITC/ANSI standard recognizes. Some companies in Canada also offer yellow cedar and spruce (S/P/F) glulams. 2400Fb-1.8E grade dominates the production of Douglas fir, southern pines and hem-fir. 2600Fb and 2800Fb southern pine grades are being developed to compete with laminated veneer lumber. The AITC development for E-rated SPF will produce a 2400Fb-1.6E grade.

Stock beams are produced primarily as Architectural (standard) grade. Industrial grade stock beams are also produced to order. Some beams are surfaced (hit and miss) to 3.5" or 5.5" in width for use as header material.

- Header grade - designed to be hidden, appearance not important
- Industrial grade - appearance is not of primary importance
- Architectural Appearance grade - exposed members where appearance is important
- Premium Appearance grade - exposed members where a high grade of appearance is required
- Clear Appearance grade - highest visual grade

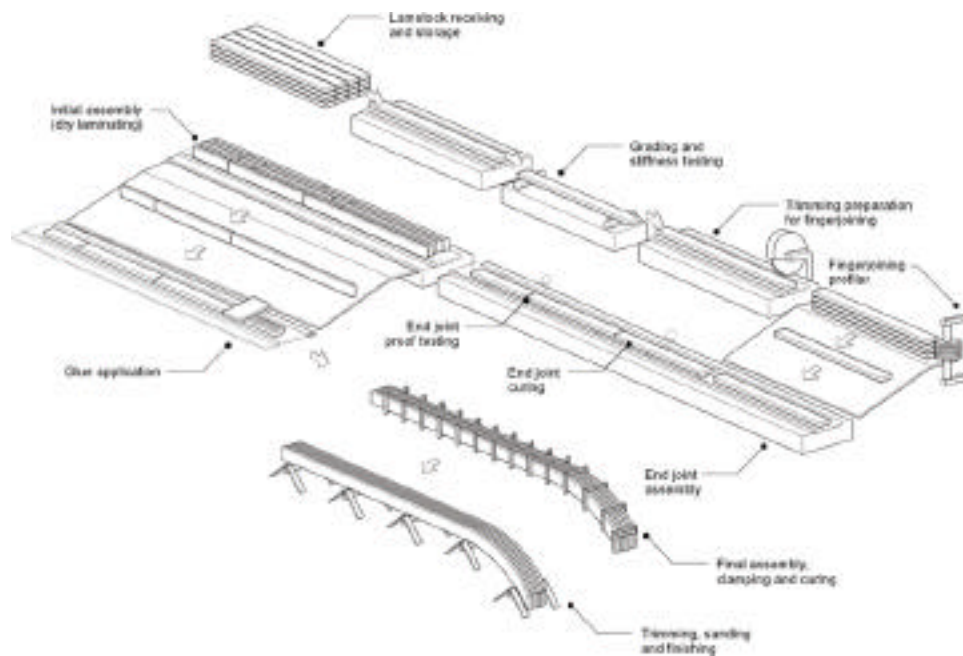
⁴² Graded under WCLIB rules

Stock beams are mostly manufactured to AITC standard sizes. For example, conventional Douglas fir and SYP standard widths are 3 1/8", 5 1/8" and 6 3/4" respectively for beams made of laminating grade lumber. Depths are increments of 1", the actual thickness of ALS surfaced dimension lumber. Normal depths with respect to widths are as follows:

- 3 1/8" wide: 9" to 18" deep (13.5" is common for Douglas fir; 14" for SYP)
- 5 1/8" wide: 9" to 24" deep (15-18" predominating)
- 6 3/4" wide: 9" to 24" deep (deeper beams predominating)

Some beams are now made to match LVL and Parallam^R sizes. Figure 1 illustrates the key process steps.

Figure 1 – Glulam Manufacturing



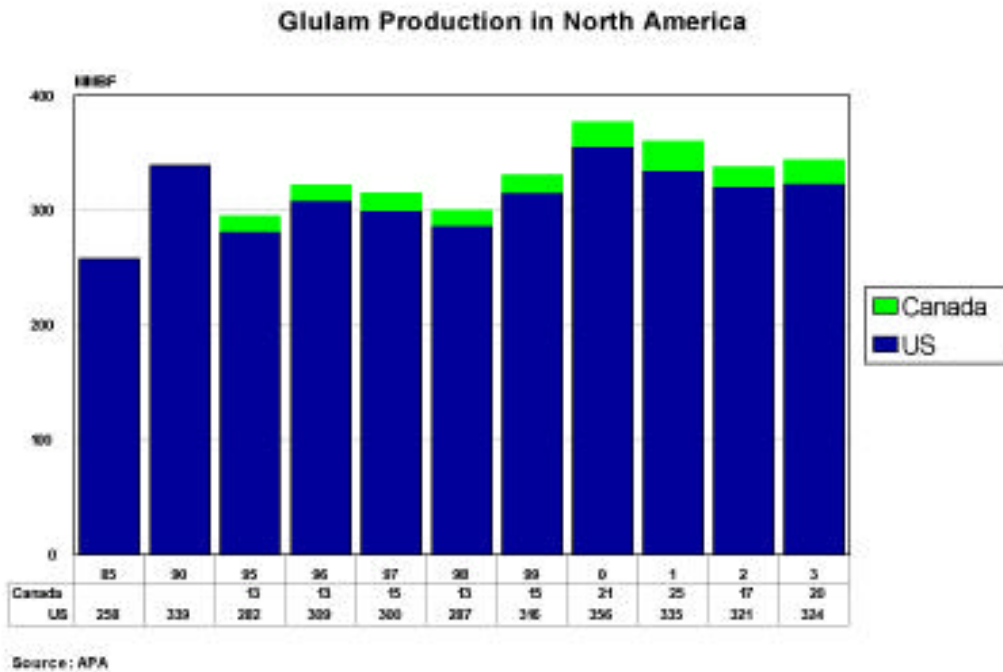
The major manufacturers of stock beams use special presses with high speed radio frequency (RF) curing of the gluelines, in either a continuous or step process. The machinery varies by company but all of these processes can be considered continuous in nature, with short glue line cure times. Small glulam companies use either a standard "C" clamp and cure, batch process at ambient temperature or cure the layed up beam in a cold press.

Supply – There are 42 glulam mills in North America, of which 8 are in Canada. Most mills are large, with automated process equipment. There are a number of quite small glulam mills, mostly in Canada and the US South. Illustrative typical small mills have glulam sales of \$1.4 million, with 15 employees; \$1.8 million with 20 employees; \$2.2

million with 34 employees. We estimate average mill prices based on current lumber costs at \$1000/MBF so the smallest glulam mill we found sells about 1.4 million bd. ft. Lumber requirements, allowing for trimming and wastage are about 1.6 million bd. ft. A small mill does not require a very large capital investment. The largest pieces of equipment are the MSR machine (\$242,000 new; also available used); a cold press (up to \$45,000 used for 16' opening press) or "C" clamps or other clamps (under \$10,000); and a glue spreader (ranges from hand application to curtain coaters (used under \$10,000). There are also the usual investments for materials handling, strapping, etc.

Production – Annual production of glulams in North America is shown in Figure 2.

Figure 2



Production has been level in recent years and we do not expect a significant growth in light of alternate products such as LVL and parallel strand lumber (Timberstrand^R and beams (Parallam^R)

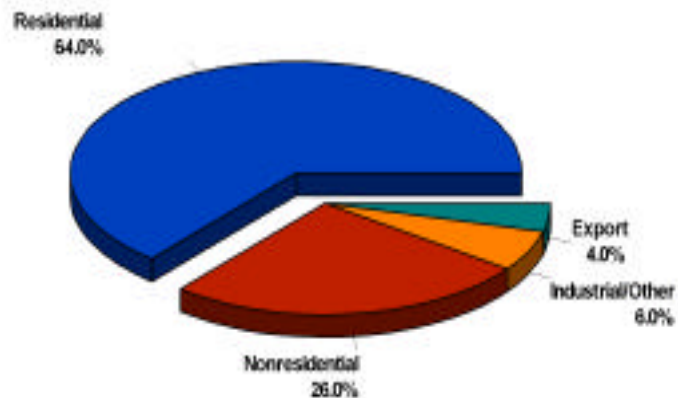
Markets - Residential construction is the largest market for glulam beams, especially stock beams, accounting for 65 percent (Figure 3), followed by non-residential construction. A small volume of custom beams (2-4% of glulam production) is also used in residences. Residential roof and floor systems have traditionally been designed with many load-bearing partitions to keep spans to 20 feet or less (effectively to 16 feet), reflecting the length of the available sawnwood beams and dimension joists.

There are a number of minor applications as well: scaffold plank, diving boards, bridges, etc. Export to Japan played a large role in the rise in glulam construction, but fell off

radically when Japanese housing declined in its recession. Japanese glulam manufacture and imports to Japan have risen dramatically in recent years as a result of the revamping of Japanese housing standards and requirements after the Great Hanshin earthquake in 1995. These standards are now much more severe. However, most imports have come from Europe. European manufacturers have been more willing to accede to Japanese standards and sizes.

Figure 3

North American Glulam Shipments By Market Segment, 2003



Total reported by APA = 344 Million Bd. Ft.

Opportunity in Alaska – There are two possibilities for glulam beams made in Alaska:

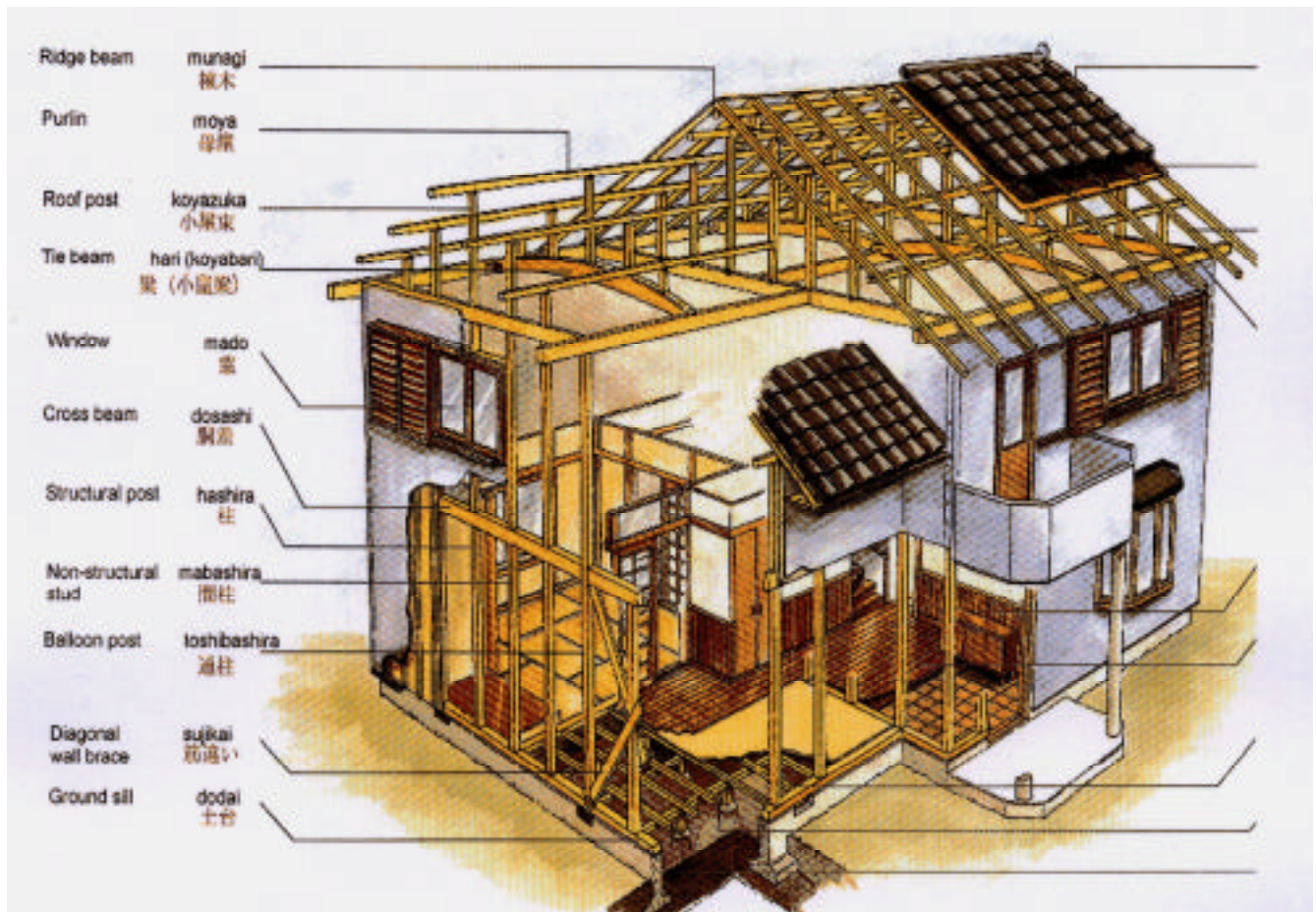
- The small local market of about 400-425,000 bd. ft., all of which is shipped up through Seattle, and
- Export to Japan. The Japanese market could consume glulams made with yellow cedar⁴³, a much favored species in Japan, as well as spruce and western hemlock. The potential is enhanced by the recent strength shown of the Euro, which makes European glulams more expensive in Japan. However, prior to any sales to Japan the mill must be in existence, and receive a JAS stamp. Production volumes

⁴³ Alaska yellow cedar is exceptionally strong & rot resistant & has long been favored in Japan. It makes an excellent glulam. See work done at Ketchikan Wood Technology Center. Also, there are reportedly six Japanese glulam manufacturers who currently make laminated sill plates & posts from imported Alaskan yellow cedar (CINTRAFOR Working Paper 91, *Niche Market opportunities for Alaskan Forest Products in Japan*, Eastin, Roos & Tsournos, January 2003)

would be small enough so that distribution is probably best arranged by contracting with one trading company to take the entire export allotment. Large trading companies (members of keiretsu or company groups) such as Itochu, Mitsui, Sumitomo, etc. sell not only in Japan but in other difficult markets such as China.

The glulams shipped to Japan would have to be specific to Japanese requirements such as sill plates (dodai), girders (obiki) and posts (hashira). See Figure 4.

Figure 4 – Japanese Traditional Wood House

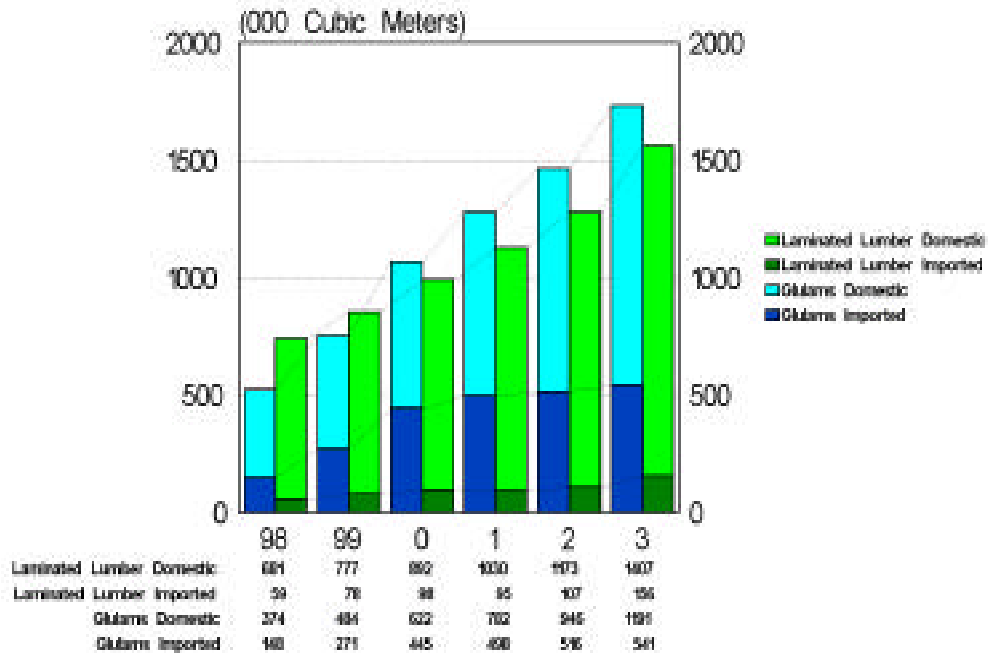


Source: Nordic Timber Council

Figure 5 shows the trend of glulams and other laminated wood in Japan.

Figure 5

Consumption of Laminated Wood Products In Japan



LVL is included in Laminated Lumber

Veneer and Laminated Veneer Lumber (LVL)

Peeling veneer for LVL and layup of LVL are two separate operations. The veneer manufacturing operation is similar to that for plywood, with the possible addition of flex testing equipment such as Metrigard. The veneer mill should be integrated with either a sawmill or a sawmill/chipper combination to make studs from the peeler core or chip them. The chips would be destined for export or for a potential MDF operation. The green veneer output of the mill is targeted to plywood, if there is a mill, or to LVL, again if there is a mill.

The layup of LVL is a stand alone operation. It may be on the same site as the veneer mill. However, it is unlikely that the veneer mill and the LVL mill will be in exact balance. LVL veneers are usually C+ grade while the veneer mix from the green end will also contain higher grades which should be sold at higher prices, or lower grades which are useful only in softwood plywood cores and backs, or to be chipped.

LVL is comprised of rotary peeled veneers oriented in the same longitudinal direction to form a structural panel (a limited volume of non-structural LVL is manufactured in plywood mills and used for millwork). The concept of structural laminated veneer lumber dates back to innovative work conducted at the U.S. Forest Products Laboratory in the mid-1930s. However, the appearance of LVL on the commercial market was delayed until the early 1970s. The first commercial appearance of LVL was Microllam, developed by Trus Joist Industries (now a division of Weyerhaeuser) and first used as flanges in its proprietary wood I-Joists.

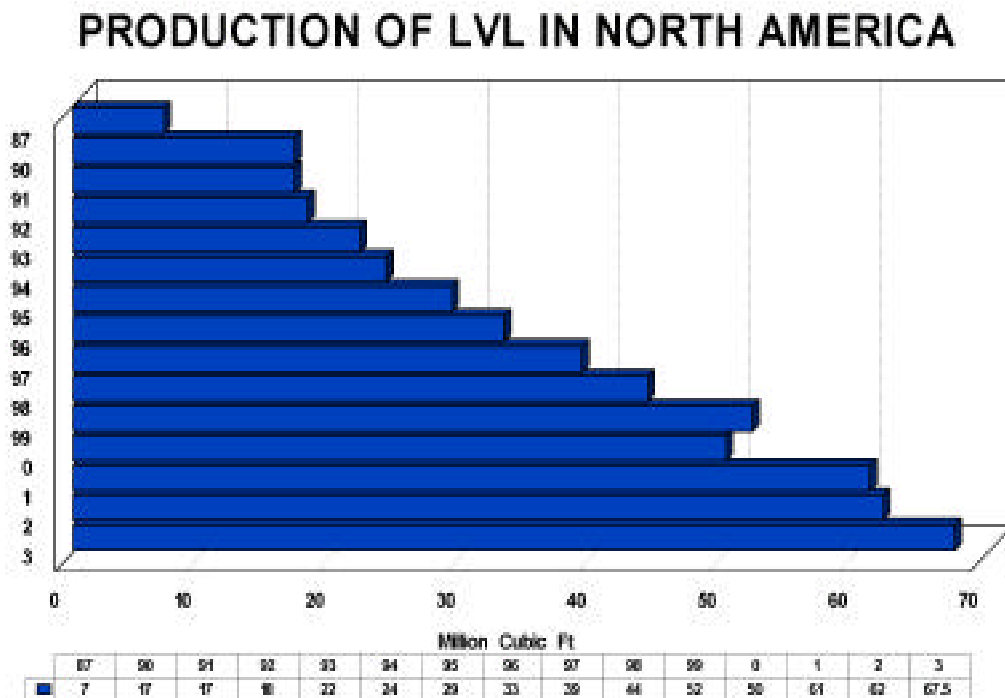
LVL, no matter of what species it is manufactured, offers significant advantages over alternate materials. Since LVL is made of layers of veneer, naturally occurring defects such as cracks, splits, loose knots, cross grain, rot, holes and others, if they are not removed in the veneer process, are distributed throughout the panel. This dispersion of defects avoids a concentration of weakness at one spot, and minimizes variations in strength as occur with lumber. Thus LVL can be allotted higher design stress values and is more dimensionally stable than its lumber equivalent. LVL derives its performance capabilities from the strength and stiffness of the veneer as determined by machine stress ratings. The strength, stiffness and durability of the glue line also affect properties as does the location of butted or over lapped end joints of the veneers.

The nature and dispersion of these veneer joinings enhances the overall strength properties of the LVL panel. Conversely, both the glue and the wood offer opportunities for biological degradation. Fortunately, LVL is readily penetrated by preservatives which protect against termitic, fungal and bacterial degradation.

Production And Producers Of LVL - All North American *structural* LVL manufacturers have expanded production in recent years. Eight companies operate more than 50 press lines of various sizes in 21 locations. Total existing North American capacity at the time of this study is 83 million ft.³ equal to 2.35 million M³. Another mill is under construction. There are no barriers to entry to the manufacture and sale of LVL except wood supply and capital. The technology is readily available from equipment manufacturers such as Dieffenbacher, Rauma Rapola or Raute Industries. Weyerhaeuser, via its acquisitions of Trust Joist International and Willamette, has its own version of LVL manufacturing equipment, and Boise Cascade has developed its own versions in its different LVL manufacturing facilities.

The reasons for this expansion are obvious. There has been a significant increase in LVL sales over the past decade, both as flanges in wood I-joists and other trusses, and as individual beams and other structural members. Figure 6 shows the growth in LVL demand from 1987 (7 million ft³ through 2003 (67.5 million cubic ft³), during which period it multiplied more than nine fold. The outlook for the future is equally encouraging. We forecast LVL demand and production to grow to 80+ million cubic feet within four years, and 110 million cubic feet within ten years.

Figure 6
Laminated Veneer Lumber (LVL)



Source: LGA estimates 1987-97; APA 1998-2003

Standards for LVL Manufacturing - LVL standards are based on performance and do not consider tree species. The first commercial LVL was made with Douglas fir veneer followed by southern yellow pines. Presently there are many softwood and hardwood species used for LVL production. The main attribute of structural LVL is its strength. The visual quality of veneer is of secondary importance. Therefore, knotty logs that have not been pruned are acceptable. Knots and knotholes as large as 3" in diameter are permissible in LVL veneer. A more important log feature for peeling is its straightness and taper. Bowed and crooked logs and a large taper in the block dramatically affect useable veneer recovery. While logs with internal rot and ring shake defects are not suitable, in general logs for LVL veneer can be of lower quality than saw logs.

There is no limit to veneer thickness used in LVL. Veneer thickness is dictated mainly by practical limits of rotary peeling and the ability to produce acceptable surface quality veneer. At present this practical limit is about 0.167 inch (4.2 mm) thickness. The use of thicker veneer reduces the number of plies, veneer handling and glue usage, but at a cost of some loss of LVL strength. Presently there are three nominal veneer thicknesses used: 1/10", 1/8" and 1/6". The latter two thicknesses are used more frequently. The block length dictates the veneer length and this in turn is related to the log's properties. For practical reasons the majority of North American LVL plants use 4' wide veneer, which can be readily purchased on an open market. Some mills use wider veneer, which allows higher press and lay up capacity, and smaller sawing losses. But there is a lack of wide veneer on the open market, and possible higher veneer composing losses.

LVL is composed of several laminas (veneers), whose position can be readily changed by altering the lay up sequence. This allows for flexible engineering of its strength. Strong, mature wood, from the outside of a log, is easily separated by peeling from the weaker, juvenile wood in the core of a log. Depending on the application and stress distribution, LVL can be designed with an appropriate set of properties. The simplest way to achieve high strength LVL is to make it of high strength veneers. Veneer strength depends mostly on its density, straightness of the grain orientation and lack of defects. Veneer density is species related; within the same species, growth rate and the growing site affect it.

The practice of mixing species in the LVL structure in order to achieve desired properties or economics is becoming very common, e.g. 'aspen' LVL is made with four outer plies of birch veneer in order to get LVL of 2.0 E. Often Douglas fir veneer is mixed with hemlock in order to reduce product cost. Another way of increasing LVL strength is by densifying it during the pressing process. Early wood cells collapse under the pressure and heat applied to LVL during curing of glue in a hot press. This results in a thinner and denser product than the original density of its veneer species.

LVL Grades - In order to be marketed in North America structural LVL has to bear a stamp stating its grade, and containing the following information:

- Trade name of the LVL product
- Grade
- Third party approval agency name
- Building code approval organization name
- Mill number and the manufacturer's name

The method of product testing in order to establish the grade is described in ASTM D5456 *Standard Specifications for Evaluation of Structural Composite Lumber Products for the USA and in Canada according to CAN3-086-M84*. There are several qualified testing agencies. Two of the better known are APA-Engineered Wood Association in Tacoma, WA and PFS Corporation in Raleigh, NC.

LVL grades are defined by two numbers, e.g. 1.8E/2900 Fb:

- 1.8 E stands for 1,800,000 psi Modulus of Elasticity (MOE or stiffness) in static bending.
- 2900 Fb stands for the maximum allowable bending stress of 2,900 psi in static bending

Currently a wide range of LVL grades is available. As the market has expanded some producers introduced lower E value and lower cost LVL, made with weaker, underutilized species. In general, MOE of beam and header LVL now ranges from 1.5 to 1.8 million psi, and for I-joist flanges it ranges from 1.8 to 2.45 million psi.

LVL Manufacturing Processes - Log preparation for LVL is the same as for plywood. Tree length logs are delivered to the plant debarked, cut to peeler block length, conditioned and transported to a peeling line. Green veneer ribbons are scanned for defects before being clipped into full sheets or random width sheets. The veneer is transported through a dryer (gas or RF) to reach a target moisture content of 3 to 5%. To meet the LVL grade requirements, veneers are machine graded to assure specified minimum bending strength and stiffness. The veneers are coated with adhesive and either layed up in a batch process or fed into a continuous process.

Different methods are used commercially to make long length LVL in North America. Raute Industries makes a batch press with one or two openings, and RF (radio frequency) curing as an option for thick LVL. Dieffenbacher makes a continuous press which uses MW (microwave) preheating to cure the resin.

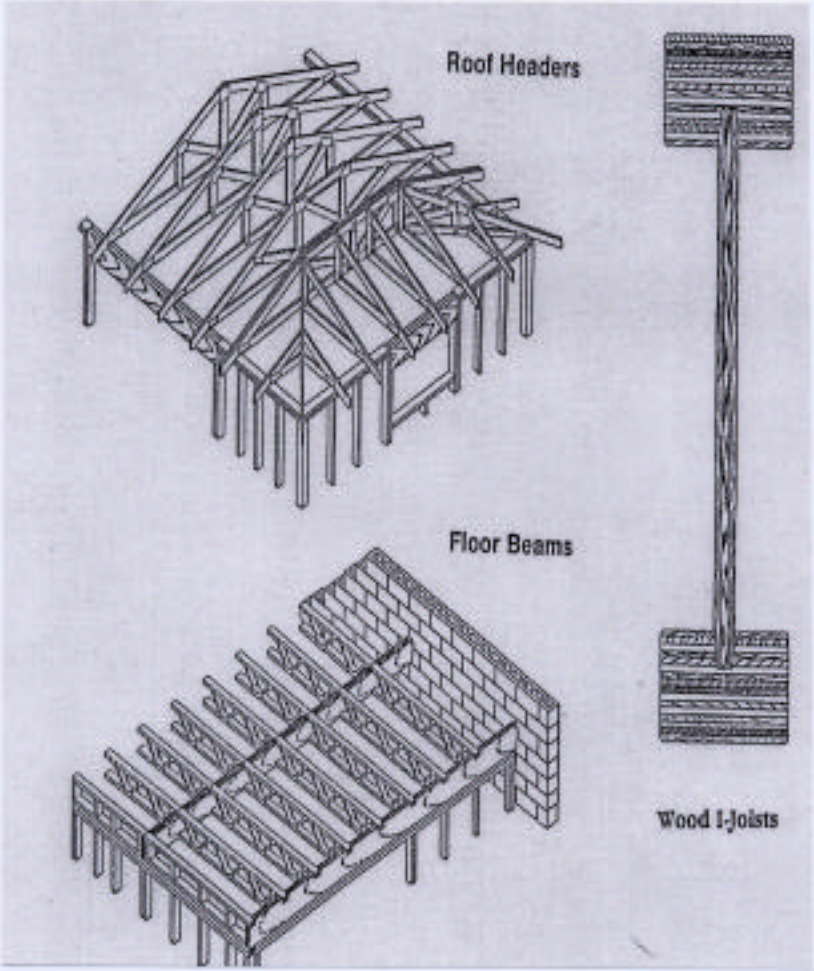
An LVL facility is a major investment. In the competitive world of today a minimum economic size mill would produce about 3.2 million cubic ft. of LVL, requiring 4.4 million cubic ft. of green veneer. This volume of veneer, in turn, if made elsewhere, would require about 9.6 million ft³ of timber (@150 million bd. ft. of timber). This size mill would require an investment of about \$36 million, assuming veneer and power could be purchased. It is possible that the capital required could be reduced by buying used equipment but no more than \$2-3 million⁴⁴.

A smaller mill is possible, but not economic unless the veneer is transferred at cost. Such a mill would produce 1 million cubic ft. and require a veneer input of 1.3 million cubic ft. Capital cost is about \$23 million; again, used equipment might shave off 5-7 % of the investment required.

Markets – Figure 7 shows the major LVL applications, especially wood I-joists and headers.

⁴⁴ Pro forma and cost information supplied by Andre Klemarewski, Applied Composites Technologies

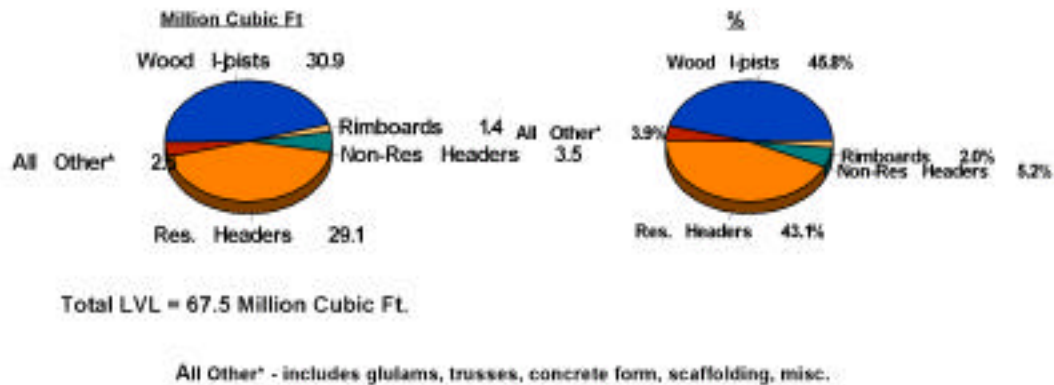
Figure 7
LVL Applications



Wood I-joists take about 46% and headers about 44% of all LVL, while the remainder is spread among a number of minor applications. Figure 8 shows the current markets.

Figure 8

LVL Markets, Year 2003



LGA estimates

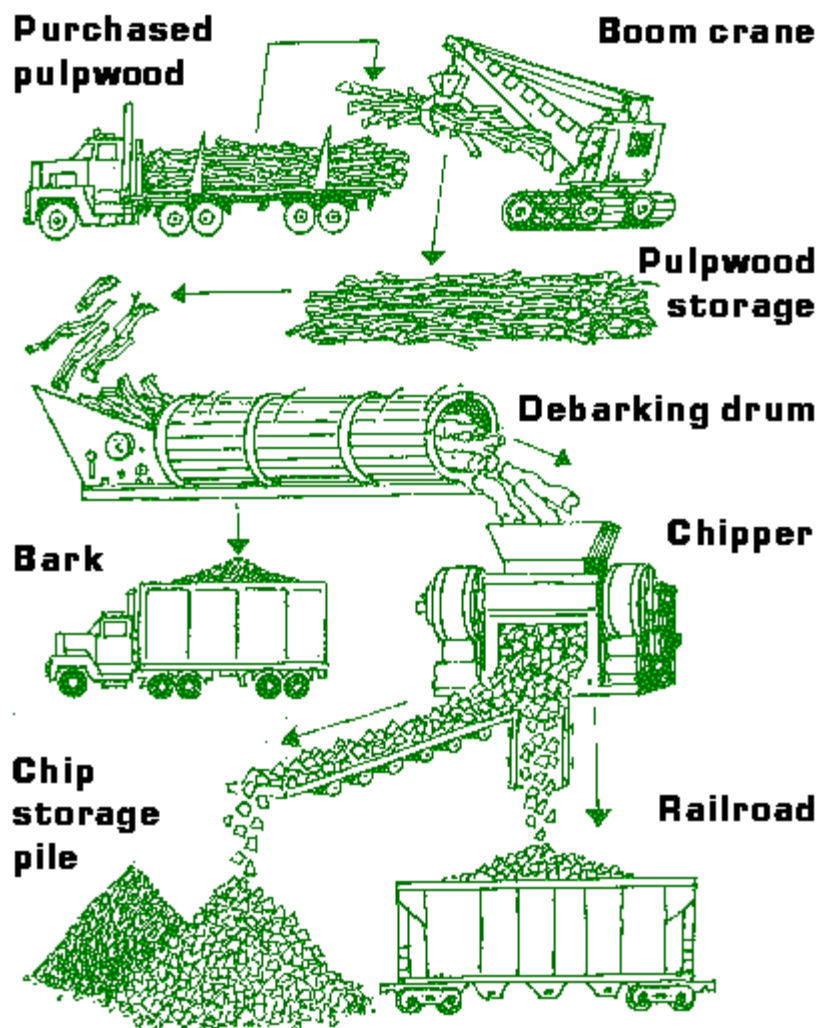
With only a very minor market in Alaska, and many LVL mills on the US West Coast, it is clear that the potential for LVL lies in export, mostly to Japan but also to China. LVL is of increasing importance in Japan although the usage of wood I-joists is minor. The demand for LVL in China is not presently known. Figure 4, shown before, presents information on LVL as well as glulams, and shows the increase in import demand.

Medium Density Fiberboard (MDF)

An MDF mill may be freestanding or integrated on site with:

- A sawmill that produces chips, sawdust, planer shavings and other residue⁴⁵ (except bark) all of which are suitable for making high grade MDF, or
- A chip mill. A typical chip mill is shown in Figure 9 but there are many variations: chipping is done in the woods, or at a freestanding mill site, or on a sawmill site or, with chippers or chipping edgers, in the sawmill.

Figure 9 – Chip Mill



⁴⁵ Recent studies (Southeast Alaska Biomass-To-Ethanol Project Feedstock Supply Plan, TSS Consultants, June 2000, done for Sealaska, Alaska Energy Authority & National Renewable Energy Laboratory) indicate that annual residue from SE Alaska mills ranges from 132,500 BDT to 158,000 BDT. Nearby British Columbia could supply from 35,000-197,500 BDT while timber harvests and thinnings from Tongass & Sealaska total 350,000-370,000 BDT annually.

MDF is a premium product which more or less accidentally found its present major markets. A pilot plant was built in Deposit, New York, and used chips made from local hardwoods as well as RF (high frequency radio waves) curing with urea formaldehyde resin to make a house siding. The initial product was not successful since urea formaldehyde is not an exterior resin. However, use as furniture corestock proved immediately successful. The new product had greatly superior edge machining capabilities, comparable to hardwood lumber, as well as smooth face properties compared to particleboard. Its smooth surface enabled direct printing, thin overlays and thin veneering, without the necessity for a crossband, achieving excellent appearance.

Processes - A major advantage of MDF versus particleboard is its high degree of tolerance with regard to variations in wood density, wood species, residues and mix ratios. Fiber is made in pressurized refiners from wood chips, planer shavings and sawdust residues, and then it is formed into a mat on a traveling belt that then enters one of four types of presses. Each of these presses produces somewhat different types and characteristics of MDF. Market requirements aid in press type selection.

The *multi-opening press*, adapted from plywood manufacture, is still the most widely used, (at least in North America) manufacturing method. The thick mat is pre-compressed, cut into lengths (in some cases placed on trays called cauls) and the cut lengths are then conveyed to a multi-opening stack press where, under heat and pressure, the mat is consolidated into a medium density panel. The panel emerges from the press, is edge trimmed, stacked for cooling and is then cut to shipping sizes. A typical smaller MDF installation would have a capacity of about 60 million sq. ft. 3/4" basis, or @105,000 M³. This would require 35 to 40 million bd. ft. of pulpwood or the equivalent in residues.⁴⁶ Capital cost would be in the neighborhood of \$70-75 million⁴⁷, more if on site power generation is required. Generally, multi-opening presses are not economic for thin panels.

An early alternative method uses the *Mende continuous press*. In this process the fibrous mat is fed onto a large heated revolving drum against which it is pressed in a continuous strip. The panel is cut into appropriate lengths after pressing. This machine produces only thin MDF, 1/8 - 1/4" thick. The quality, while acceptable for many hidden applications, is generally relatively low due, among other things, to the curvature built into the mat. There are three of these presses in North America, but scores worldwide. Generally capital requirements are considerably less for Mende mills, about \$35-40 million. Output is in the 35-40 million sq. ft. 3/4" range (@70,000 M³), requiring 25 to 30 million bd. ft. of pulpwood or the equivalent in residues.

The *single opening press* employs one large opening (which may be up to 12' wide and 80' long) which, when filled, is subjected to heat and pressure. These presses, while not unknown in North America, are much more common in Europe.

A major innovation was the introduction of the *flatbed continuous press*, which is faster, has better control over physical dimensions and properties, and allows the economical production of much thinner panels (but is less economical for thicker panels). The first such MDF mills were built in Asia and Europe, and more recently in North America. Now most of the large, modern mills built today use a continuous press from one of the

⁴⁶ This is the estimated raw material needed for manufacturing, based on an historical average of 2.8 dry tons of wood chips per MBF of Tongass pulpwood. The number of board feet of timber harvest required to make this raw material available is roughly double this amount, but varies depending on the composition of particular timber sales. Mende mills use somewhat more raw material per cubic foot of finished product.

⁴⁷ Cost and production data for MDF courtesy of Vajda Consulting.

three European manufacturers: Siempelkamp, Dieffenbacher and Metso. These are somewhat more expensive but allow greater control over the finished product. Recent mills with capacities of 120+ million sq. ft. – cost in excess of \$1000 per MSF –, plus power and infrastructure.

Initially all MDF was made from roundwood chips. New technology now allows the use of a very high percentage of sawdust and shavings, while still making quality MDF, thus radically reducing raw material costs. Urban wood is used in some mills in Europe, but has failed as a raw material in the US. Agricultural residues are used in mills in China and Southeast Asia. However, the quality of these products is admittedly low, and the entire output is used locally.

Stability has always been an issue with MDF. One approach has been to modify the equipment, as in the steam injection press, which has proved especially useful for thick panels. Another has been to replace all or part of the common urea formaldehyde resin binder with one that is humidity or water resistant, such as melamine UF, phenol formaldehyde or isocyanate. *Market requirements determine the need for these.*

Products - MDF may be shipped as raw board or finished in some way: veneered, painted, printed, overlaid, etc. MDF is also required in various sizes: 3'x6', 4'x8', 5'x9' and others. Certain products (e.g. molding) are shipped to specified profiles and primed and/or painted. There are a number of specialties and value-added products which significantly increase mill revenues: moisture and water resistance, fire retardance, formaldehyde free, low density, thin panels, high density and others. A market study is needed to define any such opportunities which also fit the species and mill characteristics of the enterprise.

From the early days of the original mill at Deposit, NY production has surged. Table 2 shows the historical rates of MDF production in North America. Both the US and Canada are important producers of MDF and there is considerable volume transferred between the two countries. There are 21 mills with 24 operating lines in the US. One new mill is under construction and 1 is being expanded. There are 7 mills with 8 operating lines in Canada with two expansions under construction. When all known mills are completed, capacity will approximate 2.4 billion sq. ft. 3/4" in the US and 1 billion sq. ft. 3/4" in Canada for a total of 3.4 billion sq. ft. 3/4".

Some of these were converted particleboard plants. MDF spread overseas tentatively in the 1970s, then with a rush in the latter 1980s and 1990s. There are now more than 250 operating MDF plants located in North America, Europe, South America, South Africa, Australia, New Zealand and Asia (especially China). More are under construction and still others are in the planning stage. Many of the new mills have thin board capabilities. Technical developments, beyond the flatbed continuous press, occurred early on and continue today. There are a number of underlying reasons for the surge in demand for MDF, particularly over the last decade:

**Growth of the MDF Industry in North America
(MM SF 3/4”)**

Year	US	Canada	Total
1980	493	0	493
1985	685	60	740
1990	950	79	1,029
1995	1,107	175	1,282
2000	1,640	706	2,346
2001	1,430	749	2,179
2002	1,593	730	2,323
2003	1,729	837	2,566

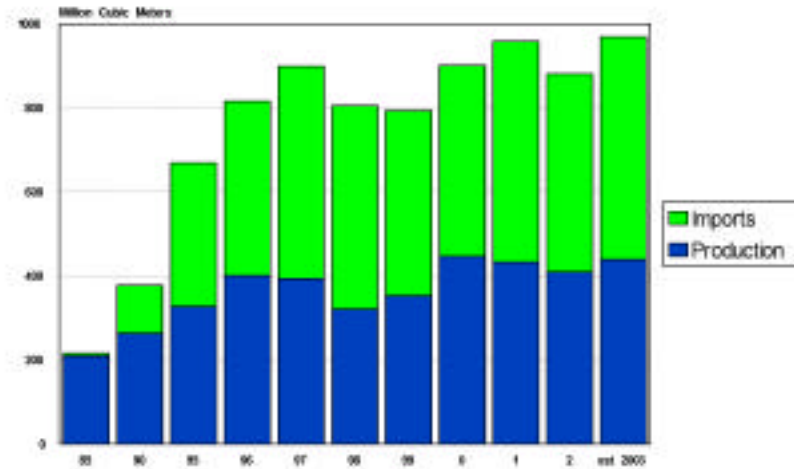
Source: Composite Panel Association 1985-2002;
LGA 1980, 2003

- New applications, especially semi-structural. As the versatility of MDF is expanded, these include doors, flooring, molding, built-ins and a host of others;
- Increasing displacement of particleboard, hardwood lumber, hardwood plywood and hardboard; and
- The cumulative dearth of fine quality tropical hardwoods for hardwood plywood, top peelable grades of softwoods and other useful species.

Japan – Japan is a logical export target for MDF from Alaska. MDF consumption has soared, both domestic and imports. Currently the four Japanese MDF makers are operating at capacity, but are limited by lack of raw material. Japan imports from many countries more MDF than it makes (Figure 10), but is currently unable to obtain all the high quality MDF it desires due to extreme demand from China.

Figure10

MDF in Japan



Note: Production is expressed in M³ while imports are recorded in metric tons which have been converted to M³ (0.71 MT=M³).

People's Republic of China – China has extensive forested land, exceeding 290 million acres, including tropical hardwoods in the south and temperate coniferous species in the north as well as plantation poplar. Forest management and logging are under strict government control, but despite that, large volumes of wood are taken by peasants for firewood. The devastation of Chinese floods is well known, and is magnified by the destruction of water retaining forests. As a result, *logging is banned in most of China*. While this will probably have no effect on illicit wood taking, it has increased the need for imports of all wood products, including MDF.

Since Dr. Leonard Guss of LGA, Inc. presented MDF to the Chinese during a technical mission in 1981, acceptance and growth have been phenomenal, matching the growth of China's furniture industry⁴⁸. There are now 54 known MDF mills in China operating and under construction, with a total installed capacity of almost 2 million M³. Many of these are small mills, often Mende continuous press lines. However, some of the more recent mills use flatbed continuous presses and are very large (in excess of 120,000 M³). Raw material is widely varied. While most mills use chips, some rely on bagasse, cotton stalks and other annuals. Quality of board is as widely variable, but all is consumed within China.

Despite this large installed capacity, China has routinely imported huge volumes of MDF amounting to an estimated 670,000 metric tons (944,000 M³) in 2003. Especially in view of the ban on logging, it is probable that China will require continued and appreciable volumes of MDF imports.

⁴⁸ For example, China is now the leading exporter of furniture to the US

Fiber

Fiber, baled or otherwise packaged, is a product of itself. One major firm, Canfor, produces fiber at its New Westminster, BC facility. A fiber mill could be integrated with a sawmill which would supply chips and other residues; those residues not useful for fiber would be burned for steam and power or otherwise disposed of. The fiber mill could also be integrated with a freestanding chipper or in-the-woods debarking and chipping machinery.

Refined wood fiber is produced by a thermomechanical pulping process (Canfor uses Sunds Defibrator) pressurized disc refiners. The disc diameters in use are 36 inches or 42 inches and turn at 1800 rpm. The fibers are cleanly separated at the middle lamella with minimal breakage across cell walls. The refining process can be tailored to produce refined wood fiber that meets exacting customer specifications. The fiber classification or distribution of fiber lengths is determined by a dry classification of as many as seven fractions using a Tyler Ro-Tap Sieve Shaker.

The refining, drying and bailing processes should be carefully controlled and monitored to ensure production of a consistent, high-quality product. Canfor's Fiber is available in a variety of Western Canadian wood species and is produced from clean, high-quality pulp-grade wood chips or custom blends of sawmill residuals.

Moisture content ranges typically from 10 to 15 per cent at the time of shipment. Unwrapped bales are held together by five bands and are approximately 0.76 meters wide by 1.02 meters high by variable length. Typical bale length is approximately 2.10 meters and weighs up to 760 kilograms at a maximum density of 460 kilograms/cubic meter. Bales are approximately 30 inches wide by 40 inches high with a typical length of 84 inches and weigh up to 1675 pounds at densities varying up to 30 pounds/cubic foot (Figure 11).

The fiber produced is sold for a number of applications:

- Soil holder, mulch and amendment (largest use); hydro seeding
- As an extender in moldable plastics
- For MDF
- As an ingredient in rubber products
- As a mat, compression molded to any shape, e.g. auto design

When used as a soil holder, the fiber is mixed with bonding agents, nutrients or other chemicals and sprayed onto horizontal or grade surfaces where it protects against erosion and enhances seed germination. Then it decomposes and adds nutrient.

The fiber is produced in what is essentially a thermo-mechanical pulp mill⁴⁹ relying on heated chips sent through the refiner. A complete package of a used TMP mill which includes the woodyard & chipping machinery is available, reportedly in very good condition, and priced at \$7 million. It is located in Indiana, packed in containers and

⁴⁹ Other technologies may be applicable, but R&D would be required, e.g.: steam explosion pulping technology

ready for shipment. Obviously, shipped to an Alaskan site and erected in a suitable building will increase the total investment substantially. The mill is rated at 200 tons per day output, or 50,000 tons for a 250 day year. Depending on species this would require from 75-90,000 tons of harvested timber (somewhat less as chips). This is equivalent to @65 – 78 million bd. ft. of timber.

Because fiber is a proprietary product to one company, which has been making and selling it for 48 years, there are no market data readily available. However, the applications for which it is sold are general throughout the US, including Alaska. This topic may justify a separate and detailed investigation, including a market study.