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Proceedings: Linking Healthy Forests and Communities Through Alaska Value-Added Forest Products



Sitka, Alaska • September 27-28, 1999

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Theodore L. Laufenberg, Technical Editor
Bridget K. Brady, Editor

Sitka, Alaska
September 27-28, 1999

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Abstract

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The Alaska forest products industry is experiencing significant changes in its structure due to economic, ecological, and social pressures. Papers presented at this workshop brought together technical specialists and exhibitors from forest products industry, associations, universities, and private, state, and federal land management agencies. Topics included: policy and management shifts necessary to link healthy forests, communities, and industries; silvicultural concerns for future forest potential; enhancing value in lumber, engineered timber products, processing of finished wood products, and special (craft and non-timber) forest products; and assessment of Alaska forest products industry's competitive position within state, national, and in Pacific Rim markets.

As the first technology transfer event of the Wood Utilization Research and Development Center, the Alaska Value-Added Forest Products Workshop set the stage for developing a strong research and development program for the new center. The center's mission includes working with community partners to identify and evaluate the opportunities for small businesses and examining how small businesses benefit the local economy. The Alaska Wood Utilization Research and Development Center opened in Sitka in January 1999. Congress directed its creation to identify and evaluate "value-added" activities that may provide a durable mix of employment, profits, and forest products industry in Alaska. The Center is a part of the USDA-FS Pacific Northwest Research Station.

Keywords: forest products, Alaska, wood, timber, logs, economics, forest management, silviculture, land use, engineered products, lumber, special forest products, non-timber forest products, markets, international, secondary processing, value-added, forest health, Sitka spruce, yellow-cedar, western redcedar, hemlock, white spruce, red alder, small business, community development, research needs, industry capacity

Preface

These proceedings comprise the papers submitted to document the presentations at the Alaska Value-added Forest Products Workshop held in Sitka, Alaska on September 27-28, 1999. As the first technology transfer effort for the Pacific Northwest Research Station (PNW) Wood Utilization Research and Development (R&D) Center, this workshop provided the outlet for a series of coordinated studies of the forest products arena. The design of these studies yielded broad coverage of the dynamic issues of Alaska forest resources and the product opportunities and industries derived from them.

During the first year to establish the Sitka center, we worked with Richard Haynes and Terry Shaw of the PNW management team on three objectives: 1) establishing the R&D program, 2) developing partnerships, and 3) hiring staff for the PNW's newest location. Our concept for expediting the development of the program of work for the center hinged on gathering current information from potential partners and soliciting ideas for the future needs of Alaska's forest products industry while the hiring process took place.

As we write this, the center has just become fully staffed and continues to develop their R&D programs. They have the results of these first coordinated studies, and supportive collaborating partners, to give them background and guidance as they undertake the challenges of identifying and evaluating opportunities for forest products in Alaska.

Given this opportunity, we'll introduce the center's staff and encourage you to contact them for advancing the discussions begun at this workshop:

Ken Kilborn, Team Leader
Bridget Brady, Information Support Specialist
Linda Christian, Forester
Dave Nicholls, Research Forest Products Technologist
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Our thanks and best wishes to each participant in this dialogue as we seek to achieve a sustainable balance in Alaska's forests, industry, and communities.

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On behalf of the Pacific Northwest Research Station, thank you to everyone who participated. We sincerely appreciate your efforts to develop information and provide guidance for future work at the new Wood Utilization R&D Center.

Thomas Mills, Director, Pacific Northwest Research (PNW) Station
Richard Haynes, Manager, PNW Social and Economic Values Research

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City and Borough of Sitka
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Region 10 and Forest Products Laboratory
Cooperative State Research Education & Extension Service
Rural Development

The authors and presenters are acknowledged for their time and effort to bring thoughtful dialogue to the wide range of workshop topics. Our workshop included user panels for each major session and we extend our appreciation to the panelists who shared their viewpoints on issues and challenges in their field. Participation in the evening exposition of value-added products and services was a highlight for many workshop attendees and we salute the exhibitors providing this hands-on and face-to-face opportunity for us.

Special thanks to our partners in the Alaska Regional Office (Region 10), Tongass' Sitka Supervisor and Ranger District staffs, PNW Public Affairs and Editing staff and the Sitka Convention and Visitors Bureau who collaborated with Bridget Brady to expedite our planning and execution of this workshop by sharing their experience, supplies, and ideas.

We are grateful for the creative talents shown on our cover design by Karen Berton. Cover photographs are by Steve Schmieding of the Forest Products Laboratory who also coordinated audio-visual support during the workshop.

Table of Contents

Opening Session	
Remarks of the Honorable James R. Lyons	1
Keynote Presentation	
A Vision for Revitalization of Alaska's Forest Products Industry	5
<i>Jamie Kenworthy</i>	
Analysis: Requirements for a New Industry	6
The Alaskan Resource.....	7
Target I in a New Industry: Large Integrated Mills	9
Target II for a New Industry: Competitive Small Sawmills	11
A Future Alaskan Industry.....	12
Linking healthy forests, communities and industry	
Ecology, Economics, Politics, and the Alaska Forest Products Industry	13
<i>Gunnar Knapp</i>	
Allowing the Forest Products Industry to Evolve	21
Creating a Favorable Environment	21
Healthy Communities	22
Assuring future forest potential	
The Southeast Alaska Timber Resource and Industry: What Might the Future Hold?	23
<i>Richard R. Zaborske, Michael H. McClellan, Jamie Barbour,</i>	
<i>Theodore L. Laufenberg, Charles G. Shaw III</i>	
The Possibility of Using New Silvicultural Systems in Hemlock-Spruce Stands in Southeast Alaska: A Retrospective Perspective	27
<i>Robert L. Deal</i>	
Timber Merchandising Systems and Timber Sale Implications:	
A Strategic Perspective	33
<i>Phil Woolwine</i>	
Agents-of-Change: Management Considerations.....	41
<i>Edmond C. Packee, Robert A. Wheeler</i>	
Forest Health Through Agents of Change	42
Root Rot and Other Pathogens.....	44
Insects as Management Concerns	44
Fire	45
Ecological Function and Management of Forest Disease in Southeast Alaska.....	49
<i>Paul E. Hennon</i>	
General patterns of tree mortality.....	49
Wood decays	51
Dwarf mistletoe	53
Yellow cedar decline	54
Enhancing values in lumber and engineered timber products	
Sawmilling Technology Application in Commodity Products	59
<i>Kenneth A. Kilborn</i>	
Current Primary Processing Industry	60
Expansion Needs in Primary Processing	61
Assessment of Research and Development Needs of Primary Industry	62
Product Recovery and Quality of Alaskan Timber.....	65
<i>Eini C. Lowell</i>	
The First Twenty-Plus Years: 1958-1979.....	66
The 1980's	66
Recent Work	67
Forward to the 21 st Century.....	71

Grading Options for Western Hemlock Pulp Logs.....	73
<i>David Green, Kent A. McDonald, John Dramm, Kenneth Kilborn</i>	
Alaskan Forest Products Industry: A Changing Focus	77
<i>Kevin Curtis</i>	
Forest Resources, Consumption and the Industry.....	78
Short-term Opportunities and Needs	82
Long-term Alaskan Species Product Opportunities	84
Maximizing Value in Secondary Processes and Specialty Products	
A Northwest Perspective on Secondary Processing	89
<i>Jim Reeb</i>	
Primary and Secondary Processing	89
How Much Value?	92
Oregon State University Forest Products	94
Alaskan Forest Products Database	94
Solid Wood Value-Added Manufacturing	97
<i>Daniel J. Parrent</i>	
Executive Summary	97
Defining "Value-Added"	98
Manufacturing "Value-Added"	100
Lumber Drying.....	101
Lumber Drying Procedures	103
Wood Machining	109
Appendix A. A Partial Profile of One Value-Added Product.....	114
Appendix B. Species Characteristics	115
Softwoods	115
Hardwoods	117
Appendix C. Mechanical Properties of Alaskan Species	119
Appendix D. Comparisons of Mechanical Properties of Western Hemlock, Sitka Spruce and White Spruce to Other Species in their Species Groups.....	121
Alaskan Special Forest Products Markets Report	125
<i>Catherine Mater</i>	
Overview of the Importance of SFP throughout the US	127
Implementation of a US Collaboration Project within Forest-Based Communities	131
Development of an Alaskan Region SFP Management Policy	133
General Markets Update for Special Forest Products	136
Specific Markets Overview for Alaskan Special Forest Products	140
Herbal Medicinals and Botanicals	140
Foods	145
Florals and Evergreens	146
Decorative/Craft Woods.....	148
Types of Value-Added Being Employed in the SFP Industry.....	163
Review of Other Factors Influencing Market Demand for SFP	166
Recreation, Tourism, and Other Non-Consumptive Forest Activities	167
Product Distribution Channels Which Positively Impact SFP Development	168
Identification of "Missing Pieces" in Order to Develop an Alaskan SFP Industry.....	170
Suggested Strategy for the Development of an Alaskan SFP Industry.....	172
Appendix A. Small-Scale Equipment for Foods, Botanicals, & Medicinals	180
Appendix B. Draft Guidelines for Certification of Non-Timber Forest Products (NTFPs)	191
Assessing Market Conditions and Alaska's Competitiveness	
The Alaska Wood Products Industry 1998 Sawmill Survey	203
<i>Alexandra Hill</i>	
Data Sources for the Alaska Wood Products Industry.....	206
Harvest Data	206
U.S. Department of Commerce Export Data	207
Alaska Department of Labor Data	207
Survey Data.....	207

Results of the 1998 Sawmill Survey.....	208
Mill Capacity.....	209
Sawmill Equipment.....	209
Production.....	210
Supply Problems.....	214
Log Consumption.....	214
Employment.....	215
Chip and Residue Production.....	216
Comments from the Survey Respondents.....	218
The Alaska Market for Value-Added Wood Products Used in Residential Construction	225
<i>Donna Logan and Scott Miller</i>	
Summary of Findings.....	225
Housing Starts.....	231
Remodeling Market.....	231
Kitchen and Bathroom Cabinets.....	233
Exterior and Interior Doors.....	234
Windows.....	236
Millwork (Mouldings and Trim).....	238
Exterior Siding.....	240
Finish Flooring.....	243
Industry Contacts.....	246
An Assessment of Market Opportunities for Alaskan Forest Product Exports	247
<i>Rosemarie Braden, Kyle Cunningham, Bruce Lippke, Ivan Eastin</i>	
Executive Summary.....	247
Objectives and Organization of Report.....	253
Domestic Forest Resource.....	254
Export Market.....	268
Leading International Markets.....	272
Considerations for Export Oriented Trade.....	281
Opportunities for Alaska's Wood Products.....	284
Future Research.....	295
Appendix A. Map of Alaska by Land Ownership.....	303
Appendix B. Considerations for Exporters to Japan.....	307
Workshop Summation: Alaska Value-Added Forest Products	317
<i>Thomas Mills, Theodore Laufenberg</i>	
Appendix I. List of Attendees	323
Appendix II. Program	329
Appendix III. Author Biographies	333

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Opening Session

Remarks of

The Honorable James R. Lyons Under Secretary for Natural Resources and Environment U.S. Department of Agriculture

Good morning and thank you for inviting me to join you this morning. I am very happy to be part of this conference and part of the effort to assist Sitka and other Southeast Alaskan communities in trying to identify new, value-added opportunities for the forest products industry. I believe that finding ways to diversify Southeast Alaska's economy is essential, as the region responds to changing social, economic, and ecological conditions.

The rather simple message I want to convey to you this morning is that we want to help in dealing with these changes as partners and collaborators. We have a tremendous amount of talent, expertise, and resources that we can bring to the table to address these changing conditions. Our primary goal is to be an effective partner in the future.

The Forest Service has worked actively over the past two years to bring diverse interests, industry groups and communities together to discover common values and develop common visions for the people of SE Alaska as well as the sustainability of the Tongass National Forest.

A healthy, ecologically sustainable Tongass National Forest is fundamental to achieving the social and economic sustainability of the region. Forest products is one critical component of the mix of goods and services from the Tongass that can help the region achieve its social and economic goals.

The creation of this Wood Utilization Laboratory here in Sitka is a shining example of the Forest Service's efforts to help Southeast Alaska weather the changing economic climate in the region. However, we need to do a couple of things to ensure that the good work of the lab and other community efforts to develop value added wood product opportunities for Southeast Alaska yield real dividends:

We need to ensure that the Wood Utilization Lab becomes both a research station for the development of value added wood product technologies and also a clearinghouse for those technologies so that we are creating some real practical benefits for communities in transition in terms of business development and job creation.

We also have to create a new mechanism for ongoing communication and dialogue between the lab and communities in transition so that we are making sure that those technologies have some practical application and utility for those communities we're trying to help.

And, we need to ensure that this dialogue is linked to other discussions regarding the future of the region and does not occur in isolation. As we identify value-added opportunities, we need to help the region define and develop markets. As we develop new technologies, we need to refine our timber sales program and management strategies to produce the species mix and timber sales to support these emerging opportunities. And we need to tie our discussions regarding desired future conditions on the Tongass back to our dialogue on new value-added opportunities.

Toward that end, I would encourage the lab to think seriously about finding ways to improve its technology transfer capability as well as its dialogue with line managers on the Tongass. We can't afford to let the Wood Utilization Lab simply work in isolation. It needs to have as its central

mission the generation of ideas that have practical application on the ground. I would also encourage the Forest Service to develop an advisory board for the lab that includes a wide diversity of wood products producers in Southeast from independent mill operators on down to the music wood and specialty craft makers. That way, the end user of these technologies is helping to develop the ideas that will have practical application for their businesses. The Forest Service has already embarked on a number of efforts to foster such dialogue about innovative ways to help the region respond to a changing timber market in Alaska.

The Forest Service sponsored a Collaborative Stewardship Symposium in the winter of 1998 in Ketchikan where over 100 people attended. I understand that at least two collaborative working groups came from this session that continue work today -- such as one on north Prince of Wales Island. In March of 1999, the Forest Service convened a Tourism Symposium here in Sitka bringing over 150 industry and interest groups and agency partners together to begin forming a vision of sustained recreation and tourism for communities of SE Alaska. The SEA-CERT process began in 1997, bringing together communities and agencies to help find ways and projects that will diversify economies impacted here in SE Alaska. Today, you are holding a workshop to help find common goals, technologies and markets to strengthen wood products businesses in SE Alaska.

Through these Symposiums, workshops like this, and SEA-CERT you have raised the awareness of what SE Alaskans are doing and the help needed to stabilize your region of the state. This will bring increased funding to Alaska, particularly SE Alaska through the Rural Development agency, through increases to Forest Service State & Private Forestry, and through priorities all USDA agencies are making to assist you.

Each of these important events and groups has taken the region a step forward - we just need to ensure that these efforts are coordinated. By working together to identify common priorities for a community, for an entire island, for the entire forest; we can better provide assistance and staff to support your goals. We are already taking steps to bring new energy and ideas to Alaska on the regional and forest level.

Just this year, Forest Service Chief Mike Dombeck appointed Rick Cables as the new Regional Forester in Alaska who brings great energy and ideas to the management of the region's national forests. We already have an experienced leader in the presence of Deputy Regional Forester Jim Caplan who provides a steady hand in the region and who is familiar with Alaska's needs. Also, a new Forest Supervisor for the Tongass National Forest in the form of Tom Puchlerz. With this combination of new leadership in the region, the Forest Service is now poised to confidently and capably move forward with creative approaches to reinvigorate the Southeast Alaska timber economy, and do so in partnership with all concerned parties.

The FY2000 USDA budget also has about \$40 million identified for Alaska Rural Development with a large percentage of that targeted for SE Alaska projects. The budget also has about \$1 million identified for Forest Service Coop Forestry, Economic Action, and Rural Economic Development work, of which about 25% will come to SE communities. We want to do more collaborative work like this and thank the hard work and dedication of many individuals for the foresight to come together and design a future based on common values.

For too long, the Forest Service and the communities of Southeast Alaska were viewed as separate entities, often in conflict, and seldom working toward the same goals and objectives. That is changing now. The dialogue is improving. And with that improved dialogue comes new opportunities to learn and grow together.

I had the opportunity to have dinner last night with Mayor Stan Filler and Gary Paxton and his lovely wife, and with Jeff Staser who is now with the Denali Commission. While it was a great dinner, what was truly marvelous was the opportunity to listen and learn about the plans and dreams that the Mayor and Gary have for the community of Sitka. Their vision is broad and balanced, and, founded on reality. Most importantly, it reflects a true passion for this community and a sincere desire to not only survive, but also grow and thrive. What they want for this community, we can help them achieve.

But we can only do so through an open dialogue, and a desire to better understand each other's point of view. I learned a lot last night about the vision of two leaders of this community. And, I'm proud to say that they were very complementary of the Forest Service leadership with whom they were working. They emphasized how important we are as a "part of the community".

We look forward to a continued partnership with the state, local communities and leaders, businesses and other federal agencies in working together to reach your goals for the future, through collaborative efforts like SEA-CERT, the second Tourism Symposium in 2000, and this Value-Added Wood Workshop.

I'm reminded of that line from the Tom Cruise movie -- Jerry Maguire --where he's in the locker room with Cuba Gooding, Jr. and Gooding's character -- a wide receiver with the Phoenix Cardinals -- is going on and on about his problems with the ball club. Cruise looks at Gooding and says, "Rod, help me help you... Help me help you."

I guess I'd say that this is the role that we would like to play here in Southeast Alaska, working with communities to help you realize your dreams, your goals, and the sustainable future you seek.

Now I'm sure many of you thought I was going to say that other line from the movie, "Show me the money". No, that's the way communities used to think of their relationship to government. Not only do we not have it any more, but I hope our partnership involves much more than the transfer of funds. Because it's really about rolling up our sleeves and sitting down and working together. And that's how I hope things will be in the future -- a true, working partnership in Southeast Alaska.

Thank you, again, for inviting me to help kick off this important collaboration. I look forward to great things from this partnership.

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Keynote Presentation

A Vision for Revitalization of Alaska's Forest Products Industry

Jamie Kenworthy
Executive Director
Alaska Science and Technology Foundation
Anchorage, Alaska

It is not clear whether Alaska in the future will have a significant forest products industry. What is clear is that the structure and economics of the industry have so changed that the industry as presently understood and organized now faces a slow death. Yet the changes in economics, technology, and markets that have downsized the Alaskan industry, suggest how a new building products industry can be revived.

Whether that industry should be revived is not a question of economics, but in the final analysis, a question of values or politics. Does Alaska want to have a forest products industry as one part of its economic base?

But before that final question can be answered, most Alaskans would want to know what has happened to the industry and what a revitalized industry might look like. For most Alaskans the question of whether the state should have a forest products industry is a question of understanding the costs and benefits, both economic and non-economic.

Decline of an Industry

The decline of the Alaskan forest products industry can be explained at least as well by changes to the industry outside Alaska as it can by actions of the federal government. A few facts can capture the declining importance of timber to the state's economy. Measured by revenue brought into the state, the forest products industry has declined from 5% of the state's economic base in 1965 to 2.3% in 1985 to little more than 1% today.

Alaska is not even a net supplier of forest products. In effect Alaska has a net "trade deficit" in lumber and other finished wood products. A recent McDowell study documents that the in-state market for dimensional lumber is 90 to 100 million-board feet/year (MMBF) with imports supplying 80-90 MMBF/year or nearly the full market. The state also consumes 90 million square feet (3/8" basis) of engineered panels each year, all imported. (1)

The Alaskan industry should be considered as two separate regional industries. While 1000 acres in the Southeast contains an average of \$1,000,000 worth of timber, a similar area in the boreal forest of Interior-Southcentral might be only a quarter as valuable. The Southcentral and Interior or Railbelt region is dominated by white spruce and is located near 70% of the state market. Southeast Alaska has more timber and higher valued trees but because of location and transportation costs, it has a very small local market of 15 MMBF/year and so must compete with Canadian and Pacific Northwest mills in the non-Alaskan Northwest states.

Between 1997 and 1998, log and lumber exports declined from \$403 million to \$171 million and pulp and paper from \$33 million to \$15 million. Between 1990 and 1997 exports were fairly steady at approximately 580 MMBF/year of raw sawlogs and pulp a year. In 1998 forest products exports dropped sharply due below 200 MMBF because of the Asian flu.

At the same time 80-90 MMBF of dimensional graded lumber was imported into the state. That western and Canadian Spruce-Pine-Fir (SPF) construction grade lumber can pay round trip travel costs and still compete with local lumber is a statement of how uncompetitive the Alaskan industry remains. Unlike northern Europe, the Alaskan industry has not integrated downstream to process the commodity into higher value products like furniture or paper. Additionally Alaska has not controlled or organized the resource to provide a consistent, predictable supply as is done in Chile, Alberta, Czechia, and New Zealand.

As a result, the state, in the past dominated by the now closed Sitka and Ketchikan pulp mills, has been largely a passive provider of labor and timber supply to corporations headquartered outside Alaska whose temporary interests have led them to operate mills in the state. The recent investment of Gateway in Ketchikan to build a veneer plant is the one mid-size investment that fits the category of modern plant investment on commercial scale.

Analysis: Requirements for a New Industry

More discouraging than the declining size of the industry are the changes within the industry. Ten years ago only 40% of the jobs in the forestry industry were in logging with 60% of the jobs in the mills and other processing operations. Now these figures are reversed. Any strategy to revive a new forest products industry must address realistically the status of an industry shrinking both relatively and absolutely as competitors elsewhere are adding more value to timber than Alaskan firms.

With one significant exception, the same general forces, which have threatened the income of Alaskans in the fisheries and oil industry, have threatened the forest products industry. Alaska has been primarily exporting a raw or low value commodity (logs, cants, and pulp) whose prices are set on world markets. However, unlike salmon and oil, the industry has declined even in periods of increasing prices. In November 1999 graded lumber prices are around \$360/1000 board feet up from \$320/1000 the year before.

Most Alaskans in the Southeast forest products industry blame the federal management of the Tongass as the cause of the industry's decline. What corporation, they reasonably ask, would invest the \$100-250 million necessary to build a fully integrated plant which must be amortized over 15 to 20 years on the basis of uncertain federal timber sales of no longer than 2-5 years? Even smaller milling operations require a 5-10 year payback. From this perspective "politics" are killing the Alaskan industry. Native corporations have grown more skeptical of the economic and environmental sustainability of exporting logs, cants, and pulp from their land.

Wood-based products such as oriented strand board (OSB), particle board, laminated veneer lumber, and other composites offer more consistent strength and uniformity than cut lumber in many structural and semi-structural applications. Firms that use advanced stamping and adhesive technology to increase their market share over producers of raw lumber. With more limited and higher cost timber supplies, the use of technology to more productively use the whole tree is becoming a more important factor in determining profitability. The closing of the Ketchikan and Sitka pulp mills and threats to other Southeast mills have grabbed headlines, these events have only confirmed two longer term trends which threaten the size of the industry: the declining share of processing jobs compared to logging jobs and the few jobs needed (through higher productivity) to harvest the same amount of timber.

Today, in Southeast Alaska unprocessed logs from Native Corporation lands fetch higher prices outside Alaska than stumpage values paid by local processors for timber from the Tongass Forest. Clearly federal timber prices are not the primary reason for the industry's decline and Alaska processors are not as efficient as outside competitors. A recent study by the US Forest Service comparing the economics of British Columbia mills to Southeast Alaska mills shows that Alaska firms have a cost per unit of output a third higher than BC both because of higher wages and lower output per worker. (2)

Lower Alaskan productivity is a result of a number of important factors: the lack of specialization of each mill's products, higher transportation costs for both supplies and shipment of product to market, a wider range in log size of Alaska forests, lack of dependable supply to scale up to economic feasibility, and cost of local infrastructure.

A new industry can be built by focusing on two different segments of the industry. The first is the approximately 20 small sawmills cutting between 1-20 MMBF/year and their aim to sell into the in-state market for dimensional lumber, house logs, and ungraded material. The second is the large integrated producer producing on a manufacturing scale the final product primarily for an export market such as veneer or other engineered material. The capitalization, scale, business experience, and competitiveness and marketing challenges are quite different for these two types of firms. But as will be seen, there is a symbiotic relationship between large and small firms who can sell to each other the high and low end logs and so improve the economics for each party. Most Alaskan saw mills are too poorly capitalized to be vertically integrated. Most mills bid on their own sales, have skids bring the wood out, and use a small share of that local supply of the limited mix of their product. This lack of a supply chain in the state, the high transportation costs and distance from markets, and the lack of infrastructure are three of the many challenges facing the industry.

Before further addressing the competitiveness issues for that new industry some discussion of the resource is necessary.

The Alaskan Resource

The issue of long-term supply is one of only many key challenges issues in a rapidly changing industry.

In contrast to Alaska, the medium and large size mills of Oregon and Washington receive most of their supply from private lands, including their own, and their business plans now must count on negligible amount of timber availability from federal national forests. (Such availability can greatly improve the scale and economic for those Northwest mills but their investment plans assume almost entirely harvesting from private lands to demonstrate economic feasibility.) While native corporation lands represent three quarters of the state's timber supply, there is negligible non-native corporation private timberland in Alaska.

Approximately 129 million acres of Alaska's 365 million acres are forested. Defining commercial timberland as natural stands capable of producing 20 cubic feet of wood per acre per year gives the state 15 million acres of potential timberland, more than all but 12 other states.

Alaska has almost 20% of the nation's forested land but only 3% of the nation's timberland. Not included in timberland are natural stands capable of producing less than 20 cubic feet/acre/year and the 5.4 million acres that have been officially withdrawn as part of national parks, wilderness area, or wildlife preserves. So while two-thirds of national forest lands outside Alaska are considered commercial timberlands, in Alaska only 12% of forestlands are considered timberlands. (3) This lack of resource is due both to the lower forest productivity outside non-Southeast Alaska and the high proportion of federal non-commercial set asides.

While most of the state's timberlands are in Southcentral and Interior Alaska, the highest density of wood and largest harvest comes from the temperate Southeast. With the Tongass National Forest dropping from 37% of the state's harvest to 23% in 1998, the Tongass is a shrinking piece of a shrinking pie. Not surprisingly, a 1999 survey shows declining jobs in the Southeast and continued growth in Southcentral and Interior Alaska. Forest products in the Southeast peaked at 6113 direct jobs in 1990 and fell to 2195 by 1998, a loss of 488 jobs between 1997 and 1998. (4)

The coastal forest of the Southeast and parts of Southcentral is so different than the boreal forest of the Interior and Southcentral in terms of age, quality, and land ownership patterns that it calls for a completely different strategy to manage. The dominant species of the coastal forest are western hemlock (60%), Sitka spruce (26%), Alaska yellow cedar (7%), and western redcedar

(7%). Almost two-thirds of commercial species in the slower growing Southcentral and Interior regions is white and Lutz spruce with the balance being paper birch, aspen, poplars and cottonwood. Trees in the Southeast forests average 400 years old, the forests of the Interior-Southcentral average 130 years for spruce and 80 years for birch. Between 50-65% of the Sitka spruce, cedar, hemlock, and other trees in the Southeast are potential saw logs; the comparable figure for the Interior and Southcentral forest is perhaps 20-30%.

Native corporation land and federal ownership of the Tongass dominates the Southeast forest. Although the Southeast harvest from native corporation peaked in 1990, since 1983 more Southeast timber has been harvested from Native Corporation lands than from the Tongass. Of the 343 million board feet (MMBF) sold in the Southeast in 1998, 63% of the harvest came Native corporations. (5) Statewide native corporations comprised 56% of the state's supply. Most estimates indicate that the biological potential of the Tongass exceeds the 155 MMBF/year harvest level set by the 1999 USDA Record of Decision.

Although 17% of Alaska's timberland is owned by the state, almost all is outside the more productive forests of Southeast Alaska. In FY97 the Department of Natural Resources (DNR) offered 86 sales totaling 42 MMBF and in FY 98 DNR had 94 sales of 21.4 MMBF. While 51 of 60 smaller 1998 sales were to local processors and provided \$522,070 to the state treasury, the total volume of state sales does not equal the supply used by one small-sized mill in the Pacific Northwest. (5)

In contrast to the Southeast, less than 7% of the Interior-Southcentral forest is federally owned, with 40% owned by the state and the balance in private ownership, primarily native corporations. While federal management of the Tongass can be cited as one factor in the decline of the industry in the Southeast, the small amount of federal land in two-thirds of the timberlands in Southcentral and Interior Alaska does not make the federal government a significant player outside Southeast. (6)

Only 13% of Alaska's interior forest of over a million acres meets the standard of a commercial timberland including half that amount, or 6.8 million acres, of Alaskan white spruce. The State of Alaska owns about 30% of the interior commercial forest including 1.9 million acres of the total of 5.5 million acres of commercial grade Alaskan white spruce.

With most birch trees losing volume to decay after about 80 years, it is also predictable that the state's best birch stands of 50-60 years age in the Susitna valley and other Southcentral areas will soon be lost to disease and decay. With Alaskan white spruce requiring a 70-120 year rotation in the Interior, fire has been the chief harvester for this important species that composes half of the commercial timber of the Interior. The spruce bark beetle infestation has affected 5.2 million acres between 1993-1998. The number of acres affected peaked at 1.1 million in 1996 and declined to 563,000 in 1997 and 316,800 in 1998. The decline is partly due to the beetles consuming their food source as they move north from the most heavily effected area of the lower Kenai. A total of 5.2 million acres were harvested by beetles from 1993-1998, a land area which far exceeds areas harvested by the industry.

The passage of SB 180 in 1996 (AS 38.05.123) promises to increase the availability of timber for such defined value-added processing as lumber, furniture, flooring, house logs, plywood, veneer, or any final product such as furniture or shakes. These sales can be negotiated to provide up to 10 MMBF/year for up to 10 years but all SB 180 sales must still meet requirements for sales including being on the DNR five year schedule, have a Forest Land Use Plan, be adequately advertised, and meet a best interest finding. SB 180 did not increase the supply of timber from state lands nor did it shorten the time of the review process to provide timber to local processors. Since DNR already has other authority to negotiate sales of 500 MBF, it can be expected that the eventual impact of SB 180 will be to increase the amount of supply dedicated to Alaska processing but not to increase the overall cut from state lands.

Target I in a New Industry: Large Integrated Mills

There are two targets to rebuilding an Alaskan industry that focus on potentially competitive product and access to a realistic level of timber supply.

The first is increasing the competitiveness of small mills in the state to produce standard products for the in-state market and niche products for export out of the state. For the first target, the competition is largely Canadian imports of dimensional wood and engineered panels. Starting with a transportation cost advantage to the largely Railbelt Alaska market, local mills must compete on price and quality.

The second target is to attract significant external investment in a large processing mill capable of producing a final product, primarily export and Lower 48 markets. The market that investment must compete in is against all engineered building materials, not just wood based products. And that competition to produce wood fiber for that larger market is worldwide.

Since the closure of mills in Wrangell, Ketchikan, and Sitka there is no large, capitalized enterprise in the state. The expected Gateway veneer plant in Ketchikan and the transformation of the Silver Bay operation of the old Wrangell mill suggests a smaller size operation producing final products may be the state's future. Larger investments in the \$100-200 million scale must be evaluated against competing returns expected by multinational forest products companies in other locations around the world.

Modern computer-assisted mills are characterized by high margins and high productivity rather than high volume and low margins. The profit margins and markets are moving to the most efficient wood processors and distributors, not necessarily the firms with the lowest cost supply of timber. While most Alaskans consider the forest products industry to produce primarily lumber and pulp, the industry might be more accurately called the industry of engineered building materials. In short, the industry in the rest of the world has changed faster than the industry in Alaska.

When lumber prices are high, non-wood building materials such as plastic, steel, aluminum, and concrete will increasingly substitute for wood-based products in both structural and semi-structural applications. Wood-based engineered products will have to possess the strength, durability, uniformity, and cost of man-made composite materials to be used in the homes of the future. With the cost of the ingredients for composite materials likely to be lower outside Alaska and the primary housing markets in Asia and the Lower 48, Alaska will need to compete with both wood-based and composite products in the world's building materials market.

A visit to any advanced wood products plant shows how technology has changed both products and processes. Thirty years ago machine operators made visual judgments making cuts to a $\frac{1}{8}$ - inch tolerance. Manual trimmers and edgers would usually be 65 -85% accurate with an incentive to overcut and leave their mistakes on the floor. Today computers are both scanners and decision makers "seeing" the whole log and making decisions on how electronically controlled networks cutting to .002" tolerances can extract maximum use from a log. Scanner optimizers and edgers regularly achieve 98-99% accuracy and recover 5-25% more from a tree. Microprocessors and automated scanners characterize the log, optimize breakdown, edging and trimming, and then can control the drying process.

Computer-assisted cutting, trimming, sorting, grading and shipping has increased both resource recovery and production speed and shipment. The skills needed to operate such an advanced plant today are not the strength and the hand and eye coordination needed in the past but the ability to program and monitor computers that control the production process. A good operator understands the manufacturing process, monitors ongoing quality parameters, and can program the computer to extract different mixes of products depending on the changing margins of different products and changing market conditions.

Advanced mills are not one product operations but integrated manufacturing plants generating their own energy from wood chips and turning out both lumber and pulp or specialized wood products like oriented strand board. While cost and quality of timber supply remains an important issue in the industry, even more critical to being competitive is the deployment of technology to more productively extract full value from the resource. The final product of an advanced integrated mill is as much a carrier of the technology as it is a processed resource.

	Old Industry	New Industry
Industry	Wood Products	Building Materials
Type	Commodity	Engineered Products
Competition	Cheaper Logs	Composites
AK Model	U.S. NW 1950-1970	Scandinavia, Alberta, Chile
Mills	Single Product (Lumber or pulp)	Integrated (full Recovery)
Labor Skill	Hand-eye coordination	Mind-instrument
Key Issue	Timber Supply	Productivity Technology

The model for a future Alaska industry is not the 20-40 year old wood processing operations of Oregon and Washington with their precarious economics dependent on large volumes of low cost timber supplies. Implementation of the President's Record of Decision on the Tongass management Plan of 155 MMBF/year represents a cut of as high as 80% from federal lands.

The model for Alaska's future forest products industry might be Scandinavia, an area with no old growth forest left and high cost supplies which deploys efficient and modernized plants with advanced computerized processing equipment, stamping equipment, and advanced gluing and drying techniques to turn lumber into furniture and structural components. With a small, high cost supply base, a wood products industry in Europe has survived by emphasizing value-added products and road access to timber supply.

Second, rather than exporting raw pulp made primarily from virgin wood as Alaska did until 1998, Alaska will need to be a source of fiber in a market which needs fiber from any competitive source whether virgin wood, recycled wood or trash, or man-made polymers, steels, and other composite materials. Federal economists have calculated that since 1989 the marginal revenue from turning Southeast logs into lumber as opposed to dissolving pulp has been greater and continues to increase.

Alberta is another example of a rural region using aspen, an underutilized species, to attract an OSB and pulp operations. While the industry declined in Alaska in the 1980s, Alberta attracted additional investment and jobs without compromising a sustainable yield policy. While Alberta's industry looks more like Alaska's industry than the high value product industry of northern Europe, Alberta, unlike Alaska, integrated horizontally to use the full resource and vertically to add value to that resource.

British Columbia is the chief exporter to Alaska of dimensional lumber. While the collapse of the Asian market in 1997 has caused the BC industry to downsize and close mills, this lower demand combined with a declining Canadian dollar has allowed BC to ship a higher quality, lower cost product to Alaska and the Lower 48.

If Alaska is to use its timber to broaden its economic base, considerations of productivity will have to be given more consideration than only the politicized issue of supply. For Alaska to attract further investment in larger (50-150 MMBF/year) plants will require:

- a predictable source of supply to give reasonable confidence of local availability of material for 10-20 years.

- skilled labor to operate modern processing technology
- a defined competitive advantage for an export market
- A more robust supply chain of harvesters, log sort yards, and manufacturers using both the high end and low end of the log and selling to each other.

Target II For a New Industry: Competitive Small Sawmills

A 1998 survey by ISER for the Department of Commerce and Economic Development well captured the small size and scale of Alaska's mills. Twenty-eight mills reported producing in 1997 a total of 62 MMBF, the size of one mid-size mill in Washington or Oregon. The average mill operates one shift a day less than 150 days a year with seven employees. (7)

The market for the bulk of small sawmills cutting less than 2MMBF/year is green wood and other ungraded material for decking, construction, and building in the 20% of the market that allows non-graded material.

Production numbers are dominated by a handful of larger (but still small by Lower 48 standards) mills, almost 90% of the product for sawmills was split in 1997 between the 37 MMBF for dimensional lumber and 31 MMBF of cants and flitches. A few larger mills in Kenai, Fairbanks, and Ketchikan now operate at near commercial scale.

Six mills in the state now produce graded lumber certified by the Western Wood Products Association under a program financed by the Alaska Science and Technology Foundation and the US Department of Commerce. Until a working group of sawmill owners convened by ASTF in 1995 identified reasonably priced grading as a key issue, there was no grader in the state accredited by the American Lumber Standards Committee and the federal government. As a result mills had no access to the 90% of the market that includes building permit areas and all government construction.

Western Wood Products Association (WWPA) has now stationed a grade inspector in the state who travels to mills around the state to certify lumber grades and suggest improvements to improve quality. Improvements result in better prices, higher margins, and more ability to invest in better equipment. The future of the Alaska-owned part of the industry is dependent on the ability of these handful of mills now producing more than 2 MMBF/year to produce cants, graded dimensional lumber, and other final products.

The ASTF-industry project has focused on lumber grading and other technical assistance to improve kiln drying, throughput, mill layout, lumber recovery and other manufacturing competitiveness topics. Two challenges facing sawmill owners have been identified as priorities. The first is to certify the superior properties of Alaskan species to replace current imported Canadian Spruce-Pine-Fir (SPF) grades. A higher design value for key Alaska species (e.g. white and Sitka spruce, yellow cedar, and western hemlock) would demonstrate the superior properties of our slowly grown, tight ring wood. Presently, graded wood is lumped into the Canadian or US SPF designation where non-Alaska fir is the weakest species, dragging down the entire category. A program to certify higher design values for these three key Alaska species is a top priority (behind grading and technical assistance) for the state's sawmill owners.

The second challenge is to scale up the investments in modern kiln operations, log recovery equipment, improved mill layout and other improvements to manufacturing operations to get to an economic scale.

Conclusion

There is little doubt that the old Alaskan forestry industry based on exporting pulp, logs, and cants will continue to shrink and die. A new industry of expanded sawmills and new investment may not be growing fast enough to replace the lost jobs in the old industry. Given the supply of timber in the state and the current stumpage value of much of that timber, both federal and nonfederal, there are no insurmountable economic reasons why Alaska cannot support a small but growing forestry industry. But it is a different industry from today.

A Future Alaskan Industry

Can Alaska witness a revived forest industry? Should it? Other democratic governments of the world as different as Finland, Sweden, Chile, Czechia, New Zealand, and Alberta have demonstrated the ability to organize and do business in world markets with forest operations that maintain broad public support. The question of whether Alaska chooses to organize itself to make this adjustment is one finally not of economics because how both the public and private sectors play their roles determines the economics and, eventually, the local politics of an industry. It is finally a political question. But for an Alaska whose economic base is perilously over dependent on the price of oil, and whose rural economies require some private sector base, the choice to determine the terms under which a wood products-based processing industry in the state can survive is a choice Alaskans would be wise to make.

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Ecology, Economics, Politics, and the Alaska Forest Products Industry

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Abstract

Ecology, economics, and politics together define and constrain opportunities for the Alaska forest products industry.

Ecology limits potential timber harvest paths and non-timber benefits over time. One kind of ecological limit is the tradeoff between potential harvest levels over time. Another kind of ecological limit is the tradeoff between timber harvests and non-timber forest benefits such as fish and wildlife and scenery. The tradeoffs we make between ecologically possible levels of timber harvests over time and ecologically possible combinations of timber and non-timber benefits are political decisions. Ecology sets broad limits to possible Alaska timber harvest paths over time. But within these broad ecological limits are narrower *political* limits that reflect the choices we are willing to make about tradeoffs over time and tradeoffs between timber and non-timber benefits.

Economics--factors beyond our control that affect costs and prices--limits the profitability of different potential future paths for the forest industry. "Economically possible" future paths for the Alaska forest products industry--those that could be profitable without public subsidies--are constrained by a number of factors. We sell into world markets at prices that reflect world demand conditions as well as our competitors' costs. Many of our costs are higher than our competitors' costs. Because the Alaska forest products industry is small and not very diversified, we cannot utilize our timber as profitably as we could if the industry were larger and more diversified. These economic constraints beyond our control mean that only some of the future paths for the forest products industry that are ecologically possible are economically possible.

Politics, decisions made through the public policy process, also affects the forest industry in many ways. Politics sets physical limits on timber harvests, but may also provide subsidies to the forest products industry. Political choices about when, where and how public timber is sold affect costs of harvesting and manufacturing. Similarly, political choices on the total volume offered for sale, imposes its effects on the scale of the industry. Primary processing requirements limit some potential uses of timber but make others more profitable by lowering costs of raw materials for in-state manufacturing. Politics will continue to influence the Alaska forest products because most Alaska forests are publicly owned, and most Alaskans (and many other Americans) have strong interests in how Alaska forests are used.

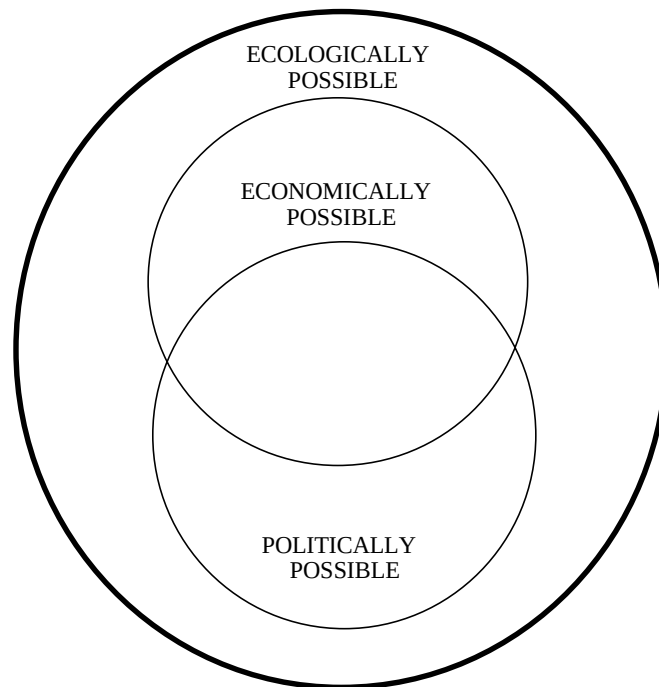
To create a healthy forest industry we should try to create an economic and political environment in which a healthy industry can evolve. A healthy industry is more likely to evolve if (a) we can build a broad political consensus over a reasonable balance in the uses of Alaska's forests which accepts timber harvesting at a scale sufficient for profitable utilization of different grades of timber to evolve; (b) we can reduce the risk investors face as to their ability to acquire timber in the volumes they need, of the species and grades they need, at the times they need it, and at costs they can plan for; (c) public timber is sold to the highest bidder, so that timber is acquired by those companies that are able to make the most profitable use of it; (d) we avoid placing specific restrictions on how, when and where timber is utilized, and allow it to be used in ways which are most profitable and which can adapt to changing market opportunities; (e) we do not subsidize the forest industry; and (f) we invest in basic research on opportunities for wood utilization to take advantage of the resources we have and of changing technology and markets.

Introduction

I wrote this paper in response to an invitation to discuss how ecological, economic and political factors affect the Alaska forest products industry. I will argue that these three factors; ecology, economics, and politics; together define and constrain opportunities for the Alaska forest products industry.

Figure 1 illustrates this point. There are many different future paths for the forest products industry that are "ecologically possible" in the sense that Alaska forests could supply the needed raw materials. The area within the large circle represents these paths. Only some of these "ecologically possible" future paths are "economically possible," in the sense that timber harvesting and forest products manufacturing could be profitable over time without subsidies, given price and cost factors beyond our control. Finally, there is a different set of future paths for the Alaska forest products industry which would be "politically possible" in the sense that the public policy process would permit or enable them to happen.

Figure 1
Potential Future Paths for the
Alaska Forest Products Industry



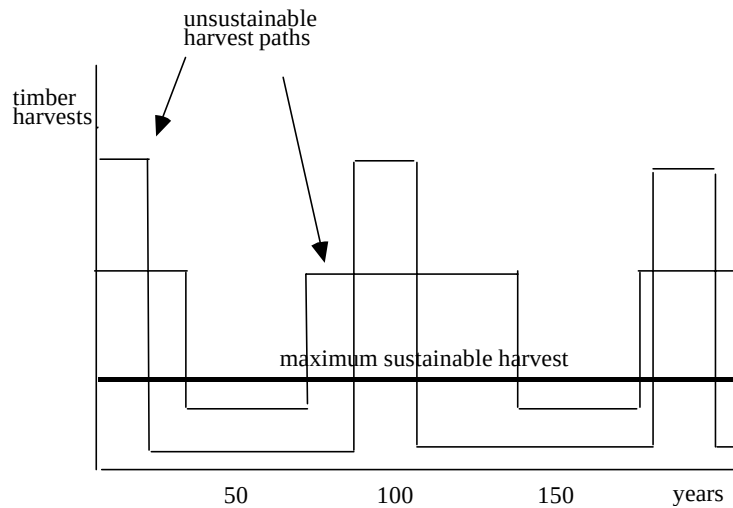
To understand where the forest products industry could go, we need to think about all three of these factors--ecology, economics, and politics--and the nature of the constraints they impose.

Ecology

Let me begin with ecology. By "ecology" I mean the limits to potential timber harvest paths and non-timber benefits over time imposed by nature. One kind of ecological limit is the tradeoff between potential harvest levels over time. For any given total area which will eventually be cut, the more we cut in any one year, the less we can cut in other years. There is a maximum "sustainable" harvest level at which we can cut the same volume each year indefinitely. Or we

can harvest higher "unsustainable" levels in some years, but then we will have to harvest at lower levels in other years. (Figure 2)

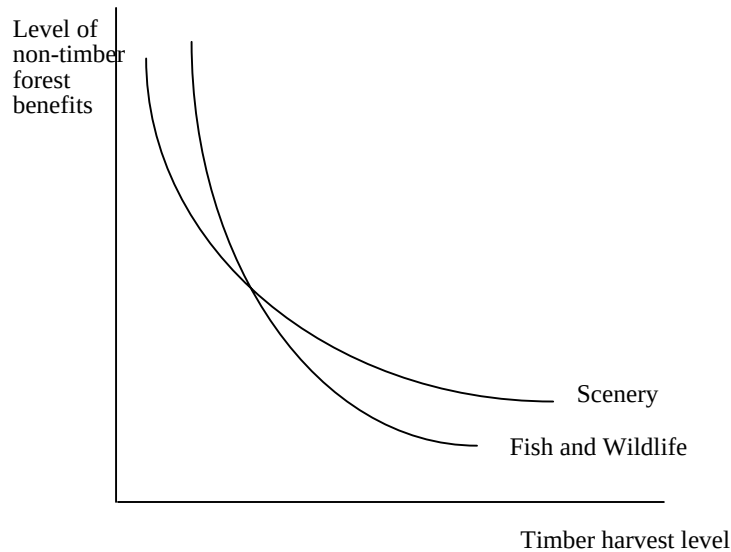
Figure 2
"Ecologically Possible"¹ Timber Harvest Paths Over Time



Another kind of ecological limit is the tradeoff between timber harvests and non-timber forest benefits such as fish, wildlife, and scenery. In general (although certainly not always), the more timber we harvest, the lower the levels of these non-timber benefits (Figure 3).

¹ Note that I am *not* using the term "ecologically possible" to imply sustainability of either timber harvests or non-timber benefits. I am only using it to imply possible combinations of timber harvests and non-timber benefits over time. Not all of these ecologically possible timber harvests paths are necessarily sustainable.

Figure 3
"Ecologically Possible" Levels of Timber Harvest
and Levels of Non-Timber Benefits

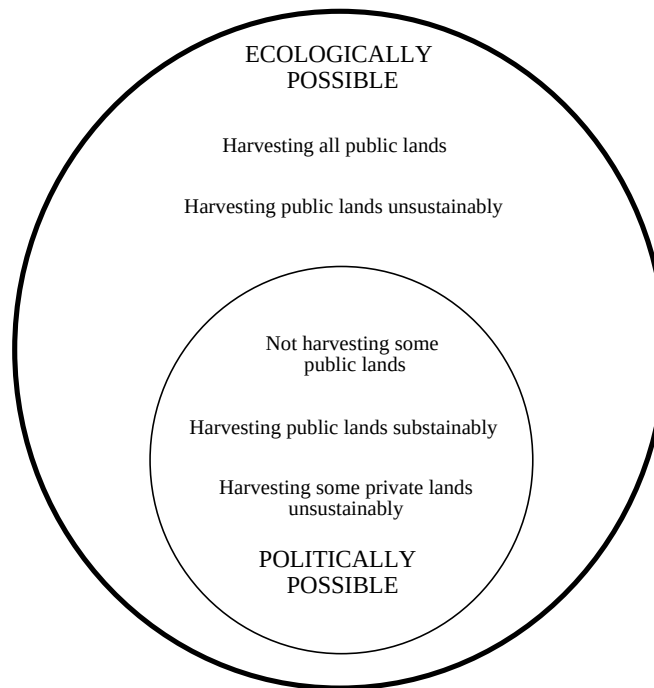


Because there are tradeoffs between timber harvests and non-timber forest benefits, decisions we make about the future of the forest products industry have the potential to affect the future of other Alaska industries. This makes it a lot more complicated to talk about the future of the Alaska forest products industry. Like it or not, when we talk about where we could or should go with the Alaska forest products industry, we are also talking about where we could or should go with other industries too, such as fisheries and tourism. No matter how much we wish we could, we can't just talk about what kind of forest products industry we want without thinking about what other kinds of industries we want.

The tradeoffs we make between ecologically possible levels of timber harvests over time and ecologically possible combinations of timber and non-timber benefits are political decisions. Ecology defines the choices open to us, but politics determines what choices we make. We may make these choices for what we consider ecological reasons, but they are nevertheless political choices.

If you look at different timber ownerships in Southeast Alaska, you can find examples of very different political choices about how much and where within the total ownership area will eventually be cut, and whether to harvest timber in a sustainable or unsustainable way. There are timber ownerships where most of the timber has been cut at a clearly unsustainable rate. There are other timber ownerships for which planned timber harvests are occurring at a sustainable rate. And we have put a lot of timber permanently off limits to harvesting by declaring it wilderness, banning logging near spawning streams, and in other ways.

Figure 4
Potential Future Paths for the
Alaska Forest Products Industry



To summarize, ecology sets broad limits to possible Alaska timber harvest paths over time. But within these broad ecological limits are narrower political limits which reflect the choices we are willing to make about tradeoffs over time and tradeoffs between timber and non-timber benefits (Figure 4).

Economics

Let me turn next to economics. By "economics" I mean external factors beyond our control that affect costs and prices and therefore profitability of different potential future paths for the forest industry over time. I use the term "economically possible" to mean future paths for the Alaska forest products industry which could be profitable without public subsidies.

"Economically possible" paths for the Alaska forest products industry are constrained by a number of factors. To have an industry of any size, we have to sell into world markets for world market prices, because the internal Alaska market isn't very large and we face competition even in Alaska from other suppliers. World market prices reflect world demand conditions as well as our competitors' costs, neither of which we can influence.

Many of our costs are higher than our competitors' costs. Much of our timber is in remote areas where it is difficult and expensive to harvest. Within Alaska, labor and transportation costs are higher than for many of our competitors. And because we are farther away than our competitors from many of our markets we also face higher transportation costs in getting products to those markets.

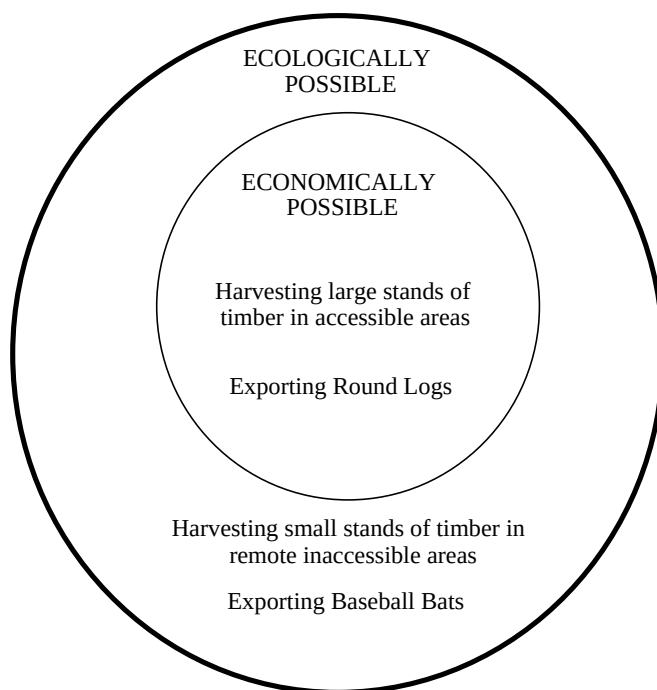
We also face a Catch-22 problem related to scale. Because the Alaska forest products industry is small and not very diversified, we face higher costs and less profitable utilization of our timber than we would if the industry were larger and more diversified. But these higher costs and less profitable utilization work against our becoming larger and more diversified.

Our cost factors tend to work against value-added manufacturing in Alaska. I'm not intending in any way to suggest that value-added manufacturing can't work or that it isn't a worthy goal. I'm simply saying that it's relatively easier for Alaska to compete in exporting round logs or low value-added products such as cants.

World market demand for forest products varies a lot over time, which causes prices to vary a lot too. When world demand is strong, and world market prices are high, timber harvesting and forest products manufacturing is profitable even in higher cost areas like Alaska. When world demand is weak and world market prices fall, many of these activities become unprofitable in Alaska while remaining profitable in other lower cost areas. Changing prices make it difficult to create a stable forest products industry anywhere, but even more difficult in Alaska.

These economic constraints beyond our control mean that only some of the future paths for the forest products industry that are ecologically possible are economically possible (Figure 5). Part of what we need to do to think clearly about the future of our forest industry is to gain a better understanding of the nature of these economic constraints and possibilities.

Figure 5
Potential Future Paths for the
Alaska Forest Products Industry



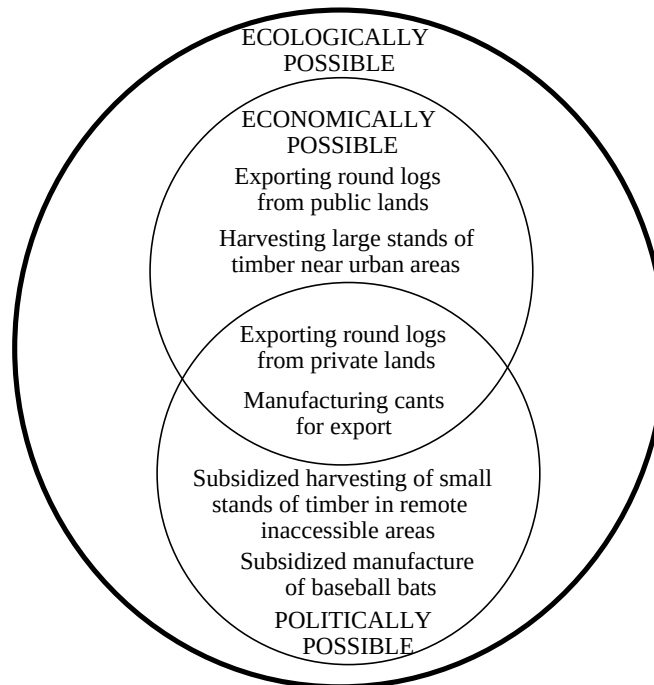
Politics

Now I want to talk more about politics. By "politics" I mean decisions affecting the forest products industry made through the public policy process and reflecting the relative interests and influence of different groups in that process. I use the term "politically possible" to refer to the set of future paths for the Alaska forest products industry which our collective political choices would permit or enable to happen.

The future paths for the forest products industry which are "politically possible" differ from those which are "economically possible." (Figure 6) Some economically possible futures are not politically possible. For example, it would be economically possible to harvest large stands of

timber near urban areas, but it is not politically possible because of the tradeoffs we are willing to make between timber benefits and non-timber benefits.

Figure 6
Potential Future Paths for the
Alaska Forest Products Industry



Some future paths that are not economically possible--in the sense that they could not be profitable without subsidies--are politically possible if we would be willing to provide the necessary subsidies. For example, it might not be profitable to harvest small stands of timber in remote areas without subsidies, but if we are willing to subsidize these harvests we can make it profitable.

Between the extremes of physical limits on timber harvests and subsidies to the forest products industry are numerous political choices that affect the profitability of the industry through their effects on costs and/or markets. When, where and how public timber is sold affects costs of harvesting and manufacturing--as does the total volume offered for sale through its effects on the scale of the industry. Primary processing requirements limit potential uses of timber but make others more profitable by lowering costs of raw materials for in-state manufacturing.

In summary, through our political choices we can change the potential future paths of the Alaska forest products industry away from those that are economically possible in the sense that they could be profitable without subsidies given constraints of costs and prices. We can create an economic desert in which a forest products industry can't possibly succeed, or we can build an economic greenhouse of subsidies to grow an industry that could not succeed on its own. It's not just ecology and it's not just economics. Our political choices matter.

Table 1 summarizes some of the most critical political choices affecting the future of the Alaska forest products industry. We may try to make these choices objectively or scientifically, to do what is "best" for the forest or the forest industry or communities or the region. But they are nevertheless inherently political choices because government makes them and they reflect the relative political interests and influence of different groups.

Table 1
Critical Political Choices Affecting the Future
of the Alaska Forest Products Industry

Political Choice	Significance for the Forest Products Industry
How much more public land will be privatized?	Most forest use decisions for private lands are made by the landowners rather than through the public process, and reflect the interests of the landowners.
How much timber will be offered for sale from public lands? Where, when and how will it be offered for sale?	How much timber is sold, and where, when and how it is sold, directly affect raw material availability and costs for the forest products industry.
What kinds of payments--such as stumpage fees, taxes and subsidies--will be made between the forest products industry and government?	These kinds of payments directly affect economic viability through their effects on forest products industry costs and revenues.
What restrictions will be placed on the uses of timber harvested from public and private lands?	Use restrictions--such as in-state manufacturing requirements--directly affect both economic returns to forest owners as well as raw material availability and costs for the forest products industry.
What restrictions will be placed on timber harvesting practices?	Restrictions on harvesting practices directly affect industry costs and volume available for harvest.

No biologist or economist can tell us the right answers to these political choices. Scientists can help us understand the choices we face, and the opportunities, and the nature of the tradeoffs. But they can't choose for us. When they try to do so (i.e. when scientists don't clearly distinguish between science and politics) they put public trust in science at risk.

Where are these political choices made? In many arenas. Political choices affecting the Alaska forest products industry occur at the federal, state and local level, and within the executive, legislative and judicial branches. Different levels of government and different branches of government may be involved in resolving the same issue, sometimes in opposition to each other.

Many of the political choices affecting the industry were made long ago and are broadly accepted as permanent, such as the creation of the Tongass and Chugach National Forests, and the Alaska Native Claims Settlement Act. Others issues are seemingly never resolved, with dissatisfied interest groups continually trying to modify or reverse current policies--as with the endless debate over the management over the Tongass National Forest.

The pervasiveness of politics is frustrating both for those on the apparent winning and losing sides of many forest issues. The losers lament that decisions were "political" rather than "scientific." The winners lament that issues don't stay settled, and the losers keep coming back to try again, or trying to win in other arenas.

I want to suggest that politics won't and can't go away as a factor influencing--or buffeting--the Alaska forest products industry. Politics won't and can't go away because most Alaska forests are publicly owned, and most Alaskans and many other Americans have strong and legitimate interests in how Alaska forests are used, and many of those interests conflict with each other. Alaskans and other Americans will continue to use their rights to participate in the political process, at different levels, to try to influence those decisions. That's democracy.

Allowing the Forest Products Industry to Evolve

Now I want to express some of my own opinions about the political choices we face. I expect and respect that you may disagree with some of my opinions. Part of what we need to do is recognize that we don't all agree, and listen to each other, and search for compromises. My purpose is not to convince you that I am right in any of my specific opinions, but rather to suggest a way of approaching the issues.

I want to try to tie what I've been talking about back into what this conference is about. How do we link healthy forests, communities and industries in Alaska?

I think we should try to create an economic and political environment in which healthy industries and healthy communities can evolve--rather than having government or universities or community planning efforts to try define them and then create them through grants or loans or subsidies or special contracts. Sometimes this works. But our most successful industries evolve as many different ideas are tried, and some of those ideas succeed.

If you find somewhere a thriving value-added forest products industry making baseball bats which is contributing to a healthy economy and a healthy community, it's probably not because the government or the university or community planning efforts came up with the idea and provided advice or grants or loans or subsidies or special contracts to get it started. Instead, it's probably because someone thought "I could make money by making baseball bats here"--and tried it--and made money and kept going and growing. For every idea that worked there were others that didn't work. And some of the difference between them may have had to do with things that you'd never think about in an economic study and which the people who tried the ideas may not have thought about either. What really led to economic development was an economic and political environment in which investors envisioned opportunities and were willing to take risks.

Governments and universities and community planning efforts are just not very good at predicting in advance what economic ideas will really be profitable. Part of what makes companies and industries successful has to do with things that economic studies are just not very good at dealing with, such as the management skills of people trying to make the industry work. And economic studies are not very good at guessing what actual costs and prices will be, or how they may change in the future as technology and costs and markets and competition change. There is no substitute for actual economic experiments.

Creating a Favorable Environment

What kind of economic and political environment will allow a healthy forest products industry to evolve in Alaska? I'll offer a few suggestions.

A healthy industry is one which is profitable, which does not depend on subsidies, which is able to adapt to continuing change in markets, which is able to take advantage of continuing innovations in technology, which does not cause long-term degradation of the environment, and which earns and enjoys public support by providing employment, a fair share of taxes, and participation in the community.

A healthy industry is more likely to evolve if we can build a broad political consensus over a reasonable balance in the uses of Alaska's forests that accepts timber harvesting at a scale sufficient for profitable utilization of different grades of timber to evolve.

A healthy industry is more likely to evolve if we can reduce the risk investors face as to their ability to acquire timber in the volumes they need, of the species and grades they need, at the times they need it, and at costs they can plan for. One way of reducing this risk is to find ways of reaching decisions about public timber supply policy that are less time-consuming, less subject to legal challenge, and more predictable. Another way is to provide for sale of long-term stumpage

rights, and allow companies to trade those rights so that timber can go to those companies that are most successfully able to make use of it when they need it.

A healthy industry is more likely to evolve if public timber is sold to the highest bidder, so that timber is acquired by those companies able to make the most profitable use of it.

A healthy industry is more likely to evolve if the public agencies which control public timber supply have a stake in its success, for example if they are partly funded by timber sales.

A healthy industry is more likely to evolve if we avoid placing specific restrictions on how, when and where timber is utilized, and allow it to be used in ways which are most profitable and which can adapt to changing market opportunities.

A healthy industry is more likely to evolve if we do not subsidize it. Industries that do not depend on subsidies are less likely to evolve in an environment where subsidies are provided. Subsidized activities compete for timber with those that don't or wouldn't depend on subsidies. And industries that do not depend on subsidies will enjoy broader political support than those that do.

A healthy industry is more likely to evolve if we invest in basic research on opportunities for wood utilization to take advantage of the resources we have and of changing technology and markets.

Healthy Communities

Finally, let me briefly talk about healthy communities. Healthy communities are built, in part, on healthy industries. If we can create economic and political conditions in which healthy industries can evolve, we help to create conditions for healthy communities to evolve.

Healthy communities have diversified economies, which make them less subject to booms and busts as market conditions change in different industries. Alaska communities will be healthier if supported by forest products, fishing, tourism and other industries together rather than by any single industry.

Healthy communities are able to adapt to change. No community can stay fixed in time. Healthy communities must expect that some industries will decline, and seek to create an environment that is favorable for others to grow.

Healthy communities have a say in the political decisions that affect their future. Alaska communities will be healthier if they have a role--a real role--in making political choices about the forests and other natural resources in their region.

Finally, people in healthy communities talk to each other, listen to each other, respect each other, and look for ways to address each others concerns about the political decisions which affect their futures. That is one way in which everyone can participate in building healthy communities.

The Southeast Alaska Timber Resource and Industry: What Might the Future Hold?

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Introduction

On August 24 and 25, 1999, in Juneau, Alaska, over 30 representatives of the forest products industry, Alaska Native corporations, environmental groups, the State of Alaska, local governments, and the USDA Forest Service (Alaska Region, Pacific Northwest Research Station, and the Forest Products Laboratory), met to discuss current and future changes occurring with forest management, industry, products, markets, and policy in Southeast Alaska. The purpose of this workshop was to identify alternate futures for the Southeast Alaska timber industry, management and policy changes necessary to achieve desired conditions, and related information needs. On September 28, 1999, in Sitka, Alaska, a second similar group met to review, expand, and refine the findings of the first group. The following is a summary of the findings from those two workshops.

Workshop Summary

Four major issues were identified and discussed during the workshop. These were:

1. Over the next 50 years, timber volume will be harvested almost exclusively from old-growth stands. Extensive timber harvest did not begin until the late 1960s. Stands managed on a 70 to 100 year rotation will not be ready for another regeneration harvest for 40 to 50 years. Small areas of land managed on extended rotations (200 years) will become available for commercial thinning in approximately 20 years, but it will be about 50 years before significant areas become available for commercial thinning.
2. Silvicultural decisions made today regarding young-stand management will have a profound effect on the types of material that will be available in the future from Southeast Alaskan forests. Characteristics such as log diameter, annual ring-width, knot size, and wood strength and stiffness, may all be influenced by intermediate treatments applied to stands.
3. Owing to high operational costs and environmental concerns in Southeast Alaska, some type of selection harvest system is almost certain to be implemented on at least a limited basis. One challenge will be to prevent this system from becoming "high-grading" (removing the highest value material and leaving the rest), which would be economically attractive in the short-term. There are, however, unanswered questions as to how to implement a selection harvest system that provides a sustainable source of high-value material while maintaining biological diversity and addressing other citizen concerns about forestry.

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4. The cost of doing business in Southeast Alaska is very high. Controlling operational costs and reducing the cost of delivering products to markets are the biggest challenges that must be dealt with in order to have a viable timber industry in Southeast Alaska.

In addition to the four major issues outlined above, a recurring unresolved question was: “Should silvicultural regimes be designed to grow large volumes of fiber or lower volumes of high quality (clear, strong, large diameter) wood?” This is a key question for forest management in Southeast Alaska because the choice of answers may put forests on a developmental trajectory that will make it difficult to change objectives in mid-rotation. This question leads directly to two important silvicultural information gaps that must be addressed as we establish management plans. First, given the lack of knowledge on how old-growth stands respond to partial cutting, what is the best way to manage these stands? Second, how can we establish and tend young stands to ensure the widest possible range of future options? Keeping all options open may yield mediocre returns, while selecting options that best fit a desired future condition may be risky but potentially more rewarding.

These questions are fundamental to the problems associated with active management of forests in Southeast Alaska because many aspects of the future industry are determined by how they are answered. The characteristics of the resource available for processing are dictated by decisions on how to tend existing stands. The nature of the transition from an old-growth to a young-growth based industry depends on how the proportion of old-growth in the harvest mix changes over the next 50 years and the characteristics, volume, and location of stands suitable for commercial thinning during that period. Finally, the harvesting, processing, and product options available to the industry after the transition to young-growth depend on the cumulative management decisions made over the next 50 years.

Topic Areas Discussed at the Workshop

Workshop participants were divided into five major topic area groups. Each group was asked to identify three to four key issues or questions that need to be addressed to have a viable timber industry in Southeast Alaska. The five topic areas and summary of their discussions follow.

I. Resources and Management

This group discussed the timber resource available now and in the future, its characteristics, and how treatments can affect the quantity and quality of timber available in the future. The following information needs were identified:

What is the relationship between silviculture and wood quality?

Very little is known on the effects of silvicultural treatments on wood physical properties, such as strength, stiffness, and density, or on wood visual properties, such as knot size or annual ring distribution for Sitka spruce and western hemlock. Depending on the intended product, these wood quality factors can have a profound effect on value. This information is needed soon, because silvicultural treatments applied today will have a great effect on the material available in the future.

How to best transition from old-growth to a young-growth wood supply?

Over the next 50 years, timber harvest volumes will come almost exclusively from old-growth stands, after which time sufficient areas of commercial thinning and young-growth regeneration harvest will become available. How can silvicultural treatments and harvesting plans be used to ease the transition from old-growth sized material to young-growth sized material? How you package sales may be as important as what you grow.

What are the implications of managing young-growth stands with extended rotations?

What management strategies will ensure the health and productive capacity of such stands? Our ability to predict forest stand development and condition beyond 100 years is limited. A key research need is how even-aged stands develop between ages 100 and 200, with and without

intermediate treatments. This information is vital to be able to predict effects on non-timber resources as well as the quality and quantity of wood that will be available in the future.

II. Industry and Infrastructure

This group discussed the status of the current timber industry and what is needed to maintain a viable industry in Southeast Alaska. Key issues and information needs identified were:

A dependable and predictable wood supply is needed.

This is very important to secure financing, to attract new industry, when making investment decisions such as upgrading or improving existing mills and facilities.

The cost of delivering raw materials to manufacturing sites needs to be reduced.

Costs in Southeast Alaska are higher than in other timber producing regions of the world and need to be reduced to make Southeast Alaska more competitive.

What wood characteristics produce the best products at lowest costs?

Knowing this can help guide industry in making investment decisions.

III. Products

This group discussed possible forest product niches for Southeast Alaska and some forest product research needs. Key issues identified were:

Clear, strong, large diameter wood will provide the widest range of future options.

This group felt that management practices designed to produce this type of material would provide managers with the widest range of future options along with providing for other resource needs.

What can Southeast Alaska do with the low-grade/low-value material?

Over one-half of the old-growth volume harvested is low-grade/low-value. Some use needs to be found for this material to make harvest operations economical.

Implications of various stand management approaches need to be presented.

In other words, what are some alternate management regimes that will provide wood but also meet other resource needs (sustainability for all resources). These alternate management scenarios need to be developed and made available for land managers and decision makers to help guide their decisions.

An evaluation and sharing of technology to produce products at the lowest cost is needed.

There is probably a lot of information available that addresses the economics of producing various products. This information needs to be gathered, compiled, and shared. Information gaps could be identified as research needs and dealt with accordingly.

IV. Markets

This group discussed what is needed to make Southeast Alaska more competitive in regional, national, and worldwide markets. The following issues and information needs were identified:

Transportation, power, and labor.

Reducing these costs is a continuing challenge in Southeast yet there does not appear to be any Southeast-wide effort to do this. This is needed if advances are to be made in this area.

Integration of niche businesses with capital-intensive businesses is needed.

Mechanisms such as business complexes should be investigated and developed to provide for the efficient delivery of raw material to processors. For example, there appears to be a number of

small operators in need of small amounts of wood but there is no mechanism in place to get it to them.

Smaller businesses require assistance in market analysis and strategy development.

Most small businesses lack the expertise and resources to conduct or commission market analyses and the development of marketing strategies.

What products can be produced with the available resource?

There is a need to make available wood technology information that links products to the characteristics of the old-growth resource currently available.

Quantify risks associated with future markets.

There is considerable uncertainty about what markets will be accessible to Alaskan producers several decades (or even two centuries) in the future. An assessment of the marketing strategies that are most likely to be successful is needed to help direct resource management and infrastructure investment decisions.

V. Policy

This group discussed the effects policy can have on the timber supply and issues policy makers need to address to have a viable timber industry.

What are the implications of shifting from production of pulp fiber to manufacture of composite and solid wood products?

Management strategies and the amount of timber volume available from a limited land base are different depending upon whether you are managing for fiber or high quality (clear, strong, large diameter) wood. All implications of this shift should be carefully considered before decisions are made.

Incentives are needed to encourage forest management for long-term objectives and sales to in-state processors.

There is a perception that current policies and regulations do not encourage private landowners to manage for long-term objectives or to sell to in-state processors. If this perception is true, policy makers should consider incentives to encourage private landowners to manage for long-term objectives and to sell to in-state processors. If this perception is not true, landowners need to be made aware of the benefits of managing for long-term objectives and selling to in-state processors.

How do we deal with the “roading dilemma?”

There is interest in reducing road construction to reduce adverse impacts to the environment. Yet roads are needed to provide access for uneven-aged management, to conduct intermediate treatments that benefit all resources, and to allow the use of cable yarding systems, which are more economical than helicopter yarding. A balance between these conflicting goals needs to be found.

What Comes Next?

Further analysis of the comments from the Juneau workshop is needed and will include new issues raised during the Sitka session. Once this is done, a list of information needs and action items will be developed to guide future research, management activities, and policy reviews. In addition, a synthesis of the comments will be prepared that can be used by land managers and decision makers to help guide management of forestlands in Southeast Alaska.

The Possibility of Using New Silvicultural Systems in Hemlock-Spruce Stands in Southeast Alaska: A Retrospective Perspective

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Abstract

The development of new silvicultural systems in southeast Alaska was assessed using a retrospective study that evaluated the effects of partial cutting on stand structure and growth, patterns of conifer regeneration, stand mortality and disease, and understory plant diversity and abundance. Seventy-three 1/5 ha plots were established in 18 different stands that were partially cut 12 to 96 years ago.

Partially cut stands had diverse and highly complex stand structures and these structures appear similar to uncut stands. Sitka spruce was maintained over a wide range of cutting intensities, and species conversion to hemlock-dominated stands generally did not occur. Stand basal area, tree species composition, and stand growth were predominantly from trees left after cutting. The largest tree diameter growth came from small to medium sized trees at time of cutting, with little of the stand growth since harvest from new regeneration or larger-diameter trees. Stand basal area growth of hemlock and spruce were proportional to species composition left after cutting.

Plant species richness and community composition were similar between uncut and partially cut plots. However, stands resulting from moderate and heavy cutting intensities had significantly different community composition than uncut plots and it appears that increasing cutting intensity caused some changes in plant community structures. Partial cutting did not significantly change abundance for most of the key species for deer forage.

Silvicultural systems that use single tree selection or small openings can be used successfully to regenerate stands for timber management in southeast Alaska. Concerns about changing tree species composition, greatly reduced stand growth and vigor, increased hemlock dwarf mistletoe infection, and higher incidence of tree wounding, decay, and mortality with partial cuts were largely unsubstantiated. Stand structural diversity, species richness and understory plant abundance were all greater in partially cut stands than in young-growth stands developing after clearcutting.

Introduction

Recent region-wide forest-management plans in Alaska (Record of Decision 1997) have prescribed guidelines for timber management in Southeast Alaska using alternatives to clearcutting. However, very little is known about alternative systems in southeast Alaska since clearcutting has been the dominant regeneration method since the early 1950s (Farr & Harris 1971, Harris & Farr 1974). Therefore, there is a critical information need to understand how partial cutting effects stand dynamics, regeneration, species composition, and understory vegetation.

In southeast Alaska partial cutting of western hemlock (*Tsuga heterophylla* (Raf.) Sarg.) and Sitka spruce (*Picea sitchensis* (Bong.) Carr.) was common until the establishment of pulp mills in the region in the early 1950s. Hemlock was used for dock pilings and lumber, and Sitka spruce for salmon cases, barrels and buildings. Logging was limited to easily accessible areas near the

shoreline and along river valleys. The total harvested areas were also generally small (less than 50 hectares), and timber was harvested by cutting individual trees or small openings in the stand and leaving the remaining overstory stand intact. The opening of pulp mills in the region led to significant changes in the way forests were managed. Road building opened up areas of previously inaccessible forests, and large blocks of forest were clearcut. Clearcutting with natural regeneration has been the predominant practice in the region since the 1950s.

Several biological and economic reasons have been reported for the continued use of clearcutting in the western hemlock-Sitka spruce forest type of Southeast Alaska and, some major concerns with the use of partial cutting have been presented by Harris and Farr (1974). However, most of the adverse effects of partial cutting are speculative or based on research done in other regions. The major objectives of this study were to assess the effects of partial cutting on stand dynamics, species composition, tree age-cohort structure and growth, and plant species diversity and abundance of mixed hemlock/spruce stands in Southeast Alaska.

Methods

Study Areas and Stand Selection

Eighteen stands were selected to sample a range of time since cutting, intensity of cutting and geographic distribution throughout southeast Alaska. Study areas were selected from 200+ potential sites identified from a variety of sources including U.S. Forest Service district files, historical records and maps, and information from local residents. Aerial photography and field visits were then used select study areas using the following criteria: a) a range of "time since cutting," with study areas selected from stands cut at least ten years up to one hundred years ago, b) stands with only one harvest entry, c) a partial cut area of at least ten ha with a wide range of cutting intensity at each site including an uncut area, d) relatively uniform topography, soils, forest type and plant associations within each stand, e) a distribution throughout the Tongass National Forest. Research sites were generally close to saltwater, less than 100 m in elevation, and located throughout southeast Alaska.

Plot Selection, Installation and Measurement

Stand conditions were thoroughly assessed by walking through the entire stand and noting the number and size of cut stumps, the number of obvious residual overstory trees, stand stocking, size of cutting area, and general stand conditions. Generally three partially cut plots and an uncut control plot were established per stand. Within each stand, cutting treatments were designated as light, medium and heavy, according to the number and size of cut stumps, and the number of obvious residual trees. Plots were centrally located within these designated cutting treatments. Actual basal area cut and proportion of stand cut was determined later through stand reconstruction. Elevation, slope, aspect, plant association and soil type of stands were recorded. A total of seventy-three 0.2 ha plots were installed in eighteen different stands removing 16 to 96 percent of the original stand basal area.

Each 0.2 ha plot contained three circular nested plots (0.02, 0.05 and 0.2 ha plots) to sample trees in different size classes (Deal 1999). For each plot, tree species, tree diameter at breast height (d.b.h.), tree height and crown position were measured for all live trees to provide current stand structural information. Species, d.b.h. and decay class data were determined for snags to provide information on tree mortality. A sub sample of tree increment cores or stem sections were collected for each tree species and crown class for tree-ring analysis to determine tree age, diameter and basal area growth and cutting date for each stand. The plot data included stand structural data on the total basal area cut, residual basal area, proportion of basal area cut, current stand density, and the proportion of spruce and hemlock in the stand.

Stand Reconstruction

Stands were reconstructed back to the date of cutting using cut stumps, current live trees, and snag information. Data on basal area cut, current live tree basal area at cutting date, and stand mortality since cutting, were combined to determine the proportion of basal area cut for each

stand cutting treatment. Tree increment cores and stem sections from 986 western hemlock, Sitka spruce, western redcedar, and Alaska-cedar were used to develop regression equations to predict tree d.b.h. at cutting date (Deal 1999). Data from all cutting treatments in each stand were combined and analyzed together, with stand specific regression equations developed to predict tree d.b.h. at date of cutting. I used forward stepwise regression analysis (Snedecor and Cochran 1980) to predict tree d.b.h. at cutting date using a number of tree and stand predictor variables. The most significant variables included current tree d.b.h., basal area, tree species, and cutting intensity. These stand-specific regression equations were then applied to all live trees in the current stand to predict tree d.b.h. at cutting date and estimate former stand basal area (excluding basal area cut and mortality estimates). I used stem taper equations to determine tree d.b.h. from cut stumps. Equations were then developed to predict tree d.b.h. from the stump diameter using forward stepwise regression analysis on a large tree data set from southeast Alaska (Deal 1999). Snag class and snag age data were used to determine the snag d.b.h. at cutting date, and then stand mortality since cutting was estimated.

Stand Structure and Growth

Stand structure and growth was analyzed by describing current stand conditions and by reconstructing the former stand at time of cutting. The date of cutting was determined using stand reconstruction techniques (Stephens 1953, Henry & Swan 1974, Oliver 1982, Lorimer 1985). Tree diameter distributions, the number of trees, snags, and cut stumps per ha, tree species composition, and stand basal areas were determined. The cutting intensity, current stand density, and species composition of each stand was described using tables and histograms. Tree species composition, tree-age cohorts and stand growth were analyzed to determine if there were differences among cut and uncut plots. Tree-ring analyses were used to investigate the effects of partial cutting on the growth of hemlock and spruce trees, different tree-age cohorts, and size classes of residual trees.

Forest Plant Communities

Understory vegetation was sampled with ten 1m-by-1m vegetation quadrats and ten 2m-radius shrub plots within each of the seventy-three 0.2 ha plots. Canopy cover classes for all herbs, mosses, lichens, liverworts, and tree seedlings less than 0.1 m tall were estimated within each vegetation quadrat. The canopy cover classes were estimated for shrubs and tree seedlings greater than 0.1 m tall within the shrub plots. The canopy cover data for the ten vegetation quadrats and shrub plots were combined and averaged within each 0.2 ha plot to estimate average abundance for each plant species found on the 0.2 ha plots. Species diversity and abundance were analyzed, and a number of multivariate analyses in PC-ORD (McCune and Mefford 1997) were used to assess plant community structures in the cut and uncut plots. Also the average cover for eight key plant species for deer forage (Hanley and McKendrick 1985, Kirchhoff and Hanley 1992) was used to determine if the abundance of key plant species might be different in stands after partial cutting.

Results And Discussion

Changes In Tree Species Composition

Partial cutting did not lead to significant changes in the composition of either Sitka spruce or western hemlock, nor did the intensity of partial cutting cause significant changes in tree species composition. There were no significant differences between the cut and uncut plots in either the proportion of spruce trees or spruce basal area. Overall, species composition in stands generally did not change after partial cutting; hemlock-dominated stands remained hemlock stands, and spruce/hemlock stands remained spruce/hemlock stands. The proportion of new tree regeneration increased with increasing intensity of cutting but the species proportions remained relatively similar over a wide range of cutting intensity. In all of the spruce/hemlock stands, and in most of the hemlock-dominated stands, there were sufficient numbers of spruce to maintain spruce in the future stand. Analysis of the 55 partially cut plots in this retrospective study showed that new spruce regeneration was established in 23 plots, and residual spruce were present and responded to release in 47 plots. Furthermore, new spruce regeneration was established in only

2 of the 18 uncut plots in this study. It appears that partial cutting can maintain Sitka spruce in mixed hemlock/spruce stands within a wide range of cutting intensity.

Stand and Tree Growth

The stand net basal area growth increased with increasing cutting intensity and cut plots had significantly greater growth than uncut plots. However, the growth response was irregular among and within stands, and a few of the lightest cutting intensity plots had negative net growth. Overall, stand net basal area growth since cutting averaged 36.9 m²/ha for all cut plots compared with 27.3 m²/ha for the uncut plots. The medium and heavy cutting intensities (plots that had at least 30 percent of the original stand basal area cut) had significantly greater growth (average of 40.6 m²/ha) than the lighter cutting intensities (average of 28.0 m²/ha for plots with less than 30% of stand basal area cut). The current stand basal area, tree species composition, and stand growth for all cutting intensities was strongly related to trees left after harvest. More than 90 percent of stand basal area growth for the fifty-five partially cut plots occurred on residual trees, and there was a highly significant difference in growth among new and residual trees. The least growth occurred on the new tree regeneration with an average diameter growth for trees in the cut plots of only 12.9 cm for the 60-year-growth period analyzed. The most diameter growth occurred on residual trees that were 10- to 70 cm d.b.h. at time of cutting. These trees grew an average of 23 to 27 cm during the 60-year-growth period. Basal area growth of hemlock and spruce was proportional to species composition left after cutting, and there were no significant differences in growth among species in either size classes or cutting intensities. About 60-75% of stand basal area growth was on hemlock trees, the remainder of growth from spruce and other species. Overall, residual trees left after cutting responded and grew rapidly after release, and both residual trees and stand growth had high growth rates following partial cutting.

Forest Plant Communities

Overall, the partially cut stands had high species richness, and the understory plant species composition was not different than uncut plots. The species richness of all plants and vascular plants was similar among uncut and partially cut plots, and the intensity of cutting did not lead to significant changes in plant species richness. The number of species per plot averaged 31.8 in the uncut plots, and averages ranged from 27.5 to 33.7 in the cut plots. Overall, there were no significant differences in plant community structures between the uncut and partially cut plots. Species composition varied widely among stands but plant community structures were similar for both the uncut and cut plots within each stand. However, the intensity of cutting did cause some significant changes in community composition. The moderate and heavy cutting intensities had significantly different community composition than the uncut plots, and it appeared that increasing cutting intensity caused some changes in plant community structures. Also, plant communities changed with latitude, and species composition and abundance appeared to be distinctly different among hemlock-dominated and spruce/hemlock stands. The plots with the fewest species and least abundance of understory plants were those with dense hemlock overstories. The six plots with the fewest vascular plants were in stands with hemlock accounting for 95% of the tree density. In addition, most of these plots with poor understory plants contained numerous small-diameter trees that were established soon after cutting, and these trees formed a dense new cohort in the stand that suppressed shrubs and herbs. It appears that hemlock-dominated stands with large numbers of trees severely suppressed understory plant development.

Five of the eight key plant species (fern-leaved goldthread, bunchberry, five-leaved bramble, foamflower, and red huckleberry) showed no significant changes in abundance, two species decreased in abundance (skunk cabbage and blueberry), and one species increased in abundance (shieldfern) following partial cutting. Overall, the modest decreases in abundance for some key species after partial cutting were relatively small compared with the near elimination of most understory herbs and shrubs that commonly occurs after clearcutting. Partially cut and uncut old-growth stands have similar species richness and plant community structures, and these similarities may be related to forest stand structures. The heterogeneous stand structures created from partial cutting are generally more similar to old-growth stands than to the uniform young-growth stands that develop after clearcutting. These partially cut stands also appear to be able to maintain plant diversity over a wide range of cutting intensity. Partial cutting also did not significantly change abundance for most of the key plant species for deer forage.

Management Implications

Silvicultural systems that use single tree selection or small openings can be used successfully to regenerate stands for timber management in southeast Alaska. Concerns about changing tree species composition, greatly reduced stand growth and vigor, increased dwarf mistletoe infection in hemlock trees, and higher incidence of tree wounding, decay, and mortality were largely unsubstantiated. Stand structural diversity, species richness and understory plant abundance were all greater in partially cut stands than in young-growth stands developing after clearcutting. It is also important to note that these partially cut stands were not part of a planned silvicultural system, and the careful evaluation and implementation of new silvicultural systems will probably further reduce problems and improve benefits. New silvicultural systems have excellent potential to maintain desirable tree species composition, create diverse stand structures that enhance biodiversity, and also provide high quality trees for future timber.

Prior to this study, information on the effects of partial cutting and the implications of using new silvicultural systems in southeast Alaska were largely unknown. Overall, the development and implementation of new silvicultural systems that use single tree selection or small openings has excellent potential to alleviate some of the problems associated with conventional clearcutting in Southeast Alaska. New silvicultural systems appear particularly useful to maintain biodiversity in western hemlock-Sitka spruce stands. These systems could also provide a sustainable timber resource including more valuable spruce trees, while also maintaining stand structural diversity, and enhancing late-successional or old-growth stand conditions that are an important part of current region-wide forest management plans.

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Timber Merchandising Systems and Timber Sale Implications: A Strategic Perspective

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Abstract

An expanded perspective on the sale of standing timber is proposed. In light of the greatly reduced harvest levels and projected low sales volumes, new thinking is needed with respect to how timber is sold. The traditional concept of timber merchandising is expanded to include the sale of stumpage. The selling agency is advised to adopt the customers' point of view in order to develop ways of selling standing timber that encourage increased utilization and value-added production. Porter's Five Competitive Forces are introduced as a strategic thinking framework useful in understanding the customers' perspective. Five concepts are suggested as starting places for research and exploration by the Region and the Wood Utilization R&D Center. This approach increases the possibility of creating win-win results for the Forest Service and the industry and ultimately the Southeast Alaska economy.

Introduction

This paper proposes an expanded perspective on the one aspect of Alaska's forest products industry over which the Forest Service has control – the sale of timber and related products from the National Forests.

In 1979 the ASQ was 520 million board feet (MMBF). Today it is 187 MMBF. Along the way Southeast Alaska lost two pulp mills and a number of sawmills. The following table and chart (Figures 1 and 2) show the trends in harvest by source from 1990 through 1998 and projected volumes for Region 10 and the State of Alaska through 2007.

The projected Region 10 average annual timber harvest through 2007 ranges from 113 to 182 MMBF of which approximately 42% is #3 sawlog or utility. This leaves roughly 65 to 106 MMBF in grade logs. In addition, the State of Alaska sells 15 to 20 MMBF in the Southeast each year. Assuming the same quality distribution the total annual grade volume on the market can be expected to range from 75 to 120 MMBF. Virtually all of the Native Corporation volume goes to export.

Listed sawmill capacity is 281 MMBF. Without the Annette sawmill, regional capacity is 212 MMBF. Subtract the Ketchikan sawmill and capacity is 148 MMBF. The next four sawmills, ranging in capacity from 9 to 40 MMBF, total 108 MMBF. Finally all the rest of the listed mills range from 1 to 5 MMBF capacity and total 40 MMBF.¹

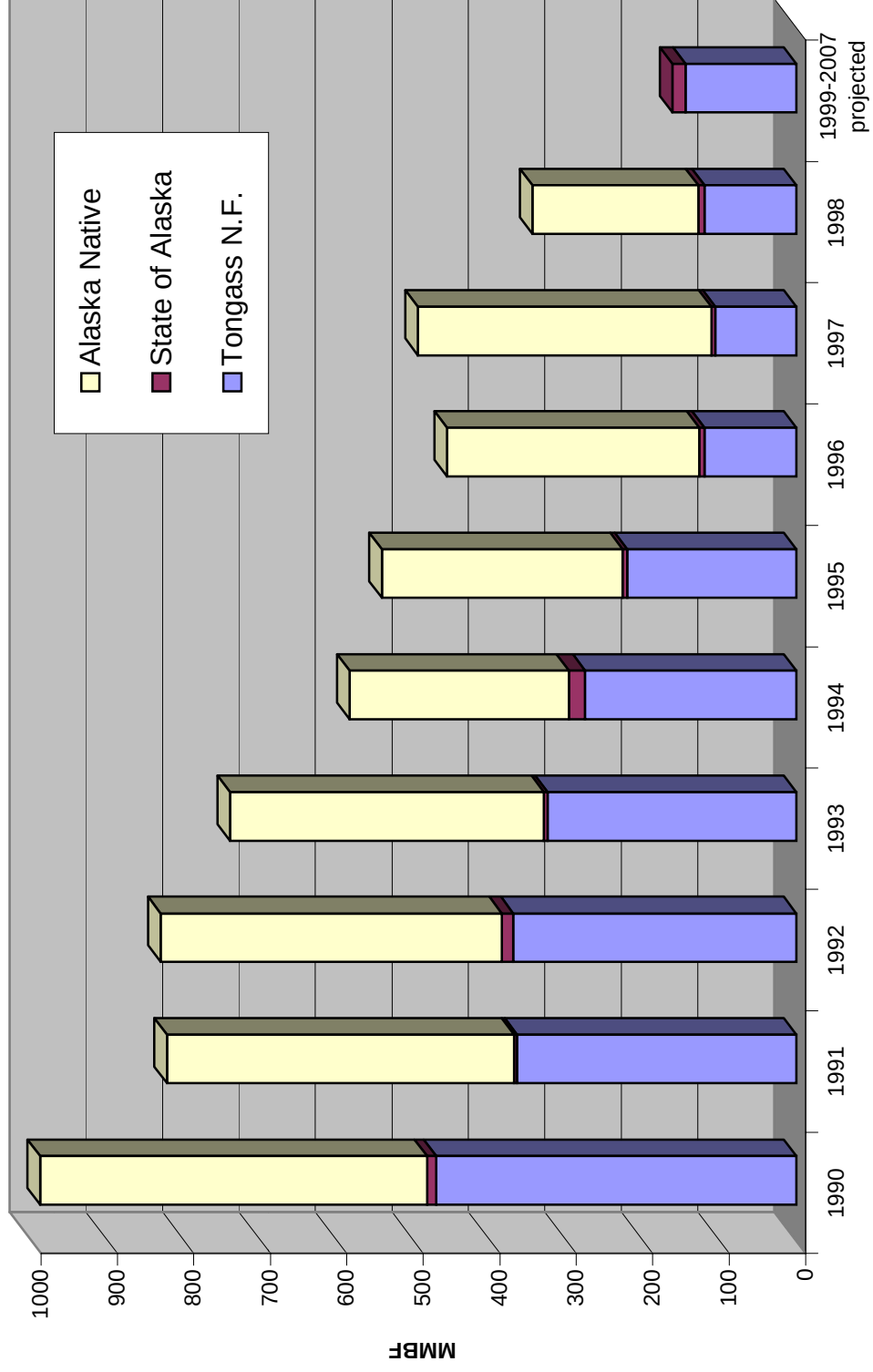
The objective of the Forest Service and the reason for the creation of the Wood Utilization R&D Center is to promote increased economic activity around the timber and special forest products available from the forest. Given the trends described above and the projected supply/demand balance, this is clearly a challenge. To meet this challenge our thinking needs to be "out of the box."

¹ Quantities taken from various Forest Service planning documents.

Figure 1 Southeast Alaska Timber Harvest and Employment Trends (1990 - 1998) MMBF											
	<u>1990</u>	<u>1991</u>	<u>1992</u>	<u>1993</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>	<u>1997</u>	<u>1998</u>	<u>Projected</u> <u>1999-2007</u>	
Tongass N.F.											
Sawlogs	399	300	303	268	222	181	97	94	108		
Utility	<u>72</u>	<u>65</u>	<u>67</u>	<u>57</u>	<u>54</u>	<u>40</u>	<u>23</u>	<u>12</u>	<u>12</u>		
Total	471	365	370	325	276	221	120	106	120		145
State of Alaska											
Sawlogs	11	4	15	5	18	4	5	5	6		
Utility	<u>1</u>				<u>3</u>	<u>2</u>	<u>2</u>		<u>2</u>		
Total	12	4	15	5	21	6	7	5	8		17
Available S.E. processing											
Sawlogs	410	304	318	273	240	185	102	99	114		
Utility	73	65	67	57	57	42	25	12	14		
Total	483	369	385	330	297	227	127	111	128		162
Alaska Native											
Sawlogs	434	307	349	328	275	234	292	336	158		
Utility	<u>72</u>	<u>147</u>	<u>97</u>	<u>82</u>	<u>12</u>	<u>81</u>	<u>38</u>	<u>48</u>	<u>59</u>		
Total	506	454	446	410	287	315	330	384	217		
Total Southeast Harvest											
Sawlogs	844	611	667	601	515	419	394	435	272		
Utility	<u>145</u>	<u>212</u>	<u>164</u>	<u>139</u>	<u>69</u>	<u>123</u>	<u>63</u>	<u>60</u>	<u>73</u>		
Total	989	823	831	740	584	542	457	495	345		
Total Employment	6,113	5,295	4,940	4,585	3,849	3,463	3,306	2,683	2,195		

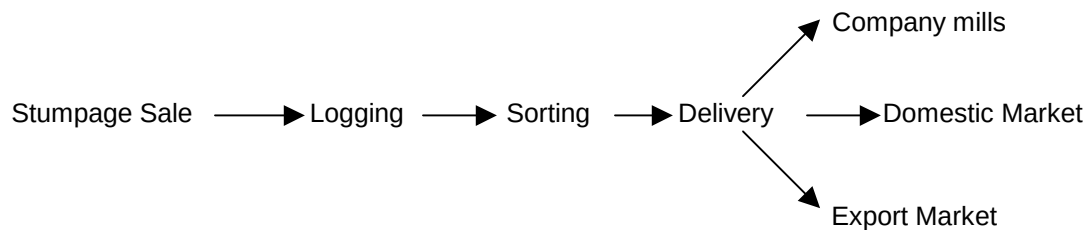
Sources: Historical data from USDA Forest Service, Alaska Region; Projections from Evaluating the Demand for Tongass Timber, Kathleen S. Morse, Regional Economist, September 28, 1998.

Figure 2
Southeast Alaska Harvest Trends



My part of this workshop is to address “Timber Merchandising Systems and Timber Sale Implications.” In our business, merchandising most commonly refers to how logs are sorted and transferred or sold to various market segments such as company processing facilities, domestic log buyers and foreign buyers. To meet the Region 10 challenge we need to expand the merchandising concept to cover stumpage sales including the various terms of sale (Figure 3). This opens up a wider range of opportunities to influence investments in closer utilization and value added products.

Figure 3
The Timber Merchandising Stream

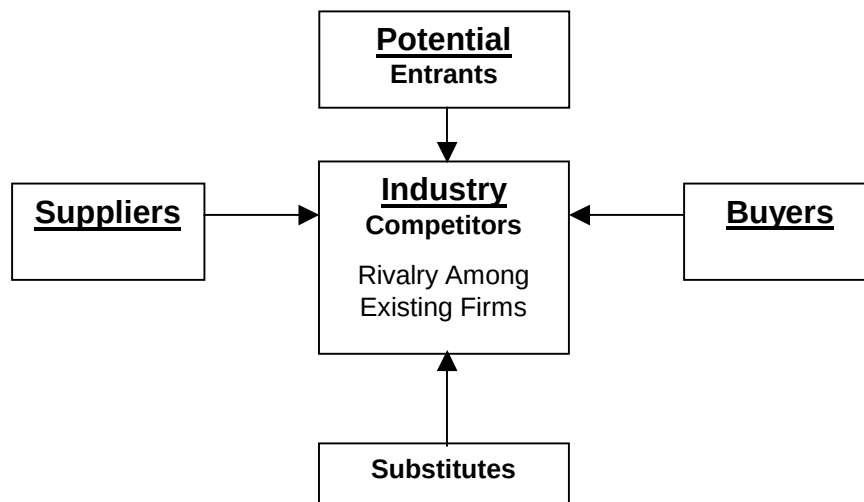


Strategic Thinking

As sellers of standing timber (and possibly produced logs) the Forest Service must stand in the customers' shoes and take on his/her perspective. More specifically, the Forest Service needs to understand what the timber buyer needs to justify investment in more advanced processing.

When considering a new investment, most business people (in this case value-added processors of timber) will think carefully about the competitive position they will or already do have. An explicit way of guiding their thinking is Porter's Five Competitive Forces² that impact profitability (Figure 4).

Figure 4
Porter's Five Competitive Forces



This framework helps business managers make useful distinctions between competitive forces, better evaluate competitive conditions and identify ways of improving their competitive position. For the purposes of this paper I will focus on the supplier force after first touching on the other four forces within the context of the solid wood forest products industry. The reader can get a more complete understanding of the forces from Mr. Porter's book.

² Michael E. Porter, Competitive Advantage, Free Press

The degree of rivalry among existing firms in the industry is most commonly determined by regional capacity relative to available timber supplies and the degree to which products are commodities vs. specialties, value-added or custom.

The threat of new entrants is usually high with the barriers being availability of and access to log supplies.

The threat of substitutes is relatively low in commodity products, but has increased in some market segments of traditionally high value uses. For example, the increased use of MDF in mouldings has reduced the use of solid-wood mouldings. Also, vinyl, aluminum and steel have increasingly penetrated the window and door markets.

Buyer bargaining power is high for commodity products such as dimension lumber and panel products. In more specialized products or custom markets establishing close customer relationships that meet their particular needs reliably can mitigate buyer power.

The supplier of standing timber normally has strong bargaining power. In Southeast Alaska the Forest Service certainly has considerable power being the dominant supplier of timber to the industry. The current sales program should generate a reasonable level of competition for timber sales given the overall demand for timber relative to the supply. However, the Forest Service agenda is not to maximize revenue from the sale of timber, but to contribute to the overall economy. This leads to the objective of increasing economic activity through various methods of improved utilization and value-added products.

Since the Forest Service cannot get into the logging and processing business its only alternative for pursuing the objective is to strategically merchandise timber sales in a way that fosters the desired result. Referring back to the five-force framework, the Forest Service, rather than using its bargaining position to directly maximize stumpage prices, can use that power to work in a "cooperative/arms length" way to develop value-added production.

Suggested Approaches to Strategic Timber Merchandising

The following suggestions are offered as starting places for research and exploration by the Region and the Wood Utilization R&D Center. These suggestions are described briefly and will require careful consideration and creative thinking to bring them to the testing or implementation stage.

The first two items are alternative approaches to develop long-term supply agreements to attract value-added investment by reducing or eliminating raw material supply uncertainty. There is not enough annual volume available to do both. The remaining three items can be done in addition to either form of long-term supply agreement thus enhancing the over-all industry's ability to increase value-added processing.

Long-term Sales Tied to Value-Added Investment

Solicit proposals for a 10-15 year timber sale or volume contract with award of the sale going to the best proposal in terms of soundness, value-added and utilization. The volume committed to such a contract need not be 100% of the operation's needs but should be enough to generate and support value-added investments. It would be desirable to leave enough open-bid sales volume to continue a stable volume of open-bid timber for the industry at large.

In this approach, the Forest Service uses its power as a supplier to drive the best combination of value-added investment, employment and stumpage price. At the same time, the investor establishes a known supply volume at a known price or price-setting formula. This takes all or much of the uncertainty out of the investor's supply position and is a critical element in justifying value-added investments.

The proposal solicitation should set forth the criteria by which proposals will be judged such as degree of value-added processing, levels of employment and stumpage rates including proposed stumpage adjustments over time and market cycles. Restraint should be exercised to avoid unnecessary requirements or limitations that inhibit interest or creativity.

From one to three proposals could then be selected for preliminary negotiations leading to final negotiations with the most favorable proposal. Renewal or replacement at the end of the sale period would be a key item of negotiation.

Timber Management Licensing System

Establish a timber management licensing system similar to the British Columbia model. The British Columbia system of managing and licensing Crown timberlands is an example of a long-term approach aimed at maximizing investments in processing. Several forms of tenure are used ranging from volume quotas renewable every five years to Tree Farm Licenses (TFL) running 25 years.

The Tree Farm License tenure could be adapted to Southeast Alaska conditions. Lands designated for timber production would be divided into one or more license areas. Terms of the licenses would be established including harvest levels, utilization standards, stumpage rates, road standards, harvest planning, logging methods, forest regeneration and silviculture methods. Companies would submit proposals and negotiate final license terms.

To the extent the licensee assumes forest management and protection responsibilities private company employment would increase and government (Forest Service) employment decline. Of course, Forest Service oversight of licensed lands should be maintained.

For detailed information on the British Columbia system refer to the Province of British Columbia FOREST ACT consolidated November 25, 1993.

Expand and Systematize Timber Salvage Activities

Expand existing salvage sales from the current opportunistic approach to a more systematic monitoring and evaluation of salvage opportunities. Salvage sites could be enhanced by combining with other local logging operations and/or adding green standing timber to make a salvage situation economical. High value recovery by helicopter would probably make up most of such an expanded program.

Such a system might include periodic satellite imagery to identify pockets or areas of blowdown. These would be examined for salvage feasibility including estimated recoverable volume and quality by species and costs of extraction and delivery to logical delivery points. For each feasible salvage site a mini-salvage plan would be prepared including the above information and further timber management prescriptions, such as removal of standing green timber to improve the economics and/or silvicultural treatment to enhance the local stand.

Expansion of the existing salvage activity may increase the volume enough to justify permanent or semi-permanent availability of helicopter capacity thus improving the economics of salvage wood.

Establish a Logging Contractor/Sorting Yard System

In the recent past approximately 500 MBF was logged and processed through a sorting yard with merchandised logs sold to local mills. The experiment generated a low level of interest and no further volume has been processed.

This option can be further explored and possibly developed over time in a way that fits Southeast Alaska conditions. Information gathered indicates that mills showed little interest in purchasing logs from such a source and logistics and associated costs were also a barrier.

However, if mills can identify certain types and species of logs that support their preferred or newly developing market niches they can create increased value at the primary processing stage. This, in turn, can develop the feedstock for secondary manufacturing. Thus loggers would then have the option of pre-sorting in the woods and delivering these logs to such a mill. Alternatively they could be delivered to a strategically located sorting yard where they can be accumulated for barging to a mill. Selected logs produced from salvage operations could also be sent directly to such mills or to sorting yards.

Log sorts are usually defined in terms of species, diameter ranges, ring count, preferred lengths, sweep allowances, degree of roughness and defect allowances.

In this way a system of woods pre-sorting and log yard sorting, storage and barging might be developed to support mills wanting to focus on higher value or specialty markets rather than cope with woods run from their timber sales. This establishes an operating mode that lends itself more to supporting remanufacturing activities that add significant value.

Add Value by Reformulating Log Export Policies

Reformulate log export policies to encourage local processing while at the same time obtaining maximum competitive prices for species and types of logs not in demand. For example, on any given sale, companies could submit bids for 100% domestic processing and/or bids with certain logs designated for export. The sale would be awarded to the highest bidder for 100% processing. If no such bids were submitted the sale would be awarded to the bid having the highest proportion designated for local processing and best price for exportable logs. Any local processor would have the right to purchase logs designated for export with the sale owner paying a commensurately lower stumpage price.

Summation

Region 10 is in a position to foster improving utilization and value-added processing via strategic merchandising of its available, and hopefully stabilized, timber harvest. Suppliers and buyers working cooperatively toward common ends can often create win-win results. If companies can be reasonably assured of the volume and quality of logs necessary to support investment in higher utilization and value-added processing opportunities, they will be in a much better position to attract the capital needed and move forward confidently.

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Agents-Of-Change: Management Considerations

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Abstract

Forest management in the next millennium will see the new paradigm, ecosystem management, be put into practice; biodiversity will be a major concern. More and more of the value-added forest products will come from second-growth forests. Management for value-added raw materials must address the agents-of-change associated with the immature forest, especially those that are carry-overs from the previous forest and those present during the stand initiation and stem exclusion stages. Examples of agents-of-change (pathogens, insects, and fire) and management options and how they might affect value-added products are discussed. The need to develop a working knowledge of the causes and how to work with them requires the use of collective wisdom, both formal and informal, to develop community understanding and implementation programs

Introduction

Forest management in the next millennium will see a new paradigm, ecosystem management. The old paradigm emphasizing commodity production and certain human services will give way to the new paradigm emphasizing ecosystem management in which human goods and services are looked upon as benefits of ecosystem processes, functions, and structures. Instead of simply managing for high yields of products and services to meet the demands of present-day publics, the effort will be toward ensuring a legacy for future generations. We must address the question, "What do we want to leave future generations?" There will be more public involvement and resource managers will be called upon to provide more technical information and implementation alternatives. Decisions will be based on collaborative efforts or "collective wisdom" that utilizes both formal and informal information. The result? The approach to forest protection must and will change.

The new paradigm involves four concepts.

- o Biodiversity
- o Forest Health
- o Sustainability (Sustainable Development)
- o Ecosystem Management.

An understanding of each of these and how they relate is essential. The definitions, essential for dialogue among professionals and between professionals and the publics, must be generic.

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Background

Biodiversity, the fundamental concept, is "...the variety and abundance of species, their genetic composition, and the communities, ecosystems, and landscapes in which they occur. It also refers to ecological structures, functions, and processes at all these levels. Biological diversity [occurs] at spatial scales that range from local to regional to global..." (Society of American Foresters 1991).

Forest health is "A condition of forest ecosystems that sustains their complexity while providing for human needs" (O'Laughlin et al. 1994). In applying this concept, remember that forest health is similar to beauty—beauty often depends upon the eye of the beholder.

What is sustainable is also similar to beauty. What is to be sustained and how much or at what level? Thus it is better to get to the heart of the issue—development! The Bruntland Commission defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission Environment & Development 1987).

Definitions of ecosystem management are numerous. Nyland (1996) defined ecosystem management as "Using stand level treatments to help sustain the integrity, diversity, and resiliency of ecosystem conditions on a landscape scale, and over the long run." Note that it involves stand level treatments on a landscape scale.

Thus ecosystem management can be equated to managing for biodiversity and, in so doing, the landscape becomes the focal point but the stand is the treatment unit. At the landscape level, vegetation regions (Zasada and Packee 1995) become an important consideration because:

- o They are environmentally quite different;
- o Species/communities can be quite different;
- o Stresses on species can be quite different;
- o Agents-of-change vary in terms of type;
- o Frequency of agents-of-change varies; and
- o Intensity of agents-of-change varies.

Abiotic agents-of-change include fire, water, ice, wind, temperature, and mass wasting. Biotic agents-of-change include pathogens, decay organisms, insects, animals, and humans. These not only can cause significant loss of commodities and services to humans but also are essential to ecosystem processes, functions, and structures. For example, heavy moose browsing can delay or eliminate the hardwood forest canopy stage of succession and various habitat structures and speed up succession to a closed canopy spruce forest (Andrews 1998).

Forest Health through Agents-of-Change

Stand characteristics or condition impact the agents-of-change. Stands of the same species do not necessarily respond the same way to agents-of-change. Second growth stands respond differently than old-growth stands. For value-added products of the future, emphasis must begin to address second growth stands so that ecological succession can be considered. A simple successional model suitable for forest health management consists of four stages (Oliver and Larson 1996):

- o Stand initiation;
- o Stem exclusion stage;
- o Understory initiation stage; and
- o Old-growth stage.

The successional stage greatly affects forest stand conditions. Habitat changes during succession and along with the habitat change, insects and animals also change.

Thus the occurrence and intensity of the impacts of agents-of-change vary with the successional stage.

Human responses to agents-of-change also vary with the successional stage. In some cases no action is necessary—for example, stands being managed for late seral or old-growth structures; reaction to a particular agent-of-change occurs—for example, salvage of spruce-beetle-killed timber; or the risk or hazard is recognized and proactive efforts are initiated—treatment of stumps and wounds with borax to minimize infestation by *Heterobasidion annosum*.

Mitigation (method and intensity) varies with successional stage. The effort may range from treating isolated trees to treating entire stands or watersheds.

Human creation of conditions suitable for a particular agent-of-change is often related to management intensity and successional stage—slash burning can create ideal conditions for *Rhizina undulata*.

The management option and intensity of effort depend upon:

- o Forest and Stand Management Objectives,
- o Intensity or Level of Management,
- o Social Constraints and Concerns,
- o Landowner Concerns,
- o Type of Forest including old-growth vs. immature,
- o Species Composition, and
- o Realities.

Intensity of management must have a site-specific management objective:

- o Wilderness vs. Timber,
- o Wildland vs. Campground/Picnic Site,
- o Cavity trees/Snags vs. Raptor Nest/Perch Trees,
- o Dense Stand vs. Open Stand,
- o Maximize Habitat for Endangered Species, and
- o Maximize Fiber Yield & Quality.

The Threshold Question: “At what point does agent-of-change impact become unacceptable?” This last question requires careful analysis.

In developing agent-of-change management scenarios and stand prescriptions the constraints, concerns, and desires of society as well as the concerns of the landowner must be considered.

Three questions beg to be answered:

- o What is desired?
- o What is acceptable?
- o What is reality or realistically possible?

In so doing the role of the professional is to

- o Explain what is possible;
- o Determine what is desired and acceptable;
- o Develop a prescription;
- o Be ethical.

By being ethical, the professional must be honest and provide all possible options with advantages and disadvantages and identify the best options.

Of great importance is to focus on the successional status of the community that is to be managed. The agents-of-change of concern are not the same across the successional sequence. In old growth or late successional communities, the agents-of-change are quite different from those of the immature forests that will be producing fiber for future value-added products:

Old-Growth or Late Seral Forest Stands:

- o Root/butt rots
- o Bole rots
- o Defoliators
- o Organic debris fuel build-up

Second-Growth Forest Stands:

- o Seedling pathogens
- o Seedling insects
- o Root and butt rots
- o Bark beetles
- o Defoliators
- o Browsers

Key to immature management is minimization of carry-over of agents-of-change from the old-growth forest to the immature forest stand. An example is the "elimination" of dwarf-mistletoe (not strictly an agent-of-change) sources from old-growth infected trees followed by good sanitation in the immature forest.

Unknown as to what the future holds and the basis for concern are what increasing intensity of management and climatic change, whether a warming trend or normal variation, might have on various organisms. Activities or conditions could change and greatly impact current models or scenarios. Bluntly, we simply don't know!

Root Rot and other Pathogens

Root and butt rots of concern in Alaska (from Barnanyay and Bauman 1972; Laurent 1974; Holsten et al. 1985; Tainter and Baker 1996; Henigman et al. 1999) include:

- o *Armillaria* spp. on *Picea glauca*, *P. sitchensis*, *Thuja plicata*, *Tsuga heterophylla*, *Populus tremuloides*,
- o *Heterobasidion annosum* on *Picea glauca*, *P. sitchensis*, *Thuja plicata*, *Tsuga heterophylla*,
- o *Inonotus tomentosus* on *Picea glauca*, *P. sitchensis*, *Tsuga heterophylla*,
- o *Phaeolus schweinitzii* on *Picea glauca*, *P. sitchensis*, *Tsuga heterophylla*,
- o *Phellinus weirii* on *Chamaecyparis nootkatensis*, *Picea sitchensis*, *Thuja plicata*, *Tsuga heterophylla*,
- o *Rhizina undulata* on *Picea glauca*, *P. sitchensis*, *Tsuga heterophylla*.

In addition, *Sirococcus strobilinus* is a serious threat to *Tsuga* regeneration and young growth (Laurent 1974). To control such pathogens might include the use of an alternative tree species for a rotation, e.g., *Populus tremuloides* on *Inonotus tomentosus* infected sites in the Northern Forest or *Alnus rubra* in the Coastal Forest where *Phellinus weirii* is a problem. Stump and wound treatment with borax in thinned stands may be necessary for control of *Heterobasidion annosus*.

Insects as Management Concerns

Briefly, some of the defoliating insects that can be a problem in immature forests (from Hard 1974; Holsten et al. 1985; Henigman et al. 1999) include:

- o *Acleris gloverana* (Black-headed budworm) on *Picea glauca*, *P. sitchensis*, *Tsuga heterophylla*,
- o *Choristoneura* sp. (Spruce budworm) on *Picea glauca*, *P. sitchensis*,

- o *Lambdina fiscellaria* (Hemlock looper) on *Chamaecyparis nootkatensis*, *Picea sitchensis*, *Tsuga heterophylla*, *Thuja plicata*,
- o *Melanophila imitata* (Green-striped forest looper) on *Chamaecyparis nootkatensis*, *Tsuga heterophylla*, *Thuja plicata*,
- o *Pristiphora erichsonni* (Larch sawfly) on *Larix laricina*,
- o *Zieraphera* spp. (Bud moth) on *Larix laricina*, *Picea glauca*, *P. sitchensis*.

Other insects of concern include:

- o *Adelges* spp. (Gall aphids and wood aphids) on *Picea glauca*, *P. sitchensis*, *Tsuga heterophylla*
- o *Dendroctonus* spp. (Bark beetles) on *Larix laricina*, *Picea glauca*, *P. sitchensis*,
- o *Ips* spp. (Engraver beetles) on *Picea glauca*, *P. sitchensis*
- o *Steremnius carcinatus* (Seedling weevil) on *Picea sitchensis*, *Tsuga heterophylla*

Good sanitation and salvage can minimize damage caused by *Ips* and *Dendroctonus*. In areas where *Dendroctonus* can be expected to be a problem, an entomological rotation based on a maximum diameter of 10 to 12 inches may be necessary. Management strategies for the other species of insects need intense study.

Fire

Fire is the last agent of change to be addressed. The impacts of fire or its exclusion must be looked upon from an ecosystem perspective:

- o Different patterns among regions.
- o No area is totally immune to fire.
- o Look at historical fires: pattern and influence on ecosystems:
 - Sets back succession
 - Releases nutrients
 - Improves browse availability
 - Landscape mosaic.
- o Look at modern human alteration of fire situations:
 - Slash build-up due to thinning and fire suppression
 - Causal agent.

Fire alters biodiversity in an area and may be essential for maintaining productivity and habitat.

What are the implications of managing agents-of-change in second growth forests for future value-added products?

- o Smaller material/piece-size:
 - Entomological rotations for bark beetles: $\leq$ 12-inch diameter logs
 - More intense utilization: eliminate slash build-up to reduce fire hazard, bark beetle or engraver beetle risk
- o Alternative species: hardwoods instead of conifers
 - Reduce root rots
 - Reduce risk: fire, insects, and pathogens
 - Encourage parasites and predators
- o Higher quality fiber--less decay, better stem form.

Conclusion

- o Ecosystem management is the new paradigm.
- o Future forest protection will emphasize second-growth stands.
- o Protection concerns of second-growth stands distinctly differ from those of old-growth stands.
- o Rotation and hence piece size will often be determined by environmental concerns.
- o To address the new paradigm, there is a need to:
 - educate resource managers,
 - educate forest users, and
 - educate the public.

The last item is critical. It requires dialogue that utilizes formal and informal knowledge, collective wisdom, and not simply emotions. But can it be done? Is there proof? Here are the consensus points developed at a conference in Fairbanks, "Managing for Forest Condition in Interior Alaska: What Are Our Options?"

Forest Condition: Forest health of the Northern Forest is declining. Contributing factors include increased insect and disease activity, greater fire risk, increased plant moisture stress and regeneration complications associated with warming and drying trends, a greater proportion of older, less vigorous stands resulting from past fire control, and loss of biodiversity due to massive mortality by the spruce beetle.

Insects: The decline in average stand vigor along with warming and drying trends increases the risk of large-scale mortality from the spruce beetle and Ips engraver beetles and defoliation by the spruce budworm and larch sawfly.

Diseases: They are a major cause of volume loss in both spruce and hardwood stands. Diseases are important in the successional transition from hardwood to coniferous forests. We are unsure of the association between disease and insects.

Climate: A warming climatic trend began about 20 years ago. Since then, conditions have been warmer and dryer than usual and contributing substantially to increased fire risk.

Forest Genetics: Reforestation should be encouraged using native species. Suggestions were made to possibly include a broader geographic range for germplasm and that more seed be collected for reforestation and germplasm protection.

Ecosystem Management: Broad level support exists for the application of ecosystem management to the Northern Forest of Alaska.

Public Involvement: Public participation is an essential part of ecosystem management.

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Ecological Function and Management of Forest Disease in Southeast Alaska

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Introduction

Numerous disease organisms live in the rain forests of Southeast Alaska, but only a few have overriding ecological and economic importance. Several diseases, such as spruce needle rust, attract attention because their populations build quickly and they are visually stunning. We have learned, however, that populations crash as quickly as they build and infected trees recover without suffering significant long-term consequences. Without major harm or mortality caused to their host and without important trophic links in the food web, these diseases appear to have minimal importance to forest managers.

Other forest diseases, particularly the heart rot fungi of live trees, go relatively unnoticed even though they cause enormous loss to timber resources and are the primary factors in many key ecological processes. These important, chronic diseases in the forests of Southeast Alaska will be the topic of this paper. Current knowledge on the ecological importance of these diseases will be presented, which could be considered as rationale in the decisions that managers use in selecting desirable disease levels in managed forests. How each disease responds to different forms of management will then be discussed with an emphasis on silvicultural techniques that could be used by managers to achieve those desirable disease levels. But first, we will step back from individual causes of tree disease and explore why it is important for ecologists and managers to have an understanding of the different forms of tree mortality in forests. Hopefully, this will put the role of tree diseases in a broader context.

General patterns of tree mortality

As a forest pathologist, I have an intense interest in the causes of tree mortality. But managers and ecologists often have more general information needs about tree death. How many trees are dying? Which trees are dying (e.g., by size, species)? How are they dying? What condition are they in when they die? How do they deteriorate after death? We need information on all of these questions to understand and manage woody debris production and forest structure, to use just two examples.

When tree death is measured, it is often classified as: 1) uprooting, 2) bole breakage (sometimes called windbreak or stem snap), and 3) dead standing. This simple classification of the modes of tree death originated in studies on canopy gap formation in the tropics. High winds, water-saturated soils, snow and ice loading, and shallow root systems lead to increased susceptibility for tree uprooting in Southeast Alaska (Alaback 1988). Until recently, uprooting was the only small-scale disturbance process that had received much attention in these forests.

An understanding of the tree mortality process in forests is important because various forms of tree mortality result in different structures and influence a number of ecological functions. Woody debris produced by each form of tree mortality may enter the forest floor, stream, or river in a different condition (e.g., with or without an attached root system, with various amounts of internal or external wood decay, and intact or in pieces). Whether trees die by uprooting, bole breakage, or standing, the type of death will alter the response of understory vegetation, conifer regeneration, wildlife habitat, nutrient cycling, and soil processes including those that affect site productivity (Hennon 1995). Mixing of organic and inorganic layers of soil occurs when trees

uproot but not when trees die standing or by bole breakage. This mixing reverses podzolization, which, if left unchecked, could lead to, reduced soil drainage and immobilization of nutrients (Ugolini and Mann 1979; Bormann *et al.* 1995).

The type of tree death and associated causal factors are highly dependent on tree and stand age (Fig. 1). Following a catastrophic, stand-replacing disturbance (e.g. clearcut or storm event), forests regenerate and develop through recognizable stages of stand development described by Oliver and Larsen (1990). Pathogens can be found in the early two stages, particularly those fungi that cause foliar and shoot diseases (Tait *et al.* 1985). They rarely cause tree mortality, however, and are relatively insignificant ecologically. The most obvious biotic agents of tree damage in young stands are porcupines, but their activity is quite localized in Southeast Alaska (Eglitis and Hennon 1997). Tree mortality is high in the early stages of stand development. Most of the dead trees are small and standing, having died through suppression brought on by competition. Woody debris produced by these small dead trees is often decayed and breaks into pieces as stems fall to the forest floor or into streams.

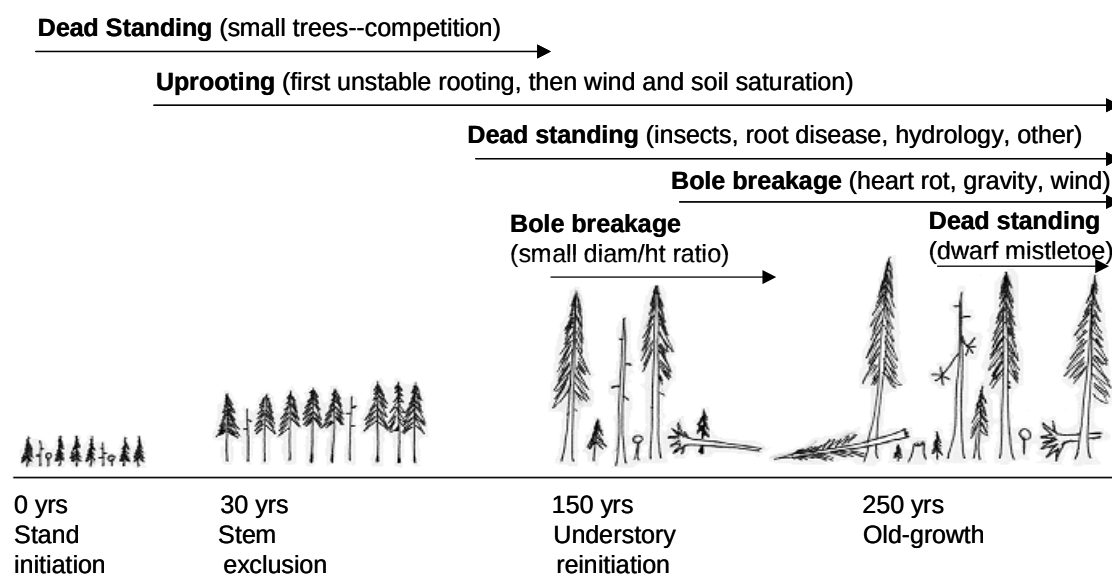


Figure 1. Stages of stand development and associated forms of tree mortality following catastrophic disturbance (e.g., clearcut or storm). Competition causes most mortality in young stands and trees usually die standing. Disease in the form of heart rot sometimes plays an active role in small-scale disturbance in the third, transitional stage and then is a constant factor in the maintenance of the old-growth stage. The time scale that corresponds to stages of stand development varies by site productivity. Many old-growth structures and conditions may be present by 250 years on some sites in Southeast Alaska. The old-growth stage may persist for very long periods of time in protected landscape positions.

In forests with a history of only natural disturbance, disease-caused mortality does not become important until stands reach the “understory reinitiation stage.” This stage can be considered as a transition from even-age to old-growth structure. We have observed several forests at this stage where diseases were responsible for the tree death that initiated canopy gaps and the emerging uneven-aged structure. The only forest that we have conducted formal measurements, however, had little in the way of tree mortality caused by disease. This particular forest, known locally in Sitka as the “Verstovia stand” regenerated after clearcut harvest performed by the Russians in the middle of the 1800s. Most mortality in this forest has been from tree boles breaking, probably during high winds or heavy snow or ice loading, because trees have grown too tall to be supported by their relatively small diameters. Tree death by bole breakage has been intensive in some areas and has created large canopy gaps in this forest. The extreme

height:diameter ratio has resulted from competition for height among trees and could have been controlled if thinning treatments had been conducted much earlier in the stand's history. Managers might also consider thinning maturing even-age forests in some areas with the goal of accelerating stand development to reach old-growth conditions at an earlier age.

The old-growth stage has a great abundance of tree diseases. The lack of catastrophic disturbance over extensive areas in the landscape of Southeast Alaska allows large forests to reach the old-growth stage. The significant tree diseases, heart rot fungi and dwarf mistletoe, are favored by both the small-scale disturbance process and by the ages of trees that occur in old forests.

Two studies in the Juneau and Sitka areas have attempted to evaluate gap-level or small-scale disturbance by measuring gap sizes and documenting tree mortality in old-growth forests (Hocker 1990, Ott 1997). Both concluded that most tree death that gives rise to canopy gaps is in the form of bole breakage (99% and 76%, respectively, for these two studies) and both recognized the associated role of heart rot. Sampling was limited in these studies, however, and their results on different forms of tree mortality appear to confuse trees that die by bole breakage with those that die standing and subsequently deteriorate.

The large "Alternatives to Clearcutting" study conducted by the Forestry Sciences Laboratory and the Alaska Region of the Forest Service has provided the opportunity to sample nearly 3000 dead trees in old-growth forests at three general locations. Accounting for time-since-death reduces the likelihood of overestimating the proportion of trees that die by bole breakage. Our sampling demonstrates that the most common form of tree mortality for canopy-level trees at these three sites is dead standing, followed by broken boles and uprooting. Of the three types of tree mortality, wind probably has a less causal role in dead standing tree death than bole breakage or uprooting. Disease plays a prominent role in causing large overstory trees in old-growth forests to die standing or die by bole breakage.

Another objective of the Alternatives to Clearcutting study is to document differences in tree mortality by the intensity and spatial arrangement of partial harvests. This area of the study addresses the concern among managers that windthrow and disease may increase with certain harvest prescriptions. We are comparing windthrow (i.e., uprooting) and disease-related mortality that occurs after harvest with pre-harvest, or the "natural" levels in old-growth forests.

Wood decays

Every important tree species worldwide is invaded and decayed by one or more species of heart rot fungi. A considerable body of literature on commercial loss by heart rot has been developed since Hartig (1874) described the causal role of fungi. The ecological roles of heart rot fungi have received surprisingly little attention, however (Hennon 1995). The dominant species of heart rot fungi of western hemlock and Sitka spruce in Southeast Alaska (Table 1) are well known to mycologists and pathologists; all are found in conifers throughout the Pacific Northwest of North America. Brown and white rot species are well represented in both Sitka spruce and western hemlock. Many of the fungi responsible for the considerable level of heart rot are spread by infectious spores that colonize large wounds on trees. One such fungus, *F. pinicola*, is extremely common and causes an estimated 73% of cull in Sitka spruce and 22% of cull in western hemlock in Southeast Alaska (Kimmey 1956). In British Columbia, wounding is associated with up to 65% of decay in live western hemlock trees (Buckland *et al.* 1949). Causes of bole wounds on trees in Southeast Alaska include porcupines, bears, beavers, logging, and road building, but falling trees and limbs appear to be the most common form of natural bole injury in western hemlock old-growth forests (Kimmey 1964).

Table 1. Decay fungi of living Sitka spruce and western hemlock in forests of coastal Alaska listed in descending order of importance for white rot and brown rot species (modified from Kimmey, 1956).

Sitka spruce	
<u>White rot fungi</u>	<u>Brown rot fungi</u>
<i>Phellinus pini</i> (Thore:Fr.) Pilat Karst.	<i>Fomitopsis pinicola</i> (Schwartz:Fr.)
<i>Armillaria</i> spp.	<i>Phaeolus schweinitzii</i> (Fr.) Pat.
<i>Heterobasidion annosum</i> (Fr.) Bref.	<i>Laetiporus sulphureus</i> (Bull.:Fr.) Murr.
<i>Merulius</i> sp.	<i>Antrodia heteromorpha</i> (Fr.) Donk.
<i>Phellinus nigrolimitatus</i> (Rom.) Bourd. & Galz.	<i>Lentinus kaufmanii</i> A.H. Smith
Western hemlock	
<u>White rot fungi</u>	<u>Brown rot fungi</u>
<i>Armillaria</i> sp.	<i>Fomitopsis pinicola</i>
<i>Heterobasidion annosum</i>	<i>Laetiporus sulphureus</i>
<i>Pholiota adiposa</i> (Fr.) Kumm.	<i>Phaeolus schweinitzii</i>
<i>Phellinus hartigii</i> (Allesch. & Schnabl) Bond.	<i>Hericius</i> sp.
<i>Phellinus pini</i>	
<i>Ganoderma applanatum</i> (Pers.:Wallr.) Pat.	

Collectively, these fungi contribute to an estimated 31% defect in the gross volume of live trees in old-growth forests in Southeast Alaska (Farr *et al.* 1976). Several factors probably explain such a high rate of wood decay, including hemlock and spruce's susceptibility to decay, long life spans of trees, their thin bark that is easily wounded, and the wet, mild climate favorable for the development and spread of fungi.

The element of time may be an especially critical factor. Because of the apparent infrequency of large-scale catastrophic disturbance, many forests in Southeast Alaska are composed of old trees. Old forests in Southeast Alaska consistently have high decay levels; in fact, heart rot should probably be one of the defining elements of a forest being classified as "old-growth."

Conifers less than 100 years old have little decay, but by 200 years, 65% of western redcedar, 50% of western hemlock, and 20% of Sitka spruce trees contain decay (Kimmey 1956). Farr *et al.* (1976) reported a significant correlation between tree age and the percentage of decayed wood volume in live trees. In some cases, heart rot fungi facilitate the change from the maturing even-aged stage (i.e., understory re-initiation stage) as it is in transition to the old-growth stage (Fig. 1).

The age of a stand when decay losses exceed annual increment was dubbed the "pathological rotation age" by Meinecke (1916). This age varies widely for different tree species and for a single species in different regions. Western hemlock, for example, reaches pathological rotation at stand ages of 225 to 275 years in western British Columbia (Buckland *et al.* 1949) and 100 to 120 years in Idaho and Montana (Weir and Hubert 1918). Many old-growth forests in Southeast Alaska are probably at this stage where the wood produced annually is in equilibrium with that which is lost to heart rot decay and mortality. Such forests may reach a relatively high degree of stability.

Where timber value is the sole objective for resource management, the manipulation of heart rot fungi is simple. Clearcutting and the use of short rotations (e.g., less than 100 years) will produce stands with little loss of wood volume to decay. The wounding of trees by porcupines or by logging during thinning operations will contribute to decay fungi causing some loss even with

shorter rotations. A new model (Hennon and DeMars 1997) can be used to predict the amount of decay that develops in logging wounds of different sizes and ages.

Resource management that includes broader objectives may involve prescriptions of partial harvest of old-growth forests. Such treatments offer the challenge of not creating even higher decay levels than already exist in old-growth forests. Viewed another way, however, partial harvesting might offer the opportunity to maintain some desirable level of decay; one that balances the maintenance of ecological function but does not cause unnecessary loss to the timber resource. Our model on decay in wounded trees (Hennon and DeMars 1997) demonstrates that trees that are wounded during logging activities have slow, but predictable development of internal wood decay. Along with information on anticipated tree injury during entries to recover wood, this model can be used to create forests with selected amounts of decay.

Dwarf mistletoe

Dwarf mistletoe is another disease that should be considered as both ecologically and economically important in Southeast Alaska. The disease is caused by *Arceuthobium tsugense*, a seed-bearing plant that lives exclusively as a parasite. Western hemlock is the principal host, but Sitka spruce and mountain hemlock are occasionally infected.

Dwarf mistletoe is abundant in old-growth forests from Portland Canal in the extreme southern portion of Southeast Alaska north to Haines. It is not found to the northwest along coastal forests of the Gulf of Alaska, even though its host, western hemlock, is common. The parasite also appears to be limited by elevation, as it is uncommon above 800 feet. Dwarf mistletoe may be unable to complete its life cycle in these areas because fruits freeze in the fall before seeds are disseminated.

Dwarf mistletoe harms trees by influencing their growth hormones and diverting the tree's resources to the infections. Infections begin as dwarf mistletoe seeds germinate and the endophytic roots grow under the bark of young twig tissue. Higher concentrations of growth hormones at the point of infection cause a surplus of uncontrolled growth that results in swellings on branches. With time, swellings enlarge and hormones cause numerous branches to emerge. This proliferation of branches, often called a "broom" or a "witch's broom," is the symptom that is most characteristic of the disease. Single infections do not often harm or kill trees. But infections become so large and numerous that heavily infected trees lose potential radial growth, height growth, experience top kill, or they die. Other effects are distorted wood grain that leads to reduced lumber value and infection through brooms by decay fungi to cause heart rot (Etheridge 1972).

The severity or infection level of a tree can be quantified (Hawksworth 1977) so that the effects on tree growth and mortality can be estimated. Two studies on the growth loss of infected hemlock attributed to dwarf mistletoe were conducted in nearby British Columbia (Smith 1969, Thompson *et al.* 1985). Their results were similar: no measurable growth loss in lightly infected trees, approximately 20% loss in moderately infected trees, and approximately 40% loss in heavily infected trees. When projected to the stand level, a forest could contain light to moderate levels of the disease without great harm to the net harvestable volume.

Dwarf mistletoe alters the structure of the forests of Southeast Alaska by causing tree mortality, trees with dead tops, reduced tree growth, increased decay levels, and the formation of brooms. Brooms can be viewed as a unique type of structure in forests. In other regions of western North America, a number of bird species including goshawk and Northern spotted owl use dwarf mistletoe brooms for nest sites (Hawksworth and Wiens 1996). Other birds and mammals use brooms for nesting, hiding, or feed on either the infected hemlock tissue or the mistletoe plant itself. Birds are responsible for the long-distance spread of the parasite (e.g., island to island in Southeast Alaska).

The small-scale disturbance regime (i.e., canopy gaps) that maintains old-growth forests is highly favorable for the spread and development of dwarf mistletoe. Once established in the upper

canopies of large trees, the parasite can infect smaller hemlock trees that colonize the gap. Short-distance spread by dwarf mistletoe occurs in the fall when seeds are forcibly discharged from the fruits on female dwarf mistletoe plants. The numerous sticky seeds travel up to 10 meters to infect the regenerating hemlock in all but the largest gaps. The disease can build to levels where every hemlock in a stand is highly infected. Tree mortality caused by dwarf mistletoe can be high, but more western hemlocks regenerate in the gaps and the old-growth forest stage is sustained in a sort of “western hemlock-dwarf mistletoe climax.”

Where timber production is the overriding management objective, eliminating dwarf mistletoe is a straightforward procedure of clearcutting and short rotation management. Stand-replacing disturbance, whether a large storm event or a clearcut, removes all but the small trees. Dwarf mistletoe can survive and spread horizontally from these small residual hemlock trees after the clearcut, but it cannot spread vertically fast enough to keep up with the rapid height growth of western hemlock in developing young forests (Shaw and Hennon 1991). The disease is eliminated in the second stage of stand development, the “stem exclusion stage” as it exists only in lower crowns of trees and then finally dies as these branches shade prune. It is difficult to predict when the parasite might once again colonize a forest after a clearcut. The forest might have to first attain maximum height growth and then the parasite be vectored to upper canopies of these trees by birds or mammals. Stands that we have examined in the understory re-initiation phase appear to be devoid of dwarf mistletoe, unless the parasite was maintained on any large infected residual trees from the original stand.

Balancing timber production and other resource objectives may be attempted through various treatments of partial harvest, but careful attention must be given to hemlock dwarf mistletoe if it is present in the stand. Partial harvests provide the opportunity to maintain the disease in managed stands compared with its elimination with clearcutting. Results from our recent studies indicate that dwarf mistletoe levels can be managed to a wide range of disease levels in response to the intensity and spatial arrangement of harvested trees. One of our studies used partial wind disturbance 110 years ago as a mimic for partial harvest to gain long-term information on the development of dwarf mistletoe (Trummer *et al.* 1998). Managers can use this model to confidently predict the amount of mistletoe in stands based on the number, size, and infection level of western hemlocks left after harvest. Our next step is to incorporate these estimates of dwarf mistletoe levels with the mistletoe-growth loss information from British Columbia to improve the SVS SEAPROG model so that it can accurately predict the impact of the disease given these new forms of management.

Yellow cedar decline

The final “disease” worthy of mention is yellow-cedar decline. While not technically a forest disease (i.e., it is not caused by a biotic agent), yellow-cedar decline certainly produces spectacular tree mortality on the landscape. Over 500,000 acres of dead and dying yellow-cedar forests have been mapped in Southeast Alaska. Information from our studies on possible biotic factors, link to climate change, and population changes in yellow-cedar forests can be found elsewhere (Hennon *et al.* 1990a, Hennon and Shaw 1997). The forests suffering this decline are typically composed of standing dead trees that died long ago, died more recently, are in stages of dying now, and some apparently healthy green trees.

We initiated studies several years ago to evaluate the value of wood from dead yellow-cedar trees. The sampling design from all of these studies follows the snag classification system that we developed in earlier studies on the epidemiology of declining forests: five classes of dead trees with the last class representing snags without limbs that died 81 years ago (Hennon *et al.* 1990b). Results from these various recovery studies are promising. The volume and value of recovered wood from dead trees remain high, with only modest reductions from the oldest snags (Hennon *et al.*). There is no loss of the strength of wood from dead trees, even 81 years after tree death (McDonald *et al.* 1997). Results on the durability (i.e., decay resistance) and heartwood chemistry of wood from dead yellow-cedars are not yet available. Generally, the large acreage of dead yellow-cedar in Southeast Alaska appears to be a valuable economic resource that has only recently been recognized.

We are also considering the ecological importance of dead yellow-cedar trees, first by evaluating how birds may use yellow-cedar snags as nesting and foraging habitat. Results on the deterioration of dead yellow-cedars suggests that internal wood remains sound as long as the snags are standing (Hennon *et al.*); consequently, these trees are not likely to be used for nest sites by cavity nesting animals. A more likely use of dead trees is as foraging habitat by insectivorous birds. Preliminary results on insect communities indicate that three species of insects are common under the bark or in the outer wood of dying cedars but they leave within a year or so after tree death. The above-ground portions of dead standing yellow-cedars appear to be relatively inactive biologically until these snags fall to the ground almost a century after tree death. Wood decay proceeds in the root systems of dead trees soon after tree death and in the boles of trees that eventually break and fall to the forest floor. It is possible that dead yellow-cedar trees contribute relatively minor ecological functions in forests with yellow-cedar decline. Plant succession is influenced, however, as the death of the yellow-cedar overstory favors the growth of other conifer species in affected stands. Removal of dead standing yellow-cedar in recovery harvests may represent an opportunity in Southeast Alaska of producing very high value timber in an ecologically sensitive manner.

Conclusion

Disturbance and stand development in Southeast Alaska have profound influence on forest diseases. Forest diseases can be viewed as destructive or beneficial, depending upon the management objective for a particular piece of land. Heart rot fungi and hemlock dwarf mistletoe are the two types of disease that can cause tremendous loss of the timber resource, but at the same time, have large influence on many ecological functions. Managers can eliminate both heart rot and dwarf mistletoe from sites by using clearcut harvests and short rotations. Many managers are concerned about the use of partial harvests in old-growth because of the perception that disease and windthrow will cause excessive loss of timber in the residual stand. But partial harvests can be viewed as a method of maintaining these diseases at some light or moderate level so that the key ecological functions that they control are preserved. Information is now available to guide managers to manipulate these diseases to any desirable level in order to meet multiple resource objectives.

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Sawmilling Technology Application in Commodity Products

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Abstract

To understand the current sawmill technology application situation in Alaska, it is helpful to have some knowledge of the history of sawmilling in this State. When one sees how hard it was to get a forest industry started in Alaska and how dependent the industry was for an overseas market, then it is not so surprising that advancement in this industry has been slow. USDA Forest Service was very instrumental in getting a sizeable industry established through the long-term sale agreements with the two producers of pulp. There was still little lumber produced for the local markets and in 1965 the Forest Service, Alaska Region, established a position of Forest Products Specialist to aid the industry to meet the needs of the smaller sawmill operators who were interested in supplying material to the local market.

Today there are only about thirty sawmills actively producing lumber for domestic construction. There are at least 200 additional sawmills in the State, but they are producing very small quantities of lumber or they are idle waiting for a better market. There is no special formula to what is needed by the industry to produce quality products and now with individuals gaining the technical knowledge and having the necessary capital, it is happening.

There seems to be three sizes of operations in the 30 active sawmills in Alaska. Mills producing near 250 thousand board feet (MBF) of lumber and house logs with one to two employees and about \$120,000 investment. Mills producing near 1000 MBF of lumber products with three to five employees and about \$300,000 investment. Mills producing 10,000 MBF and over, with ten or more employees and an investment of over \$2,500,000.

History

The Journal of Forestry, June 1960, Volume 58, Number 6 has many good articles on the history of the forest products industry in Alaska with references about wood products uses since Russian occupation of Sitka. Following are a few excerpts from an article by Archie M. Buyers who was formerly woods manager, Alaska Lumber and Pulp Company, Inc. at Sitka. "Today the timber industry in Alaska is beginning to develop the potential that has been dormant while waiting favorable economic conditions. Ten years ago the annual log scale in Alaska was less than 100 million board feet. In 1960 it should reach five times that and the value of the products shipped from Alaska's forests will probably be ten times what it was in 1950."

The Post-War Period. "...establishment of both mills and logging operations would require the attraction of competent labor...."

Recent Expansion. "...the forest industry in Alaska today: dissolving pulp mills at Ketchikan and Sitka with daily capacities of 575 and 340 tons respectfully, older sawmills at Ketchikan, Wrangell, Juneau, and Sitka, and a second sawmill, specializing in the production of kiln-dried hemlock lumber, nearly complete at Wrangell . . ."

¹ Team Leader of the Alaska Wood Utilization R&D Center, USDA FS Pacific Northwest Research Station as of December 1999.

Outlook. "...a possibility of increased diversification in use and products. Because of the transportation cost and other economic difficulties, there is some tendency to cut the upper log grades in plants closest to the point of production rather than at the plant best equipped to convert them. No profitable sustained market has yet been found for manufacturing western redcedar or Alaska-cedar therefore, some cedar log export has been permitted. It seems likely that the timber industry in Southeast Alaska will stabilize in roughly 10 years' time (1970) with one small and three large pulp mills and about a half dozen sawmills with a total annual log requirement of about 800 million board feet. a stable industry using 800 million board feet of wood annually can be expected to employ directly about 4000 workers and have an annual product value in excess of 130 million dollars. These are certainly destined to be impressive figures in the Alaskan economy for many years.

"...interior spruce-birch-aspen boreal forest. There has been no industrial activity in this forest except small local sawmill ventures and the cutting of mine timbers and other minor forest products. ... no major industry will be based on this resource for at least 25 years."

The Handloggers by W. H. Jackson (1974) with Ethel Dassow is another good historical source of how the industry in Southeast Alaska got its start. This book explains why, until the start of logging for the pulp mills, there was very little evidence of timber harvesting in Southeast Alaska. It is a story of a young couple that, shortly after getting married, moved to Ketchikan and spent a lifetime as a Handlogger in this great land.

USDA Forest Service, Alaska Region's forest industry assistance program. Until 1965, the assistance given the forest products industry was provided by the Pacific Northwest Forest and Range Experiment Station and the Forest Products Laboratory. From 1965 to 1972, Vernon Clapp was moved to Juneau as the Region's first Forest Products Specialist. From 1972 to 1974, David Schumann filled the position of Forest Products Specialist for the Region and the position was moved to Anchorage. From 1977 to 1984 and from 1994 to 1997, I (Ken Kilborn) filled this position. The purpose of this position was to transfer technology from research and knowledge from other areas of the country to the forest industry of Alaska. The position required knowledge in timber harvesting, primary and secondary wood products processing, and marketing. Basic understanding of lumber drying, preservative treatments, wood construction, timber bridges, engineered wood products, pulp and paper, and special forest products were also necessary.

Current Primary Processing Industry

From the history of the forest products industry in Alaska and from my own experience in working with this industry for nearly twelve years, many of the problems mentioned in the article by Archie Buyers are still with us.

There are about thirty sawmills with an annual production of between 250,000 and 50,000,000 board feet per year operating in Alaska. There are at least 200 sawmills that are producing less than 250,000 board feet per year. Some of these small production mills are only sawing enough lumber for special projects such as a cabin or house and many are sitting idle waiting for a time when they need more lumber. Most of these small scale-mills are not interested in supplying commodity lumber to the wholesale or retail Alaskan market. The thirty active sawmills have more than adequate capacity to supply the current Alaska market for construction lumber, but most of these mills are not operating at capacity. With the size of the Alaska market for commodity lumber products (approximately 100 million board feet per year) (McDowell Group, 1998) and many mills not operating at capacity, there are still opportunities for additional sawmills to get into this market. I do not see the number of sawmills producing more than 250,000 board feet per year being more than fifty unless one or more of the larger sawmills should go out of business or depend more on the export market for their production. The current timber supply issue and the presently limited export market are definitely two reasons for the small number of active sawmills in the State.

Expansion Needs In Primary Processing

To produce acceptable lumber for the Alaska commodity market and achieve an acceptable recovery rate in conversion of sawlogs (which is necessary for a profitable operation), a sawmill should consist of a main breakdown saw, a resaw, an edger, a trim saw, either an air drying yard or a dry kiln, a planer, and adequate dry storage. Very few sawmills in Alaska have all this equipment and few have the available capital to purchase the needed equipment. There are still at least two options. Each sawmill can acquire the necessary equipment or by working cooperatively; centralized facilities could do some of the processing for a number of sawmills such as drying, planing, and grading of the lumber. This second practice has worked well in several areas of the world and makes good sense where operators are working with limited capital. On my last trip to Russia forestry officials in Siberia discussed this concept as a way to get quality produced lumber to the market. As in Alaska, Siberia has hundreds of thousands of acres of forested land needing harvesting because of forest health reasons needs to get this land under management. The main problem in Siberia and Alaska is much of the wood material that needs to be harvested is low in quality with most possible markets being chips for pulp or engineered products or as a fuel source. The high quality logs are readily sold to area sawmills or exported.

Cost estimates for equipment will look at purchasing new equipment, used equipment, and a combination of new and used equipment. With the number of sawmills in the lower forty-eight states and Canada being reduced (especially in the Pacific Northwest and British Columbia) there is good quality used equipment available at reasonable prices. There are several reasons for purchasing new equipment such as manufacturer warranties, assistance in setting up and operating equipment, and usually lower maintenance costs. Often, used equipment comes with no warranty, manufacturers' assistance or even an operation manual, and can have high installation, operation and maintenance costs depending on condition. This is where a combination of new and used equipment can make sense. Buy equipment of which one has a good working knowledge on the used market and buy new equipment where more technical assistance and assurance are needed. Shipping costs will be similar for new or used equipment.

Manufacturers of sawmill equipment in recent years have been producing videotapes showing their equipment in action and discussing many of the attributes of their machinery. Most of these videos are available free by calling the supplier or manufacturer and usually the phone call is also free. Nearly all sawmill equipment sold now comes with a well-prepared operator's manual. Sometimes it is even possible to get the operators manual with used equipment and one should always ask the seller if there are manuals or at least written instructions on operation and maintenance. One should be suspect of new equipment where the manufacturer does not supply a warranty, operator's manual or technical support in setting up and operating the equipment. Another good idea before purchasing equipment is to attend equipment trade shows or visit other operations in the area and find out what they are using and how happy they are with their choice of manufacturer. If not comfortable in making the decision on what equipment to purchase, work with a knowledgeable consultant especially when considering systems not common to Alaska. There are names, addresses, and phone numbers available for nearly every sawmill need. Wood industry publications often produce a directory of suppliers each year as well as having ads in most monthly issues for some of the items. This information is often available from state and federal wood products specialists, the Forest Products Conservation and Recycling Technology Marketing group at the Forest Products Laboratory, and a few quasi-private assistance specialists such as myself and Dan Parrent. Currently there are several publications and web sites listing used sawmill equipment with prices (TMS Machinery Sales, 1999) and these publications are available free to the industry.

The investment requirement for a small sawmill employing two people starts at about \$120,000. The equipment will include a portable or small stationary sawmill (either circular or a band, \$20,000), board edger (\$5000), single saw trim saw (\$1000), single head planer (\$3000), waste removal equipment (\$4000), fork lift for lumber package loads (\$12,000), flat bed truck (\$15,000), five acres of land (room for some air drying of lumber, \$40,000), and building to cover machinery (\$20,000). The probability would be that most of this equipment would be purchased in a used condition. Annual production for this operation would need to be at least 250 MBF on a single

shift basis to cover log costs, manufacturing costs, overhead, and salary with a very small profit margin.

The investment requirement for a somewhat larger sawmill that can meet the requirements of producing lumber that meets Uniform Building Code (UBC) specifications starts at about \$300,000. This mill should need up to five employees. Additional or different equipment needed by this mill would be a large portable or stationary sawmill (\$70,000), board edger (\$5000), thin blade resaw (\$20,000), moveable 2-saw trimmer (\$10,000), four head planer (\$35,000), powered transfer systems (\$30,000), fork lift (\$20,000), flat bed truck (\$15,000), dry kiln (\$25,000), and larger two-story building (\$70,000). With using a kiln, five acres for the mill site would be enough but more acreage would be preferable. At least one employee would need to get certified as a lumber grader and at least one would need to understand dry kiln operations. Annual production for this operation would need to be about 1000 MBF on a single shift basis to cover log costs, manufacturing costs, overhead, and salary with a small profit margin.

The investment requirement for a sawmill that can produce 10,000 MBF on a single shift basis per year would be about \$2,500,000. This mill would have a debarker (\$40,000), chipper (\$60,000), programmable high strain band headrig (\$400,000), thin-saw gang edger (\$90,000), thin band resaw (\$50,000), multi-saw trimmer (\$60,000), powered log and lumber transfer systems (\$70,000), four or six head planer or timber sizer (\$175,000), adequate waste removal system (\$80,000), dry kilns (\$250,000), dry lumber storage shed (\$75,000). This mill would need at least ten employees and at least one should be a qualified grader and two should be trained to operate dry kilns. Twenty acres of well-drained and fairly level land would be the minimum size for this system (\$200,000). A mill of this size would need to have its own filling room with all the necessary equipment to maintain both band and circular saws (\$50,000). The building for this mill would need to be at least two stories high, enclosed as much as possible, heated, have adequate employee facilities such as lunch room and restrooms (\$800,000). A separate building would be needed for an office (\$100,000). Annual production for this operation at 10,000 MBF would cover log costs, manufacturing costs, overhead and salary and should provide a good return on the investment.

There is no one size of operation that will fit every circumstance. There needs to be an analysis to determine the interrelationships of size of operation to fit available resources within an economic area, markets, and realistic financing.

Assessment of Research and Development Needs of Primary Industry

1. Development of kiln schedules for Alaskan species and for low temperature kilns. Although there are established kiln schedules for most species grown in Alaska these schedules do not take into account the higher density of trees grown in the northern latitudes. The small size of most sawmills in Alaska suggests using dehumidification or hot water kilns while the majority of kiln schedules were prepared for conventional kilns.
2. Determine design values for wood construction for Alaskan species, especially Alaska spruces, western hemlock, and yellow-cedar. Again because of the higher densities of trees grown in the northern latitudes both Alaska's spruces and hemlocks usually will have higher strength value than similar or same species grown at lower latitudes. Another problem that needs to be resolved is does this added strength of Alaska's spruces justify having a separate grade instead of being grouped under the SPF-S (spruce-pine-fir South) grade and Alaska's hemlock being grouped with the Hem-Fir grade. Alaska yellow-cedar is currently graded in a group called Western Cedars and is considerably stronger than any other cedar in this group. Even without consideration of the fact that Alaska yellow-cedar grows at more northern latitudes than the other cedars in this group, there is evidence that lumber from this species has strength values approaching second growth Douglas-fir and larch.
3. Supply and demand studies for the commodity market. Quarterly reporting of the supply and demand conditions within the State of Alaska would give the wood products industry, land

management agencies, financial lending institutions, commodity purchasers, and the concerned public much better information on which to make decisions.

4. Economic analysis for potential wood product industries. Studies could be done for various types and sizes of potential industries to at least demonstrate what is needed by these industries to be cost effective. Maximizing recovery of the available wood resource needs to be accomplished as long as it is cost effective in each step of harvesting, transportation, and processing.
5. Market analysis for Alaskan consumption, domestic, and export sales. In addition to the supply and demand studies mentioned above, markets need to be analyzed to aid in the development of a sustainable and even expandable commodity wood products industry.

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Product Recovery and Quality of Alaskan Timber

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Abstract

The Ecologically Sustainable Production of Forest Resources (ESP) team at the PNW Research Station, Portland, OR has conducted twelve studies on the volume and value recovery of timber from Alaska. The tree/log samples cover a broad range of conditions, areas, and species. Condition of resource includes beach logs (Ernst et al. 1986), beetle-killed (Lowell and Willits 1998, Scott et al. 1996), and fire-killed (Willits and Sampson 1988) as well as live material (Fahey 1983, Woodfin and Snellgrove 1976). Studies have been conducted in Southeast, Southcentral, and the Interior with spruce and hemlock being the primary species evaluated.

Many of the earlier studies (prior to 1990) were designed to provide input for the residual value appraisal system used by the USDA National Forest System. They provide useful information on volume and grade recovery for visually graded lumber for the domestic market. Two more recent studies (Green et al. 2000, Christensen et al. in prep.) provide data for a broader array of products.

This report is an overview of these studies, their findings, and their applicability to today's markets and resources.

Introduction

The Ecologically Sustainable Production of Forest Resources (ESP) team at the PNW Research Station, Portland, OR has a long history of wood product recovery work throughout the western United States. About one dozen of the 125 studies have been conducted in Alaska. A typical wood product recovery study involves selecting a sample of trees (or logs), harvesting them, processing the logs into lumber, veneer, or pulp and tracking the recovered product from each individual log. Data may then be compiled so that recovery from a specific tree can be calculated thus tying the characteristics of the resource to the quality of the end product.

The research performed by the ESP team is designed to answer specific questions that resource professionals working throughout Alaska have identified. Many earlier studies were designed to collect data used to develop tree and log grades. Consequently, many of these studies were conducted using old log grading rules that are no longer applicable (Sullivan and Shields 1958, Lane et al. 1972). These projects also report on combinations of lumber grades and products that are not relevant to today's markets.

Other previous work (Woodfin and Snellgrove 1976, Fahey 1983, Ernst et al. 1986) was designed to provide lumber value information that could be applied to the National Forest System's residual value appraisal system used in pricing timber sales. They were not designed to provide answers to specific questions about alternative products or the economics of utilizing the low-grade portion of today's resource.

The First Twenty-Plus Years: 1958-1979

During this time period, there were three major objectives for product recovery studies, all to provide data for support of the residual value appraisal system used by National Forest timber staff: (1) lumber recovery for export sizes, (2) tree and log defects and their effect on recovery, and (3) recovery of products from logs graded as cull. All of these studies were conducted in Southeast Alaska on western hemlock (*Tsuga heterophylla* (Raf.) Sarg.) or Sitka spruce (*Picea sitchensis* (Bong.) Carr.). Studies that looked at recovery for export sizes used export grades and associated prices that were proprietary giving these studies limited value beyond their initial objectives. Dry kilns were not available locally and lumber from these studies was graded in the green condition.

Sullivan and Shields (1958) were researching the relationship between log grades of old growth Sitka spruce and rough green lumber recovery to provide information for calculating average log grade values. Logs, not trees, were the sampling unit and the logs were selected from rafts. It was noted that these logs came from "better than average quality timber stands." Eighty-five percent of the logs had a small-end diameter of 14 inches or greater. Rough green lumber recovery, primarily for the domestic market, was reported for each log grade. It was determined that the sample was not adequate to draw any statistically significant conclusions about recovery as a function of log characteristics and diameter class.

Providing a basis for timber appraisal of Sitka spruce sawtimber on the Tongass National Forest was the objective of the recovery study by Lane et al. (1972). This objective made it necessary to provide recovery data based on the export cant market. Logs were sawn to optimize grade recovery and not volume recovery. Lumber was graded green (i.e. not kiln dried) by both Export lumber grading rules and Pacific Lumber Inspection Bureau grading rules. A second objective was to collect data to be used in developing a tree grading system for Sitka spruce for use as a tool in appraising timber.

The next study, by Woodfin and Snellgrove (1976), evaluated old-growth western hemlock from Southeast Alaska. The objectives of the study were to update lumber recovery information for use in tree valuation systems and to provide data to improve the log grading rules. Prior to this study, much of the hemlock was a resource for pulp mills. By 1973, an increasing amount of hemlock was being processed into cants and lumber for export. Over 88 percent of the lumber sawn for this study was in 4-inch thick products, primarily 4 x 4's for the Japanese export market.

Utilization and technology standards have changed over the years, not just in terms of mill equipment, but also in terms of products. Resource characteristics are also changing. While these studies may not address current issues concerning the resource and its potential for products, it does provide valuable information on the old-growth resource in Southeast Alaska.

The 1980's

Better utilization of timber resources seemed to be the focal point of research in Alaska during the 1980's. Questions became more specific with three studies examining the product recovery of dead material (wind-thrown, fire-killed, and beach logs) and a fourth looking at solid wood product potential from logs designated for pulp. Again the research emphasis was in Southeast Alaska but the study on fire-killed timber added white spruce (*Picea glauca* (Moench) Voss) from Interior Alaska to the ESP database. Each of the studies on dead material included a control sample of live trees to evaluate the effect of death on recovery.

Pulp log recovery

The capability of mills in Alaska at the time of this study (Fahey, T. 1983) dictated that larger hemlock logs (greater than 15 inches) were generally cut into export cants while smaller logs were usually chipped for pulp. In the Pacific Northwest, however, hemlock was used primarily for

dimension lumber although coastal mills produced large volumes of clears and “baby squares” for export.

Logs were sawn at mills outside of Alaska in the Pacific Northwest and it was concluded that dimension lumber could be produced from the hemlock pulp logs. Recovery probably would have been lower if sawn in Alaska because of lower mill efficiency and also a lack of local markets for the lower grade material would lead to chipping this material.

Wind-thrown timber

Sitka spruce and western hemlock in coastal forests of Southeast Alaska often experience wind damage in the form of uprooting or breakage (Harris 1974). A study was conducted (Fahey and Cahill 1983) to evaluate the quality of pulp produced from mill residues generated from processed blown-down timber. The hemlock sample had three categories of logs: (1) on the ground for 11 years, (2) on the ground for 3-5 years, and (3) a live, control sample. The spruce sample had only two categories of logs: (1) on the ground for 3-5 years and (2) a live, control sample.

Findings of this research are that chips from trees that had blown down as much as 10 years earlier produced usable grades of viscose pulp. Pulp yields were slightly lower (about 2%) from the downed sample of trees while ash content was slightly higher.

Beach log recovery

This study (Ernst et al. 1986), conducted in 1982, provides information about recovery of volume and value for dimension lumber and cants sawn from Sitka spruce and western hemlock beach logs. The sample, collected from beaches adjacent to the Wrangell-Petersburg area, consisted of two categories of beach logs, recent dead and older dead, and a third, live control sample. Logs processed at the cant mill had small-end diameters ranging from 11 inches to over 27 inches. The dimension mill processed logs from 7-inches small end diameter to over 27 inches.

The same quality and volume of lumber was produced from the recent dead sample as from the live sample for both Sitka spruce and hemlock. The older dead beach logs yielded less lumber, either because they had more defect or they were off-color because of exposure. Often, logs that are off-color are chipped rather than sawn into lumber.

Fire-killed timber

Interior Alaska has low precipitation and high temperatures during the summer that can create extremely hazardous wildfire conditions. One of these fires, the Rosie Creek fire, southwest of Fairbanks, provided the opportunity to evaluate the recovery of dimension lumber from fire-killed white spruce trees (Willits and Sampson 1988). This volume and value data was useful to land and mill managers to effectively salvage the resource. Tree samples were selected and processed during a period of 2- and 3-years after the fire with a corresponding live sample selected and processed at the same time as the 2-year old dead material.

Significant losses in value were found between the live and dead samples. There was no significant difference in value for lumber recovered from the 2- and 3-year dead material. It was recommended that fire-killed timber be harvested immediately to retain its value. Alternative products, such as house logs and firewood, suffered a loss in value if the timber was left standing for as little as a year.

Recent Work

A shift in land management objectives started early in the 1990's. Timber harvest and the need for appraisal values was no longer the driving force behind product recovery studies. Information gathered during these studies was being used by many different landowners and interested parties, not just by National Forest System and mill personnel. Additionally, a broader array of products was being considered as a means to recover value from local timber. Technological

advances in engineered wood products and non-destructive testing techniques allow for evaluation of higher value products than had typically been produced from the resource.

Beetle-killed spruce on the Kenai Peninsula

A continuing infestation of the spruce beetle (*Dendroctonus rufipennis*) in Interior and Southcentral Alaska has led to declining forest health through increased mortality and consequently, high fuel loads have built up in the forest. Public and private landowners, state and federal agencies, and numerous organizations have worked together to develop an action plan for managing and rehabilitating the infested areas (Kenai Peninsula Spruce Bark Beetle Task Force 1998).

A study undertaken in 1993 examined the recovery from beetle-killed trees for a number of products (Scott et al. 1996, Lowell and Willits 1998, Lowell, in press). A visual classification system based on tree condition was developed. There was a live, control sample and three classes of dead trees. Lumber volume and value recovery was calculated for each deterioration class by log small-end diameter. Defect present prior to attack by beetles (existing defect) played a significant role in recovery results (Figure 1). Models developed for each deterioration class included a variable to account for losses from existing defect. Volume and value of lumber sawn from logs of dead trees did not statistically differ among classes of dead material but was significantly different from the live, control sample. Value of material is reflected in lumber grade recovery (Figure 2). A much larger percent of higher grade lumber, Standard and Better, was recovered from the live sample. Therefore, two deterioration classes are sufficient for describing the beetle-killed resource – one for live and infested and a second for dead trees.

Samples processed into veneer had the same existing rot characteristics as the lumber recovery sample. Veneer recovery followed the same pattern as lumber recovery with the live, control sample recovering a higher volume of veneer than the deteriorated sample. Only two of the three deterioration classes were sampled as it was determined that it would not be economical to process the most deteriorated wood. There was no significant difference in veneer recovery between logs from the two deterioration classes. Value is reflected by the grade of veneer recovered. Figure 3 shows a higher percent of C and D grade veneer recovered from the live sample than recovered from logs in either of the 2 deterioration classes.

Figure 1 – Percent of cubic volume defect by type of defect for each deterioration class.

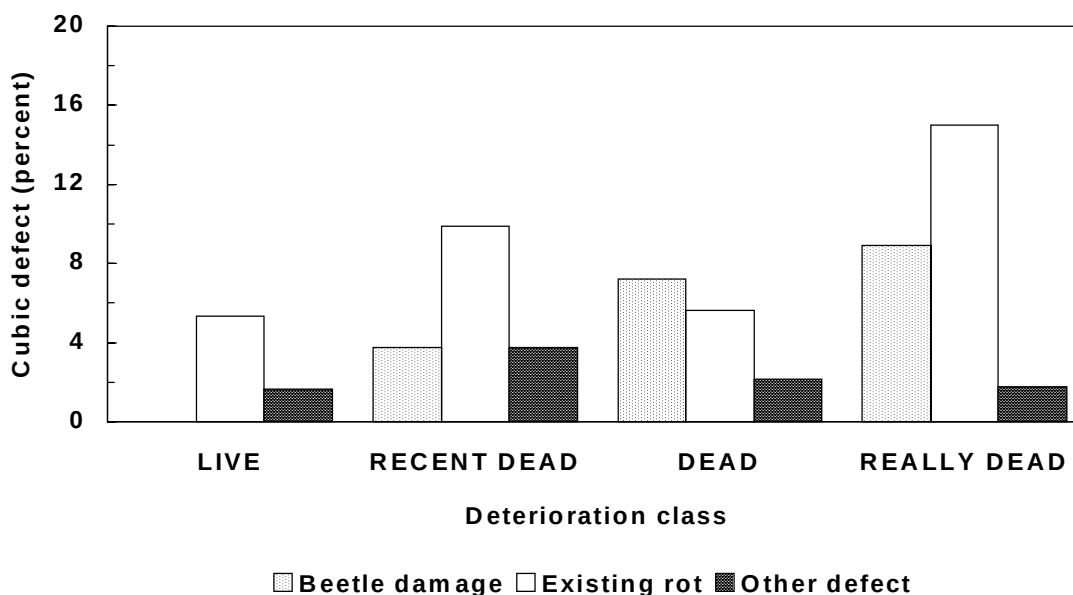


Figure 2 – Percent of board foot volume recovered in each lumber grade by deterioration class.

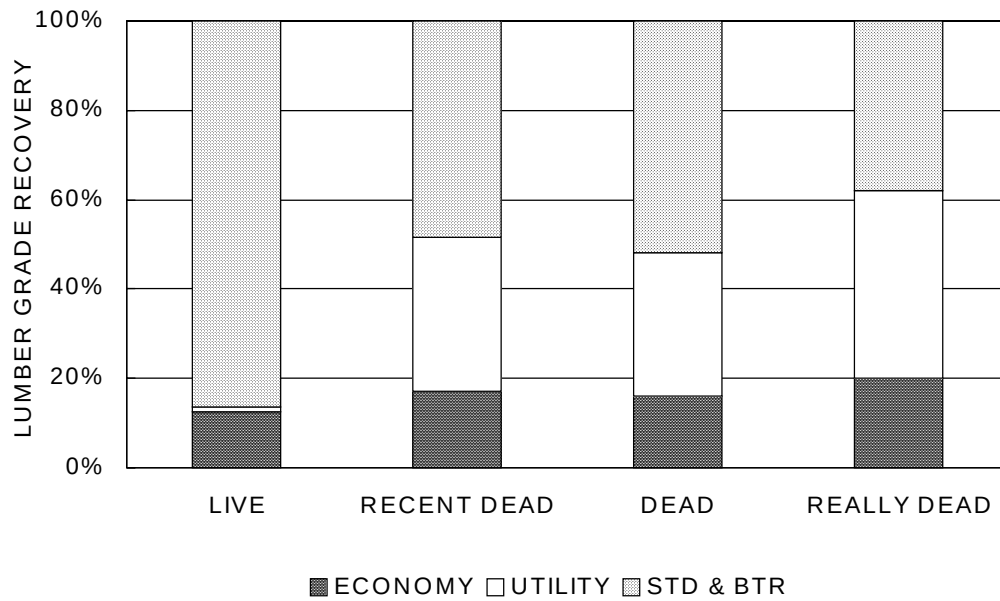
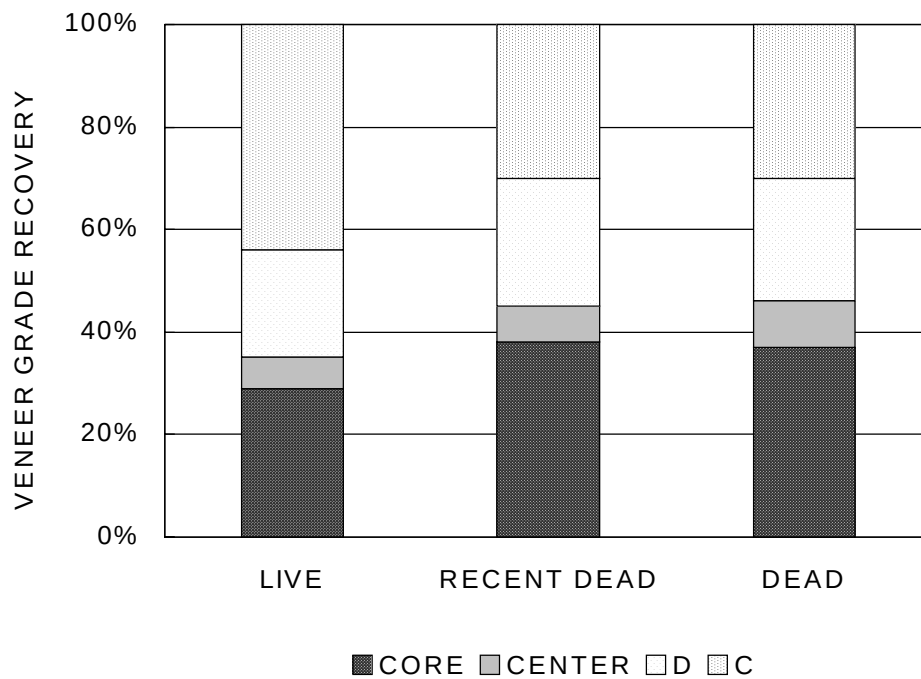


Figure 3 – Percent of volume in each veneer grade by deterioration class.



Use of dead spruce for building log homes was evaluated for a number of different types of house logs. Table 1 shows the percent of usable length in each deterioration class for the different types of house logs. A very high percent of the dead resource can be used as turned logs where the raw material requirements (6-10 inches and 8-16 feet) are less stringent than for the other types of house logs. Scribed logs had a preferred length of 32 feet and consequently, fewer logs could be processed for this end product.

Table 1.
Percent of total length in each deterioration class for all logs sampled that is suitable for use as different types of log home logs.

Type of house log	Deterioration class		
	Recent dead	Dead	Really dead
	percent		
Turned	90	93	86
2-sided	42	45	55
3-sided	58	56	61
Scribed	34	35	33

The beetle-killed material was pulped effectively using the kraft pulping process and there was no difference in pulp yield among the deterioration classes. Because of the existing rot and the sap rot present as a result of beetle infestation in the deteriorated logs, refining energy was the same or slightly less for the pulp from the deteriorated wood. Paper properties varied as a result of deterioration. Burst and tensile strength were dependent on the amount of log decay with tensile strength slightly higher for the more deteriorated wood. Tear strength, which is dependent on fiber length, was slightly lower as fibers tend to be shorter in deteriorated wood. Although paper strength properties were affected, they were still at an acceptable level when compared to the live, control sample.

Young-growth, thinning, and wood quality

Along with an objective to determine baseline product volume and value recovery from young-growth timber in Southeast Alaska, came the desire to answer several other questions (Christensen et al. in preparation). What was the effect of thinning stands of hemlock and Sitka spruce? What was the effect of fluting in hemlock on the product recovery? Could non-destructive testing techniques predict the suitability of the resource for engineered products? The cooperating mill was cutting primarily for high-quality export grade lumber and not to maximize the volume recovery. No differences in the amount of lumber recovered were found between thinned and unthinned material for a given species but differences were found between thinned spruce and thinned hemlock. Timber from unthinned spruce stands was found to have the greatest volume recovery. Thinning had been performed at about age 60, relatively late in stand development, so the influence of thinning on lumber grade was minimal.

Lumber quality was very good with over 90% of grade recovery Number 2 and Better under Western Wood Products Association structural light framing rules (Western Wood Products Association 1995). About 14% of the lumber was in the two highest grades, Select Structural and Clear. There was very little volume in the lowest grades, Utility and Economy. Logs from lower on the tree stem (e.g. butt logs) generally yield larger amounts of higher-grade lumber. Of particular interest in this sample is that high quality lumber is also being produced from the upper logs. Fluting in hemlock had no effect on grade recovery.

The young-growth resource sampled for this study had excellent mechanical properties. The highest visual grades of lumber (Clear and Select Structural) also produced the best quality structural material. The stiffness and strength of the lumber from both species met or exceeded published values and were comparable to lumber sawn from trees in western Oregon and

Washington. Results of mechanical testing indicate that lumber produced from the young-growth resource in Southeast Alaska is as good as the lumber from the traditional old-growth resource.

Forward to the 21st Century

Research will continue to evaluate the effects of land management activities on the quality of the forest resource for a broad array of wood products. There will be greater use of simulation models that can grow stands of trees, implement forest management activities, and saw or peel wood products, enabling evaluation of the suitability of the future resource for not just solid wood products, but for engineered and value-added products as well.

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Grading Options for Western Hemlock Pulp Logs

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Sitka, Alaska

Summary

In Southeast Alaska, large high quality logs of western hemlock (*Tsuga heterophylla*) have traditionally been cut into export cants and lower quality logs have generally been chipped for pulp. While pulp chips may still be exported, the demise of local pulping facilities has greatly reduced markets for these lower quality logs. Although product recovery studies were conducted in the 1970s and 1980s, these studies did not focus on the grading systems currently used for engineered wood products, such as wooden trusses, I-joists, and glued-laminated timbers. The objective of this study is to estimate the grade yield of structural dimension lumber that can be obtained from lower quality western hemlock "pulp logs." A complete discussion of the results of this study, including a discussion of the voluntary product code system and technical considerations in using results from a grade yield study, can be found in Research Paper FPL-RP-583 (Green et.al, 2000).

Four hundred and nine logs were selected at random from inventory at a mill in Southeast Alaska. Eighty nine percent of the logs graded as either No. 3 or No. 4 by the Puget Sound Log Scaling and Grading Bureau. Four percent of the logs graded as No.2 and 7% as "cull" logs. The culls could not be processed in a commercial sawmill. Small-end diameter of the 32-ft-long logs ranged from 5 to 36 inches, with most less than 12 inches in diameter. The logs were sawn into nominal 2x4, 2x6, and 2x10 lumber and visually graded as structural lumber by a Quality Supervisor of the Western Wood Products Association. All lumber graded as at least No.3 Structural Framing in the rough, green condition (72% of the total number of pieces of lumber produced) was dried, surfaced, and shipped to the Forest Products Laboratory in Madison, Wisconsin, for testing. For dried and planed lumber, the results of this research indicate the following:

- As Structural Framing, No. 2 and better lumber is suited for framing and truss production, and No. 3 for general construction. Approximately 50% of the dressed, dry lumber was graded as No. 2 and better, and 67% as No. 3 and better, Table 1.
- As lumber for the production of glued-laminated structural timbers (lamstock), about 28% of the pieces qualified as L1, 17% as L2, and 17% as L3, Table 2. For lamstock, the amount that qualifies as "Dense," is critical: 85% to 95% of the lumber qualified as Dense.
- Approximately 80% of machine-stress-rated lumber (MSR) is used in truss production and 20% for the production of wooden I-joists. Most trusses are made from 2x4 lumber. Two important grades for truss lumber are 1650f and 1800f. Approximately 33% of the 2x4 lumber could qualify for 1800f and 35% as 1650f, Table 3. For 2x4 lumber of the highest grades, the yield of MSR lumber was often much higher than with visually graded lumber with equivalent properties.

The results of this research demonstrate that a significant amount of high quality structural lumber can be produced from Alaskan hemlock logs once used primarily for production of pulp chips. This information helps establish the technical feasibility of producing high quality hemlock dimension lumber in Southeast Alaska. As is generally true with all the grading systems, markets are more easily found for the higher-grade lumber. The challenge is to find markets for the approximately 50% of the pieces that did not make at least No.2 Structural Light Framing, plus the sawdust, bark and slabs. This research did not evaluate potential markets for this lumber or address economic feasibility. The research also did not evaluate the yield of structural lumber from higher quality "sawlogs". It is unlikely that a modern production-oriented mill would be established just to process such logs. However, lumber obtained from pulpwood logs could significantly supplement lumber being produced from higher quality sawlogs.

References

Green, D.W.; McDonald, K.A.; Kilborn, K.; Damm, J. 2000. Grading options for western hemlock "pulpwood" logs from Southeast Alaska. Research Paper FPL-RP-583. USDA Forest Service, Forest Products Laboratory, Madison, WI.

Table 1
Grade yield of Structural Framing from dressed, dry lumber

Lumber grade	Number of pieces			Percentage of Lumber Volume			
	2x4	2x6	2x10	2x4	2x6	2x10	All
Sel.Str.	114	203	26	3.3	8.9	1.9	14.1
No.1	202	153	15	5.8	6.7	1.1	13.6
No.2	218	298	50	6.3	13.1	3.6	23.0
No.3	146	247	31	4.2	10.8	2.3	17.3
Economy	451	348	51	13.1	15.2	3.7	32.0
All	1,131	1,249	173	32.7	54.7	12.6	100

Table 2
Grade yield of Lamstock from dressed, dry lumber

Lumber grade	Number of pieces			Percentage of Lumber Volume			
	2x4	2x6	2x10	2x4	2x6	2x10	All
L1	300	347	64	8.7	15.1	4.7	28.5
L2	169	225	28	4.9	9.9	2.0	16.8
L3	161	239	21	4.6	10.5	1.5	16.6
Economy	501	438	60	14.5	19.2	4.4	38.1
All	1,131	1,249	173	32.7	54.7	12.6	100

Table 3
Estimated percent grade yields of Alaskan hemlock sorted
as MSR lumber

		Yield of	Yields from visual grades of MSR					
<u>Size</u>	<u>MSR grade</u>	<u>MSR^a</u>	<u>Sel.Str.</u>	<u>No. 1</u>	<u>No. 2</u>	<u>No. 3</u>	<u>VQL 5</u>	<u>All</u>
		Sorting one MSR grade at a time						
2x4	2400f-2.0E	9.4	6.7	13.7	16.3	4.2	49.7	100
	2100f-1.8E	18.8	0	14.5	13.0	4.0	49.7	100
	1800f-1.6E	33.4	0	5.3	8.2	3.4	49.7	100
	1650f-1.5E	35.2	0	4.3	7.6	3.2	49.7	100
	1450f-1.3E	41.8	0	0	6.0	2.5	49.7	100
2x6	2400f-2.0E	8.5	11.6	11.5	20.4	7.4	40.6	100
	2100f-1.8E	11.8	10.0	10.6	19.6	7.4	40.6	100
	1800f-1.6E	19.4	0	15.9	17.2	6.9	40.6	100
	1650f-1.5E	24.0	0	13.0	15.7	6.7	40.6	100
	1450f-1.3E	37.2	0	6.6	9.4	6.2	40.6	100
		Sorting two MSR grades at once						
2x4	2100f-1.8E	18.8	0	0	0	0	0	-
	1650f-1.5E	15.3	0	4.7	8.0	3.5	49.7	100
2x6	2100f-1.8E	11.8	0	0	0	0	0	-
	1450f-1.3E	24.9	0	7.0	9.5	6.2	40.6	100

^a Note that when grades are sorted one grade at a time, the number of pieces in lower MSR grades includes the pieces from a higher grade.

Selected Addresses

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Alaskan Forest Products Industry: A Changing Focus

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Introduction

For many years, the forest products industry had little need to watch global markets and even less need for high technology solutions. The market during that time was domestic for the most part and many of the products being manufactured were the same solid-sawn products that had been manufactured for decades. Alaska's forest products industry during this period was concentrated in the production of chips and pulp and the export of round logs and cants which required little or no local (Alaskan) processing after harvest. Due to a lack of widespread use of lumber grading services, solid-sawn, dimension lumber and timber products manufactured in Alaska were, primarily, limited in use for construction to areas without building code enforcement and for non-engineered uses such as fencing.

The forest products industry today is both international and high technology driven. For the most part, the trees that are harvested now are different than those that previous generations used and require much more post-harvest manufacture to turn them into marketable products. Much of the timber available today on the international market is smaller in diameter and lower in quality than has historically been true (McKeever 1997); requiring more sophisticated manufacturing techniques and a gradual shift in approach to wood utilization from solid-sawn to engineered wood products (EWP).

Many of today's new, engineered wood products are designed to maximize performance and minimize both the quantity and quality of the input wood fiber. Because of this, global forest products manufacturers use much smaller trees to produce a range of engineered wood products that exceed the capabilities of the old solid sawn products and are competitive with concrete and steel in today's construction environment. Species that were not considered cost effective to harvest in the day of large solid-sawn members are receiving new attention as input to the more efficient manufacturing processes that have evolved in parallel with the emphasis on engineered wood products.

Alaska's forest products industry is competing in this world where the quality and quantity of wood fiber harvested from traditionally high supply regions is decreasing yet Alaska's sawmill facilities and equipment have been, generally speaking, minimally processing mid- to high-grade timber. Alaskan producers are also facing buyers who are no longer willing to pay top dollar for minimally processed products but are paying higher prices for competitors value-added and engineered wood products that offer better performance, enhanced characteristics, and more consistent quality. Additionally, Alaskan manufacturing facilities are located far from large markets in the contiguous United States adding high shipping costs to the other costs of production.

In order to compete in this changing environment, Alaskan firms must be able to produce a variety of high quality wood products ranging from solid-sawn material to those that are engineered to maximize performance and minimize both the quantity and quality of the input wood fiber. As a first step in response to these stimuli, Alaska's forest products industry is expanding into the visually graded lumber and timber markets utilizing resources made available by a program entitled *The Forest Products Manufacturing Project* jointly funded by the Industry Network Corporation (INC) and the Alaska Science and Technology Foundation (ASTF).

In addition to introducing low-cost visual grading services for Alaska's timber species under existing national rules, the Forest Products Manufacturing Project is seeking to increase the value of Alaska's visually graded lumber through an in-grade testing program. Visually graded products

will continue to be an important part of the Alaskan forest products industry but, because of high transportation costs to Alaska and the shift in emphasis in global markets, Alaska needs to examine the potential of its native timber species for machine stress rating and for use in the engineered wood products market. To this end, the Forest Products Manufacturing Project is currently planning a products development Center for Alaskan manufacturers to use in the evaluation and development of new products for this fast changing market.

The primary objective of this paper is to develop a picture of an Alaskan engineered wood products industry and some of the barriers remaining to be overcome in order to develop engineered wood products utilizing Alaskan species as input to the manufacturing process. Alaska, however, is not on the brink of such an industry. That is, there is much that must be accomplished before Alaska can be competitive in a very sophisticated engineered wood products marketplace. This paper will, therefore, explore a variety of topics; all of which the author feels are necessary to sound and rational development of an engineered wood products industry in Alaska.

Forest Resources, Consumption and the Industry

Roughly one-third of the approximately 365 million acres in Alaska is forested, much of it capable of producing commercial volumes of timber (Curtis et. al. 1993a). The forested land is divided between coastal and interior forests. Growing in these two vastly different types of forested land there are commercial quantities of a number of hardwood and softwood species including: aspen, birch, cottonwood, Sitka and white spruces, hemlock, yellow-cedar and redcedar. Much of this timber is difficult and costly to access but is old growth, high quality timber or Interior softwoods with high densities due to the slow growth influenced by low temperatures and short growing seasons. Interior forests also contain extremely large quantities of high quality hardwoods that have been under-utilized for years but are receiving renewed interest for use in engineered wood products with advances in manufacturing technology which can easily accommodate their relatively small diameters.

Alaska currently imports between 80 and 90 MMBF of dimension lumber and timbers (10 to 15 MMBF of which is preservatively-treated) and an additional 10 to 20 MMBF of other wood products such as wood I-joists and glued-laminated timber (McDowell 1998). Additionally, Alaska is currently importing approximately 90 million square feet (3/8" basis) of engineered panels and veneers (McDowell 1998). A further 40,000 short tons of other manufactured wood products such as pallets, door and window frames and dunnage are purchased every year by Alaskan consumers and industries.

Change in Resource Utilization to Smaller Diameter, Lower Quality Logs.

McKeever (1997) reported a shift from large diameter old growth timber to small diameter, second and third growth input to the engineered wood products fabrication industry. This report cites a decrease in the average diameter of log being manufactured west of the Cascade Mountains into softwood plywood from 18 inches in 1990 to 12 inches in 1997. The trend in global markets is also towards smaller diameter timber as new resources such as those in the Russian Far East are developed. Additionally, the McKeever summary reports both continued small diameter usage or reductions in the size of logs utilized in the production of a variety of engineered wood products ranging from Oriented Strand Board (OSB) to Laminated Veneer Lumber (LVL) to glued-laminated timber and pre-fabricated wood I-joists.

Alaska has an abundance of both large- and small-diameter timber available for harvest. This material is spread, however, over a vast geographical area with an under-developed transportation infrastructure. This makes the timber more expensive to harvest than has historically been true of the timber harvested on public and private lands in the contiguous United States. The dwindling supply of timber from public land in the contiguous United States, coupled with advances in technology allowing the fabrication of engineered wood products from smaller and smaller trees, however, is resulting in a national and international value-added wood

products market in which Alaskan timber is becoming much more desirable than it has been in the past.

Because Alaskan timber has been deemed too expensive to develop in the past, Alaska retains a significant amount of very dense, high quality, medium to large diameter wood suitable for the upper end of the wood products manufacturing industry. Alaskan spruces, hemlock and yellow cedar are representative of resource timber that is either old growth or very dense and clear grained due to Alaska's unique growing climate; and these species are commercially available in large quantities unlike many species having similar characteristics in the contiguous United States.

New Uses for Local Species for Import Substitution

Possibly the first step in the development of any large scale wood products manufacturing industry in Alaska is to find new uses for local species to replace wood products currently imported. Certainly the first step in the development of a competitive engineered wood products industry in Alaska will be the characterization of our species. This process will occur most naturally as the by-product of a wood products import substitution effort.

Ozarska (1998), a research scientist with CSIRO, in a review of current research of value-added opportunities for native Australian species, raised many points which have a strong similarity to problems experienced by existing and would-be Alaskan producers of value-added products. Australia has a history of hardwood imports to support its furniture industry. With changes in supply of hardwoods in the global market, new emphasis has been placed on the development of local timber species for import replacement. Alaska has long been an exporter of minimally processed softwoods and an importer of finished wood products. With changes both in the international market for wood products and a desire to diversify its economy, the wood products industry in Alaska is currently seeking to develop higher value-added uses for local timber species.

Ozarska characterized the past Australian hardwood usage as follows: high-quality timber went to structural uses while low-quality material was utilized for packaging, pallets or wood chips. Historically, in Alaska, the majority of high quality logs were exported in round-log or cant form while many of the harvested lower quality logs went primarily to the production of pulp or wood chips for export.

Ozarska further postulated the future of Australian value-added hardwood production as the use of the entire timber resource (both high- and low-quality harvest) as being focused on high value-added products composed of both high quality timber and resawn, upgraded and glued lower quality timber. Both second growth and small diameter Alaskan timber needs secondary processing to compete effectively in the modern, global market for wood products.

In a summary of current problems in the Australian value-added industry Ozarska cited a lack of specific grading rules, a lack of quality drying requirements and schedules, unknown machining requirements for local species, a lack of information on glues and gluing processes for local species and a lack of data on quality finishing alternatives for local species. All of these conditions exist to one extent or another in the Alaskan forest products industry.

State Funding to Stimulate Value-Added Processing of the Timber Resource a Key Ingredient

Virtually all of the contiguous United States has active, healthy forest products industries have now or have had in the past some public support for basic infrastructure development. As previously mentioned, the first step in the development of a competitive engineered wood products industry in Alaska will be the characterization of the mechanical and machining properties of commercially viable Alaskan timber species. The cost of these types of industry-wide, infrastructure-related developments cannot be borne by a single business intent on the development and marketing of new engineered wood products. Some level of public support must be available to fund these basic building blocks of an engineered wood products industry.

Vlosky and Chance (Vlosky 1996), in an analysis of state funding of forest products development and research, reviewed six (6) state programs (Kentucky, Louisiana, Maine, Oregon, Pennsylvania and Washington) that had been reported in the literature to have some mechanism of public support for the development, stimulation and/or redirection of the forest products industry in each state. The survey study revealed that eighteen (18) states had, at the time the survey was conducted, some form of support for the forest products industry. Alaska was not one of the eighteen responding states reporting state funding for the forest products industry in 1996.

The state of Alaska is currently funding some of the work aimed at the modernization of the statewide forest products industry through the participation of the Alaska Science and Technology Foundation in the Forest Products Manufacturing Project. Current funding, however, is modest and many of the state agencies involved directly or indirectly in the forest products industry have recently received critical cutbacks in areas supportive of the movement to a modern, broad-based forest products industry.

The focus of much of the funding reported by Vlosky and Chance was the secondary or value-added, forest products processing industry. The average funding of the 23 wood products development state programs identified during the study was \$2.4 million.

Among the characteristics identified as an element of the successful wood products development programs Vlosky and Chance reported were: 1) analysis of existing industry, 2) establishment of a forest products industry development council, 3) accurate forest resource data, 4) access by industry elements to professional assistance, 5) technical assistance on forest products, 6) export assistance and an export directory, and 7) a focal point in state government for the forest products industry.

Of the above seven characteristics identified as necessary for successful state support of its forest products industry, the following summarizes some of the steps taken to-date and planned for the near-term future in Alaska:

- Item 1) *analysis of existing industry* - In an attempt to assess opportunities for import substitution for Alaskan forest products manufacturers, the Forest Products Manufacturing Project funded a market study (McDowell 1998) with the goal of quantifying the demand for forest products in the State of Alaska. The Industry Network Corporation, the Alaska Department of Commerce, the U.S. Forest Service and the Juneau Economic Development District co-fund an Industry Producers Index to aid potential purchasers in identifying Alaskan firms producing items of interest to them.
- Item 2) *establishment of a forest products industry development council* - The Forest Products Manufacturing Project formed an industry advisory committee in 1996. The Forest Products Industry Advisory Committee directs the efforts of the Forest Products Manufacturing Project on specific endeavors as well as setting the general direction that future efforts will take. The advisory committee is primarily composed of wood products manufacturers, timber resource owners and timber and forest products consultants but also has representatives from several state and federal agencies and economic development agencies.
- Item 3) *accurate forest resource data* - The state Division of Forestry is currently inventorying much of the forest resource on state-owned land while State and Private Forestry, of the U.S. Forest Service, is responsible for the state-wide inventory of the forest resource in Alaska and has conducted inventories on much of the remaining forested land.
- Items 4) and 5) *access to professional and technical assistance* - The Forest Products Manufacturing Project is funding low-cost grading services for Alaska, the initial stages of an in-grade testing program for Alaskan species and is seeking funding to develop a testing and development center for Alaskan wood products manufacturers. Additionally, the Project maintains a list of pre-qualified consultants with expertise in the forest

products area and provides low-cost technical assistance to mills attempting to quantify their current operations and/or evaluate mill and production improvement options. The U.S. Forest Service has placed a number of individuals in the Wood Utilization Center in Sitka whose primary function is research on value-added opportunities for Alaskan forest products to supplement the work performed on a regular basis by the many Forest Service employees stationed in Alaska on an on-going basis.

Item 6) *export assistance and an export directory* - The Industry Network Corporation and the State Department of Commerce have jointly enrolled as participants in the Softwood Export Council (SEC). The SEC is a national group of industry members and associated regulatory and economic development agencies that have joined together to share overseas marketing costs and leverage yearly dues through access to federal funds whose purpose is to promote overseas sales of United States wood and forest products. The first joint, Alaskan project conducted under the SEC partnership will be the *Guide to International Opportunities for Alaskan Softwood Producers* to be completed by the end of January 2000. The Guide will concentrate on identifying international marketing opportunities for Alaskan species in the Pacific Rim and European markets.

Item 7) *a focal point in state government for the forest products industry* - Until recently, when funding for the position was eliminated by legislative decree, the Department of Commerce maintained a full-time forest products specialist on staff whose duties included providing a central focus for the many groups in Alaska working on various aspects of the forest products industry.

Building Design, Quality Assurance, Public Safety & National Certification Agencies

Regulation of quality will remain a key issue as Alaska attempts to enter the engineered wood products market. Central to the concept of quality control and protection of the public are the use of model building codes, product certification agencies and standards writing bodies. In their article, *Standards for Structural Wood Products and Their Use in the United States*, Green and Hernandez (1998) make the statement: "Compared with 50 years ago, the forest resource in the United States today has a more diverse array of species available for use, but is composed of trees of smaller diameter. More efficient utilization of this new forest resource is a challenge to the building industry."

Green and Hernandez report that wood products used in the United States include: 1) round timbers including poles, piles and construction logs, 2) solid-sawn structural lumber, 3) structural composite lumber including Laminated Veneer Lumber (LVL), Parallel Strand Lumber (PSL) and Laminated Strand Lumber (LSL), 4) Structural Panel Products 5) Mechanically- and Glued-Laminated Timbers and 6) Wood I-Joists. Engineers and architects obtain design values for these products, comply with local ordinances and derive confidence in a uniform level of quality through the use of a system of model building codes such as the Uniform Building Code (1994) published by the International Conference of Building Officials (ICBO).

Model building codes, in turn, rely on standards and rules for the above products developed by a number of agencies such as the American Society for Testing and Materials (ASTM 1998), the American National Standards Institute (ANSI 1992a), the American Forest and Paper Association (AF&PA 1997) and the American Institute of Timber Construction (AITC 1992). Design values and manufacturing quality assurance are also derived from industry sources that have submitted new, proprietary products for testing and certification by subsidiaries of the agencies maintaining the model building codes.

Green and Hernandez further point out that, because of the need for consistent and reliable wood products, manufacturers of light-frame wood trusses are the largest consumers of machine stress rated (MSR) and machine-evaluated lumber (MEL) in the United States. Metal plate connected wood truss design is governed by ANSI/TPI 1-95 (TPI 1995).

Short-term Opportunities and Needs

One of the key ingredients to business growth, other than public policy and market economics, is the creation of an environment that is supportive of industry development. Such support can take many forms, but one that is key to the development of a vigorous value-added forest products industry in Alaska is for public and private entities to come together to provide those elements necessary to industry development which are difficult or impossible for individual businesses to fund and which will benefit the entire industry rather than a single company.

Examples of such industry-wide benefit projects are the low-cost grading services, technical assistance and the in-grade testing program currently being undertaken by the Forest Products Manufacturing Project. Low-cost grading services are intended to increase the value of locally manufactured wood products by establishing access to markets that have typically had entry barriers too high for many small firms to surmount individually. Technical assistance provides business owners with current technological solutions to their problems and advice and assistance on re-investment of assets. The in-grade testing program will seek to increase the utility of the resource by establishing new product identities for specific Alaskan forest products, segregate Alaskan species from current industry-wide specifications aggregating Alaskan species with inferior species and, possibly, through increases in design values resulting from specific tests of Alaskan species.

Industry-wide benefits, when funded with a combination of private sector and public sector monies, benefit end-users of the targeted products, individual businesses and the economic health of the state. As such, the agenda for such work needs to be set by a combination of industry, end-user and public participants such as the Forest Products Industry Advisory Committee. Businesses prosper from access to knowledge and technology that is difficult or impossible to obtain individually and the public benefits from the ability to purchase a wide range of locally produced items that promote import substitution and keep money circulating in the local economy.

Timber Supply

Possibly the primary barrier to short-term development of the forest products industry in the state is the availability of timber from which to manufacture value-added wood products. This issue is, however, primarily a matter of public sentiment and market economics and cannot be easily affected by industry groups or scientists in the short-term. It is necessary, though, to address the issue of timber supply as it relates to the development of an engineered wood products industry in Alaska as the level of investment necessary to construct modern manufacturing facilities is so great that the investment can not be justified without a sufficient, long-term timber supply to obtain financing. The issue of timber supply is much too broad to be examined in a paper such as this; however, it is prudent to at least discuss the nature and extent of the resource available before discussing an industry based on the resource.

The current timber supply may or may not be a limiting factor in the expansion of the Alaskan forest products industry in the short-term. Almost by definition, engineered wood products make maximal use of minimal resources in support of production. With cutbacks in the pulp and chip industries in the state, historical harvest levels may be sufficient to support this expansion in the short-term. Realizing more production from the existing harvest through more efficient use of the resource is possible both from manufacturing efficiencies and because higher value-added products create more local return for a given harvest level. Status-quo harvest levels will not likely support long-term expansion of the value-added forest products industry in Alaska.

Of the forested land in Alaska, much of the commercially viable land lies in one of three ownership categories: public (both State and Federal ownership), private native Corporation and private non-native Corporation owned land. Private ownership, both native Corporation and non-native Corporation owned land represents the highest potential for short-term increases in harvest. Privately held resources are traditionally developed when market conditions result in timber sale prices that are acceptable to both industry and owners of the resource. Value-added

production should allow manufacturers to pay higher timber prices as they realize higher prices for their products. Public policy sets harvest levels on public lands and, hence, changes in the harvest from public lands cannot be expected to increase in the short-term to support expansion of a value-added wood products industry.

Industry Expansion Requirements

A healthy engineered wood products industry is only possible in conjunction with a healthy diversified, horizontally and vertically integrated forest products industry. That is, it is impossible to have a successful, competitive engineered wood products industry in Alaska without a variety of manufacturers that are willing to process virtually every part of a harvested tree.

Building a diversified, horizontally and vertically integrated forest products industry in Alaska will require large capital investments by manufacturers and a willingness to finance these investments by Alaskan financial institutions and venture capitalists. Short-term changes in Alaskan manufacturing capabilities are limited both by the availability of such funding and what it is possible to accomplish in a short period of time given the current state of production facilities in Alaska.

Capital for expansion becomes available when lending institutions and venture capitalists feel confident in the long-term prospects for a business or industry. Public, industry-wide advances in available technology such as those represented by the introduction of visual grading for dimension lumber and the in-grade testing program and visible government support of an industry stimulate the confidence of expansion capital sources in the viability of the industry as a whole. A stable, long-term supply of timber is also a key element in convincing capital sources of the viability of the forest products industry in Alaska.

Individual businesses must then convince expansion capital sources of the dependability of their business in repaying expansion-related debt. In assessing short-term opportunities for the Alaskan forest products industry, a producer must consider, among other factors: the cost of adapting their current production capacity to supply new products to:

- local, domestic and export markets,
- untreated and preservatively treated wood products markets,
- solid-sawn and engineered wood products markets, and
- the available transportation infrastructure providing access to these markets.

Transportation infrastructure has long been a limiting factor to expansion of the forest products industry in the state. When the market for minimally processed forest products is depressed, the high cost of transportation infrastructure development in Alaska makes harvest of many of our resources economically infeasible. Higher prices for value-added production will contribute to making such infrastructure development economically feasible. Transportation infrastructure development is dependent on market development and market development is dependent on the transportation infrastructure, however, and this situation will remain more of a problem in Alaska than in analogous business development in the contiguous United States.

Short-term Alaskan Species Product Opportunities

Of the many possible value-added wood products identified herein, 1) non-structural shop lumber typically used in such products as door and window frames, the musical instrument industry and the furniture and cabinetry industry where purchase contracts and specifications are generally developed specifically between the buyer and seller and 2) the visually graded, solid-sawn structural lumber products identified by Green and Hernandez represent the most immediate opportunity for Alaskan producers. These products are currently being produced in Alaska either by purchase agreement between the buyer and seller or under the auspices of the visual grading rules of the Western Wood Products Association (WWPA). There are currently nine mills in Alaska registered as members of the WWPA under the Forest Products Manufacturing Project receiving monthly grading certification by WWPA's Alaskan mill inspector. These nine mills have an aggregate production capacity of approximately 100 MMBF per year.

The in-grade sampling and testing program will, potentially, provide an additional incentive to manufacturers to produce visually graded structural lumber by increasing the value of such lumber on the market through Alaskan specific design values and/or Alaskan specific product identification and marketing. Technical assistance provided by the Project or the Forest Service personnel in the Wood Utilization Center in Sitka will assist Alaskan manufacturers not currently involved in this market to upgrade their facilities or capabilities to produce products of sufficient quality and quantity to compete in this market.

Even though producers of light-frame wood trusses in the contiguous United States frequently use machine stress rated (MSR) and machine-evaluated lumber (MEL), visually graded material can also be used to produce these products. This area represents a significant market in which Alaskan producers can participate with current wood products manufacturing capabilities. Lacking short-term, local access to MSR and MEL equipment, high quality lumber, visually graded under existing WWP rules can be utilized in the construction of light-frame wood trusses. There is current production capacity in state of light-frame trusses, but local producers of these items are currently employing imported lumber products in their manufacture. In the long-term, development of MSR standards and capacity in-state will eventually provide this industry with high-quality, locally produced machine stress rated lumber for manufacture of light frame trusses. Both Alaskan spruces and hemlock produce dense, select structural wood sufficient for the manufacture of lumber for use in the light-frame wood truss market. Import substitution of virtually all of the non-Alaskan wood used in these applications is a possibility that makes this a high priority for further research and development.

Several Alaskan species possess the structural characteristics necessary for them to be manufactured into high-quality veneers and structural panel products. Two conditions will have to be met prior to them justifying the large capital expenditures required for a modern peeling or panel plant: a sufficient quantity of timber available over a long enough time period and either local or export markets of sufficient size and accessible in an economically feasible manner. Modern processing equipment is available in both the United States and Europe that can process Alaskan timber species into veneers and structural panel products.

Long-term Alaskan Species Product Opportunities

Other structural wood products identified by Green and Hernandez require additional work before introduction to the market utilizing Alaskan species. In some cases the required additional work is primarily product development in nature. In many cases, the additional work will be primarily related to conforming to existing certification and grading rules in developing common engineered wood products utilizing Alaskan species. In some cases, potential Alaskan producers of a new product will focus on the development of model building code reports for new, proprietary products.

Poles and Preservative Treatment Options

Round timbers for utility poles and piling, construction logs (ANSI 1992 and ASTM 1998) for log homes and packaged log construction all require standards and grading for consistency. Many of the medium size utility poles used in local electrical distribution systems and much of the treated timber piling could be manufactured from Alaskan species. These products are currently imported at great cost due to their length and associated handling costs but could be manufactured from local species given testing to establish design values and development of a suitable preservative system with which to treat them. Strength design values, once determined, would have to be submitted to the American National Standards Institute for approval; a lengthy process but one that is justifiable due to the high import costs associated with these items.

Some Alaskan timber species will accept pressure treatment utilizing traditional chemicals such as creosote, CCA and ACQ. Pressure treating standards are developed and maintained by the American Wood Preservers Association (AWPA 1998).

The cost of capitalization of a pressure treatment plant to apply these chemicals in Alaska has, historically, been too high to be feasible given the size of the Alaskan market. Utilization of the Alaskan species which accept pressure treatment for poles would, hence, require shipment of the poles to the contiguous United States and back to Alaska subsequent to treatment, thus, defeating the purpose in the utilization of the local species.

Some Alaskan species, such as white spruce, are refractory in nature and will not accept pressure treatment. The fibers of such species literally crush before accepting a suitable amount of preservative chemical.

Additionally, there is growing public resistance to the use of traditional treatment chemicals such as the arsenic and chromium contained in preservatives such as CCA. Preservative treatments other than those employing pressure means and which utilize more environmentally friendly treatment chemicals have been researched by the Forest Service for use in Alaska for several decades (Gjovik 1972). One of these alternative treatments, double-diffusion, will effectively treat many Alaskan species, including the refractory white spruce, and is currently being employed by an Alaskan firm in treating wood elements of engineered structures (Curtis et. al. 1993b).

Standards and specifications will have to be developed which will allow state and federal purchasing departments to accept double-diffusion treated wood elements. Such standards can be developed by application to the American Society of Testing and Materials and are, hence, long-term development in nature.

Log Construction

There is currently a competitive Alaskan market for log construction and log construction packages. Current capacity tends to consist of relatively small manufacturers serving a, primarily, local market. No single manufacturer currently has the capacity to serve a large, year-round market however. No existing Alaskan producer has the market recognition of, for example, Lindal Cedar Homes.

There is an existing and somewhat quantifiable demand for export to the Pacific Rim market of standardized and quality-assured log construction packages. Actualization of this export market for Alaskan production will require the development of quality control standards, purchase specifications, log grades and a standardized grading system for these items. Without such standards, overseas buyers are unlikely to purchase from Alaskan manufacturers due to product variability within a given facility and throughout the statewide industry as a whole. Such construction must also conform to export market building codes which introduces yet another layer of complexity to this market. The Softwood Export Council is currently conducting a market study for the Alaska Department of Community and Economic Development and the ASTF/INC Forest Products Manufacturing Project to determine the size and focus of the overseas log construction market.

Additionally, no single manufacturer currently has the capacity to manufacture log structures and/or kits in sufficient volume to justify overseas marketing costs. Short-term success in this industry is likely to be realized only after small firms combine their output and adhere to uniform quality specifications. Combined marketing, even of differing product lines within such cooperatives, may then become economically feasible.

Engineered Beams & Columns

Green and Hernandez reported that there were thirty glulam plants in the contiguous United States producing approximately 300 MMBF per year. This industry has developed over the years to utilize both high- and low-grade material in different portions of the cross section.

Similar to the utility pole market, this is also an attractive product for fabrication in Alaska due to high shipping costs from the contiguous United States to Alaska. Alaskan species are well suited for use in the manufacture of glued-laminated timbers but will require further development prior to actualization of this potential.

Development of glulam manufacturing capability utilizing local species will require the development of manufacturing and design specifications for our local species. Quality assurance and certification of these locally manufactured glued-laminated timbers will need to adhere to standards established by the American Institute of Timber Construction and the American National Standards Institute (AITC 1992, 1993a and 1993b).

Wood I-joists are frequently employed in both residential and light commercial construction in Alaska and represent an attractive product for Alaskan manufacture because of associated shipping costs. Because these products are proprietary, however, building code acceptance following ASTM D5055 (ASTM 1997) guidelines is likely to be cost prohibitive for local producers given high capitalization costs for the requisite production facilities, the relatively small local demand and the high shipping costs necessary to access export markets.

Conclusions

Alaskan timber species have the strength and stiffness characteristics necessary for them to compete in global markets in both solid-sawn and engineered wood products. The barriers to the entry of Alaskan timber into these markets are, in most cases, not engineering properties related. Because the majority of these market barriers are not engineering properties related, they can be eliminated with a determination to develop Alaska's forest products industry and sound business and engineering planning for the forest resource in the state.

Opportunities exist for Alaskan forest products in both domestic and export markets. The wood products, identified in the McDowell report, currently imported into Alaska represent an immediate opportunity for Alaskan firms to gain access to an existing market that is already consuming products similar to those being offered as import substitutions. For many Alaskan producers, this immediate access to an existing market should be their short-term focus for growth.

In the case of solid-sawn lumber, entry into the domestic market can be immediate. Grading, technical assistance in manufacturing and the in-grade testing program will allow Alaskan producers access to these traditional markets. Alaskan solid-sawn lumber of sufficient quality can also be substituted for imported lumber in the existing, light-frame truss industry in the state. Gaining access to the existing in-state housing construction market represents a significant opportunity for expansion for many Alaskan mills.

Further, as more rural mills become certified, local production can replace products imported at great expense in rural Alaska for the housing market. Transportation costs for construction lumber in rural Alaska represent such a significant portion of the total cost of housing projects that production by rural mills of graded material to serve localized markets represents a significant increase in the buying power of these projects.

Dwindling supplies from historically high harvest areas in the world and a changing international wood products market also represent an immediate opportunity for those mills of sufficient size and with access to a sufficient timber supply to enter the international market. Alaskan hemlock and red and yellow cedars are all gradable, exportable products now and will likely become more valuable with Alaskan specific design values that highlight properties such as natural decay resistance or higher allowable strength values when segregated from mixed species designations.

White and Sitka spruces, which Alaska has in abundance, both possess excellent engineering properties and will also benefit from the in-grade testing program as they are separated out of species groupings containing inferior softwoods. The Alaskan spruces will also potentially benefit from the in-grade testing program from increased design values associated with the slow, dense growth promoted by the Alaskan climate.

Yellow-cedar, redcedar, hemlock, and Alaska's spruces all have current market recognition for properties ranging from natural decay prevention to defect free clears to the Japanese appreciation of clear white wood. These existing market advantages, when combined with

Alaskan specific species designations for construction lumber should be the focus of efforts to increase export consumption of these species. Programs such as the Softwood Export Council membership and participation need to remain high priorities of the Forest Products Manufacturing Project and the Alaska Division of Commerce.

While Alaskan producers focus on capitalizing on the many natural advantages of Alaskan species and recent changes in the statewide forest products industry, bodies such as the Forest Product Industry Advisory committee need to remain focused on the future and making sure that new work aimed at finding new uses for our forest resources continue to produce new opportunities so that they are already available when industry becomes ready for them.

If the state of Alaska desires an energetic and healthy forest products industry, some mechanism for focusing resources that will provide benefit for the industry statewide must exist. One mechanism to direct resources back to the industry would be for the state legislature to redirect a portion of the stumpage collected from the sale of timber on state land back into forest products research and development. Such funding should be directed at those products and projects which industry and end-users of wood products identify as being most critical for development in Alaska.

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A Northwest Perspective on Secondary Processing

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The paper will include many facts but it will also include my opinion. I hope it will stimulate you to think about what value-added forest products manufacturing might mean for Southeast Alaska.

The outline of the paper follows:

- Define and contrast primary (commodity) versus secondary (value-added) processing and give examples of both.
- Discuss the changes in Oregon State University's outreach and research focuses - based on the emergence of the value-added forest products industry.
- Briefly discuss the interactive web site for the Alaska forest products industry.
 - Importance of information sharing and networking
 - Michigan's Department of Natural Resources web site as an example.

Primary and Secondary Processing

First, let me define what I mean by commodity forest products manufacturing. The two processing facilities most commonly lumped into this category are lumber mills and plywood plants. Most pulp and paper mills are commodity producers. The facility produces large volumes of very similar products (if not identical) to products produced by other like mills. Large commodity producers in Oregon usually share the following:

- Located close to available raw material - forests and logs.
- Steady and large volume of raw material:
 - Softwood sawmill - 750 MBF (thousand board feet) to 1 MMBF (million board feet) of logs per 16-hour day.
 - Pulp mill - 40,000 tons of chips per week (1,300 truckloads or 450 rail cars).
 - Medium density fiberboard - 7,000 - 10,000 tons of shavings or chips per week (200 - 300 truckloads).
- Highest variable cost is the raw material.
- Little or no influence on price so controlling costs becomes very important.
- Process large volume of product at the lowest manufacturing cost to make a profit.
- Low cost implies high conversion efficiencies - lot of product with little waste.
- Highly automated - Trend is toward fewer employees in the mill. For example, the following table reports the decline in the number of sawmill employees per million board feet (MMBF) of softwood lumber produced in Oregon over a ten-year period.

Oregon Data	
Year	Avg. # Employees to mill 1 MMBF of lumber
1979	4.5
1983	3.4
1987	2.8
1989	2.0

- Can do only a few things to differentiate your product from the competition such as packaging, and special mill customer relationships such as allowing the customer to buy in smaller quantities or to buy mixed-size packages (some things your competitor

- might not allow). Personal relationships with the customer are very important but difficult to maintain with customers who only look at cost of the commodity product.
- Little value is gained by advertising product you cannot differentiate from the competition.
- Infrastructure to support the industry is very important to its success and might include the following for a sawmill:
 - A skilled labor force.
 - Equipment and material manufacturers, custom dryers, small motor re-builders, saw and file shops located to service the mill's needs.
 - Satellite mills available to use "waste or byproducts of the process" and make a product thus alleviating some environmental concerns.
- Many commodity manufacturers are starting to see the value of processing their commodity products further – (i.e. adding more value before shipping).

First, let me give you my definition of lumber recovery in the softwood lumber industry. Recovery is usually defined as lumber in board feet (nominal not actual measure) divided by log volume in cubic feet (measured inside the bark). Curve sawing is a newer technology that has been improving the recovery in softwood mills. Curve sawing is a method where the saw follows the contour of the log. The boards are curved when they come off the saw but flatten or straighten out as they dry. An example of good recovery for a softwood curve sawing system, cutting 8' to 20' logs with an average diameter of about 9 - 10" (small end), would be about 820 - 880 board feet per cubic foot of log volume. Let's compare this with a chipping saw cutting smaller diameter logs. A chipping saw, first has chipping heads to produce a small cant, and second, a series of saws to cut the cant into boards. Good recovery for a chipping saw cutting softwood logs with an average diameter of 5 - 8" (small end) would be 710 - 730 board feet per cubic foot of log volume. So, you can see that lumber recovery depends on the method of sawing and the size of the logs sawn. The above examples can be used as a guide to lumber recovery values you might expect at well-operated softwood lumber mills.

Grade recovery is another important factor to consider. One way to describe grade recovery is to call it value recovery. In this case, a mill is more interested in obtaining the highest value from its lumber output, not the highest volume of output. How can a lower volume of output actually increase profit? Let me use an example. Let's say #3 2X4s are worth \$350/thousand board feet (MBF) and #2 2X4s are worth \$450/MBF. An 18' 2X4 with a #3 grade knot, located near one end of the board, is worth \$4.20 to the mill $[(2X4X18)/12 = 12 \text{ board feet and } (12/1000) \times \$350 = \$4.20]$. If the #3 grade knot is trimmed off, the 2X4 now becomes a 16' #2 grade board. It is worth \$4.80 to the mill $[(2X4X16)/12 = 10.6667 \text{ board feet and } (10.6667/1000) \times \$450 = \$4.80]$. When a mill produces thousands of 2X4s a day, a small increase in the value of boards can mean a large increase in profit, yet the volume of lumber decreases. Often, grade recovery is used to determine how well a mill is doing. Grade recovery is usually stated as the percent of #2 and Better lumber produced. Again, this depends on the size of the lumber. For 2X4s, grade recoveries of about 75% would be high but for 2X10s grade recoveries would be expected to be in the 80%+ range. You can see that volume recovery is often the important measure in the sawmill but value recovery is usually a more important measure in the planer mill where the final grade and value is assigned.

I worked in the southern pine sawmill industry for about nine years so I will use a sawmill as an example of how a commodity forest products manufacturing firm might operate. An example of a commodity softwood sawmill might include the following:

- Efficient mill will recover 80% of the log volume as lumber.
 - o Remainder will be bark, sawdust and green pulp chips from the green end of the sawmill and planer shavings and dry chips from the dry end of the sawmill.
 - o Bark and sawdust can be burned in a boiler to produce electricity and steam either at the sawmill or a satellite mill.
 - o Sawdust can also go to a fiberboard or particleboard plant. Green chips can go to a pulp mill, fiberboard or particleboard plant.
 - o Planer shavings and dry chips can go to a fiberboard or particleboard plant.

- About 80% of the lumber will be #2 grade or better.
- Production = 40 - 50 thousand board feet (MBF) per hour:
 - A 16-foot 2X4 contains 10 and 2/3 board feet of wood.
 - Mill processes an equivalent of 3,750 to 4,687 2X4s per hour.
 - Mill produces an equivalent of 30,000 - 37,500 2X4s in an 8-hour shift.
 - 24,000 - 30,000 will be #2 or better grade.
- Average price for 2X4, (#2 or Standard) and better (CROW'S)
 - Douglas fir (green) ~ \$360/MBF Kiln dry (KD) - add another \$20/MBF
 - Douglas fir (green) and delivered to east coast ~ \$450/MBF
 - Spruce-Pine-Fir ~ \$385/MBF KD - add another \$35/MBF
 - Southern Yellow Pine ~ \$420/MBF

Now, let's look at some commonalities associated with value added forest products manufacturing. Many value added manufacturing firms share these characteristics:

- Located close to the final consumer.
 - Furniture centers in the U. S. are located near population centers - east coast, central U.S. - KY, IN, OH, and west - southern California - all three regions use mostly eastern hardwoods. The California furniture mills use hardwoods shipped from the eastern, mid-western and southern hardwood states. It is less expensive to ship dry hardwood lumber than it is to ship finished goods, therefore the value added plants are located near the population center of southern California and not near the forests. They are able to add enough value to their products to make up for the higher shipping charges that can be more than \$100/MBF of lumber.
- Wood is only one of several material costs.
 - Other costs include adhesives, fabric, hardware and finishes. These can be higher than the wood cost.
- Efficient conversion of wood into product not as critical but still important.
 - Convert only 50% of wood into products. Produce dry wood waste.
- Although product utility may be identical to competitors', manufacturer has great flexibility in individualizing the product (recliner made by Lane has the same utility as a recliner made by La-Z-Boy but consumers have different ideas about quality, price and other non-utility characteristics).
- Labor intensive. Although value-added processors automate as much as they can, they tend to employ more workers per unit of output. On average, for every employee in the sawmill to produce a board foot of lumber, it takes 6 employees in the value added sector to convert that board foot of lumber into value added products.
- Low production costs are not as important as they are to commodity producers. High quality and the ability to differentiate the product from competitors are more important. Advertising becomes very important and can be a high cost for the manufacturer. Lane and La-Z-Boy both produce upholstered recliners, but I think if you asked for a name of a recliner, most people would say La-Z-Boy.
- Infrastructure to support the industry is also very important to the value-added industry. This may include the following:
 - o Skilled labor force.
 - o Equipment and material manufacturers.
 - o Technical expertise: adhesives, finishes, knife grinding, saw shops, etc.

As an example of value added manufacturers I will compare two similar companies, both produce upholstered furniture, one is located in Kentucky and the other in North Carolina:

- Both are close to the eastern hardwood lumber industry and, more importantly, they are close to the population centers where most of the final customers are located.
- Wood and other material costs are similar.
- Efficient use of wood and other material are about the same.
- Both mills are labor intensive.
- Both add high value to their products.
- Kentucky mill sells in a niche market. They produce furniture for retirement homes, hospitals and rehabilitation centers. The furniture is sturdier, resistant to tipping over,

seats are higher, some have the ability for the seat to tilt and the fabric is durable and easy to clean.

North Carolina mill sells to its own chain of retail stores and to other retail stores. They sell upholstered household furniture.

- Both spend a sizable amount for advertising but they advertise to different clients.
- Infrastructure to support the industry is more available to the North Carolina firm. I will use an example to illustrate the importance of infrastructure, at least as it relates to our two upholstered furniture manufacturers.

A skilled labor force is not available to the Kentucky manufacturer. For example, skilled fabric cutters earn almost twice the amount North Carolina fabric cutters earn. Efficient conversion of fabric into furniture covering and not scrap is as important as efficient conversion of wood into furniture parts and not chips. The North Carolina manufacturer can advertise in the newspaper and get skilled applicants for his fabric cutters. The manufacturer in Kentucky cannot do this because he is located in an area where no similar manufacturing facilities exist. There are no skilled fabric cutters since there is not an established upholstered furniture industry in Kentucky or the surrounding states. The Kentucky manufacturer can compete because he adds a lot of value to his product and services a niche market.

How Much Value?

What is the ``value" of value added? This data is from the Census of Manufacturers, Industry Series, 1992. When looking at the data try, and imagine which area has the most infrastructure supporting that industry. North Carolina has large infrastructure support but so does southern California, and they are both located close to most of their final consumers.

Category	Area	Value added (Million dollars)
Wood Household Furniture	U. S.	\$4,726.20
``	N. Carolina	\$1,235.90
``	California	\$ 363.40
``	Oregon	\$ 35.50
``	Kentucky	\$ 19.10
``	Indiana	\$ 187.50
Upholstered Household Furniture	U. S.	\$3,009.90
``	N. Carolina	\$ 912.50
``	California	\$ 312.80
``	Oregon	\$ 25.70
``	Kentucky	Not listed
``	Indiana	\$ 62.10

I selected several states to compare. It is evident that North Carolina has many more furniture mills and therefore a larger pool of skilled employees than the other states. In 1992, North Carolina had \$1.2 billion of the total U.S. value added of \$4.7 billion for the wood household furniture sector. Service industries build in the regions where the client industry is most prevalent. A skilled employee can leave one manufacturer and be hired by another who is located only a short distance away. Kentucky is a major hardwood lumber producer. However, most of its lumber is sold to states such as Indiana and North Carolina who add value to the lumber.

We can get some idea of value added by looking at the value of the lumber going into the production of each category and comparing this with the value added and the value shipped amounts:

<u>Category</u>	<u>Value added (Million dollars)</u>	<u>Value shipped (Million dollars)</u>	<u>Value of HW Lumber (Million dollars)</u>
Wood Household Furniture	\$4,726.20	\$8,737.00	\$445.50
Multiplier	10.6	19.6	
Upholstered Household Furniture	\$3,009.90	\$6,223.30	\$142.90
Multiplier	21.1	43.6	

For wood household furniture, \$445.5 million worth of hardwood lumber was used to produce over \$4.7 billion in wages and products. For upholstered household furniture, \$142.9 million of hardwood lumber was used to produce over \$3 billion in wages and products. Multipliers indicate how many times the value of the lumber was increased by processing it into products.

At least in the short term, there is good news for both commodity and value added forest products manufacturers. The single most important driver for forest products in the U. S. is housing. Solid wood products, panel products, engineered wood products, mouldings, cabinets, and a vast number of other wood products (commodity and value added) are consumed with new housing. New furniture and other value added products are often purchased with a new home. Projections for new housing construction look strong.

Oregon State University Forest Products

Historically, the Oregon State University Forest Products Department's research and resident teaching programs emphasized, besides basic wood science and technology, teaching about the primary wood products industry. This was the main focus because for many years the primary industry was the number one manufacturing industry for Oregon for both number of employees and economic value. Although Oregon still remains the number one softwood lumber producer in the U.S., numbers of employees in the primary industry have been declining. Hi-tech (mostly electronics) firms have become the number one manufacturing employer in Oregon. Primary forest products still remain economically very important to the state and, for some communities, remains the largest employer. Another important statistic is that it is estimated there are more employees working in the value-added forest products industry than in the primary industry in Oregon. Recent forecasts indicate the value-added sector as growing while categorizing the primary sector as remaining stagnant or facing further decline. These forecasts were not ignored at Oregon State University. About five years ago Oregon State University hired two campus-based faculty to work primarily in value-added forest products research and extension. In addition, two county extension agents were hired and located away from OSU's campus to support value-added forest products in two regions of the state. The emphasis OSU extension has put on this can be seen from the Table below:

Priority Audiences for OSU Forestry Extension (Percent of total FTE¹ spent on audience)		
	Agents	Specialists
Small woodland owners	47%	29%
Manufacturers	11%	28%
Loggers	6%	10%
Resource professionals	9%	18%
Youth/Educators	6%	4%
Christmas tree growers	7%	0%
General public	14%	10%
¹Full time equivalent		

Manufacturers, as a primary audience, were least represented (by FTE) before the value-added FTE was added. It is now second on the list. This reflects the fact that most of the FTE for manufacturers is being used to address the needs of the value-added sector. In addition, a value-added forest products manufacturing course is now being taught in the undergraduate curriculum and several research projects directly related to value-added forest products have been, or are currently, being conducted by scientists in the Department of Forest Products. This represents a significant investment by OSU in support of the value-added forest products sector in Oregon and the Pacific Northwest for both research and extension.

Alaskan Forest Products Database

Oregon State University and the U.S. Forest Service are cooperating to produce an Internet-based, interactive database for Alaska. The main objective of the database is to make information, that would be either difficult or impossible to attain, available to forest products manufacturers. The database will include a listing of manufacturers, what products they produce, what raw material needs they have, any excess machine capacity they might be willing to rent, and other information that could help manufacturers compete. For example, an Alaskan manufacturer may want to know where to purchase spruce veneer. A spruce veneer producer wishes to find customers. If either or both are listed in the database then contact can be made. A company in Japan could use the database to find an Alaskan manufacturer. Another example, computer-controlled equipment is relatively expensive but often necessary to produce high quality

products. Its difficult at times to justify the cost of this equipment if it is not used most of the time. For example, an expensive piece of equipment might be used, on average, only 4 hours out of each 8-hour shift. However, several small manufacturers have products that can be produced on a similar machine but do not have resources to purchase one. If the manufacturer who has excess capacity is willing to rent time on the machine then both the owner and renter improve their competitiveness.

The database will be designed to be dynamic and interactive so that users will be able to change data for their company. Security measures will be in place so that only certain individuals within a company will be allowed to enter new data. The database is scheduled for completion by October 2000. If you want to see a similar database up-and-running check out Michigan's Department of Natural Resources' Web site at: <http://www.dnr.state.mi.us/dnr/main.htm>.

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Solid Wood Value-Added Manufacturing

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Executive Summary

This presentation provides some concepts that could serve to develop some common ground in discussing value-added wood products. It also discusses some of the challenges faced by would-be Alaskan value-added wood products manufacturers and some of the strategies and opportunities that could be exploited. The presentation continues with a discussion of the two most basic value-added manufacturing processes, namely lumber drying and wood machining (planing and profiling). A cursory examination of moulding as a potentially profitable and viable product is presented, along with tree and wood characteristics and traditional uses for hardwood and softwood species indigenous to Alaska. Lastly, information about the mechanical properties of Alaskan woods is presented with a tabular comparison of the mechanical properties of western hemlock to other species in its species group (HemFir) and Sitka and White spruce to other species in their species group (SPF; Spruce, Pine, Fir).

Table Of Contents

Defining "Value-Added"	98
Introduction	98
Adding Value versus Adding Cost	98
Wood Products Classification	100
Manufacturing "Value-Added"	100
Lumber Drying	101
Lumber Drying Procedures	103
Wood Machining	109
Appendix A. A Partial Profile of One Value Added Product	114
Appendix B. Species Characteristics	115
Softwoods	115
Hardwoods	117
Appendix C. Mechanical Properties of Alaskan Species	119
Appendix D. Comparisons of Mechanical Properties of Western Hemlock, Sitka Spruce and White Spruce To Other Species in Their Species Groups	121

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Solid Wood Value-Added Manufacturing

Defining “Value-Added”

Introduction

A great deal of confusion, deliberate or incidental, seems to be associated with the term “value-added”, especially here in Southeast Alaska and, further, as it is applied to “forest products” (whatever they are). Some may argue that converting low-grade, low-value utility logs into pulp is “value-added processing”. Someone else may define the ultimate value-added product as a one-of-a-kind piece of artwork that may take an artist weeks or months to produce and sell for thousands of dollars. Some have even suggested a new term, “value-created”, as a way of distinguishing between value-added commodity products and higher value wood products (like furniture). Who’s right? Who’s to say? Does it matter?

Adding Value versus Adding Cost

Anytime a raw material is handled, sorted, or in anyway transformed, costs are incurred and it can be argued to be a value-adding process. However, just because some action has been performed on a piece of wood doesn’t necessarily make it more valuable unless someone else is willing or able to absorb the cost incurred. It might seem that the more finished a product becomes, the more valuable it becomes. The situation is not quite that simple. It is possible to add too much value (i.e., the product is not price competitive). That, in large part, is why we see so much raw material leave Alaska in a minimally processed form to go to low-wage countries like Mexico and China and return to us as finished goods. The transportation costs to and from such Third World producers are, apparently, less than the labor and processing costs to make the products here. (At a recent seminar in Seattle, it was revealed that China’s labor costs, in some sectors, are 1/20th to 1/50th of average U.S. labor costs.)

Can value-added commodities made in Alaska compete successfully in the world marketplace? This seems to be one of several \$64,000 questions. My own take on the question is a definite “maybe”. The Alaska situation, particularly in Southeast, is unlike any I’ve encountered. To compete for a place in the world marketplace (against low-cost radiata pine from South America and New Zealand, and low-labor cost countries like Mexico and China), Alaskan producers will need to be very efficient, both in terms of conversion of raw material and in terms of economy (i.e., high product output with minimal high-cost labor input). Several internal forces are working against us:

- Converting raw materials (logs) with high efficiency means investing in more efficient processing equipment (in some cases, very expensive high-tech equipment). Large investments usually involve commercial lenders. Commercial lenders tend to be very conservative. Without a dependable source of raw material, it is very difficult to attract the necessary capital. So, we attempt to compete using old, low-tech, low-productivity, low-recovery equipment, failing to recover all that we can from the raw material inputs and using more labor that we can afford to use, thereby making our per unit costs higher.
- Social pressures (from environmental interests) insist on “more jobs per board foot”. However, that very sentiment works against Alaska’s ability to compete in the global marketplace because our labor rates, being commensurate with our cost-of-living, are high. In order to compete globally, we must minimize the number of jobs per board foot while adding as much value as “the marketplace” (and it’s not one homogeneous marketplace) can absorb.

In summary, to compete effectively, Alaska’s wood products producers must be highly efficient in their processes and utilize the minimum amount of labor possible. Short of that, other producers

are going to eat our lunch, unless we re-think our situation and target other opportunities. Do such opportunities exist?

I was at a sawmill operation (in the Interior, on the road system) earlier this year where, in addition to running a sawmill, they also build prefab buildings (cabins, storage sheds, etc.). They were buying kiln-dried, surfaced-4-sides, graded dimension lumber from Canada because they could buy it cheaper (including delivery) than they could produce rough, green, ungraded lumber themselves. [This is a reflection of a temporary condition created by soft worldwide demand for softwood structural lumber and a strong U.S. dollar versus Canadian dollar. Even though the condition is temporary, it can persist for many months and extend to several years.]

Obviously, the opportunities for marketing value-added commodity products (i.e., dimension lumber) from Alaska are being severely challenged, even within the State. Just for the record though, a few Alaska producers are meeting the challenge, apparently successfully (at least for the time being).

So, if Alaska isn't particularly well positioned to compete in the world marketplace for commodity goods, what options are there? Two places we can start looking are *import substitution*, which I just alluded to, and *niche products*.

- **Import substitution** means making products here in Alaska for local (in State) consumption, thereby substituting them for products currently imported. This may be relatively easily accomplished for sawn lumber products, [even though they, perhaps, may require some processing beyond sawing (i.e., drying, planing, grading)] and perhaps finished, solid wood products (moulding, stair parts, furniture, etc.). Sheet goods/panel products such as plywood, oriented strand board (OSB) and medium density fiberboard (MDF) cannot be manufactured on a small scale, as can lumber, so it would seem unlikely to me that a plant to manufacture any of these products will ever be built in Alaska. The Alaska market is not big enough to absorb the production of a panel plant and world markets are too "cheap" (i.e., Alaska would likely be a high-cost producer).
- **Niche products** are products that are unique to Alaska, (i.e., they are not readily available from any other source). Red and Yellow cedar are somewhat unique, especially Yellow cedar. I believe there are niche markets for yellow cedar structural elements due to its natural decay resistance and possible substitution for chemically treated lumber in applications where human contact is likely (playgrounds, picnic tables, outdoor furniture, etc.). The characteristics of our better hemlock and spruce (i.e., slow growth rates and sizes suitable for sawing vertical grain) make it highly desirable for millwork and structural elements (trim moulding, door and window components, architectural timbers, ladder stock, light aircraft components, etc.). Decorative/appearance/face veneer is used to wrap moulding, door parts and furniture parts made from less expensive substrates (finger jointed stock and particleboard). Extremely high quality spruce, though perhaps in limited supply, is highly prized for use in musical instrument components/parts (pianos, guitars, harps, etc.). Hemlock and spruce (Sitka and White) structural timbers could compete for a place in timberframe construction, especially if we can get good design values established for Alaska spruce. Red alder is almost completely ignored, yet there is good demand for it in furniture manufacturing. We have an abundance of burls, large and small, that are valuable for the production of specialty items. Interior Cottonwood and Birch show some promise for interior woodwork and furniture. And although not a focus of this presentation, opportunities for developing non-timber forest products (NTFPs), have barely been documented.

The key to identifying opportunities for Alaska forest products is market research. However, the key to implementing opportunities may prove to be more elusive.

Wood Products Classification

Precise definitions of forest products, primary products and secondary products are virtually non-existent or, more precisely perhaps, don't have precise definitions as the industry periodically re-invents itself or as others re-define it for us. The term "forest products" used to infer roundwood products (veneer logs, sawlogs, pulpwood). However, the definition has continuously broadened as more "users" derived more uses (tangible and intangible, wood and non-wood) from the forests. Today, the definition of forest products is nearly as varied as the people you might ask to define it and would include everything from traditional roundwood products to root wads, floral greenery, mushrooms, botanicals, wildlife, water and recreational opportunities. Presumably, anything and everything that comes from the forest is a "forest product". If we are no longer on solid ground in inferring roundwood products when we use the term forest products, then we must define our own niche in this scheme. I offer the term "timber products" (as opposed to the term "wood products", which I tend to reserve for processed products such as lumber, cut stock, flooring, pallets, furniture, etc.).

In terms of wood product development, primary products used to mean sawn lumber products, but has grown to include products such as plywood, particleboard, MDF, OSB, etc. [The term "primary" refers to "first" as opposed to "of higher importance"]. Secondary products are generally those products made from primary products (trusses, wood I-beams, flooring, pallets, cut stock, moulding blanks, furniture parts, etc.). Tertiary products, a term that seldom gets much use, are those products made from secondary products such as, finished furniture, stair treads, balusters, cabinets, moulding, and musical instruments.

Blurring the line between these terms is another catch-all term, "finished products". Whenever a product reaches its final, consumable form it can be considered a finished product. It could reach that finished form at any stage along its development (primary, secondary, tertiary), depending on the product. Some examples might be useful:

- **Finished timber products.** A debarked log of a given size, cut to a specified length, could be considered a finished product if it is to be used in a log home or, following preservative treatment, as a utility pole. Fence posts are often just merely split and put into use.
- **Finished primary products.** Lumber, especially softwood lumber, cut to specified dimensions, right off the saw, might, in some cases, be considered a finished product. Other primary products which might be considered "finished" include rustic siding, poles, fence boards, decking, timbers, ties, shingles/shakes, 3-sided house logs and so forth.
- **Finished secondary products.** More commonly, lumber undergoes additional (secondary) processing before being used. Green or partially air-dried lumber cut to specified sizes can go directly into products like pallets, shipping containers, crates, etc. Dry lumber can be used in framing (construction). Graded and planed it can be used as components for trusses, laminated beams and wood I-beams. Additional processing can produce products like trim moulding, furniture parts, paneling and flooring.
- **Finished tertiary products.** Typical raw material inputs for tertiary products are "unfinished" secondary products like turning squares, turnings, cut-stock and glued panels. These parts or blanks become components for products such as doors and windows, stair treads, balusters, and furniture.

Manufacturing "Value-Added"

Hopefully, after slogging through all the foregoing discussion, we've reached some common ground in understanding the value-added dilemma and the various stages of processing. Even if

we don't agree with the definitions, we can understand how they're being used in this particular context at least.

Ken Kilborn provided the overview of primary processing options for small and medium size operations. I have the pleasure to talk to you about options in secondary processing, an area that I find fascinating; the options are mind-boggling. The problem is, "Where to begin?!!"

The two most common secondary operations, or at least those of greatest interest to most producers in Alaska, are drying and planing (or planing/moulding).

Lumber Drying

1. Why dry lumber?

Wood, in its natural state, contains a large amount of water. The presence of water influences the properties of wood to such an extent that, for many purposes, significant amounts of moisture must be removed before the wood can be used in manufacturing. Specific reasons for drying wood include:

- Reduction of water content reduces weight and the associated shipping/handling costs (For lighter hardwoods and most softwoods, a 1% moisture content loss is equal to about 20 pounds of water per MBF).
- Wet wood is unstable; it will not maintain its original size. Drying wood confines shrinking and swelling to manageable ranges.
- Dry wood machines more easily, efficiently, and with better results. Finish quality is greatly improved.
- Improved joinery – screw and nail holding ability, glue-ability
- Control over warping, splitting, checking, etc.
- Improved finish-ability – paint, stain, varnish
- Dry wood (less than 22% moisture content) is less susceptible to attack by stain, mold, decay fungi and insects.
- Drying wood improves its strength, service life and performance.

2. Water in wood

Wood is a complex natural material made up of a variety of minute structures. Wood cells can be compared to straws, but the cell walls consist of several distinct layers. Water held within these layers is called bound water. Water held in the cell cavity (i.e., the center section of the straw) is called free water. The removal of free water requires less energy than removal of bound water. The presence of free water is required for some processes (preservative treatment with diffusible chemicals), but its removal has relatively little effect on most wood properties. Wood is said to be at fiber saturation point when cell walls are still water-saturated, but no free water remains in the cell cavity. The moisture content of individual cell walls at the fiber saturation point is usually around 30%. The fiber saturation point is important for the following reasons:

- More energy is required to dry lumber beyond this point
- Wood cells begin to shrink below this point
- Large changes in many physical and mechanical properties begin to occur below this point

3. How wood dries

Lumber dries from the outside in. Water in wood moves from areas of high water content to areas of low water content. So, as the surface of the lumber dries, water moves toward the surface from the interior. Water is evaporated off the surface of a board into the surrounding air if that air is capable of accepting it (a function of temperature and relative humidity). The air must be exchanged periodically in order to insure a fresh supply of dry air capable of accepting additional water vapor. If the air exchange is too slow, drying is retarded and mold can develop. Excessive air circulation results in wasted electricity (in operating the fans) and too-fast drying can result in surface checking as stress forces within the wood develop. A drying schedule that

removes water from the surface at a rate equal to that with which it is replaced by moisture from the core will achieve the best results, with the least degrade and drying stress.

4. Equilibrium moisture content

Wood loses or gains moisture until the amount it contains is in balance with the moisture in the surrounding atmosphere. The moisture content of the wood at this balance point is called the equilibrium moisture content (EMC). EMC depends primarily upon the temperature and relative humidity of the surrounding air. However, at lower relative humidity (30% or less), relatively large changes in temperature exert rather minor influences on EMC. For example, the EMC of wood at 80°F and 20% RH would be about 4.5% while at 30°F and 20% RH, the EMC would be about 4.44%. In a house during the winter with a temperature of 70° and a relative humidity (RH) of 40%, the EMC of wood would be about 7.7%, while during the summer at 70° and 75% RH, the EMC of wood would be about 14.4%.

5. Wood shrinkage and movement

When wood is dried to about 15% moisture content, about half of the total possible shrinkage has occurred. When dried to 8%, nearly $\frac{3}{4}$ of the total possible shrinkage has occurred. Of greatest importance to wood products manufacturers are shrinkage across the grain (at right angles to the growth rings) called radial shrinkage and shrinkage tangent to the grain (parallel to the growth rings) called tangential shrinkage. Another type of shrinkage (shrinkage along the grain, lengthwise) is called longitudinal shrinkage. Longitudinal shrinkage is usually insignificant and widely ignored. Table 1 presents shrinkage values for Alaskan woods and a few selected others.

Table 1. Shrinkage values of Alaskan and similar species, based on dimension when green²

SPECIES	SHRINKAGE (percent)					
	Dried to 20% MC		Dried to 6% MC		Dried to 0% MC	
	Radial	Tangential	Radial	Tangential	Radial	Tangential
<i>Softwoods</i>						
Yellow Cedar	0.9	2.0	2.2	4.8	2.8	6.0
Western redcedar	0.8	1.7	1.9	4.0	2.4	5.0
Western hemlock	1.4	2.6	3.4	6.2	4.2	7.8
Sitka spruce	1.4	2.5	3.4	6.0	4.3	7.5
White spruce	*	*	*	*	4.7	8.2
E. White Pine	0.8	2.0	1.8	4.8	2.1	6.1
Douglas fir**	*	*	*	*	4.8	7.6
Ponderosa pine	1.3	2.1	3.1	5.0	3.9	6.2
<i>Hardwoods</i>						
Red alder	1.5	2.4	3.5	5.8	4.4	7.3
Quaking aspen	1.2	2.2	2.8	5.4	3.5	6.7
Paper birch	2.1	2.9	5.0	6.9	6.3	8.6
Black cottonwood	1.2	2.9	2.9	6.9	3.6	8.6
Black cherry	1.2	2.4	3.0	5.7	3.7	7.1
Basswood	2.2	3.1	5.3	7.4	6.6	9.3
Soft (red) maple	1.3	2.7	3.2	6.6	4.0	8.2

* not published

** coastal variety

² Wood Handbook, Wood as an Engineering Material

6. How much will it shrink?

Knowing the total shrinkage of a species dried to 0% MC, the percent shrinkage at any moisture content (below 30%) can be calculated, since shrinkage curves are reasonably close to straight lines from 30% (fiber saturation point) to 0%. Each 1% change in moisture content (below 30%) is equal to $1/30^{\text{th}}$ of the total shrinkage from 30% to 0%. It can be calculated mathematically by applying the formula

$$S_M = [S_O (30-M)] / 30$$

Where S_M is percent shrinkage from green to final moisture content (M)
 S_O is the total shrinkage (to 0% MC)
M is the final moisture content

Since the intermediate (6% and 20% MC) shrinkage values for White spruce were not published we can calculate them using the formula, since the total (0% MC) shrinkage values are known. What would the tangential shrinkage of White spruce be, dried to 6% MC?

$$S_M = [S_O (30-M)] / 30$$

$$S_M = [8.2 (30-6)] / 30$$

$$S_M = [8.2 (24)] / 30$$

$$S_M = 196.8 / 30$$

$$S_M = 6.56$$

The answer is 6.56%. For a flat grain board, shrinkage across the width would amount to 0.0656 inches (slightly more than $1/16''$) per inch. For a 12" wide board, that would amount to over $\frac{3}{4}$ of an inch (0.787 to be precise).

If the board were vertical grain, radial shrinkage would be most apparent (tangential shrinkage would affect the thickness). Radial shrinkage to 6% MC would amount to $(4.7 \times (30 - 6)) / 30$, or 3.76%, or less than half an inch (0.45) in 12 inches.

Lumber Drying Procedures

All methods employed to dry lumber involve moving moisture from the inside of the wood to the surface where it is evaporated into the air. Heat, low humidity, low air pressure and air movement affect the process, and can be manipulated to accelerate the process.

Producing quality wood products is a process that begins in the woods. Damage created or inflicted in the harvesting process doesn't magically disappear; it gets carried through the manufacturing system until the appropriate operation eliminates it as a defect (often after a considerable amount of time and effort (i.e., money) has been invested into it). Mis-manufacturing in the sawmill, especially thick and thin lumber, gets carried to downstream processes as well (to the loss of the sawmill and the downstream manufacturer). If you are producing lumber with significant thickness variation or your rough green target sizes are significantly above what would be considered normal, determine the cause(s) and take corrective actions. You might be surprised to learn what it's costing you.

Obtaining quality dried lumber starts with quality green lumber (the subject of another presentation). I'll focus my attention on things over which you, as a lumber drier, may have direct control.

1. Stickers

With a few exceptions, lumber drying begins with assembling sawn lumber into piles or packages (packs), the courses (layers) of which are separated by stickers. Stickers, also known as stacking sticks, are critically important to the drying process, yet are often overlooked and under-appreciated. "The purpose of stickers is to separate each board surface so that air can flow over each surface and evaporate water" (Dry Kiln Operator's Manual). A secondary purpose of

stickers is to support each course of lumber in the pile; to transfer the weight of the courses above to the courses below; and to prevent/minimize warping in the process. Important considerations for sticker selections include: species/grade/physical properties, moisture content, size and placement.

a) **Species/grade/physical properties.** Real stickers (as opposed to scrap lumber and edgings) can represent a significant investment (not necessarily on a per unit basis, but rather when you consider how many an operation might need). Stickers made from clear, straight-grained lumber remain straighter and are less prone to breakage than stickers made from low-grade material. Harder, stronger woods are more desirable than softer woods. Heartwood may also reduce the tendency for staining.

b) **Moisture content.** Stickers should be made from kiln-dried lumber and they should be protected from re-adsorbing moisture when not in use (or lose their value as being kiln dried to begin with). Using kiln-dried stickers reduces the chance of sticker stain, which is a discoloration of the lumber where it contacted the sticker (usually caused by mold due to retarded drying). Kiln drying of the stickers kills mold spores that can cause stain and protection from re-adsorption minimizes re-infection with new mold spores. Kiln drying also reduces distortion and thickness shrinkage that occur in use (of the stickers themselves).

c) **Size.**

1) Width. Wide stickers can retard drying in the areas where the lumber and the sticker come into contact. These areas may remain at higher moisture content than areas of the lumber not in contact with the stickers. If stickers are too narrow on the other hand, the lumber or the stickers may be crushed. Stickers for softwoods are generally about 2" wide (sometimes 3 or more inches wide for softer species such as sugar pine, white pine and ponderosa pine). Stickers for hardwoods are generally 1¼" to 1½" wide. Within these general recommendations, uniformity of sticker width is not a critical factor.

2) Thickness. Stickers are usually ¾" to 1" thick, although ½" stickers are sometimes used. [I have even seen thinner material used (i.e., lath ¼" – ⅜" thick), but not so much for drying, but rather to avoid mold problems associated with "dead-piling" while lumber is sitting in inventory.] Thin stickers do increase the capacity of a kiln and may be adequate for slow drying species. They increase air velocity through the lumber stack and tend to make air flow more uniform. However, the increased number of courses of lumber causes a decrease in the volume of air passing over each board surface. In fast drying species, the volume of air per unit of time may be inadequate to hold the amount of moisture being evaporated from the board surface, which could result in staining. In addition, thin stickers break and deform more readily.

Regardless of what thickness is used, all stickers should be dimensioned (usually planed on one side) to a uniform thickness. A sticker that is surfaced on 4 sides (S4S) is the best choice. Variation in sticker thickness is a surefire way to produce wavy boards. Obviously, thickness and width should be sufficiently different to avoid mis-orientation.

3) Sticker length is a function of package width. Stickers must be at least as long as the pack is wide or up to 2" longer.

d) **Placement.** Good location, placement, and alignment of stickers will reduce warping and minimize end-checking and splitting. Stickers should be placed flush with or very near the ends of boards whenever possible. This will minimize warping at the board ends and will also retard drying to some extent, thus helping to minimize end-checking and splitting.

Sticker spacing is part art, part science. You can perhaps get by with fewer stickers if they are wider, but then you may have to contend with mold, sticker stain or non-uniform drying. Ultimately, the optimal sticker spacing is governed by the lumber's thickness, its tendency to warp and its resistance to crushing. General spacing recommendations for softwoods are 2-4 feet, with wider spacing reserved for thicker softwoods (2" or greater) and harder (less crush prone) species. Narrower sticker spacing is more appropriate for thinner stock (6/4 or less) and softer woods. Recommendations for hardwoods generally run 1-2 feet.

Stickers must be in good vertical alignment in order to transmit the weight from one to another all the way to the ground. Misaligned stickers transfer weight to the span of lumber between the stickers, causing a deflection and, upon drying, warp.

2. Air Drying of Lumber

Wood is a hygroscopic material, which means it releases and re-adsorbs water easily, as a function of ambient air temperature and relative humidity (see discussion of equilibrium moisture content). Under the right conditions, lumber can be dried *au naturel*, that is, without any artificial manipulation of temperature or humidity. There are four environmental conditions that determine the degree to which (or the rate at which) lumber will dry outdoors.

a) **Temperature.** Lumber will dry in air temperatures from -40°F to over 100°F (and beyond, of course), but relatively little drying takes place below 50°F . The advantage of higher temperatures is a faster drying rate (warmer air can hold more moisture).

b) **Relative humidity** varies on a daily basis from about 20% to 100% as daily temperatures rise and fall (although with relatively little daily change in temperature as is experienced in Southeast Alaska, RH is not as likely to range as much either). The active drying period occurs when RH is below 80% (again, not a common condition in coastal Alaska).

c) **Wind** facilitates drying by removing moisture-laden air and permitting drier air to enter the lumber piles. Air circulation is essential to the drying process. However, too much wind can cause excessively rapid drying. End and surface checks and splits are early indications that drying is too rapid.

d) **Exposure to elements.** Exposure to direct sunlight can cause serious degradation as the surface of the lumber dries faster than desired. A dry surface and a wet core create stresses within the lumber resulting in surface checks and splits. Precipitation will obviously rewet any exposed surface, thereby extending drying times and can even cause degrade.

e) **Considerations for Alaska.** Air-drying is not free and not without potential for incurring degradation. The initial costs may be low (if you have land available for a drying yard), but availability and site development in some areas may be prohibitive or limiting (particularly true in Alaska and especially true in Southeast). Besides the direct and obvious costs associated with a drying yard, there are the not-so-obvious costs associated with holding an inventory and loss due to degrade.

Alaska's climate, ranging from temperate rainforest in Southeast and coastal Southcentral to semi-arid in the Interior, offers a spectrum of challenges to air drying lumber. In rainy, cool, Southeast, there may be little opportunity to achieve much air drying as temperatures are rarely much above 50°F for any extended length of time, relative humidity less than 80% is equally rare, and rainfall amounts range from nearly 100 inches to over 200 inches per year. In the Interior, where relative humidity is generally low, temperatures can range from -50°F to 90°F and winds are frequent and occasionally strong, practices for air drying lumber are generally aimed at controlling the rate of drying rather than trying to accelerate it.

In Southeast and coastal Southcentral Alaska, perhaps the best ways of increasing the opportunities for air drying lumber include:

- Covering lumber piles with specially constructed roofs (sometimes referred to as pile covers) with at least a 12" overhang on all sides
- Shed drying – storing lumber piles in open-sided pole barns or sheds
- Taking maximum advantage of prevailing winds (orienting packs with their long axis at 45° to 90° to the wind, well-spaced)
- Taking maximum advantage of available sunlight (placing packs out of the shadows of buildings and trees; the north end of the yard will warm sooner than the south end due to the orientation of the sun, dark colored roofs will absorb more solar energy than light colored roofs)
- Keep weeds, grass and brush growth trimmed low and store lumber packs on bunks (6" x 6" or larger) to guarantee good air circulation through the pack

For dry, windy conditions like those often found in parts of Interior Alaska, methods to control the drying rate amount to protecting lumber from overexposure to extreme conditions:

- Treating lumber with an end-coating (typically, a waxy emulsification applied by brushing, dipping or spraying) will retard moisture loss through exposed end grain. Studies have shown end-coating to reduce end checking and cracking by as much as 2/3 over uncoated ends. End-coating can also aid in preventing stain.
- Covering lumber piles with pile covers or storing piles in open-sided sheds to protect against direct sunlight and/or precipitation
- Orienting lumber piles with their short axis to the prevailing wind (Note: this would normally expose end grain to the wind, which would mean taking additional measures to control end-checking).
- Wrapping piles in burlap or shade cloth to reduce airflow through the piles or storing lumber in sheds that have a semi-permeable air barrier on the windward side.
- Experimenting with sticker thickness. Thinner stickers reduce the amount of air available for drying, but may increase the velocity of the air moving through the pile.

3. Forced-Air Drying

Forced-air drying (also called shed fan drying) is an intermediate alternative between straight air-drying and kiln drying. In forced-air drying, large fans are placed in one end of a 3-sided, covered shed and air is drawn through the lumber piles in lieu of relying on the wind. There is no heat or humidity control. The fans can be set-up to operate 24 hours a day, and/or controlled by humidistats and thermostats (or a programmable logic controller) to shut down when attempting to dry would be futile, such as:

- When the relative humidity exceeds 90% (especially for drier lumber as little or no drying will take place at this RH).
- When the relative humidity is less than 45% (especially for check-prone species) as drying may occur too rapidly.
- When air temperatures are below 45°F, since little drying is likely to occur.

Some potential advantages of forced-air drying include:

- Drying may take place in $\frac{1}{3}$ to $\frac{1}{2}$ the time of air drying (depending on weather).
- Degrade due to exposure is reduced (however, check-prone species may suffer higher degrade losses if dried too quickly).
- In many areas, lumber can be dried relatively easily to 22% moisture content at which point risk of further degrade is significantly reduced.
- There is more uniformity in moisture content among boards forced-dried than air-dried.

Some potential disadvantages of forced-air drying include:

- Incurred costs of shed construction, fans, fan installation, electrical systems and operating costs.
- Placing lumber in a shed dryer may require more time and skill than putting lumber in a drying yard.
- Forced-air drying is dependent on the weather (as is air drying) and production scheduling may prove problematic.

One method of improving the effectiveness of a forced-air dryer is to pave the area in front of the shed with black asphalt to act as a solar collector that will (to some degree) heat the air before it is drawn into the shed. However, depending on the depth of the shed, this may require closer monitoring of the drying process and rotation of packs in the shed to obtain an even drying rate. Other opportunities for capturing solar potential could also be included.

4. Kiln Drying

This presentation cannot begin to be a treatise on the subject of kiln drying. The subject area is simply too large to cover in a brief presentation. General principles and introductions to various systems will be made.

Kiln drying is defined as, “the process of drying lumber in a dry kiln” and a kiln is defined as, “a heated chamber for drying lumber, veneer and other wood products in which temperature and relative humidity are controlled” (Dry Kiln Operator's Manual). My own definition of kiln drying might go something like this, “the process of drying lumber in a chamber, through the implementation of accelerated means (heat, humidity, air pressure, air velocity) under controlled conditions”.

As technology progresses, new types of kilns are being developed and various sub-classes of more general categories are being recognized. This discussion will be limited to those general categories with, perhaps, brief insights into some of the sub-classes.

Experts in the field of dry kilns classify kilns according to:

- **operational techniques** (compartment kilns vs. progressive kilns),
- **operational temperatures** (low, conventional, elevated, high),
- **type of heating and/or energy source** (steam, direct fired, hot water, solar, etc.), and
- **specialized systems** (dehumidification, solar, vacuum, radio frequency, etc.).

It wasn't that long ago, perhaps 20 years or so, that I could state with confidence that the vast majority of dry kilns operating in the U.S., and North America for that matter, were what were then considered “conventional steam kilns”. They were compartment kilns, meaning that each

chamber held a given load of lumber for the duration of the drying process, which most kilns still are today. [In a progressive kiln, by contrast, the lumber goes in green in one end of the kiln and comes out dry on the other. It's a continuous process whereby lumber is moved through the kiln, which gets progressively hotter and/or drier, until the lumber coming out is dry. For every pack of lumber that is removed on the dry end, a new pack is added on the green end, comparable to an assembly line process.] Compartment kilns can be divided into two groups according to the way they are loaded, although given the same type of heating, venting and air-circulation systems, they would be operationally very similar. The two categories of compartment kilns according to their method of loading are

- **Track loaded kilns** - - where the lumber is loaded onto kiln trucks or carts which are moved into and out of the kiln on tracks, and
- **Package [loaded] kilns** (sometimes called side loaded kilns) - - where stickered packages (piles or stacks) of lumber are loaded into and removed from the kiln with a forklift truck.

Conventional steam refers to the operational temperature of the kiln (120° to 180°F) and the method by which heat is generated and supplied (often by a wood waste-fired, low-pressure steam boiler). Today there are low temperature kilns operating at generally less than 120°, elevated temperature kilns operating at temperatures between 180° and 211° and high temperature kilns that operate at temperatures over 212° (usually 230° – 280°).

Steam, transferred through pipes, is still commonly employed to supply heat to kilns. However, many wood-fired boilers have been replaced by fuel oil and natural gas boilers, especially in areas where the markets for sawmill by-products (chips, sawdust, bark) are strong or where environmental standards preclude operating a wood-fired boiler. With direct-fired kilns, hot air (the result of burning some fuels, such as oil, gas, wood, etc.) is pumped directly into the kiln (under controlled conditions, of course). Typically, direct-fired kilns are used in elevated and high temperature applications, usually when drying softwoods (especially southern pines). Hot water and hot oil systems have found application in smaller capacity kilns, although they are generally not thought to be as efficient as steam heated kilns. However, considering economies of scale, hot water/oil may be the only viable alternative to steam in smaller applications. Interest in solar kilns peaked subsequent to the OPEC oil embargo in the 1970's and several designs were promulgated and shown to be effective in some regions. One private company even developed a small commercial solar kiln that, to my knowledge, is still manufactured (there's even one in Alaska).

Dehumidification (DH) kilns have been around for more than 20 years in the U.S. DH is another way of achieving a small economy of scale. With conventional steam kilns, the air in the kiln is heated as it passes over hot steam pipes. The hot air then passes over the wet lumber, picking up moisture in the process. This hot, moist air is then periodically vented from the kiln; replaced by drier, cooler fresh air and the process begins over again. About 75% of all the heat put into a conventional steam kiln is exhausted through the vents. By contrast, in a DH kiln, the warm, moist air is passed over cold condensing coils thereby causing much of the water vapor to condense. The air is then re-warmed slightly and pumped back into the kiln. All of the heat required to operate a DH kiln is supplied by the "heat pump" which is electric. Some manufacturers have recognized the limitations of such an arrangement and now supply some form of supplemental heat to improve efficiency. Setting pitch in some softwood species may require the inclusion of supplemental heat as DH kilns rarely operate above 160°F unaided.

Vacuum kilns employ an airtight chamber and the application of a partial vacuum thereby reducing the air pressure in the chamber and effectively reducing the boiling point of water. The drying rate is increased without the danger of incurring drying defects associated with drying at high temperatures. However, the mere application of a vacuum will not dry lumber by itself. Heat is still required, but convective heat transfer cannot take place in a vacuum. One method (with variations) of supplying heat to the lumber is accomplished by applying heat directly to the boards via specialized electric "blankets" or heated platens (heated by hot water, oil or steam) placed between the courses of the lumber (no stickers). Another option involves the use of high-

frequency electrical energy (like a microwave oven). Regardless of the means of applying heat, vacuum kilns must also provide some means by which water vapor is condensed (usually on a cold surface) and removed from the kiln (usually by a pump). Vacuum kilns are more commonly being used in intensive applications where conventional systems and drying schedules prove too costly. The products being dried are usually thicker hardwood products that are prone to drying defects with conventional systems or must undergo long periods of inventory or extremely gentle and time-consuming drying schedules.

Wood Machining

As I said earlier, it has been my observation that the secondary operations of greatest interest to Alaskan wood products manufacturers are kiln drying and planing. At this point we will shift gears and take a closer look at wood machining operations.

Solid wood products, whether finished (like dimension lumber, boards, paneling, etc.) or merely components of an assembled product (a pallet deck board, door/window part, etc.) must generally conform to some specified size, with defined length, thickness and width. Length, determined by crosscutting and width, determined by ripping, are fairly straightforward procedures. Thickness however, especially in a finished part, is a subject requiring a much greater degree of detail. Planing or surfacing is the means by which finished thickness is achieved. A related operation, which imparts a cross-sectional shape to a rectilinear piece of lumber, is called profiling.

1. General Considerations

Not all surfacing/planing machines are created equal. There is a huge variety, both within and across machine types, to suit practically every need from the serious hobbyist to the largest corporate operation and everything in between. You must give careful consideration to your needs (your products, your markets) when choosing the equipment to fit your situation. It would be easy to buy the wrong machine, especially the first time around. The two most important considerations in specifying a machine are product diversity and order quantities. Of course, cost is also a very important consideration.

You must have the mentality of a machinist, thinking in terms of thousandths of an inch, not 8^{ths}, or 16^{ths} or even 32^{nds} when you own and operate a moulder or planer/matcher. You will need a proper set of tools as well (machinist's level accurate to .0005 inches in 1 foot or less, a high quality dial indicator, a 6-8' machinist's straight edge, several smaller straight edges, dial calipers or micrometers, etc.). Most plants that run a planer/matcher or moulder on a full time basis have one or two people (experts) whose only job is attending to that machine for changeovers, set-up, maintenance, troubleshooting, knife grinding, etc.

For a small operation, it is only natural to want to retain as much flexibility as possible; to have the ability to produce the widest variety of products, given the changing nature of the markets and unpredictable opportunities. I know some people would like to be able to produce virtually everything from arrow shafts to house logs, all on the same machine. Is such a thing possible? Theoretically perhaps, but is it practical? Probably not.

Moulders and planer/matchers are not simple machines. They are fine, intricate machines with complex relationships between their parts. They can't very well be left out in the weather and be expected to operate very well for very long. Such equipment should be housed in a climate-controlled building on a reinforced concrete foundation. The machine must be leveled side-to-side and end-to-end within a few thousandths of an inch per foot. Although some machines are belted, most of them require 3-phase power with each cutterhead being driven by its own motor. Adequate dust collection is essential for safe and proper machine operation (allow an additional \$5-10,000+ for used equipment, with costs commensurate with capacity, dictated by the planer), and a knife/profile grinder would be an indispensable piece of auxiliary equipment (\$2,500-\$7,500 used, \$10,000-\$15,000 new).

Machine set-up time is an extremely important consideration. I have a 1946 Boice Crane 12" finish planer with a three-knife head. There are no jacking screws in the head and no jointing

attachment. I don't claim to be an expert planerman, and it takes me several hours to get the knives set to within 0.002" - 0.003" across the width of the head and from knife to knife (and 0.003" is only marginally acceptable).

Can you imagine how long it would take – just to replace the knives – in an old 4 head, 8 or 12 knife per head machine? Older machines, the kind that many Alaskan mills are likely to buy, may require a half-day or longer for an experienced moulder operator or planerman to changeover, possibly making an order for a few hundred lineal feet of custom moulding uneconomical (and yet that is one of those niche products/markets that I referred to earlier). That is why older machines are relatively cheap and new machines are so expensive. Newer machines incorporate timesaving features like digital readouts, CNC controls and automatic recall features (software) that permit quick changeovers if the next set of cutterheads is balanced, jointed and ready to install. However, the price tag for such equipment reflects such capabilities (\$75,000 - \$100,000+), and spare cutterheads and tooling are not cheap. But, as the alternative, what does downtime cost? In a production situation that changes over twice a day and loses just 15 minutes per changeover, 30 productive minutes per day or 125 hours per year are lost. If the machine runs at 1000 fpm, they've lost 1000 fpm x 60 minutes per hour x 125 hours per year = 7,500,000 lineal feet of production. At just \$.01 per lineal foot, the loss amounts to \$75,000 per year (enough to pay for a few bells and whistles).

For every 100 feet per minute (fpm) of feed rate, a moulder or planer/matcher will produce 6,000 lineal feet of product per machine hour (100 fpm x 60 min/hr.). That would be the equivalent of 4,000 board feet (bf) of 2x4s, or 6,000 bf of 2x6s or 8,000 bf of 2x8s, etc., per hour. One hundred feet per minute would be considered slow for most softwood applications, but even at that rate and given 7½ hours of machine time per day, production would amount to 45,000 lineal feet per day (30mbf 2x4s or 45MBF 2x6s or 60MBF 2x8s, etc.). On a high-speed machine (1,000+ fpm), these production levels could be achieved in an hour or less. So, does it make sense to pay \$100,000+ for a machine that might only need to be run one hour per week or a half-day per month? Can you afford not to?

It is no secret that the key to making money in making commodity products (even value-added commodity products) is quantity – keeping the machines running. However, for most situations in Alaska, the quantities are likely to be relatively small and diversity of products is likely to be relatively large, especially when markets are "local". Accepting that premise means having to give serious consideration to machines that might not quite be considered serious commercial equipment in order to achieve proper economy of scale while maintaining maximum flexibility.

2. A Question of Scale

For a large producer (tens or hundreds of millions of board feet per year) of a narrow range of products (i.e., studs or dimension lumber), the choice is simple; a high-speed planer/matcher with a 15" width capacity. For a large producer of random width (RW) shop lumber, a high-speed double surfacer may be all that is needed if as-sawn width variation is minimal. For a small stud mill, a 4-sided planer with a 2" x 6" capacity would be sufficient. But, as product diversity increases and order quantities decrease, the choices or options are not quite so cut and dried, especially when real world constraints, like budgets, are included in the decision making process.

a) Planers

The simplest planing machine has a single (top) planing head and is called a single surfacer. As a board is conveyed through the machine, the knives in the rotating cutterhead engage the workpiece and remove material in excess of a predetermined finished thickness. In this regard, a planer could correctly be called a "thicknesser". The most common sizes (widths) for commercial single surfacers are 24", 30", 36" and 48" with typical feed rates of 25 to 100 lineal feet per minute. However, with segmented feedrolls and chipbreakers, feeding multiple pieces across the width of the machine can effectively double, triple or even quadruple the feed rate. A used, heavy-duty single surfacer, 24"-30" wide, will cost \$3,000 - \$10,000+ and a good dust collection system is a necessity.

[NOTE: It is not a planer's function to flatten cupped stock. The feedrolls, chipbreaker and pressure bar will temporarily flatten cupped stock by pressing it to the center table, allowing the cutterhead to take a uniform cut across the width of a board. But, upon being released from the downward pressure and exiting the machine, the cup will reappear. Only a jointer or facer (automatic jointer) can reliably turn warped stock into flat stock.]

The next machine offered for consideration is a double surfacer with planing heads on the top and bottom. The obvious advantage over the single surfacer is that both upper and lower surfaces of a board can be planed in a single pass through the machine as opposed to having to undertake two passes through a single surfacer. To a small degree, some planing accuracy might be forfeited in going from a single surfacer to a double surfacer, the importance of which would be determined by the application or the customer. But in most cases, the loss would be small, especially compared to the gains in production. Some double surfacers are also capable of a limited degree of jointing (cup and/or warp removal), depending on their design. Note however, that double surfacers are also "double trouble" (or more) when it comes time for set-up, alignment, troubleshooting and maintenance. Good used double surfacers might be able to be bought starting at around \$8-10,000, but note that a new Newman Whitney (Model EPR-24) with a feed rate of up to 400 fpm sells for about \$135,000.

Of course, the most talked about planing machine is the 4-sided planer. It is a double surfacer with the addition of two side cutterheads (left and right). On a planer/matcher, the two side heads are directly opposite each other. [NOTE: The side heads on a planer/matcher do not tilt.] More complex machines may also include a facer (automatic power-fed jointer), a hogging [side] head to eliminate severe over-width, or additional top and bottom profiling heads. A planer/matcher is capable of producing a limited range of profiled products with a high degree of accuracy, most noticeably shiplap and tongue and groove products (siding, flooring, paneling). A timber sizer is a planer/matcher on steroids; capable of 4-sided surfacing and profiling on timbers as large as 24" x 36".

Prices for used planer/matchers might start at around \$15,000, but be prepared to do a lot of work on these. A modern machine (used), in good working order, is likely to cost \$35,000 - \$60,000 and a rebuilt machine will cost in the neighborhood of \$90,000. A new Newman Whitney (Model M990) will cost a cool \$ 1/4 million, but it is capable of running 1,200 to 2,000 fpm. Such a major investment would provide the capacity to process well over 100 million to 225 million linear feet per year (assuming 1,000-2,000 fpm x 60 minutes/hr x 7.5 hrs/day x 250 days/yr.). Even at 75% machine availability, the capacity would still be 85-170 million lineal feet. No single sawmill in Alaska could keep that machine busy everyday. Remember the earlier premise that "to complete in the world marketplace for commodity products [even value-added commodity products] Alaskan producers will need to be very efficient, both in terms of conversion of raw material and in terms of economy (i.e., high product output with minimal high-cost labor input). Outside of Alaska, manufacturers are operating machines capable at such feed rates. Generally, their fixed costs are lower than Alaska's and the variable costs associated with higher feed rates are minimal.

b) Moulders

A moulder (sometimes called a "sticker") is a close cousin to a planer/matcher. In its simplest configuration, a moulder has a top head, followed by 2 side heads, followed by a bottom head (although European manufacturers tend to reverse the order of top and bottom heads). Complex machines may have as many as 9 heads. Moulders differ from planer/matchers in that the side heads are not directly opposite each other and can tilt in or out (which is the reason they cannot be directly opposite each other. It is argued that such staggered side heads compromise the moulder's ability to exert absolute control over the workpiece and therefore is not capable of machining to close tolerances (for such products as tongue and groove strip flooring, for example). [I am certain that some moulder manufacturers would argue this point.] On the other hand, planer/matchers

cannot produce the variety of profiles that moulders are capable of producing and are generally not available in as small a capacity machine as moulders are (i.e., 2" x 6"). Maximum feed rates for moulders would generally be in the 100-150 fpm range for S4S applications, but operational feed rates would be much lower for close tolerance parts. Used, larger capacity moulders with 5-7 cutterheads will cost \$30,000 - \$55,000, while a new moulder, depending on size, capacity and configuration will start at \$35,000 and run to well over \$100,000.

Scaling back a little bit to a mid-size moulder would still require an investment of at least \$25,000 - \$30,000 (including dust collection equipment and a profile grinder), but you would begin to lose some capabilities in the larger dimensions (i.e., 10" and wider by 6"-8" and thicker). Production capacity, given feed rates of 100 fpm, would be 11.5 million linear feet per year at 100% machine availability or 8.4 million at 75% machine availability. At a feed rate of 50 fpm, these production estimates would be cut in half and would begin to get us into the ballpark where the production capacity of many more Alaskan mills would begin to be commensurate with planing capacity.

With anything smaller than a medium-sized moulder, you begin to lose size capability rapidly. A 4-head moulder with a 2" by 4" or 2" by 6" capacity would be severely restricted in the softwood dimension lumber market, except for studs. But for some producers, especially those whose raw material inputs are smaller, or where hardwoods figure into the raw material mix, or where products tend to be smaller (like many moulding products), these machines might be appropriate. Be aware however, that these small machines are still fairly complex. Set-up times can be long or excessive, thereby possibly precluding profitability on short runs of some products. At this point it may be more feasible to consider separate machining operations that offer a greater degree of flexibility, faster [individual] set-up times, but perhaps lower productivity and more labor input. Nearly everything a planer/matcher can do may be done with smaller, stand-alone machines. And for some products, even less is required. It's all a matter of being able to match machine cost with machine capability with machine efficacy with products and quantities, etc.

c) Small Machine Options

There are several stand-alone machines that are capable of producing profiled products. All are worthy of consideration in a small commercial setting.

The largest of these machines is a 3-sided machine that their distributors like to call a planer/moulder. The machine, weighing in at about 1,600 pounds, consists of a 14" top head single surfacer that is capable of producing shallow profiles (maximum depth $\frac{3}{4}$ " or less depending on manufacturer) in addition to normal, straight-knife planing. Maximum planing width is 14" and maximum depth is usually 6 or 8 inches. Following the top head are two side heads, one right and one left. In this regard, this machine resembles the planer/matcher due to the fact that the side heads are arranged opposite of each other and do not tilt. The maximum moulding width is 12" and maximum thickness is around 3 inches. The machines I am familiar with are equipped with variable feed rates that are adjustable from 15-30 fpm. The machines come equipped with (4) 3-phase electric motors – one for the top head, one for each side head and one for the feed works. Each motor has its own push button magnetic starter. Prices for new machines (sans shipping) run \$7,000 - \$8,000.

The 3-sided planer/moulder is really just an assemblage of two vertical spindle shapers and a top (horizontal) cutterhead, which leads us to the next machine type. Shapers come in a wide variety of sizes and configurations, but I won't get into any great detail about the merits of one versus another. The basic machine architecture, however, is common to all. It consists of a vertical spindle (spindle diameters can range from $\frac{3}{4}$ " to 1½" in diameter) that accepts a variety of cutterheads. Some spindles tilt (like moulder side heads) while others do not (like matcher side heads). Obviously, tilting heads will provide greater flexibility, but at a higher price. Some shapers have sliding tables to

assist in conveying the workpiece past the cutterhead; others have a simple miter gauge slot milled into the tabletop. An offset vertical fence permits control of the workpiece. There are shapers with 1 head, 2 heads and 3 heads, each providing a separate workstation. I don't really see a clear advantage to a multi-head shaper versus 2 or more stand-alone machines, but I am sure there must be some advantage, having seen several such set-ups (perhaps for making raised-panel cabinet doors). Prices for new single spindle shapers start around \$900 and go as high as \$3,000. For commercial work at any level, I would consider as incomplete a single-spindle shaper that did not have a high quality power feeder (\$600 - \$700) to improve production, quality and safety.

The next machine is one that is fairly unique in its field. It would be like taking a single-spindle shaper and turning it 90°, thereby forming a horizontal profiling head, and in the case of these machines, operating as a top head. Until recently, this class of machine had just one manufacturer that I knew of, Williams and Hussey. Their machine, which they refer to as a moulder/planer, consists of a single, 7-inch wide, 2-knife top head. Weighing in at only about 200 pounds, it may sound like a toy, but don't underestimate it. It is capable of imparting 78 knife cuts per inch (the cutterhead with 2 knives, rotates at 7,000 rpm and the feed rate is 15 fpm) assuring a very high quality finish. This is a well-built, rugged little machine and is very versatile. Virtually any single-knife profile can be produced on this machine, including base moulding, casing, chair rail, picture frame, crown moulding, certain siding patterns, etc. Due to the fact that it is open on one side, it is technically possible to plane or profile a workpiece up to 14" wide. And equipped with an optional jig, it is even capable of producing elliptical, curved moulding. Maximum stock thickness is 8 inches. The machine features powered infeed and outfeed rolls. The manufacturer claims that tooling changes can be accomplished in 2 minutes. Several companies offer custom knife grinding/sharpening and tooling costs are relatively reasonable (generally about \$200 per set or less plus shipping). A complete package including the machine, custom-built steel stand, dust collection hood, motor and starter will run about \$1,700 plus shipping.

A newcomer to this field is Charles Schmidt & Co. and their machine is called a tilting arbor multi-moulder. Again, the cutterhead is a top head, but it differs from the Williams and Hussey machine in that the head can be tilted up to 45°. Other operational features are similar, but it is a larger, more robust machine weighing in at approximately 900 pounds with a list price of nearly \$14,000. This (or a very similar machine) is also distributed by Mikron Woodworking Machinery Co. (The Mikron M645. See www.mikronmachinery.com.)

Lastly are a couple light duty machines by RBI and Woodmaster that also offer that ability to produce mouldings from a horizontal top arbor cutterhead. Although primarily a planer, they can be converted to gang rip saw or a profiler by changing out the cutterhead. In my opinion, neither of these machines would stand up very long to continuous daily production, but for intermittent use or small production runs, they may be sufficient.

Appendix A. A Partial Profile of One Value-Added Product

Moulding has the potential to be a moneymaker in the Alaska market considering the value of the raw material at the wholesale level and the price of the finished product at the retail level. The following table presents retail prices (which likely include mark-ups by middlemen and any number of possible additional shipping and handling costs) on some common mouldings, obtained by visiting Spenard's Builders Supply in Sitka, AK on July 26, 1999. The moulding was labeled as hemlock, and I believe it was hemlock. The grade of the material was high, though not entirely clear.

a)	2 ½ x 8'	colonial casing	\$12.49
b)	3 ¼ x 8'	colonial base moulding	\$10.49
c)	2 7/16 x 8'	chair rail moulding	\$ 9.79
d)	2 ¼ x 8'	crown moulding	\$ 7.49
e)	3 ¼ x 8'	crown moulding	\$13.99
f)	4 ¼ x 8'	crown moulding	\$14.99

It appeared as though all of these mouldings could be produced from nominal 4/4 stock, 3", 4" and 5" wide and, in some cases, thinner stock of less than nominal widths could have been used. Let's take a closer look at the value-added potential of these products.

Table A1. Potential for adding value in the production of trim moulding

Item	Retail Price	Raw Material Input			Added Value (retail price – cost of raw material)	Added Value per board foot of input
		Nominal Size	Board Feet	Cost*		
a)	12.49	1x3x8	2	2.00	10.49	5.24
b)	10.49	1x4x8	2 2/3	2.67	7.82	2.93
c)	9.79	1x3x8	2	2.00	7.79	3.90
d)	7.49	1x3x8	2	2.00	5.49	2.74
e)	13.99	1x4x8	2 2/3	2.67	11.32	4.24
f)	14.99	1x5x8	3 1/3	3.33	11.66	3.50

* at \$1000/MBF

Appendix B. Species Characteristics^{1,2}

Softwoods

1. Sitka Spruce (*Picea sitchensis*)

Sitka spruce is native to the Pacific Coast region from Southcentral Alaska (Kodiak Island and Cook Inlet), southeast through southeastern Alaska, western British Columbia, western Washington, western Oregon and northwestern California. Trees normally reach heights of 160 feet (48.77 m) with diameters of 5 feet (1.52 m). A record tree was recorded to be 216 feet (65.84 m) tall with a diameter of 16.7 feet (5.09 m).

The sapwood of Sitka spruce is creamy white to light yellow and the heartwood is pinkish yellow to brown. The sapwood may be 3 to 6 inches (7.62 to 15.24 cm) wide or even wider in young trees. The wood has a fine uniform texture and generally has straight grain. It is moderately light in weight, moderately low in bending and compressive strength, moderately stiff, moderately soft, and moderately low in resistance to shock. On the basis of weight, it rates high in strength properties and can be obtained in clear, straight-grained pieces. It has moderately small shrinkage. It is not difficult to kiln dry and can be worked easily (when free of knots). The heartwood is slightly resistant to non-resistant to decay. It is resistant to preservative treatments under pressure, but can be treated by water diffusion processes.

Sitka spruce is used primarily for lumber, plywood and cooperage. Boxes and crates account for a considerable amount of the remanufactured lumber. Other important uses are furniture, planing mill products, sash, doors, blinds, millwork, sounding boards for high quality pianos, guitar faces, ladders (rails), components for experimental light aircraft, oars, planking, masts and spars for boats, and turbine blades and boats. Sitka spruce has been, by far, the most important wood for aircraft construction because it has the highest strength to weight ratio. Thin panels of Sitka spruce are highly resonant, making them desirable for piano sounding boards and guitar tops.

2. White Spruce (*Picea glauca*)

White spruce is native to widespread areas across northern North America near the northern limit of trees, from Newfoundland, Labrador and northern Quebec, west to the Hudson Bay, northwest Mackinaw and northwestern and southwestern Alaska, south to southern British Columbia, southern Alberta and northwestern Montana, east to southern Manitoba, central Minnesota, central Michigan, southern Ontario, northern New York and Maine. It is also found locally in the Black Hills of South Dakota and Wyoming. Trees reach heights of 110 feet (33.53 m), with diameters of 2 feet (0.61 m). Exceptionally large trees have been reported with a height of 150 feet (45.72 m) and a diameter of 4 feet (1.22 m).

The wood dries easily, is stable after drying, is moderately light in weight and easily worked. It is generally straight, even grained, soft, and finishes with a satin-like surface. The wood is creamy white or straw colored and there is little difference between the color of the heartwood and sapwood. The heartwood is slightly resistant to non-resistant to decay. Both heartwood and sapwood are resistant to preservative treatments under pressure, but can be treated by water diffusion processes. The largest use of white spruce is pulpwood. It is also used for framing material, general millwork, boxes and crates, and piano soundboards.

3. Black Spruce (*Picea mariana*)

Black spruce has a widespread distribution across northern North America near the northern limit of trees, from Newfoundland, Labrador and northern Quebec, west to the Hudson Bay, northwest Mackinaw and central, western and southern Alaska, south to central British Columbia, and east to southern Manitoba, central Minnesota, Wisconsin, southeastern Michigan, southern Ontario,

¹ *Softwoods of North America*, H.A. Alden, FPL-GTR-102

² *Hardwoods of North America*, H.A. Alden, FPL-GTR-83

New York, central and northeastern Pennsylvania, northern New Jersey, Rhode Island and Massachusetts. Trees reach heights of more than 50 feet (15.24 m), with diameters of 1 foot (0.30 m). Exceptional trees grow to 90 feet (27.43 m) with a diameter of almost 2 feet (0.61 m).

The wood dries easily, is stable after drying, is moderately light in weight and easily worked, has moderate shrinkage, and is moderately strong, stiff, tough and hard. It is not very resistant to bending or end-wise compression. It is straight, even grained, medium to fine textured, soft and produces a lustrous finish. It is without characteristic odor or taste. The wood is a pale yellowish white, and there is little difference in color between the heartwood and sapwood. It has exceptional resonance qualities, in the form of thin boards. It has moderately high shrinkage, but is easily air or kiln dried. It is easily worked, glues well, is average in paint holding ability, but rates low in nail holding capacity. The heartwood is slightly resistant to non-resistant to decay and both heartwood and sapwood are resistant to preservative treatments under pressure, but can be treated by water diffusion processes. The largest use of black spruce is pulpwood. It is also used for framing material, general millwork, boxes and crates and piano soundboards.

4. Western Hemlock (*Tsuga heterophylla*)

Western hemlock is native to the Pacific Coast region from Southcentral Alaska (Kenai Peninsula), Southeast Alaska and western British Columbia to western Washington, western Oregon and northwestern California. It is also found in the Rocky Mountain region from southeastern British Columbia south to northeastern Washington, northern Idaho and northwestern Montana. Trees reach heights of 200 feet (60.96 m) with diameters of 3 feet (0.91 m). An exceptional specimen was recorded at a height of 259 feet (78.94 m) with a diameter of 9 feet (2.74 m).

The heartwood and sapwood of western hemlock are almost white with a purplish tinge. The sapwood, which is sometimes lighter in color, is generally not more than 1 inch (2.54 cm) thick. The wood often contains small sound black knots that are usually tight and stay in place. Dark streaks are often found in the lumber; these are caused by hemlock bark maggots and generally do not reduce strength. Western hemlock is moderately light in weight and moderate in strength. It is moderate in its hardness, stiffness and shock resistance. It has moderately high shrinkage, about the same as Douglas-fir. Green hemlock lumber contains considerably more water than Douglas fir and requires longer kiln drying time. Trees may contain wetwood and/or ringshake. The wood is intermediate in nail holding ability and has a tendency to split when nailed. It glues, stains, polishes, varnishes and paints satisfactorily. The heartwood of hemlock is slightly resistant to nonresistant to decay. With incising, the wood can be treated with pressure treatment.

Western hemlock is used for pulpwood, lumber, roof decking, laminating stock, mouldings, architectural trim, general construction, newsprint and plywood. The lumber is used extensively for building material, such as sheathing, siding, sub-flooring, joists, studding, planking and rafters. Considerable quantities are used in the manufacture of boxes, pallets, crates, and flooring and smaller amounts for furniture and ladders (rails).

5. [Alaska] Yellow Cedar (*Chamaecyparis nootkatensis*)

Alaska or Yellow cedar is found in the coastal forests from southwestern Alaska through British Columbia to northern California. Trees attain heights of 120 feet (36.58 m) with diameters of 6 feet (1.83 m). Trees from Alaska are frequently older than 300 years. Dominant trees can be 300-700 years old, with a record of more than 1,040 years.

The sapwood is narrow and sometimes slightly lighter than the bright clear yellow heartwood. It has a mild distinctive odor that is best described as "raw potatoes". The wood is moderately heavy, soft, fine textured, straight grained, easily worked and durable. It is moderate in strength, stiffness, hardness and shock resistance. It shrinks little in drying and is stable in use after seasoning. The wood of Yellow cedar is readily worked by both hand and machine tools. There is a slight dulling effect on cutting edges, but it usually finishes very well. In lumber with a wavy grain, there is a tendency for the grain to pick up in planing and moulding. It nails and glues well

and holds paints, stains and varnishes satisfactorily. The heartwood is resistant to very resistant to decay naturally, and the wood is resistant to pressure treatment.

Alaska yellow cedar is used locally for interior trim, furniture, small boat hulls, firewood and canoe paddles. It is used commercially for battery separators, bedding for heavy machinery, boat building, bridge and dock decking, cabinetry, carving, cooling towers, framing, furniture, heavy flooring, doors, stadium seats, utility poles, water and chemical tanks and window boxes. In Japan it is highly valued for use as architectural timbers.

6. Western Redcedar (*Thuja plicata*)

Western redcedar grows in the Pacific Northwest and along the Pacific coast into Southeast Alaska. Trees reach heights of 200 feet (60.96 m) with diameters of 16 feet (4.88 m). The trunks of older trees are buttressed, fluted and quite tapered.

The heartwood is reddish or pinkish brown and the sapwood nearly white. The sapwood is narrow, often not more than 1 inch (2.54 cm) in width. The wood is generally straight grained and has a uniform but rather coarse texture. It has very low shrinkage. It is light in weight, moderately soft, low in strength when used as beams or posts, and low in shock resistance. The wood works well with both hand tools and machine operations. It may splinter when worked on the end grain. It is subject to compression during planing and moulding. It nails and screws well and takes both stain and paint satisfactorily. The heartwood is resistant to very resistant to decay, but is not immune to attack by termites and furniture beetles. The wood is resistant to pressure treatment.

Western redcedar is used principally for shingles and shakes, saunas, outdoor furniture, decking, fencing, lumber, poles, posts and piles, exterior siding, interior finish, greenhouse construction, ship and boat building, boxes and crates, sash, doors and millwork.

Hardwoods

1. Red Alder (*Alnus rubra*)

Red alder is the only commercial species of alder in North America. It is the most common hardwood in the Pacific Northwest and is the largest of the American alders. It is a fast growing pioneer species.

Red alder is found in the Pacific coast region from southeastern Alaska to western British Columbia and south through western Washington and western Oregon to southern California. Red alder is not commonly found east of the Cascade or Sierra Nevada ranges, although there are several isolated populations in Northern Idaho. On good sites, red alder can reach heights of 100 to 130 feet (30 to 40 m) and have diameters of 22 to 30 inches (56 to 76 cm). In closed stands, the trees typically have clear, slightly tapered boles and narrow dome-like crowns. The light gray bark is thin and smooth. Red alder forms extensive, fibrous root systems and has nitrogen-fixing nodules on its roots.

Red alder wood is almost white when freshly cut but quickly changes to a light tan or light brown with a yellow or reddish tinge when exposed to the air. Heartwood is formed only in trees of advanced age and there is no visible boundary between heartwood and sapwood. The wood is diffuse-porous, moderately light and soft. It is excellent for turning and polishing and takes glue, paint and stain well. The heartwood is rated as slightly or nonresistant to decay. Logs should be processed quickly after cutting, particularly during warm weather, as decay can proceed rapidly. If processing must be delayed, the logs should be stored in water. Green lumber should be carefully stickered and stacked for air-drying or promptly kiln dried to prevent damage from microbial stain.

Red alder lumber is used in nonstructural applications, appearance grade lumber, chips for pulp and paper, furniture, cabinets, pallets, plywood core stock, interior finish, fuelwood, charcoal, and chips for smoke curing.

2. White [Paper] Birch (*Betula papyrifera*)

There are 30-50 varieties of birches that grow throughout northern temperate forests of Asia, North America and Europe. The range of White birch (varieties) is quite extensive, essentially circumnavigating the North Pole; from southern New England and northern New York, north into Quebec and Ontario and west through the Lake States, across northern Canada, and northern Alaska. All Birch species look alike microscopically. In Alaska, three varieties, which readily hybridize, are recognized: Western paper birch (*B. papyrifera* var. *commutata*) in Southeast Alaska, Alaska paper birch (*B. papyrifera* var. *humilis*) in interior forests and south to the Pacific coast and Kenai birch (*B. papyrifera* var. *kenaica*) in southern and Interior Alaska.

White birch can attain heights of 60 feet (18 m) with diameters approaching 2 feet (0.6m), but typically run about 2/3 smaller in both height and diameter. Compared to White birch in the Northeast and eastern Canada, Alaska birches are considerably lower grade primarily due to the smaller average diameter of the trees, a high incidence of stain and decay in the heartwood and a high percent of knotty material.

The wood varies only slightly among species/varieties. All species are diffuse porous and have grain ranging from straight to curly. The texture is generally fine and uniform. White birch may be satisfactorily worked with both hand tools and machines. The wood is rated as slightly to non-resistant to decay.

Along with other birch species, White birch is suitable for use as face veneer or core stock. Birch plywood is used for doors, furniture, paneling, storage and appliance cabinets, aircraft and specialty uses. Lumber is used for turned products such as spools, bobbins, handles and toys/parts. It is also used for pulpwood, fuelwood, turnery, distillation products, toothpicks, ice cream sticks, and tongue depressors. In Alaska, the sap is sometimes collected and concentrated into Birch syrup.

3. Black Cottonwood (*Populus trichocarpa*)

The distribution of Cottonwood includes most of North America with Eastern Cottonwood (*P. deltoides*) in the eastern to Midwestern U.S. and Black Cottonwood in the western U.S. Cottonwood trees can reach heights of up to 190 feet (77 m) with a diameter of 6 feet (2.4 m).

The sapwood of Cottonwood is white while the heartwood is light brown to brown. The wood is weak in bending and compression, soft and low in shock resistance. It has a sour odor when wet, but no characteristic odor or taste when dry. Tension wood is frequently present, causing a fuzzy surface when cut. Ring shake is a common defect. Cottonwood glues well, has low nail holding ability, does not split easily and holds paint well. It is rated as slightly to nonresistant to decay. Uses include lumber, veneer and plywood core stock, pulpwood, boxes, crates, food containers, interior furniture and casket parts, agricultural implements, woodenware, and cutting boards. In Alaska it is used as exterior siding, interior paneling and specialty finished products.

4. Quaking Aspen (*Populus tremuloides*)

Quaking Aspen ranges from Alaska through Canada and into the western and northeastern U.S. It occurs as far south as central Mexico at elevations where moisture is adequate and summers are sufficiently cool. Aspen can reach heights of 120 feet (48 m) with a diameter of 4 feet (1.6 m) on the best sites, but typically achieve only 1/2 to 1/3 of these dimensions. Some trees are quite cylindrical with little taper and few limbs; others can be very crooked or contorted.

The sapwood of Aspen is white, blending into the light brown heartwood. The wood of Aspen has a uniform texture; it is straight grained, light and soft and has good dimensional stability and low to moderate shrinkage. Often, the lumber has a tendency to warp in drying. Aspen does not split when nailed, machines easily with a slightly fuzzy surface and turns, bores and sands well. It holds nails poorly to fairly well, but glues and holds paint well. It is easily pulped by all commercial processes. It is slightly to nonresistant to decay and is extremely resistant to pressure treatment.

Aspen pulp is used in books, newsprint and fine printing papers and as feedstock for composite wood products like fiberboard, particleboard, oriented strand board, etc. Veneer is used as core stock while lumber finds application in boxes, crates, pallets, furniture parts, matchsticks, tongue depressors, paneling and excelsior.

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Appendix C. Mechanical Properties of Alaskan Species

Table C1. Mechanical Properties of Alaskan Softwoods (English units)³

Properties	Sitka Spruce <i>Green</i> 12%	White Spruce <i>Green</i> 12%	Black Spruce <i>Green</i> 12%	W. Hemlock <i>Green</i> 12%	Yellow Cedar <i>Green</i> 12%	W. Redcedar <i>Green</i> 12%
Moisture Content						
Specific Gravity	0.37	0.40	0.38	0.42	0.42	0.31
MOR (lbf/in ³)	5,700	10,200	6,100	6,600	6,400	5,200
MOE (x10 ⁶ lbf/in ³)	1.23	1.57	1.38	1.31	1.14	0.94
Work to max. load (in-lbf/in ³)	6.3	9.4	7.4	6.9	9.2	5.0
Impact bending (in)	24	25	24	22	27	17
C _{II} (lbf/in ²)	2,670	5,610	2,840	3,360	3,050	2,770
C _I (lbf/in ²)	280	580	240	280	350	240
Shear _{II} (lbf/in ²)	760	1,150	739	860	840	770
Tension _I (lbf/in ²)	250	370	100	290	330	230
Side Hardness (lbf)	350	510	370	410	440	260

Table C2. Mechanical Properties of Alaskan Softwoods (metric units)³

Properties	Sitka Spruce <i>Green</i> 12%	White Spruce <i>Green</i> 12%	Black Spruce <i>Green</i> 12%	W. Hemlock <i>Green</i> 12%	Yellow Cedar <i>Green</i> 12%	W. Redcedar <i>Green</i> 12%
Moisture Content						
Specific Gravity	0.33	0.36	0.38	0.42	0.42	0.31
MOR (kPa)	34,000	65,000	42,000	46,000	44,000	35,900
MOE (MPa)	7,900	9,900	9,500	9,000	7,900	6,500
Work to max. load kJ/m ³)	43	65	51	48	63	34
Impact bending (mm)	610	640	610	560	690	430
C _{II} (kPa)	16,200	35,700	19,600	23,200	21,000	19,100
C _I (kPa)	1,400	3,000	1,700	1,900	2,400	1,700
Shear _{II} (kPa)	4,400	6,700	5,100	5,900	5,800	5,300
Tension _I (kPa)	1,700	2,600	700	2,000	2,300	1,600
Side Hardness (N)	1,600	2,300	1,600	1,800	2,000	1,200

Table C3. Mechanical Properties of Alaskan Hardwoods (English units)³

Properties	Red Alder		Paper Birch		Black Cottonwood		Quaking Aspen	
	Green	12%	Green	12%	Green	12%	Green	12%
Moisture Content								
Specific Gravity	0.37	0.41	0.48	0.55	0.31	0.35	0.35	0.38
MOR (lbf/in ²)	6,500	9,800	6,400	12,300	4,900	8,500	5,100	8,400
MOE (x10 ⁶ lbf/in ³)	1.17	1.38	1.17	1.59	1.08	1.27	0.86	1.18
Work to max. load (in-lbf/in ³)	8.0	8.4	16.2	16.0	5.0	6.7	6.4	7.6
Impact bending (in)	22	20	49	34	20	22	22	21
C _{II} (lbf/in ²)	2,960	5,820	2,360	5,960	2,200	4,500	2,140	4,250
C _I (lbf/in ²)	250	440	270	600	160	300	180	370
Shear _{II} (lbf/in ²)	770	1,080	840	1,210	610	1,040	660	850
Tension _I (lbf/in ²)	390	420	380	---	270	330	230	260
Side Hardness (lbf)	440	590	560	910	250	350	300	350

Table C4. Mechanical Properties of Alaskan Hardwoods (metric units)³

Properties	Red Alder		Paper Birch		Black Cottonwood		Quaking Aspen	
	Green	12%	Green	12%	Green	12%	Green	12%
Moisture Content								
Specific Gravity	0.37	0.41	0.48	0.55	0.31	0.35	0.35	0.38
MOR (kPa)	45,000	68,000	44,000	85,000	34,000	59,000	35,000	58,000
MOE (MPa)	8,100	9,500	8,100	11,000	7,400	8,800	5,900	8,100
Work to max. load (kJ/m ³)	55	58	112	110	34	46	44	52
Impact bending (mm)	560	510	1,240	860	510	560	560	530
C _{II} (kPa)	20,400	40,100	16,300	39,200	15,200	31,000	14,800	29,300
C _I (kPa)	1,700	3,000	1,900	4,100	1,100	2,100	1,200	2,600
Shear _{II} (kPa)	5,300	7,400	5,800	8,300	4,200	7,200	4,600	5,900
Tension _I (kPa)	2,700	2,900	2,600	---	1,900	2,300	1,600	1,800
Side Hardness (N)	2,000	2,600	2,500	4,000	1,100	1,600	1,300	1,600

³ Wood Handbook, Wood As An Engineering Material, FPL-GTR-113, March 1999

Appendix D. Comparisons of Mechanical Properties of Western Hemlock, Sitka Spruce and White Spruce to Other Species in their Species Groups

According to the data presented in the Wood Handbook, western hemlock leads its species group (HemFir) in the following mechanical property categories:

- o Specific gravity (green and 12% MC)
- o Modulus of rupture (green and 12% MC)
- o Work to maximum load (green)
- o Impact bending (green)
- o Compression parallel to the grain (green and 12% MC)
- o Shear parallel to the grain (green and 12% MC)
- o Side hardness (green and 12% MC)

Based on this cursory examination, creating a separate species category for Alaska western hemlock, through an in-grade testing program could prove beneficial by separating Alaska western hemlock from other, apparently weaker, species.

Alaska spruces (Sitka and White), on the other hand, are, according to the published data, among the *weaker* species in their SPF species group. Only Sitka spruce leads the group, in only one property category, namely, shear parallel to the grain (green), and only just barely. The results of an in-grade testing program for these species could potentially diminish their standing, unless they prove to be significantly stronger than the published data indicates.

Table D1. Mechanical Properties of Species within the Hem/Fir Species Group (English units)³

Properties	Moisture Content	W. Hemlock		CA Red Fir		Grand Fir		Noble Fir		Pacific Silver		White Fir	
		Green	12%	Green	12%	Green	12%	Green	12%	Green	12%	Green	12%
Specific Gravity		0.42	0.45	0.36	0.38	0.35	0.37	0.37	0.39	0.40	0.43	0.37	0.39
MOR (lb _f /in ³)		6,600	11,300	5,800	10,500	5,800	8,900	6,200	10,700	6,400	11,000	5,900	9,800
MOE (x10 ⁶ lb _f /in ³)		1.31	1.63	1.17	1.50	1.25	1.57	1.38	1.72	1.42	1.76	1.16	1.50
Work to max. load (in-lb _f /in ³)		6.9	8.3	6.4	8.9	5.6	7.5	6.0	8.8	6.0	9.3	5.6	7.2
Impact bending (in)		22	23	21	24	22	28	19	23	21	24	22	20
C _{II} (lb _f /in ²)		3,360	7,200	2,760	5,460	2,940	5,290	3,010	6,100	3,140	6,410	2,900	5,800
C _⊥ (lb _f /in ²)		280	550	330	610	270	500	270	520	220	450	280	530
Shear _{II} (lb _f /in ²)		860	1,290	770	1,040	740	900	800	1,050	750	1,220	760	1,100
Tension _⊥ (lb _f /in ²)		290	340	380	390	240	240	230	220	240	---	300	300
Side Hardness (lb _f)		410	540	360	500	360	490	290	410	310	430	340	480

Table D2. Mechanical Properties of Species within the SPF Species Group (English units)³

Properties	Sitka Spruce		White Spruce		Engleman Sp.		Jack Pine		Lodgepole Pine		Red Pine		Balsam Fir	
	Green	12%	Green	12%	Green	12%	Green	12%	Green	12%	Green	12%	Green	12%
Moisture Content														
Specific Gravity	0.37	0.40	0.33	0.36	0.33	0.35	0.40	0.43	0.38	0.41	0.41	0.46	0.33	0.35
MOR (lbf/in ²)	5,700	10,200	5,000	9,400	4,700	9,300	6,000	9,900	5,500	9,400	5,800	11,000	5,500	9,200
MOE (x10 ⁶ lbf/in ³)	1.23	1.57	1.14	1.43	1.03	1.30	1.07	1.35	1.08	1.34	1.28	1.63	1.25	1.45
Work to max. load (in-lbf/in ³)	6.3	9.4	6.0	7.7	5.1	6.4	7.2	8.3	5.6	6.8	6.1	9.9	4.7	5.1
Impact bending (in)	24	25	22	20	16	18	26	27	20	20	26	26	16	20
C _{II} (lbf/in ²)	2,670	5,610	2,350	5,180	2,180	4,480	2,950	5,660	2,610	5,370	2,730	6,070	2,630	5,280
C _⊥ (lbf/in ²)	280	580	210	430	200	410	300	580	250	610	260	600	190	404
Shear _{II} (lbf/in ²)	760	1,150	640	970	640	1,200	750	1,170	680	880	690	1,210	662	944
Tension _⊥ (lbf/in ²)	250	370	220	360	240	350	360	420	220	290	300	460	180	180
Side Hardness (lbf)	350	510	320	480	260	390	400	570	330	480	340	560	290	400

³ Wood Handbook (Wood As An Engineering Material)

Alaskan Special Forest Products Markets Report

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Table of Contents

	Page
Background	127
Overview of the Importance of SFP throughout the US	127
Oregon Case	128
Missouri Case	129
California Case	129
Overview of the Importance of SFP Currently Within the USDA Forest Service	129
Development of a USDA FS National Strategy for SFP	129
Implementation of a US Collaborative Project Within	
Forest-Based Communities	131
Development of an Alaska Region SFP Management Policy	133
General Markets Update for Special Forest Products:	136
Herbal Medicines/Botanicals	137
Foods (Mushrooms)	138
Florals/Evergreens, etc.	138
Decoratives; Craft Woods	139
Specific Markets Overview for Alaskan Special Forest Products	140
Herbal Medicines/Botanicals	140
a) <i>Vaccinium (blueberry & huckleberry)</i>	140
b) <i>Nettles</i>	141
c) <i>Foxglove</i>	142
d) <i>Horsetail</i>	142
e) <i>Willow</i>	142
f) <i>Elderberries</i>	142
g) <i>Valerian</i>	143
h) <i>Poplar</i>	143
i) <i>Crabapple</i>	143
j) <i>Devil's Club</i>	144
k) <i>Rosehips</i>	144
l) <i>Bearberry, Kinnickinnick</i>	144
m) <i>Yarrow</i>	145
n) <i>Labrador Tea</i>	145
Foods	145
a) <i>Huckleberries</i>	145
b) <i>Nettles</i>	145
c) <i>Other species potential</i>	145
Florals/Evergreens, etc.	146
a) <i>Rosehips</i>	146
b) <i>Tree Tops, Twigs, Branches, Poles, Mosses, Bark</i>	146
c) <i>Boughs</i>	147
d) <i>Other species potential</i>	147

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Table of Contents

	Page
Background	127
Overview of the Importance of SFP throughout the US	127
Oregon Case	128
Missouri Case	129
California Case	129
Overview of the Importance of SFP Currently Within the USDA Forest Service	129
Development of a USDA FS National Strategy for SFP	129
Implementation of a US Collaborative Project Within	
Forest-Based Communities	131
Development of an Alaska Region SFP Management Policy	133
General Markets Update for Special Forest Products:	136
Herbal Medicines/Botanicals	137
Foods (Mushrooms)	138
Florals/Evergreens, etc.	138
Decoratives; Craft Woods	139
Specific Markets Overview for Alaskan Special Forest Products	140
Herbal Medicines/Botanicals	140
a) <i>Vaccinium (blueberry & huckleberry)</i>	140
b) <i>Nettles</i>	141
c) <i>Foxglove</i>	142
d) <i>Horsetail</i>	142
e) <i>Willow</i>	142
f) <i>Elderberries</i>	142
g) <i>Valerian</i>	143
h) <i>Poplar</i>	143
i) <i>Crabapple</i>	143
j) <i>Devil's Club</i>	144
k) <i>Rosehips</i>	144
l) <i>Bearberry, Kinnickinnick</i>	144
m) <i>Yarrow</i>	145
n) <i>Labrador Tea</i>	145
Foods	145
a) <i>Huckleberries</i>	145
b) <i>Nettles</i>	145
c) <i>Other species potential</i>	145
Florals/Evergreens, etc.	146
a) <i>Rosehips</i>	146
b) <i>Tree Tops, Twigs, Branches, Poles, Mosses, Bark</i>	146
c) <i>Boughs</i>	147
d) <i>Other species potential</i>	147

Decoratives; Craft Woods	148
a) <i>Beetle-Killed Spruce for the Log Home Industry</i>	148
b) <i>Products Made from Characterwood</i>	152
c) <i>Products Made for the Burgeoning Mail-Order Catalog Industry</i>	159
General Update on the Types of Value-Added Being Employed in the SFP Industry	163
Review of Other Factors Affecting/Influencing Market Demand for SFP	166
Certified SFP	166
Organic Products Market Demand Growth	166
Interplay Potential of SFP with Recreation, Tourism, and Other Non-Consumptive Forest Activities	167
Review of Different Product Distribution Channels Which Can Positively Impact SFP Development in Alaska	168
Identification of "Missing Pieces" in order to Develop an Alaskan SFP Industry	170
Suggested Strategy for the Development of an Alaskan SFP Industry	172
Appendix A: Small scale value-added equipment for foods, botanicals, and medicinals	180
Appendix B: Draft Guidelines for certification of non-timber forest products (NTFPs)	191

Alaskan Special Forest Products Market Research Report

Background

In June of 1999, Mater Engineering of Corvallis, Oregon was retained by the USDA Forest Service to research and prepare a report that would:

- Identify the market opportunities for special (non-timber) forest products and unique (craft or art) wood products from species existing in Alaska;
- Identify key priorities and research needs to developing a special forest products (SFP) business in the State; and
- Recommend a strategy plan for establishing a SFP marketing effort in Alaska.

Due to budget constraints for this effort, the project would not allow for primary markets research (direct buyer interviews) to be conducted. Rather, existing published data and specific results of recent SFP market research conducted by Mater Engineering for other public entities have been employed as the baseline for this research report effort.

Overview of the Importance of SFP throughout the US

Special forest products (SFP), also known as non-timber forest products (NTFP), are defined by the Forest Service as products derived from non-timber biological resources that are used for personal, educational, commercial, and scientific use. SFP resources include, but are not limited to: mushrooms, boughs, Christmas trees, bark, ferns, moss, burls, berries, cones, conks, herbs, roots, and wildflowers. Also included are cuttings and transplants. SFP resources exclude saw-timber, pulpwood, cull logs, small round-wood, house logs, utility poles, minerals, animals, animal parts, rocks, water and soil.

As little as five years ago in the US, awareness of the volume, value, and movement of other products from the forest (aside from traditional standing timber) was virtually non-existent. In 1991, the Willamette National Forest in the State of Oregon engaged in the first major study of SFP on national public forestlands. (The project was initiated by the USDA FS as an effort to evaluate the market potential of SFP to provide for economic stabilization of forest-based communities that had been devastated by the closure of federal forests to logging in order to protect the habitat of the spotted owl.) Markets research conducted for that pioneering study documented a \$72,000,000 unmet annual market demand for four targeted forest florals and evergreens: salal, sword fern, evergreen huckleberry, and beargrass. That effort served as a benchmark for other public and private forestland owners to follow.

Since then, the upswing in SFP activity within public and private forests throughout the US has been nothing short of extraordinary. Consider:

- Many national forest systems across the US now have permit and fee structures in place for harvesting non-timber forest products. The permit structures cover a range of non-timber products including florals, foods, medicinals, botanicals, decorative woods, and much more.
- Currently, the USDA Forest Service is creating the first national strategy document on SFP management on public forestlands. The first drafts of the document have already been released for public review.

- For the first time, US Congressional hearings were held in Washington, D.C. in March of 1998, on the subject of SFP relative to national forest lands management.
- There is a specific shift in use and demand for SFP throughout the US. The range in product offerings has increased substantially. It now includes foods, flavorings, medicinal herbs, pharmaceuticals, decoratives, greenery, dyes, florals, landscape materials, and even materials used in industrial production.
- The focus on SFP has hit the radar-screen of both public and private forestland managers across the US. Since 1995 within the Pacific Northwest (PNW):
 - o Over 12,000 individuals have attended programs on SFP;
 - o Over 7000 private forestland owners have participated in sustainable management training programs focusing on timber and non-timber products;
 - o 17 Native American tribes now manage SFP as part of their total forest lands programs.

Across the US over 60 University Extension foresters now incorporate the management and market potential of SFP in their community assistance service offerings.

From a district FS ranger perspective, increase in demand for SFP has dramatically impacted workload and time allocation for accomplishing required work. As an example, between February 1996 and February 1997, one single ranger district in the PNW issued 1500 SFP permits for the commercial harvesting of floral greens, bringing in almost \$65,000 in revenue.

- Industry experts state that the least valuable non-timber forest products are worth many times more per pound than the most valuable hardwoods in American forests. Each dollar of product at the forest is worth at least \$20 of consumer products. Each job related to harvesting generates at least 10 other jobs in the economy through processing, transport, marketing, sales, etc. This, compared to primary wood product production where every 1 million board feet of wood processed into lumber provides for only 3 jobs in the production line.
- The real value of SFP harvested may only be partially known, as patented value-added products derived from these resources occurs without financial pass-back to resource owners. As an example, in 1997, one sale of a patented product manufactured from SFP harvested from US public forestlands went for \$200 million. The public forests, however, received no financial benefit from that sale.

Awareness of the impacts of special forest products management in traditional forest systems is gaining marked visibility within the traditional forest industry. Examples of regional SFP efforts and impacts across the US include:

Oregon case study

During the early 1990's, when protection of the spotted owl through the Endangered Species Act was creating significant changes to traditional logging practices in Oregon, the Willamette National Forest engaged in a special forest products evaluation to determine if non-timber products in the spotted owl region held market value sufficient to create employment stability within the region. As the first study of its kind in the nation, the results were surprising to many in the forest products industry:

- a) Worldwide sales for just four florals grown in abundance in the Willamette National Forest (salal, huckleberry, swordfern, and beargrass) were over \$72 million annually, dispelling the perception that foraging greens from the forest for the floral industry is small business with little market opportunity.

- b) The projected facility to process the four florals for domestic markets was estimated to achieve \$2.3 million in annual sales; achieve \$94,000 in before-tax profits; achieve a 21% return on investment; and bring in over \$80,000 in annual permit fees to the USDA Forest Service.
- c) The processing operations would employ fourteen (14) full-time, family-wage positions, two (2) seasonal positions, and 114 forager positions.
- d) The targeted florals could be harvested sustainably, with annual harvest levels equaling only 2.5% of the total estimated volume in the study area. A two-year harvest rotation was recommended in order to ensure sustainable volumes, protect surrounding species, and produce marketable product characteristics.
- e) If the products were further processed into value-added product (preserved florals), annual sales could be increased by over 60%, less product would need to be extracted from the forest, and profit margins would increase by almost 200%

Missouri case study

In 1994, the State of Missouri Department of Natural Resources engaged in a markets evaluation of non-timber products from their State's forest systems. The research concluded that projected annual market demand increases of between 10% to 20% were noted by buyers in seven non-timber products found in their forests - witch hazel, echinacea, black walnut hulls, ginseng, goldenseal, may apple, and slippery elm. The State also discovered a demand for dandelion root in the sports beverage industry, creating an agro-forestry project that now produces over \$3,000 per acre in sales annually.

California case study

In 1996, a community within the Hayfork Watershed region, located adjacent to the Trinity National Forest engaged in markets research to determine viable market options for non-timber products that could be grown in the forestlands surrounding the community. The community, located at a higher elevation, discovered that the echinacea they could grow within their forests held higher potency than traditional markets could offer, but the size of their operation was too small to attract major herbal and medicinal markets. A new echinacea herbal product for thoroughbred racehorses directed to the naturopathic veterinary industry proved a profitable ticket for the community.

Overview of the Importance of SFP Currently Within the USDA FS

Development of a USDA FS National Strategy for SFP

The USDA Forest Service is in the process of developing a strategy for managing special forest products within the context of ecosystem management. The purpose of the strategy would be to provide guidance and direction for the Forest Service to manage special forest products resources on National Forest System lands, and also to provide assistance to state and private forest managers.

Although still in draft form, the suggested strategy recognizes the need for further knowledge regarding the harvesting of special forest products: how harvesting affects species and ecosystems. It is acknowledged that many of the special forest products species are not included in monitoring and inventory databases. Further information is needed in the areas of distribution and abundance of special forest products resources. Data is needed for the extent of harvesting actually occurring, and the processing and utilization of these special forest products. Also needed is information regarding the markets, pricing, and economic value of commercial special forest products.

The National Strategy indicates the Forest Service intention to include special forest products in their attempts to assist local communities in finding ways to diversify and strengthen the local economy through partnerships and community-based efforts.

In the draft document, the need to recognize and consider the historic and cultural ties with the land experienced by American Indians, Alaska Natives and others associated with traditional, customary use is acknowledged.

The draft National Strategy suggests forest management practices that include methods that are compatible with the principles of sustainable forest management. Within this framework, the draft document identifies five possible goals:

- 1) Special forest products resources are available within the limitations of ecosystem sustainability.
- 2) Management of special forest products resources integrates into Forest Service resource and land management, and coordinates with land management outside the Agency.
- 3) Forest Service policies are consistent with laws, treaties, and regulations.
- 4) Inventory, monitoring, and research provide information needed to manage special forest products species and resources for sustainability.
- 5) Education, training, and technology transfer are provided to public, tribal, and private stakeholders.

There are many various policies governing the management of special forest products resources on different National Forest systems. This Forest Service strategic plan is intended to formulate a framework concerning special forest products resources that are clear, comprehensive, and fair, and also provide a consistent approach for the law enforcement and administration of commercial and non-commercial harvests.

The Forest Service also encourages adoption of **sustainable management** of special forest products resources on state and private lands. "Where appropriate, special forest products should be integrated into inventory, monitoring, and other activities that address criteria and indicators used to measure long term sustainable forest management."

Within the draft strategy, the following five priorities are recommended:

1. Ecosystem management

Included in ecosystem management are mandates to ensure healthy and viable ecosystems, using an ecosystem management approach. This involves using the most current scientific knowledge to aid in making decisions that will affect ecosystems. Also, ongoing research will define ways to improve the management of and ways to use special forest products in a sustainable manner.

2. Strengthening rural communities

The Forest Service is committed to helping rural communities to diversify and strengthen their economies by providing technical expertise in utilizing and marketing special forest products. The Forest Service will also act as a link to Federal and other state agencies, as well as the private sector, in helping to build a broad base of partnerships and alliances for rural community assistance. Also contributing to the strength and health of rural communities, the Forest Service will help these communities to use the natural resource-based assets to be consistent with healthy ecosystem management principles.

3. Partnerships and collaboration

Establishing and enhancing partnerships in the management of special forest products resources on both public and private land is a critical priority for the Forest Service. This involves cooperation with other stakeholders: state and Federal agencies, tribes, and communities in sharing information and technology transfer. Also involved in this linkage is the collaboration of other Federal and state agencies, tribal governments, and private landowners in developing policies and management practices that are ecologically sustainable. There is an emphasis on respecting the rights of state and private landowners regarding the management of their lands.

4. Inventory, monitoring and research

The Forest Service has expressed a focus on research into current and most recent information on best management practices for the administration of special forest products policy. Again, there is an emphasis on sharing information through partnerships and coordinating with other Federal and state agencies, tribal governments, and the private sector. It has been acknowledged that the inventory and monitoring of special forest products practices has been lacking in the past. The Forest Service hopes to coordinate these efforts with the efforts of other governmental agencies, local communities and private landowners.

5. Public involvement

The Forest Service strategy relies heavily on research, collaboration and cooperation with other governmental agencies and local communities. This translates into an open invitation and real need for public participation in formulating and administering best management policies that encourage ecosystem health and sustainability. The agency requests public involvement that extends an open dialogue regarding issues that concern the public. A stated goal is to involve public, private, and tribal stakeholders in developing monitoring strategies. Significant in this is the intention to develop and conduct public education programs that will be targeted to a variety of audiences, including specific focus on programs to accomplish three goals:

- a. Reduce conflict among stakeholders;
- b. Create a realistic understanding of special forest products species and their relationship to ecosystems; and
- c. Improve communication among user groups.

The Forest Service's current draft of a national SFP strategy establishes the framework for managing special forest products resources. It encourages the use of the best and most current science and knowledge to ensure management programs are ecologically responsible, economically viable, and socially acceptable.

Implementation of a US Collaborative Project within Forest-Based Communities

In 1999, the USDA FS initiated a prototype project focused on research collaboration with forest-based communities within the special forest products sector. The project is unique in several ways:

- It is the first research effort in special forest products undertaken by the USDA FS where communities have the opportunity to be directly involved in the selection and implementation of SFP research projects to be funded by the Forest Service;

- Funding for the follow-on SFP research selected by targeted communities has already been secured, so once project foci are determined, the research projects can be quickly implemented;
- Research areas determined by a community do not have to be focused on determining the commercial value of the SFP resource. The project also allows for research that can seek a better understanding of the cultural, spiritual, personal, and/or social values of SFP within a forest-based community.
- The research projects identified must contain biological research components, but can also include other research components (such as cultural, social, spiritual) as well.

Four forest regions within the Pacific Northwest were selected for the US Collaborative Project on SFP: The Gifford Pinchot National Forest region in Washington State; the Willamette and Siuslaw National Forest regions in Oregon; and the Grand Ronde and Siletz Indian Tribal lands in Oregon which abut Siuslaw National Forest lands.

In order to determine forest-based community needs, over 50 in-field dialogues with traditional and non-traditional stakeholders in each project region were conducted.

Traditional stakeholders include non-commercial and commercial harvesters, producers, resource managers, and resource contacts.

Non-traditional stakeholders include individuals who have not yet played a central role in the SFP in these regions, such as non-industrial private forestland owners and environmental organizations.

Within the 50 regional dialogues conducted, 20 would be with traditional commercial stakeholders; 20 with social or non-commercial traditional stakeholders; and the remainder 10 with non-traditional stakeholders.

Key project challenges include:

- 1) Identifying issues and priorities for Chain-of-Custody (COC) participants (harvesters-producers-resource managers-resource contacts) within each region. Determine common concerns.
- 2) Identifying issues and priorities for each COC participant category across all regions. Determine common concerns.
- 3) Prioritize common concern areas (per region; per participant category) based on:
 - Adaptability to project potential; and
 - Ability to achieve results within 2-3 years.

Mater Engineering was retained by the Forest Service to undertake the traditional commercial and non-traditional dialogues in each project region. The traditional non-commercial and social dialogues are being conducted by researchers within USDA FS PNW Region 6.

The in-field dialogues and analysis of dialogue input is scheduled for completion by October, 1999, with potential research project(s) implementation by April, 2000.

Important Lessons Learned From In-Field Dialogues

Although the non-commercial and social dialogues are still being completed, the traditional commercial dialogues have been completed, with preliminary results worth noting for Alaska consideration. The preliminary results dramatically underscore both opportunities and barriers which can be anticipated when focusing research and marketing efforts on the SFP sector. Aside

from suggestions offered on product-specific research, key preliminary general findings presented by commercial stakeholder dialogues in the project regions include the following:

- The markets for both traditional and non-traditional special forest products are substantial and growing, creating documentable economic benefits to forest-based communities.
- With growing, even unmet, markets for special forest products, problems of resource theft, over-harvesting, diminished resource quality, and reduced over-all forest resource sustainability become critical concerns for both traditional and non-traditional stakeholders.
- Because of growing market demand for special forest products, the harvesting and processing of SFP has become "big business" - sometimes at the expense of the forest-based communities, local small-scale processors, and local family harvesters.
- There is an immediate and growing need to re-connect community and local people back to the forest surrounding them;

Many of the concerns documented in this Collaborative Project in the PNW have been noted elsewhere where the special forest products industry has taken hold – Montana, for example. After years of watching hundreds of thousands of pounds of echinacea poached from state, private, and federal forestlands, Montana citizens passed new legislation in April of 1999 protecting the plant. The new law makes it a crime to dig up echinacea from state lands for commercial use. Anyone caught poaching the plant will be fined \$1,000 per day. Personal use harvesters can dig up to 1.5 pounds without being fined. The state estimates that 700,000 pounds of echinacea have been poached from their lands in the last 5 years. The poaching became a problem when European herbal companies staked out Montana, as the best supply source for the wild-crafted plant. Roadside buying stations paying \$8 per pound for the root were set up; often in areas where 70% unemployment existed.

What's important to note here is that the business of SFP is not going to "go away". The demand for SFP is continuing to grow. Creative, incentive-based solutions (i.e. financial rewards for good behavior) may be much more appropriate than strictly regulatory measures for defining pathways to success.

Development of an Alaska Region SFP management policy

The commercial use of special forest products, especially mushrooms and floral greens, is a large and expanding business in the Pacific Northwest Region (Region 6). The Alaska Region of the FS issues permits for commercial use in response to requests. However, there have been few in comparison with parts of the Pacific Northwest Region. It is not currently Alaska Region policy to promote development of a special forest products industry in Alaska. We anticipate increased interest in commercial use of special forest products in the Alaska Region, and with it, heightened concern about appropriate policy. Concerns have centered around conservation of poorly understood ecosystems, sustainability of specific plant species, potential damage to other resources during harvest, special forest products gathering methods, and the perpetuation of cultural resources.

Legislation Pertinent to Alaska

For thousands of years, Alaska Native tribes have been gathering special forest products for subsistence and cultural uses. The Alaska National Interest Lands and Conservation Act (ANILCA) is a Federal law, having been a National act passed by Congress in 1980. Title VIII of ANILCA specifically outlines the subsistence priority for use of fish, wildlife, and other wild renewable resources, by rural residents of Alaska.

Section 801 of ANILCA states that "...the continuation of the opportunity for subsistence uses by rural residents of Alaska is essential to Native physical, economic, traditional, and cultural existence and to non-Native physical, economic, traditional, and social existence..." It goes on to

say “Continuation of the opportunity for subsistence use of resources on public and other lands in Alaska is threatened by the increasing population of Alaska. Congress invokes its constitutional authority over Native affairs to protect and provide the opportunity for continued subsistence uses on the public lands by Native and non-Native rural residents.”

Section 802 of ANILCA states that “Nonwasteful subsistence uses of fish and wildlife and other renewable resources shall be the priority consumptive uses of all such resources on the public lands of Alaska when necessary to restrict taking.” “‘Subsistence use’ means the customary and traditional uses by rural Alaska residents of wild, renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of non-edible by-products of fish and wildlife resources taken for personal or family consumption; for barter or sharing; and for customary trade.”

Other Federal laws and policies direct agencies in their relationships with federally recognized American Indian and Alaska Native tribes. Because Alaska Natives are major stakeholders with regard to the use of renewable natural resources on federal lands in Alaska, these laws and policies are critical to developing a special forest products policy.

In 1998, President Clinton signed Executive Order 13084, which allowed for Indian tribal governments to have an active participatory role in policy-making criteria and consultation. It specifically states, “Each agency shall have an effective process to permit elected officials and other representatives of Indian tribal governments to provide meaningful and timely input in the development of regulatory policies on matters that significantly or uniquely affect their communities.”

The American Indian Religious Freedom Act of 1978 recognized the importance of traditional Indian spiritual practices. It directed federal agencies to evaluate their policies and procedures, determining appropriate changes necessary to protect and preserve Native American religious cultural rights and practices, and report to Congress.

Forest Service Guidelines

As a result of this, the Forest Service Manual (Washington Office) mandates that the Forest Service:

1. Maintain a governmental relationship with federally recognized tribal governments.
2. Administer programs and activities to address and be sensitive to traditional Native religious beliefs and practices.
3. Provide research, transfer of technology, and technical assistance to tribal governments.

To date, there have not been many studies performed on special forest products in the state of Alaska. In an attempt to address the unique issues and circumstances in Alaska regarding special forest products, the USDA Forest Service began developing a Special Forest Products Management Policy starting in 1997. At publication, the Alaska Region policy was still in its final stages of development and expected to undergo further revision before finalization in late 2000. A recent copy can be obtained from any Forest Service district in Alaska, or on the Alaska Region web site at www.fs.fed.us/r10.

Key themes in the draft policy are its emphasis on protection of traditional non-commercial uses – a high priority for many Alaskan’s – and ecosystem values, while allowing for sustainable commercial use for economic diversification in Alaska. The regional policy development team has already spent 2 ½ years reaching out to tribes and the public and responding to issues and concerns. Much of the body and content of the policy is the formulation of strategies that address those concerns. Following are examples of public and tribal input from the comment period in spring of 1999:

Public Comments on SFP Draft Policy

- Opposes commercial use of traditional plants. (Kayaani Commission)
- Define a set area around a community where no commercial harvest is allowed, so each and every traditional site does not have to be documented. (Dolly Garza, SE Regional Subsistence Federal Advisory Council member)
- Supports policy, and emphasizes need for monitoring impacts of harvest activities and applying results. (Klukwan Inc.)
- Opposes prohibition of commercial sale of devil's club due to "cultural sensitivity." Sets a precedent for other species to be banned on the basis of the "ever-changing societal whims of political correctness." (Kristie Sherrodd, Sitka resident)
- Commercial harvest should not negatively impact Native/subsistence use. Opposes the concept of requiring personal use permits. Supports commercial use for cottage industry if important traditional use areas are reserved for subsistence and personal use. (Buck Lindekugel, Southeast Alaska Conservation Council)
- Recommends that traditional Native art be exempt from commercial permitting process. Suggested that educational use be not considered commercial, as with non-commercial research use. (Janice Chriswell, Steve Henrikson, Mary Lou King, Juneau residents)
- Concerns about pricing inconsistencies and potential barriers due to pricing. (Jay Larson, Girdwood Forest Industries)

Tribal Comments Received on the Draft Policy

- Concerned about impacts of commercial use on areas of traditional/subsistence use by the Tribe. Suggests a need for specific policy protecting traditional Native uses. Concerned about how Forest Service valuation of special forest products will impact traditional barter and trade, including issues of competition. Concerned about how Forest Service will prevent over harvesting of special forest products. (Kenaitze Indian Tribe)
- Opposes commercial use of subsistence resources. Concerned that tribal/personal use will be regulated in the future. Much concern about protecting the tribe's subsistence uses since they are "urban." Need assurance that the distribution of materials within large extended families will not be interfered with. Involve tribes in monitoring and enforcement. (Douglas Indian Association)
- Opposes commercial use of special forest products on the Tongass National Forest, because of objections to how the Forest Service has managed timber harvesting in the past. Offers list of 29 species (in addition to devil's club) that the tribe would like excluded from commercial harvest. Suggests excluding wetlands from commercial harvest areas due to ecosystem fragility. (Organized Village of Kake)
- Recommends that the Forest Service exclude indigenous special forest products from any commercial harvesting in their respective village areas and that no commercial harvest of indigenous special forest products be allowed until the Forest Service has conducted proper studies for each special forest product and the potential impact of commercial harvesting on the specific species, the environment, and subsistence uses. The same holds true for indigenous marine plants. Lists 30 terrestrial plants and 5 marine plants it recommends excluding from commercial harvest. (Central Council of Tlingit and Haida Indian Tribes of Alaska)
- Supports commercial use of special forest products only if the Forest Service has thoroughly assessed the habitat management for each specific plant. Recommends a list

of 27 plants to be excluded from commercial harvest. (Klawock Cooperative Association)

- Opposes commercial use of SFP, saying that “The commercialization of our plants without a better understanding of the biological impacts or how the region-wide policy will be tailored to our local concerns, cultural needs and traditional uses...makes it impossible for the Sitka Tribe to support the Draft Policy at this time.” Concerned about intellectual property rights of Alaska Natives. Encourages comanagement, including a tribal/FS monitoring program. Expresses need to study local harvest demands and sustainability of proposed harvest levels. (Sitka Tribe of Alaska)

Following is a sample list of species recommended for exclusion from commercial harvesting, this one from Central Council of Tlingit and Haida Indian Tribes of Alaska)

<i>Hudson's Bay tea (a.k.a. Labrador Tea)</i>	<i>Mountain turnips</i>
<i>Red cedar boughs</i>	<i>Spruce pitch and young spruce tips</i>
<i>Dwarf juniper</i>	<i>Yellow cloudberry</i>
<i>High bush cranberries</i>	<i>Low bush cranberries</i>
<i>Bog cranberries</i>	<i>Gray currant berries</i>
<i>Black currant berries</i>	<i>Rosehips</i>
<i>Crabapples</i>	<i>Nagoon berries</i>
<i>Salmonberries</i>	<i>Timbleberries</i>
<i>Elderberries</i>	<i>Wild strawberries</i>
<i>Wild raspberries</i>	<i>All varieties of blueberries</i>
<i>Red huckleberries</i>	<i>Chocolate lily or Indian rice</i>
<i>Hemlock bark, sap, or pitch</i>	<i>Wild celery</i>
<i>Nettles</i>	<i>Foxglove</i>
<i>Wild rhubarb</i>	<i>Crabapples</i>

The Alaska Region of the Forest Service has responded by developing a draft policy that does not require permits for personal or subsistence use of special forest products unless there is a specific local impact to be mitigated. Commercial use is allowed through a permitting process that includes environmental review and tribal and public scoping. It also establishes a priority ranking for types of SFP use in the Alaska Region. Special forest products resource use is prioritized (from highest to lowest) accordingly:

1. Subsistence use
2. Personal use
3. Non-commercial research and educational use
4. Commercial use (including research where the primary goal is development of a commercial product).

Although the Forest Service was unable to exclude all the various plants listed by tribes from commercial harvest, it does establish that because of forest wide cultural sensitivity concerns, commercial harvest of devil's club is not allowed on the Tongass National Forest. Commercial harvest of devil's club on the Chugach National Forest will be determined at the project level through appropriate NEPA analysis.

General Markets Update for Special Forest Products

Within the arena of special forest products, there are at least four (4) key categories that need to be explored. These are:

- Herbal Medicinals and Botanicals
- Foods from the Forest
- Florals and Evergreens
- Decoratives and Craft Woods

The following text provides a general markets update for each of these categories, highlighting the top market demand facts that underscore the reasons for the notable increase in SFP focus:

Herbal Medicinals/Botanicals

The end product value of herbal medicinals has increased dramatically. For example:

- In 1992 the herbal medicinal market was estimated at just under \$1 billion a year and was growing between 13%-15% per year. Today, it is a \$2 billion industry, with demand especially high throughout Europe and Japan. There is a significantly growing domestic market as well. Of the 25 top selling herbs in the US commerce, 50% are included in the 1400 plant species found and traded in the US.
- The estimated US retail sales of herbal dietary supplements had increased from \$500 million in 1992 to well over \$3.2 billion in 1996. In 1997, NBC News and **Prevention Magazine** published survey results of herb use in America. Survey results concluded that 60 million Americans use herbs, spending an average of \$54 per person annually. In 1998 the **Journal of the American Medical Association** published survey results concluding that the total sales of herbal products to American consumers reached \$5.1 billion, with herbs out-selling vitamins for the first time. Supplying these retailers, it is estimated that the total value of the raw materials (crude herbs, powders, bulk extracts, etc.) is approximately \$600 million.

At least 140 plant species are wild-harvested from American forests (including roots, barks, herbs [whole plant], and seed) that are used in the manufacture of herbal dietary supplement products. The U.S. Pharmacopoeia held its second conference on botanical standards in August 1998, prioritizing 21 botanicals for important monograph development. Of these, 62% originate in the US, with almost half being wild-crafted from American forests (vs. cultivated on agricultural lands).

A significant contributor to the increase in herbal medicinals is the growing acceptance of the use of alternative or complimentary medicines (which includes herbs) by mainstream medical providers:

- The Arizona Center for Health and Medicine offers both conventional and alternative medical treatment to patients. A 1998 poll of 300 Center patients showed that 95% were satisfied with the care they received, compared to 76% of patients in other medical centers who had only received conventional care. The cost of care for the Center had also dropped by 56%, and emergency room services were used less often. Arizona now requires insurance companies doing business in the state to cover alternative care.
- In 1997, California Blue Shield introduced an alternative health and wellness program for its 1.6 million members.

At least 26 highly accredited traditional medical schools in 13 states across the U.S. offer courses on alternative medicine including Harvard Medical School, Columbia University, and Stanford.

According to a 1997 survey conducted for **Prevention Magazine**, in 1998, herbs were one of the strongest-selling items in natural product stores, accounting for almost 40% of all store sales in the US.

The US market is only one of several with significant market areas for herbal products. A substantial export market exists for many of these products. The German market for herbal supplements is estimated at over \$8 billion per year - far larger than the rapidly expanding American markets. The alternative medicine market in Canada is experiencing double digit growth each year. In 1997, 42% of Canadians reported using alternative medicines and practices. In response to this consumer demand, Wal-Mart Canada in early 1999 announced it would create 50 full-time sections of herbs and sports supplements in its in-store pharmacies.

Foods

In 1995, there were less than 1 million pounds of matsutake mushrooms harvested from the PNW, but in 1997 in just an 8-week period 1.2 million pounds were harvested - providing approximately \$365,000 into the US Treasury.

In 1992, the wild edible mushroom industry's contribution to the economy of the PNW was estimated at \$41.1 million. In 1997, industry experts estimated the updated value for wild mushroom picking in Oregon alone to be \$50 million. Eastern Oregon pickers earn approximately \$10 million during harvest season; pickers in the Cascades will earn up to \$15 million for their matsutake harvest. Some mushroom types, like matsutakes, have been known to sell for more than \$600 per pound.

Markets for mushrooms are more focused on Asia and Europe. It is not uncommon to have as much as 30 tons of morels being shipped to Europe each day during the height of mushroom season. Europe consumes three times the total volume of wild mushrooms as consumed in the US. Most of the morels harvested in the PNW will be shipped to Europe within 72 hours of harvesting.

The quality of mushrooms harvested in the PNW is well known. Brokers who sell to The White House even draw from PNW resources.

Florals, Evergreens, etc.

At the processor level in 1989, the economic contribution of the florals and Christmas greens industry was estimated at \$128.5 million and over 10,000 jobs to the economy of western Oregon, western Washington, and southwestern British Columbia. Of the \$128 million, almost \$50 million was paid directly to harvesters for raw product. In 1994, the value for just the PNW (OR, WA, and ID) was estimated at \$107 million. 1997 data for the PNW suggests that SFP sales at the wholesale level reached \$180 million.

In tracking the SFP sales from BLM forestlands in Oregon and Washington during 1993-1994, it was discovered that significant increases in sales activity were occurring (based on volume extracted). For example, tree bough volume extracted from BLM lands increased by almost 130% during that period of time. Moss extraction increased by over 600%, and beach grass by over 2,000%.

The herbal market is not the only SFP product arena where substantial export markets exist. It is estimated that over 70% of evergreen floral products (salal, ferns, evergreen huckleberry, etc.) are sent to markets outside the US.

Moss and lichens used in the floral industry are harvested extensively from public forestlands in the US and exported to worldwide markets.

Floral sales in the US are growing by \$1 billion per year (equaling almost \$15 billion in sales in 1998). Floral sales per person reached a record \$55.56, 10% higher than just four years ago. The continued growth in the markets has brought new corporate players to the table including Sunkist Growers and Dole Food Company.

In contrast to public perception, 53% of all florals and greens supply sold in the US markets comes from domestic (vs. imported) supplies.

Aromatherapy products, made from cones, forest florals, and botanicals found in the forest, are the top-ranking "perfect gifts" for US consumers in 1999 - besting flowers, CDs, gourmet foods, and house wares - this according to **Giftware Business** magazine.

The demand for tree twigs and limbs, both with and without foliage, in the domestic and international floral markets is growing. Sold as both a fresh and preserved (foliated) product, the volumes of material extracted from the forest are not small, often being helicopter-lifted from the forests. As an example, permit sales data for 1996 from 8 national forests in Oregon and Washington revealed that almost 700,000 pounds of branches were harvested during that period of time.

The use of small (1"-3") tree limbs in the artificial tree top industry is no small matter. Artificial trees for the home and office are in demand and are sold throughout US and global markets. Manufactured from a variety of tree specie limbs and silk leaf/flower add-ons, market demand in the US is growing by 25% annually. In 1992, projected increases in the sales of "permanent" trees were 65% in the US, with sales values at \$112 million; exceeding the sales value of "permanent" foliage at \$109 million.

Collection of boughs has continued to increase, particularly in the Northwest US. Yet, demand exceeds supply, especially in some certain targeted species such as western redcedar and noble fir. In 1995, over 20 million pounds of boughs were harvested in the Northwest alone. Today, bough harvesting and sales from public and private forestlands across the US is big business - often providing forest floral wholesalers substantial profit margins that out-perform other SFP product income generators.

Decoratives, Craft Woods

According to a July 1999 informal survey conducted by *The Crafts Report*, a snapshot of US spiritual artists (such as native Americans) performance in sales of their wood and non-wood products reveals the following:

- Average annual income is \$58,300, with ranges from \$11,000/yr. to \$300,000/yr.
- On the average, approximately \$21,900 per year is spent on the purchase of wood and other materials to create their artwork.
- These artists attend between 4 to 8 art shows per year displaying their works. Their average sales per show are approximately \$10,500, with ranges from \$800 to \$20,000.

The new trend in custom log home production based on customer demand is the use of standing dead timber and character (deformed) logs, both typically left to rot on forest floors. Custom log home manufacturers who offer these unique material factors for home production often garner 30% increases in home sales.

Craft show performances for woodworkers relative to attendance levels and sales are good indicators of the increasing markets for wood crafts throughout the US. Here's how it looks:

- a) Floor space for the 1999 Woodworking, Machinery and Furnishings Supply Fair (WWF) held in Anaheim, California increased from 324,000 sq. ft. in 1997 to 340,000 sq. ft. in 1999. Over 20,000 attendees are expected - about a 10% increase over 1997 levels.
- b) The Carolinas Woodworking and Furniture Supply Show, which began in 1986 with 65 exhibitors, broke all attendance records this year with more than 8,000 people attending their show. Among attendees were visitors from 36 different states and eight different countries.
- c) The three-year-old Fort Washington Woodworking Show in Pennsylvania saw attendance and sales increases in 1998. The show drew 23,000 attendees - up from 17,000 in 1997, and 16,000 in its first year. Total sales were at \$1.2 million - up from \$950,000 in 1997. The average exhibitor sales were \$3,276, up from \$2,659 in 1998.

- d) Boston's Crafts at the Castle registered a 25% increase in attendance; the Designer Arts show in New York doubled its attendee figures; and the turnout at the Michigan Guild of Artists was also up 25%.

American Furniture Manufacturers Association experts expect 1999 furniture sales to increase by 4% over 1998 sales. But consumer preference in wood species used for furniture pieces is changing. Although the standards, such as cherry, red oak, and pine comprised about 45% of the total furniture pieces on display during the Association's 1999 International Market held in High Point, birch and alder were two of only three of the top ten wood species demonstrating percentage increases in furniture application. Rubberwood was the third species.

Specific Markets Overview for Alaskan Special Forest Products

With the exception of Southcentral Alaska, the remainder of Alaska territories have only baseline information regarding SFP evidenced in their forests. Some USDA FS district offices in Alaska have attempted to identify and catalogue their SFP. For example, the West Copper River Delta region has developed a pocket-sized guide to SFP in their national forest.

There are 20 separate major ecosystem regions throughout Alaska¹. Each of those regions has SFPs: decorative woods, low shrubs, herbs/medicinals, and mosses and lichens - many with commercial value in the domestic and international markets. (It should be noted that very little information exists which documents volume of these SFP in total, or even on an ecosystem basis.) [A listing of SFP per ecosystem region in Alaska is available from the web site of the Pacific Northwest Research Station: <http://www.fs.fed.us/pnw/pubs/qtr500>.]

Although the funding limitations for this contract did not allow for any direct buyer interviews to be conducted, Mater Engineering has recently completed other SFP markets research projects for public entities in the PNW within the last two years resulting in findings that can be directly applied to consideration of current market demand for Alaska SFP. The following text provides product market highlights for some of targeted Alaskan SFPs.

Herbal Medicinals and Botanicals

Since both the industry and market within Alaska are very small at this time, national and global trends for a selection of Alaskan species are provided to show market potential. Actual Alaskan markets may differ significantly due to local conditions, including distance from the world market, and substantial potential for value added sales to the extensive tourist market within the region.

a) *Vaccinium* (blueberry, red huckleberry) [*spec. parvifolium*]

Specific Trends:

- 1) A preliminary U.S. government study shows that blueberries possess greater antioxidant activity than any of the forty fruits and vegetables tested. In fact, a little less than two-thirds of a cup of blueberries showed more antioxidant capacity than the generally recommended daily doses of vitamins E or C, according to the study, which was reported in a federal newsletter earlier this year.

¹ Hulten, Eric 1968. Flora of Alaska and neighboring territories; a manual of the vascular plants. Stanford University Press, Stanford, CA 1008 p.

Antioxidants defend the body against cell damage caused by oxygen free radicals that can lead to cancer, heart disease, and other illnesses.

In the study, blueberries were followed in antioxidant strength by Concord grape juice, strawberries, kale, and spinach.

The study was conducted by the Agricultural Research Service, a division of the U.S. Department of Agriculture, and reported in the USDA's January 1997 issue of *Food and Nutrition Research Briefs*. Animal studies are now under way to determine if the test-tube results will carry over to humans.

- 2) During World War II, pilots in the British Royal Air Force reported improved night vision after eating bilberry jam. (Bilberry is a species of blueberry not found in Alaska, but with similar properties.) During the 1960s, Italian and French scientists investigated these reports to learn whether bilberries could improve vision. As a result, preparations of bilberry fruit are used in Europe today to enhance poor microcirculation and thus improve eye ailments such as night blindness and diabetic retinopathy. Research shows that pigments in bilberry called anthocyanosides strengthen capillaries by protecting them from free radical damage and stimulating the formation of healthy connective tissue.

Market Demand (based on existing data)

According to 1998 buyers interviews conducted by Mater Engineering throughout US and Canada:

- o Almost 70% of buyers interviewed were looking for new/additional sources of supply.
- o A majority of those interested in new supply sources were particularly interested in bilberry leaf and berry.
- o Several stated interest for blueberry and huckleberry leaf.
- o Volumes quoted for: bilberry leaf (10-20 tons per year); bilberry berry (5-10 tons per year); blueberry leaf (3,000-4,000 lbs. per year).
- o Prices quoted for: blueberry (\$3/lb. dry); bilberry leaf (\$3.20/kilo); bilberry extract (\$2.50/kilo).
- o Huckleberry leaf demand was especially high in the certified organic markets.

b) Nettles

Specific Trends

- 1) Today, nettles are widely used in alternative medicines. Because of their diuretic action - once ingested, they encourage the flushing of the system - they are often included in cleansing diets.
- 2) In Germany, a preparation of nettle roots is approved by authorities to relieve urinary problems associated with benign prostatic hyperplasia.

Market Demand (based on existing data)

Current mail-order catalogue prices for nettle products are as follows:

- o Leaf: \$12 per pound
- o Herb: \$10 per pound
- o Root: \$17 per pound

Specific buyer interviews are required to ascertain current and projected market demand.

c) Foxglove

Foxglove is a non-native species, being originally introduced to the US from Europe. It is commonly found in disturbed locations in human-inhabited areas. Extreme caution should be used with this plant, since the toxins within it can cause poisoning and even death.

Specific Trends

Foxglove contains substances that are among the most potent heart treatment drugs used today. From the late 1800's to 1930, researchers more precisely isolated glycosides such as digitoxin and digoxin that are now manufactured into prescribed drugs.

Market Demand (based on existing data)

Current mail-order catalogue prices for foxglove are as follows:

- o Single plants: \$4.49 each
- o 3-6 plants: \$4.25 each
- o 7 or more plants: \$3.95 each

Specific buyer interviews are required to ascertain current and projected market demand.

d) Horsetail

Specific Trends

Besides being used as an abrasive, horsetail has been an important remedy in folk medicine. A poultice of crushed sterile stems has been applied to wounds to stop bleeding. A liquid extract made by boiling the stems has been used as a mouthwash for oral infections, and there is evidence that horsetail has some antibiotic properties.

Market Demand (based on existing data)

Current mail-order catalogue price for horsetail is \$12 per pound. Specific buyer interviews are required to ascertain current and projected market demand.

e) Willow

Specific Trends

White willow preparations, such as teas brewed from the leaves or inner bark, serve as home remedies for fevers and chills, rheumatic pains, and digestive problems. Externally they work as a disinfectant and astringent on cuts and sores. Young, pliable shoots are good for weaving baskets and wicker furniture. Willow charcoal has been used for charcoal artist's pencils.

Market Demand (based on existing data)

Current mail-order catalogue price for willow bark is \$11 per pound. Specific buyer interviews are required to ascertain current and projected market demand.

f) Elderberries

Specific Trends

American herbalists combine the dried flowers of *Sambucus canadensis* with peppermint to treat fevers and colds (the Alaskan species is *S. racemosa*). Current interest in this species stems from the research of Israeli scientist Dr. Madeleine Mumcuoglu, who, along with her colleagues at Hadassah University Medical Center in Jerusalem, developed an elderberry extract standardized to contain three flavonoids. In a 1993 clinical study performed during a flu outbreak in Israel, she found that the extract reduces the severity and duration of flu symptoms compared to a placebo. Apparently, the extract's compounds inhibit the ability of the flu virus to enter cells, and thus disarm the virus's ability to infect.

The Germans prescribe elderberry flower to induce sweating in order to treat fevers and increase bronchial secretions associated with full-blown colds.

Market Demand (based on existing data)

Current mail-order catalogue prices for elderberry products are as follows:

- o Berries: \$16 per pound
- o Flowers: \$20 per pound

Specific buyer interviews are required to ascertain current and projected market demand.

g) Valerian

Specific Trends

For centuries the powdered rhizomes, or rootstock, and roots of the garden heliotrope have been used as a sedative for "nervous" disorders and as an antispasmodic for intestinal pains. Pharmacological studies have validated these uses.

Market Demand (based on existing data)

During 1998, valerian sales for herbal use experienced over 35% growth in sales. Total US sales were estimated at \$8 million.

Current mail-order catalogue prices for valerian products are as follows:

- o Root: \$21 per pound
- o Root Powder: \$22 per pound

Specific buyer interviews are required to ascertain current and projected market demand.

h) Balsam Poplar (*populus balsamifera*, *P. trichocarpa*)

Specific Trends

- 1) Young poplar buds in the spring are often covered with a resinous varnish with a balsamic aroma. These aromatic resins are used in the herbal product sold as "Balm of Gilead".
- 2) Germany's national Commission E, which advises its citizens on the safety and effectiveness of pharmaceuticals, recognizes the use of poplar buds for superficial skin injuries, external hemorrhoids, frostbite, and sunburn. Britons have condoned poplar bud use for dealing with these same ailments. Multiple species of poplars are used interchangeably for these purposes.

Market Demand (based on existing data)

Unknown. Specific buyer markets research required.

i) Crabapple

Specific Trends

The skin of crabapples is rich in pectin, which is known to remove toxic heavy metals such as lead, mercury, arsenic, and copper from the body; to prevent intestinal damage and constipation associated with a low-fiber diet; and to effectively reduce blood cholesterol. Eating crabapples can also help increase energy efficiency and slow the rise of blood sugar, both of which can benefit hypoglycemics and diabetics.

Market Demand (based on existing data)

Unknown. Specific buyer markets research required.

j) Devil's Club

Specific Trends

Tea made from the inner bark is taken by many people today for diabetes^{2,3}. The roots, especially the greenish inner bark, are the major plant parts used in medicinals today. This plant is also used to help deal with numerous other ailments including arthritis, ulcers, and digestive tract ailments.

Market Demand (based on existing data)

According to 1998 buyers interviews conducted by Mater Engineering throughout the US and Canada:

- o Demand from certified organic markets are especially good;
- o 50% of the buyers interviewed are looking for additional supply sources. Demand exceeds supply;
- o Prices quoted ranged from \$22/lb. up to \$85/lb. for dry root bark;
- o Buyers currently looking for US supply source of Devil's Club essential oil. They currently are buying from France.

k) Rosehips

Specific Trends

The fruit (rosehip) of this plant is used in potpourri manufacturing and in tea production. The plant purportedly promotes blood circulation, and is also used for the treatment of other ailments such as stomachaches.

Market Demand (based on existing data)

According to 1998 buyers interviews conducted by Mater Engineering throughout the US and Canada:

- o 55% of buyers interviewed were looking for a new supply source;
- o Interest in part of plant did vary. Some buyers only wanted the hip (includes seeds); some wanted both hip and leaf; some wanted only the fruit shells (no seeds);
- o Biggest competition is from Chile. Buyers desire a domestic supply;
- o Volumes quoted: 1 ton/yr. (hip only); 2,000-3,000 lbs./yr. (hip and leaves);
- o Prices quoted: \$2-\$2.50/lb. dry (shells, not seeds); \$13/lb. seed oil.
- o Current mail-order catalogue price for rosehips is \$11 per pound. Specific buyer interviews are required to ascertain current and projected market demand.

l) Bearberry, Kinnickinnick

Specific Trends

Because of their reputed diuretic and antiseptic action, the leaves have been used chiefly to treat kidney and bladder infections. Pharmacological studies suggest that the plant may have urinary antiseptic properties, but its reported diuretic effects are questionable.

² Moore, Michael; *Medicinal Plants of the Pacific West*; Red Crane books: Santa Fe, 1993

³ Winston, David AGH; *Eclectic and Specific Botanical Protocols*; *The Protocol Journal of Botanical Medicine*; Winter 1996

Market Demand (based on existing data)

Unknown. Specific buyer markets research required.

m) Yarrow

Specific Trends

An infusion of the leaves and flower tops is consumed to reduce fever and as a mild tonic to stimulate the appetite. A poultice made for the whole plant or a powder of ground-up dried yarrow tops is applied to cuts and wounds. Modern researchers find good experimental evidence for yarrow's use as an anti-inflammatory agent and possibly as an astringent.

Market Demand (based on existing data)

Current mail-order catalogue prices for yarrow flower and herb are \$18 per pound. Specific buyer interviews are required to ascertain current and projected market demand.

n) Labrador Tea

Specific Trends

Tea made from the leaves is ingested for colds and sore throats. It is said to be relaxing and, for some people, to cause drowsiness, possibly due to the toxic glycosides present in the leaves.

Market Demand (based on existing data)

Unknown. Specific buyer markets research required.

Foods

a) Huckleberries (*vaccinium parvifolium*)

According to 1998 buyers interviews conducted by Mater Engineering throughout the US and Canada:

- o Small percentage of buyers interested in additional supply source, even though 90% interviewed do buy.
- o Most buyers indicated that demand was steady but not growing;
- o Prices quoted: \$4-\$6/lb. (final shipper)
- o Limited interest in the organic foods market as well. Buyers indicated the product does not ship well.
- o Prices quoted for organic markets: \$14-\$18 per flat.

b) Nettles

- 1) In various studies, dried nettles have been shown to contain between 25 and 42 percent protein - making them a top source of green vegetable protein. They are also rich in calcium, magnesium, and zinc, and contain high levels of potassium, selenium, and other minerals, as well as vitamins B, C, and A.
- 2) Young nettle shoots are an excellent cooked vegetable when washed and then steamed in water left clinging to the leaves. Europeans add nettles to soups and casseroles and make them into fritters, beers, wines, puddings, and teas. They even make stinging nettle cheese.

c) Other species potential

Other noted Alaskan species have marketplace potential. These include honey produced from Fireweed, jams, jellies, syrups, etc. produced from Salmonberries, Thimbleberries, and Raspberries; and extract from Wintergreen.

Florals and Evergreens

a) Rosehips

According to 1998 buyers interviews conducted by Mater Engineering throughout the US and Canada:

- o Demand appears to be minimal. They are mostly used in the fall and readily available from local sources.
- o Knud Nielsen recently acquired a potpourri manufacturing facility. They may have a need for rosehips but volumes are very small. Most potpourri products are imported.
- o Another buyer introduced a new wreath line with rosehips this last year. Lukewarm reception at world trade show.
- o One (1) buyer indicated an interest in buying dried rosehips. Price quoted was \$.05/dried head.

b) Tree tops, Twigs, Branches, Poles (Birch, Alder, Aspen); Mosses; Bark

According to 1998 buyers interviews conducted by Mater Engineering throughout the US and Canada:

General Interview Results

- o Birch has a ready market.
- o Almost 65% of those interviewed were interested in an Alder product. Interested buyers were located in Oregon, Indiana, Michigan, Alabama, Colorado, California, and Texas.
- o Many of those interviewed were also interested in an Aspen product. Possible interested buyers were located in Indiana, Michigan, Alabama, and California.

Sizes Required

- Poles, Forks, Multi-branch:
 - o Lengths range from 6-12 ft., and some up to 14 ft. long.
 - o Base diameters varied, depending on contact's uses; 3/4" up to 5".
 - o Prices quoted: \$1.50 - \$5.75 from sizes ranging from 6-12 ft., \$1.00 extra for each foot over 12 ft.
 - o Bundling varied: 6,000/truckload, 3-4 branches/bundle, 10 trunks/bundle
- Branches:
 - o Lengths ranged from 2-4 ft.
 - o Base diameter of 3/8" - 1"
 - o Prices quoted: \$.03 - \$.06/per branch/twig
 - o Bundling varied: 10-20 twigs/bundle and 100 stems/bundle

Purchase Requirements Indicated

- Several stated the branches need to be clean, foliage removed.
- Some buy poles with side branches and others need the side branches removed.
- Some preferred fresh, others dry.
- A few need the branches fumigated, or fumigate the branches themselves.
- One contact needs the poles delivered within a day of being harvested (Silkcraft of Oregon).

In 1993, Mater Engineering undertook a SFP markets evaluation for Weyerhaeuser Canada (Saskatchewan). At that time, direct interviews with over 160 buyers throughout North America revealed that minor products in Saskatchewan were far from equilibrium in terms of supply and demand (See Table 1). The best product opportunities for Saskatchewan species had immediate income opportunity of more than US\$1.5 million based on the baseline interviews conducted. Annual usage of peat and sheet moss was 330,000 pounds, but the immediate additional demand was another 181,000 pounds, which translated into a current lost income of about \$223,000. For branches with no foliage, there was an unfilled demand of 1.4 million branches,

with an income loss of \$224,000, and for preserved branches with foliage, a 455,000- branch demand and an income loss of \$414,000. Buyers also have bought 41,600 tree tops (poles only) for \$52,000. And Hong Kong would have bought 62,000 square feet of birch bark flats (flattened birch bark cut into 2 feet by 2 feet square to be and used in the international floral industry for basket making).

Table 1: Product Opportunities for Saskatchewan Species Based on Usage, Demand, and Potential Income in U.S. Dollars (1993)

Product	Sales Unit	Annual Usage (1000's)	Additional Demand (1000's)	Potential Additional Income (1000's \$)
Mosses	Pounds	330.2	181.0	222.65
Branches (no foliage)	Branches	2,4000.0	1,400.0	224.00
Branches (w/foliage)	Branches	617.4	455.0	413.64
Tree Tops (poles only)	Tops	280.1	41.6	52.00
Birch Bark Flats	Sq. Ft.	Unknown	62,000 ¹	Unknown

¹Plus an additional 2,776 cases of bark

c) Boughs

According to buyers and harvesters interviews conducted by Mater Engineering throughout Oregon and Washington in 1999, there is an unmet demand for boughs, especially from western redcedar and noble fir. Spruce boughs are also heavily harvested for domestic and international markets. Concerns over the lack of access to new supplies of boughs have prompted harvesters to notify the USDA FS of their issues. Harvesters state that if new supplies do not become available in the new future, within 10 years the bough industry in the PNW will be gone. (Note: harvesting from tree plantations is also being done, but these are low elevation plantations. The best quality boughs tend to be harvested from higher elevations.)

Harvesters and processors have also requested that additional plantings of western redcedar into public forestlands be implemented to address immediate and future market demand for western redcedar boughs.

d) Other species potential

In prior markets research studies conducted by Mater Engineering within the last 3 years, market demand in the floral industry has been documented for other Alaskan species:

- o Yarrow is used as both a fresh and dried floral product;
- o Salal is an Alaska floral green with real potential and outside buyers have already been inquiring.
- o Horsetail has growing market demand as a floral product as well as a product used in the floral container manufacturing industry;
- o Club moss has just recently been introduced into the floral markets in the US, although it has a long market history in other countries (such as Europe and Asia); and
- o Red-osier dogwood's limbs and branches have experienced consistent market demand in the floral industry throughout North America and Asia.

Decorative/Craft Woods

Based on prior research⁴ conducted by Mater Engineering in 1998 for the Alaskan Copper River region, SFP wood product market potential can be separated into three (3) key areas:

- o Beetle-killed spruce for the log home industry;
- o Products made from "characterwood"; and
- o Products made for the burgeoning mail-order catalog industry.

The following text details the findings from that 1998 report:

a) Beetle-killed spruce for the log home industry

Many of species found in Alaska are particularly adapted for product development directed at the log home and log home accessories industries. These same accessory products are well suited for the mail-order product distribution channels referenced earlier.

Key market factors that support this product area for strong Alaskan consideration include:

- 1) 6% of all custom-built homes in the U.S. today are log homes.
- 2) Log homes are the fastest-growing portion of the custom home market in the U.S. with sales increasing about 6% annually.
- 3) Almost 40% of log home producers in the U.S. are custom homebuilders (handcrafters).
- 4) Over 90% of all log homes constructed have custom-designed features which often include characterwood application.
- 5) 80% of log home purchases are primary homes.
- 6) Standing-dead timber use in log home construction and log home amenities is actually recommended by architects and preferred by many log home producers.

The Alaskan log home industry (and in-state market) is relatively small and unable to consume the quantity of good house logs made available by the spruce bark beetle epidemic. Numerous log home companies in the lower 48 states already use dead-standing timber for house logs, especially species of lodgepole pine, Engelmann spruce, and Douglas fir. Some companies prefer it and use dead timber exclusively because it has advantages over green logs for use as house logs. Green logs require air drying down to a maximum of 15% moisture content or less, and air drying logs can take 6 to 18 months, but standing-dead timber can often have as low as 9% moisture content.

More importantly, the log and timber frame home industry is growing and the prices of these homes are increasing. Log homes have moved upscale, becoming much larger and much more sophisticated than rustic cabins. There are many new log home styles made to fit any taste, sometimes approaching art!

The log home industry has subsequently spawned new businesses that specialize in accessories for log homes: rustic furniture, wood flooring, hot tubs, spiral staircases, kitchen cabinets, and custom windows and doors, to name a few. All of these use wood, and much of this wood is preferred to have "character"--an interesting form or color that makes it unique. Sometimes customers will pay up to 30% more for character logs, yet these may be the very same logs that are rejected by graders in Alaska as being substandard for commodity-type uses such as lumber.

⁴ "Lincoln County Grower/Gatherer Markets for the Economic Development alliance of Lincoln County, Oregon"; researched and published in July 1998 by Mater Engineering, Ltd.

For this 1998 project, Mater Engineering conducted direct interviews with over fourteen (14) log home producers in the six-state area of Alaska, Oregon, Washington, Idaho, Texas, and Montana. The majority of companies interviewed either currently used or expressed a strong interest in using beetle-killed spruce from Alaska for their product offering (see *Figure 1*). These companies stated the following reasons for preferring dead-standing timber for production of their log homes:

- o it is stable and does not require periodic caulking
- o it has minimal shrinkage and settles less
- o it weighs less, which decreases shipping costs
- o building with it results in a tight, energy efficient home
- o many customers appreciate the use of material that doesn't harm the living forest

Disadvantages were also noted by producers:

- o must be harvested within 1 to 3 years to avoid rot
- o needs more careful handling to avoid breakages
- o needs dry storage to reduce further rot
- o cracks collect dirt and gravel which may damage saws and equipment

Companies interviewed for this project also indicated other factors that further support direct focus on log homes and log home products:

- 1) For handcrafter units, producers stated that their customers prefer heavy character logs for posts, beams, walls, stairs, and other interior features.
- 2) Customers typically are charged up to an additional 30% for character material in the home.
- 3) The type of character preferred by customers includes:
 - o weather checks
 - o knots
 - o sweep
 - o unusual forms/shapes
 - o root bases as posts for staircase/deck railings
- 4) Some producers indicated they work exclusively with standing-dead timber to satisfy consumer demand for environmentally-correct product.
- 5) Continuous resource supply is a key concern for region-specific log home producers.

Figure 1: Interest in House Logs From Standing-Dead Pine and Spruce Timber - 1998			
State	Company	Price (\$/ MBF)	Distance pulled
Oregon	Oregon Log Home Co.	\$500 to \$800	400 mile radius
	Homestead Log Homes, Inc.	\$470 to \$660	300 mile radius
	Place in the Sun Log Homes	no price given	500 to 600 miles
Washington	Ark II, Inc.	\$500 to \$675	400 to 500 miles
	Cascade Log Homes	\$800 to \$1000	300 mile radius
Idaho	Edgewood Fine Log Structures*♥	\$750 to \$810	250 mile radius
	Sun Valley Log Homes *	\$1000 to \$1135	600+ mile radius
	Aero Log Homes *	no price given	350 miles
Montana	Alpine Log Homes *	\$1250 to \$1490	600+ mile radius
	Garland Homes ** ♥	\$1200 to \$1405	600 mile radius
	Rocky Mountain Log Homes * ♥	\$400 to \$500	500 to 600 miles
Texas	Satterwhite Log Homes * ★	price not given	over 1000 miles
Alaska	Superior Products, Inc. *	price not given	350 miles

- * These companies expressed an interest in using beetle-killed white spruce from Alaska
- ** This company expressed an interest in setting up a joint venture to process milled house logs in Alaska, using their own equipment
- ★ This company is very interested in purchasing cants from standing-dead timber: 6 x 6, 6 x 8, and 8 x 8, in random lengths from 8 feet to 16 feet
- ♥ These companies were interested in certification, or had customers who preferred the purchase of standing-dead timber for environmental reasons

- 6) Producers indicated a solid interest in resource supply from Alaska. One producer from Montana even indicated an interest in establishing a joint-venture operation in Alaska.

As noted in Figure 1, the value of good marketing research can make a significant difference on product success or failure. For house logs, as an example, quoted price ranges varied dramatically between producers interviewed: from as low as \$400/MBF to almost \$1500/MBF. Differences in transportation distance from the resource supply to the producer also ranged significantly from only 250 miles to over 1,000 miles. It is also important to note those companies which have an interest in not only purchasing logs from Alaska, but also value-added cants for their log home products.

Characteristics of ideal house logs noted by product producers interviewed for this project include:

- o rot-free
- o drying checks not over 1/4 inch (for 8" dia. logs) to 1/2 inch (for 15" dia. logs)
- o straight, with little taper, no more than 2 inches in 16 feet of length
- o 7 inches or larger diameter at the small end
- o overall diameter of 8 inches to 16 inches
- o grain spirality less than one full turn in 16 feet of length

- o minimum length of 8 feet (12 feet is preferred), maximum of 40 feet (for shipping)
- o moisture content below 15%

In discussion with representatives of the International Log Home Shows in Kamloops, British Columbia, Mater Engineering learned that 1998 customer surveys taken at the annual show revealed the following amenity choices for log home purchasers:

- 1) Handcrafted, custom log home styles are the most preferred choices by purchasers of log homes.
- 2) Circular staircases have become very popular, with wooden stairs running neck-and-neck with cast iron staircase systems.
- 3) Wooden windows and doors from high-end companies are the preference among buyers.
- 4) Wood flooring continues to be a strong preference among buyers, with both narrow strip hardwood floors and wide plank softwood floors. There is a trend towards wide planks because of the antique look.
- 5) Rustic-looking softwood furniture is a "very strong seller", as are collections of antique reproduction furniture with rustic styles like cedar chests, blanket boxes, quilt racks, etc. These kinds of furnishings are also very popular with many buyers other than log home owners. People often attend log home shows to purchase the furniture, not the homes.
- 6) Both spas and saunas are popular with log home buyers and builders alike.
- 7) Wood carvings, especially of wildlife, are very popular decorative amenities on staircase posts, mantels, columns, in doorways, on verandas, etc. Chandeliers are also popular, as are antique reproduction rustic lighting like copper lampshades with pinholes.
- 8) The #1 top priority amenity space in log homes stated by home buyers is the fireplace area.

Other trends worth noting include data from a recent survey released by the National Home Builders National Research Center which shows at least one real surprise for the top rated hobbies of log home owners (in order of priority).

o Personal Computers	o Camping
o Fishing	o Hunting
o Skiing	o Boating
o Golfing	o Bowling
o Tennis	

All these trends and survey results point to strong product development opportunities for Alaskan region species in the log home and home accessories arenas. Other suggested product development options worth considering included:

- o Window "dressings" such as architectural millwork, limb drape rods, highlight/sky-light accents.
- o Prefab. sunrooms & garden sheds
- o Wine holder units
- o CD storage units
- o Shoe storage units
- o Jacuzzi amenities
- o Home office furniture
- o Craft/collectible work stations & storage units

b) Products made from "characterwood"

Concern over the quality of timber resource likely to be harvested from Alaska is high. Undesirable characteristics such as mineral stain, fungal "phase" lines, beetle-kill material, heart rot, large knots, and other traditional defect continue to hamper industry's ability to view value-added processing with a higher degree of confidence. But traditional views, based on market demand, are changing. Although viewed as wood "defect" by those traditionally schooled in the wood products industry, the natural character of wood is now being incorporated into value-added products to service worldwide consumer demand for this type of look. At no time has the visible use of "characterwood" in product development been more evident - especially in furniture manufacturing. Based on recent (1996) research conducted by wood scientists at Virginia Tech and University of Kentucky, the use for characterwood in product development can be broken into traditional and non-traditional character mark categories:

Traditional character marks

- o sound knots (1" diameter or less)
- o small holes (pin holes; wormholes)
- o small pitch/gum pockets
- o mineral streak
- o mineral or sap stain
- o grain and color variations

Non-Traditional character marks

- o unsound knots
- o large knots (> 1" diameter)
- o bark pockets
- o wane
- o split
- o large wormholes
- o insect tunneling
- o short/shallow checks

Although the study concentrated on mill yield of characterwood rather than determining actual market demand for characterwood, the researchers determined that characterwood acceptance in furniture should lead to a shift in the relative prices of different lumber grades. This would make it economically feasible for sawmills to cut additional boards from the center cants.

The researchers determined that each 1% increase in rough mill yield that occurs industry wide would reduce timber demand (hardwood focused on for this study) by approximately .2%. On a per-mill basis, the increase in yield is dramatic. The researchers undertook on-site testing of different cutting patterns in sawmills that would accommodate characterwood marks in dimension production. Results of the testing illustrated that allowing for character marks in furniture dimension parts increases yield significantly:

- 1) Allowing for character marks up to 2-inches in diameter on both faces of dimension parts increases the yield 13.8% for 2A Common lumber and 6.1% for 1 Common lumber.
- 2) If 2-inch character marks are only allowed on one face with the other face entirely clear, the yield increase is 6.5% for all 2A Common lumber and 3.2% for 1 Common lumber.
- 3) If character marks are limited to 1-inch diameter and allowed on both faces, the yield increase for 2A Common is 7.8% and 3.3% for 1 Common.
- 4) If 1-inch character marks are only allowed on one face with the other face entirely clear, the yield increases are 3.9% and 1.9%, respectively.

Figure 2, illustrates the traditional and non-traditional character found in Alaskan species which are used as characterwood in key value-added wood products such as furniture and log homes.

Since no published market research evaluating the use of characterwood in product development currently exists, for this 1998 project Mater Engineering evaluated the U.S. high-end catalog market and general U.S. wood product producer market for characterwood use in products manufactured and sold to U.S. consumers. Results of these evaluations are detailed below.

High-End Catalog Market for Characterwood Products

Twenty leading catalogs offering higher-priced furniture pieces were evaluated. The catalogs were selected based on their widespread market distribution and their wide variety of product types and styles offered to U.S. consumers. Examples of catalogs surveyed included Gump's, Bloomingdale's, Pottery Barn, Crate and Barrel, Sugar Hill, Horchow Home, and Sundance. The purpose of the product analysis was to determine the following:

- 1) How many catalogs offer furniture pieces with characterwood as a stated benefit in the product text. Product text in catalogs is an excellent indicator of consumer preferences in product selections. Furniture pieces offered to consumers with text that describes the attractive use of knotty wood or wormwood are extremely important indicators of consumer preferences to wood product producers.

Figure 2: Traditional and Non-Traditional Characterwood in Furniture and Log Home Offerings		
Types of Character	Character in Alaskan Woods (Beetle-killed Spruce, Birch, Aspen)	
Traditional:	Used in Furniture	Used in Log Homes
o Small/Sound Knots	☺	☺
o Small Holes	☺	☺
o Grain and Color Variations	☺	☺
o Pitch/Gum Pockets		
o Mineral/Sap Stain	☺	☺
Non-Traditional:		
o Unsound Knots	☺	☺
o Large Knots	☺	☺
o Short/Shallow Checks	☺	☺
o Large Wormholes	☺	☺
o Insect Tunneling	☺	☺
o Spalty Wood	☺	☺
o Splits/Weatherchecks	☺	☺
o Wane		
o Bark Pockets		
o Unusual Forms and Shapes	☺	☺

- 2) What types of traditional and non-traditional wood characteristics were observed in furniture product offering photos in the catalogs? Furniture pieces offering the attractive use of wormwood may also have other characteristics noteworthy to the wood product producer.
- 3) How many catalogs offered furniture products with stated finishes imitating characterwood. In order for product manufacturers to offer furniture pieces with consistent characterwood markings throughout the piece, distressing of the wood is often accomplished during in-line

production. As with the actual use of characterwood, it is important to note how many catalogs refer to the unique finishes that may be employed in product development - again as a key indicator of consumer preference.

- 4) How many catalogs offered furniture pieces illustrating contemporary painted furniture. This is important when considering the introduction of lesser known species use, as well as characterwood use, in product offerings.

Figure 3, attached, illustrates that a significant volume of the catalogs analyzed for this project actually stated the use of characterwood in their product offering text. Over 65% of the surveyed catalogs employed phrases such as "knotty wood", "rough-sawn wood", "seasoned or rustic wood", "burly wood", "figured wood", "wormwood", "checked wood", "distressed wood", and weather-aged wood", to describe the unique attributes of the furniture piece being offered to the consumer. For example, Blue River Trading Company catalog offers an "antique pine and wormwood desk that is more than a piece of furniture; it's a collectible of the find that becomes an heirloom".

Figure 7, attached, illustrates that a significant volume of the catalogs analyzed for this project included product photos of furniture that was observed to have both traditional and non-traditional characterwood marks. 100% of the catalogs surveyed offered furniture products with traditional character marks such as sound knots, small holes, small pitch/gum pockets, mineral stain, and color and grain variations. Over 55% of the surveyed catalogs offered products with non-traditional character marks such as large knots, insect tunneling, short/shallow checks, splits, and even the use of spalty wood. As an example, Pottery Barn offers a \$1,000 US Sierra Armoire that, although not stated in the product text, clearly exhibits the following characterwood markings:

- o mineral stain
- o large knots (>1" diameter)
- o small holes
- o small/sound knots
- o splits
- o short/shallow checks

Bloomingdale's By Mail offers a "rustic" 5-drawer chest that appears to employ spalty wood in the drawer panels.

**Figure 3: Catalog Furniture Offerings with Stated Characterwood
(20 Top U.S. Catalogs Surveyed)**

Wood Characteristics	% With Stated Characteristic in Product Text
Wormwood	35%
Knotty	15%
Seasoned/Rustic	15%
"Natural" Wood	15%
Burly	15%
Reclaimed/Recycled	15%
Weather-Aged	10%
Barn Wood/ Fence Wood	10%
Rough-Sawn	10%
Figured	5%
Checked	5%

Figure 4: Observed Traditional & Non-Traditional Characterwood in Furniture Offerings (20 Top U.S. Catalogs Surveyed)

Characteristics	% With Characteristic Observed in Product Photo
Traditional:	
o Small/Sound Knots	85%
o Small Holes	90%
o Grain/Color Variations	100%
o Pitch/Gum Pockets	40%
o Mineral/Sap Stain	35%
Non-Traditional:	
o Unsound Knots	25%
o Large Knots	50%
o Short/Shallow Checks	40%
o Large Wormholes	30%
o Insect Tunneling	30%
o Spalty Wood	25%
o Splits	10%
o Wane	0%
o Bark Pockets	0%

Figure 5 illustrates that a significant volume of the catalogs analyzed for this project actually stated the use of finishes in their product offering text that imitates characterwood. Over 85% of the surveyed catalogs employed phrases such as "antiqued/aged", "distressed", "weathered", "crackled", "time-worn", and "wormwood", in their product text to describe the finishes on unique furniture pieces being offered to the consumer. For example, Sugar Hill catalog offers a Thomas bed design with a "time-worn coffee-washed, antiqued finish to recall the flavor of an old Victorian porch." Demand for these types of products was also evidenced in manufacturer inquiries received by Mater Engineering during the course of this project. As an example (see attached cover letter), DL Gremmels & Associates contacted Mater Engineering in April, 1997 to inquire into the location of manufacturers who would be able to produce Thomas Beds and Night Stands with white lacquer and antique-honey lacquer finishes. Per month quantities from just this one inquiry were as follows:

- o Bed with white lacquer: 88 units
- o Bed with antique-honey lacquer: 40 units
- o Night Stand with white lacquer: 44 units

The price per unit being offered by Gremmels for the bed unit is \$245 US. The catalog price to the consumer is \$900 US per unit.

Figure 6 illustrates that a significant volume of the catalogs analyzed for this project offered furniture pieces with contemporary paint finishes adaptable to lesser known species use and characterwood use. Over 90% of the surveyed catalogs offered these types of product offerings with the majority of the pieces made from hardwoods. 30% of the product offerings were made from mahogany or other tropical hardwoods - although the consumer would never know it by looking at the piece. Examples:

- o **Sugar Hill** offers its consumers a "hand-painted southern folk-art chest" that is "distressed" to produce "the look of a prized antique". The piece sells for \$950 US.

- o **Bloomingdale's By Mail** offers a cocktail table made from "sturdy plantation mahogany" that is then painted in antique white resulting in a "colonial times" fashion piece. **Crate and Barrel** offers a cache made from "solid mahogany" and then adds a "hand-applied blue antique finish" to it.

Overall Producer Analysis of Characterwood Use in Product Development:

In addition to the catalog product offering analysis conducted for this 1998 project, Mater Engineering also surveyed over 70 wood product producers throughout the U.S. to determine their use of characterwood and finishes in product offerings. The manufacturers represented approximately 14 different types of wood products including:

- o Furniture
- o Flooring
- o Cabinetry
- o Doors
- o Building Materials
- o Clocks
- o Musical instruments
- o Marquetry
- o Stair systems
- o Moulding and Millwork

Figure 5: Catalog Furniture Offerings with Stated Finishes Imitating Characterwood (20 Top U.S. Catalogs Surveyed)

Finish Characteristic	% With Stated Characteristic in Product Text
Antiqued/Aged	70%
Distressed	55%
Color-Washed	35%
Weathered	25%
Crackled	15%
Time-Worn	15%
Seasoned/Rustic	10%
Wormwood	5%

Figure 6: Catalog Furniture Offerings Illustrating Contemporary - Painted Wood (20 Top U.S. Catalogs Surveyed)

80% of surveyed catalogs offered furniture pieces with a contemporary paint finishing. Of those:	
60%	o Painted hardwood furniture pieces
50%	o Painted softwood furniture pieces
30%	o Painted mahogany or other tropical hardwood furniture pieces

Figure 7, attached, delineates the results of that survey, illustrating the following:

- 1) 44% of all product type producers stated the use of characterwood in their product brochure text.
- 2) 29% of all product type producers stated the use of contemporary paint finishes imitating characterwood in their product brochure text.
- 3) 46% already use tropical species in their product manufacture.

Industry Association Characterwood Campaign Effort

The American Hardwood Export Council (AHEC) is dedicated to promoting United States hardwood exports worldwide. In 1996, AHEC launched an advertising campaign in Europe referred to as the "Bin" program. The image depicted in the ads reveal a trashcan (called "bin" in the U.K.), and the copy reads, "Are you wasting the wood?" The aim is to reveal the fact that a great deal of lower-grade and character-marked wood is wasted because of the stringent specifications for clear lumber, and the utilization of a narrow range of wood species dictated for product development.

The ad campaign targets manufacturers, designers, architects, and specifiers to plan wood use to meet existing resource. The greater aim of the campaign is to increase the utilization of lower grade and character-marked hardwoods, with an emphasis on utilizing a wider variety of species.

According to AHEC officials, the ad campaign elicited inquiries from the target audiences, created considerable interest among consumers, and attracted a positive response from environmental groups in Europe. In order to make sustainability work, the market needs to adapt to a changing forest mix. AHEC noted that there were new trends exhibited at the annual Furniture Convention in High Point, which revealed designs utilizing character-marked "distressed" furniture.

Another new ad campaign has been launched by AHEC in Europe. The image is a 1950's-style American refrigerator in eight different species and the accompanying slogan "We can lay on a great spread." The refrigerator is used as a metaphor for the wide choice of wood species, from light and dark colors to wood grains and smooth textures. The ad campaign also promotes a significant environmental message. According to Michael Buckley, the European director of AHEC, "We're stressing the sustainable forestry practices used in the U.S. and encouraging the market to use the various species available, rather than concentrate on just a few. We're also using timber with a lot of character marks to emphasize that this is part of its beauty."

The AHEC effort in Europe is not only important for moving products from lower grade and lesser-known species, but also dovetails other European efforts to produce and sell wood products that only come from forest systems throughout the world which are independently certified as being sustainably-managed (see below for further details).

**Figure 7: U.S. Product Manufacturers Survey Matrix
July 1997**

Product Produced	# of Producers Surveyed	Characterwood Stated in Product Text (% of Product Total)	Contemporary Paint Finish Stated in Product Text (% of Product Total)	Already Use Tropical Species in Product Manufacture (% of Product Total)
Cabinetry	2	2 (100%)	1 (50%)	0
Building Materials	1	1 (100%)	1 (100%)	0
Clocks	5	3 (60%)	1 (20%)	4 (80%)
Wooden Containers	1	0	0	0
Musical Instruments	6	2 (33%)	0	6 (100%)
Doors	2	2 (100%)	1 (50%)	1 (50%)
Flooring	5	5 (100%)	0	0
Gazebos	3	0	0	0
Architectural Millwork	9	1 (11%)	1 (11%)	5 (56%)
Furniture	24	13 (54%)	13 (54%)	8 (33%)
Stairs	5	0	1 (20%)	3 (60%)
Marquetry	2	2 (100%)	0	2 (100%)
Outdoor Furniture	5	0	1 (20%)	4 (80%)
Upholstered Furniture Frames	1	0	0	0
Totals	71	31 (44%)	20 (29%)	33 (46%)

Specific Industry Examples of Price Differentials Paid for Characterwood

As noted above, little information is published regarding characterwood use in product development. However, industry examples are beginning to emerge which illustrate the significant product pricing opportunities for characterwood - especially employed in furniture and flooring markets. For example:

- o In 1997, Kane Hardwoods (subsidiary of Collins Pine) located in Kane, Pennsylvania used falldown due to wood "defect" from hardwood lumber production provided for Lexington Furniture to turn wood waste into a high-end wood product. The hardwood falldown traditionally went into pallet stock and sold at \$150/MBF as pallet grade. Kane Hardwoods determined that they could redirect that characterwood downfall into the custom flooring market. Sold as a custom grade, the lumber achieved a \$480/MBF price from flooring producers. Sold as custom flooring, the flooring producer was able to sell the product to home builders at \$3,300/MBF retail value.
- o Collins Pine also had similar experiences with their west coast softwoods. Prompted by the need to move certified pine shelving made from lower-grade (#3) lumber, they quickly realized that consumers in the DIY markets were requesting "appearance grade" pine products ("appearance grade" refers to the desirable "character" of knots, grain variation, mineral stain, etc. found in the wood.) Sold as appearance grade pine, Collins Pine realized a price differential of one lumber grade difference (between #3 grade sales prices to #2 grade sales prices)
- o In Utah, during 1997, wood product producers concerned about the amount of substantially lower-grade spruce, aspen, and subalpine fir embarked on a markets

analysis to determine if market demand existed for characterwood products made from these lower grades. Focusing on the furniture and flooring markets just in the U.S., the manufacturers were able to convert 46 cents per board foot prices for lower grade lumber into \$2.50 per board foot custom grade flooring product.

- o In Vernon, British Columbia, Canada, a first of its kind log sort and sales yard was established as a pilot project in 1996 to evaluate other log sales options for the Ministry of Forestry. The government placed a twenty-five cent (\$.25) per cubic meter sales price on low-grade logs in order to entice logging operations to extract the material rather than leaving it to rot on the forest floor. Known as their "two-bit" log sales, the character logs (usually with high sweep - twists, turns, and "pistol grip" configurations) were, instead, sorted as custom sorts in the log sort/sales yard and sold to log home manufacturers for \$80 per cubic meter.

Products made for the burgeoning mail-order catalog industry

With Alaska as a major stop point for the Cruise Lines, tourists look to purchasing products handcrafted from the area. The development of a product distribution mechanism, such as a product catalog carrying SFP harvested and hand-made in Alaska, is a natural value-added collaboration likely to produce positive results.

Development of an **Alaska SFP Catalog** offering products to visiting tourists is an idea already well grounded in consumer purchase practices throughout the U.S. Consider:

- 1) Nearly 6 out 10 rural Americans (59%) purchased by catalog in 1996, compared with 57% of urban Americans.
- 2) On average, U.S. catalog shoppers spent \$530 each on catalog purchases in 1996.
- 3) The growth of sales in catalog shopping has been significant since 1992:

1992:	\$36 billion in sales
1996:	\$58 billion in sales
2001:	\$113 billion in sales (estimated)

- 4) 43 million Americans receive 5 or more catalogs each month.
- 5) Home furnishings, garden accessories, collectibles, and crafts and hobby accessories comprised a healthy share of the total catalog market equaling over 10% (\$6 billion) of the \$58 billion sold in 1996.

Simply put, consumers are already acclimated to mail order purchasing. The process brings an added advantage to the traveling tourist who may wish to continue to "travel light" while still being able to purchase both larger and smaller products that catch their eye and pocketbook. The **Alaska SFP Catalog** can be distributed to Cruise Lines and placed in each passenger cabin. The catalog products can also be sold through mail-order catalog programs on CD-ROM (virtual catalogs with sound, color, and motion demonstrating product assembly ease) that may also be installed on the ships. Sections of the catalog can be submitted to Alaska Airlines as a catalog insert in their in-air gifts catalog publication.

While developing the products for the **Alaska SFP Catalog**, the product manufacturers can also be preparing their products to be simultaneously sold through other major mail-order catalog houses in the U.S. and on the Web. Recent surveys of product buyers from these mail-order catalog houses suggest some strong market opportunities for Alaskan product producers:

1996 High-End Catalog Buyers Survey

In 1996, Mater Engineering interviewed over thirty of the top high-end mail order catalogs selling unique wood products throughout North America to ascertain product market demand for wood products. Catalogs were selected for interview based on prior product offerings and correlations to products that potentially could be offered by Alaskan producers. Figure 8, attached, provides a

complete listing of the catalogs contacted for this study, including the catalog wood product buyers names, addresses, and phone/fax numbers.

Figure 8: Buyers Contacts for 20 Top Mail Order Catalogs in the U.S. That Sell Wood Products

Company	Address	Phone	Contact Name (Buyer)
Sundance	1909 South 4250 West Salt Lake City, UT 84104	801-973-2711	Laura Thorpe
Sugar Hill	1037 Front Avenue Columbus, GA 31902	706-565-2100	Connie Smith
Plow & Hearth	PO Box 500 Madison, VA 22727	540-948-2272	Steve Wagner
Last Best Place	1112 7th Avenue Monroe, WI 53566	513-936-3170	Dianne Combs
Personal Touch	1 Komer Center Elmira, NY 14902	607-733-5541	Maureen Monroe
Crate & Barrel	PO Box 9059 Wheeling, IL 60090	847-480-2024	Pat Eckerstrom
Coldwater Creek	1123 Lake Street Sandpoint, ID 83864	208-263-2266	Tina Manchester
Gardeners Eden	PO Box 7307 San Francisco, CA 94120	415-421-7900	Melissa
Eddie Bauer	Fifth & Union, PO Box 3700 Seattle, WA 98124	425-882-6470	Harvey Cantor
Orvis	Historic Route 7A, PO Box 798 Manchester, VT 05254	802-362-3622	Francis Woodwork
Pottery Barn	PO Box 7044 San Francisco, CA 94120	415-421-7900	Liz Melzner
Anticipations	9 Ross Simons Drive Cranston, RI 02920	800-521-7677	Tiffany Hiporite
Home (Bloomingdale's)	475 Knotter Drive Cheshire, CT 06410	212-705-2000	Dan Engle
Kitchen & Home	PO Box 46 Hanover, PA 17333	201-863-7300	Laurie Rudeshauser
Charles Keath, Ltd.	1265 Oakbrook Drive Norcross, GA 30093	800-388-6565 770-449-3100	Terry
Gump's	250 Post Street San Francisco, CA 94108	800-284-8677	David Peck
Hold Everything (subsidiary of Williams-Sonoma)	PO Box 7807 San Francisco, CA 94120	800-421-2264	Craig Latters
Nature Company	PO Box 188 Florence, KY 41022	800-227-1114	Beverly
Signals	WGBH Educational Foundation PO Box 64428 St. Paul, MN 55164	800-669-9696	Furnishings Buyer
Plummer-McCutcheon	98180 Le Saint Drive Fairfield, OH 45014	800-321-1484	Ray Moore

Questions addressed to the product buyers for these catalogs included:

- 1) Have the unique furniture and wood products been good sellers for the catalog?
- 2) What products are the best sellers?
- 3) What kinds of wood products are you looking for to satisfy your catalog customers?
- 4) What designs appear to be the most popular (lodge, country, western, natural, Native American, Shaker, mission)? Are there any new designs that appear to be coming into popularity?
- 5) Is it better to create "signature" pieces (lower product volume; typically higher-priced)?
- 6) Are light woods preferred over dark woods?
- 7) Is a pastel "bleached" or "sandwashed" finish to furniture a continuing trend (e.g. teal color, etc.)? What other finishes seem to be the most popular?
- 8) Is a Ready-To-Assemble (RTA) design preferred - even for large items?
- 9) Is an interior design approach more desirable than selling individual pieces, non-coordinated furniture? (Example - coffee table design to match table lamp, and end table).
- 10) What types of furniture seem to be more preferred by your buyers (bedroom [end tables, bed headboards], family room [coffee tables, end tables, etc.], computer/desk, home, office)?
- 11) Have you noted any products that your consumers have indicated they want but no manufacturer is providing you. Similarly, are there products that you can't seem to get enough of (too low volume being produced to meet consumer demand)?
- 12) Is there a preferred method for product packaging?
- 13) Is there an advantage to your catalog if the product being offered comes from sustainably-harvested non-old growth forests? If so, would certification of the products be of importance to you and your consumer? (Product uniqueness, etc.)
- 14) Are there other opportunities to illustrate product uniqueness to consumers outside of environmentally appropriate product claims?
- 15) Do you require exclusive contracts with the product manufacturer? If so, how long will the exclusive contract component be for?
- 16) Do you buy from new product manufacturers with no prior business history? What are your requirements in this area?
- 17) Do you require the product manufacturer to keep an inventory of product on hand? If so, how much inventory volume do you require?

Result samples of the interviews are summarized in the "**Catalog Survey Overviews**" matrix, attached. The seven catalogs highlighted in the matrix represent a good cross-section of the catalogs surveyed.

Answers to the seventeen critical questions posed for catalog buyers provided interesting insight to how products get selected for catalog inclusion. Summarizing:

- 1) Catalog buyers interviewed for this study indicated that the unique wood furniture and craft items sold in their catalogs were classified as "good-excellent sellers." Some of the buyers

referenced that they could not get enough of certain furniture and craft items to satisfy consumer demand. Sugarhill, as an example, referenced painted scenic wooden chests with rounded tops as the catalog's best seller for three years running.

- 2) Many catalog buyers indicated a preference toward "signature pieces." This would enable the product manufacturer to potentially offer limited, numbered, and signed wood furniture and craft items for sale through these high-end markets.
- 3) The preference toward dark or light woods used in product manufacturing was fairly split between the catalog buyers interviewed for this project. While catalogs such as *Last Best Place*, *Hold Everything*, and *Plummer-McCutcheon* did indicate a preference toward lighter wood colors, *Sugarhill* and *Sundance* indicated that they sell about the same product volume of dark and light-colored woods.
- 4) Unlike what most might suspect for product design standards, while several catalogs indicated a requirement for Ready-To-Assemble (RTA) product design, *Plummer-McCutcheon* and *Sugarhill* stipulated a pre-assembled requirement for product shipped to the consumers. This is a bit surprising especially since both of these catalogs sell large item pieces such as king-size beds including headboards, frames, support posts, etc. Buyers told Mater Engineering personnel that pre-assembled requirements specifically cater to those product buyers who do not want to fuss with product assembly, and were willing and able to pay to have the product delivered fully assembled and ready for immediate use.
- 5) Most catalog buyers seemed to prefer individual piece designs over interior "multiple product" designs. For example, furniture designs that seem to sell the best are those that allow the user to create a separate interior design statement within a room. Instead of offering a coffee table that tends to mandate a matching design by surrounding pieces, a small wall credenza with matching wall mirror is preferred. This allows the purchaser to create a design "corner" within a room rather than having the entire room a matched design.
- 6) Buyers stated they had on-going product needs for unusual or signature wood product pieces and referenced a lack of hand painted wooden products in demand by American consumers. In particular, buyers repeatedly referenced the need for more wooden planters, small tables, hand painted wooden stools and bowls, and signature piece bedroom furniture.
- 7) With environmental restrictions on tropical woods being a focal point for many product manufacturers and retailers throughout the world, catalog buyers had mixed reaction to the question of whether they prefer a "stamped" or certified wood product (certified meaning the product has been independently certified as coming from a sustainably-managed forest). Some catalog buyers, such as *Hold Everything*, will purchase no products made from endangered tropical species such as teak. Other catalogs, such as *Frontgate*, prefer products manufactured from plantation (vs. native) woods. *Northstyle* requires the product manufacturer to identify the source of the wood manufactured into the product, whereas *Last Best Place* is actually currently looking at complete certification for their wood products (they currently require that wood products sold in their magazine must be documented as coming from U.S. forests.) *Sundance* highlights wood products manufactured from recycled and native U.S. woods, as well as giving special preference to wood products manufactured from windfall or naturally-downed trees.

As a counter-balance, *Plummer-McCutcheon* buyers stated they actually drop customers from their catalog list who request documentation on wood sources for their catalog products.

- 8) Committing product sales to only one catalog for a defined period of time (referred to as "exclusivity") is preferred by the majority of catalog buyers interviewed for this contract but not required by any of the catalogs. Some, like *Sundance*, will advertise a product as "Exclusive for *Sundance*" if the product manufacturer has made that commitment. Catalog buyers also state that items sold as "exclusives" for their catalogs are often selected for

cover or back-page photo pieces. Experts note that securing a cover or back page photo position for a catalog usually increases product sales five-fold for the product manufacturer.

- 9) All catalog buyers interviewed stated they did not require a business history of the product manufacturer before they conducted business with the producer. Rather, they look for a producer's ability to manufacture products according to quality requirements, quantity requirements, and look for detail in product promotion presentation that speak to timely product delivery and attention to personalized consumer detail.
- 10) Product inventory and shipment requirements can be a major concern for product manufacturers, so attention to the particular needs of the catalogs is prudent. Requirements do vary according to catalog. For example:
 - o *Frontgate* and *Sundance* have no inventory requirements but do need accurate delivery times from the manufacturer upfront. In their catalogs, they will then inform the purchaser of the product to allow for that stipulated time period for product shipment.
 - o *Hold Everything* and *Northstyle* may require product inventories depending on the type of product offered. This is especially true for smaller-sized products.
 - o Some catalogs, such as *Plummer-McCutcheon*, *The Last Best Place*, and *Sugarhill* will provide anticipated monthly sales projections upfront to the manufacturer for negotiations. It's up to the manufacturer to be able to document to the catalog buyer that they will be able to meet the projected product demand. *Plummer-McCutcheon* will actually purchase 40% of the anticipated product volume from the manufacturer upfront and warehouse in their own facilities. For smaller-sized products, as is typically sold in *Northstyle*, the catalog will also purchase volumes upfront from the manufacturer.
 - o Many of the catalogs require the product manufacturer to 'drop ship' - to ship product to end-user direct from the manufacturer. This was particularly referenced by *Plummer-McCutcheon*, *Sugarhill*, and *Sundance*. This requires the manufacturer to seriously consider individual product packaging (vs. bulk packaging). Care and attention to product protection, packaging aesthetics, inclusion of product add-ons and purchaser shipping letters are all important considerations to the catalog buyer.

General Update on the Types of Value-Added Being Employed in the SFP Industry

With locational factors and transportation issues related with product flow from Alaska, adding value to SFP harvested from the State can make good dollars and cents. Each of the key SFP categories discussed in the report has value-added potential that offer financial bottom-line benefits. For botanicals and medicinals, the value-added processing of the raw resource through a) packaging in bulk; b) freeze drying; c) producing resource extracts; and d) producing resource capsules can produce entirely different bottom lines for any business (see Table 2):

Table 2: Value-Added Processing of Nettles

Seed	Bulk	Freeze Dried	Extracts	Capsule
\$2.25 (400 seeds)	Leaf = \$12/lb. Herb = \$1/lb. Root = \$17/lb.	\$12.95 (90 capsules) 300 mg.	\$7.50 (1 oz.) \$28.40 (4 oz.)	\$17.95 (45 capsules)

For florals, being able to offer a glycerin-preserved product over a fresh-cut product can increase your product profit margin by over 300%, and reduce your required resource harvest from the forest by almost 40%.

Part of the key is in identifying smaller-scale value-added production technology that can be more easily financed, set-up, and operated in rural or isolated areas. For this project, information on some of the existing smaller-scale value-added processing technologies for foods, decorative woods, and botanicals/medicinals is offered for review:

- o **Foods & Medicinals/Botanicals:** In the "**Value-Added**" section of this report, Appendix A, information is provided on existing smaller-scale processing options for both forest foods (such as converting mushrooms to mushroom powder) and botanicals and medicinals from bulk packaging to drying to distillation to smaller-scale encapsulation machines. The data comes from a recent Mater Engineering project that required information gathering on both new and used equipment manufacturers in these areas. Company names, equipment performance data, and 1996 pricing schedules are provided.
- o **Smaller scale technology for decorative and craft woods:** Although more research is needed in this area, two practical and innovative technologies deserve mentioning. For initial small diameter processing of logs into lumber used in decorative wood processing, we recommend use of a **Micro-Mill** unit.

The Micro-Mill is a relatively new production unit designed to efficiently and effectively recover small diameter logs. There are both stationary and portable Micro-Mill machines. Logs longer than 12' will need a unit that is anchored to a cement pad because the powered in-feed and out-feed tables must maintain a precise alignment (using an electric eye). This 'stationary' unit can be containerized and moved with crane and truck. Logs of 18' to 24' in length can be handled with this set-up.

The machine can produce a variety of different cant sizes depending on diameter size of the log, with ranges between 3" x 3" cants up to 8" x 8" cants.

The Micro-Mill was designed to use parts that are readily available as standard off-the-shelf items in sizes that are widely available around the world--appropriate for remote operations. The knives can be made to last longer depending on the material processed. Milling frozen logs or oily woods retains cutter edges significantly better than milling dry logs. Up to three saws can be added to the outfeed side of the mill to split the cants into boards of adjustable dimensions on a single pass through the mill. This option comes as part of the basic Micro-Mill package (no extra cost), and is ideal for the production of the agricultural stake products.

The Micro-Mill can also be designed to accommodate a diesel-powered unit to convert it from mobile to stationary operations.

Other operating information includes:

- o Maximum processing rate: 4 MBF/hour, 20 foot logs
- o Maximum possible log length: 24' to 32'
- o Transition time from mobile to stationary unit (to process longer logs): 4 to 5 days
- o Time to move/set-up stationary electric unit: 2 to 3 days

Space requirements are as follows:

- o basic Micro-Mill mill: 10' by 20'
 - o infeed and outfeed tables:
 - auto-leveling: 18' to 24' long by 10' wide
 - portable: 10' long by 10' wide
 - o log deck: 30' long by 20' wide (custom dimensions available)
 - o green chain: 30' long by 20' wide (custom dimensions available)
- Milling operations costs for the Micro-mill are shown in Figure 9.

Figure 9: Milling Operations Costs for the Micro-Mill

Item	Cost (estimated average)
Basic Micro-Mill: diesel 160 hp, 6 x 6 cants portable, towable, 1.5 hour set-up infeed and outfeed tables 12 foot logs, manual feed	\$141,000
Larger Micro-Mill: diesel 220 hp, 8 x 8 cants portable, towable, 1.5 hour set-up hydraulic drives in-feed and out-feed tables 12 foot logs, manual feed	\$151,000
Electric Micro-Mill: stationary, but can be moved and set-up in 4-5 days 3-phase power 24' to 30' logs, powered in-feed and out-feed tables	\$ na
Options: 10' to 15 log deck, green chain, hydraulic trim saws containerization auto-leveling infeed/outfeed tables, stationary 30' log deck with singulator green chain on outfeed table, hydraulic electric unit (stationary operations) master control panel (for electrified machine)	\$6,500 \$4,800 \$6,500 \$21,000 \$13,500 \$6000 to \$10,000 \$14,000 \$15,000
Operating Costs: for 160 hp unit for 220 hp unit for electric unit chipping knives, replacements finishing knives, replacements knife set crane and flatbed truck (to convert between mobile and stationary uses)	3 gallons/hour (diesel) \$80 (changed every 8 days) \$60 (changed every 6 to 8 days) \$140/set

For woodworkers and craftsmen, adding further value to the lumber obtained from small-diameter logs requires additional processing. Wood bending, for example, requires soaking/steaming wood strips before molding. Michael Dunbar, a well-known Windsor-chair maker from New Hampshire has recently designed a small-scale "steam box" for just that purpose. The steam box measures 65" in length and weighs just over 10 lbs.! Constructed of 1/4" PVC pipe known in the plumbing trade as schedule 80, the 4" diameter pipe has a junction in the center to accept a short pipe that connects to a radiator hose which is connected to a small water tank. The ends of the main pipe are closed with friction-fit PVC caps, and a pair of vent holes is drilled on the underside of the box to bleed off excess steam. The steam box sells for \$225 with a wooden stand, or \$200 without the stand (see www.windsorchairmakers.com for more information).

Finally, we should always keep our eyes open to value-added through turning trash to cash. Who would have guessed that harvesting dandelions for the gourmet foods markets would blossom into the \$5 million business it is today. Californians may still be shaking their heads at the recent Asian inquiry for 7,000 lbs. of manzanita leaves (considered a nuisance species) which will be used in the manufacture of sunscreen lotion. Can Cow's Parsnip be next?

Review of Other Factors Affecting/Influencing Market Demand for SFP

There are two key outside factors that likely influence the financial investment and growth of the special forest products industry. They are:

- o **Independent, third party certification of special forest products** to match the major worldwide certification movement for wood-based products.
- o **Growth of organic products demand** (with SFP from public forestlands more likely to meet current certified organic requirements than those harvested from private forestlands).

Background information on both of these factors follows:

Certified SFP

Certification of public and private forestlands in the US and throughout the world is one of the top issues continuing to be discussed within the forest industry today. Currently, only one certification program offers resource managers the ability to sell certified wood into product markets worldwide. The international **Forest Stewardship Council** (FSC), headquartered in Mexico but with North American offices based in Washington, D.C., anticipates having more than 50 million acres of forestland certified by the year 2000. In the US, over 5 million acres of forestland is certified, with the majority coming from public (state and county) forestlands. Market demand for FSC-certified wood is growing substantially, with major retailers like Home Depot announcing their preference for FSC-certified wood products just this month. They have also become members of the North American Certified Forest Products Council headquartered out of Portland, Oregon. FSC certifiers were invited to present at the 1998 International Woodworkers Machinery and Furniture show held in Atlanta, with over 10% of the total workshop attendees (2,000) initiating follow-up calls to the certifiers for more information.

But certification does not just apply to wood-based products. The FSC has just completed a working draft of principles and guidelines that are proposed for use in certifying non-timber forest products. A review of the details proposed in the latest FSC SFP draft of proposed principles and guidelines is included in Appendix B of this report.

Organic Products Market Demand Growth

- 1) Sales of organic products have typically grown by 20%-25% annually in the US. According to a recent study conducted by the Food Marketing Institute, 37% of shoppers have purchased organic food. Retailers are finding organic products are in demand, resulting in the strongest category growth in the industry. Breaking traditional growth patterns, it is estimated that organic sales will increase 150% by the year 2000. This may, in part, be due to organic product suppliers' plans to increase the amount of organic products they will offer retailers. Natural Foods Merchandiser's June 1999 edition states that certified organic farmers in the US plan to:
 - o Increase the volume of organic products they sell (74%);
 - o Increase their number of markets and buyers (63%); and
 - o Increase their number of acres in production (56%)

- 2) Responding to customer demand, General Mills announced in 1999 its offering of a new organic cereal called *Sunrise*.
- 3) In 1997, *Delicious Magazine* polled over 2,000 readers in the US. They determined that over 50% of their readers purchase organic products on a weekly basis. That same year, 76% of chefs responding to a *Food and Wine Magazine* survey indicated they actively seek out organically grown ingredients.
- 4) The organic dairy industry is growing robustly, in double digits, 50% to 80% annually, according to economic research analysts at U.S. Bankcorp Piper Jaffrey. Organic yogurts and milks are gaining momentum in the natural and especially conventional markets. Between 1996 and 1997, organic ice cream grew 292% in sales and organic cheese 153%, according to the Organic Trade Association's first Organic Manufacturer Market Survey.

Interplay Potential of SFP with Recreation, Tourism, and Other Non-Consumptive Forest Activities

In addition to protecting subsistence and personal use, recognizing the importance of balancing commercial harvest activities with recreation, tourism, and other non-consumptive forest activities is important for Alaska. How that successfully gets accomplished may require excursions down unusual paths. Some options for consideration include:

- Tapping into new tourism industry foundations created to maintain/improve the environment and targeted ecosystems. You may be surprised at what you find. For example, Travelers Conservation Foundation (TCF) was initiated in 1998 by the U.S. Tour Operators Association (USTOA). It is a not-for-profit organization that brings together leaders of the tourism industry to protect, restore, and conserve the world's natural, cultural, and historic treasures. The goals of TCF are to:
 - o Invest strategically in globally significant sites with the collective resources of the nation's major tour operators;
 - o Promote public and tourism industry education and awareness with regard to natural, cultural, and historic treasures;
 - o Involve travelers in the protection, restoration and conservation of worldwide travel destinations through their support of participating operators; and
 - o Take a leadership role in the industry's contribution to conservation efforts around the world.

Founders of TCF include the CEO's of Holland America Westours, Special Expeditions, Mayflower Tours, Tauck Tours Inc., and the executive director of USTOA.

Projects undertaken by this unusual foundation typically include cash grants coupled with matching corporate grants, in-field program development assistance, and public education. For more information, contact: Ms. Julie Goebel, executive director of TCF (2968 SW Champlain Drive; Portland, Oregon 97201; Tel: (503) 226-1271; Fax: (503) 226-2803; e-mail: travelfund@aol.com).

- **Catering to recreational/tourist visitors:** Consumers worldwide are adapted to purchasing through mail-order catalogues. The phenomenon is as strong in Asian and European countries as it is throughout North America. Product catalog offerings with a "Distinctively Alaska" label can be used to differentiate those products made from Alaska non-timber forest products from other product offerings. Developing a catalogue around "Distinctively Alaska"

products can be adapted to other multiple mail-order distribution channels including in-room ship brochures, airlines "skymall" catalogs, and high-end catalog markets.

- **Establishing Cruise Line Kiosks with product selection/sales program links:** This allows a cruise line tourist to "order in advance" and pick up on arrival if they so choose. The kiosks might also employ the "Distinctively Alaska" label, but expand the product offering for custom-designed efforts. Products could include from specially packaged Alaska herbs and medicinals and hand-turned wooden fishing rods and reels, to handcrafted wooden stools with custom-painted designs. The traveler may either pick the product up upon destination arrival or can have it direct shipped to their home.
- **Consider a CD-ROM "library" of product offerings on board ships.** More and more travelers of all ages and economic backgrounds are now traveling with portable computers (PCs) that allow them access to e-mail, the Internet, and other program outlets while traveling. Having a CD-ROM library of gifts and products to review may provide maximum convenience to the traveler and offer the traveler a preview of product offerings and locations during their entire tour throughout Alaska.

Review of Different Product Distribution Channels Which Can Positively Impact SFP Development from Alaska

With Alaska's "isolated" location to major retail and consumer markets, understanding the value and unique opportunities offered through high-end catalog marketing and cruise line product distribution can prove profitable venues for Alaska non-timber forest product producers. Direct Internet marketing and sales may also prove an effective product distribution channel.

Direct Marketing through the Internet: Direct marketing of SFP is expected to allow between 6 to 16 times more market access than what can be expected from working with traditional wholesale routes. Direct marketing is particularly adaptive to the eco-tourist industry, sustainable harvesting from smaller acreages, and small-scale product manufacturing. To take advantage of these direct markets, harvesters will need access to small scale processing equipment, computerized labeling systems, cold storage facilities, and small-scale harvesting equipment. One mode of direct marketing is now accomplished through use of the Internet. Projections for the next 10 years from now suggest a tremendous increase in on-line buying. It is projected there will be 15 to 20 million households purchasing food, products, and services on-line, compared to 200,000 in 1998.

Internet Marketing of Special Forest Products

The sales of natural products totaled \$25.4 billion in total sales in 1998. This is how the percentages break down (Table 3):

Table 3: SFP Marketing Tools

Category	Percentage of Sales *
Practitioners	4%
Mail Order	4%
Internet	0.2%
Multi-Level Marketers	17%
Mass Market (food and supplements)	26%
Natural Products Retailers (food and supplements)	49%

* Because of rounding, percentages do not add up to 100%.

Many natural products retailers began appearing on the Internet in force in 1998. Manufacturers of natural products and catalog retailers have also been appearing on the Internet and World Wide Web. The Internet market is still relatively new, and difficult to track. However, *Nutrition Business Journal* estimates that online sales of supplements and natural products will reach \$160 million in 1999 and as high as \$500 million by 2001. This is a tremendous increase from the 1998 sales volume of \$40 million.

The natural products companies with Internet presence include traditional retailers and also virtual stores such as *Mothernature.com*, *GreenTree.com*, and *Healthshop.com*. Some industry representatives think that vitamin and mineral supplements (VMS) products will capture significant market share. Thomas Weisel Partners, banking consultants in San Francisco, conjectures that the Internet will ultimately control more than 50% of all VMS sales.

So far in the marketing of natural products on the Internet, the supplements category has enjoyed the most attention from online shoppers. There are four major groupings of online natural products retailers: venture capital-backed sites that have never had a retail store; the bricks-and-mortars retailers; supplements manufacturers; and traditional mail-order catalogers. Also, sites such as *Drugstore.com* and *PlanetRX.com* sell supplements as well as prescription drugs.

The market opportunity for Internet presence of natural products companies is teeming with possibilities. 18 million people subscribe to AOL, and half of them have made purchases on the Internet. The start-up cost to a significant Internet presence requires a strong financial backing to attract Internet users to specific sites. *Mothernature.com* has spent \$35 million for advertising in 1999 alone.

In many cases, the focus on these Web sites is education. Jeffrey Hollander, president of Seventh Generation, said that although they provide a lot of information on their packaging, there is more that they would like to inform people about. He said, "We can't handle hundreds of phone calls every day, but thousands can hit our Web site."

It is expected that many more natural products companies will announce their presence on the Internet in the next couple of years.

The Web is also a source of many informative and helpful sites in woodworking and fine arts and crafts topics. More and more companies are taking advantage of this opportunity to present their works and market to a wide and ever-growing audience.

The Guild, a company that has been publishing an artist/designer sourcebook for 16 years, has created a Web site called www.guild.com. The site is a resource for sellers and buyers, and also provides an information guide to the world of fine arts and crafts. There are over 2000 artists in the Guild's database, and many of those artists appear on the Web site. 51 woodworkers are at this site. Invited artists have 1,215 works on display at the site, which may be viewed and also purchased online. The home page features a framed window of featured artwork that changes every few seconds. There are search options that enable the browser to search for art by type of work, by artist name, or by gallery name.

The site also provides an Artist Center, which lists the available artists and provides bibliographic history on each artist and the mediums they use. Other links from the home page include Gallery Row, and Traveler's Center, which showcases pieces in galleries and lists galleries, events, and museums across the country. John Anderson, vice president in charge of marketing at guild.com, said that this web site averages over 11 minutes per visit, compared with the average of one minute spent on other web sites per visit.

Santa Fe Stoneworks in Santa Fe, NM, has started a Web site that focuses on business information for the craft industry. The site (www.jiverson.com) includes discussion groups and open chat rooms, a bulletin board/community forum for postings of craft-related topics, a resource section for books and periodicals, and a list of frequently asked craft questions.

The FAQ section is intended to work as a informational aid on business topics such as the need for liability insurance, pricing and cost structures, brochures and literature requirements, how to build a business plan, and where to obtain capital and price points. Also provided on the Web site is advice on other business and marketing-related topics: how to create an integrated marketing program; how to handle tax and accounting issues; how and when to install production controls; and how to improve relationships with service professionals and employees.

Other opportunities for artists and woodworkers are showing up on the Web. Pathways is a juried exhibition, featuring 61 pieces from 46 artists from 20 states and six countries. The web site (www.pathways98.org) opened last August and will remain online through this summer.

The value in this type of arrangement for the artist is that it is a relatively low-cost way in which to show his or her work. Items marked with a price or dollar sign are available for purchase, directly from the artist. Pathways receives a 10% commission on sales, which is used to fund the site. Random samples indicate that the site receives 30 user sessions per day and 1500 hits per day. The Web offers global exposure; inquiries have been received from Europe and Australia.

It is certainly evident that the fine arts and crafts industry, as well as the natural products industry, can benefit enormously from the advertising, marketing, and sales opportunities the Internet provides. This resource will only gain in popularity and allow greater exposure in the months and years ahead.

Identification of "Missing Pieces" in Order to Develop an Alaskan SFP Industry.

Alaska is not alone in attempting to define the "missing pieces" needed to create a successful SFP industry. Nationally, the key recurring questions that seem to be at the forefront flow into three distinct foci:

1. Biological Focus (applies to all forest landscapes):
 - o What are the regenerative values of SFP and what harvest rotations should be applied in order to ensure proper species regeneration?
 - o What are the effects of over-harvesting on SFP (short-term; long-term)?
 - o What are the effects of traditional timber harvesting on SFP?
 - o What is the volume of SFP in the forest landscape? Of that volume, how much would be deemed to have commercial quality characteristics?
 - o What are the appropriate harvest techniques that should be employed to ensure sustainability of the SFP resource in a forest landscape?
 - o Are there value-added options, such as environmentally-friendly in-field preserving techniques, which can reduce harvest impact on a forest ecosystem yet create added commercial value to a SFP harvested resource?
2. Public Forests Focus:
 - o What new legislation is likely to impact public forestland management in SFP? Public forestland managers with SFP activity may be required to adhere to new SFP legislation currently proposed for presidential signing in 2000. H.R. 2466 specifically redirects permit and fee dollars obtained for SFP harvesting off of public lands back into regional budgets to help manage SFP programs. The legislation is a welcomed effort to acknowledge and support SFP program development at the regional basis, but may also

prove challenging in the process. If signed by the President, the legislation would require forest managers to issue SFP permits, licenses, and fees at a not-below fair market value. Forest managers would be required to stay current with specific product market values at all times, and may be required to develop of a variable rate structure to accommodate seasonal and annual market price fluctuations.

- o How do public land managers address over-harvesting issues? How is harvesting and over-harvesting documented and monitored?
 - o What are the best incentive-based approaches to reducing resource theft?
 - o How do public land managers balance legal and ethical obligations to Native American and Alaska Natives? This issue is playing itself out in several federal forest systems across the US - with learning experiences that should be of immediate value to other U.S. locations. The Confederated Tribes of the Grand Ronde in Oregon, for example, have signed the first tribal-federal forest management contract allowing the Grand Ronde Tribe to inventory and develop a management plan for both timber and non-timber forest products on 20,000 acres of tribal land and 6,000 acres of abutting Siuslaw National Forest.
 - o What is the best approach to developing accurate resource inventory data?
 - o How do public land managers gain increased knowledge of agro-forestry options employing SFPs?
 - o What are the best techniques for documenting existing levels of harvest activity on public lands?
 - o How do public land managers stay on top of the real size and scope of the SFP industry?
 - o How do public land managers successfully manage fee and permit programs to benefit the public and the ecosystem?
3. Private Forests Focus: Private forestland managers have very similar concerns to managing their land for SFPs, as do public land managers. Resource inventory and monitoring, knowing the value of SFP growing on their lands, understanding the market opportunities for SFPs, and gaining knowledge on value-added options are as much of interest to the private land managers as they are to public land managers.

While these missing pieces seem a bit daunting, they also offer a unique opportunity to look at leveraged benefits and unusual partnerships. For example, in the Pacific Northwest resource theft is an over-arching issue for both public and private forestland manager ... and a real issue among different cultural populations who harvest from those forest systems. The common concern allows for some creative options for solutions which include refocused enforcement at buying stations rather than in the forest, inter-cultural incentive programs to increase monitoring within cultural communities, and development of harvester "clearinghouses" for private forestland owners which list certified harvesters who have a track record of responsible resource harvesting and maintenance of the forest ecosystems.

Suggested Strategy for the Development of an Alaskan SFP Industry

For Alaska, nine (9) strategic steps to developing a successful SFP program is recommended:

- Step 1:** Document the Resource
- Step 2:** Expand SFP Focus to Include Multiple Functions
- Step 3:** Evaluate Market Opportunities
- Step 4:** Determine Value-Added Options
- Step 5:** Set Up Pilot Project Areas
- Step 6:** Coordinate Traditional Timber Harvests to SFP Opportunities
- Step 7:** Become SFP Investor Savvy
- Step 8:** Target Your Research Eye on the "Weeds"
- Step 9:** Seek Out Creative, Non-Traditional Project Financing

Document the Resource

First, you need to determine what you really have to work with. Verify species, location, and volume. Determine species category:

- Category A:** Species which appear to be in abundance in the study region which hold immediate market potential; separate out from total volume commercially-viable volume to work with.
- Category B:** Species which appear to hold market potential but lack volume verification in the field;
- Category C:** Species which hold aesthetic and/or botanical characteristics that suggest evaluation for new product development to service domestic and offshore markets.

Where possible, evaluate appropriate harvest methods for targeted species. Incorporate inventory of SFP into the overall forest management plan. Identify policies, environmental/cultural considerations, and administrative issues, associated with species harvesting that need to be addressed.

Expand SFP Focus to Include Multiple Functions

The results of the USDA FS Collaborative Project initiated in the PNW underscores the need to recognize both biological and social research in tandem when dealing with SFPs. Over 100 commercial harvesters and producers of SFP were interviewed for the project. Each interviewee was given an opportunity to identify and prioritize SFP research projects they wished to see undertaken in their region. Interviewer recommendations were categorized into biological research, social research (cultural, spiritual values of SFP, etc.), technical improvement projects (increasing shelf-life of a product, etc.), and administrative improvement projects (better permit system, etc.). 89% and 85% of project priorities identified by those interviewed were in biological and social research areas, respectively (note: more than one project recommendation per person was identified).

Along with issues impacting commercial use, social issues such as subsistence rights in Alaska will have equal bearing in SFP policy development. Spiritual issues surrounding forest landscapes are also emerging as a high area interest, even among traditional professional foresters. In addition, native plant restoration in tribal forest systems, to reintroduce younger

tribal members to past cultural native plant uses, is currently being examined by Indian tribes in the PNW. Commercial, social, spiritual, and cultural foci all have value within a SFP system.

Evaluate Market Opportunities

This is usually the area that demands the most due diligence. Understanding market opportunities comes from information developed from **general product trends** research and **specific buyer interviews**. General product trends give you a “larger picture” view of product demand, but do not provide the detailed buyer information necessary to move a business plan forward. Only direct product buyer interviews accomplish that goal. (See “Become SFP Investor Savvy” section below for more details.)

Determine Value-Added Options

Understanding how to differentiate your product(s) in the marketplace is an important contribution to achieving any business success. For Alaska SFP product producers, using the same product values that support the recreation and tourism industries may be advisable. For example:

If your focus is: Maintaining the pristine Alaska environment through sustainable resource management.

Your product strategy might be:

a) Selecting the right business partners:

Chef's Collaborative 2000, launched in 1993, is a nationwide organization of chefs working to promote sustainable food choices. The 1500 chef-member organization specifically targets supporting local agriculture, using organic products, and implementing seasonal menus. The key focus is achieving healthier, tastier food, along with selecting foods that have the least impact on the environment.

b) Obtaining certification of forest management practices for market recognition:

Third party, performance-based forest certification is becoming recognized by an international retail community as a preferred product label of choice. The certification label ensures consumers that the products sold on the retailers shelf have been sustainably harvested from a well-managed forest. In the United States, there are several certification programs offered to public and private forestland managers. These include the internationally recognized **Forest Stewardship Council (FSC)**, and the American Forest and Paper Association's **Sustainable Forestry Initiative (SFI)**. Currently, only the FSC program is recognized in the marketplace. It is also currently the only program that offers certification of non-timber forest products.

Working with certified forest resources allows you immediate access to **Certified Forest Products Councils (CFPCs)**. These Councils now exist in more than 35 countries throughout the world, including Asia. Its members include small, one-man woodworking operations to multi-national forest product corporations. The Councils connect buyers of certified wood products with resource suppliers all over the world.

For more information on forest certification in the U.S., contact The Pinchot Institute for Conservation in Washington D.C. and request copies of *Understanding Forest Certification: Answers to Key Questions and A Certification Handbook for Public Forestland Managers* (Tel: (202) 797-6580; Fax: (202) 797-6583; www.pinchot.org).

- c) Setting up a certified harvester-training program with development of a harvester "clearinghouse" for use by public and private resource managers and resource buyers.
- d) Establishing a permit structure that is based on access matched to performance in sustainability as first steps.

If your focus is: Offering higher quality product(s).

Your product strategy might be: Researching any unique distinctions in your resources that can give you a competitive edge - such as higher-grade extracts that may be derived from higher elevation resources. SFP producers in the Trinity National Forest determined that their echinacea grown at higher elevations in their forest produced an appreciably higher-grade extract than echinacea grown in lower elevations. Working with smaller agro-forestry volumes, producers manufactured **Animune** - a high-grade poultice used on thoroughbred racehorses is now sold through growing naturopathic veterinary market channels.

If your focus is: Linking with the recreation and tourism industry in Alaska.

Your product strategy might be: Connecting with other product sectors in Alaska: fish-skin hats sold as art pieces displayed on beetle-killed spruce hat stands. Sell the story of the fish killed by human hands on a tree killed by nature.

Set Up Pilot Project Areas

Setting up pilot project areas allows you to test various permitting structures, harvesting techniques, and monitoring methods to determine what works best in each region. Pilot projects also allow you to test policy options to identify practical opportunities and constraints. Developing case studies that can be used as learning experiences in other high-latitude forest regions is also of high value.

Coordinate Traditional Timber Harvests to SFP Opportunities

Consider establishing collaborative management efforts between Federal, State, Mental Health Trust, and Native Corporation forestland managers to determine schedules for traditional timber harvests that allow early opportunities for SFP harvesters. Special forest products are rarely salvaged during timber harvest operations, and much of the timber harvest by-product (limbs, burls, moss, cones, all understory) is left as waste. Such collaborative strategies could take full advantage of the forest resource and create enormously positive public good will.

Become SFP Investor Savvy

We need to understand the business of the special forest products industry; who invests in the SFP industry and what they look for. Evaluate SFP business opportunities with an "investor's eye" to success. To become investor savvy, conducting due diligence in four (4) areas of analysis is required:

- o Markets analysis
- o Resource analysis
- o Labor analysis
- o Processing analysis

Markets Analysis

Due diligence should at least include the following:

a. Evaluation of fluctuations in product pricing:

o Historical Price Review:

Historical review of product pricing can provide excellent information for possible proforma sensitivity analysis to be conducted for business plan development. An investor might view risk in selling evergreen huckleberry, with per unit prices steadily increasing between 1989-1996, quite differently than salal that has realized dramatic per unit price fluctuations during that same period of time.

o On-Season/Off-Season Pricing:

Being able to provide quality product during low supply times is a key factor in developing a successful SFP business. Prices between on and off-season typically change 15% - 20%, depending on the product being sold. This appears to be especially true for certain foods, such as matsutake mushrooms, where prices have been known to fluctuate by almost 60%. Time periods designating on and off-season can also fluctuate from year to year.

b. Identifying product demand:

o Direct buyer interview requirements:

Very few investments are finalized without documentation based on direct interviews with product buyers. The SFP field is not like either the traditional wood products or agricultural industries where published prices for commodity products are at relatively easy reach. Ascertaining "bankable" product demand must be based on primary buyer interviews that, further, are based on review of sample product provided by the intended supplier.

o Beyond "my-back-yard" buyer interviews:

Product demand and product pricing can be substantially different from buyer to buyer. Differences are not only seen in product pricing, but also volume demand. Harvesters tend to rely solely on processors and wholesalers closest to their supply. While there is logic in this from a product transportation point of view, often the best product and pricing opportunities are lost. As an example, while ascertaining market demand for birch treetops from Minnesota to be used in the artificial tree industry, buyers throughout the Midwest extending over to California were interviewed by Mater Engineering personnel. Best prices and volume demand came from California buyers, even with transportation costs included. Further, the California buyers discovered a market for treetops made from California manzanita, a species considered to be a "junk" species in California. Back haul arrangements were negotiated between the two states for the shipment of river birch to California buyers, and manzanita to Missouri buyers.

o Specialty area opportunity analysis:

Especially for smaller volume product areas, evaluating markets outside the traditional product distribution arenas can bear excellent results. Echinacea suppliers from higher elevation forests located in the Hay Fork, California area discovered that their echinacea held more potent qualities as a result of being grown at higher elevations. They focused that benefit toward the naturopathic veterinary business and, in 1997, announced the development of Animune, a product made of echinacea from their forests for thoroughbred racehorses.

- o Buyer response to over-harvesting conditions:

More and more buyers are indicating growing concerns regarding over-harvesting of certain forest species. Prince's Pine (*Pipsessewa*), as an example, is a product many buyers no longer trade in because of the serious over-harvesting which had occurred in the West, coupled with the slow, difficult regeneration time of the plant. The plant is harvested for both medicinal product application as well as an added ingredient in the manufacture of soft drinks such as Pepsi-Cola. At one point, large volumes of the harvested plant were being helicopter-harvested from the National Forest systems located in western US.

Other buyers reference a growing demand for quality sword fern, offering that poorer quality sword fern seems to be more the norm as a result of over-harvesting.

Investors will pay attention to concerns regarding over-harvesting of species located in regions outside their project area. As an example, the over-harvesting of goldenseal in the Ozarks has lead to a demand for Oregon Grape Root as a substitute for goldenseal.

- c. Assessing competition:

- o Domestic:

As many as twenty suppliers per product per buyer are relied upon in order to obtain the volumes of product required to satisfy demand. In general, buyers appear reluctant to work with just a handful of suppliers because of their vulnerability to inconsistent supplier work schedules and shifts in product harvests (i.e. sword fern harvesters shift to harvesting matsutake mushrooms leaving fern buyers without supply). Suppliers who are able to provide consistent quality and volume, reliable and timely product delivery, and offer credible documentation regarding appropriate harvest techniques offer unique competitive advantage in the industry.

- o Offshore Competition:

Investors will pay keen attention to offshore product competition in this industry. The demand for matsutakes, as an example, may continue to be strong, but sources of supply can shift dramatically from year to year. In 1991, with high global market demand for matsutakes, the Korean government flooded the market with their own matsutakes harvested by their military personnel.

Investors will also be aware that similar species can acquire different qualities when grown in different conditions. As an example, although arnica grows in natural forest systems in the U.S., buyers often state they purchase arnica only from European forest sources because of the apparent different properties associated with the European-grown plant.

- d. Capturing opportunities:

Opportunities for species substitutions that arise due to over-harvesting conditions, as noted earlier, may fall in cycles. The increased demand for Oregon Grape root as a substitute for goldenseal may have a life cycle of only three-to-five years when a cultivated goldenseal supply is expected on the market.

- e. Differentiating products in the marketplace:

As with any other product, differentiating the products offered to buyers and consumers pays off. Notable characteristics that have proven to be successful product differentials in the special forest products industry include:

Sustainably certified forests and forest products: Buyers are noting the increased activity in sustainable forestry practices and the importance those practices are to the special forest

products industry. Many buyers believe that better sustainable forestry practices will result in higher-quality and more consistent volumes of SFP from those forest systems.

Geographic location: Geographic location can play an important part in the sales of certain foods, botanicals, and medicinals. It appears less a marketable factor for florals (save for perceived exotics). Gourmet mushrooms harvested from the Pacific Northwest, Yosemite forest spices, and Oregon Grape Root are examples of this marketable product differential.

Ethnicity of resource: Several botanical manufacturers (buyers) note in the advertising of their products that they use only products harvested by indigenous peoples from multiple regions throughout the world. While this may not be a deciding factor for product purchase by the consumer, it is clear that the product manufacturers consider it an important added marketing element.

Unusual physical properties of species being offered: Careful attention to differing properties (either real or perceived) of SFP can clearly separate product marketability. For wild-crafted ginseng harvested in the Midwest, over 30 different grades of product are produced and sold worldwide. Echinacea grown from higher elevations in Hayfork, California produces more potent properties which has provided keen market advantage to product suppliers.

Resources Analysis

There are several key areas investors will want to see due diligence conducted in before committing their investment dollars:

a. Commercially-Viable Quantity and Quality Determination

A common mistake made by many entering the SFP market is to assume that all product growing in the forest system is commercially viable. Ethnobotanists retained by the USDA Forest Service to document SFP growing in National Forest Systems have made such assumptions in more recent reports. When market analysis was conducted for the growing stock noted by the ethnobotanists, it was quickly discovered that only a portion of the observed growing stock was actually marketable. As an example, volumes of salal evidenced as growing in multiple forest system regions were deemed not of commercial quality due to stem extensions, decreased foliage per stem, and darker foliage color - characteristics usually resulting from too-dense overstory conditions.

For any business plan development in this industry, there is no substitute for random, in-field plot documentation to better ascertain existing and future sustainable commercially-viable product quantity and quality.

b. Rotation Harvesting

Identifying appropriate rotations on harvesting practices for commercially harvested products is an important business plan consideration. This is especially true for private forestland owners where the amount and location of forestland acres do not deviate from year to year. Several cautions are worth noting here:

- o First, much of the information known and published on regeneration capabilities of many special forest products is anecdotal and often not scientific case study. This does not mean that the information is wrong. It does suggest that information regarding these important concerns should come from reputable sources in the industry - usually individuals who have worked with the product over an extended period of time. Even so, it is best to calculate conservatively on these rotational values once in-field investigation and plotting has been completed;
- o Second, attention should be given to agro-forestry cultivation trends that are likely to increase over time. If done correctly, agro-forestry efforts can actually decrease product

waste factor in the field by offering more quality-controlled harvesting sites. It can also increase labor productivity by condensing travel time and consolidating workspace area. From an economics standpoint, the price per acre for product produced can also increase rather substantially. As an example, the State of Missouri anticipates capturing from \$3,000 - \$4,000 per acre more from forestlands growing dandelion root in their forests as an agro-forestry crop.

c. Access to Resource Over Time

For business plan consideration, investors will take note of the following access to resource considerations, especially when relying on product volumes coming from forestlands not owned and operated by the product supplier:

- o Public forestlands supply: Limitations on access to resource are not uncommon and should be factored into business risk evaluation. The revocation of USDA FS harvesting permits for Prince's Pine (*Pipsessewa*) due to over-harvesting is but one recent example. Other restrictions on harvesting due to weather conditions should also be noted. The U.S. Forest Service in the West restricts the harvesting of Port Orford cedar boughs during rainy season.
- o Private lands: Changes in ownerships, acreage limitations, and scheduled and non-scheduled timber harvesting conditions need to be noted under project risks. Non-scheduled timber harvesting off private forestlands is a significant concern in many regions throughout the U.S. This type of timber harvesting can occur when family emergencies arise requiring immediate capital. They also often arise when timber supply is reduced and private landowners are approached by major timber corporations, logging contractors, investors, and even banking institutions looking to buy logs for processing. Both clearcutting and high-grading of timber resources can have substantial impacts on the quality and quantity of SFP to come from forestland acres.

d. Multiple Markets - Single Species

Especially good market and business opportunities can be accessed when targeting single species that have multiple markets. As examples, yarrow can be sold as a floral for \$.25 per pound and as a medicinal base for \$3.50 per pound. The flower from Oregon Grape can be a) replanted to regenerate up-rooted product from the forest floor; b) sold as a floral @ \$1.00 per bunch; and c) sold as a medicinal (root) at \$3.50 per pound.

e. New Product Opportunities

A keen eye to new product opportunities is valuable to business development consideration. Although not without risks, new product opportunities can also produce solid business results. Just within the last few years, devil's club (an obnoxious weed to foresters and loggers) is now in demand for the manufacture of an insulin substitution. The noxious weed St. John's Wort has recently been internationally acclaimed as an effective Prozac substitute.

Labor Analysis

With any business plan, access to qualified labor and calculated labor performance levels should be carefully evaluated:

- If relying on external labor forces for raw resource supply, careful investigation into access to qualified harvester pools and their track record in the area for job and quality consistency are crucial. These considerations are fundamental to "bankable" business plan development.

- If relying on internal labor for raw resource harvesting, issues requiring direct attention are:
 - a) Harvest training for sustainability of resource: Leaf count retention per stem harvested, appropriate root extraction techniques, and required replanting practices are all required training for an internal labor force deemed responsible for sustainable SFP practices.
 - b) Appropriate training for harvesting of multiple species: External labor pools are well-known in the SFP industry for being non-adaptive to harvesting multiple species. Sword fern harvesters, as an example, will often refuse to learn to harvest salal or evergreen huckleberry. Internal labor should be trained to correctly harvest multiple species from the forest.
 - c) Training for waste reduction: Appropriate bundling techniques for damage reduction, elimination of fresh-harvested fungal-infected plants which can turn large volumes of harvested product to waste in a matter of hours, and appropriate product preserving techniques are key training considerations for an internal labor force.

Processing Analysis

Aside from harvesting raw resource, future business plan consideration should identify added processing which can increase the value per unit of product sold. Processing can occur at different levels, from simple in-field preserving operations to large wholesale concerns.

Once a decision is made to look at added processing of SFP, special analysis is required to ascertain production requirements to successfully be in business (commercial packaging requirements, product processing requirements, cold storage requirements to achieve year-round product sales, etc.).

Target Your Research Eye on the "Weeds"

As noted in earlier sections of this report, some of the best opportunities in SFP markets are found in turning "trash" to "cash". Manzanita, a "trash" shrub in California, has high value in the cosmetic industry in Japan. Dandelions are a weed species in the PNW, but are also used in the manufacture of many over-the-counter products including hair conditioners and gourmet wines and teas.

Seek Out Creative, Non-Traditional Project Financing

For public lands: Unusual opportunities now exist with non-traditional partners such as the Environmental Protection Agency, which offers significant funding opportunities to link watershed restoration using SFP trees and plants.

For private lands: New programs are just being introduced to the U.S. market offer private forest landowners special investment linkages while maintaining land ownership. One such investment program is called the Forest Bank offered through The Nature Conservancy. Unlike traditional conservation easements where the landowner relinquishes title to the land, the Forest Bank allows the owner to retain the land, but place the standing timber as asset into the Forest Bank. In essence, the Forest Bank owns and manages the trees, but the landowner still owns the land. A fair market value for the standing timber is established with that cash value deposited into a customer (landowner) account in the Bank. The customer can collect interest and dividends off the principle amount deposited and can conduct cash withdrawals. The Forest Bank manages the land under certified sustainable forest management practices.

For more information on the Forest Bank, contact the Clinch Valley Forest Bank; Abingdon, VA.; Toll-Free 1-877-4-CLINCH.

Appendix A. Small-Scale for Value-Added Equipment for Foods, Botanicals, & Medicinals

The following outline provides an overview of the information obtained by Mater Engineering in 1996 during direct interviews with product manufacturers throughout the U.S. All manufacturers listed have manufactured equipment used in the herbs and botanicals industry.

Hammermills

Williams Patent Crusher and Pulverizer Company
2701 North Broadway
St. Louis, MO 63102-1597
(314) 621-3348
Contact Person: Don Groppe

Hammermills are their basic product that reduces materials by mid-air impact with hammers attached to a high-speed rotor. They need specific information about applications and the capacity needed before a specific price could be quoted, but have provided small and large capacity horsepower and price variations for review (see equipment matrix attached).

The Fitzpatrick Company
832 Industrial Drive
Elmhurst, IL 60126
(708) 530-3333
(708) 530-0832 fax
Contact Person: Al Cimaglia

They need specific information about applications and the capacity needed before a specific price could be quoted, but have provided variations on horsepower - price comparisons for our review (see equipment matrix attached).

Andritz Sprout-Bauer
Sherman Street
Muncy, PA 17756
(717) 546-8211
(717) 546-1306 fax
Contact Person: Priscilla Blass

They have a variety of hammermills and dimensions to offer a buyer, with varying levels of performance. They need specific information about applications and the capacity needed before a specific price could be quoted, but have provided variations on horsepower - price comparisons for our review (see equipment matrix attached).

Roskamp Champion
2975 Airline Circle
Waterloo, IA 50703
(319) 232-8444
1(800) 366-2563
(319) 236-0481 fax
Contact Person: Scott Anderson

Hammermills are simple to operate and are able to process a broad range of materials. Information provided by this manufacturer includes the following: maintenance is easy, simple, and routine; and cost of wear parts is low. Hammermills tend to produce a wider distribution of size in the products. A hammermill grind also appears finer due to more fine material in the ground product. A higher hammermill tip speed will produce a finer grind. Lower speeds produce a coarser and more uniform grind. Higher tip speeds are required to grind tough materials such as fibers. Lower speeds will increase the grinding efficiency on easy to grind materials such as cereals and soybean meal. Roskamp Hammermills range from 5 to 600 HP, widths of 12" to 48", diameters of 16" to 54", and a variety of feeders, control systems, and air systems. The prices range from \$20,000 for 15 horsepower to \$60,000 for 200 horsepower. The machines average about 60 pounds per horsepower per hour. Roskamp would do a free test using the product the customer supplies to help determine what the best machine would be for their use. Customers are welcomed to visit the lab and watch the testing.

Roll Crushers

Williams Patent Crusher and Pulverizer Company
2701 North Broadway
St. Louis, MO 63102-1597
(314) 621-3348
Contact Person: Don Groppe

Roll Crushers Single roll crushers reduce via impact, shear, and compression. Double-roll crushers reduce primarily through compression. A Double-roll crusher is recommended as it grinds finer. Prices range from \$1,000 for a 5-7 horsepower, \$23,000 for a 20-30 horsepower, and \$60,000 for a 50-60 horsepower.

Roskamp Champion
2975 Airline Circle
Waterloo, IA 50703
(319) 232-8444
1(800) 366-2563
(319) 236-0481 fax

Information provided by this manufacturer includes the following:

Roskamp Roll Crushers are engineered to meet specific requirements for particle size distribution and capacity. Roskamp rolls could be smooth or corrugated, operated at the same speed or differential speeds, and assembled in single, double, or triple reduction configurations. The roll crushers are designed to provide consistent, uniform particle size reduction under continuous operation.

Roller Mills are more energy efficient than hammermills with more tons processed. With a roller there are fewer fine and oversized bits, and less dust. Roskamp rollers range in size from 3 to 300 HP, a roll diameter of 6.5" to 12", roll widths of 6" to 72", and a variety of feeders and control systems.

Roller mills will be more energy efficient than hammermills when grinding friable products such as corn, grain, and wheat. At fine particles, the difference between roller and hammermills are not noticeable. As the grind becomes coarser, the differences become more noticeable. Roller mills are not particularly well suited for fine grinding of cereals and rations containing high proportions of fiber such as oats and barley.

Roskamp would do a free test using the product the customer supplies to help determine what the best machine would be. Customers are welcomed to visit the lab and watch the testing.

Roller Mills

William Patent Crusher and Pulverizer Company
2701 North Broadway
St. Louis, MO 63102-1597
(314) 621-3348
Contact Person: Don Groppe

Roller Mills Pulverizing is accomplished by contact and pressure of vertical rollers against a stationary bull ring. Fluidized, heated material is efficiently ground, dried, classified, and conveyed in one operation. They need specific information about applications and the capacity needed before a specific price could be quoted, but have provided variations on horsepower - price comparisons for our review (see equipment matrix attached).

Impact Dryer Mills

Williams Patent Crusher and Pulverizer Company
2701 North Broadway
St. Louis, MO 63102-1597
(314) 621-3348
Contact Person: Don Groppe

Impact Dryer Mills are special hammermills that combine a flow of hot air or gas with an integral separator to make grinding, drying, sizing, and conveying of many materials an automatic, simultaneous operation. They need specific information about applications and the capacity needed before a specific price could be quoted, but have provided variations on horsepower - price comparisons for our review (see equipment matrix attached).

Impactors

Williams Patent Crusher and Pulverizer Company
2701 North Broadway
St. Louis, MO 63102-1597
(314) 621-3348
Contact Person: Don Groppe

Impactors are mills with no grates to keep the material in the grinding chambers. This minimizes rubbing action and makes them well suited to abrasive feeds. They need specific information about applications and the capacity needed before a specific price could be quoted, but have provided variations on horsepower - price comparisons for our review (see equipment matrix attached).

Fluid Bed Dryers

Food Engineering Corporation
2765 Niagara Lane
Minneapolis, MN 55447-4844
(612) 559-5200
(612) 559-4657 fax
Contact Person: Mark Fickes

Information provided by this manufacturer includes the following:

This company's equipment is suitable to dry a wide range of foods, including cereals, nuts, and vegetables. Their dryers feature optional "Full Climate Control" of the circulating air over a wide range of dry bulb and dew point temperatures. Controlling the uniformity of product discharge temperature and moisture provides greater uniformity of product for subsequent process steps. Line yields are increased since fewer fractions, splits, and fines are generated with properly conditioned product. Dryers are offered with steam, hot water, gas, electric, and other heating systems. The Dryers can be shipped totally assembled, decreasing installation time and expense.

They offer a wide variety of dryers such as, **Multi-pass Belt, Single-Pass Belt, Impingement, Fluid Bed, Rotary, and Vibratory**. They also offer steam cookers, conditioners, and rotary coating drums. They provide installation, start up support, and training.

They need specific information about applications and the capacity needed before a specific price could be quoted, but have provided variations on horsepower - price comparisons for our review (see equipment matrix attached).

The Fitzpatrick Company
832 Industrial Drive
Elmhurst, IL 60126
(708) 530-3333
(708) 530-0832 fax
Contact Person: Al Cimaglia

The Fitzpatrick Company manufactures fluid drying equipment. They also make a fluid bed dryer for granular materials.

They need specific information about applications and the capacity needed before a specific price could be quoted, but have provided variations on horsepower - price comparisons for our review (see equipment matrix attached).

Slicers

Urschel Laboratories, Inc.
Al Watkins Representative
6950 SW Hampton Street
Tigard, OR 97223
(503) 624-8260

Model CC

The model CC, a root slicer, uniformly slices, strip cuts, shred, and granulates a wide variety of food products at high production capabilities with excellent results. The versatile machine features interchangeable cutting heads that enable the processor to change the type of cut in just minutes. Specially designed throwaway knives do not require sharpening and are inexpensive to replace. The Model CC features continuous operation for uninterrupted production and simplified design for easy cleanup and maintenance.

The model CC Slicer is a centrifugal type slicer. Product enters the rotating impeller and is forced against the inner surface of the cutting head, which consists of eight individual cutting stations. A slice is produced as product passes each knife in a smooth and uninterrupted manner.

Model OV

The Urschel Model OV Slicer is the fastest, most efficient machine available for the uniform crosscut slicing of a wide variety of elongated food products at high production capacities. One

slice is made at a time, which prevents any crushing of the product. The Model OV features a wide selection of slice thickness from which to choose, continuous operation for uninterrupted production and is designed for easy cleanup and maintenance. The machine is not suited for slicing sticky products or product with a high sugar concentration.

The product drops from the hopper onto two high-speed belt conveyors, sloped to form a “V” cross section. A third moving belt over the top of the “V” completes the product enclosure, ensuring positive feed into the slicing wheel. The product is completely surrounded by moving conveyor belts and corrugated rolls that are very thin and under a thousand pounds serve as spokes and support the rim of the slicing wheel. The knives are gently twisted in order to make a uniform pitch from the hub to the rim. It is the pitch and the number of knives that determines the thickness of the slice and maintains the speed of the product while it is being sliced. The knives move through the product at 95 feet per second (29 m/s) producing clean, crosscut slices. The cut slices are then discharges into a spiral chute, which reduces their speed before being discharges from the machine.

They do not have any slicers that would do a good job on ginger or ginseng. They were unable to recommend a company that would carry slicers for those items. The company recommends a comitrol, which is a milling machine that runs at 30 horsepower and has a budget price of \$30,000.

They need specific information about applications and the capacity needed before a specific price could be quoted, but have provided variations on horsepower - price comparisons for our review (see equipment matrix attached).

Vacuum Dryers

Stokes Vacuum
5500 Tabor Road
Philadelphia, PA 19120
(215) 831-5400
(215) 831-5420 fax
Contact Person: Scott Ryan

Stokes Vacuum provides a wide variety of shelf dryers, vacuum rotary dryers, and vacuum conical dryers in many different sizes.

Stokes Vacuum has received ISO 9001 registration. Stokes Vacuum personnel will, if needed, run tests on pilot scale equipment in their demonstration laboratory to help in selecting the correct equipment, formulating operating procedures, and developing cost estimates.

Dehydrators

Commercial Dehydrator Systems Inc.
256 Bethel Drive
Eugene, OR 97402
(541) 688-5281
Contact Person: Dave Stone

They produce tray dryers. The model #ST-22, Multi-tray, fixed rack, cabinet style dryer of 8'9" high, 4'6" wide, and 7'6" long can be used for drying spices. It is not recommended for liquid, powder, or corrosives. All their dryers are able to dry spices, but are not able to handle liquids, powders, or corrosives.

They need specific information about applications and the capacity needed before a specific price could be quoted, but have provided variations on horsepower - price comparisons for our review (see equipment matrix attached).

Freeze Dryers

Innovative Preservation Corporation
Highway 371 South
PO Box 409
Nisswa, MN 56468
1(800) 551-3223
(218) 963-2900
(218) 963-2472 fax

Their freeze dryers range from \$17,900 for the Model 2452, a starter model; to \$35,900 for Model 3680, their most cost effective high production unit. The Model 2452 has over 30 feet of drying capacity, while the Model 3680 has over 88 square feet of drying capacity. Delivery is not included in the price.

Botanique Preservation Equipment Inc.
Richard Long President
15905 Greenway-Hayden Loop, Ste. 104
Scottsdale, AZ 85260
(602) 998-8228
(602) 998-4078 fax

Botanique manufactures **Freeze Dryers**. Freeze dryers removes moisture without affecting its biological, chemical or structural properties. There are three steps in freeze-drying.

In the first step the product is frozen solid, which converts the water content of the material to ice. The final temperature must be below the product's collapse temperature, so that it maintains its structural soundness. Once the product is frozen solid, the condenser and vacuum systems are energized for the next critical process step.

In the second step, the objective is to remove the unbound, or easily removed ice from the product. This water is now in the form of free ice, which is removed by converting it directly from a solid to a vapor, in a process called sublimation.

The third step is secondary drying which removes any remaining water. This final step is a long process and is actually started during the first step.

Prices vary according to the size of the machine. The lowest price is \$14,190 for a 24Dx24 "Mini Pro" Automatic with three shelves, three trays and 8.05 square feet of tray space, and 7.81 inches of space between trays. Since Botanique is used by florists, the machine can hold 290 blooms. The largest is \$167,380, 370.0 square feet of tray space and hold about 13,320 blooms.

Universal Milling

Kemutuc, Inc.
130 Wharton Road
Bristol, PA 19007
(215) 788-8013
(215) 788-5113 fax

Local contact: Greaves Company
9442 SW Barbur Blvd. #5
Portland, OR 97219
(503) 246-1718
Rick Isherwood
Max Webb

Kemutuc's KEK division has been manufacturing milling and sifting equipment for over 75 years. Their high-speed mills are available from 3 to 75 HP; intermediate size reduction cone mills are available between 1 to 15 HP.

The equipment construction materials can be chosen to suit the process requirements. Epoxy resin coated cast iron is fine for many applications, with castings in stainless steel also available. There is a wide range of finishes and the equipment can be tested with the client's products at the test center before a machine is ordered. KEK Universal Mills are ideal for grinding a wide variety of food applications, including hard crystalline products such as sugar or salt to soft, fibrous products such as wheat, barley, and oats.

As each plant is different, every mill installation will have different mill requirements. KEK Universal Mills can be tailored to fit the customer's need. Kemutuc will take the product and design the system best suited to mill the product. If circumstances dictate that the tests are best carried out at the customer's premises, it can be accommodated using their transportable demonstration units.

Centrifugal Sifters

Kemutuc, Inc.
Local contact: Greaves Company
9442 SW Barbur Blvd. #5
Portland, OR 97219
(503) 246-1718
Rick Isherwood

Their centrifugal sifters are available from 1/2 HP to 10HP. KEK centrifugal sifters may be operated 24 hours a day, seven days a week during which time the machine may be left to operate alone with periodic inspection. The process operator can easily change sieve screen assemblies in a few minutes. No tools or spanners are needed. For those applications where there is likelihood of items such as bolts, nuts, spikes of wood or similar items that could damage the fine mesh sieve screens in particular, a screen protection system can be added to the centrifugal sifter. The sifter can process up to 2 tons an hour. Many KEK centrifugal sifters are found at bagging or packaging point of the process. The sifter can remove any dust formed during processing which can spoil the look, feel, or performance of the product. If circumstances dictate that the tests are best carried out at the customer's premises, it can be accommodated using their transportable demonstration units.

Steam Distillation

Plant Technologies Inc.
Albany, Oregon 97321
(541) 926-4599
Contact Person: Dr. Don Roberts

Plant Technology, Inc. constructed their own small steam distillation machine. It is capable of handling an experimental plot of land up to a couple of acres. The company decided to construct their own machine when they were unable to find a small enough machine for their use. Plant Technology is interested in talking with interested parties about conducting a pilot program.

They sell samples to clients so that the clients are better able to see how much extraction they might get. The charge for unprocessed five gallons samples is \$250 and up. If the herb is processed the company charges from \$150 to \$200 for a five gallon sample.

Newhouse Manufacturing Company
Redmond, Oregon
(541) 548-1055
Contact Person: Bob Lundy

Newhouse company produces a small distillation unit, 12"x18" for around \$1,000. This does not come with a separator can, which costs around \$195.

Root Extractors

Gallenberg Equipment
W9112 Cherry Road
Antigo, WI 54409-8730
1(800) 533-2662
(715) 623-3754
(715) 627-4557 fax
Contact Person: Jim Adamski

The company has several different sizes of harvesters. They also custom build harvesters to fit the customer's needs. The company recommended using a potato harvester to pull up the roots. A small digger that pulls the root out of the soil, leaving it on top to be picked up by hand, costs from \$10,500 to \$15,000.

The company makes a ginseng digger, which is a double-row digger that must be pulled by a 75 horsepower tractor. The basic ginseng digger is around \$12,000. The more options that are added increase the price upward to \$14,000. This is the smallest ginseng digger that is available.

The company is willing to talk with interested parties to explain the different types of ginseng equipment, and to help them choose the correct piece of equipment best suited to their needs.

Haines Equipment Inc.
20 Carrington St.
Avoca, NY 14809
(607) 566-8531
(607) 566-2240 fax
Contact Person: Karol Haines

The company recommends using a potato harvester to pull up herb roots. A single-row potato digger with a side boom starts at around \$12,000 for a new machine.

KPR Inc.
PO Box 608
375 Avenue D West
Wendell, ID 83355-0608
(208) 536-6601
(208) 536-6695 fax
Contact Person: Bob Rietveld

The company does sell both new and used equipment. Used harvesters start at around \$15,000 and up depending how the size and power needed in the harvester. A new harvester, the G2 1500 series, a single-row potato harvester is around \$54,500, with the 1700 series starting around \$65,200.

Alaska SFP Project Value-Added Equipment Matrix(1996 price values)

Company	Horsepower (lowest offered)	Pounds/hr	\$ (not installed)	Comments	Offer used equipment
Hammermills					
Williams	5 hp	200 pds/day	\$12,000		no
Fitzpatrick	5 hp	200 pds/day	\$14,000	Handset units coarse grind	no
Sprout-Bauer	50 hp	2,000 pds/day	\$20,000		no
Roskamp	5 hp	200 pds/day	\$5,053 (w/o motor) \$5,528 (w/ motor)		no
Roll Crushers					
Williams	5 - 7 hp		\$1,000	Double-roller fine grind	no
Roller Mills					
Williams			start at \$100,000		
Impact Dryer Mills					
Williams			start at \$50,000		
Fluid Bed Dryers					
Food Engineering	10 hp	100 - 300 pds/day	\$50,000		no
Fitzpatrick	10 hp	200 pds/day	\$50,000		
Vacuum Conical Dryers					
Stokes	3 cubic feet		\$35,000	Good for liquid, and free-flowing	no
Dehydrators					
Commercial	50 amps	30 - 60 pds/day	\$4,200	good for cottage industries	no

Company	Horsepower (lowest offered)	Pounds/hr	\$ (not installed)	Comments	Offer used equipment
Freeze Dryers					
Innovative	small:	600-800 blossoms	\$17,000	used to dry flowers, able to use for food	no
Botanique	small:	290 blossoms	\$14,190	used to dry flowers, able to use for food	no
Millers					
Urschel	15 hp	100 - 300 pds/day	\$28,000	budget price	no
Kemutuc	small: 10	100 - 300 pds/day	\$50,000		no
Sifter					
Kemutuc	small: 3/4	150 - 300 pds/hr	\$12,000		no
Solar Dry Kiln					
Wood-Mizer	9' Solardry Jr. Kiln		\$2,310.00	Although designed for wood, is possibly suitable for drying herbs	no
Harvesting Equipment (Root Extractors)					
KPR	D2 Harvester	Single row	\$15,000+	used equipment, hand held	yes
Gallenberg	Potato Digger	Single-row	\$10,500 - \$15,000		no
	Ginseng Digger	Double-row	\$60,000	different varieties of ginseng harvesters	
Haines	Potato Harvester	Single-row	\$12,000	harvester with side boom	
Steam Distillation					
Newhouse	12"x18"		\$1,195	includes condenser, box, and separator can	no

Appendix B. Draft Guidelines for Certification of Non-Timber Forest Products (NTFPs)

The Forest Stewardship Council (FSC) is developing guidelines for the certification of non-timber forest products. The following is a summary and breakdown of the draft guidelines. Please check with the FSC for the latest guidelines (1-877-372-5646 or www.fscus.org).

Generic Guidelines for Assessing the Management of NTFPs in Natural Forests

NTFP Marketing and Certification Project, Rainforest Alliance

Non-Timber Forest Products (NTFPs) are biological resources/products other than timber that are harvested from forests for subsistence and trade. NTFPs include a variety of products, including medicinal plants, fibers, resins, latex, oils, gums, fruits, nuts, foods, spices, flowers, dyes, construction materials, craft materials, rattan, bamboo, fish, and game (wildlife). The following information deals with plant products harvested from a variety of life forms and plant parts, including reproductive propagules, plant exudates, and vegetative structure such as roots and bark.

The draft report states, "The harvest of NTFPs can have lower impacts on the forest ecosystem than timber harvesting, can provide an array of social and economic benefits, particularly to community operations, and should be an important component of forest ecosystem management. NTFPs require special management and monitoring considerations in order to ensure the long term viability of species and to minimize adverse social and ecological impacts." (From the FSC Principles & Criteria #11)

The main tools for guiding assessments are principles, criteria, and indicators. This hierarchical framework breaks down the goal of sustainable forest management (NTFP management) into levels and parameters that can be assessed:

Principles:	Break overall goal into more specific components
Criteria:	Add meaning
Indicators:	Add performance value
Verifiers:	Add greater specificity to measure an indicator.

Smartwood NTFP Guidelines Criteria

1. Commitment to FSC Principles and Legal Requirements

Non-timber forest products (NTFPs) shall be managed in accordance with Principles and Criteria 1-10 of the FSC, and (Draft) Principle 11 (Non-Timber Forest Products) and its Criteria. NTFP certification will also take place within the ethical and legal framework of international environmental and human rights laws and policy, and national, state/provincial, and local laws in the country where forest management occurs.

2. Land Tenure and Use Rights and Responsibilities

The forest operation must respect and incorporate customary law with regards to tenure, and forest and species stewardship. Guaranteeing rights and access to resources enables forest managers and communities to invest in long-term forest management strategies.

3. Forest Management Planning and Monitoring

A management plan shall be written, implemented, and kept up to date. The long-term objectives of management and the means of achieving them shall be clearly stated. Plans need to respond to the economic and social interests of local communities.

Forest management should include systematic research and data collection needed to monitor the following:

- o Estimated growth and yield (production of forest products harvested);
- o Regeneration and condition of the forest;
- o Observed changes in the flora and fauna;
- o Environmental impacts of harvesting and related operations;
- o Social impacts of harvesting and related operations.

4. Forest Management Practices

Proper harvesting techniques must be employed in order to minimize the impact of NTFP harvesting on species populations and species diversity.

5. Environmental Impacts and Biological Conservation

Certifiable NTFP management shall ensure long-term ecological viability of NTFP populations. Care must be taken that species are not overharvested, and appropriate protection must be provided for vulnerable species in residual stands. This includes field assessments of the forest condition to be completed prior to the harvesting. Ecological functions and values are maintained intact, enhanced, or restored. These include:

- o Forest regeneration;
- o Genetic, species, and ecosystem diversity;
- o Natural cycles that affect the productivity of the forest ecosystem.

6. Social and Cultural Impacts

Certification must not create imbalance in existing traditional management systems, many of which are based on complex histories of use and belief. NTFP certification should bolster local economies in culturally and socially appropriate ways. NTFP certification efforts should attempt to minimize any potentially negative impacts of market forces on traditional local use and management of forests and forest products.

7. Community and Worker Relations

Community Relations

NTFP certification is intended to increase and/or stabilize long-term local income from the forest resource. As much value as possible should be captured at the local level. Processing of products should be conducted as close to harvesting locations as possible in order to maximize the benefits that accrue to communities near the forest area.

Worker Relations

Workers must be paid at least equivalent to the legal minimum wage, the union negotiated rate, or the sector average. Men and women must receive equal pay for equal work. Other benefits (health, retirement, workers' compensation, housing, food) for full-time staff and contractors must be consistent with prevailing standards.

8. Benefits from the Forest and Economic Viability

The intent behind NTFP certification is to optimize the economic potential of certain marketable species in order to provide a larger economic return from a given forest area for local communities and forest managers without negatively impacting local use of these or other NTFP species. Forest management should strive to strengthen and diversify the local economy, avoiding whenever possible dependence on a single forest product.

Small holders should be able to participate in negotiating contracts for the sale of their products.

9. Chain of Custody in the Forest

Chain of custody (COC) is a tracking system that enables certifiers to trace each forest product from its origin through harvesting, processing, storage, and sale. NTFP chain of custody issues can be highly problematic. NTFPs are often gathered from a wide geographic area, can be channeled into bulk as well as specialty markets, processing facilities might be used for both certified and non-certified products, and there might be extremely complicated internal chains of custody. In some cases, the costs of resolving the chain of custody issues might outweigh the return that can be made from attempting to produce certified NTFPs. Product inventory and handling up to the point of sale or transport of the product to other parties outside the forest is critical to NTFP certification.

Volume and source data on raw materials must be available (scaled, inventoried, measured) at intermediate storage facilities, processing and distribution centers. Certified forest products must be clearly distinguished from non-certified products through marks or labels, separate documented storage, or accompanying invoices or bills of lading.

Unique marking or identification of certified products should exist at all stages of processing and distribution up to the point of sale or transport either outside the forest or to a third party.

All marketing materials and public representation of certified forest products should be consistent with certifier policy.

Performance Indicators and Verifiers

The aforementioned principles and criteria are a relatively unchanging foundation. The following indicators and verifiers will be adapted based on regional and site-specific considerations. A range of verifiers are supplied for the following indicators, not all of which will be used in each case. Certifiers will need to select those that are most effective and appropriate in a given situation.

The performance indicators and verifiers are for the following classes of NTFPs:

- o Exudates (produced by plants and trees)
- o Vegetative structures: apical bud, bark, root, leaves
- o Reproductive propagules: fruit, seeds

The broad category of NTFPs has been divided into classes which are based upon the product or plant part harvested. This was done to allow for more effective field assessments by providing information necessary to determine sustainability. Species-specific performance indicators, verifiers, and other guidance documents will also be developed and employed in some field assessments, particularly for internationally-marketed species such as palm heart, brazil nuts, rattan, and chicle.

Indicators and verifiers are based on the draft FSC Draft Principle and Criteria 11.2 which states:

Management plans, operational activities and monitoring shall ensure long term ecological viability of NTFP populations. Management systems should address the ecological processes of,

and implement activities to minimize the ecological impacts of harvesting on, various types of NTFPs, including but not limited to:

- o Products which require the removal of the individual
- o Products which affect the species' growth or productivity
- o Products which, when harvested, cause damage to trees or other forest products
- o Products which are critical to nutrient cycling
- o Products which have high wildlife value
- o Products which have very specific ecological interdependencies
- o Products which are harvested for subsistence use

Exudates

Exudates are produced by plants and trees. Latex, resin, oleoresin and gums are exudates. They are commonly used as sealants, medicines, foods, and in industrial applications. Harvest of exudates is performed by tapping the tree or cutting into the bark. The impact of this type of harvest is measured by the maturity of the plant or tree and the frequency and intensity of harvest. When extracting exudates, the physiological demands on the tree to produce additional latex or oleoresin compete with the tree's ecological necessity to produce seeds.

Management Indicators and Verifiers for Exudates

Indicator	Verifiers
Rates of harvesting: intensity, frequency, seasonality (Knowledge)	Scientific study Local management/use of selected species exists Harvest rates known and documented Analysis of implications of different harvest rates
Minimum diameter or age of trees for tapping (Diameter and/or age)	Specify maximum # of taps/incisions per tree Establish minimum diameter/age on species and site-specific basis
Quantity of exudates extracted that reduces negative impact on long term production & vigor (Quantity)	Document records of volumes extracted Data on relationships between amount extracted and tree health
Frequency of harvest (Frequency)	Frequency not greater than stipulated frequency. Frequencies adjusted according to DBH or age of tree Records of harvest frequency are documented Frequency info. Based on several different observations
Harvesting timed to reduce stress during reproductive periods (Timing/Seasonality/Precipitation)	Harvesting occurs according to specified timing info. Is available on reproductive cycles Written instructions on best times to harvest Evidence that collectors not harvesting during reproductive periods

Management Indicators and Verifiers for Exudates (cont.)

Indicator	Verifiers
% of individuals harvested from entire population will allow for the retention of mature, reproducing individuals, and reflect natural diversity in composition and structure (Density/Abundance)	Portion of mature, reproducing individuals to retain is specified This portion of individuals is retained Harvesting occurs according to pre-agreed density Structural & genetic diversity maintained
Exudates collected according to best harvesting practices (Techniques)	Trees not felled unless part of approved silvicultural operations Appropriate height for taps/incisions are determined Appropriate depth of tap is determined Tap does not exceed specified depth Negative, indirect impacts of harvesting are minimized
Growth rates & regeneration are regularly monitored (Growth rates & regeneration)	Frequency of monitoring is specified Periodic regeneration surveys are conducted Size class distribution includes seedlings to large adults Seedling or sapling densities remain equal to or above baseline values If seedling or sapling densities significantly, harvest adjustments made by: 1) limiting total area from which resource harvested 2) regulating # or size of plants being harvested 3) enrichment planting of harvested species
Regular visual appraisals of behavior & condition of harvestable plants/trees pre and post harvest (Visual appraisal of health & vigor)	Over specified time period, harvestable plants/trees do not display loss of vigor, disease, stunted growth or aborted fruit/leaves. If harvested individuals display weakened condition, harvest volumes are reduced. If visual assessments & inventories indicate decline in density of non-targeted species in harvest area, adjustments are made in management regime to recover density.

Vegetative Structures

Vegetative structures consist of different plant parts such as stem, leaf, root, bark and apical bud (primary growing bud at tip of stem). These NTFPs are used for food, medicine, crafts and building materials. The impact of harvesting these products depends upon the plant growth form and the technique and density of harvest. With proper harvesting techniques, plants may recover from damage due to harvesting of leaves, sprouts and branches as they reach compensatory growth.

Monitoring Indicators and Verifiers for All Types of Vegetative Structures

Indicator	Verifier
Growth rates & regeneration regularly monitored by documented inventory system (Growth rates & Regeneration)	Periodic regeneration surveys Size class includes seedlings to large adults Seedling or sapling densities remain equal to or above baseline values If seedling or sapling densities decline, these harvest adjustments are made: 1) limit total area from which resource harvested 2) regulating the number or size of harvested plants 3) enrichment planting of harvested species
Regular visual appraisals of behavior & condition of harvestable plants/trees pre- and post harvest (Visual appraisal)	Plants/trees do not display loss of vigor, disease, aborted fruit/leaves or stunted growth. If harvestable individuals display weakened condition, acceptable harvest volumes will be reduced. If visual assessments & inventories reveal decline in density of non-targeted species in harvest area, adjustments made in management regime to recover diversity.

Management Indicators and Verifiers for Specific Vegetative Structures

Apical Bud

Indicators	Verifiers
Multi-stemmed species that have the ability to resprout (Species selection)	Where numerous species produce a similar product, multi-stemmed species & those with the ability to resprout are harvested preferentially
Rates of harvesting: intensity, frequency, and seasonality (Knowledge)	Scientific study Local management/use of selected species Harvest rates documented Analysis of implications of different harvest rates
Minimum age or height at which apical buds may be harvested (Diameter and/or age)	Minimum age/height for first & subsequent harvests are specified Individuals harvested at or above minimum DBH/age
Quantity of plant tissue removed minimizes negative impacts on long term vigor (Quantity)	Document volumes extracted Data on relationships between volume extracted & plant health

Management Indicators and Verifiers for Specific Vegetative Structures (con't)

Apical Bud (con't)

Indicators	Verifiers
Frequency of harvest determined (Frequency)	Frequency of harvest does not exceed stipulated frequency Frequencies adjusted according to age or height of harvestable tree Document records of harvest frequency Frequency info based on different observations
Harvesting is timed to reduce stress during reproductive periods (Timing/Seasonality)	Harvesting time is specified Info. available on reproductive cycles Written instructions on when not to harvest and when to harvest
Percentage of individuals harvested from entire population will allow for the retention of mature, reproducing individuals (Density/Abundance)	Portion of mature, reproducing individuals to retain is specified. Portion of mature, reproducing individuals is retained. # of individuals harvested according to pre-agreed density. Structural & genetic diversity maintained.

Bark

Indicator	Verifier
Rates of harvesting: intensity, frequency, seasonality (Knowledge)	Scientific study Local management/use of selected species Harvest rates documented in writing Analysis of different types of harvest rates
Minimum DBH or age at which bark may be harvested (Diameter and/or age)	Minimum age/DBH for first harvest specified Individuals harvested at or above minimum DBH/age
Quantity of bark removed minimize negative impacts on long term vigor (Quantity)	Volumes extracted are documented. Data or visual observations on relationships between vol. extracted & plant health
Frequency of harvest (Frequency)	Harvest frequency does not exceed stipulated frequency Frequencies adjusted according to DBH of harvestable tree Records of harvest frequency Frequency info. based on observations of many different sources

Management Indicators and Verifiers for Specific Vegetative Structures (cont.)

Bark (cont.)

Indicator	Verifier
Harvesting is timed to reduce stress during reproductive periods (Timing/Seasonality)	Harvesting occurs according to specified timing Info. available on reproductive cycles Instructions on periods to avoid harvesting as well as when to harvest Evidence that collectors avoid harvests during reproductive periods
Percentage of individuals harvested from entire population will allow for retention of mature, reproducing individuals (Density/Abundance)	Portion of mature, reproducing individuals specified Portion of mature, reproducing individuals retained # of individuals harvested according to pre-agreed density Structural & genetic diversity maintained
Bark harvested according to specified techniques that minimize negative impacts on vigor (Techniques)	Trees will not be girdled Trees will not be felled in order to harvest bark, unless part of a coppicing system. Bark can be collected from trees felled as part of approved silvicultural operation. Appropriate heights for bark harvest are determined Bark is harvested only at agreed upon heights and % of diameter Stemwood will not be damaged Negative, indirect impacts of harvesting minimized

Root

Indicator	Verifier
Rates of harvesting: intensity, frequency, seasonality (Knowledge)	Scientific study Local management/use of selected species Harvest rates documented in writing Analysis of implications of different harvest rates
Root harvest conducted at specified maturity (Diameter and/or age)	Minimum age for first harvest specified Individuals harvested at or above minimum age Individuals harvested following reproductive maturity
Quantity of root collected is specified (Quantity)	Volumes extracted are documented Data or visual observations on relationships between volume extracted and plant health Mortality does not exceed recruitment
Frequency of harvest is determined (Frequency)	Frequency does not exceed stipulated frequency Frequencies adjusted according to age/size of harvestable plant. Frequencies adjusted according to recruitment in population. Records of harvest frequency documented Info. on frequency based on many different sources.

Management Indicators and Verifiers for Specific Vegetative Structures (cont.)

Root (cont.)

Indicator	Verifier
Harvesting is timed to reduce stress during reproductive periods (Timing/Seasonality)	Harvesting occurs according to specified timing Info. available on reproductive cycles Root harvest conducted after fruit/seed of individual plant has matured Instructions on periods to avoid and when to harvest Evidence collectors are avoiding harvests during reproductive cycles
Percentage of individuals harvested will allow for retention of mature, reproducing individuals (Density/Abundance)	Portion of mature, reproducing individuals to retain is specified Portion of mature, reproducing individuals is retained # of individuals harvested according to pre-agreed density Structural and genetic diversity maintained
Roots harvested according to specified techniques (Techniques)	Correct portion of root, bulb, or rootbark to be harvested is determined. Only specified portion of root, bulb, or rootbark is harvested. Harvest techniques in accordance with species' ability to sprout or to spread by root and/or seed. If plant is capable of recovery, only a portion of the root is harvested; the rest left to resprout. Seed collected from mature plant prior to harvest planted in vicinity of harvested individual. Negative, indirect impacts of harvesting minimized.

Leaves

Indicator	Verifier
Rates of harvesting: intensity, frequency, seasonality (Knowledge)	Scientific study Local management/use of selected species Harvest rates documented in writing Analysis of implications of different harvest rates
Indicator	Verifier
Leaf harvest conducted at specified DBH/age (Diameter and/or age)	Minimum age for first harvest specified Individuals harvested at or above minimum age
Quantity of leaves harvested in accordance with specified amount (Quantity)	Volumes extracted documented Data or visual observations on relationships between vol. extracted and plant health. Appropriate proportion of healthy leaves is determined Sufficient proportion of healthy leaves remain on each individual to allow for photosynthesis

Management Indicators and Verifiers for Specific Vegetative Structures (cont.)

Leaves (cont.)

Indicator	Verifier
Frequency of harvest from individual determined (Frequency)	Frequency of harvest does not exceed stipulated frequency Frequencies adjusted according to age of harvestable plant Sufficient time between successive harvests for plants to produce new leaves Records of harvest frequency documented Frequency info. based on observations of many different sources
Harvesting timed to reduce stress during reproductive periods (Timing/Seasonality)	Harvesting occurs according to specified timing Info. available on reproductive cycles Instructions of periods to avoid harvesting and when to harvest
Percentage of individuals from which leaves are harvested limited (Density/Abundance)	Portion of mature, reproducing individuals to be retained is specified Mature, reproducing individuals retained. # of individuals from which leaves are harvested according to pre-agreed density Structural & genetic diversity maintained
Leaves harvested according to specified techniques (Techniques)	Individual plants not destroyed during harvest Trees/shrubs are not felled Reproductive structures & apical buds remain intact. NO signs of post-harvest damage Branches are not to be removed for picking leaves Leaves not collected from felled tree, unless part of approved silvicultural operations

Reproductive Propagules: Fruit/Seed

The fruits, nuts and oil seeds of the reproductive propagules of plants are harvested for use as food, oil, crafts and medicines. The continual removal of significant quantities of fruits and seeds can directly affect the ability of plants to reproduce. A shortfall in recruitment can result in decreased plant densities and changes in size-class structure. Continued harvest can affect the genetic composition of the exploited tree population. Sometimes frugivores, which play a significant role in germination and seed dispersal may migrate to more isolated forests.

Management Indicators and Verifiers for Reproductive Propagules (fruit/seed)

Indicator	Verifier
Harvesting rates: intensity, frequency, seasonality (Knowledge)	Scientific study Local management/use of selected species Harvest rates documented in writing Analysis of implications of different harvest rates
Research, documentation, or systematic observation of population dynamics (Quantity)	Volumes extracted documented Productive capacity of species determined through weighing, counting, measuring quantity of resource produced by different sample trees throughout harvest season. No more than determined percentage of harvestable yield extracted
Fruit harvested according to specified methods (Techniques)	Trees are not felled Fruit, seeds, nuts harvested from tree itself or directly from ground after falling from tree Trees not damaged to induce premature fruiting Determined portion of fruits remain in forest for wildlife (disperser) populations

Monitoring Indicators and Verifiers for Vegetation Propagules

Indicator	Verifier
Growth rates & regeneration monitored by inventory system (Growth rates & regeneration)	Periodic regeneration surveys conducted Size class distribution demonstrates population structure from seedlings to large adults Seedling or sapling densities remain equal to or above baseline values If seedling or sapling densities decline, these harvest adjustment made: 1) limiting total area from which resource can be harvested 2) regulating number of fruits harvested and/or 3) enrichment planting of harvested species

Monitoring Indicators and Verifiers for Vegetation Propagules (cont.)

Indicator	Verifier
Regular visual appraisals of behavior and condition of harvestable plants/trees conducts before and after harvest (Visual appraisal)	Harvestable plants/trees do not display loss of vigor, disease, aborted fruit/leaves or stunted growth If harvested individuals display weakened condition, acceptable harvest volumes will be reduced If visual assessments indicate decline in density of non-targeted species in harvest area, adjustments will be made in management regime in order to recover diversity
Periodic assessments are conducted in order to evaluate populations of dispersors of seeds & fruits (Wildlife/Dispersors)	Within harvest area, populations of fruit-dispersing animals remain stable If these populations decline, harvest adjustments are made

As the preceding tables indicate, many of the indicators and verifiers are similar for different non-timber forest products. Of prominent importance is the need to closely monitor the harvesting process and the rates of regeneration: discovering the true sustainability of special forest products.

The Alaska Wood Products Industry 1998 Sawmill Survey

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Abstract

In 1998, the Forest Service, University of Alaska Cooperative Extension Service, and the Alaska Department of Commerce jointly funded a survey of Alaska sawmills, which was conducted by the Institute of Social and Economic Research (ISER) at the University of Alaska Anchorage. This paper discusses the survey and its results.

The 1998 survey covered mill capacity, employment, total production, production by type of product and export or domestic sale, log consumption by species and original timber ownership, chip and residue production, information on suppliers and customers, and several questions about the timber industry in general. It focused on data for calendar year 1997. Some principal findings were:

- Our respondents reported a design capacity of about 240 MMBF annually, almost 200 MMBF of that capacity in Southeast Alaska. They reported that the practical capacity of their mills was somewhat lower – about 205 MMBF statewide, with 174 MMBF in Southeast.
- In 1997, production ranged from 20 MBF to 20,000 MBF. Most firms produced less than 1,000 MBF, and aggregate production was about 67,000 MBF.
- About 55 percent of products were exported and 45 percent sold domestically. About 55 percent of exports were dimensional lumber and 40 percent cants. Domestic sales were 70 percent dimensional lumber and 20 percent cants.
- Of the 27 mills that answered the down time questions, 13 reported no down time due to supply problems. Five firms reported that they lost one day per week or more – up to over half of their total possible time - to lack of supply; the remaining 9 reported just a few days each year.
- Tongass timber accounted for about 90 percent of all the log consumption reported statewide, and over 98 percent of Southeast firms' logs. Elsewhere, privately owned timber provides almost half of Southcentral sawmills' supply, and over 10 percent of Interior sawmills' logs, with the remainder of wood in those regions coming primarily from state land.
- Most mill residue (about 85 percent) is sold (for landscaping and bedding) or used for energy rather than landfilled or burned.

In the last section of the survey, we asked several open-ended questions and solicited comments.

- About half the mills responding in Southeast and Interior reported supply problems, and 4 out of 5 Southcentral mills did. The most common suggestion for government help was more state and local timber sales. Almost half the respondents believed government could help the industry most by providing a dependable timber supply and providing more sales

- Although many respondents would have liked to produce dried lumber, most mills had not and few had plans to do so. Many responses cited high costs as the reason. Despite these concerns about costs, the most common new product plan was to obtain a kiln for drying lumber.
- Two thirds of the mills thought it was feasible for Alaska to manufacture more value added products, but half of those respondents worried about costs, supply and access to markets.

Table of Contents

Abstract.....	203
Introduction	206
Data Sources for the Alaska Wood Products Industry	206
Harvest Data	206
U.S. Department of Commerce Export Data	207
Alaska Department of Labor Data.....	207
Survey Data.....	207
1996 Wood Products and Harvest survey.....	207
1998 Sawmill Survey	208
Results of the 1998 Sawmill Survey	208
Mill Capacity.....	209
Sawmill Equipment.....	209
Production	210
Supply Problems	214
Log Consumption	214
Employment	215
Chip and Residue Production	216
Comments from the Survey Respondents.....	218

List of Tables

Table 1.	Survey Responses for ISER Wood Products Surveys, 1996 and 1998.....	208
Table 2.	Comparison of Mill Capacity Estimated by USFS and by 1997 ISER Survey....	209
Table 3.	Number Of Our Respondents Who Reported Non-Zero Production, 1991 To 1997	210
Table 4.	Production Reported by Alaska Sawmills, by Species and Destination, Compared with Lumber Exports by Species.....	212
Table 5.	Volume of Wood Products Manufactured, 1997, by Region and Product (MBF).....	213
Table 6.	Down Time due to Lack of Supply	214
Table 7.	Log Consumption by Region and Species, 1997 (MBF)	215
Table 8.	Log Consumption by Region and Ownership, 1997 (MBF).....	215
Table 9.	Distribution of Mills by Level of Capacity Utilization and Region, 1997	215
Table 10.	Distribution of Mills by Number of Employees in 1997	216
Table 11.	Residue Production in 1997	217
Table 12.	Disposition of Mill Residue	217
Table 13.	Residue Disposition by Type and Region	218
Table 14.	Origin of Mill Residue by Region.....	218
Table 15.	Question 6A. Have you encountered problems in obtaining a wood supply? Do you have any suggested solutions?	219
Table 16.	Question 6B: What problems have you encountered in either producing or marketing dried lumber?	220
Table 17.	Question 6C: Do you have any plans for expansion or moving into a different product line? If so, please give a brief description of your plans and the type of equipment you would like to purchase over the next five years.	221
Table 18.	Question 6D: Given the choice, what species, grade and volume of wood do you prefer to purchase?.....	222
Table 19.	Question 6E. In your opinion, what role can the state government play in assisting the wood products industry?	223
Table 20.	Question 6F: In your opinion, is it feasible to manufacture more value-added wood products in Alaska? Why or why not?.....	224

List of Figures

Figure 1.	Annual Production Index	211
Figure 2.	Statewide: Number of Firms by Annual Production.....	211
Figure 3.	Southeast: Number of Firms by Annual Production	211
Figure 4.	State: Number of Firms by Days Operated	211
Figure 5.	Southeast: Number of Firms by Days Operated	211

Introduction

A basic step towards understanding the potential of the Alaska wood products industry is knowing how much timber is harvested, what products are made from timber in Alaska, and how much of the timber harvested here is shipped outside Alaska in the round. A continuing problem in understanding the industry has been that only some of this basic information is available.

The federal and state governments release data on how much timber is harvested from public lands, but no data are collected regularly on timber harvests from private lands. The federal government releases data on exports of round logs and manufactured wood products to foreign countries, but no comprehensive data are released on shipments of round logs or wood products to other states. And no data are collected regularly on wood products manufacturing within Alaska.

In the past, prior to the 1980s, when Alaska's forest products industry was dominated by mills using Tongass timber and exporting almost all their products, lack of data was not a major concern. Federal harvest data showed how much timber was being harvested, and federal export data showed what wood products were being manufactured, and where they went.

In the 1980s, Native timber harvests became a major part of Alaska's timber industry. Private harvests have exceeded public harvests since the early eighties. However, it is still possible to estimate these private harvests from data on raw log exports, since most private harvests were exported without processing.

In the 1990s, however, as the industry changed with the closure of the Southeast Alaska pulp mills and large sawmills, a much greater share of Alaska timber harvests go to either in-state markets or to other states primarily Washington and Oregon. By 1997, domestic sales were important to most sawmills, and the USFS estimated that 30 to 40 percent of Alaska lumber was sold domestically¹. As a result, export data no longer provide an accurate indication of how much Alaska timber is being harvested or what products are produced from it. The need for better information about what is actually harvested and produced in Alaska has grown as the industry changed.

In response to this situation, the University of Alaska Anchorage, together with the Alaska Department of Commerce and Economic Development, the Cooperative Extension Service at the University of Alaska Fairbanks, and the Forest Service undertook a sawmill survey in 1998. This report discusses the survey and its major findings.

Data Sources for the Alaska Wood Products Industry

Harvest Data

There is no regular source of complete information on Alaska timber harvests. Loggers harvesting from public lands report their annual harvest volumes. On private lands, however, there are no requirements for loggers to report their harvest. Alaska's Forest Practices Act does require most timber harvesters to file Notifications of Operation with the Alaska Department of Natural Resources for harvest operations they are conducting. These notifications contain the location and acreage to be harvested, type of operation, starting date and estimated completion date. However, permits may cover several years, and loggers do not have to report how many of those acres they harvest each year of the permit, or the volume of wood they actually harvest.

¹ Morse, Kathleen, "Evaluating the Demand for Tongass Timber", USDA Forest Service, Region 10, Sep 28, 1988, p. 15. estimated that 30 to 40 percent of Alaska lumber was sold domestically. Our survey indicates a higher share, perhaps 40 to 50 percent. However, if we exclude KPC's Ketchikan and Annette Island sawmills, the domestic share jumps to 80 percent. Most Alaska sawmills sell primarily to domestic markets.

Also, the emphasis for the State is in using the information to promote good forestry practices, not to obtain aggregate information about the industry. The state does, however, compile data on timber sales and harvests on state lands, and on "active harvest acreage" on private lands.

The USFS Alaska Region compiles an annual report, required under ANILCA, assessing the market for Tongass National Forest timber, "Timber Supply and Demand". That report includes a variety of data on exports, prices, capacity, employment, harvest and other factors relevant to the market for Tongass timber. In addition to reporting harvests from public lands, it estimates timber harvest from private land based on public harvests, interviews with sawmills on the amount of wood they have consumed, and on data export of raw logs.

These USFS data are the best series available on harvest over time, but give little detail on wood products manufacture. Also, it includes only limited information about the industry in Southcentral Alaska, and none at all about the Interior.

U.S. Department of Commerce Export Data

The US Department of Commerce collects data on exported goods, which includes data on raw logs, lumber, chips, and pulp/paper products. The Pacific Northwest Research Station compiles these export data quarterly in "Production, Prices, Employment and trade in Northwest Forest Industries. However, products used locally, used elsewhere in the US, or sold within the US but immediately exported from outside Alaska do not appear in the data.

Alaska Department of Labor Data

The Alaska Department of Labor collects and publishes data on number of wage and salary employees in the industry and their payroll. These data exclude sole proprietors and other self-employed workers. The US Army Corps of Engineers collects data on shipments of goods by water from selected ports. Under Federal law, vessel-operating companies must report domestic waterborne commercial movements to the Corps. The Corps reports tons of cargo moved to and from specific ports, by type of cargo, and by export, coastwise or internal movement. Coastwise refers to domestic transport that includes a segment of ocean travel; internal refers to domestic traffic carries only on inland waterways. These data are in thousands of short tons, rather than in board feet. Also, most rafted logs are not reported in the data.

Survey Data

The state and the Forest Service would like more complete information on the Alaska wood products industry, and there have been several recent efforts to collect more detailed primary information. The Institute of Social and Economic Research at the University of Alaska has conducted two surveys of wood products manufacturers (1996 and 1998) and one of loggers (1996) in Alaska. These surveys provide new information about the type of wood products manufactured in Alaska, and also an independent estimate to assess the accuracy of other estimates.

1996 Wood Products and Harvest Survey

In 1996, ISER conducted a telephone survey of all the logging companies and primary wood products manufacturers we were able to contact. We developed our initial list of companies' telephone listings and from information provided by the USFS, the Alaska Department of Commerce, and the University of Alaska Cooperative Extension Service. We developed the survey instrument in cooperation with the Pacific Northwest Research Station. In order to avoid the most sensitive areas and promote a higher response rate, we didn't ask about prices, sales, income, or profitability. Rather, we focused on the quantity of timber harvested or goods produced, and whether it was sold locally (within Alaska), to other markets within the US, or exported. We attempted to contact 67 firms, and obtained 44 completed surveys. Nine firms were out of business, ten we couldn't contact, and four declined to participate in the survey.

1998 Sawmill Survey

The 1998 survey was jointly funded by the Forest Service, University of Alaska Cooperative Extension Service, and the Alaska Department of Commerce. The Alaska Department of Commerce had developed a Sawmill Survey instrument, which covered many of the same questions as the 1996 survey, and additional questions about mill capacity and residue. The survey was mailed to 111 firms identified from business licenses. ISER followed up the mailing with telephone contacts to firms that didn't respond. Repeated telephone contacts over a two-month period gave us 46 completed surveys. The lower response rate for the 1998 survey is the result of the large group of firms (54) whose status we can't ascertain. Some of these are producing sawmills that simply didn't want to participate. Some are logging firms without significant sawmill operations. Some are out of business. In all cases, we didn't have enough contact with them to confirm into which category they would fall.

Table 1. Survey Responses for ISER Wood Products Surveys, 1996 and 1998			
Survey Status	Sawmill Status	Logging and Primary Wood Products Survey, 1996	Sawmill Survey 1998
Completed Survey	In Business	44	46
Working Phone, No Contact or Survey Promised but No Survey	Some in Business, Some not	10	54
Refused Survey	In Business	4	3
Confirmed Out of Business	Not in Business	5	7
No Working Telephone Number	Probably not in Business	4	2
Grand Total		67	112
Possible Active Sawmills		58	103
Response Rate		76%	45%

The low response rate for the 1998 survey affects some types of data more than others. Alaska's wood products industry is still relatively concentrated in a few big firms (and was more so in 1997). We have identified and captured most of these large firms in the survey. Therefore, summary data on total production and employment should reflect the state fairly well. However, there are many small firms, each of which may produce only a tiny fraction of a large firm's output. For questions where the number of firms rather than the volume of production are important, the survey data is less reliable.

Results of the 1998 Sawmill Survey

In 1998, a survey instrument (included as appendix A) was developed by DCED, the Forest Service and other interested parties. The questionnaire asked detailed questions about 1997 operations, and some historical information as well. It covered mill capacity, employment, total production, production by type of product and export or domestic sale, log consumption by species and original timber ownership, chip and residue production, information on suppliers and customers, and several questions about the timber industry in general. Of the 45 firms that responded to our survey, 4 gave only identification information, and left the rest of the survey blank. Forty-one provided partial or complete answers.

Mill Capacity

We didn't talk to mills that weren't in business, so our survey looks only at the capacity of operating mills. It will underestimate the total capacity of the industry, especially in Southeast Alaska, since there is significant capacity in mills that are not operating. Our estimate of 198 MMBF per year is about one-third lower than the 281 recently estimated by the USFS². The Wrangell Sawmill (not currently operating) accounts for 40 MMBF; Differences in the capacity estimates reported by our respondents and reported for those same mills by the Forest service accounts for 32 MMBF more. The Forest Service identified 28 MMBF of capacity in mills we tried to contact, but we unable to get responses from, and estimated 5 MMBF of capacity in "other mills". We identified 14 MBF of capacity in Southeast mills that would fall into that "other " group. The total capacity in Southeast is likely somewhat higher than the 281 MMBF estimate: perhaps 290 or 300 MMBF. This discussion relates to design capacity. We asked about the practical capacity as well as the design capacity of the mills. Practical capacity was consistently about 10 percent lower than design capacity.

Table 2. Comparison of Mill Capacity Estimated by USFS and by 1997 ISER Survey			
		1998 Survey	
	USFS	Design Capacity	Practical Capacity
Total Capacity, State		241	205.5
Total Capacity, SE	281	198	173.6
Mills not operating, 1997	64	9	5
Total Capacity, Operating Mills	217	189	169
Total Capacity, Mills over 10 MMBF	164	173	150
Total capacity, SE Mills < 10 MMBF	34.4	68	23.6

Sawmill Equipment

Of the 41 respondents who told us about their type of sawmill equipment, all had either a band saw or a circular saw as their head rig. In Southeast, 15 had circular saws, 5 had band saws, and 4 had both. In the remainder of the state, 9 had circular saws, 7 had band saws, and 1 had both. The four largest-producing firms all had band saws; one of them had a circular saw as well. A few firms had other types of head rigs in addition to their band or circular saws: 2 gang saws, one chipping mill and one scragg mill.

The maximum log diameter for the head rigs ranged from 6 inches to 10 feet; 10 saws had 3 feet or less logs size; 13 could handle logs from 3 to 6 feet; 4 could handle logs larger than 6 feet, and for 2 we had no answer.

The band saws were much less disparate in size. Of the 17 reported, 5 gave no size. Of the remaining 12, 9 had maximum log sizes of were between 28 and 37 inches, and the largest capacity reported was 71 inches.

Twenty-one firms reported resaw capacity. Two firms had a single circular saw, 8 a multiple circular saw; 9 a single band saw and 4 a multiple band saw. This totals to 23 because two firms have two resaw rigs. One firm had single circular and single band saws; one firm had both single and multiple circular saws.

² Morse (Idem, p. 14)

Sixteen firms have air-drying capacity – 6 in Southeast and 10 in other parts of the state. Only three of our respondent firms (none of them in Southeast) had kiln-drying capability, averaging 4 MBF capacities.

Production

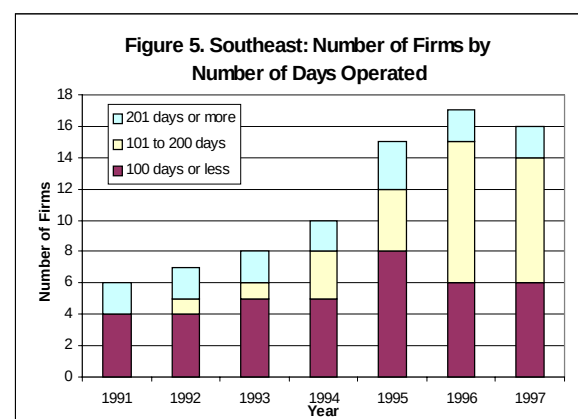
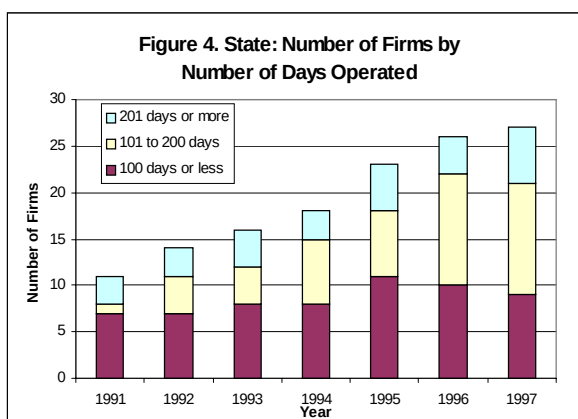
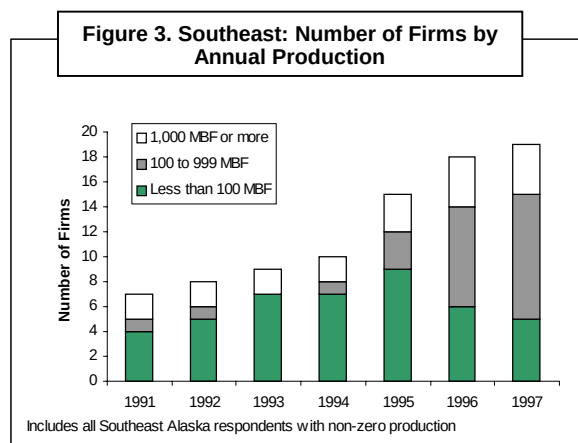
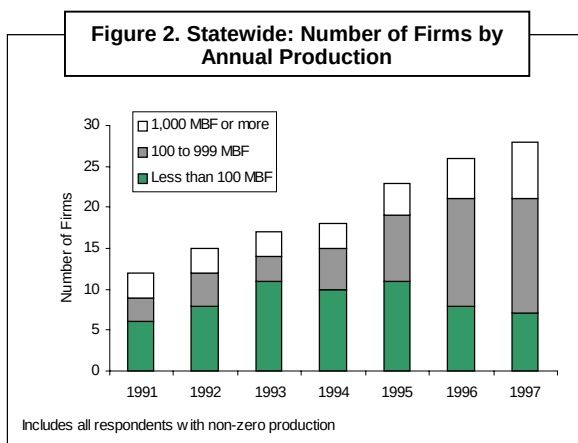
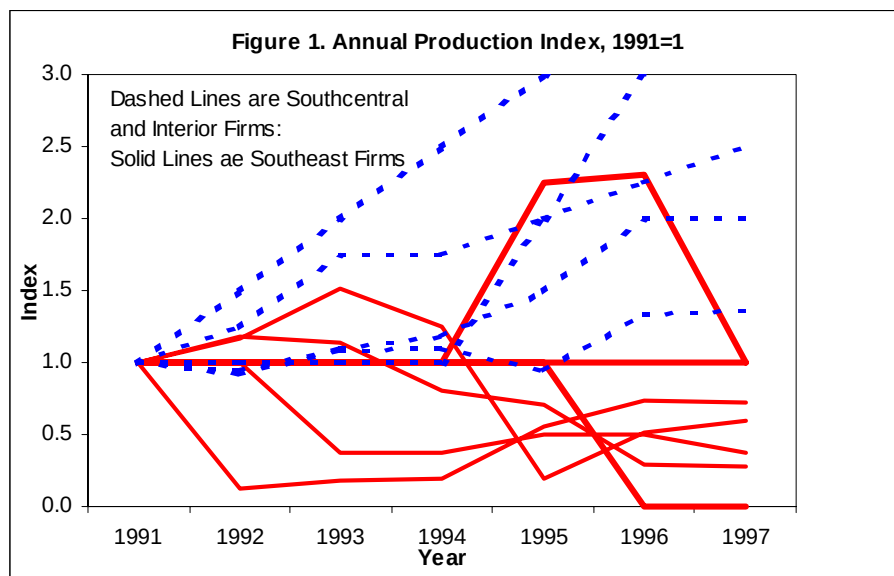
We asked about total production from 1991 to 1997; and also for detailed information about 1997 production by product and destination. Since we talked to firms that began operating after 1991, but not to firms that ceased operation before 1997, our responses will tend to show an increasing number of firms, whether or not that is the case.

Table 3. Number Of Our Respondents Who Reported Non-Zero Production, 1991 To 1997							
	1991	1992	1993	1994	1995	1996	1997
Total	14	17	19	20	25	28	31
Southeast	7	8	9	10	15	18	19
Southcentral	2	3	3	3	3	3	4
Interior	5	6	7	7	7	7	8

Of our 41 total respondents, 14 reported some production data for 1991, increasing to 31 for 1997. For 1997, 6 firms didn't answer the "total production" question, 3 responded, "don't know" and 4 responded zero (two of those began operations in 1998). The total production reported declined from over 100,000 MBF in 1992 and 1993 to 55 - 60,000 MBF in 1995 through 1997.

Seven firms in Southeast that gave production numbers for all seven years. Although several increased production in the first half of the nineties, by 1997, all produced the same volume or less than they had six years earlier. In contrast, all five firms in the other parts of Alaska with data for all seven years (two Southcentral and 3 Interior) increased their annual production. (Figure 1)

The smallest production by a single mill– about 20 MBF per year – stayed constant. However, the largest production dropped from 60,000 MBF to just over 20,000 MBF. Firms entering the market between 1991 and 1997 were most often in the middle group of both production (100 to 1000 MBF) and days (101 to 200 operating days per year) (figures, below). So, the share of both large and small firms dropped, and that of middle sized firms, grew.



Our respondents' production was split about evenly between export and domestic products. Exports were dominated by just a few mills: Only seven mills out of 30 that reported their product destinations reported any export; two of those made up 80 percent of exported volume.

We can see how much of Alaska's wood products exports we have captured in our survey by looking at the US Department of Commerce (DOC) export statistics. Our respondents accounted for more than the total of reported export products. We report too many board feet of hemlock lumber, probably the result of a double counting in one of the respondents³. In spruce and cedar products, the discrepancies are smaller and are probably due to rounding in the responses.

Table 4. Production Reported by Alaska Sawmills, by Species and Destination, Compared with Lumber Exports by Species				
Species	Domestic	Export	Total Production	US DoC Exports
Spruce	8,559	12,487	21,046	13,053
Hemlock	21,957	22,606 ³	44,563	18,524
Cedar	449	232	681	84
Other	493		493	926
Total	31,458	35,325	66,783	32,587

Export products included both dimensional lumber and cants; our respondents reported about two-thirds of the export volume was lumber and one-third cants. Although we believe there's a wide margin of error in those responses, (see previous paragraph) and cants and flitches probably make up somewhere between one third and one half the export volume.

For products sold domestically, there's no independent source of data to compare with our total reported volume. We believe that we have missed some volume. Based on our analysis of capacity and of exports, we have responses from all the largest sawmills, but are missing a number of smaller mills. Morse estimates 64 MMBF of capacity in mills with less than 10 MMBF annual capacity; our respondents account for only 34.4 MMBF, or about half of this. If we assume that production for these small mills was in proportion to capacity, then we can estimate how much of Southeast Alaska's production we failed to capture in our survey.

The small Southeast mills we talked to, totaling 34.4 MMBF of capacity, together produced 2,118 MBF of wood products. If the total capacity of small Southeast mills in operation in 1997 is 64 MMBF, then this implies that we failed to obtain responses from mills that together produced about

$$2,118 \times (64 - 34.4) / 34.4 = 1,847 \text{ MBF of products}$$

Although this is half the production of small Southeast mills, it is only about 3 percent of total Alaska production.

Dimensional lumber was the main product sold domestically, accounting for 71 percent of production for US markets reported in our survey. Cants and flitches accounted for 18 percent, and boards, ties, timbers and house logs were each 2 to 3 percent of total production. Again, the totals are dominated by a few mills. There were 24 firms reporting domestic sales of dimensional lumber; 3 of those accounted for over 90 percent of the 21,678 MBF produced, and 21 other mills each accounted for 2 percent or less. This dominance by a few larger mills is true both in Southeast and in the remainder of Alaska; two or three firms in each region account for over 90 percent of the region's domestically sold production.

³ One respondent reported consuming about 4 MMBF fewer hemlock logs (Sec 3) than the hemlock output reported (section 2); and about 4MMBF less total production in 1997 (section 1) than the sum of the products. Furthermore this is the only respondent with enough exports to account for the discrepancy. However, we have been unable to contact the respondent for clarification.

Table 5. Volume of Wood Products Manufactured, 1997, by Region and Product (MBF)			
Region/Product	Domestic	Export*	Total Production
<u>Southeast Total</u>	26,098	35,325	61,423
Boards	1,001	1,080	2,081
Cants/flitches	5,462	14,662	20,124
Decking	2		2
Dimensional	18,453	19,525	37,978
House logs	20		20
Other	91		91
Shingles		58	58
Ties	1,000		1,000
Timbers	70		70
<u>Southcentral Total</u>	940		940
Dimensional	540		540
House logs	400		400
Other	Amt. unknown		Amt. unknown
<u>Interior Total</u>	3,421		3,421
Boards	10		10
Cants/flitches	50		50
Dimensional	2,685		2,685
House logs	214		214
Other	23		23
Timbers	438		438
<u>State Total</u>	30,459	35,325	65,784
Boards	1,011	1,080	2,091
Cants/flitches	5,512	14,662	20,174
Decking	2		2
Dimensional	21,678	19,525	41,203
House logs	634		634
Other	114		114
Shingles		58	58
Ties	1,000		1,000
Timbers	508		508

* Note: Although we know actual exports are about 4 MMBF lower than the 35 MMBF reported here, we do not know which products to delete. Therefore, we are reporting the responses as given.

Supply Problems

Several questions shed light on the issue of the effect of wood supply problems on Alaska's sawmills. We asked the mills how many days they were shut down due to routine maintenance and due to supply problems⁴. We also asked their capacity and actual 1997 production, from which we can estimate capacity utilization. In the open-ended comments section (question 6), we asked if they had problems obtaining a wood supply, and what solutions they would suggest, if they did have problems. We also asked what they saw as a useful government role in the wood products industry.

Of the 27 mills that answered the down time questions, 13 reported no down time due to supply problems. Five firms reported that they lost one day per week or more – up to over half of their total possible time - to lack of supply; the remaining 9 reported just a few days each year.

Capacity utilization estimates ranged from 3 percent to over 70 percent. There were 22 firms for which we had both a capacity utilization estimate, and a reply on days down for lack of supply. At first analysis there appears to be a strong correlation between these two measures. However, the correlation is dependent on two mills with outlying values of down days. The other 20 firms show no correlation between their capacity utilization measures and reported days lost to supply problems.

The comments provided in question 6 were not unexpected. Mills that reported many days lost due to lack of supply mostly reported wanting more sales, noting both the Tongass and beetle killed spruce as sources for that supply. A few firms, however, reported no supply problems. Conversely, although there were many “no problem” comments from firms that reported no days lost due to lack of supply, several firms did report that supply was a problem.

Table 6. Down Time due to Lack of Supply	
Number of Days	Number of Mills
Zero days	14
Up to one day per month	8
One day per week or more	5

* no mills reported more than one day per month but less than one day per week

Log Consumption

We asked about both species and ownership of logs used by sawmills in our survey. Hemlock and spruce logs from the Tongass National Forest account for over 95 percent of logs used by Southeast sawmills, and they are over 85 percent of logs consumed statewide. In Southcentral and Interior Alaska, however, white spruce is the dominant log, with some consumption of birch and cottonwood. While privately owned timber provides less than 1 percent of logs supplied to Southeast sawmills, it comprises almost half of Southcentral sawmills' supply, and over 10 percent of Interior sawmills logs. Of the 21 Southeast mills that provided information on their log consumption, 8 were totally supplied by Tongass logs, and 4 more obtained the majority of their wood there.

⁴ Unfortunately, some answers are difficult to interpret, since some answered in total shift or days per year, some in shifts or days per week, and still others in percent of time. It isn't always possible to determine what the respondent intended.

Table 7. Log Consumption by Region and Species, 1997 (MBF)				
Species	Southeast	Southcentral	Interior	Alaska Total
Sitka Spruce	15,760	-	-	15,760
Hemlock	36,114	-	-	36,114
Redcedar	1,701	-	-	1,701
Yellow Cedar	468	-	-	468
White Spruce	-	1,880	3,222	5,102
Birch & Cottonwood	-	150	315	465

Table 8. Log Consumption by Region and Ownership, 1997 (MBF)				
Ownership	Southeast	Southcentral	Interior	Alaska Total
Public	54,185	1,695	3,056	58,936
Chugach	50	85	-	135
Tongass	53,386	-	-	53,386
State of Alaska	435	1,510	3,052	4,997
Other Public	314	100	4	418
Private	301	1470	481	2,252
Native	95	600	80	775
Other Private	206	870	401	1,477

Log consumption data lets us estimate the capacity utilization of mills in our survey, which the table below shows is low throughout the state. The maximum capacity utilization was only 50 percent, and several mills had zero.

Table 9. Distribution of Mills by Level of Capacity Utilization and Region, 1997				
	Number of Mills			
Capacity Utilization	Southeast	Southcentral	Interior	Alaska Total
10 percent or less	10	1	5	16
11 to 30 percent	8	2	2	12
Over 30 percent	3	2	1	6
Average Utilization	28%	23%	14%	26%
Note: capacity is based on one shift, 250 days per year for all mills				

Employment

We asked about full and part time employment, and 38 mills provided answers. The total number of employees ranged from 0 to 77. However, one quarter of mills had no full time employees; four out of 5 had five or fewer full time employees. Altogether, our respondents employed 283 full time employees and 57 part time employees, for a total of 340 jobs. The 5 largest firms accounted for three-quarters of full time employment, and two-thirds of total employment. About 1 in 10 of the full time employees are in an administrative or managerial position. The Alaska Department of Labor (AKDoL) tracks wage & salary employment in logging, lumber, and pulp and paper industries. In 1997, they reported an average annual lumber employment of 383 jobs.

Table 10. Distribution of Mills by Number of Employees in 1997			
	Number of Firms with specified number of employees:		
Number of Employees	Total Employment	Full Time Employment	Part Time Employment
No employees	2	10	18
1 employee	7	6	5
2 employees	2	7	4
3 employees	5	2	5
4 employees	6	2	3
5 employees	3	3	1
6 employees	5	2	2
7 employees	3	1	0
10 to 50 employees	3	3	0
Over 50 employees	2	2	0
Total Employment, All Mills	340	283	57

Chip and Residue Production

Nineteen sawmills were able to give us numerical estimates of their residue production, although used several different units of measure, and so it is difficult to produce a single total. In addition, eight sawmills reported zero residue production, but several of those cited all residues as going to the landfill or burned on site; clearly they are producing some residue. Table 11 summarizes the residue production reported.

Table 11. Residue Production in 1997
Chips 94,495 Bone Dry Units 10,760 Cubic Yards 1 mill reported chip production, but no quantity
Hogged Fuel 39,935 Bone Dry Units 204 tons 9,470 Cubic Yards 4 mills reported hogged fuel production, but no quantity
Slabs 2,982 cords 606 tons 7,500 Cubic Yards 50 thousand board feet 5 mills reported slab production, but no quantity

The first column in the table below shows how many mills use each type of use as their primary means of disposing of residue; the second shows how many sawmills reported at least some of their residue in each category. Of 39 sawmills that answered at least some part of section 5, only three produced any of their energy needs from residue, and one reported using residue for local heat (that mill is included in “firewood”). Ten more made some use of most of their residue, typically as firewood. Fourteen mills either burned or sent to the landfill most of their residue as waste. Eleven more didn’t specify how they disposed of residue.

Table 12. Disposition of Mill Residue		
Use of Residue	# of Mills disposing of most residue this way	# of Mills disposing of some residue this way
Energy	3	3
Firewood/fuel	8	12
Landscape/bedding	2	8
Sell	2	3
Burned	6	6
Landfill	7	10
Waste/unknown	11	13
Total	39	N/A

Two mills reported cogeneration capacity, and one more said they would be “working on that soon”. One of the two mills with cogeneration capacity did not actually produce any of their energy with it; the other produced all of their energy from residue.

By estimating conversion factors⁵, we were able to combine most of the reporting mills information to look at what proportion of residue is disposed of in each manner. The table below shows the results by region. Residue is used, rather than thrown away, throughout the state. In Southeast, the most prevalent use is for energy generation, in Southcentral, landscaping and bedding, and in the Interior, firewood. Firewood is the second largest use in both Southcentral and Southeast. Although less than 0.5 percent of residue that is disposed of in Southeast or Southcentral is burned, fully half of Interior's unused residue is burned rather than deposited in a landfill.

Only a few sawmills produced chips from whole logs, but these mills accounted for the majority of the chips produced; so about 60,000 bone dry units (BDU) of chips, or 64 percent of all reported chip BDU, were produced from whole logs.

Table 13. Residue Disposition by Type and Region				
	Southeast	Southcentral	Interior	Alaska Total
Economic Use	84%	90%	77%	85%
Disposal	16%	10%	23%	15%
Economic Uses				
Energy Source	65%	0%	5%	44%
Local Heat	0%	0%	4%	0%
Firewood/Fuel	35%	17%	59%	31%
Landscaping/ Bedding	0%	82%	33%	24%
Sold	0%	1%	0%	0%
Disposal Methods				
Burned	0%	0%	49%	5%
Landfill	100%	100%	51%	95%

Table 14. Origin of Mill Residue by Region				
	Southeast	Southcentral	Interior	Alaska Total
Chipped from Whole Logs	77%	2%	0%	54%
Produced as By-Product	23%	98%	100%	46%

Comments from the Survey Respondents

The last section of the survey asks respondents several open-ended questions. About half the mills responding in Southeast and Interior reported supply problems, and 4 out of 5 Southcentral mills did. The most common suggestion for government help was more state and local timber sales, especially in Southeast; next was more small sales. Then better timed or longer sales.

This theme was repeated when mills were asked what they saw as the government's most important role in helping the industry. The two most common answers, provided by almost half the respondents, were "provide a dependable timber supply" and "negotiate small sales or a

⁵ We used conversion factors given in "Timber Supply and demand 1997", USFS Region 10, Table A-18, p. 42. However, for cubic yards and feet we converted to cubic meters, then used the "log and lumber, board feet (lumber tally) to m³" conversion of 2.36 m³ per MBF to produce a board feet measure, and the chip conversion of 2.7 tons chips per MBF. For cords, often used as a measure of slabs, we first converted cords to ft³ at a simple 4 ft x 4 ft x 8 ft factor, since stacked slabs won't have as much open space as round wood; and then proceeded as described. While these are very rough conversion factors, they do let us draw general conclusions about mill residue dispositions.

variety of sales. The next most commonly cited strategies were subsidies, regulatory changes and other assistance targeted at small businesses.

When asked what species and grade mills preferred to buy, the results were unsurprising. Southeast mills wanted Sitka spruce and cedar followed by hemlock; Southcentral and Interior firms wanted white or Lutz spruce. Although some respondents mentioned wanting better grades of wood, all grades were named, and many respondents did not address their grade preferences.

We asked about plans for producing dried wood, or other product plans the mills might have. Most mills had not produced dried wood and few had plans to do so. Many responses cited costs (of a kiln, of producing, storing and transporting the wood) as reasons they did not produce dried timber. Several Southeast mills cited lack of supply, and Interior mills, low quality wood as reasons.

Despite these concerns about costs, the most common new product plan was to obtain a kiln for drying lumber. Most other new product responses included adding some sort of equipment to the mill, most commonly a planer or band saw. Some firms mentioned one or another new product, and a few said they were planning to sell more in the domestic market. Seven of the 37 mills answering this question said they had no new plans, and one planned to leave the industry.

We asked respondents if they thought it was feasible for Alaska mills to manufacture more value added products. The majority (25 out of 36 mills responding) thought it was, but one third offered qualifications. Like the 'no' respondents, qualified yes respondents worried about costs, supply and access to markets. The more optimistic yes respondents cited the need to do this and ability of Alaska markets to purchase local production.

The following tables summarize the responses provided to the six questions we asked.

Table 15. Question 6A. Have you encountered problems in obtaining a wood supply? Do you have any suggested solutions?				
	Statewide total	Southeast	Southcentral	Interior
Total Mills Responding	39	24	5	10
We are having Problems	21	13	4	4
No Supply Problems	12	5	1	6
Need More Sales	5	4	1	0
Need more Small sales	4	4	0	0
Need better timing/longer sales	5	2	2	1
Need less red tape	2	2	0	0
Reduce lawsuits	1	1	0	0
More funding	2	2	0	0
More state/local timber	7	5	1	1
Stop log exports	1	1	0	0
Let state manage Tongass	1	1	0	0
Too much logging/ clear cutting	2	1	0	1
Cost too high/market won't support cost	3	3	0	0
Use beetle kill	2	1	1	0
Educate wood users	1	1	0	0
Need funding for stockpiling	1	0	1	0

Table 16. Question 6B: What problems have you encountered in either producing or marketing dried lumber?				
	Statewide total	Southeast	Southcentral	Interior
Total Mills Responding	32	20	4	8
haven't produced dried timber	14	10	1	3
need a kiln; kiln too expensive	6	2	3	1
just starting	1	1	0	0
energy costs	3	3	0	0
energy availability	2	2	0	0
access to markets	1	1	0	0
wood supply	3	3	0	0
wood quality	4	1	0	3
grading	1	0	1	0
regulatory restrictions	1	1	0	0
transportation costs	2	2	0	0
need larger capacity	1	1	0	0
hard to be competitively priced	3	2	1	0
need to store dry wood (cost, space)	3	2	0	1

Table 17. Question 6C: Do you have any plans for expansion or moving into a different product line? If so, please give a brief description of your plans and the type of equipment you would like to purchase over the next five years.				
	Statewide total	Southeast	South central	Interior
Total Mills Responding	37	22	5	10
Moving towards domestic market	3	3	0	0
"upgrades" to mill	4	3	0	1
resaw	8	5	2	1
band saw	1	0	1	0
edger	4	4	0	0
trimmer	2	1	1	0
kilns, dryers	14	9	2	3
planer	10	6	0	4
molder	6	5	0	1
milling machine	1	1	0	0
chipper	2	0	2	0
debarker	3	0	2	1
scragg mill	2	0	1	1
mulcher	1	0	1	0
fencing, decking	2	2	0	0
siding	2	1	0	1
woodworking: furniture, tourist items	2	1	0	1
tongue and groove	1	0	0	1
packaging, dust collection	1	1	0	0
cedar shake system	1	1	0	0
green chains for sorting lumber	1	1	0	0
pellet press for presto logs	1	1	0	0
depends on quantity and cost of supply	1	1	0	0
Would like to, but no plans now	2	2	0	0
Planning to leave sawmill business	1	0	1	0
No plans for new products	5	2	0	3

Table 18. Question 6D: Given the choice, what species, grade and volume of wood do you prefer to purchase?				
	Statewide total	Southeast	Southcentral	Interior
Total Mills Responding	38	22	5	11
Species				
Hemlock	11	11	0	0
Sitka Spruce	18	15	2	0
Redcedar	12	12	0	0
Yellow Cedar	6	6	0	0
White/Lutz Spruce	14	0	4	9
Birch	3	1	1	1
Aspen	1	0	0	1
Cottonwood	1	1	0	0
Grades				
Grade 1 select	3	2	1	0
Grade 2 and better	3	2	1	0
Grade 3 and better	0	0	0	0
all grades	2	1	1	0
shop and better	1	1	0	0
best grade available	1	1	0	0
beetle infested	1	0	1	0
"good" quality	1	0	0	1
Total Volume Mentioned (MBF)	17,351	8,551	7,200	1,600

Table 19. Question 6E. In your opinion, what role can the state government play in assisting the wood products industry?				
	Statewide total	Southeast	South-central	Interior
Total Mills Responding	36	22	5	9
provide dependable timber supply	9	5	1	3
more Tongass logging	3	3	0	0
keep logging roads open	1	1	0	0
use mental health trust forests	1	1	0	0
make regulations friendly to local products	1	1	0	0
make regulations friendly to logging	2	0	0	2
"favorable atmosphere" for business development	1	1	0	0
stop /discourage exports of raw materials	3	2	0	1
small business assistance	3	1	1	1
startup grants/ funding for small businesses	5	3	2	0
less emphasis on big businesses	3	1	0	2
negotiate small sales/ variety of sales	8	7	1	0
ensure sustainable resource management	3	1	1	1
more foresters	1	0	1	0
marketing assistance	2	0	0	2
State should buy all Alaskan products	2	0	1	1
State already doing what they should	4	2	0	2

Table 20. Question 6F: In your opinion, is it feasible to manufacture more value-added wood products in Alaska? Why or why not?				
	Statewide total	Southeast	South-central	Interior
Total Mills Responding	36	22	5	9
Yes	25	15	4	6
Yes but difficult	3	3	0	0
Y-we have raw materials	8	5	2	1
Y-cut bureaucracy	2	2	0	0
Y-must market Alaska	3	1	0	2
Y-need dependable supply	2	2	0	0
Y-need start up subsidies for this	1	1	0	0
Y - we cut less volume and need to get more from it	1	1	0	0
Y-can selectively log best trees without hurting old growth forest	2	1	1	0
Y - Alaska market can sustain local value added businesses	6	2	1	3
No	4	2	1	1
No-Transportation costs	4	3	0	1
N- high local costs	2	1	0	1
N- not enough long term supply	1	0	1	0
N- difficult to compete here; only some products can	3	3	0	0
N -difficult to understand market	1	0	0	1

The Alaska Market for Value-Added Wood Products Used In Residential Construction

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Table of Contents

Summary of Findings.....	225
Introduction	229
Housing Starts	231
Remodeling Market	231
Kitchen and Bathroom Cabinets.....	233
Exterior and Interior Doors	234
Windows	236
Millwork (Mouldings and Trim).....	238
Exterior Siding	240
Finish flooring	243
Industry Contacts.....	246

Summary of Findings

The purpose of this study was to measure the demand for value-added wood products used in Alaska's new residential house construction market, both single-family and multi-family units, and where possible, estimate usage factors in remodeling. Market profiles were developed for the following specific types of wood products:

- kitchen and bathroom cabinets
- exterior and interior (passage and closet) doors
- windows
- millwork (mouldings and trim)
- exterior siding
- finish flooring

Readers should note that demand estimates are based on national indicators and local knowledge. They do not represent of actual sales data. Usage factors developed by the National Association of Homebuilders (NAHB) and other national manufacturers associations were used as the basis for estimates. These estimates were then adjusted based on interviews with local suppliers of building materials. Key findings are presented below.

Alaska Housing Starts

In 1998, according to Alaska Housing Finance Corporation (AHFC) records, there were 3,682 new housing starts, including single- and multi-family dwellings, in Alaska. Of these housing starts, 80 percent were single-family dwellings, 18 percent were multi-family, and mobile homes made up the remainder (3 percent).

For single-family construction, Anchorage represented 40 percent of new units; Fairbanks represented 6 percent and Juneau 4 percent. The rest of Alaska made up the remaining percent (51 percent) of new housing units.

For multi-family construction, Anchorage represented 67 percent of new units; Fairbanks represented 12 percent and Juneau made up 2 percent. The rest of Alaska made up 19 percent of new multi-family construction.

Remodeling Market

Expenditures for improvements and repairs of residential properties in 1998 were estimated at \$119.5 billion, according to the U.S. Commerce Department's Bureau of the Census. 1999 remodeling expenditures are expected to be an estimated \$135 billion.¹

Prior to the mid-1980s, it was believed that wood products use for residential repair and remodeling was about one-half that for new residential construction.² However, since then, many believe consumption for residential repair and remodeling to be rapidly approaching that for new residential construction and may actually exceed that for new single-family housing.³ This makes the remodeling sector an important market for wood products.

Currently, about 24 percent of all lumber, 23 percent of all structural panels, 15 percent of all nonstructural panels, and lesser amounts of engineered woods products consumed in the U.S. are used for residential repair and remodeling.⁴

Unfortunately, there are no reliable breakouts of remodeling expenditures for Alaska. Based simply on Alaska's proportion of the national population, in 1998, remodeling expenditures for the state would be expected to be:

- \$19.4 million on kitchens and bathrooms;
- \$18.1 million on windows and doors;
- \$7.6 million on siding; and,
- \$13.7 million on flooring.

Kitchen and Bathroom Cabinets

Based on NAHB national averages and estimates by local suppliers/retailers, in 1998, new construction of single- and multi-family dwellings in Alaska utilized the following:

- 38,000 solid wood cabinets (74%),
- 4,700 wood veneer cabinets (9%),
- 7,800 laminate cabinets (15%), and
- 1,000 other materials cabinets (2%) installed in Alaska.

The dominant suppliers/brand names for kitchen/bathroom cabinets in Alaska are: Merillat, Dewils, Craftmade, Aristocraft, Mid-Continent and Shrock. Oak dominates the market. Cherry and maple place second.

¹ Per National Association of the Remodeling Industry

² U.S. Department of Agriculture, Forest Service 1990

³ McKeever, David B. and Robert G. Anderson, Wood Products Used for Residential Repair and Remodeling in the United States, 1991

⁴ Wood Products Council, Wood Products Used in Residential Repair and Remodeling, 1997

Exterior and Interior Doors

In 1998, there were an estimated 10,091 exterior doors used in Alaska single- and multi-family dwellings of which 1,615 (16 percent) were wood. On a percentage basis, the exterior front door market in Alaska is estimated to be:

Steel	82%	8,300 exterior doors
Wood	16%	1,600
Fiberglass	2%	200

In 1998, in single- and multi-family residential housing, there were an estimated 39,709 interior passage doors, and 23,109 closet doors installed in Alaska. NAHB usage factors indicate that these estimates broke down as follows:

Passage, hardboard panel	51%	20,000 doors
Passage, hardboard flush	18%	7,300
Passage, wood panel	17%	6,700
Passage, wood flush	11%	4,500
Passage, other	3%	1,100
Closet, hardboard panel	48%	11,000 doors
Closet, hardboard flush	7%	1,600
Closet, wood panel	10%	2,300
Closet, wood flush	14%	3,200
Closet, other	21%	4,900

The major interior wood door name brands in Alaska include Simpson, Doorcraft and Bend.

Windows

In 1998, an estimated 57,000 windows were installed in Alaska housing starts of which 28,000 were unclad wood, aluminum clad wood or vinyl-clad wood.

According to suppliers and retailers, the Alaska's window market comprises:

Wood, unclad	10%	5,600 windows
Wood, aluminum clad	10%	5,600
Wood, vinyl clad	30%	17,000
Vinyl sash and frame	46%	26,000
Aluminum, unclad	0%	(insignificant)
Aluminum, vinyl clad	0%	(insignificant)
Other	4%	2,300

Vinyl sash and frame dominates the market, and its dominance appears to be growing. Wood casement windows are more popular in the Alaska market than elsewhere in the country. Aluminum windows perform badly in Alaska's cold climate and are rarely found.

The main suppliers of wood windows are Pozzi, Clad Windows, Anderson, Marvin and Hurd. The largest window manufacturers in the nation — Anderson, Hurd and Marvin — while present in Alaska, do not dominate the Anchorage market.

Millwork (Mouldings and Trim)

Alaska's suppliers and retailers of wood millwork indicated that NAHB factors are less accurate for millwork than other categories. Their estimates indicate the following moulding and trim use in an average 2,000 sq. foot single-family Alaska house.

Casing: Windows — 500-600 lineal ft.; Doors – 610 lineal ft.
 Base: 700 lineal ft.
 Baseshoe: 0 lineal ft. (insignificant)
 Closet pole: 60 lineal ft.
 Chair rail: 20 lineal ft. ft (found in an estimated 10 percent of new homes)
 Crown moulding: 20 lineal ft (found in an estimated 10 percent of new homes)

While there is no national average available for millwork in multi-family homes, representatives of NAHB and the Wood Moulding and Millwork Producers Association (WMMPA) indicate that Alaska's moulding and trim use in an average 1,075 sq. foot multi-family apartment would be half of what is found in a single-family dwelling.

In 1998, based on Alaska supplier estimates, in new construction of single- and multi-family units there were approximately:

1.6-2.0 million lineal feet of wood window casing
 2.0 million lineal feet of wood door casing
 2.3 lineal feet of wood base
 baseshoe (insignificant)
 195,000 lineal feet of closet pole
 65,000 lineal feet of chair rail
 65,000 lineal feet of crown moulding installed in Alaska.

The majority of moulding and millwork (an estimated 70 percent) is paint grade. Of paint grade millwork, 85-90 percent is finger-jointed pine and 10-15 percent is produced from MDF. MDF moulding does not work well in very cold regions because condensation on fasteners tends to cause puckering in the moulding surface. Solid pine and hemlock makes up 15-20 percent of moulding use and hardwood moulding rounds out the market at 10-15 percent.⁵ The preferred hard wood is oak.

There does not appear to be a dominant name brand in millwork. It is viewed more as a commodity. The Canadian company, Sauders, is a major supplier to Alaska's millwork market.

Exterior Siding

Based on NAHB averages, Alaska used an estimated 7,315,500 sq. ft of siding in 1998. Plywood, hardboard, lumber, shakes and shingles, and waferboard/OSB make up approximately 92 percent of the siding market, with the balance primarily vinyl. Based on interviews with wholesalers and retailers, the Alaska market is estimated to be composed as follows:

Waferboard/OSB	40%	2.9 million square feet
Plywood (including T1-11)	35 %	2.6 million
Lumber	15%	1.1 million
Hardboard	2 %	146,000
Shakes/Shingles	0%	(insignificant)
Aluminum	1%	73,000
Steel	1%	73,000
Vinyl	5%	365,000
Brick	0%	(insignificant)
Fiber Cement	1%	73,000
Stucco	0%	(insignificant)

Even though vinyl siding dominates in the US market (often averaging around 75 percent of the siding market), in Alaska, vinyl makes up only about 5 percent of the siding market. In solid wood

⁵ Per Stan Blaine, Wood Moulding and Millwork Producers Association and Dave Carter, Hardwood Inc.

siding, no one supplier dominates the Alaska market. In the OSB siding market, Louisiana Pacific (LP) is the primary supplier.

Finish flooring

The national average of 277.67 board feet per housing start implies that the Alaska market for hardwood flooring in 1998 was approximately one million board feet. However, according to local suppliers/retailers of flooring material, wood flooring is not used as often in Alaska, in part because there are fewer high-end (over \$300,000 value).

Based on averages for the single-family dwelling (2,075 sq. ft), and the multi-family apartment (1,075 sq. ft), Alaska's total flooring market in new construction is estimated at 6.8 million square feet.

Wood strip/plank, wood laminate, and wood parquet comprise approximately 9 percent of the flooring market.

The following is an estimated percentage break out of flooring material used in the Alaska market:

Wood Strip or Plank	6%	408,000 square feet
Wood Laminate	1%	68,000
Wood Parquet	2%	136,000
Wood Other	0%	(insignificant)
Carpet	35%	2.4 million
Resilient Tile	14%	953,000
Resilient Sheet	18%	1.2 million
Ceramic Tile, Glazed	8%	545,000
Ceramic Tile, Mosaic	2%	136,000
Ceramic Tile, Other	1%	68,000
Quarry Tile	2%	136,000
Non-Wood Laminate	6%	408,000
Marble	1%	68,000
Other	1%	68,000

Bruce is one of the most popular brands of wood flooring in Alaska.

Introduction

In 1998 the McDowell Group estimated the total volume of lumber and lumber products used in Alaska at 90 to 100 million board feet. The vast majority of this lumber, including nearly all lumber used for new residential construction, is sourced from outside Alaska.

Efforts at local manufacture of products for the Alaska market have been limited. Reasons generally given include reliable access to appropriate timber, costs associated with importing raw materials (from the Lower 48 or internationally), transportation costs to move product within Alaska, and difficulties achieving economies of scale given the relatively small local market.

As a result, many of Alaska's 150 or more forest product manufacturers find they lack the marketing capacity, product development capability, technology, and financing to compete successfully with out-of-state firms for local market share. While some Alaska producers have found niche markets, most remain outside the mainstream of Alaska wood product sales.

Study Purpose

As part of its efforts to evaluate demand for Alaska wood products, the USDA Forest Service Wood Utilization Center asked the McDowell Group to assess and provide market profiles for six categories of wood products used in housing developments, new construction and, where possible, remodeling in Alaska. The products profiled were kitchen and bathroom cabinets, interior and exterior doors, windows, millwork, exterior siding, and flooring. These profiles focused on:

Market Definition

The study estimates the in-state new construction and remodeling/renovation market for the six wood products, based on national averages. How big is the market? What products are in demand? Who are the major purchasers? How much of these products are purchased in Alaska's major population centers, i.e., Anchorage, Fairbanks, Juneau?

Market Characteristics

The study describes consumer preferences relative to competing products, for example is vinyl siding preferred over wood siding? What are the key needs and perceptions of potential purchasers? How likely are they to try Alaska product?

The result is a preliminary profile and assessment of the statewide Alaska market for these six types of value-added wood products.

Methodology

Two research methods were used to gather the data in this report: confidential executive interviews and secondary research and analysis. Both quantitative and qualitative analyses were conducted. The quantitative analysis included: a search of secondary sources on national markets for the selected products in housing starts (new construction and remodeling). Interviews with various national product manufacturers associations were conducted to gather information on the characteristics of their products and to obtain additional data on the average use of their products in either new construction or remodeling of single-family and multi-family dwellings. Information on mobile homes was not collected and is not considered in this study. F.W. Dodge of the McGraw-Hill Construction Information Group was also contacted. Although F.W. Dodge has not conducted any study of the Alaska market, they were able to supply samples of studies prepared for other states. These samples were used, along with estimates by local suppliers and retailers, to help interpret national usage factors in the light of local conditions.

The qualitative analysis included: executive-style interviews with both retailers and purchasers of the six product categories. Interviews attempted to identify opportunities for Alaska production with respect to the products listed above, as well as to obtain their opinions of Alaska products that are currently available. Additional context for evaluating research results was provided by McDowell Group's 1998 study, The Alaska Market for Value-Added Lumber Products.

Readers should note that the broad range of products represented by the six product categories, together with budget and time limitations on the research, means that conclusions should be regarded only as general indicators of potential demand. Actual demand for individual products is influenced by a wide variety of market factors that interact in complex ways. The report does not attempt to analyze or predict demand for individual products.

Housing Starts

In 1998, according to Alaska Housing Finance Corporation (AHFC) records, there were 3,682 new housing starts in Alaska. Of these housing starts, 80 percent were single-family dwellings, 18 percent were multi-family starts and mobile homes made up the remainder (3 percent).

In 1998, Anchorage represented 40 percent of the new single-family units, while Fairbanks represented 6 percent and Juneau 4 percent. The rest of Alaska made up the remaining percent (51 percent) of new housing starts.

For multi-family construction, Anchorage represented 67 percent of the new units, while Fairbanks represented 12 percent and Juneau made up 2 percent. The remainder of Alaska made up 19 percent of the new multi-family unit construction.

Mobile home starts totaled 100 in 1998, or 3 percent of total housing starts.⁶

Table 1. Alaska Housing Starts, 1998, Number of Units, and Percent of Total

1998	Single-Family Units	% total Single-Family Units	Multi-Family Units	% total Multi-Family Units	Mobile Homes	% total Mobile Homes	Total Units	% Total
Anchorage	1163	39.7%	437	66.7%	53	53.0%	1653	44.9%
Fairbanks North Star Borough	161	5.5	78	11.9	4	4.0	246	6.7
Juneau Borough	123	4.2	16	2.4	12	12.0	151	4.1
Rest of Alaska	1480	50.6	124	18.9	31	31.0	1632	44.3
Category Total	2927	100.0	655	100.0	100	100.0	3682	100.0

Source: Alaska Housing Finance Corporation

Remodeling Market

The remodeling market is divided into two categories:

- 1) maintenance and repair; and
- 2) improvements
- 3) additions (new rooms)/alteration; and
- 4) major replacements

Expenditures for improvements and repairs of residential properties in 1998 were estimated at \$119.5 billion, according to the U.S. Commerce Department's Bureau of the Census. This is an increase of 1 percent from the 1997 estimate of \$118.6 billion. Improvements accounted for 67 percent (\$80.3 billion) of the 1998 total. The remaining 33 percent (\$39.2 billion) was spent on maintenance and repairs. 1999 remodeling expenditures are expected to be an estimated \$135 billion.⁷

According to the National Association of the Remodeling Industry (NARI), the top five remodeling projects are:

- 1) Kitchen improvement;

⁶ Since most of the mobile homes are pre-manufactured outside of Alaska, they are not included in this analysis.

⁷ Per National Association of the Remodeling Industry

- 2) Bath improvement;
- 3) Interior room improvement—other than kitchen and bath;
- 4) Room addition; and
- 5) Window replacement.

The National Association of Home Builders (NAHB) estimated that in 1997:

- \$8.5 billion was spent on kitchen (46 percent) and bathroom (54 percent) remodels;
- \$7.9 billion was spent on windows (72 percent) and doors (28 percent);
- \$3.3 billion was spent on siding; and
- \$6.0 billion was spent on new flooring.

Prior to the mid-1980s, it was believed that wood products use for residential repair and remodeling was about one-half that for new residential construction.⁸ However, since then, many believe consumption for residential repair and remodeling to be rapidly approaching that for new residential construction and may actually exceed that for new single-family housing.⁹ This makes the remodeling sector an important market for wood products. Currently, about 24 percent of all lumber, 23 percent of all structural panels, 15 percent of all nonstructural panels, and lesser amounts of engineered woods products consumed in the U.S. are used for residential repair and remodeling.¹⁰

Remodeling of kitchens and bathrooms can include simple replacement of a bathroom vanity; complete removal and replacement of cabinets, fixtures, and wall and floor coverings; replacement of doors and windows; and addition or removal of walls. Kitchen and bathroom remodeling is differentiated from other room remodeling because kitchen and bathrooms typically use different types of materials. For example, large amounts of nonstructural panels typically used in kitchen cabinets and other millwork are not used in other rooms.¹¹ Based on national averages, as much as 75 percent of the kitchen and bathroom cabinet market may be the result of remodeling expenditures.¹²

Re-siding is defined as the complete replacement of the existing exterior wall covering, including fascia, soffit, and other siding-related components. Repairs to the sheathing and framing during the re-siding project are also included, as is the installation of additional sheathing for insulation or for providing a smooth surface for the new siding.

All panels, structural and nonstructural, are used for door panels, skins and cores. Sixty percent of the lumber is used for doors and window frames, door panels, door jams, and other millwork; 40 percent is used for framing modifications for installing the new doors and windows.¹³ Door and window replacements include the replacement of existing exterior doors and windows, interior doors, related millwork, and framing lumber needed to install the doors and windows.

Unfortunately, there are no reliable breakouts of remodeling expenditures for Alaska. Based simply on Alaska's proportion of the national population, remodeling expenditures for the state would be:

- \$19.4 million on kitchens and bathrooms;
- \$18.1 million on windows and doors;
- \$7.6 million on siding; and
- \$13.7 million on flooring.

⁸ U.S. Department of Agriculture, Forest Service 1990

⁹ McKeever, David B. and Robert G. Anderson, Wood Products Used for Residential Repair and Remodeling in the United States, 1991

¹⁰ Wood Products Council, Wood Products Used in Residential Repair and Remodeling, 1997

¹¹ McKeever, David B. and Robert G. Anderson, Wood Products Used for Residential Repair and Remodeling in the United States, 1991, p. 15

¹² Kitchen Cabinet Manufacturers Association, press release, August 17, 1998.

¹³ McKeever, David B. and Robert G. Anderson, Wood Products Used for Residential Repair and Remodeling in the United States, 1991, p. 18

Due to the lack of statistics on remodeling usage, market demand estimates in this report are for new construction only, unless otherwise indicated.

Kitchen and Bathroom Cabinets

Overview of National Market

According to the NAHB, an average 2,085 square foot single-family home has 13 kitchen cabinets and 2 other cabinets (a total of 15 cabinets). The average multi-family apartment in a low-rise building (1,075 square feet) has an average of 10 kitchen cabinets and 2 bathroom cabinets (a total of 12 cabinets).¹⁴

While new construction is an important market, the national remodeling market accounts for approximately 75 percent of cabinet sales.¹⁵ In 1997, approximately \$8.5 billion was spent nationally remodeling kitchens (46 percent) and baths (54 percent).¹⁶ Much of this remodeling expense was for cabinetry.

Wood and wood veneer products dominate the cabinet market, accounting for almost 85 percent of the market. Plastic laminates account for 15 percent.¹⁷ Oak is the primary type of wood used for cabinets. Maple and cherry rank a distant second and third.

Recently when consumers were asked their preference for wood, maple was top choice, capturing 34 percent of the vote, which represented a rise from 32 percent in 1998. Oak was next at 18 percent, then cherry (13 percent) and hickory (4%). Birch was also growing in popularity, chosen by 6 percent of the respondents, a rise from 5 percent in 1998.¹⁸ The challenge for producers of cabinetry made from maple, cherry, hickory and birch will be find ways to bring prices down and gain wider distribution to affect the dominance of oak in the cabinet market.

Alaska Market

Based on NAHB national averages and estimates by local suppliers/retailers, in 1998 there were approximately 51,700 cabinets installed in new housing construction in Alaska. The material break out is estimated to be:

- 38,000 solid wood cabinets (74%),
- 4,700 wood veneer cabinets (9%),
- 7,800 laminate cabinets (15%), and
- 1,000 other materials cabinets (2%) installed in Alaska.

The dominant suppliers/brand names for kitchen/bathroom cabinets in Alaska are: Merillat, Dewils, Craftmade, Aristocraft, Diamond, Mid-Continent and Shrock.

If national trends for remodeling hold in Alaska, up to an additional 75 percent or another 38,000 cabinets were installed in existing homes in the state. In the Juneau area, since new housing starts have been slow, cabinets used in remodeling may make up 50-60 percent of the market. In the Fairbanks area, at least 75 percent of cabinets sold go into new construction and an estimated 25 percent are used for remodeling of kitchens and bathrooms. Rural Alaska's

¹⁴ per National Association of Home Builders

¹⁵ Kitchen Cabinet Manufacturers Association, press release, August 17,1998.

¹⁶ National Association of Home Builders

¹⁷ Kitchen Cabinet Manufacturers Association, press release, August 17,1998.

¹⁸ Southern Lumberman, September 1999.

proportion of new construction to remodeling is considered similar to what is found in the Fairbanks area.

Throughout the state, oak dominates the market, as much as 80 percent. The remaining 20 percent is made up of cherry, maple, ash, hickory, birch, and other woods.

Some past efforts to use native birch for cabinet manufacture have not been particularly well received in Alaska. Contractors have complained of problems in matching colors and grain, as well as warping and splitting, especially when cabinets are installed during the colder months. Comparison of Alaska birch with birch from other locations indicates there is no inherent reason that Alaska wood will not perform well if it is properly dried and handled. However, some market resistance has resulted from the perception of performance problems.

Appearance is a greater limitation on market demand. Consumer preference for oak results from its historical usage in much of the United States. Oak is both plentiful and moderately priced in many areas of the U.S. Alaskans might well develop a preference for indigenous birch, much as Scandinavians have. However, such a shift in consumer taste will require substantial marketing efforts.

Table 2. Alaska's New Residential Construction Market Demand for Kitchen and Bathroom Cabinets (1998 estimates)

1998	# of Units	%Total	National Average, # of cabinets	Alaska Average, # of cabinets	Solid Wood	Wood Veneer	Laminate	Other
Single-Family								
Anchorage	1163	39.7%	15	17,445	12,909	1,570	2,617	349
Fairbanks North Star Borough	161	5.5	15	2,415	1,787	217	362	48
Juneau Borough	123	4.2	15	1,845	1,365	166	277	37
Rest of Alaska	1480	50.6	15	22,200	16,428	1,998	3,330	444
Single Total	2927		15	43,905	32,490	3,951	6,586	878
Multi-Family								
Anchorage	437	66.7	12	5,244	3,881	472	787	105
Fairbanks North Star Borough	78	11.9	12	936	693	84	140	19
Juneau Borough	16	2.4	12	192	142	17	29	4
Rest of Alaska	124	18.9	12	1,488	1,101	134	223	30
Multi Total	655		12	7,860	5,816	707	1,179	157
TOTAL CABINETS				51,764	38,306	4,658	7,765	1,033

Source: AHFC, NAHB

Exterior and Interior Doors

Overview of National Market

According to the NAHB, in an average 2,085 square foot single-family home, 12 interior passage doors, seven closet doors, and three exterior doors (including one patio door) are used. The front entry doors use the following materials:

- 63 percent are made of steel,
- 18 percent are wood, and
- 19 percent are made of fiberglass.

In each case the vast majority of front exterior doors had raised panels.¹⁹ About 80 percent of other entry doors are made of steel and 16 percent are made of wood. Only 4 percent are fiberglass.²⁰

In an average multi-family apartment, there are two exterior doors, seven interior passage doors and four closets.²¹

According to a market study published by *F.W. Dodge*, estimates of material used for interior doors are:

Passage, hardboard panel	36%
Passage, hardboard flush	13%
Passage, wood panel	12%
Passage, wood flush	8%
Passage, other	2%
Closet, hardboard panel	14%
Closet, hardboard flush	2%
Closet, wood panel	3%
Closet, wood flush	4%
Closet, other	6%

Alaska Market

Exterior Doors

The characteristics of the exterior door market in Alaska are somewhat dissimilar to the national average market. One difference is that more steel doors are used. Steel doors are dimensionally stable, have good insulating qualities and are less expensive. While fiberglass may be making inroads into the Southeast Alaska market (as much as 10 percent), these doors still are not sold much in the rest of Alaska. Fiberglass doors are prohibitively expensive for rural housing programs.²² Exterior doors in HUD new home construction are 100 percent steel. No wood is used. In the Southeast Alaska market, the trend is away from wood exterior doors, largely a result of climatic conditions leading to swelling, jamming and cupping of the doors.

In 1998, there were an estimated 10,000 exterior doors used of which 1,600 were wood. On a percentage basis, the exterior front door market in Alaska is estimated to be:

Steel	82%
Wood	16%
Fiberglass	2%

Dominant brand names in the exterior door market are Thermatru, Peachtree, and Stanley. The remodeling market may account for as much as 70 percent of the exterior doors sold.

Interior Doors

The interior door market (both passage and closet) appears similar to national averages. In 1998, there were an estimated 39,700 interior passage doors and 23,100 closet doors installed in Alaska's new residential construction. On a statewide basis, the material used is estimated to be:

Passage, hardboard panel	51%	20,000 doors
Passage, hardboard flush	18%	7,300

¹⁹ Ahluwailia, Gopal. "New Home Features and Materials", *Housing Economics*, July 1998, p. 8-10.

²⁰ Ahluwailia, Gopal. "New Home Features and Materials", *Housing Economics*, July 1998, p. 8-10.

²¹ per National Association of Home Builders

²² per Brian Keener, URESO

Passage, wood panel	17%	6,700
Passage, wood flush	11%	4,500
Passage, other	3%	1,100
Closet, hardboard panel	48%	11,000 doors
Closet, hardboard flush	7%	1,600
Closet, wood panel	10%	2,300
Closet, wood flush	14%	3,200
Closet, other	21%	4,900

Based on the region of Alaska, however, there may be differences in percentage breakout. For instance, in Southeast Alaska, passage doors often match the closet doors in material used. The breakout may be closer to 35 percent hardboard panel, 0 percent for hardboard flush, 15 percent wood panel and 50 percent wood flush for both passage and closet doors. In rural Alaska the market appears to be 80 percent hardboard panel and 20 percent wood flush for both passage and closet doors.

Dominant brand names of interior wood doors in Alaska are Simpson, Doorcraft, and Bend.

The remodeling market may make up as much as 60 percent of interior doors sold in Alaska.

Table 3. Alaska's New Residential Construction Market Demand for Exterior and Interior Doors (1998 estimates)

1998	# of units	%Total	# of Exterior Doors	# of Wood Exterior	# of Interior, Passage	# of Interior, Closet
Single-Family						
Anchorage	1163	39.7%	3,489	558	13,956	8,141
Fairbanks North Star Borough	161	5.5	483	77	1,932	1,127
Juneau Borough	123	4.2	369	59	1,476	861
Rest of Alaska	1480	50.6	4,440	710	17,760	10,360
Total	2927		8,781	1,405	35,124	20,489
Multi-Family						
Anchorage	437	66.7	874	140	3,059	1,748
Fairbanks North Star Borough	78	11.9	156	25	546	312
Juneau Borough	16	2.4	32	5	112	64
Rest of Alaska	124	18.9	248	40	868	496
Total	655		1,310	210	4,585	2,620
Total Doors			10,091	1,615	39,709	23,109

Source: AHFC, NAHB

Windows

Overview of National Market

According to the NAHB, an average single-family home has 18 windows, and an average multi-family apartment has six. Of all the windows installed, approximately 19 percent are made from wood, 30 percent from vinyl and 51 percent from aluminum. Few wood windows, with the exception of Pozzi (Bend, Oregon), are manufactured in the West. The majority of the large manufacturers are found in the Midwest or on the East Coast (e.g., Anderson, Marvin).

Alaska Market

Based on the NAHB figures, in 1998 an estimated 57,000 windows were installed in Alaska housing starts, of which 28,000 were unclad wood, aluminum-clad wood or vinyl-clad wood.

According to suppliers and retailers, the Alaska's window market for new residential construction in 1998 comprised:

Wood, unclad	10%	5,600 windows
Wood, aluminum clad	10%	5,600
Wood, vinyl clad	30%	17,000
Vinyl sash and frame	46%	26,000
Aluminum, unclad	0%	(insignificant)
Aluminum, vinyl clad	0%	(insignificant)
Other	4%	2,300

Vinyl sash and frame dominates the national market, and its dominance in Alaska appears to be growing. The reputation of the vinyl product is that it has a good R-value and is durable. In rural Alaska, about 95 percent of the windows are vinyl sash and frame. In Southeast Alaska 65-75 percent of the windows are vinyl sash and frame. Wood casement windows seem to be more popular in Alaska than elsewhere in the country. Aluminum windows perform badly in Alaska's cold climate and are rarely found.

The main brand names of wood windows are Pozzi, Clad Windows, Anderson, Marvin and Hurd. The largest window manufacturers in the nation — Anderson, Hurd and Marvin —while present in Alaska, do not dominate the Anchorage market. Reasons cited are that the latter companies tend to serve higher-end markets, with an emphasis on clad windows, whereas Alaska homes tend to be somewhat more modest. Alaskan's also use more casement (side-opening) windows compared with a preference for double-hung (vertical-sliding) windows in many other parts of the country.

There are window manufacturers found in Alaska, i.e., Alaska Window (Fairbanks), and Northerm Windows (Anchorage), but these manufacturers are not using wood in their production.

Based on discussions with local retailers and distributors, the remodeling market in Alaska may make up as much as 50-60 percent of all windows sold.

**Table 4. Alaska's New Residential Construction Market Demand
For Windows (1998 estimates)**

1998	# of Units	%Total	# of Windows	# of Wood, Unclad	# of Wood, Alum. Clad	# of Wood, Vinyl Clad	# of Vinyl, Sash and Frame	# of Other
Single-Family								
Anchorage	1163	39.7%	20,934	2,093	2,093	6,280	9,630	837
Fairbanks North Star Borough	161	5.5	2,898	290	290	869	1,333	116
Juneau Borough	123	4.2	2,214	221	221	664	1,018	89
Rest of Alaska	1480	50.6	26,640	2,664	2,664	7,992	12,254	1,066
Total	2,927		52,686	5,269	5,269	15,806	24,236	2,107
Multi-Family								
Anchorage	437	66.7	2,622	262	262	787	1,206	105
Fairbanks North Star Borough	78	11.9	468	47	47	140	215	19
Juneau Borough	16	2.4	96	10	10	29	44	4
Rest of Alaska	124	18.9	744	74	74	223	342	30
Total	655		3,930	393	393	1,179	1,808	157
Total Windows	3,582		56,616	5,662	5,662	16,985	26,043	2,264

Source: NAHB, AHFC

Millwork (Mouldings and Trim)

Overview of National Market

According to the Wood Moulding and Millwork Producers Association (WMMPA), the following is a list of major trim items for a single-family house of about 2,000 sq. feet.²³

Casing: Windows – 359 lineal feet; Doors – 610 lineal feet
 Base: 550 lineal ft.
 Baseshoe: 50 lineal ft.
 Closet pole: 39 lineal ft.
 Chair rail: 300 lineal ft.
 Crown moulding: 350 lineal ft.

The WMMPA does not prepare similar averages for multi-family dwellings. However, given the NAHB average size of 1,075 square feet for a multi-family apartment, a WMMPA representative said that halving the single family allowances provides a reasonable estimate.

Alaska Market

Alaska's suppliers and retailers of wood millwork estimated somewhat different moulding and millwork usages:

Casing: Windows — 500-600 lineal feet; Doors – 610 lineal ft.

²³ Per Stan Blaine, Wood Moulding and Millwork Producers Association.

Base: 700 lineal ft.
Baseshoe: 0 lineal ft. (insignificant)
Closet pole: 60 lineal ft. (Generally, Alaskans have more and bigger closets than found nationwide)
Chair rail: 20 lineal ft. (found in an estimated 10 percent of new homes)
Crown moulding: 20 lineal ft (found in an estimated 10 percent of new homes)

While there is no national average available for millwork in multi-family homes, halving the Alaska supplier estimate results in the following:

Casing: Windows -- 250-300 lineal feet; Doors -- 305 lineal ft.
Base: 350 lineal ft.
Baseshoe: 0 lineal ft. (insignificant)
Closet pole: 30 lineal ft.
Chair rail: 10 lineal ft.
Crown moulding: 10 lineal ft.

Applying these estimates to 1998 Alaska construction results in the following estimate of total Alaska usage:

1.6-2.0 million lineal feet of wood window casing
2.0 million lineal feet of wood door casing
2.3 million lineal feet of wood base
0 lineal ft of wood baseshoe (insignificant)
195,000 lineal feet of closet pole
65,000 lineal feet of chair rail
65,000 lineal feet of crown moulding installed in Alaska

The majority of moulding and trim -- an estimated 70 percent -- is paint grade. Of this 70 percent, 85-90 percent is finger-jointed pine and 10-15 percent is produced from MDF. MDF moulding does not perform as well in very cold regions as condensation on fasteners tends to cause puckering in the moulding surface. Fairbanks contractors have also complained about MDF millwork splintering when using a nail gun. Generally, however, MDF use is growing in the Alaska market. MDF use in Southeast Alaska is about 50 percent of paint grade millwork. Solid pine and hemlock makes up 15-20 percent of moulding use and hardwood moulding rounds out the market at 10-15 percent.²⁴ The preferred hardwood is oak, with maple a distant second.

Some of the millwork found in Alaska comes from several manufacturers on the West coast of the US, primarily in California. The Canadian company, Sauders, is the biggest player in Alaska. However, there does not appear to be a dominant name brand in millwork. It is viewed mainly as a commodity.

²⁴ Per Stan Blaine, Wood Moulding and Millwork Producers Association and Dave Carter, Hardwood Inc.

Table 5. Alaska's New Residential Construction Market Demand for Millwork (Moulding and Trim), in lineal feet (1998 estimates)

1998	# of Units	%Total	Window Casing	Door Casing	Base	Closet Pole	Chair Rail	Crown
Single-Family								
Anchorage	1163	39.7%	581,500-697,800	709,430	814,100	69,780	23,260	23,260
Fairbanks North Star Borough	161	5.5	80,500-96,600	98,210	112,700	9,660	3,220	3,220
Juneau Borough	123	4.2	61,500-73,800	75,030	86,100	7,380	2,460	2,460
Rest of Alaska	1480	50.6	740,000-888,000	902,800	1,036,000	88,800	29,600	29,600
Single-Total	2927		1,463,500 - 1,756,200	1,785,470	2,048,900	175,620	58,540	58,540
Multi-Family								
Anchorage	437	66.7	109,250-131,100	133,285	152,950	13,110	4,370	4,370
Fairbanks North Star Borough	78	11.9	19,500-23,400	23,790	27,300	2,340	780	780
Juneau Borough	16	2.4	4,000-4,800	4,880	5,600	480	160	160
Rest of Alaska	124	18.9	31,000-37,200	37,820	43,400	3,720	1,240	1,240
Multi-Total	655		163,750 - 196,500	199,775	229,250	19,650	6,550	6,550
TOTAL	3,582		1,627,250 - 1,952,700	1,985,245	2,278,150	195,270	65,090	65,090

Source: WWMPA, AHFC

Exterior Siding

Overview of National Market

According to the NAHB, an average 2,085 square foot single-family home uses 2,325 square feet of exterior siding material. An average amount of exterior siding for a multi-family apartment is 779 sq. ft. In many markets in the Lower 48, vinyl siding dominates sales (approximately 75% on the east coast). Wood siding is more popular in the West. However, according to the National Association of the Remodeling Industry, wood siding is declining relative to other sidings that are perceived as lower maintenance, such as vinyl.

Alaska Market

Based on NAHB averages, Alaska used an estimated 7.3 million sq. ft of siding—all types—in 1998. When NAHB averages are adjusted per interviews with local wholesalers and retailers, the total Alaska market for exterior siding for new residential construction is estimated to be approximately:

Waferboard/OSB	40%	2.9 million square feet
Plywood (including T1-11) ²⁵	35 %	2.6 million
Lumber	15%	1.1 million
Hardboard	2 %	146,00
Shakes/Shingles	0%	(insignificant)
Aluminum	1%	73,000
Steel	1%	73,000

²⁵ T1-11 is textured plywood used as finish siding, primarily in lower cost construction.

Vinyl	5%	366,000
Brick	0%	(insignificant)
Fiber Cement	1%	73,000
Stucco	0%	(insignificant)

While vinyl siding is very popular in the US market as a whole, in Alaska, vinyl makes up only about 5 percent of the total exterior siding market. In the Southeast Alaska market, vinyl dominates the market at about 70 percent, largely because it performs better in a wetter, milder climate than found elsewhere in the state. Waferboard is not used in this market. Cedar siding, T1-11 and fiber cement each make up 10 percent. In rural Alaska, an estimated 30 percent of the siding is vinyl, 50 percent is steel siding and 20 percent is hardboard.

In the solid wood exterior siding market, no one supplier dominates the Alaska market. In the OSB siding market, Louisiana Pacific (LP) is the primary supplier.

Roughly 20-25 percent of siding sold in Alaska is used for remodeling or re-siding.

**Table 6. Alaska's New Residential Construction Market Demand
for Exterior Siding, in square feet (1998 estimates)**

1998	# of Units	% of Total	Total Siding	Aluminum	Steel	Vinyl	Hardboard	Plywood	Lumber	Waferboard	Fiber cement
Single-Family											
Anchorage	1,163	39.7%	2,703,975	27,040	27,040	135,199	54,080	946,391	405,596	1,081,590	27,040
Fairbanks North Star Borough	161	5.5	374,325	3,743	3,743	18,716	7,487	131,014	56,149	149,730	3,743
Juneau Borough	123	4.2	285,975	2,860	2,860	14,299	5,720	100,091	42,896	114,390	2,860
Rest of Alaska	1,480	50.6	3,441,000	34,410	34,410	172,050	68,820	1,204,350	516,150	1,376,400	34,410
Total	2,927		6,805,275	68,053	68,053	340,264	136,106	2,381,846	1,020,791	2,722,110	68,053
Multi-Family											
Anchorage	437	66.7	340,423	3,404	3,404	17,021	6,809	119,148	51,064	136,169	3,404
Fairbanks North Star Borough	78	11.9	60,762	608	608	3,038	1,215	21,267	9,114	24,305	608
Juneau	16	2.4	12,464	125	125	623.2	249	4,362	1,870	4,986	125
Rest of Alaska	124	18.9	96,596	966	966	4,830	1,932	33,809	14,489	38,638	966
Total	655		510,245	5,103	5,103	25,512	10,205	178,586	76,537	204,098	5,102
Total Siding			7,315,520	73,156	73,156	365,776	146,311	2,560,432	1,097,328	2,926,208	73,155

Source: AHFC, NAHB

Finish Flooring

Overview of National Market

According to the NAHB, 2,085 square feet of flooring material is used in an average single-family home. In an average multi-family apartment, 1,075 square feet of flooring is used. The most common flooring material in entry foyers was ceramic tile (41 percent), followed by vinyl sheet (29 percent) and finished hardwood at 25 percent. In a multi-family home, a national average of 72 percent was carpeted, 13 percent was resilient sheet, 4 percent was resilient tile, 2 percent was wood strip, plank or parquet, 2 percent was ceramic tile (glazed or mosaic), and 7 percent was other materials.²⁶

According to Gopal Ahluwalia, Director of Research at the NAHB, wood flooring is found almost exclusively in “upscale houses”, that is a new home over 3,000 square feet, ranging from \$250,000 and over. This type of house comprises only 16 percent of new US homes built.

According to the National Oak Flooring Manufacturers Association, in 1998, the national average quantity of hard wood flooring per start was 277.67 board feet.

While consumers rank wood flooring as attractive and desirable, it is still perceived as an expensive option. With very few exceptions this flooring is made from hardwoods, such as oak and maple. Wood flooring is largely manufactured in Southeast US, and very little comes from western US manufacturers.

Alaska Market

The national average of 277.67 board feet per housing start, implies that the Alaska market for hardwood flooring in 1998 was approximately one million board feet. However, according to local suppliers/retailers of flooring material, wood flooring is not used as often in Alaska, in part because there are fewer high-end (over \$300,000 value).

Approximately 6.8 million sq. ft of flooring material was used in new residential construction in 1998.

The following is an estimated percentage break out of flooring material used, for both single-family and multi-family new construction, in the Alaska market:

Wood Strip or Plank	6%	408,000 square feet
Wood Laminate	1%	68,000
Wood Parquet	2%	136,000
Wood Other	0%	(insignificant)
Carpet	35%	2.4 million
Resilient Tile	14%	953,000
Resilient Sheet	18%	1.2 million
Ceramic Tile, Glazed	8%	545,000
Ceramic Tile, Mosaic	2%	136,000
Ceramic Tile, Other	1%	68,000
Quarry Tile	2%	136,000
Non-Wood Laminate	6%	408,000
Marble	1%	68,000
Other	1%	68,000

Wood flooring is virtually non-existent in rural Alaska. Approximately, 60 percent of the flooring is resilient tile and sheet and 40 percent is carpet. Bruce is one of the most popular wood flooring

²⁶ Per National Association of Home Builders

name brand in Alaska. Oak remains the most popular choice for wood flooring (roughly 80 percent). Maple, hickory, aspen, and cherry are used as well. The characteristics of Alaska birch are similar to eastern birch. However, local contractors tend to prefer kiln-dried Eastern Birch to air-dried Alaska products. Alaska Science and Technology Foundation (ASTF) funded a study on kiln-dried Alaska birch and found that it dried and performed well.²⁷ Roughly 70 percent of flooring sold in Alaska is for remodeling purposes.

²⁷ Per Mark Stern, Alaska Wood Moulding Inc., recipient of ASTF grant funding

**Table 7. Alaska's New Residential Construction Market Demand
for Floor Material, in square feet (1998 estimates)**

1998	# of Units	% of Total	Total Flooring	Carpet	Resilient Tile	Resilient Sheet	Wood Strip	Wood Laminate	Wood Parquet	Ceramic Tile, glazed	Ceramic tile, mosaic	Ceramic Tile, other	Non- wood Lam	Marble	Other
Single-Family															
Anchorage	1,163	39.7	2,424,855	848,699	339,480	436,474	145,491	24,249	48,497	193,988	48,497	24,249	145,491	24,249	24,249
Fairbanks North Star Borough	161	5.5	335,685	117,490	46,996	60,423	20,141	3,357	6,714	26,855	6,714	3,357	20,141	3,357	3,357
Juneau Borough	123	4.2	256,455	89,759	35,904	46,162	15,387	2,565	5,129	20,516	5,129	2,565	15,387	2,565	2,565
Rest of Alaska	1,480	50.6	3,085,800	1,080,030	432,012	555,444	185,148	30,858	61,716	246,864	61,716	30,858	185,148	30,858	30,858
Total	2,927		6,102,795	2,135,978	854,391	1,098,503	366,168	61,028	122,056	488,224	122,056	61,028	366,168	61,028	61,028
Multi-Family															
Anchorage	427	65.2	459,025	160,659	64,264	82,625	27,542	4,590	9,181	36,722	9,181	4,590	27,542	4,590	4,590
Fairbanks North Star Borough	78	11.9	83,850	29,348	11,739	15,093	5,031	839	1,677	6,708	1,677	839	5,031	839	839
Juneau Borough	16	2.4	17,200	6,020	2,408	3,096	1,032	172	344	1,376	344	172	1,032	172	172
Rest of Alaska	124	18.9	133,300	46,655	18,662	23,994	7,998	1,333	2,666	10,664	2,666	1,333	7,998	1,333	1,333
Total	655		704,125	246,444	98,578	126,743	42,248	7,041	14,083	56,330	14,083	7,041	42,248	7,041	
TOTAL															
FLOORING			6,806,920	2,382,422	952,969	1,225,246	408,415	68,069	136,138	544,554	136,138	68,069	408,415	68,069	68,069

Source: AHFC, NAHB

Industry Contacts

National Manufacturers/Trade Associations

- American Architectural Manufacturers Association
- F.W. Dodge
- Hardwood Plywood and Veneer Association
- Kitchen Cabinet Manufacturers Association
- Maple Floor Manufacturers Association
- National Association of Home Builders
- National Association of the Remodeling Industry
- National Oak Flooring Manufacturers Association
- National Wood Flooring Association
- Window and Door Manufacturers Association
- The Hardwood Council
- Wood Moulding and Millwork Producers Association
- Wood Products Council

Alaska Retailers/Suppliers

- Alaskan Wood Moulding, Inc. (Anchorage)
- Don Abel Building Supply (Juneau)
- Hardwoods, Inc. Alaska (Anchorage)
- Huttig Building Products (Anchorage)
- Northwood Wood Products (Fairbanks)
- Plumbing Showcase (Fairbanks)
- Spenard Builders Supply, Inc. (Anchorage, Fairbanks)
- Superior Hardwood (Fairbanks)
- URESCO Construction Materials, Inc. (Anchorage and Kent, WA)
- Valley Lumber (Juneau)

Alaska Non-Profit Organizations

- Alaska Home Builders Association
- Associated General Contractors of Alaska

Public Agencies

- Alaska Housing Finance Corporation
- Construction Expenditures Branch, Manufacturing and Construction Division, U.S. Department of Commerce
- Forest Products Laboratory, Forest Service, U.S. Department of Agriculture

An Assessment of Market Opportunities for Alaskan Forest Product Exports

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Executive Summary

Alaska's forest resource and its competitive position in the international timber market have important implications for a variety of market strategies and future research objectives. While the timber industry is limited by numerous infrastructure and economy of scale factors, the state does possess high quality raw materials. In order to evaluate future opportunities it is important to fully assess the present situation. While the bulk of this paper addresses research needs and potential market opportunities, it also includes an assessment of the current situation regarding the timber resource and mill capabilities, as declining harvest volumes and high mill costs are major impediments to future investments.

Largely due to Alaska's rather limited role in global wood markets, little data is generally available regarding the competitiveness of Alaskan forest products in international export markets. Similarly, little information exists linking export product opportunities in foreign markets to the types of forest products that can be manufactured competitively in Alaska. This exploratory research describes market opportunities for Alaskan forest products in broad terms, and suggests a range of products that might be produced competitively in Alaska, while identifying areas where further research and market development is needed in order to develop export markets for Alaskan forest products.

Alaska's clear market advantage is its ability to supply high quality Sitka spruce. However, recent changes in the Tongass Land Management Plan threaten to reduce harvests on the state's largest timber resource. In order to extract more value from available resources, policy makers are interested in developing higher valued processing among the state's firms and in becoming a more prominent supplier of secondary processed goods in the international market. While increased use of high quality wood represents a major opportunity, it will be essential to also enhance the opportunities for small diameter lower grade resources, which are becoming more abundant.

To date, the Alaskan forest sector has maintained a stable share in the log export market, experienced substantial fluctuations in chip exports, and experienced a decline in the market for lumber. Secondary product exports have increased, but from such a low volume that it would be premature to identify this new market penetration as a major success.

The wood products industry in Alaska has significant obstacles to overcome before it can become a prominent supplier of wood products. Challenges include: limited access to timber resources, higher production costs, geography and infrastructure that limit the movement of materials within the state, dated equipment at most sawmills, limited transportation infrastructure, and expensive transportation to markets within Alaska and to the Continental US and Asia. There are strategies that may improve Alaska's competitiveness in foreign and Continental US markets, yet there are many factors that should be considered before targeting the export market.

The most significant obstacle to developing Alaska's wood products industry involves inefficiencies in processing. Many sawmills in Alaska produce dimension lumber, yet few are efficient. According to an Alaska DCED survey of sawmills (1998), most of the 39 mills surveyed, operate well below capacity with only two mills operating two shifts per day and the remaining mills operating one shift per day or less. Out of 38 mills that responded to an inquiry about the equipment they use, only two mills operate dry kilns, and most mills use circular saws, a lower productivity method of milling. More automatic equipment for handling, milling, stacking, and drying is needed to lower production costs, increase efficiency, and compete more effectively in foreign and domestic markets. These types of mill upgrades are costly. In order to attract investment to upgrade production facilities, the state needs to consider offering a range of services including a consistent supply of raw materials, financing opportunities for small mills, export and marketing assistance, and promotion of Alaskan products in US and international markets. There is also much information that should be gathered before embarking on the costly endeavor of upgrading mills and promoting the industry. Analysts need to understand why manufacturing costs are high. Only after all of the cost components that go into manufacturing process are identified and the reasons costs are elevated and understood, can an attempt be made to reduce these costs.

While it might seem desirable to concentrate promotion on secondary processing, such processing is highly dependent upon a stable resource supply. Hence, success with secondary processing will likely require a degree of economic health in logging and primary processing as well.

Opportunities for Consideration

While Alaskan mills face several challenges there are a variety of opportunities that may be considered. All of these options would require further investigation, necessitating future research of most processing. Given the small scale of most mills in Alaska there is little internal research on future opportunities.

Given the value in Japan placed on high quality Sitka spruce, the Japanese post and beam market should be considered. While Alaskan producers do not appear to be able to compete in the dimension lumber market, they may be able to compete in the market for appearance grade and construction grade baby squares, used in the post and beam market. Further research required to understand the Japanese market is discussed below.

Alaskan producers may also consider producing engineered wood products from Sitka spruce. While high grade Sitka spruce logs command the highest prices, logs that are #3 grade or lower account for almost half of the timber inventory on the Tongass. Engineered wood products can make use of a low-grade small diameter resource to manufacture a high-grade product by removing defects. Smaller diameter Sitka spruce has the same strength to weight ratio of large diameter Sitka spruce logs, which makes it a desirable material for structural or appearance grade engineered wood products. Engineered wood products processing increases the productivity of the timber resource compared to traditional sawmill practices, resulting in greater use of a limited timber resource. Processing typically utilizes approximately 80% of a small diameter tree compared to 40% for traditional log sawmilling.

Options discussed in this report range from producing planed lumber for the Japanese market to glulam lumber, veneer, and LVL. While lumber is still the most widely used building material, engineered wood products are gaining market share as available high quality timber is declining, and relatively defect free building materials can be made from otherwise inferior raw materials.

The option of producing cedar decking and siding for the North American market should also be considered. Cedar comprises 7% of the timber in Alaska's National Forests, or approximately 3.2 million m³. At the same time, high quality redcedar is becoming increasingly scarce in the PNW. Reduced availability has contributed to a steady increase in redcedar prices.

Future Research

Methods must be developed to improve the economy of scale in production, transportation, and marketing capabilities within Alaska's forest product sector if it is to become more competitive. To improve scale economies and, in turn competitiveness with international suppliers, a series of research and development tasks should be implemented. It appears most feasible for this research to be carried out by a consortium formed by agencies such as the Wood Utilization Center, the Alaska Department of Commerce and Economic Development, and the University of Alaska in order to share costs and expertise.

First, manufacturing cost differences with BC and the PNW appear to be the largest contributor to the higher cost structure of Alaskan lumber. While stumpage prices in Alaska are the lowest among the three regions, manufacturing costs in Alaska comprise 50% of total lumber costs compared to 27% in BC, and 21% in the PNW. While manufacturing costs may be higher due to dated or insufficient machinery and higher labor costs, little detailed information is available regarding why this is the case. In order to increase the competitiveness of Alaska's secondary processing industry, policymakers must understand these factors. Are mills operating below capacity with dated machinery because they have insufficient supply or are mill owners employed in other lines of work and operate the mill below capacity by choice? Further understanding of why labor costs are higher is also needed. If wages are higher because skilled labor is scarce, steps to train the workforce may be considered. Information of this type could direct future efforts to either initiate financing agreements to upgrade equipment, work to help mills establish foreign contracts, or develop methods for mills to access more raw materials.

Another option to improve production efficiency is to provide financial incentives to centralize some aspects of production. This type of activity may require large-scale investment from a private company or a group of companies. Currently, a major forest products company is constructing a new veneer mill in Ketchikan, indicating that there is industry interest in locating secondary processing in Alaska. The goal of a centralized processing facility is to increase the economy of scale of many small producers and provide services to increase product competitiveness such as kiln drying, grading, and finishing.

Once mill productivity is improved, firms may benefit from research and promotional activities provided by industry associations. Associations perform tasks such as market research, informing firms about trade leads and foreign markets, and facilitating cooperative promotion and marketing. Alaskan producers could take advantage of services offered by the Softwood Export Council (SEC) through the Alaska Department of Commerce and Economic Development (DCED) membership. The SEC promotes US wood products by attending trade shows, identifying trade leads, and by allocating Foreign Agriculture Funds to members for overseas expenses incurred through promoting US wood products in international markets.

Associations also facilitate communication between members to encourage cooperative work arrangements and timber sales. Promoting improved communication could take the form of workshops with producers to teach new processing technologies to methods to effective marketing. Given the dispersal of mills in Alaska and the small size of most mills, this type of information can also be disseminated on the Internet through on-line forums. One role for an association may be to establish training programs and support training activities in partnership with government agencies.

Second, Alaskan mills should be surveyed as a means to understand the reasons behind the higher costs of processing and labor as well as to understand what products firms are producing by species and grade. The Alaska DCED gathered valuable information through a 1998 survey, yet more detailed information regarding processing and marketing may help develop approaches to improve mill efficiency and develop marketing strategies based on the products that are being produced. For example, there is limited understanding among shippers and producers in Alaska regarding how products are transported to foreign markets. Improved understanding could help facilitate the movement of goods.

Third, Japanese importers and builders should be surveyed in order to understand how and where Alaskan wood products are being used and how they are being distributed in Japan. This research includes identifying where Alaskan wood products are being used by grade and species, how they are being used, and what species and grades are being used as substitutes. Further, the distribution system for wood products is important in affecting firm success. Identifying the uses and distribution system for Alaskan wood may help identify areas where Alaska products are not currently used but could be, and may also help improve market presence. From a pure market opportunity perspective, this research would be considered the most important of all research options presented. Unfortunately, the high cost of manufacturing, dispersed location of processors, and increasing constraints on timber supply will more than likely inhibit interest in developing new markets unless improvements are made simultaneously in these areas.

Fourth, research should be conducted regarding the economic feasibility of installing and maintaining a variety of engineered wood product plants and their respective potential profitability. Given present and projected harvest reductions, in depth research should be performed to understand how much production would be required for Alaskan mills to be competitive with mills located in Canada and the Continental US, and whether sufficient raw material supply could be obtained to sustain necessary production levels. Given the lack of markets for lower grade small diameter material, this research may need to be expanded to include the full use of residuals including methods to lower the high cost of energy.

Finally, a feasibility study should be implemented to determine the viability of establishing a centralized processing facility in Southeast Alaska as a means of improving the region's economy of scale. Analysis should consider transportation costs to move logs to the facility, the ability for sawmills to provide a consistent supply, long-term supply projections, financial incentives, and the competitive advantage that centralized processing would provide.

Table of Contents

Executive Summary.....	247
List of Figures.....	252
List of Tables.....	252
Objectives And Organization Of Report	253
Introduction.....	254
Domestic Forest Resource.....	254
Alaska's Commercial Species.....	254
Statewide Timberland Ownership Distribution	255
Statewide Federal Timberland Ownership	255
Statewide Private Forestland Ownership.....	258
Timber Harvest Trends	258
Restrictions	259
Future Trends	259
Characterization of Alaska's Mills	261
Labor, Harvesting, and Manufacturing Costs.....	262
Labor	262
Harvesting	263
Manufacturing.....	264
Total Costs.....	265
Transportation.....	267
Energy Costs.....	267
Domestic Market.....	267
Export Market	268
Leading Exports by Product.....	268
Leading International Markets.....	272
Japan	272
Korea.....	278
China.....	279
Considerations For Export Oriented Trade.....	281
Trade Associations	282
Lumber Grading	283
Importance of Market Diversification.....	283
British Columbia's Value-Added Promotion Programs	283
Opportunities For Alaska's Wood Products.....	284
Centralized Processing	284
Japanese Niche Markets and the Post and Beam Construction Market	285
US Market for Western Redcedar Decking and Siding.....	287
Engineered Wood Products.....	289
Glue-Laminated Lumber (Glulam).....	290
Planed lumber for the Japanese Glulam Market.....	291
Veneer	291
Laminated Veneer Lumber (LVL).....	292
Future Research.....	295
Cost Effectiveness of Processing	295
Efficiency Gains in Alaska's Manufacturing Sector.....	295
Survey of Alaskan Processors	296
Survey of End-Users of Alaskan Wood Products in Japan.....	296
Centralized Broker/Processing Facility	296
Conclusion.....	297
References	300
Appendix A. Map of Alaska by Land Ownership.....	303
Appendix B. Considerations for Exporters to Japan.....	307

List of Figures

Figure 1.	Commercial acres of forestland in Southeast Alaska by owner	254
Figure 2.	Log grades of the Tongass inventory	255
Figure 3.	Alaska timber harvest volumes and projections by ownership, 1990-2010	258
Figure 4.	Demand scenarios for Tongass timber	258
Figure 5.	Mill capacity, lumber production and timber supply for Southeast Alaska	259
Figure 6.	Harvest costs in Southeast Alaska, British Columbia, and the Pacific Northwest, 1985-1995	262
Figure 7.	Total sawmilling costs in Southeast Alaska, British Columbia, and the PNW, 1985-1995	263
Figure 8.	Lumber production costs in Southeast Alaska, British Columbia, and the Pacific Northwest, 1985 -1995	264
Figure 9.	Total costs of lumber production (with stumpage) in Southeast Alaska, British Columbia, and the Pacific Northwest, 1994	264
Figure 10.	Leading primary processed wood products from Alaska to all destinations, 1989 -1998	267
Figure 11.	Softwood log export volume and revenue exports from Alaska to all destinations, 1986-1998	267
Figure 12.	Leading secondary processed wood product exports from Alaska to all destinations, 1989-1998	269
Figure 13.	Leading primary processed wood product exports from Alaska to Japan, 1989-1998	271
Figure 14.	Average price for hemlock export logs by grade	272
Figure 15.	Average value for Alaskan log exports to all destinations by species	273
Figure 16.	Alaska softwood logs export volume to Japan by species, 1986-1997	274
Figure 17.	Japanese wholesale log prices	274
Figure 18.	Japanese softwood log imports by source, 1986-1997	275
Figure 19.	China's leading manufactured wood product imports, 1995-1997	279
Figure 20.	Japan's glulam imports from North America	289
Figure 21.	North American structural panel and LVL production	291
Figure 22.	North American I-joist production, 1990-2000	292
Figure 23.	Total costs of lumber production (with stumpage) in Southeast Alaska, British Columbia, and the Pacific Northwest, 1994	293

List of Tables

Table 1.	Alaska's forest inventory by region and forest type	253
Table 2.	Distribution of 1995 harvest by species and grade, for Southeast Alaska.	257
Table 3.	Labor inputs in the logging and sawmill sectors in Alaska, Oregon and Washington, 1987-1994	261
Table 4.	Alaska's total wood product exports by destination	270
Table 5.	Alaska's softwood log export volume by destination	271
Table 6.	Japan's softwood lumber import volume by source	276
Table 7.	Projected Korean demand and supply for timber	276
Table 8.	Korean production of lumber by species	277
Table 9.	Korean end use markets by product, 1997	277
Table 10.	Average yearly prices for inland western redcedar logs and lumber in the US, 1988-1998	286
Table 11.	Estimated square footage of various residential siding materials installed in 1994-1995 in the Puget Sound market, market share, and estimated share that the Puget Sound market represents for each residential siding material nationally	286
Table 12.	Japanese production and imports of appearance grade and structural glulam, 1987-1996	289
Table 13.	Japan's production and imports of LVL	290
Table 14.	US and Canada laminated veneer lumber production and capacity	292

Objectives and Organization of Report

Alaska's forest industry has important implications for a range of forest policy questions including current efforts to increase value-added processing in the region as well as the more general debate regarding sustainable economic development in a region that is dependent upon public forests. Primarily due to its remote location, Alaska has generally been recognized as a high cost producer of wood products. However, certain softwood species and log grades available in Alaska are capable of commanding high market prices, thereby offsetting, to some degree, higher production costs.

Little data is generally available regarding the competitiveness of Alaskan forest products in international export markets. Similarly, little information exists linking export product opportunities in foreign markets to the types of forest products that can be manufactured competitively in Alaska. This industry analysis will characterize the market opportunities for Alaskan forest products, identify a range of products that might be produced competitively in Alaska, and identify areas where further research and market development is needed in order to develop export markets for Alaskan forest products.

The specific objectives of this research are to: 1) describe potential market opportunities for Alaskan forest products, and 2) provide a summary of future research priorities to help develop the export potential of the Alaskan forest products industry. These two objectives are to a degree dependent upon two additional objectives that can largely be met by summarizing secondary data to 1) assess the size, quality, and availability of the forest resource in Alaska, and 2) assess the size, location, and competitiveness of the forest products industry in Alaska. While a goal for the Alaska forest products sector could be to increase value-added exports, success with such a goal depends on primary processing facilities and available resources, thereby requiring an analysis of both the market opportunities and supply problems for the overall forest sector.

While the timber industry is limited by harvest restrictions, high processing costs, limited mill capabilities, transportation infrastructure, and physical geography that divides processors and markets, the state does possess high quality raw materials that could support increased processing. An assessment of these challenges as well as the timber industry's strengths in conjunction with the state's position as supplier of timber products can serve as a basis for future research and strategy development.

The first section of this study presents the current timber inventory, ownership, and restrictions that affect timber supply availability. It also analyzes input factors that affect Alaskan firms' competitive position relative to other suppliers, such as labor, harvesting and manufacturing costs, and the availability of transportation to offshore markets. While some processors may be competitive in supplying high quality Sitka spruce logs, their ability to supply value-added products may be significantly constrained by manufacturing and transportation costs. Therefore, the data presented during this section is used as a framework upon which marketing strategies and future research opportunities are developed.

The next four sections characterize the current situation in foreign markets, some aspects of trade development, the competitive advantages and disadvantages of Alaska's processors in these markets, and opportunities for future research and market development. Analysis of Alaska's competitive position presented in the first section of the paper were considered in conjunction with international trade data to determine what markets might be accessed successfully by Alaska producers. These sections address the impacts that Alaska's production costs and mill structure have on their ability to compete in foreign markets and how these influence the mix of products that could be exported. These sections also assess factors that exporters must consider before they attempt to access foreign markets and how these factors relate to Alaska's timber industry.

The final section addresses future research that could contribute to improving competitiveness and high-value-added production to Alaskan producers.

Introduction

Approximately 100 commercial sawmills and secondary-manufacturing firms operate within the State of Alaska. These mills predominately produce primary manufactured products including cants, flitches, dimension lumber, lumber for remanufacturing, railway ties, shakes and shingles, components for musical instruments, and a variety of specialty products. A limited number of firms produce secondary processed goods such as millwork, furniture, and prefabricated buildings. Historically, Alaskan firms have set themselves apart from other producers by supplying high-quality old growth western hemlock, Sitka spruce, and western redcedar (Alaska Division of Trade and Development 1999).

While Alaskan producers appear to be able to command a high price for high quality logs, several events that occurred during the 1990's continue to severely limit the competitiveness of Alaska's timber industry. First, Southeast Alaska's only pulp mills closed in 1993 and 1997. Second, the Tongass Land Use Management Plan (TLMP), adopted in 1997, significantly limited allowable harvests. Finally, the Asian economic crisis caused a substantial decline in demand for forest products in Asian countries, previously Alaska's primary export market (Alaska Division of Trade and Development 1999).

Alaskan producers must confront several challenges in order to survive and expand their role as a supplier in the international timber market. The first challenge involves establishing a consistent raw material supply. The second challenge lies in the ability of Alaskan producers to be competitive with other producers in supplying the Pacific-Rim market. Logistical issues such as a limited infrastructure to transport of raw materials within the state and to foreign markets, inadequate economy of scale, and other high costs, tend to make producing and exporting goods in Alaska more costly. This report will analyze the competitive issues facing Alaska's forest products industry, given these logistical and infrastructure challenges, and provide recommendations for increasing Alaskan firms' scale and competitiveness as a producer of secondary processed wood products in the international timber market.

Alaskan firms have clearly been dependent upon exporting primary wood products, deriving over \$660 million in export revenue in 1993, the industry's peak. However, Alaska's forest products industry has clearly been impacted by fluctuations in the international market. By 1998, export revenues had dropped to just under \$200 million. The sharp decline is due to a variety of factors including the Asian economic crisis, declining international timber prices, lower cost competitors, changes in forest harvest regulations which led to a decline in Alaska's available timber resource, rising domestic processing costs, and expensive and time consuming shipping to international markets. The drop in Alaska's timber revenue and declining timber resource has led to interest in increased secondary processing opportunities. This paper will provide a preliminary analysis for leading export products and potential opportunities in foreign and domestic markets in conjunction with constraints imposed by access to Alaska's timber resource and comparative processing and transportation costs. The intent is to provide a preliminary screening process for more in depth research. Since supply constraints to a large degree limit the marketing opportunities, they will be covered first.

Domestic Forest Resource

Alaska's Commercial Species

Sitka spruce (*Picea sitchensis*) and western hemlock (*Tsuga heterophylla*) are the dominant species in Alaska, representing 26% and 34% of the statewide timber inventory, respectively. western redcedar (*Thuja plicata*) and Yellow cedar (*Chamaecyparis nootkatensis*) have high market values but low volumes (1% of total inventory), preventing them from being a major commercial species.

There are two distinguishing forest types in Alaska: coastal and interior. The Interior forest is 115 million acres in area and is comprised of 61% softwood and 39% hardwood (Table 1). Alaska's Interior forests contain approximately 23% of Alaska's total timber inventory, 34 billion board feet

of which is hardwood timber; mainly brush alder, birch, aspen, and cottonwood. Since this resource is dispersed over a large area, it is difficult to remove and utilize. Therefore, it is not considered a viable option for the basis of higher processing in the state. The coastal forest covers a much smaller area with 14 million acres, yet it contains 77% of Alaska's timber inventory, making it the dominant source of supply for the state's timber industry. The coastal forest is predominately softwood (99%) with minor amounts of hardwoods (1%).

Alaska is the world's leading supplier of Sitka spruce lumber, exporting 215 million board feet annually (Warren 1997). However, British Columbia (BC) and the Pacific Northwest (PNW) are also within the growing range of most Alaskan species. This places Alaskan forest products in direct competition with BC and the PNW in commodity markets. Alaskan firms have largely differentiated their forest products by their only current advantage: high quality old growth logs and lumber.

Table 1. Alaska's forest inventory by region and forest type (million board feet)

	Softwood Volume	Softwood Percent of Region Total	Hardwood Volume	Hardwood Percent of Region Total	State Total
Coastal	287,422	99%	3,580	1%	291,002
Region Percent of Total					77%
Interior	53,344	61%	34,048	39%	87,392
Region Percent of Total					23%
Total	340,766	90%	37,628	10%	378,394

Source: van Hees 1999.

Statewide Timberland Ownership Distribution

Forest ownership in Alaska can be divided into three categories: federal, state (including boroughs and municipalities) and private forests (including native corporations). Approximately 77 million acres are federally owned and 22 million acres are owned by the state. The private sector consists of non-industrial private landowners that control approximately 30 million acres. A map of Alaska by land ownership designation is included in Appendix A.

Varying ownership of lands have different state harvest restrictions, which influences timber uses and types of products that may be produced. State and federal timber harvest restrictions restrict the export of logs harvested from state or federal land. Private land owners, exempt from this restriction, primarily export higher value logs. Therefore, timber used in secondary processing will either be limited to timber harvested from state and federal lands or will require facilities that can compete with export markets for logs.

Statewide Federal Timberland Ownership

The Tongass National Forest (Tongass), located in Southeast Alaska, contains 46% of the state's timberland, the largest single ownership of timber area in the state (Figure 1). It contains 16.9 million acres, of which 676,000 acres (4% of the land) are declared suitable for commercial harvesting. Historically, the Tongass has been a major supplier of timber to local sawmills. Given access to this timber resource, the forest products industry in Alaska is most concentrated in Southeast Alaska.

The second largest federally owned forest is the Chugach National Forest on the Kenai Peninsula, which encompasses Prince William Sound and much of the surrounding area. Although it is the second largest National Forest with 5.3 million acres, it supplied only 0.3% of Alaska's total harvest in 1997.

Recent changes to the Tongass Land Management Plan (TLMP) severely limit the amount of timber available for harvest. While timber availability alone does not provide an industry with a competitive advantage in processing, it is a significant factor. Four central changes threaten to

severely impact availability and access to the raw material. First, one of the most important changes to the plan is a modification enacted in 1999 to remove 100,000 acres from the harvestable timber base, reducing it to 576,000 acres. Second, allowable harvest rotation age was doubled to 200 years, making it harder to develop an industry based on second growth timber. Third, open road density in the forest was reduced from 1 mile per square mile of forests to 0.7 miles per square mile of forested land, compounding accessibility issues already inherent in the forest. Finally, average allowable sale quantity (ASQ) was cut from 267 MMBF to 187 MMBF, placing an overall limit on the annual production of the forest (Golnick 1999). The species mixture on the Tongass includes 51% #2 and better grade Sitka spruce, hemlock, and western redcedar 42% # 3 and utility grade, and 2% cedar (Figure 2). The loss of the pulp mills means that the low-grade material must find another outlet. Utilizing or disposing of this timber efficiently will be important to the future competitiveness of the industry (Morse 1998).

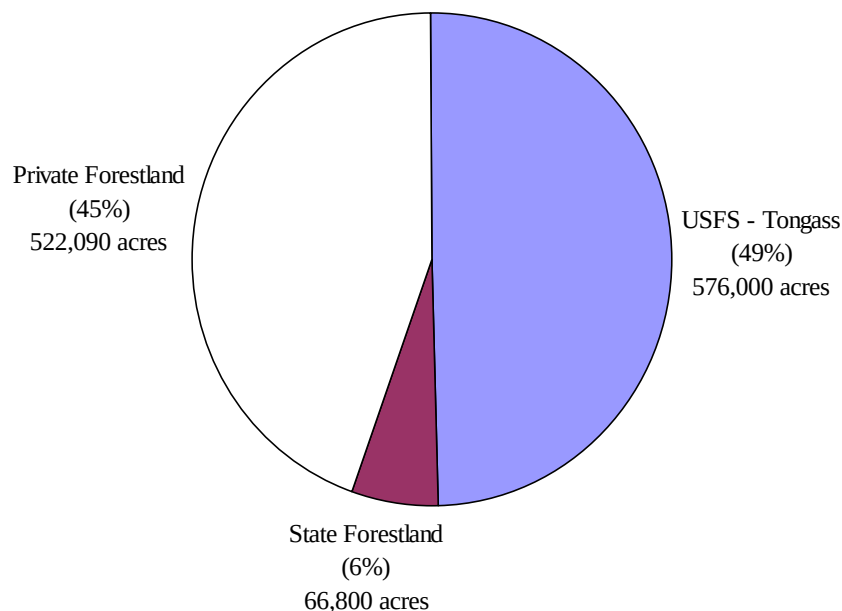


Figure 1. Commercial acres of forestland in Southeast Alaska by owner (The Southeast Regional Timber Industry Task Force 1997).

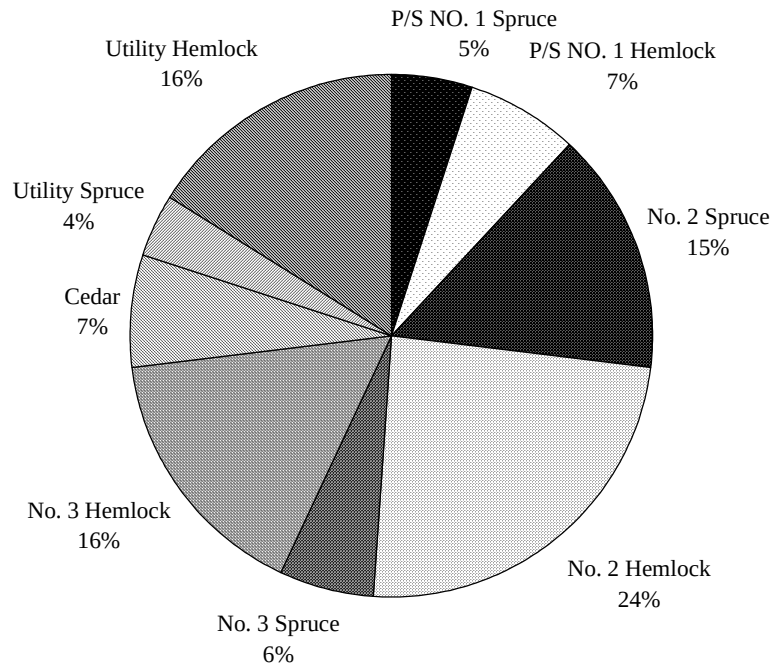


Figure 2. Log grades of the Tongass inventory.
(The Southeast Regional Timber Industry Task Force 1997).

Alaska's State Forestland Ownership

While the state has substantial land holdings, the acreage that is available for commercial purposes is relatively small. Of the 22 million acres of state owned forestland, only 1.3 million acres are considered commercial forestland. Approximately 2% of Alaska's state-owned forests located in two separate forests are considered harvestable: the 247,000-acre Haines State Forest and the 1.8-million-acre Tanana Valley State Forest (Alaska DNR 1998). Within these two forests only 66,800 acres are considered suitable for commercial harvesting (Alaska Department of Forestry 1995; The Southeast Regional Timber Industry Task Force 1997). Thus, although the inventory of standing timber is approximately 3.4 billion board feet, just 57 million board feet is available to harvest (Phelps 1997). State forests are under multiple use management, as are most other state lands. However state forests must allow timber harvest for commercial and private use. Timber harvest in the past five years has totaled 11 million board feet on the Haines State Forests and 35 million board feet on the Tanana State Forests. Revenues from timber sales are used as a source of funding by state agencies.

State lands, as well as federal and private lands are subject to the Forest Resources and Practices Act. The Act provides that of all harvested lands "be reforested to the fullest extent practicable". The Act is intended to protect the forest, water quality, and fish habitat. Provision for harvests on state and municipal lands mandate that landowners must have data showing that reforestation will lead to sustainable production of forest products (Alaska DNR 1998b). Alaskan management practices usually entail natural regeneration. In Southeast Alaska natural regeneration following harvest is prolific. This often leads to overstocking of second growth stands and thereby problems associated with stand stagnation, small diameter size, and generally poor timber quality.

The Division of Forestry (DOF) has leeway in making small sales to meet local industry needs. For example, with local purchasers, the DOF can make sales of up to 500,000 board feet on state lands. If unemployment is high and mill capacity grossly underutilized, the DOF can make larger sales for terms up to 25 years. Sales of up to 10 million board feet can be negotiated provided the timber is used in local value-added manufacturing (Phelps 1997). The implications of this program for the forest industry and harvesting have been well received. The authority of the state to make sales under these conditions can help nurture a secondary processing industry.

However, regulations may also hinder the formation of a primary processing industry by raising log costs.

Statewide Private Forestland Ownership

Alaska's commercially viable private forests comprise 30 million acres and are concentrated in the Southeast and Southcentral regions of the state (Alaska DNR 1998). Native Corporations own 98% of the region's private forestland. Regulations governing private forestland tend to be less restrictive than regulations for federal lands. While the Forest Practices Act does apply to private lands, it has been noted that it is only loosely enforced with a focus on protecting spawning beds of anadromous fish (USDA Forest Service 1999). Access to much of the timber resource is limited by inadequate road access and physical characteristics of the terrain that prohibit removal of timber. Of the 30 million acres of private timberland, only 521,000 acres are considered commercial forestland (The Southeast Regional Timber Industry Task Force 1997).

Timberland ownership and government regulations have several impacts on the industry. The ban on log exports from harvests on federal lands reduces the stumpage value of federal timber. The residual stumpage or timber value (market price less processing cost) of processed lumber in Alaska is generally lower than that of export logs, and is reflected in lower stumpage prices in federal timber, which cannot enter the log export market. The lucrative export market for logs attracts almost all of the high-quality logs produced on private land.

Producing cants for the export market is often the most profitable operation for a sawmill using federal timber. This circumvents the log export ban while requiring only minimal processing. Cants are often shipped to Japan where they are re-sawn.

Primary and secondary processing is impacted by the log ban and by forest ownership. The fact that almost all logs on private lands are exported means that sawmills are almost completely dependent upon federal timber. These sawmills do not appear to be competitive with the export market for privately produced logs and are simultaneously facing reduced allowable federal harvest levels. Without an adequate scale of quality materials to create value-added products, establishing either primary or secondary processing industry of an economic scale may be difficult.

Timber Harvest Trends

Annual harvest volumes in Alaska have been declining for the past several years, falling to 740 million board feet in 1997, an almost 30% decline from 1990. This decline is partially attributed to declining harvests in the National Forests. Alaska's National Forests, particularly the Tongass, supplied 46%, or almost 480 million board feet of Alaska's timber in 1990. However, environmental considerations in the revised harvest plans have reduced harvest levels to 125 million board feet, 74% below 1990 harvest levels. Timber harvest volume on privately owned lands has been fairly stable since 1990, yet has increased in share of total volume, from 53% in 1990 to 81% in 1997. The share increase resulted from the overall decline in production rather than an increase in harvest on private lands (Warren 1999).

Obstacles facing the forest industry in Alaska also influence the grades of species harvested. Companies tend to rely on higher valued Sitka spruce to increase their competitiveness with other suppliers. Table 2 shows the distribution of species and grades harvested in 1995. The bulk of the Sitka spruce harvests were high quality sawlogs that captured premiums in the export market.

Lower ASQ and high access costs could considerably hinder Alaska's ability to become a prominent value-added wood product manufacturer and supplier in the international market. International customers place a high value on stable supplier relationships throughout fluctuating business cycles. Alaska's ability to harvest consistent timber volumes has been constrained by several factors including harvest reductions brought upon by the Tongass National Forest harvest restrictions, legal challenges to timber sales, higher logging and milling costs among Alaskan mills, and challenges associated with transporting wood products. When prices are high, high cost stands can be harvested. When prices are low, only higher-grade stands may be

economically viable to harvest, affecting the ability of Alaskan suppliers to consistently provide products.

Table 2. Distribution of 1995 harvest by species and grade, for Southeast Alaska.

	Premium Sawlog	Sawlog	Low-Grade Sawlog	Utility Grade	Species Share of Total
Sitka spruce	17.4%	52.7%	11.3%	18.6%	23.8%
Hemlock	7.2%	41.2%	24.8%	26.8%	58.3%

Source: Robertson and Brooks, unpublished report. Region 10 Log Scale Ticket database, and COFI Vancouver Log Market reports.

Note: SEA log classes are translated as follows: Premium Sawlog = No. 1 sawlog, select and special mill. Sawlog = No. 2 sawlog. Low-Grade Sawlog = No. 3 and No. 4 sawlogs. Utility = utility.

Restrictions

There are several regulations that provide the basis for managing federal timber and establish the pattern for state regulations including the National Environmental Policy Act, the National Forest Management Act, the Sustained Yield Act, and the Endangered Species Act (Alaska DNR 1998).

Future Trends

The sawmill industry is feeling the impact of further harvest restrictions in the Tongass National Forest, yet the future viability of the industry depends to a degree on a steady and predictable supply of timber. Harvest from the Tongass is necessary to supply a large-scale timber-processing sector in Alaska, yet it is not sufficient to improve industry competitiveness. Factors affecting competitiveness such as adequate processing efficiency, low cost of labor, and adequate transportation infrastructure are as important as sufficient timber supply. However, this section will focus solely on projected timber supply based on two models that incorporate supply and demand scenarios.

A model developed by Brooks and Haynes (1997), calculates timber harvest volumes based market demand. By varying the demand conditions and the ensuing changes in the industry, high, medium, and low demand scenarios for timber harvests were produced. Under the medium scenario model, the projections indicate that total harvest levels will continue to decline and then stabilize after the year 2000 (Figure 3). Based on increased demand scenarios, harvest levels on Alaska's National Forests are projected to gradually increase through 2010. The next major reduction in the overall timber harvest level will stem from declining harvest on private lands. Projections estimate that production on private lands will fall below the harvest level on National Forests due to the declining private timber inventory (Brooks and Haynes 1997).

Sawmills have been entirely dependent upon federal timber and have not been successful purchasing timber from private lands. Because timber from private lands is exported in log form, the major impact of reduced timber availability will be to private timber holders and loggers. The impacts are already being felt. Some corporations reported that they no longer harvest timber on their lands and many are attempting to diversify into heavy construction, contract road building, and secondary wood processing. Even with the inherent uncertainty associated with projections, they do provide a framework for understanding the role that supply may have on strategic decisions within the industry.

Another model with high, medium, and low projections was developed for the Tongass National Forest (Morse 1998). Figure 4 portrays the demand projections. The high demand scenario is based on the assumption that an efficient and competitive industry will be able to utilize most of the timber resource to feed a larger share of domestic and export markets. In the low demand scenario, market share will continue to decline as competition and demand increase, and mills may utilize the small but high valued segment of the resource. The medium scenario is closer to the low scenario. While market share and lumber recovery increase, producers are relegated to niche markets for old growth products, limiting overall growth and potential.

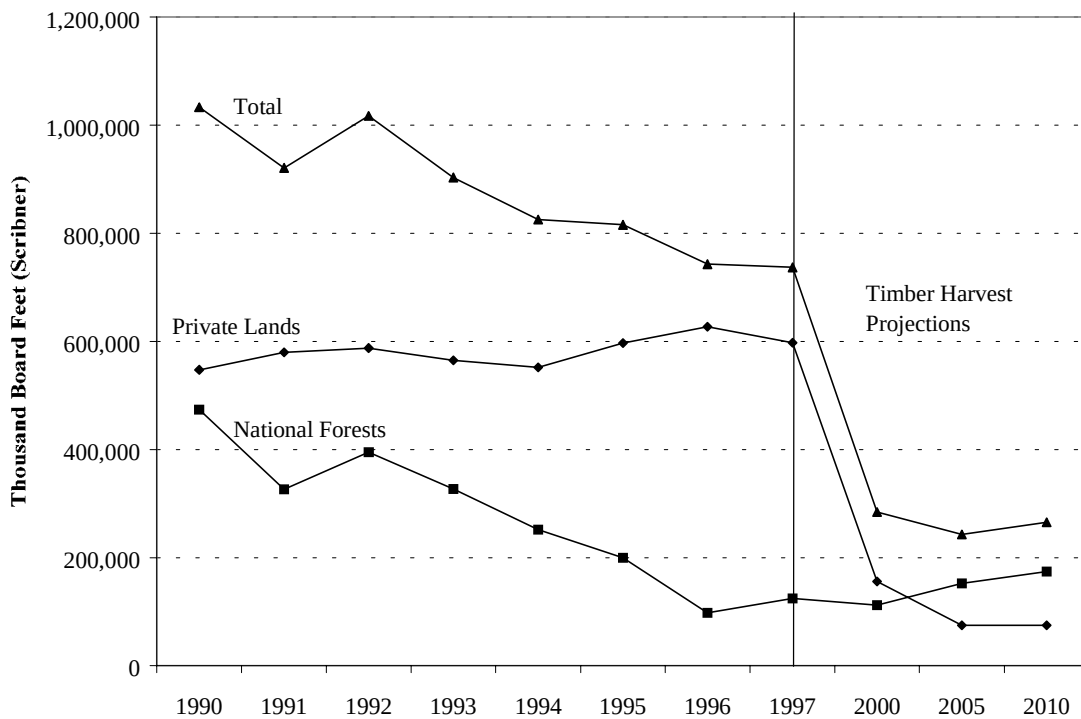


Figure 3. Alaska timber harvest volumes and projections by ownership, 1990-2010 (Brooks and Haynes 1997).

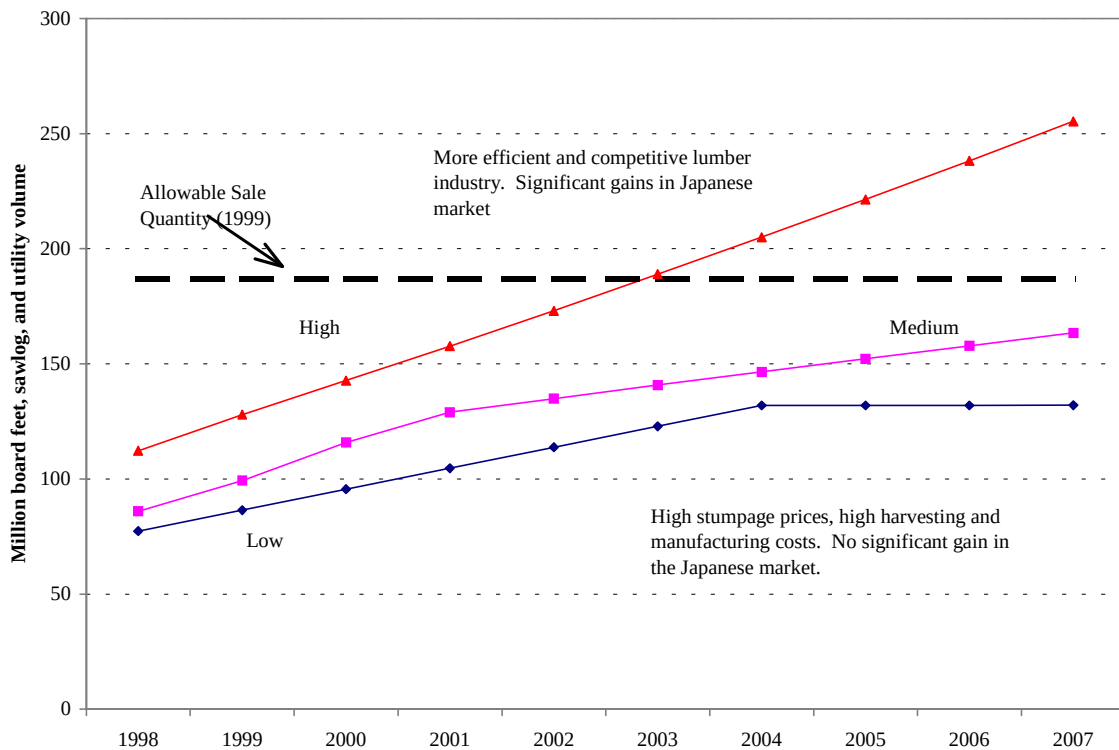


Figure 4. Demand scenarios for Tongass timber (Morse 1998)

While these projections are only estimates based on different assumptions, they provide a perspective for evaluating future conditions. For example, if the market for wood products increases rapidly, it stands to reason that larger facilities might be developed to capitalize on the increased demand. However, with allowable sale quantities setting a maximum limit to the supply, the industries overall scale will be limited by the ASQ, and to gains in efficiency and lumber recovery. Within the time frame of the projections, only the high demand scenario for Tongass timber exceeds the ASQ. The low demand trend even indicates that the ASQ will not act as a supply constraint to the industry as cost competitiveness is insufficient to use the available resources.

It is important to note that to a high degree demand for Alaskan timber is dependent upon supply constraints in other supply regions. The reduced harvests in Washington, Oregon, and neighboring states have impacted the demand for Alaskan timber. For investment purposes, these projections can be influential to decision making. One conclusion is that the ASQ will in effect cap investment levels regardless of higher demand and product price. The limit will ensure that once demand reaches the ASQ, there will be increased competition for the available supply. This may keep investments low because of the risk of poor returns on investment and contribute to the eventual lack of growth within the industry.

The ASQ may also stimulate some investment. To achieve anything approximating an economy of scale, firms will have to make efforts to get as large a share of the ASQ as possible. If the ASQ is reached and excess sawmill capacity still exists, increased competitiveness in the sawmill industry will primarily be achieved by attrition of less cost-effective facilities.

Characterization of Alaska's Mills

The sawmill industry has undergone substantial change recently related to a variety of supply, infrastructure, and efficiency factors. As shown in Figure 5, concurrent with reduced federal timber supply, mill capacity declined from 370 million board feet in 1990 to 220 million board feet in 1997. During this time, only 52% of installed capacity was used. Since 1993, average mill capacity has exceeded federal timber supply. This is the result of new mills with large capacities and modern equipment being opened at the same time as timber harvests were declining on the Tongass. The expected result is that capacity will decline further as older and less efficient mills are shut down.

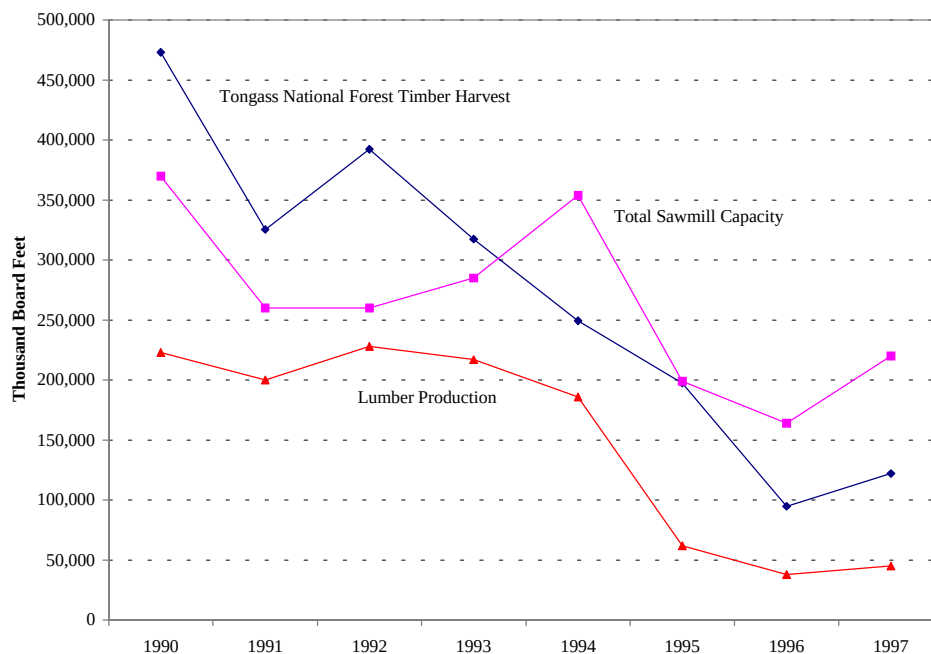


Figure 5. Mill capacity, lumber production and timber supply for Southeast Alaska (Morse, 1998).

Alaskan mill demographics and productivity information was compiled by The Alaska DCED (1998) through a survey of sawmills. Of 112 sawmills surveyed, 46 returned completed surveys. The findings of the survey indicate the timber industry is dominated by small mills with low production volumes, and limited processing infrastructure. Of the mills surveyed, 50% employed less than 4 people and 90% employed fewer than 25 people. Only two of the mills reported needing more than 40 people to operate at full capacity. Many of the smaller mills may be part time or seasonal operations that may not operate when markets are poor.

Lumber mills in competing regions such as the PNW typically produce 100 million board feet of lumber per year and employ 100 or more workers. Alaska's harvest restrictions and expansive geography cannot support mills of this proportion, and as a result, costs are higher. In effect, to be competitive on such a small scale, Alaska mills must be customized to niche markets. Alaskan mills will have to make investments in their wood processing facilities in order to increase their competitiveness. In Alaska, the most common headrig is a circular saw, followed by bandsaw headrigs. The minimum sized logs for processing ranged from 8" diameter to 48" diameters (DCED 1997). The often-remote location of sawmills influences the style of headrig used. While less efficient, circular saws are often preferred in these situations because they require less support and are easier to repair and maintain. However, the use of circular saws reduces recovery and increases cost. The changing timber base will almost certainly require mills to re-equip to handle smaller second growth logs. Updating the equipment could allow mills to retool operations to produce products for niche markets. However, handling smaller second growth logs will also degrade the high quality that has differentiated Alaska's supply in the market.

The lack of kiln drying facilities precludes Alaska from many segments of the export and domestic markets. Of the mills surveyed, 16 of the mills reported some capacity for air-drying their lumber and three had dehumidification facilities and only two operated dry kilns. Several sawmills in Southeast Alaska have indicated plans to improve dry-kiln capacity. Future installation of dry kilns and dry storage will be necessary to be competitive in the export market and especially for second growth timber.

Survey results indicate that 86% of the total state production of lumber and 100% of the total state production for export occurs in Southeast Alaska. Dimension lumber comprises 69% of the total domestic production, while cants/flitches are 56% of total export production. Statewide, the aggregate practical production capacity of the mills surveyed for an eight-hour shift is 593 MMBF. Southeast Alaska contains 78% of the state's practical capacity with an aggregate 462 MMBF per eight-hour shift.

Labor, Harvesting, and Manufacturing Costs

In order to assess Alaska's competitive position as a timber supplier, the costs associated with timber harvest and processing are compared to processors in BC and the PNW. Costs associated with the extraction of timber are largely allocated to stumpage, labor, fuel, and transportation. These costs will directly impact Southeast Alaska's competitiveness relative to other producers.

Labor

Overall, labor costs in Alaska are much higher than labor costs in the PNW for a variety of reasons. As shown in Table 3, labor costs for harvesting timber in Alaska are on average 65% higher than costs for the PNW although they have been as much as 87% higher as discussed in a report to be published by Robertson and Brooks that collected comparable statistics. The physical characteristics of the forests and lack of automation in the mills requires more labor per thousand board feet of lumber produced. In addition to more intensive use of labor, the base wages in Alaska are higher, and the pool of skilled labor in the timber industry can be small at times, resulting in competitive wage increases to attract the needed labor. The higher labor intensity and higher wage has resulted in an additional \$24 per thousand board foot for logging costs on average (Table 3) (Robertson and Brooks, unpublished report).

Sawmill labor costs in Alaska are on average 49% higher than their PNW counterpart and are increasing at a much faster rate than wages in the PNW. Between 1987 and 1994 average wages in Alaska's sawmill sector increased 7% compared to 1.7% in the PNW. However, as shown by table 3, labor costs in Alaska appear to have been highly variable, varying as much as 145% in one year. Such a high degree of variation seems unreasonable and warrants further investigation labor costs are an important element in competitiveness.

Table 3. Labor inputs in the logging and sawmill sectors in Alaska, Oregon and Washington, 1987-1994.

Year	1987	1988	1989	1990	1991	1992	1993	1994	Average	Yearly Growth
Logging Unit Labor Cost (1995 \$ / MBF ls)										
AK	62.29	44.36	57.84	57.63	63.35	57.99	60.47	84.74	61.08	4.6%
PNW	33.47	33.06	33.38	36.15	36.51	38.15	40.41	45.27	37.05	4.3%
% Difference	86%	34%	73%	59%	74%	52%	50%	87%	65%	--
Sawmills Unit Labor Cost (1995 \$ / MBF lt)										
AK	52.97	130.00	57.96	78.19	100.59	102.58	124.15	93.07	92.44	7.0%
PNW	59.64	59.56	59.06	61.26	62.32	63.01	68.28	64.55	62.21	1.7%
% Difference	-11%	118%	-2%	28%	61%	63%	82%	44%	49%	--

Source: Robertson and Brooks, unpublished report

Harvesting

On a comparative basis of harvesting costs for regions with similar species and physical characteristics, BC emerges as the high cost producer of logs (Figure 6). Notably, BC and Southeast Alaska show an increasing trend in harvest costs, while the PNW has declined since 1991. These trends are a likely caused by declining acreage and volumes and labor intensity influences on the cost of harvesting operations. It should be noted however, that these harvest cost estimates exclude roading costs, which may elevate final costs in Alaska. A large volume of timber in the PNW is harvested from plantations, lowering the cost of road construction. Other timber is located near already established roads. Limited infrastructure in Alaska however, necessitates construction of roads in order to reach the timber resource. Therefore, logging costs in Alaska may be as high or higher than costs in the PNW and BC.

Smaller acreage can eliminate the advantage of economies of scale in harvesting operations. Lower volumes per acre reduce efficiency of logging efforts (Robertson and Brooks 1997). These factors are indicative of marginal or second growth stands being harvested and reflects the dwindling availability of prime stands. There is no evidence that this trend will reverse. The PNW has large holdings of privately owned second growth timber that can be more easily accessed with more uniform characteristics that keep these costs relatively stable. High prices in Pacific Rim markets resulting from declining harvests in the PNW after 1990 temporarily reduced the impact of high log costs. The Asian recession resulted in an overall market decline in 1997-1998, making cost competitiveness much more critical.

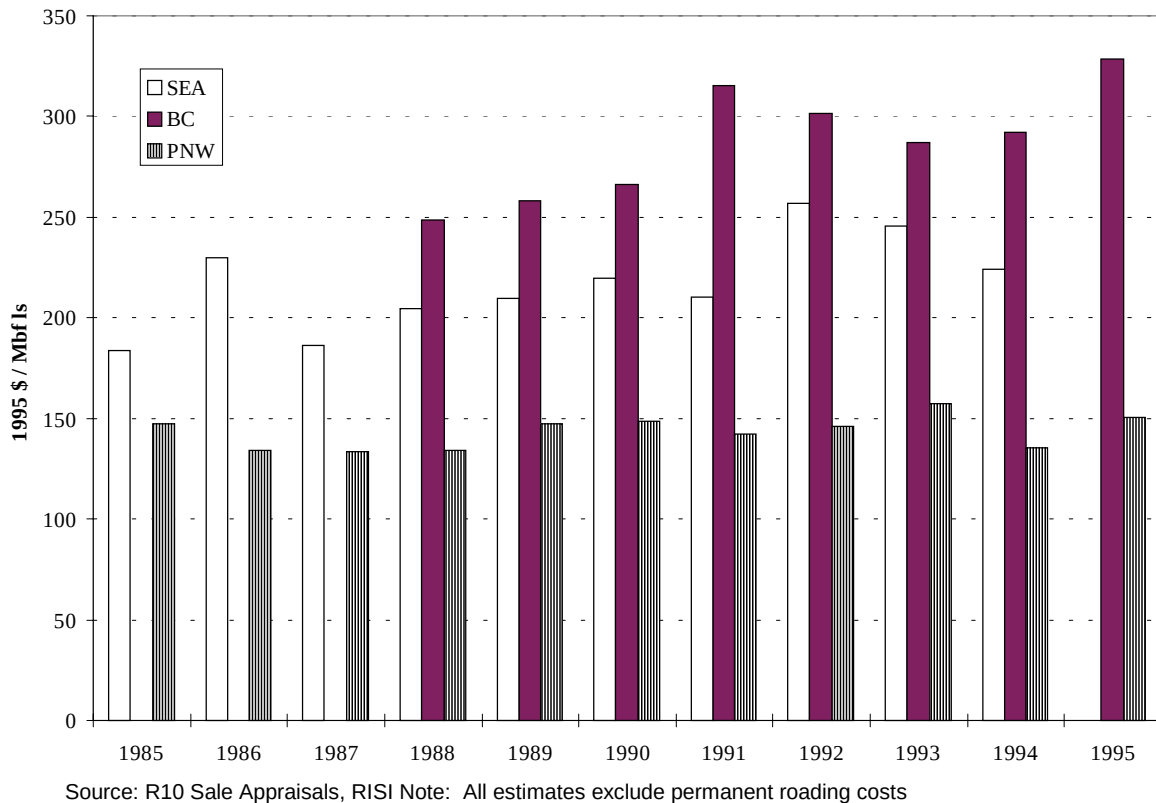
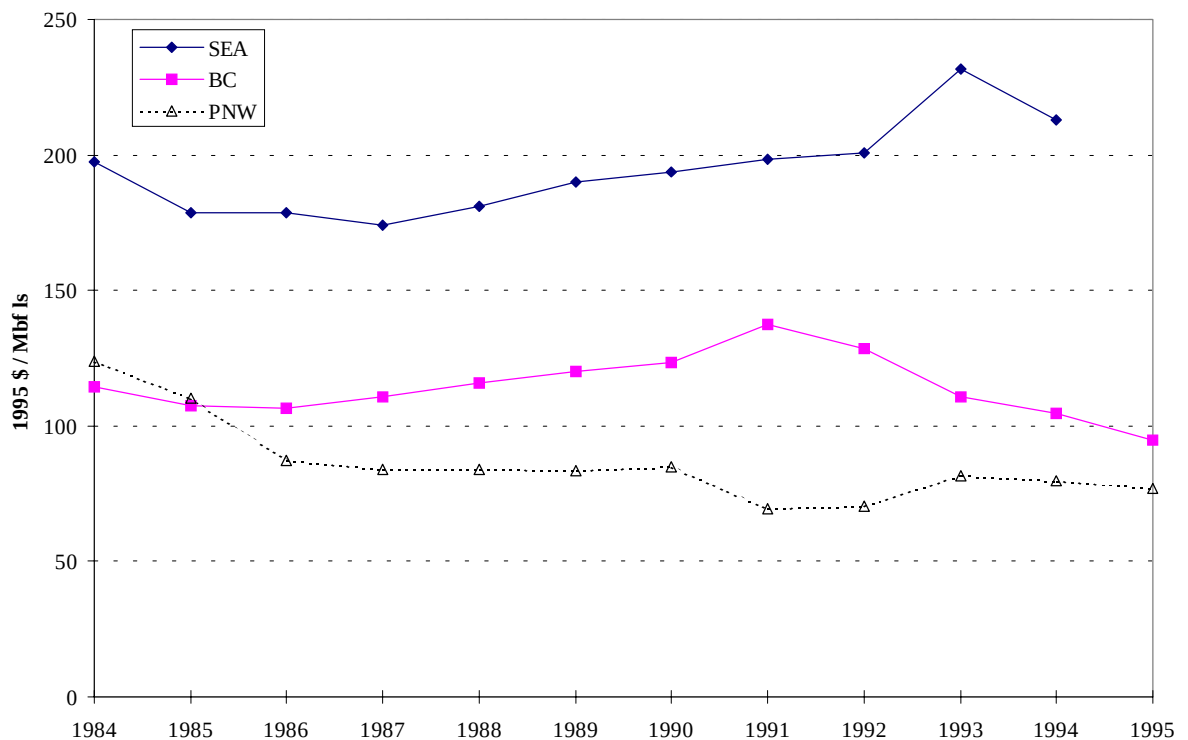


Figure 6. Harvest costs in Southeast Alaska, British Columbia, and the Pacific Northwest, 1985-1995 (Robertson and Brooks, unpublished report).

Manufacturing

Southeast Alaska has the highest manufacturing costs per thousand board feet (Figure 7). The large discrepancy between Alaska and the other regions can be partially attributed to smaller economies of scale. There are more large manufacturers with more efficient technology and large market presence in BC and the PNW. The declining costs in BC and the PNW are the result of increased gains through efficiency, capital investments in processing technology, and improvements in infrastructure. Rising costs in Alaska include the impact of the pulp mill closures. Low-grade material that previously fed the pulp mills was re-channeled into the sawmills providing revenue to offset costs. The smaller size of the lower quality material results in lower yields and higher handling costs.



Source: R10 Sale Appraisals, RISI

Figure 7. Total sawmilling costs in Southeast Alaska, British Columbia, and the PNW, 1985-1995 (Robertson and Brooks, unpublished report).

Total Costs

On a total cost basis, Southeast Alaska emerges as the high cost producer and the PNW as the low cost producer (Figure 8). British Columbia's resource base has fairly similar physical and timber characteristics to Alaska and costs for both BC and Southeast Alaska is increasing at a rate of 2% per year. Costs for the PNW are falling at a rate of 2% per year. Between 1986 and 1995, it cost an average of \$370 to produce one thousand board feet. In stark contrast, the PNW averaged \$170 per thousand board feet. British Columbia was closer to Alaska with an average of \$345 per thousand board feet in Alaska. Since the Alaska share of lumber is higher for cants, which reduce costs, these averages understate the true disparity in total costs.

Figure 9 contains a snapshot of the cost components for sawmills in the three regions. The main cost to producers in the PNW is stumpage. This highlights the competitive advantage in harvesting and manufacturing that exists in the PNW. While BC has higher harvesting costs than Southeast Alaska, figure 10 clearly displays their advantage processing. Southeast Alaska does have lower stumpage prices. Stumpage prices in 1994 in the PNW and BC were 58% and 14 % of total lumber production costs, respectively, while Southeast Alaska's stumpage prices were 9%.

Stumpage prices are generally residual values, that is, the amount one can afford to pay for stumpage after subtracting processing and logging costs. Even with low stumpage costs, Alaska appears to be the higher cost producer but some of this difference may reflect higher average quality. Since lumber production costs are so high in Alaska and stumpage is so low, there is not much opportunity to aggressively manage the forest for higher growth. Under the current situation, the returns to forest management are too low for all but minimal regeneration costs.

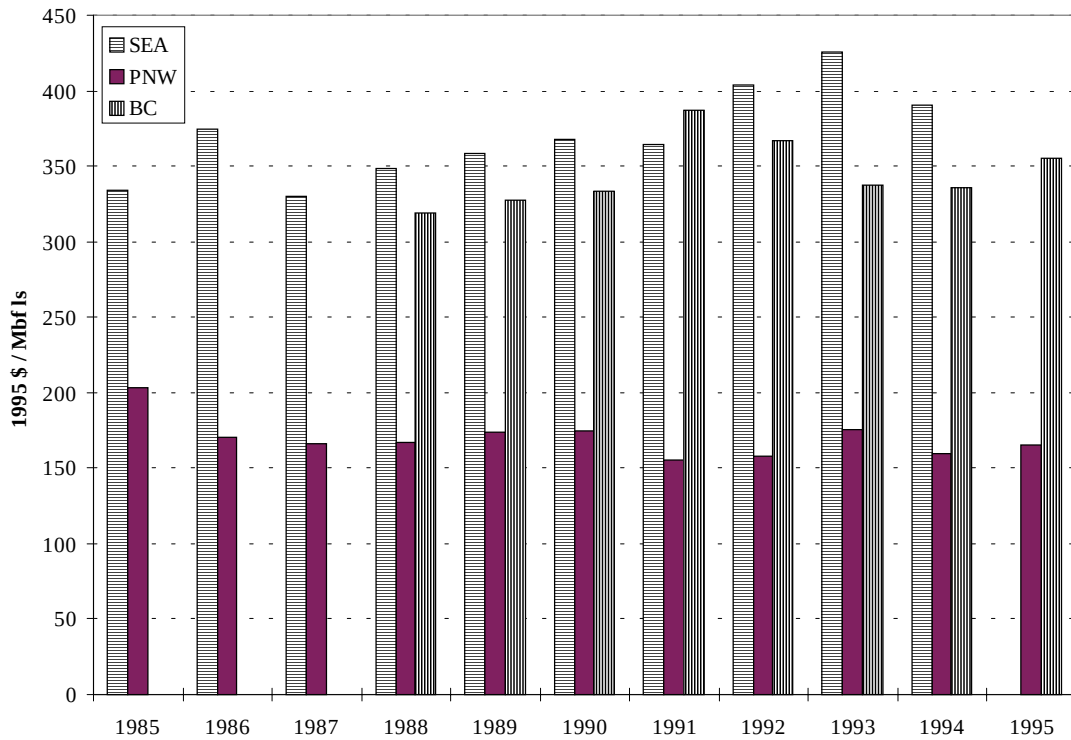


Figure 8. Lumber production costs in Southeast Alaska, British Columbia, and the Pacific Northwest, 1985-1995 (Robertson and Brooks, unpublished report).

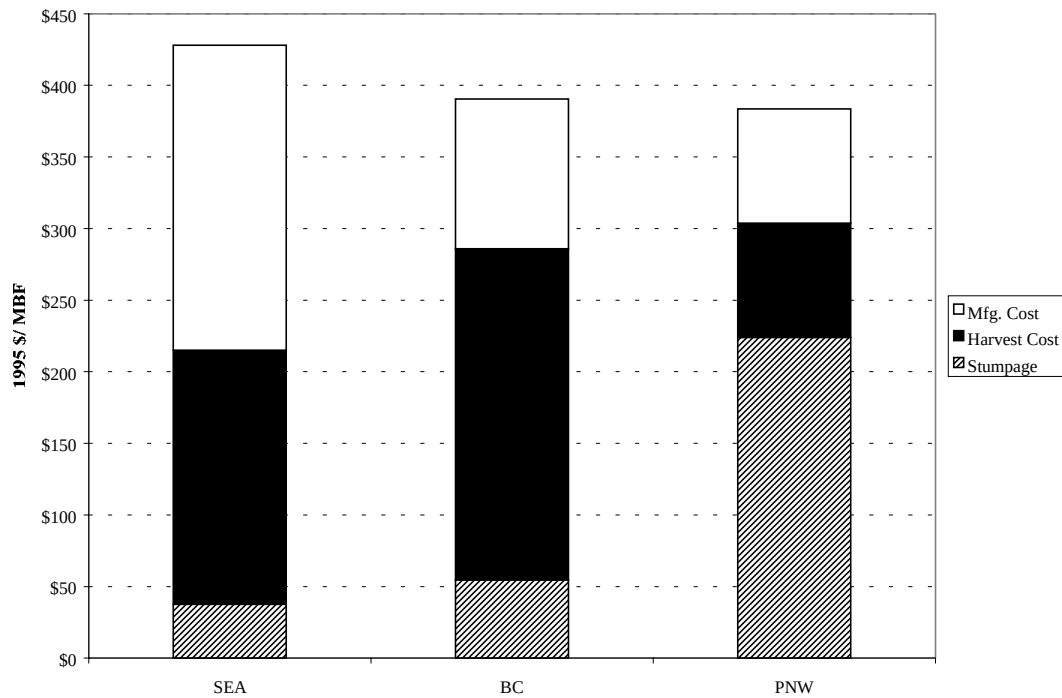


Figure 9. Total costs of lumber production (with stumpage) in Southeast Alaska, British Columbia, and the Pacific Northwest, 1994 (Robertson and Brooks, unpublished report).

Transportation

Alaska's remoteness from its major markets increases transportation costs and reduces competitiveness of manufacturers. Wood products are commonly shipped by barge to the lower 48 states, and the limited availability of barges can further increase costs. One company estimates that shipping adds \$45 to the cost of producing one thousand board feet of lumber since lumber exported to Japan must be shipped through Seattle. The Jones Act prohibits foreign vessels from transporting goods to more than one US port per voyage, which limits domestic shipments of supplies to higher cost US carriers (Clark 1982). Most US carriers of products shipped from Alaska first bring products to Seattle, and then reload the shipment onto new carriers, even if the final destination is another region of Alaska or Asia.

Transportation within the state is also limited by distance, poor road infrastructure, seasonality, and physical geography. These factors limit the movement of timber from the source to mills, from mills to ports, and finished goods to regional markets within the state and to other markets. Goods destined for other regions within Alaska are commonly routed through Seattle. All of these factors contribute to added costs to the final product.

Transportation can also impact the types of products that can be transported. Logs are presently shipped on barges, exposed to the elements. Secondary wood products such as lumber and veneer require protection from the elements, which adds another cost to already expensive transport to the Continental US or to international markets.

Energy Costs

Energy costs vary dramatically throughout each region of Alaska regardless of the method of generation. Southeast Alaska utilities averaged 9.8 cents/kWh for commercial/industrial customers in 1995, while Washington utilities averaged 3.25 cents/kwh in 1995 (Washington Energy Policy Group 1999). However, one sawmill, generating electricity by diesel generators, reported 37 cents/kWh in 1999 (Alaska Electric Power Statistics 1996). Officials in the Alaska Department of Energy cite possible future installation of hydroelectric dams in the Southeast. Currently, some hydroelectric dams have a surplus of energy, but whether that energy will be made available to industrial users at competitive prices remains to be seen. Efforts to procure special sale arrangements with the power companies may be worth pursuing. In order to develop competitive dry kilns in Alaska, firms will need access to energy at rates that are comparable to those of their competitors in other regions.

Primary processing facilities in the PNW have access to low cost power. Co-generation facilities with pulp mill have made some facilities independent external energy sources. The technology exists for wood biomass electricity generation to be competitive. While this could be an alternative for low quality wood in Alaska, issues of scale may compromise performance expectations.

Domestic Market

The Alaskan domestic market for wood products and wooden building materials remains small. Between 1993 and 1997, there was an average 2,800 housing starts per year. Even if totally supplied by Alaska wood, this would consume only a small share of Alaskan production. In phone interviews, many sawmills in Southeast Alaska said it was more cost effective to purchase building materials from British Colombia rather than produce their own. However, in Interior Alaska, sawmills can competitively produce wooden building materials for several reasons. The low humidity of the Interior aids rapid air drying, thus most framing material produced does not require kiln drying. Also, the distance from competitors, such as British Colombia, adds to the shipping cost raising the overall price.

Export Market

Leading Exports by Product

Softwood logs comprise the bulk of Alaska's forest product exports, followed by softwood lumber and chips (Figure 10). Revenues from log exports remained relatively steady during 1989-1997 with the exception of a spike in revenue in 1992-1993, largely the result of the strong Japanese housing market and harvest constraints in the PNW, which allowed suppliers to command high prices for high-grade wood products.

Export data in Figure 11 show that while log export revenues declined after 1993, export volume continued to increase, signaling a decline in the price premium for Alaskan logs. With the log shortage created by reduced harvests in the PNW and Alaska, Japan began using Radiata pine as a substitute in low-grade applications and European whitewoods in high-grade applications, increasing global competition. The gap between log export revenue and volume from Alaska has narrowed since late 1993, an indication that Alaskan suppliers are deriving less value from the logs they produce in the international timber market. Since the downturn in the Japanese market, Japanese producers are increasingly substituting domestic logs and lumber for imported logs.

Chips, produced from lower grade logs, have become the second leading revenue producing export from Alaska, although chip export revenues have been very erratic during the past ten years. Chip exports increased from 1989 to 1995, yet export revenue dropped from over \$20 million in 1995 to less than \$11 million in 1998. Historically, Alaska's pulp mills provided an outlet for chip sales. Since the pulp mill closures, the volume of low-grade logs have increased without a domestic market. With the first pulp mill closure, chip exports increased, but harvest reductions impacted sawmills and reduced residuals after 1995, chip exports declined. Chip exports from other regions have been more stable and the market behavior may also include the result of other competitive problems.

Softwood lumber is now Alaska's leading revenue producing wood product. Export revenue from lumber however, has experienced a dramatic decline during recent years as well. Over the past ten years, lumber exports declined from a high of over \$84 million in 1990, to just over \$4 million in 1998. Some of the decline in exports can be attributed to changes in demand in Japan, yet increased competition from the PNW and BC also contributed to the decline.

It is important to note the decline in lumber exports in 1994 coincided with changes in the TLMP, which reduced harvests. The harvest decline initiated a chain reaction effect on exports. As lumber production and exports declined, chips, a residual of lumber production also declined.

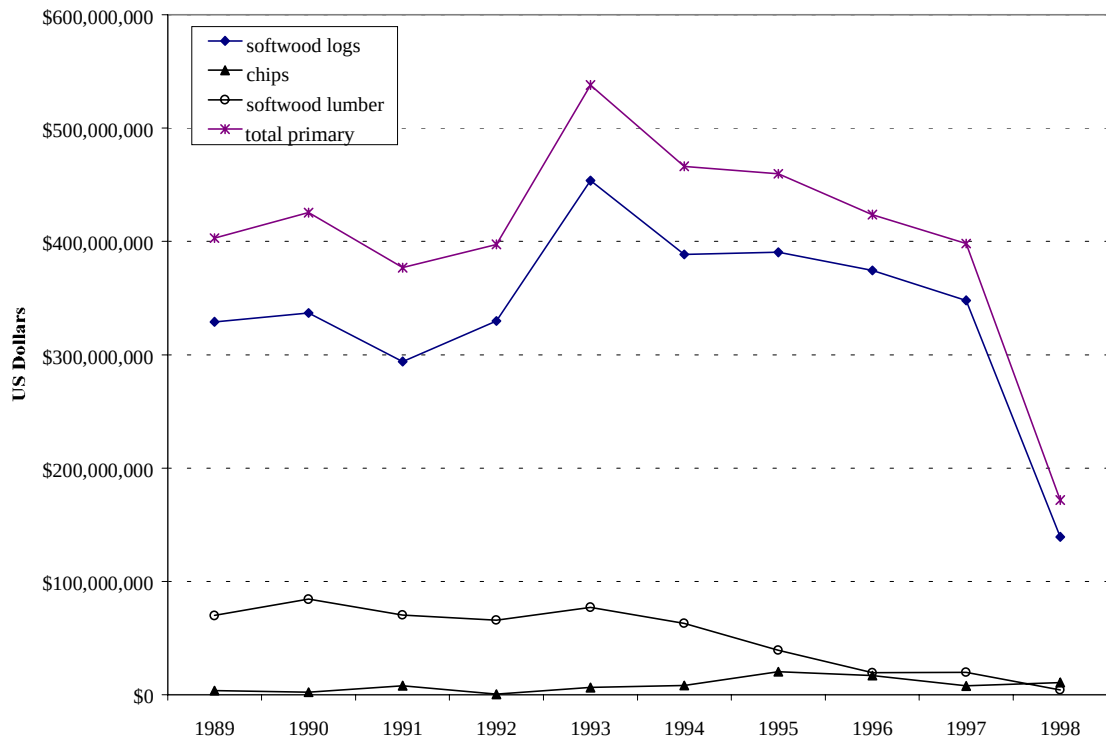


Figure 10. Leading primary processed wood products from Alaska to all destinations, 1989-1998 (Department of Commerce 1999).

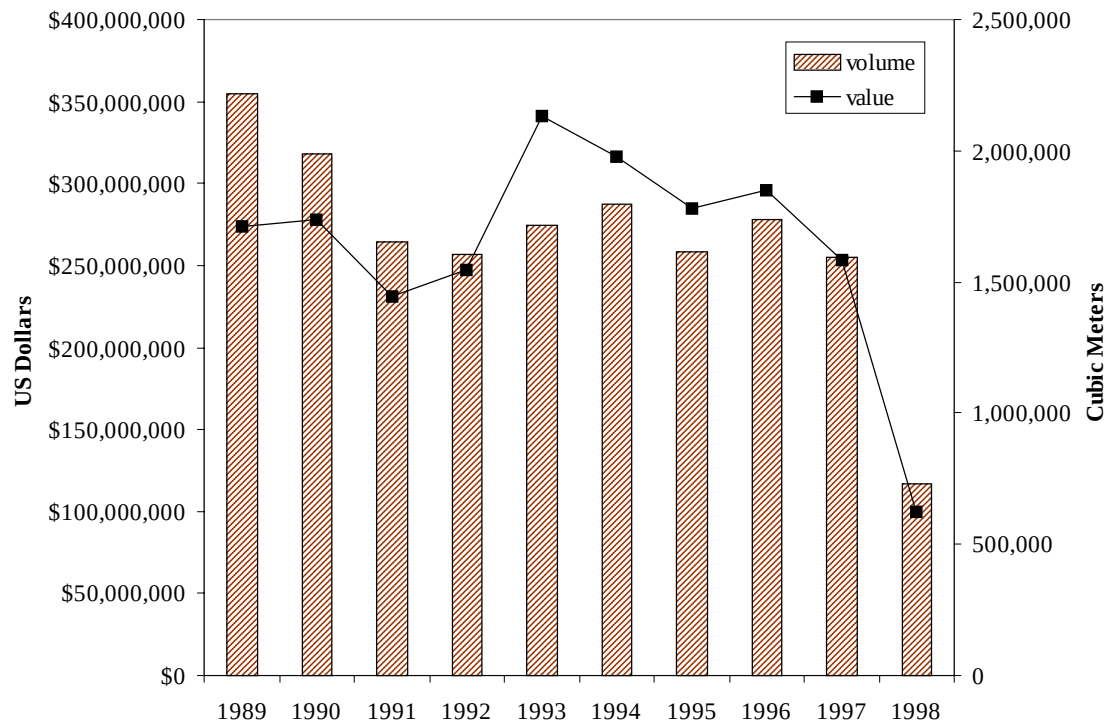


Figure 11. Softwood log export volume and revenue exports from Alaska to all destinations, 1986-1998 (Department of Commerce 1999).

As revenue from primary wood products has been declining, export revenue from secondary processed wood products has been increasing. Even during 1997-1998, a period when exports from the US declined an average of 40% due to the Asian economic crisis, Alaskan exports of secondary processed wood products demonstrated minimal losses and some sectors increased (Figure 12). Leading revenue producing secondary processed products from Alaska in order of revenue include wood or wood frame seats, pallets and packing cases, wooden furniture, and wooden doors and frames. It should be noted however, that exports of secondary manufactured products produce only a fraction of the revenue produced by primary wood products. In 1998, Alaska exported \$172 million in primary products and \$2.7 million in secondary processed products.

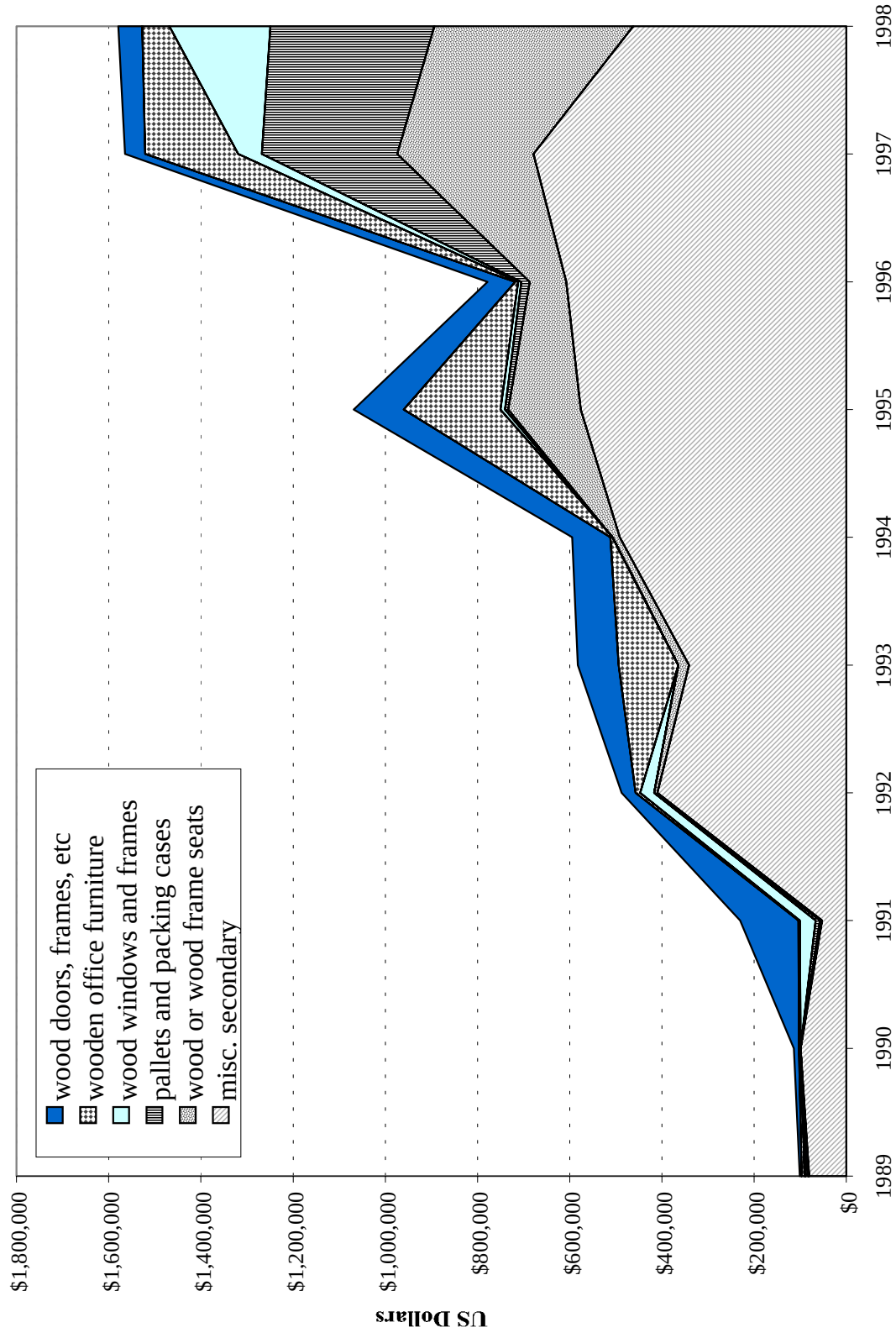


Figure 12. Leading secondary processed wood product exports from Alaska to all destinations, 1989-1998
(Department of Commerce 1999).

Leading International Markets

Japan

Japan is Alaska's most important export market. Not only has Japan consistently comprised approximately two-thirds of Alaska's revenue from wood product exports, but Japan also purchases almost all of Alaska's old growth Sitka spruce logs and cants. In terms of sales revenue, the second leading export destination is Canada, followed by South Korea, and Hong Kong. Like other PNW timber suppliers, Alaska has been heavily impacted by the Asian recession. Although export revenue from sales to Japan had been declining steadily since 1989, the impact of the decline in the housing market in Japan, which started during the fourth quarter of 1997, has had the most significant impact on revenues. As shown in table 4, between 1996 and 1998, export revenue from Japan declined 65%, the greatest decline in Alaska's exporting history. Alaskan wood products performed similarly in other Asian markets. Exports to South Korea, declined 62%, and exports to Mainland China declined 83%.

Hong Kong is the only Asian country to have escaped the impact of the economic downturn. Economic reforms in Hong Kong and China's forest products markets, like many other sectors of the economy are changing rapidly under economic reforms. Overall, the US has experienced increasing exports to China. While it is not apparent from statistics of Alaskan exports, from 1980 to 1997, China's growing construction activity and economic development stimulated demand for forest products. There are several drivers for China's growing demand. China's GDP has increased annually by about 9% over the past decade, its population is one of the largest in the world with 1.3 billion people, and the Chinese government has lowered tariffs on many imports, including forest products. Growing affluence among China's population and increased market access has stimulated demand for wood products. Housing reforms are expected to continue to fuel consumer demand for wood products. While demand is expected to increase rapidly, China's domestic timber production is constrained by limited available forest areas and increased forest protection concerns, which may signal an opportunity for international suppliers (Waggener and Zeng, 1999).

Table 4. Alaska's total wood product exports by destination (US \$ millions).

Destination	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	Change 1996-'98
Japan	\$436.4	\$433.4	\$374.7	\$371.6	\$482.9	\$409.5	\$375.9	\$355.5	\$301.8	\$126.2	-65%
Canada	\$9.5	\$3.7	\$9.1	\$3.7	\$1.9	\$8.2	\$36.3	\$17.6	\$26.6	\$26.6	51%
South Korea	\$44.2	\$53.3	\$37.8	\$49.6	\$77.5	\$53.0	\$58.2	\$65.5	\$72.0	\$24.7	-62%
Hong Kong	\$0.2	\$0.5	\$1.0	\$6.1	\$1.9	\$1.9	\$2.6	\$3.9	\$4.7	\$5.9	51%
China	\$25.4	\$23.0	\$30.0	\$32.0	\$22.3	\$26.8	\$18.0	\$14.9	\$9.4	\$2.5	-83%
Other	\$1.2	\$1.2	\$1.2	\$1.2	\$1.1	\$1.2	\$1.2	\$1.2	\$1.1	\$1.0	-59%
Total	\$623.4	\$620.5	\$544.3	\$574.4	\$662.8	\$579.7	\$603.8	\$528.7	\$448.3	\$192.7	-64%

Source: US Department of Commerce 1999.

Logs

Almost 95% of Alaska's wood products export revenue is generated by softwood logs, lumber, and chips (Figure 13). Over 70% of Alaska's wood products are exported in the log form, with over 51% of log sales shipped to Japan. Other leading markets for Alaskan logs include Canada, Korea, and China (Table 5). As shown, softwood log export volumes have declined significantly from 1989 to 1998, largely due to losses in Japan, Korea, and China. Revenues remained more stable until 1997-1998 as prices increased following supply constraints in the PNW, but then declined with the Asian crisis.

While South Korea and China have been major consumers of Alaskan logs buyers in these destinations are much more price sensitive than Japanese buyers. They also have different uses for the logs they import and as such, use lower quality and lower priced timber. They have to a

large degree substituted lower cost radiata pine logs for hemlock and Douglas-fir as log prices have increased.

The graph in Figure 14 shows average prices for comparative quality and diameter softwood logs in Japan, China and Korea. The log grade names shown denote standard log grades by the country destination followed by the diameter in inches. Pricing data indicate that logs 12" and greater of a quality sufficient for the Japanese market are consistently higher priced than logs of the same diameter, but of a lower quality that are acceptable in the Chinese market. While logs suitable for the Korean market are 4" smaller in diameter than logs suitable for China, they consistently garner the same price. Log sorts for each country are uniquely tailored to the needs of that country.

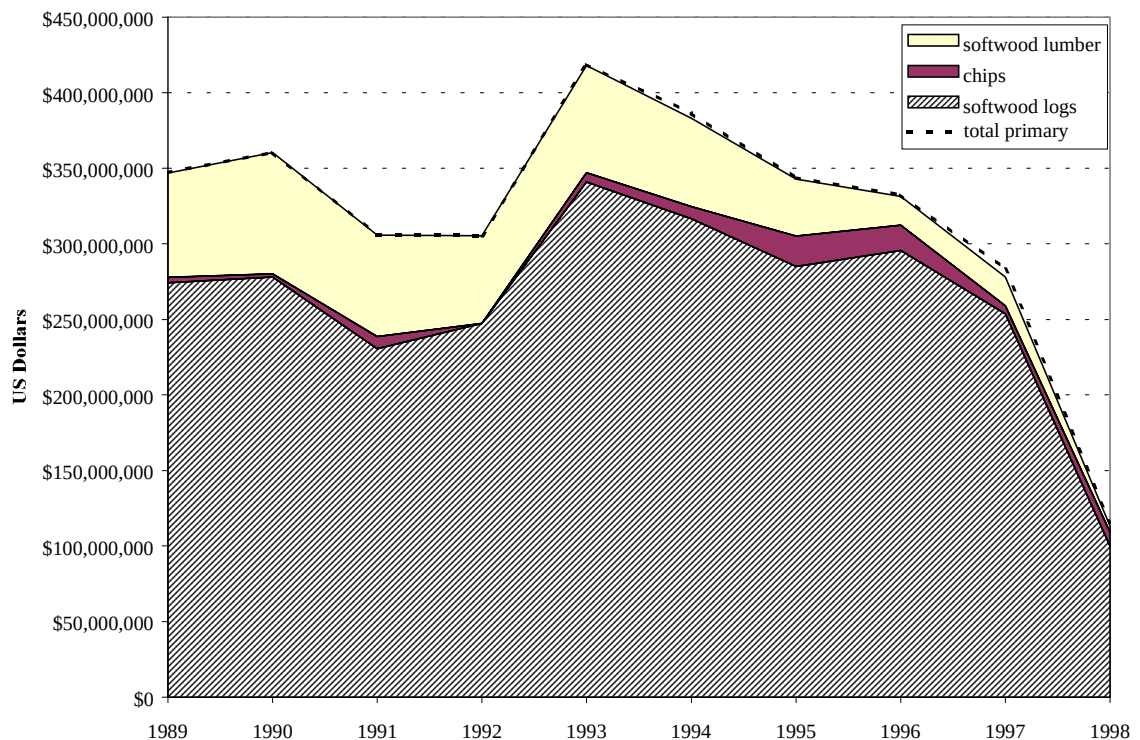


Figure 13. Leading primary processed wood product exports from Alaska to Japan, 1989-1998
(US Department of Commerce 1999).

Table 5. Alaska's softwood log export volume by destination (1,000 cubic meters).

Destination	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Japan	2,216	1,990	1,653	1,605	1,718	1,795	1,617	1,735	1,592	731
South Korea	2,903	2,204	2,019	1,354	755	500	570	336	271	51
China	2,096	1,539	1,456	915	433	274	63	54	64	55
Canada	137	128	132	31	13	38	607	181	50	68
Hong Kong	0	0	0	20	0	0	0	0	0	0
Other	9,020	7,767	6,257	5,958	4,817	4,514	4,413	4,502	2,744	2,953
Total	16,372	13,628	11,517	9,883	7,736	7,121	7,270	6,808	4,721	3,858

Source: US Department of Commerce 1999.

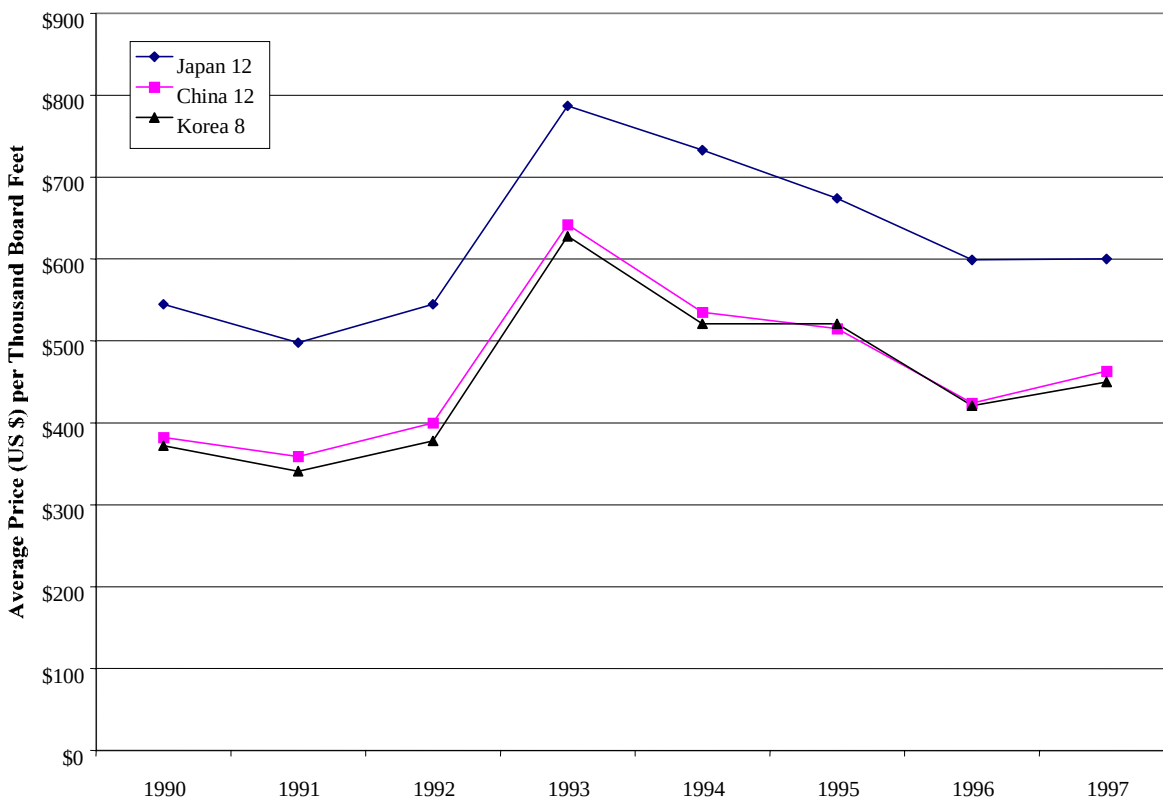


Figure 14. Average price for hemlock export logs by grade (Log Lines).

Export statistics also show that there are clear differences in export revenues by species. The graph in Figure 15 shows that Sitka spruce has maintained a relatively consistent price premium over other Alaskan species. Spruce is also the leading species of logs exported from Alaska to Japan (Figure 16). Over the past seven years, Alaskan mills have exported approximately 300 million board feet of Sitka spruce each year to Japan, or on average, 55% of total log export volume. The popularity of Sitka spruce may stem from the fact that it is commonly used in Japanese post and beam homes as a substitute for sugi, a domestically grown Japanese species. Hemlock was the lowest priced species on average over the time period analyzed, largely because it competes directly with hemlock supplied by lower cost producers in BC and the PNW and has been displaced by radiata pine in some markets.

A yen-based price index for major North American log species in Japan that indicates price sensitivity by species, shows that after 1993, Sitka spruce prices stabilized and demonstrated an upward trend, indicating that spruce occupied a high quality niche relative to hemlock until mid 1997 (Figure 17). Sitka spruce prices also displayed more stability than hemlock or Douglas-fir prices. Western hemlock and Douglas-fir are imported in larger volumes than Sitka spruce and are therefore more susceptible to substitution by other species, especially within lower grade categories (Robertson and Brooks 1997). Alaskan hemlock value has declined steadily since 1989. Western redcedar export values are very limited but appear to be gaining a stronger niche market with rising prices.

The impact of the harvest constraints on the State's competitiveness in Japan is evident when looking at Japan's softwood log imports by source (Figure 18). Alaska has a significantly smaller share of the Japanese imported softwood log market than Russian, US, or radiata pine suppliers. However, Alaska has maintained a much more consistent share of the Japanese market than suppliers in the Continental US, who have lost market share to lower cost Russian and radiata

suppliers as harvest levels were reduced. Overall, the Alaskan share of the Japanese log market has increased since harvests on private lands have not declined significantly.

PNW hemlock sold at high prices during the early period of harvest reductions in the PNW, but has since trended downward with Alaskan hemlock. Douglas fir's structural characteristics, which are highly valued in Japan, have resulted in prices almost as high as spruce. The spruce/fir premium over other species remains at high levels even after the general decline in Asian market prices.

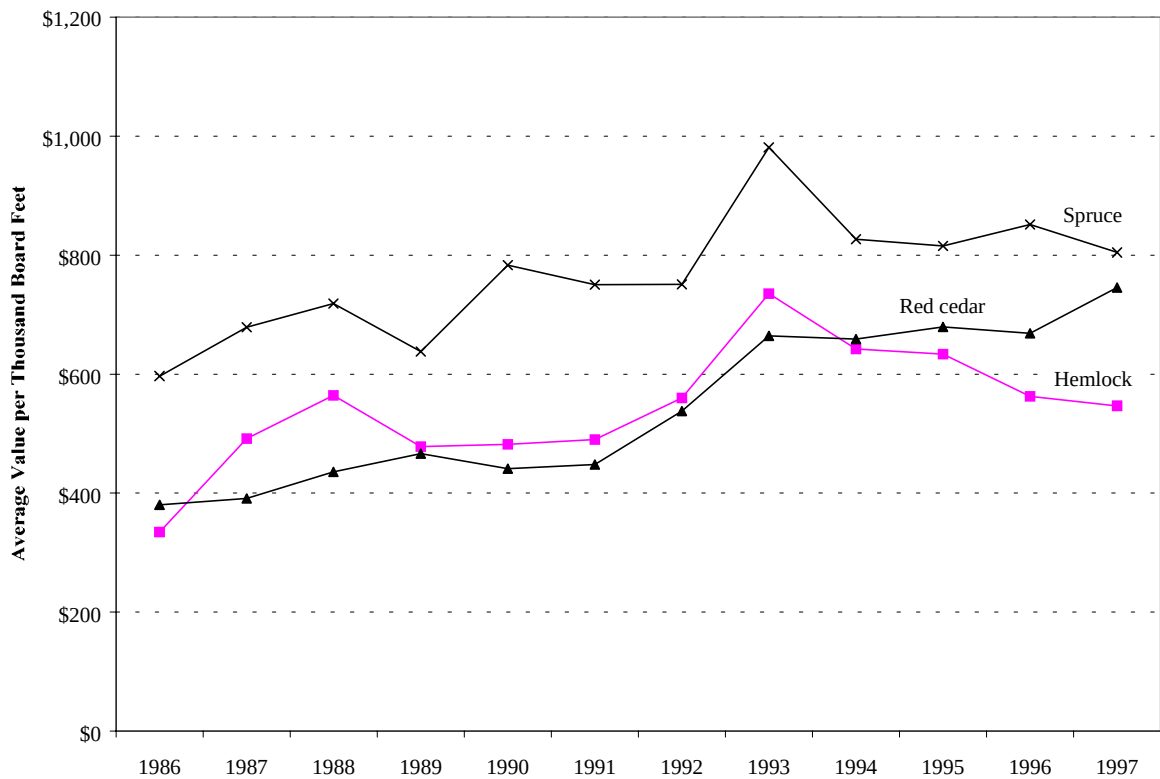


Figure 15. Average value for Alaskan log exports to all destinations by species (Warren 1998).

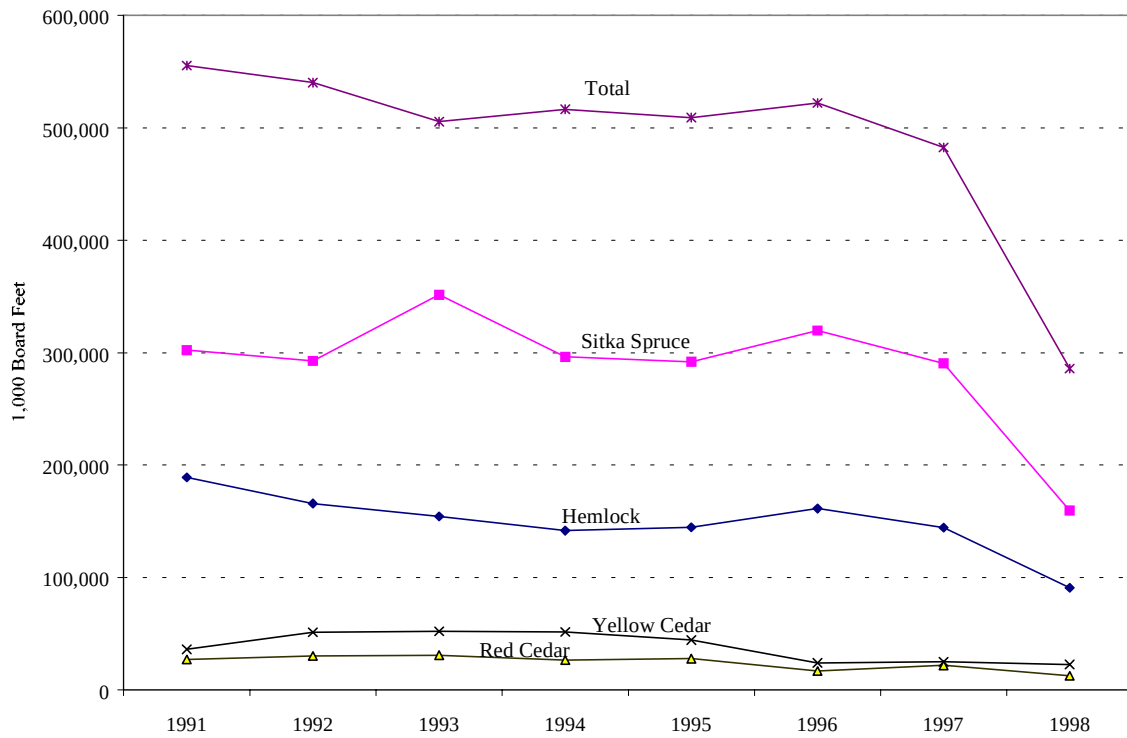


Figure 16. Alaska softwood logs export volume to Japan by species, 1986-1997 (Warren 1998).

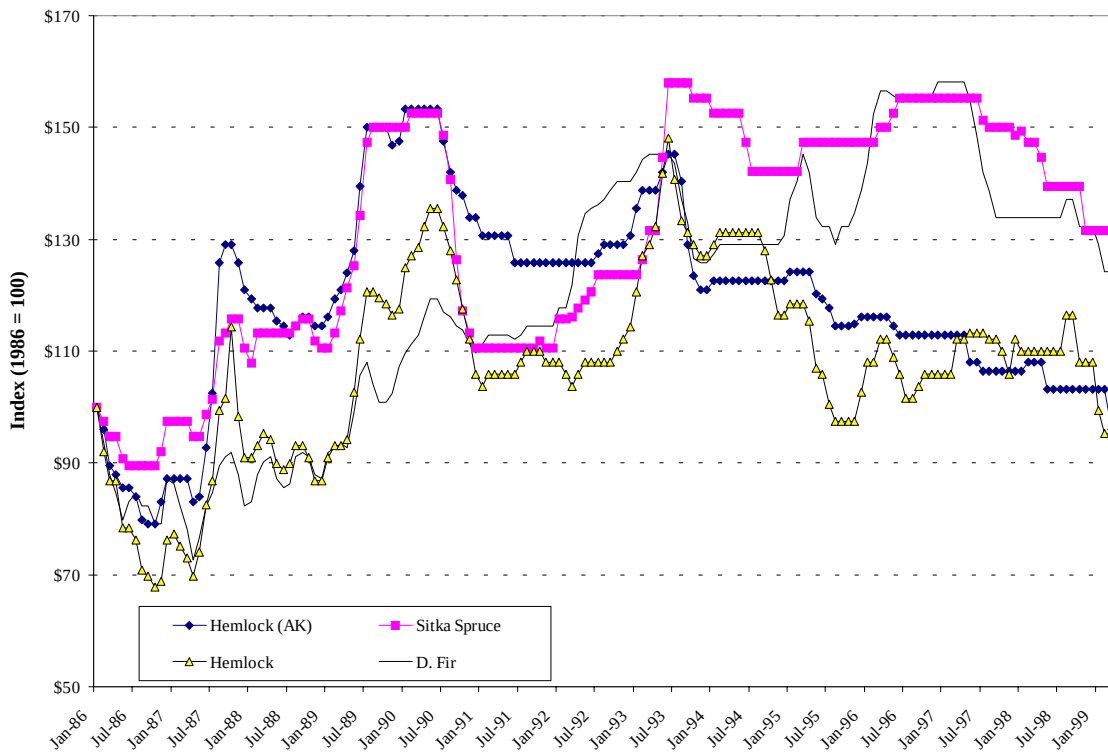


Figure 17. Japanese wholesale log prices (Yen Price Index, Jan 1998 = 100) (Japan Lumber Journal).

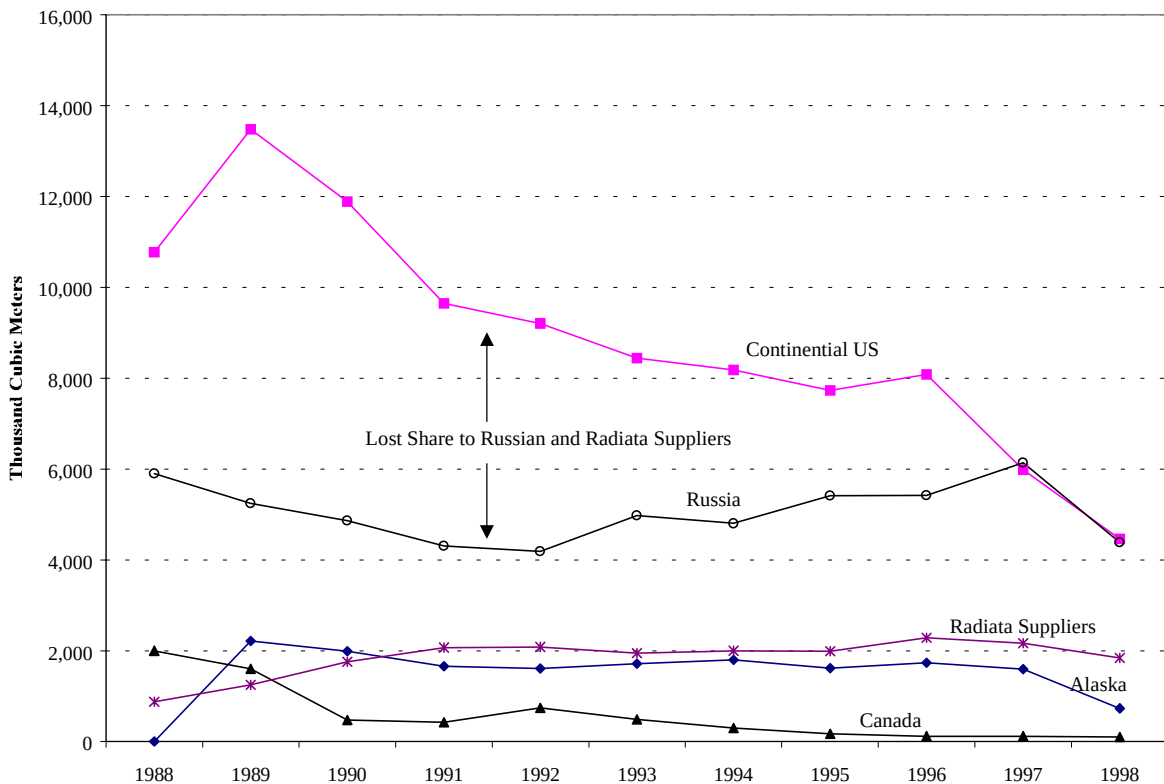


Figure 18. Japanese softwood log imports by source, 1986-1997 (US Department of Commerce, JAIWIC, and Foreign Agricultural Service).

Lumber

Japan consumes 60% of Alaska's softwood lumber exports, yet Alaska supplies less than 1% of Japan's softwood lumber imports. Over the past eleven years Alaskan producers' export volume and share of the Japanese imported softwood lumber market has dropped from almost 6% to less than 1% (Table 6). Overall, Japan's lumber imports have fallen dramatically since the end of 1997 when the country entered a recession. While Alaskan suppliers have lost market share, lower cost suppliers have made visible gains, most notably, Canada, Russia, New Zealand, and Chile. High-quality European whitewood also increased in share.

Alaska's most significant competitor for Japan's lumber market is British Columbia. Even though harvest costs in BC are higher than Alaska and the PNW, government controlled stumpage prices have enabled the Canadian lumber industry to maintain a cost competitive edge over regional competitors. Strong government support for the Canadian lumber industry including international marketing support, workforce training, and low stumpage prices have helped Canada become a dominant supplier of softwood lumber in the US and Asia.

Japan's lumber market is large enough to consume Alaska's sawn-wood output. However, Alaskan processors have to customize their facilities with competitive costs to increase market share. Kiln-dried dimension lumber and baby squares produced at a cost efficient rate are needed to meet Japan's rising demand for kiln-dried products. There is a segment of the post and beam market in Japan that uses green lumber, yet builders are beginning to use kiln-dried lumber. Increasing uses of second growth wood have made it more important that all structural wood is kiln-dried. The Japanese government is also establishing a number of initiatives to improve the durability and quality of homes and as part of these plans, the construction industry is requiring more kiln-dried lumber. Therefore, Alaskan sawmills that produce green lumber may have to consider producing kiln-dried lumber in order to improve sales in the Japanese construction market.

Another option is to establish joint ventures with foreign companies to help fund upgrades to facilities to produce kiln-dried products for Japan. The advantage of entering into a joint venture would not only include accessing capital funds, but gaining access to distribution channels and customers in Japan.

Table 6. Japan's softwood lumber import volume by source (1,000 cubic meters).

Supplier	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Canada	4,000	4,000	4,500	5,400	5,200	5,350	5,700	6,000	5,700	3,950
Continental US	3,400	2,800	2,600	2,400	2,500	2,300	2,050	2,000	1,550	689
Europe	50	0	0	0	200	500	800	1,100	2,050	1,097
Radiata	230	350	350	300	350	300	450	400	700	654
Russia	175	150	150	150	170	200	250	250	300	307
Alaska	432	474	382	302	339	253	117	63	71	19
Total	7,855	7,300	7,600	8,250	8,420	8,650	9,250	9,750	10,300	6,697
Alaska share	5.5%	6.5%	5.0%	3.7%	4.0%	2.9%	1.3%	0.6%	0.7%	0.3%

Source: US Department of Commerce, Foreign Agricultural Service, JAIWIC 1999.

Korea

Korea, the third leading market for Alaska's wood producers, was one of the economies hardest hit by the Asian economic crisis, yet government restructuring in the country's financial sectors has restored some financial stability and the economy is recovering at a faster rate than expected. Demand for wood products in Korea was shaken by the economic downturn, and during 1998, imports of wood products declined 60%. However, in the first quarter of 1999, imports of forest products already increased from 30% to 200% over 1998 levels, depending on the product category (AF&PA 1999).

Prior to the Asian economic crisis, the Korea Forestry Administration predicted that increases in population and annual income would increase demand for total "timber" (which includes all wood products such as chips, pulp, logs, and lumber) to 26.42 million m³ by 2000 (Table 7) (Korea Forestry Administration 1997).

Table 7. Projected Korean demand and supply for timber (million cubic meters).

Classification	1992	2000	2010	2020	2030	2040
Demand	22.28	26.42	30.74	34.56	37.39	38.80
Supply	22.28	26.42	30.74	34.56	37.39	38.80
Domestic supply	1.12	2.54	4.79	7.53	10.85	13.80
Import	21.15	23.88	25.95	27.03	26.54	25.00
Self-sufficiency	5%	9.6%	15.6%	21.8%	29.0%	35.6%

Source: Yoo 1997

Despite limited domestic timber resources, Korea has been one of the world's leading producers of plywood and veneer. Consequently, it is also one of the world's leading consumers of timber. In 1996, Korea imported 6.8 million m³ of softwood logs, 1.4 million m³ of hardwood logs, and 366,000 m³ of softwood lumber (Foreign Agriculture Service 1997). Historically, Korea has imported more softwood logs from Alaska than any other wood product. In 1989, Korea imported almost 3 million m³ of softwood logs from Alaskan producers, yet the volume of log imports from Alaska has declined steadily over time. By 1998, imports dropped to just over 51,000 m³. It is likely that the majority of these logs were used for pulping and for plywood. Alaskan logs have been replaced by lower cost substitutes, primarily radiata pine from New Zealand.

As shown in Table 8, in 1997, 95% of Korea's domestically produced lumber was produced from softwood logs (Wood Markets Quarterly 1997). Domestic sawmills and panel manufacturers facing rising overhead costs and dated technology are finding it difficult to compete with imported lumber and plywood. Industry analysts predict the domestic sawmill industry will continue to shrink, and one analyst predicts 50% of these mills will close during the next few years, increasing the demand for imported wood products (Widman's World Wood Review 1997).

Wood frame construction accounts for only a small amount of lumber consumption. Approximately 73% is used for concrete formwork or scaffolding, the majority of which is low quality softwood lumber (Table 9). Builders generally prefer the special sizes produced by local manufacturers, which limits the widespread use of North American dimension lumber. Domestic manufacturers continue to supply approximately three times the amount of lumber imported (Korea Plywood Industries Association 1998).

Table 8. Korean production of lumber by species (1,000 cubic meters).

Species	Year			
	1994	1995	1996	1997
Softwood	3,190	3,014	3,105	3,073
Hardwood	672	426	275	157
Total	3,862	3,440	3,380	3,230

Source: Korea Plywood Industries Association 1998

Table 9. Korean end use markets by product, 1997.

End Use	Sawn Wood	All Wood
Construction & Engineering	73.2%	56.1%
Packaging	10.2%	5.9%
Furniture	n/a	23.5%
Other	16.6%	14.5%
Total	100%	100%

Source: Korea Forestry Research Institute 1998

Imports of secondary processed products in Korea are increasing, yet Korea is a largely price driven market. Therefore, while Korea may be a market for low processed wood products such as logs, it appears that producers in Alaska and the Continental US may find it extremely difficult to compete with lower cost Russian larch and New Zealand and Chilean radiata pine. The main use of logs in Korea is in plywood and manufactured board production for the construction sector, therefore Korean customers purchase primarily low quality logs. Rather than focus on Korea for higher valued wood products, it may be more appropriate for Alaskan producers to focus on maintaining their share of the Korean market for pulp logs.

China

China is becoming an increasingly important end market for timber suppliers. In 1997, it imported almost \$2 billion in primary processed timber products. The US is the fourth leading supplier of wood products to China, following Malaysia, Indonesia, and Gabon, although suppliers in Russia, New Zealand, and Chile are gaining market share (Waggener and Zeng, unpublished report). Much of the imported timber is in log form for further manufacturing in China's growing furniture and board industry. While log imports peaked in 1988 at about 10 million cubic meters, they decreased radically and now average about 10% of consumption. Small volumes of lumber are also imported for the country's growing wood frame housing industry (Waggener and Zeng).

Pulp was the leading export from Alaska to China, yet exports were declining steadily prior to the KPC mill closure. Softwood logs are now the leading export from Alaska, totaling almost \$2 million in 1997, a sharp decline from exports of almost \$20 million in 1992 (US Department of Commerce 1999).

As shown in Figure 19, China imports more rough lumber and plywood than any other secondary processed wood product (HS 44). While plywood imports have declined in the past three years, materials used in furniture production and construction have increased - the impact of changes in China's economic stimulus and housing policies. While Korea's market for wood products has been shaken by lower cost producers and construction standards that make building wood frame housing difficult, China is consuming more wood as it is becoming a more prominent producer of secondary processed goods for domestic consumption and export (Waggener and Zeng).

China's forest products market, like many other sectors of the economy, is changing rapidly under economic reforms. From 1980 to 1997, China's growing construction activity and economic development significantly increased the consumption of forest products. There are several drivers for China's increased consumption of forest products. As mentioned earlier, China's GDP has increased annually by about 9% over the past decade, the population is one of the largest in the world, and the Chinese government has lowered tariffs on many imports, including forest products. Housing reforms are also stimulating the demand for wood products. While demand for wood products has increased, and is expected to continue to increase rapidly, China's domestic timber production is constrained by limited available forest areas and increased forest protection concerns (Waggener and Zeng).

There are also several policy changes in China that may stimulate imports. Import tariffs for all solid wood products have fallen from 100% during the 1980s to a maximum of 21% currently. China also agreed that if the Accelerated Tariff Liberalization (ATL) agreement was reached at the December 1999 World Trade Organization meeting, they would join the forest products tariff reduction initiative. While the ATL agreement was not achieved, China's willingness to join, suggests that China may be receptive to eliminating wood and paper tariffs by 2005 (AF&PA 2000).

As the economy continues to develop, demand for secondary and manufactured forest products is escalating. Expenditures on primary, secondary, and manufactured forest product imports (solid wood, pulp, and paper) almost doubled, from \$3.5 billion in 1992, to \$6 billion in 1997. Imports of unprocessed, or primary, forest products are relatively constant at about \$1 billion. Rising consumption and declining domestic timber production will likely mean greater demand for imported secondary processed wood products (Waggener and Zeng). US exports of solid wood to China is estimated to reach \$60 million in 1999, up from \$41 million in 1998 (AF&PA 2000).

Policy reforms and changes in the market have contributed to the recent decline in imports of secondary and manufactured wood products. Prior to 1989, widespread speculative investment, including an increase in construction activity, resulted in many non-performing loans and threatened to weaken China's economy. In 1989, China instituted conservative fiscal policies, tightened the wide availability of credit and slowed the entire Chinese economy. Previous rapid growth in the construction industry and wood products markets declined. Meanwhile, the market for lower cost wood substitutes developed quickly.

Housing reforms and the 1998 logging ban, however, are expected to stimulate wood products markets, with probable higher prices and increased imports. Severe flooding in 1998 was attributed to over logging in interior China, and the Chinese government instituted a logging ban in state forests. The State Forestry Administration planned to reduce log harvests by 12 million cubic meters in 1999. Over time, additional forestland will be banned from logging, and should contribute to increased reliance on imported timber (FAS 1999). Imports of value added secondary and manufactured forest products could increase in the next five years, assuming continued rapid domestic economic development.

In 1993, China launched its Affordable Housing project, which brought rental prices for government housing closer to market prices. The project has also encouraged people to buy their own houses and will likely drive economic growth in the housing market over the next three to five years. China's highest ranking housing official predicted that the system of government housing will end in 2000 and private ownership will become the norm. China's banks also committed to increase the number of mortgages awarded to potential homebuyers (AF&PA

2000a). In spite of the housing policy changes, new home sales have been sluggish. Of the 5.25 million square meters of floor space completed in the first two months of 1999, only 4.15 million were sold (FAS 2000).

An important market segment for materials for interior remodeling and decoration is now emerging in major urban centers. Investment in new housing will also have a “multiplier” effect on associated industries, especially wood for construction, furniture, and interior use. Housing reform is a major national undertaking, which will, however, only gradually bring new opportunities for foreign firms that export secondary and manufactured products to China.

To preserve forests threatened by floods, especially the serious flooding that took place during the summer of 1998 the Chinese government announced efforts to limit deforestation. The most important action taken is a proposed nationwide logging ban for harvesting in the remaining natural forests. China's annual allowable cut for all timber may be set as low as 47 million cubic meters in 2000, as compared to the 55-60 million cubic meters of the previous decade. The demand for imported wood should increase as China depletes its current surplus of timber and wood products. This will likely create a growing timber shortage over the next several decades and should provide long-term opportunities for greater wood product imports (Waggener and Zeng).

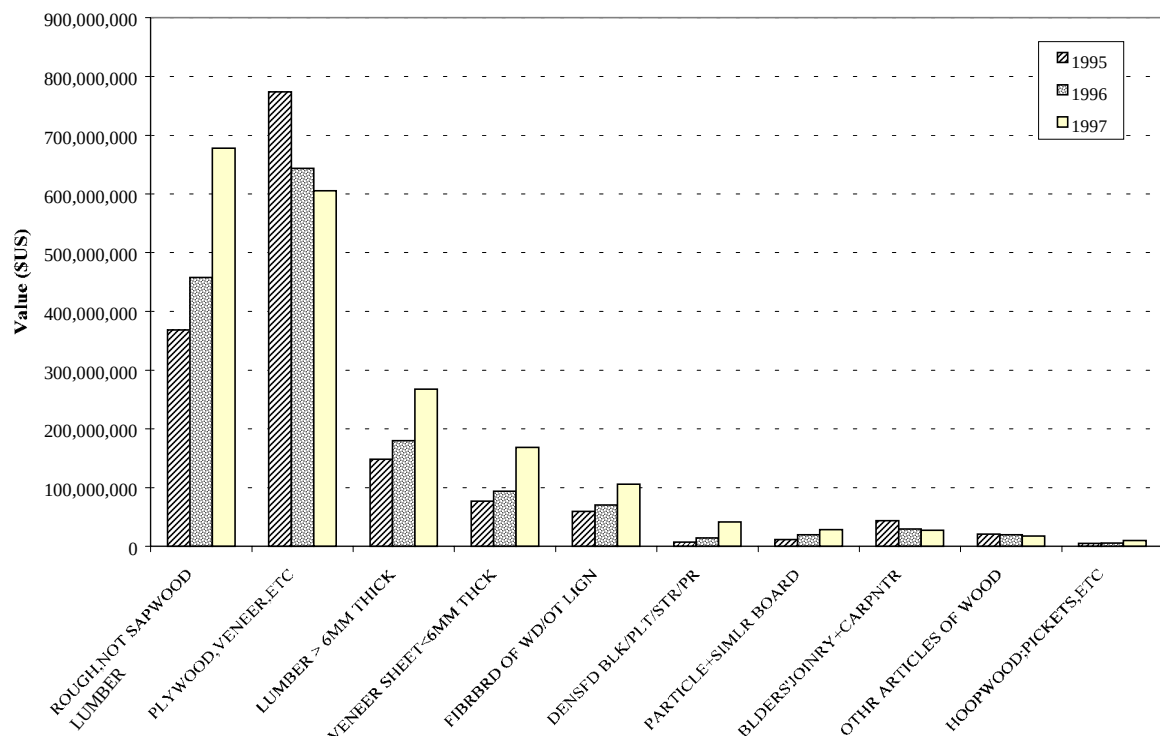


Figure 19. China's leading manufactured wood product imports, 1995-1997.

Considerations for Export Oriented Trade

To date, the Alaskan forest sector has maintained small but stable share in the log export market, experienced substantial fluctuations in chip exports, and experienced a declining market, particularly in lumber. Secondary product exports have increased, but from such a low volume that it would be premature to identify this new market penetration as a major success.

As discussed, the wood products industry in Alaska has significant obstacles to overcome before it can become a prominent supplier of wood products. Challenges include: limited access to timber resources, higher production costs, geography and infrastructure that limit the movement of materials within the state, dated equipment at most sawmills, and expensive transportation to markets within Alaska, and to the Continental US and Asia. There are strategies that may improve Alaska's competitiveness in foreign and Continental US markets, yet there are many factors that should be considered before targeting the export market.

While it might seem desirable to concentrate promotion on secondary processing, such processing is also highly dependent upon a stable resource supply. Hence, success with secondary processing will likely require a degree of economic health in logging and primary processing.

A foremost consideration for firms interested in exporting their products is the additional effort involved in marketing products internationally. The methods for doing business vary greatly from country to country and attention must be paid to promoting and selling products in specific markets. For example, the ways of doing business and the products desired in Korea are very different from Japan and the US. Firms must spend time and resources on marketing their products, understanding end-use markets, and developing business relationships. In Asia, these relationships cannot be developed overnight, but instead require personal attention and after sales service. The small scale of most Alaskan production makes it even more difficult to promote the higher service standards required in export markets. More detail about considerations for exporters who want to do business in Japan is included in Appendix B.

Given Alaska's limited product line for serving offshore markets, joint ventures to serve specific market niches such as Japan's post and beam construction sector, may be attractive. Some US suppliers with joint venture partnerships have also been successful at maintaining market share throughout the Japanese recession. Trade associations could play a significant role in facilitating joint ventures and creating supplier cooperatives to support joint ventures or other distribution arrangements.

Trade Associations

The Alaska Forest Association's (AFA) main objective is to work with businesses and government on timber availability, insurance, and pension issues. However, it appears there is a need for an association or office to help promote timber products, perform market research, identify trade leads, educate firms about foreign markets, and facilitate cooperative promotion and marketing among Alaskan wood product manufacturers. Promotion could include trade missions to Japan, Korea, and China to visit government agencies and meet potential buyers, as well as sponsor programs to bring potential Asian customers to Alaska to meet processors and view processing facilities. This could either be the role of the Wood Utilization Center, an independent office, or an expansion of the AFA. The Alaska Governor's Office of International Trade already promotes Alaska's products in international markets on a general scale, yet given the size of the timber industry and the intense competition between suppliers, the timber industry should have a trade association focused on promoting Alaskan forest products.

The State of Alaska DCED already receives funding for some of these activities through membership in the Softwood Export Council (SEC). The SEC promotes US wood products through international trade shows, trade leads to members, providing funds for printing and translating expenses for promotional literature distributed to foreign markets or performing research in foreign markets.

Associations can also increase communication between processors and facilitate cooperative relationships. Methods to improve communication between processors by can be facilitated by workshops with producers to discuss topics ranging from new processing technologies and methods for increasing efficiency to effective marketing. Understanding that many firms are small sized companies located in rural areas, these meetings might also include on-line forums. Although some individuals without computer resources will unavoidably be excluded from this type of meeting, it would increase communication between processors, and in turn business

interaction. Associations can also facilitate business transactions between firms, such as informing small companies of timber sales. This type of service could also be conducted on the Internet.

Associations can also facilitate promotional ventures. The provincial government of BC has funded five regional value-added manufacturing associations and provides funds and organizational support for discussions to promote grassroots development of the value-added sector. Forest Renewal BC, a government sponsored group, also contributed \$500,000 to create a display in Osaka and Tokyo highlighting Canadian value-added building materials (Southeast Regional Timber Industry Task Force 1997). This type of promotion is regarded as having been beneficial to improving sales for Canadian producers who have substantially increased their market share with US producers.

Lumber Grading

Grading is another important competitive factor. According to the Alaska DCED survey (1998), only 10 out of 38 mills that responded reported they have their lumber graded and certified.

Imported materials that do not meet Japan Agricultural Standards (JAS) or Japan Industrial Standards (JIS) cannot be used in homes where the mortgage is provided by the Government Home Loan Corporation (GLHC) (Eastin and Rahainkenan 1997). The Western Wood Products Association has one employee in Anchorage who travels to various mills to grade lumber. WWPA is also certified to teach and authorize mills to grade wood products to meet JAS requirements. In order to have lumber graded, mills must become members of WWPA. Membership dues are based on production volumes and grading services are included. According to a WWPA representative, only the largest mills in Alaska have their lumber graded.

For the majority of mills, installing planing systems and dry-kilns may be most important in terms of increasing product marketability. Users who require graded lumber will naturally have high standards and will generally require lumber that is dried and planed.

Importance of Market Diversification

The detriments of relying on export markets have been made clear by the Asian economic crisis. Exports of wood products from the PNW declined 41% between 1996 and 1998. Primary processed exports from Alaska to all destinations declined 58% during the same period. While the economies in Asia are starting to rebound, many US firms have been forced out of business by the recession. Alaska's location and small population dictates its dependence on exports to international and US markets. However, Alaskan firms may ensure some measure of protection against fluctuating markets by differentiating the products they produce and by selling to several markets.

The safest export development strategy has generally been to export products that have a strong foothold in the domestic market and to reduce the risk of downturns in either market. This will be particularly difficult for Alaskan wood producers. Dedicating production to exports may be the only viable alternative, which also necessitates understanding the export market in great detail.

British Columbia's Value-Added Promotion Programs

Value-added processors in BC face many of the same obstacles as Alaskan processors, including scarcity of skilled labor, scarcity of resources, access to financing and business planning, and limited infrastructure in rural areas and poor communication between processors. The Canadian government has implemented several programs to promote value-added processing that may either serve as a model for Alaska's forest sector, or be used as sources of training for Alaskan firms. Initiatives that help channel timber to value-added processors, train workers for value-added processing, and promote small business success include:

➤➤ Value-Added Credit System

To give large timber companies incentive to manufacture products for smaller value-added processors and to promote trade between large timber companies and secondary processors, the Canadian Ministry of Forests developed the Value-Added

Credit System using \$265,000 from Forest Renewal BC. The program gives recognition to major timber firms who supply raw materials to value-added processors. The goal of the program is to ensure that small producers receive a secure supply of wood.

➤➤ **Small Business Forest Enterprise Program**

The Small Business Forest Enterprise Program (SBFEP) is a bidding program that allocated more than 2 billion board feet of timber to processors based on the amount of employment the processor will generate and the value that the processor will extract from the timber.

➤➤ **Value-Added Skill Center**

Available supply of skilled workers is also an issue in both Alaska and BC. In order to re-train workers and introduce younger people to work in value-added processing, the Value-Added Skills Center was established to teach students skills identified as most important by value-added processing firms. The Center will receive approximately \$10 million over the next five years to train up to 600 students. Classes are designed in one-week blocks for students already working in the forest industry. In order to be accessible to firms and students in rural areas, during the first five years of the program, Forest Renewal BC will pay course fees and travel and living expenses for eligible students and firms pay employee wages during training. After five years, firms will fully fund students. While it may not make economic sense to duplicate such a program in Alaska, scholarships could be provided to attend the BC program, which is open to non-BC students.

➤➤ **National Center for Advanced Wood Processing**

The National Center for Advanced Wood Processing at the University of British Columbia will train 3,550 students annually in business skills needed for value-added processing firms. A similar program taught in Alaska may be a particularly useful forum to teach manufacturers about international marketing as well as financial aspects of value-added processing. Funding for the BC program comes from an \$8.5 million endowment from Forest Renewal BC; \$16 million from provincial and federal government, the forest industry, and the University of British Columbia; and a \$7.4 million grant from the Ministry of Education, Skills and Training. An additional \$200,000 for operating costs and \$150,000 in scholarships will be allocated annually by the BC forest industry (Southeast Regional Timber Industry Task Force 1997). Again, the alternative for promoting scholarships for Alaskan workers to attend this program could provide a low cost method of training.

Opportunities for Alaska's Wood Products

Centralized Processing

Most of the sawmills interviewed reported that they do not process sufficient volumes to warrant the use of a broker. Out of 39 sawmills that responded the DCED survey (1998) about production volumes, 4 mills reported no production for 1997. Average production for the 28 active mills that responded to the survey was only 2,285,000 board feet in 1997 and total lumber production of survey respondents was approximately 62 million board feet. In addition, half of the mills surveyed employ fewer than 4 employees and 90% employ fewer than 25, indicating that most mills have insufficient staff to devote to expanding into larger markets. Reportedly, most mills are small operations that supply the local market. These small mills survive in local niche markets but may have trouble differentiating their product from lower cost, higher volume producers.

Locating processing in a central area could increase the economy of scale of several poorly mechanized small mills in addition to increasing the quality of products manufactured. The state could provide incentives to encourage a private firm or several integrated firms to locate in a centralized location to purchase logs from mills for processing into dimension lumber and other processed goods. By increasing the economy of scale of many small producers, centralized

processing facility could provide services such as kiln drying, grading, and finishing to produce goods to meet export standards.

Japanese Niche Markets and the Post and Beam Construction Market

While it will be important to determine how to lower the costs of processing in Alaska to improve competitiveness, acquiring a greater insight on how the material will be used in Japan could be of great assistance in determining most appropriate approaches to lower costs.

Japan's cost advantages for custom cutting logs or cants in Japan is derived from several factors. Japanese sawmills generally custom cut multiple sizes to length for local post and beam construction order files. It is difficult to impossible for a distant (North American) sawmill to produce as many sizes and pre-cut to length specifications as Japanese producers. As an alternative strategy, US manufacturers have pre-cut lumber packages for 2x4 construction and 2x4 manufactured housing shells to be assembled in Japan. While neither of these strategies may be a best fit for Alaska, understanding what the Japanese do with high quality Alaskan logs and cants, what sizes, grades, and lengths they prefer is essential to determine if additional custom processing could be effective. Almost assuredly such custom processing would require mills dedicated to Japanese grades and sizes. In order for investments in mill customization to be attractive there may have to be increased awareness of the existence of a stable supply volume of consistent quality, the availability of competitive transportation, and competitive logging and manufacturing costs. While there may be market opportunities for development, attracting investment capital will require some assurance of a stable resource supply.

While a strategy of producing only baby squares for the Japan market would be in direct competition with similar supplier strategies in BC and the PNW, increased market research might be able to determine how Alaska Sitka spruce and hemlock can become a niche market in Japan.

More in-depth market research is needed to determine how Alaskan wood is used in Japan, the competitive position of other species, and what species are used as substitutes, including grade differentiation. Additional steps may also be required to assess the potential to supply different species and grade mixes of custom cut wood at competitive prices.

In addition to understanding how different products are used and how they compete, understanding the Japanese distribution system also increases supplier competitiveness. According to Eastin and Rahikaninen, (1997) bypassing the traditional Japanese distribution channels in favor of selling products directly to home builders provides suppliers with substantial cost savings and helps to increase the competitiveness of US made building products in Japan. A more recent survey of US and Canadian building products exporters by Eastin and Cunningham (unpublished report) also examined the impact of the Asian economic downturn on exporters of wooden building materials and found that direct distribution also played a substantial role in the ability to withstand market fluctuations.

Preliminary results indicate that while many firms went out of business or suffered losses after the 1997 recession, some firms prospered during the downturn. Product sales by way of direct exports to Japanese homebuilders or through a company sales office in Japan was the key factor noted in determining firm success. Successful firms sell an average of 70% of their products through these outlets. Short distribution channels circumvent the complicated and costly aspects of using middlemen and reduce exposure to the impacts of economic fluctuations. Dependence on middlemen during the Asian recession increased firm exposure to the risks of business fluctuations that brokers experienced. It also increased the supplier's risk of losing a key component in the distribution of products in Japan if the broker went out of business. While the small scale of Alaskan producers would appear to make such distribution arrangements difficult, a centralized marketing service for a cooperative of producers could be an alternative.

The type of products exported also play a role in firm success. Companies primarily exporting commodities such as lumber and plywood experienced a substantial loss in export revenue. Conversely, companies that sold value-added goods, such as cabinets and prefabricated building materials maintained or increased export revenues.

Most firms reported a major increase in the price sensitivity of the Japanese homebuilders since the recession started. An increase in price sensitivity resulted in lower export revenues for most, but not all firms. Mitigating factors appear to be the distribution channels used and products exported. The increase in price sensitivity, shortening of the distribution channel, and successfully exported products reveal a shift in the behavior of the Japanese homebuilders. It appears that Japanese homebuilders have moved away from total quality to more of value orientation. Shorter distribution chains lower costs for all parties involved. Even though prefabricated housing might be more expensive, the issue of quality and savings in the construction phase is an appealing feature for homebuilders. Given the limited volume of processed goods that Alaskan firms produce, it may also be wise to focus on identifying and supplying several medium to large sized Japanese construction firms as opposed to using a scatter-shot approach to introduce products into the market.

The idea of attempting to upgrade processing facilities, learn about a new market, identify the uses of Alaskan species in the foreign market, and invest time and resources to introduce a product in a foreign market is daunting for a company with limited experience and few employees. Instead, with the help of a state or industry association or a private broker, several Alaskan firms or a centralized cooperative or broker may attempt to identify and supply a few key builders in Japan. By developing relationships with fewer builders, producers may develop a less price dependent relationship and thus may retain customers when prices fluctuate. It appears that the ability to serve fewer customers with very high levels of service both in terms of product quality and customer responsiveness, than many customers with moderate service, has a great impact in increasing sales. In fact, respondents to a survey conducted for the Eastin and Rahikaninen (1997) report indicated that establishing a strong personal relationship with their Japanese customers is the most important factor for succeeding in the Japanese market. In order to develop such relationships, better data on production costs and market opportunities (as noted above) may be essential.

Based on trade and price statistics, there appear to be two distinct markets for Alaskan wood products: lower priced commodity markets and higher priced niche markets. Alaskan hemlock is generally used in structural applications, 2x4 studs and joists, and post and beam construction. Therefore, it competes directly with other hemlock suppliers and other whitewood species. Historically, Japan imports hemlock from Alaska when demand exceeds supply from other international suppliers. Since analysts predict that the future Japanese housing market will likely be smaller than before the economic decline, the market for commodity grade logs and lumber will likely be dominated by lower priced wood from Canadian, Russian and radiata pine suppliers, and demand for higher priced hemlock from Alaska will decline. However, hemlock is also used with Japanese hinoki in post and beam applications, which may present an opportunity for Alaskan hemlock producers to expand their presence in the post and beam industry (Gruenfeld 1984).

There is also demand in the post and beam industry for Sitka spruce for its strength, low weight, and its pleasing appearance. Demand is greatest in the Hokkaido area (Gruenfeld 1999). Sitka spruce is the most comparable imported species to sugi, a Japanese species, which is used for post and beam construction, paneling, furniture, and joinery (Clark 1984). Japanese builders also report using Sitka spruce for doorjambs, mouldings, and for traditional *shoji* screens. Reportedly, Sitka spruce is used as structural material covered by finish material and as exposed beams in traditional *tatami* rooms. The latter application requires timber with few knots, straight grain, and attractive color. Alaskan producers may have a competitive edge in this market since Sitka spruce is already utilized in the post and beam homes as a substitute for sugi. In 1998, Alaska supplied approximately 65% of the Sitka spruce volume imported by Japan from the US (Japan Lumber Journal 1999b; Warren 1999). However, there is limited information available about exact uses for Sitka spruce, factors that influence builder selection, and the distribution system for the wood.

Except for supplying baby squares, the post and beam industry remains largely untapped by suppliers in the Continental US, yet it is much larger than the 2x4 market in Japan. For example, in 1998, post and beam houses represented 82% of all new wooden housing starts, whereas 2x4

wood frame housing starts represented 6%. Alaskan producers may be able to offset high production and transportation costs by supplying high-quality products to niche markets. It may be advantageous for Alaskan producers to attempt to avoid competing directly with other hemlock and Sitka spruce producers by milling kiln-dried lumber to fit post and beam construction specifications. For example, post and beam construction uses standard lengths of 3, 3.8, and 4 meters. Most US sawmills produce lumber in lengths to meet 2x4 construction requirements. Since the majority of the wooden home market in Japan is comprised of post and beam construction, many US lumber mills are missing the larger segment of the market. On the other hand, Canadian companies have made significant inroads into the Japanese softwood lumber markets by supplying products that meet Japanese buyer needs. Since Alaskan producers do not appear to be able to compete with US producers on the basis of price, it may be effective to differentiate their products through non-price based attributes. However, Japanese consumers are beginning to require that their lumber be kiln-dried and graded. In order to attempt to compete in the Japanese market, many of Alaska's sawmills would have to include dry kilns and planers to their production lines.

Further research is needed to analyze current and potential uses for Alaskan Sitka spruce and hemlock in Japanese construction, where it could be used as a substitute for other timber species, and which markets remain untapped but could be penetrated by Alaskan producers. More information is needed to understand the distribution system for Alaskan wood products.

US Market for Western Redcedar Decking and Siding

While Sitka spruce and hemlock are the most commonly used species grown in Alaska, there is also considerable volume of high valued western redcedar. According to the most recent US Forest Service timber inventory, there is over 1.1 billion m³ of standing western redcedar on National Forest Lands or 6% of total timber on National Forest lands. Over 60% of the standing timber is above 21 centimeters in diameter. An additional 67 million m³ is available on private lands (van Hees 1999b).

High quality redcedar is becoming increasingly scarce in the PNW and BC, creating an opportunity for Alaskan producers. Reduced availability has contributed to the steady increase in redcedar prices. As shown in table 10, average prices for #3 grade western redcedar lumber increased \$426 from 1990 to 1998. Log prices have been less stable; yet have increased approximately \$550 during the same time period (Log Lines 1999). As shown by the small price margin received for lumber compared to logs, it appears more profitable for processors to supply logs as opposed to lumber, which fits in well with the limited infrastructure at most of Alaska's mills.

According to a study of builder perceptions of western redcedar decking and siding by Shook and Eastin (1996), builders stated that they favor the ease of installation, beautiful appearance, and consumer status associated with cedar siding. The physical properties of redcedar also make it resistant to the elements. However, as shown in table 10, from 1994 to 1995, 2.5 million square feet of western redcedar siding was installed in the Puget Sound region, amounting to only 9.2% of the Puget Sound siding market. The most commonly noted detractors associated with western redcedar siding include poor product consistency and uniformity, and high-cost maintenance.

In a follow up study of builder perceptions of western redcedar residential decking by Shook, Eastin, and Fleishman (unpublished report), the authors found that the most important characteristics to consumers are product longevity, an aesthetically pleasing appearance, and durability. However, the most cited detractors associated with western redcedar included inconsistent supply and price, and high maintenance. There were clear regional differences in the use of western redcedar as a decking material. Western redcedar had a 32% market share of decking materials in the Northwest US, 17% market share in the Northeast, 15.2% in the Southwest, and 3.1% in the Southeast.

In the siding market, manufacturers can change negative perceptions among builders about product inconsistency and uniformity by changing current manufacturing methods and quality

control. In addition, manufacturers should also market their product so that architects, builders, and designers perceive that it is equal in quality and status to competing siding materials. The objective is to market high-grade cedar in such a way that it is perceived as comparable to the product consistency and uniformity of brick, hardboard, stucco, and OSB siding. By promoting the physical attributes of western redcedar with the already existing perception that builders and consumers have of its beautiful appearance and high status, a premium price could be charged for higher quality redcedar products.

In the decking market, it is best to focus on supplying the Northwest US since transportation costs from the source are lowest, and western redcedar already has a large market share. Based on builder responses, suppliers should focus on price competition with other similar products. While attempting to undercut other products might erode the high status appeal that is associated with western redcedar, attempting to maintain stable prices would be beneficial to promoting its use. Suppliers should also develop promotional campaigns that emphasize that proper, yet easy maintenance will enhance the natural weather and insect resistant properties of western redcedar.

Table 10. Average yearly prices for inland western redcedar logs and lumber in the US, 1988-1998.

Product	1990	1991	1992	1993	1994	1995	1996	1997	1998
#2 sawmill log, domestic	\$419	\$458	\$559	\$697	\$751	\$725	\$654	N/A	\$978
#3 sawmill log, domestic	\$362	\$417	\$547	\$657	\$691	\$624	\$610	N/A	\$910
1x6", #3 & better, kiln-dried	\$572	\$580	\$702	\$871	\$647	\$708	\$788	\$944	\$998

Source: Log Lines

Table 11. Estimated square footage of various residential siding materials installed in 1994-1995 in the Puget Sound market, market share, and estimated share that the Puget Sound market represents for each residential siding material nationally.

Siding Material	Estimated Square Feet Installed (August 1994 through July 1995)	Puget Sound Market Share	Estimated share of the National Market Represented by the Puget Sound Market ^a
OSB	14,029,146	51.3%	7.60%
Hardboard	3,532,245	12.9%	0.40%
Plywood	2,927,467	10.7%	2.48%
Western redcedar	2,510,960	9.2%	1.51%
Stucco	239,867	0.9%	NA ^b
Vinyl	1,081,440	4.0%	0.04%
Brick	1,012,693	3.7%	NA
Cedar Shakes/Shingles	945,467	3.5%	NA
Wood Fiber-Cement	908,480	3.3%	NA
Other (e.g. metal)	72,000	0.3%	NA
Spruce (solid)	66,667	0.2%	NA
Aluminum	3,467	0.0%	0.24%
Redwood	0	0.0%	NA
Total	27,329,899	NA	NA

Source: Shook and Eastin 1996

a Calculated using 1994 product shipment data provided by various industry associations.

b Not available due to lack of data or unreliable product shipment data

Engineered Wood Products

While high-grade Sitka spruce logs command the highest prices, logs that are #3 grade or lower account for 45% of the timber inventory on the Tongass. Small diameter timber is lower grade due to lower ring count, more knots, and a higher ratio of heartwood. However, while smaller diameter timber is lower quality, it tends to be more easily machined since the logs are more uniform in size and have less taper or sweep (Dubal et al. 1991). Engineered wood products enable processors to utilize small diameter low-quality timber resource to manufacture a high quality product by removing defects. Small diameter Sitka spruce has the same high strength to weight ratio and pleasing appearance as larger Sitka spruce logs, which makes it a desirable material for structural or appearance grade engineered wood products. As Haygreen and Boyer (1996) state "a major advantage of these composite lumber products is that they allow production of relatively large sizes of lumber from small logs."

Engineered wood products processing increases the productivity of the timber resource compared to traditional sawmill practices, resulting in greater use of a limited timber resource. Processing typically utilizes approximately 80% of a small diameter tree compared to 40% for traditional log sawmilling. Generally, LVL production uses 52% of a log, parallel strand lumber uses 64%, and laminated strand lumber (LSL) uses 76% (Haygreen and Boyer 1996). Production also reduces the expense of disposing of the residuals of lumber processing.

In addition to extending the use of raw materials, demand for engineered wood products is strong. Since engineered wood products were introduced, they have quickly gained popularity, competing directly with solid wood building materials. In 1995, North American structural panel production totaled approximately 33 billion square feet. In the same year, I-joist production totaled 400 billion linear feet. By 1998, structural panel production totaled 38 billion square feet, and I-joist production totaled almost 800 billion linear feet (Adair 1999). The market for finger-jointed studs in North America is supplied by 24 mills that produce approximately one million m³ annually (Crows 1996). While solid wood lumber is still the most widely used building material, engineered wood products are gaining market share as available high quality timber is declining, and relatively defect free building materials can be made from otherwise inferior raw materials.

Shifting trends in construction in North American also shape the building materials industry. Thirty three percent of US consumption of plywood and lumber is used for new residential construction, yet home remodeling has grown from a \$50 billion market in 1980 to \$106 billion in 1990. International building codes are being standardized to accept engineered wood products and more furniture manufacturers are incorporating less expensive and equally durable engineered products into their production (Wright, Paun, and Barbour, unpublished report).

There are several types of engineered wood products that Alaskan manufacturers can produce. Given the state's cost structure it would not be feasible to compete with lower cost producers in developing countries. Therefore it is not recommended that Alaskan manufacturers produce MDF or plywood, which is dominated by producers in Southeast Asia. Instead, there are several products that could capitalize on the strength and appearance properties of Alaska's Sitka spruce.

While engineered wood products enable processors to extend their timber inventory and utilize otherwise inferior logs, there are factors that are critical to success. Walters (1996) offers several considerations. First, since engineered wood products are not commodities, producers must brand products and develop brand loyalty. For example, Trus Joist MacMillan produces LSL, yet the most recognized name for the product is TimberStrand®, the company's brand name. In fact, when builders refer to LSL, they typically call it TimberStrand®.

More detailed research should be conducted regarding the economic feasibility of installing and maintaining a variety of engineered wood products plants and their respective potential profitability. Given present and projected harvest reductions, in depth research should be performed to understand how much production would be required in order for Alaskan mills to be competitive with mills located in Canada and the Continental US, and how much raw material

would be needed to sustain necessary production levels. Some products that may be considered by Alaskan firms include the following.

Glue-Laminated Lumber (Glulam)

US producers supply the majority of Japan's structural laminated lumber and exports have increased until recently (Figure 20). In 1990, only about 1% of North American glulam was exported. In 1997, 23% was exported, almost all of it to Japan. The Japanese recession had a detrimental impact on the demand for laminated lumber, yet the price and demand for laminated lumber in Japan have picked up recently with the recovery of housing demand in Japan. Domestic production of glulam in Japan is 30-40% higher than the previous year and prices are up slightly. (Japan Lumber Journal 1999). While analysts are optimistic about the outlook for glulam in Japan competition from Europe and New Zealand is increasing. As the glulam market is recovering, imports from other suppliers are increasing. In 1997, 28% of Japan's imported glulam was supplied by Sweden, 27% from Germany, 13% from Finland, 10% from China, 9% from New Zealand, and 13% from Austria, Norway and Denmark (Adair 1999).

Glulam is used in both post and beam and 2x4 construction. Since Alaskan producers may be at a disadvantage compared to lower cost producers in the Continental US, it may be wise to focus on milling laminated lumber to suit post and beam construction specifications and to market products to post and beam builders. Glulam is used in all types of construction in Japan. In 1997, 87% of glulam was used in residential construction and 13% in nonresidential buildings, large structures, joinery, and large bridges (Adair 1999).

A glulam plant would require capital investment beyond an existing sawmill. The plant would either need to purchase kiln-dried, machine stress graded lumber, or install stress grading machinery and a dry kiln. Production would also require a finger jointer in order to cut defects from the lumber, a system for mixing adhesives, a system for applying adhesives, large clamping devices, and equipment to test strength and tension attributes. The disadvantage with operating a laminated lumber facility, however, is finding a use for lumber that does not meet strength requirements for structural material. Some producers make shelving out of lower grade material, but this requires finding additional markets and customers. Lower grade residue could also be chipped and marketed to OSB producers in the PNW. Additional research should be conducted into the economic feasibility of constructing a laminated lumber plant in Southeast Alaska and markets for processing residue.

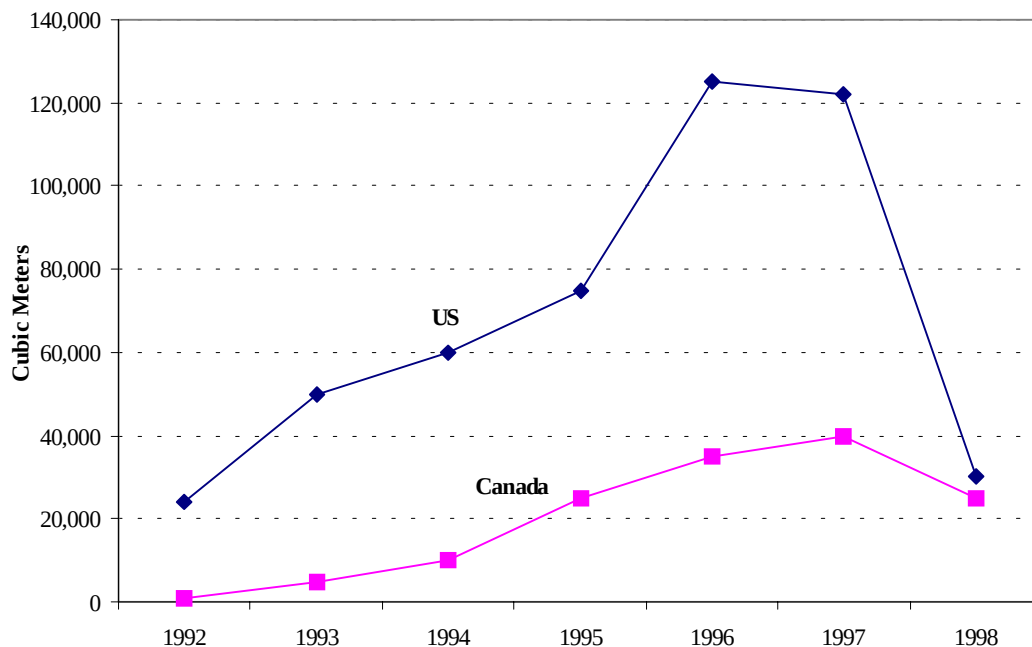


Figure 20. Japan's glulam imports from North America (Adair 1999).

Planed lumber for the Japanese Glulam Market

A less capital and labor intensive option for Alaskan processors may be to produce kiln-dried, planed lumber for the Japanese glulam lumber market. As illustrated in table 12, Japanese production of glulam lumber is significantly greater than import volume, and both sources were growing prior to the 1997 recession. Capital investment to produce planed lumber would be considerably lower than would be required to construct a glulam mill and would be limited to a sawmill, dry kiln, and a planer/sander.

Table 12. Japanese production and imports of appearance grade and structural glulam, 1987-1996(1,000 cubic meters).

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Total domestic production	348.9	408.8	435.8	449.6	455	451.3	496.6	551.3	581.9	719.9
Fittings and fixtures	234	282.3	301.2	323	328.5	324	356.5	377.2	373.8	379.8
Structural	114.9	126.6	134.6	126.6	126.5	127.3	140.1	174.1	208.1	340.1
Imports	n/a	n/a	14.1	27.2	34.4	38.3	76.7	115.7	189.9	275.5

Source: Japan Lumber Journal 1999c.

Veneer

While clear lumber and laminated lumber require high-grade raw materials, veneer sheets for LVL and plywood production can use lower quality and smaller diameter logs since the manufacturing processes for LVL and plywood minimize structural weaknesses caused by defects in the raw material. Therefore, there may also be a market niche for Alaska's smaller diameter spruce and hemlock, particularly among plywood and LVL manufacturers in the Continental US. Producing green veneer sheets for LVL and plywood manufacturers in the PNW may enable Alaskan producers to offset demand fluctuations in international markets.

Louisiana Pacific (LP) is currently constructing a green veneer plant in Sitka to supply green hemlock and spruce veneer to plywood and LVL producers in the Pacific Northwest (PNW). The estimated completion date is June 2000. The company plans to use logs 16" in diameter and smaller. Higher quality logs will be used in LP's sawmill for lumber for the Asian market. Given

the declining timber supply on public lands and the decline in the availability of high quality timber in the PNW, the demand for Alaskan spruce and hemlock is increasing among PNW LVL manufacturers (Skilling 1999). The advantage of producing green veneer is that it does not require dry kilns, special handling during shipping, or storage to ensure that it stays dry. It does require containerization during shipping however, to ensure that it does not come in contact with salt water, which could interfere with gluing during processing.

Laminated Veneer Lumber (LVL)

Further down the value chain is the option of constructing an LVL mill. If there were a mill that could produce dried veneer, an LVL mill would require non-destructive evaluation equipment to stress test the material, adhesive equipment, layup equipment, pressing equipment, and remanufacturing equipment to cut the LVL. LP estimates the approximate cost to construct an LVL mill would be between \$10-20 million if equipment to produce veneer is already in place (Skilling 1999).

Japan is the largest Pacific Rim market for LVL. Japan's consumption of softwood LVL in 1997 was approximately 187,000 m³, half of which was produced domestically (Table 13). According to industry experts the outlook for increased use of LVL is good. Raw materials for LVL production in Japan are radiata pine, and Russian and Japanese larch. About 85% of the softwood LVL is used in nonstructural applications for furniture and components. There is some export of I-joists, but while statistics are not available the volume is thought to be small (Adair 1999).

The US market is another likely end-market. As stated earlier, timber shortages in the PNW are causing manufacturers to look outside their region for raw materials. Since 1994, there have been 29 plywood, OSB and panel plant closures in the US and Canada. However, production of veneer-based products has remained relatively stable. Production of parallel strand lumber, plywood, plywood sheathing, and LVL totaled 20 billion square feet on a 3/8" basis, which is about the same volume produced in 1990. By 2000, North American production of LVL is expected to reach almost 2 billion square feet (Adair 1999). Another projection estimates that by 2002, the number of LVL mills will reach twenty, up from three mills in 1987 (Barclay 1996). As shown in Figure 21, LVL production volume has been increasing and is projected to continue to comprise a larger part of North American structural panel production. The strong outlook for veneer products may signal an opportunity for Alaska to become either a supplier of veneer for the US LVL market or a producer.

LVL production is closely related to the I-Joist market, and I-Joist production has increased almost 700 million linear feet since 1990 (Figure 22). Projections for 1999 indicate an additional 25% increase in production. These statistics bode well for the LVL market since it is used for I-joist flanges and builders like to use LVL as a beam and header material (Adair 1999).

Table 13. Japan's production and imports of LVL (1,000 cubic meters).

	1995	1996	1997
Imported softwood	42	73	50
Domestic softwood	58	46	49
Subtotal	100	119	99
Hardwood (88% of domestic)	61	124	88
Total	161	243	187

Source: Adair 1999.

Consistent access to raw materials is vital to the success of any secondary processing facility. LP estimates that between 50-80 MMBF of raw material would be needed to operate its veneer mill. In order to attract businesses to invest capital to build mills and processing timber products in Alaska, the state must be able to ensure that a reliable supply of materials is available. Table 14 is a list of all North American LVL mills and their production capacity. Average production capacity for these mills is 2.95 million ft³. A rough estimate from a consulting firm in the

engineered wood products industry, states that in order for an Alaskan firm to be economically competitive with LVL producers in the PNW, a mill would need to produce approximately 3 million ft^3 of LVL annually. This capacity would require approximately 38 million board feet of raw logs (Klemarewski 1999). It is important to remember that recovery does vary depending upon log diameter and quality. Therefore, while veneer mills can process additional lower quality logs than laminated lumber facilities, the raw material input is not necessarily low quality wood.

It might be difficult for an independent mill to compete with LVL mills in the Continental US given disparity in infrastructure and established distribution and marketing channels. Instead, an Alaskan mill should consider using an agent to distribute the product.

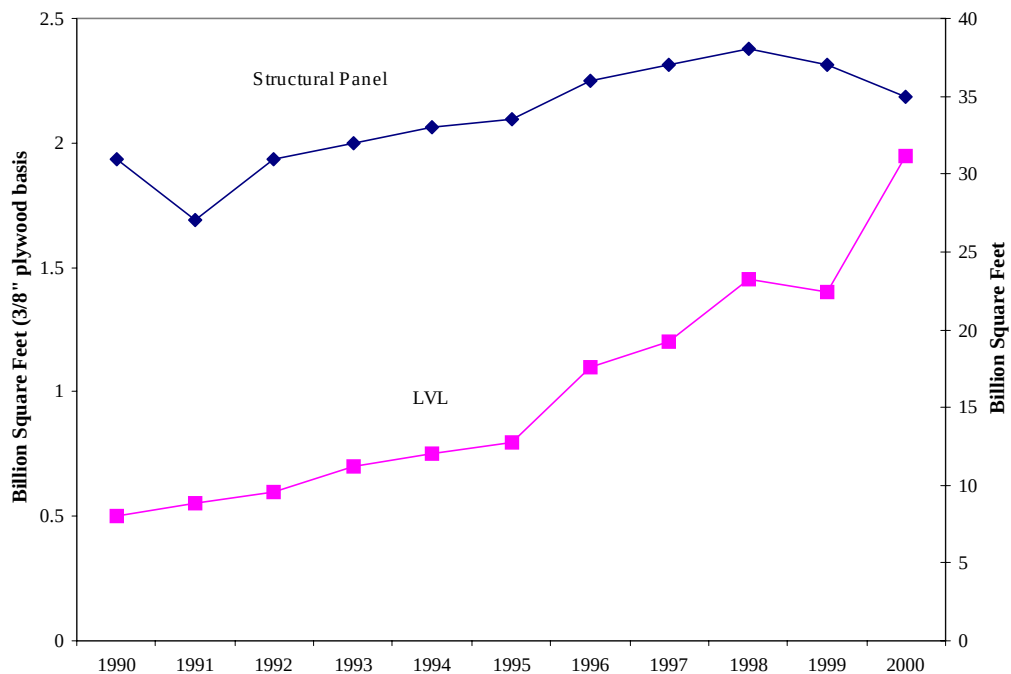


Figure 21. North American structural panel and LVL production (Adair 1999).

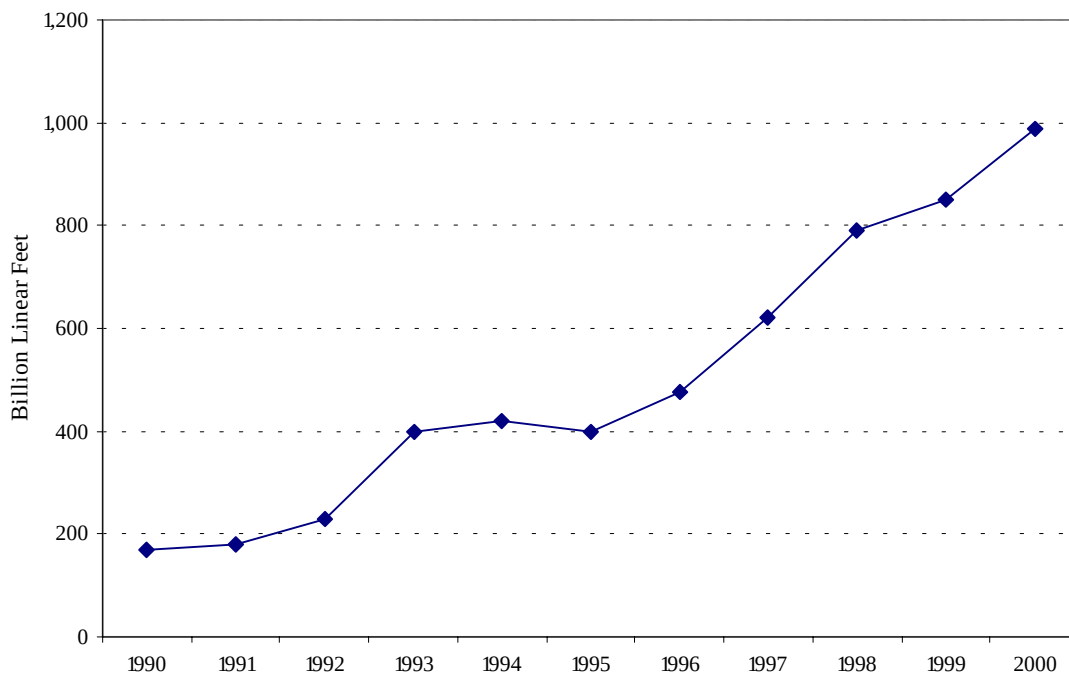


Figure 22. North American I-joist production, 1990-2000 (Adair 1999).

Table 14. US and Canada laminated veneer lumber production and capacity (English measure, million cubic feet).

State/Location		Company (Former name)	Year Built	1994	1995	1996	1997	1998
OR	Eugene	TJ-MacMillan	1970	5.580	5.580	5.580	5.580	5.580
OR	Junction City	TJ-MacMillan	1978	3.814	3.814	3.814	3.814	3.814
NC	Wilmington	LP (Mitek)	1986	3.002	2.295	3.108	3.108	3.108
LA	Natchitoches	TJ-MacMillan	1986	6.003	7.204	7.204	7.204	7.204
NC	Roxboro	GP (Arrowood)	1987	0.600	1.201	2.790	2.790	2.790
OR	Hines	LP (Tecton Laminates)	1987	3.214	3.214	3.214	3.214	3.214
GA	Valdosta	TJ-MacMillan	1989	3.991	4.202	4.202	4.202	4.202
OR	Stayton	TJ-MacMillan	1989	2.401	2.401			2.401
OR	Winston	Willamette Industries, Inc.	1989	1.201	1.801	1.589	1.589	1.589
OR	White City	Boise-Cascade	1990	3.991	6.003	6.003	6.003	6.003
QU	Ville Marie	Tembec	1990	0.636	0.636	0.706	0.706	0.706
NV	Fernley	LP	1992	2.190	1.589	2.507	2.507	2.507
OR	Brookings	South Coast Lumber	1994	0.388	0.989	0.989	0.989	0.989
WV	Buckhannon	TJ-MacMillan	1995		0.989	2.401	2.401	2.401
LA	Lena	Boise-Cascade	1996			2.190	4.414	4.414
OR	Albany	Willamette Industries, Inc.	1996			0.600	1.483	1.483
AB	R Mtn House	Sunpine	1997				0.812	2.790
SE-US		TJ-MacMillan	1998					2.401
AL	Thorsby	Union Camp	1998					2.790
LA	Simmsboro	Willamette Industries, Inc.	1998					1.589

Source: Spelter, H., D. McKeever, and I. Durbak. 1997.

Future Research

Cost Effectiveness of Processing

In Washington State, log export volumes have declined over 50% since harvest levels on federal lands were reduced and log exports from state lands were banned. Lumber production levels in the state remained stable even as lumber prices almost doubled from 1990 to 1995 as a result of the harvest restrictions. Later, lumber prices were cut almost in half, following the Asian economic crisis. The same was not true in Alaska. Log export revenue remained stable while lumber production declined, providing evidence that Alaskan processed lumber, although heavily weighted to cants, is much less competitive than logs. If the price of Alaskan lumber was competitive, greater volumes of log exports would have been diverted to maintain lumber production, as occurred in Washington State. Mill surveys that analyze the return to log value by grade and species for exports versus production of cants and other lumber could be used to determine the degree of cost reduction necessary for processed lumber to be more competitive. This would be of considerable assistance in determining whether it would be practical to upgrade processor capabilities.

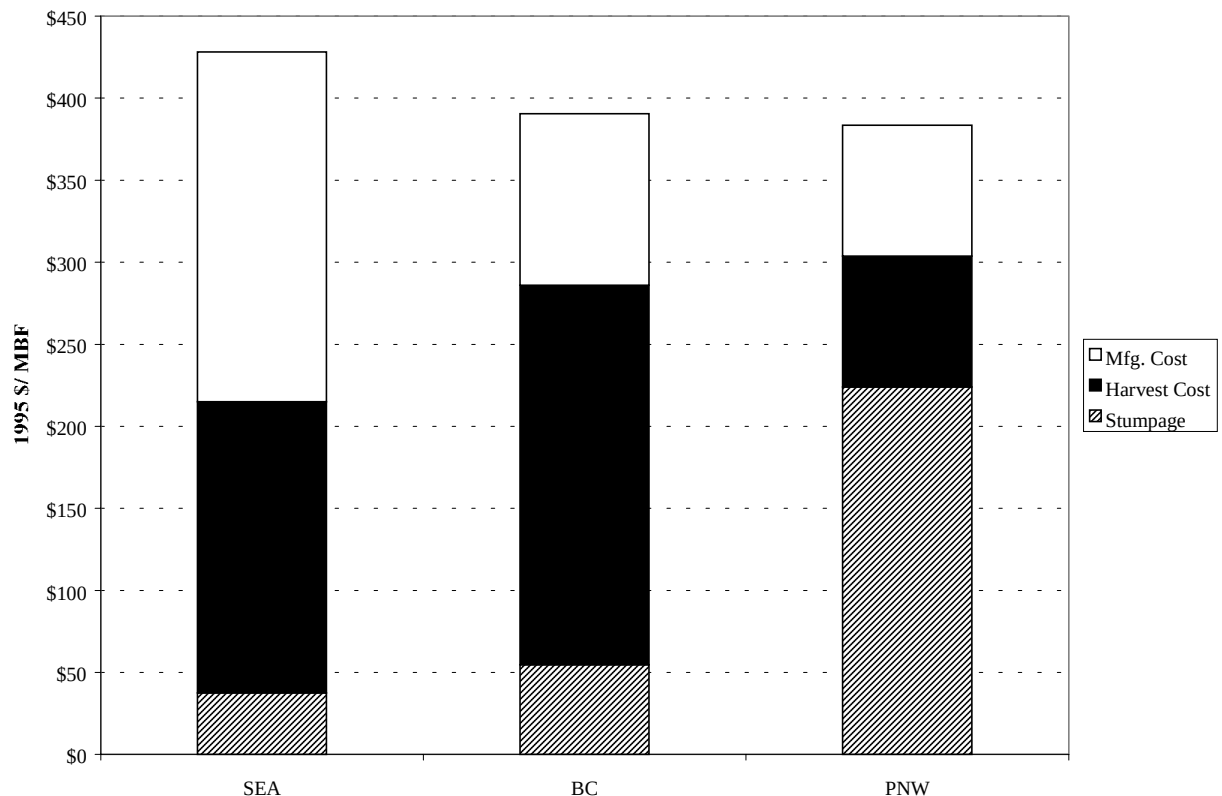


Figure 23. Total costs of lumber production (with stumpage) in Southeast Alaska, British Columbia, and the Pacific Northwest, 1994 (Robertson and Brooks, unpublished report).

Efficiency Gains in Alaska's Manufacturing Sector

As shown in Figure 23, manufacturing cost differences with BC in particular, appear to be the largest contributor to the higher cost structure of Alaskan lumber. Additional research should analyze why these manufacturing costs are higher than in neighboring regions. On the surface it appears that manufacturing costs are higher due to dated or insufficient machinery, and higher labor costs. Given these constraints, facilities with low economies of scale and excess capacity may have little motivation to invest in facility upgrades. Yet, more detailed understanding about specific factors can help policymakers and technicians address Alaska's lack of competitiveness with other suppliers. For example, it is generally agreed that wages are higher in Alaska, yet are

wages in Alaska's sawmill sector high because skilled labor is scarce? If a shortage of skilled labor drives labor costs up, policymakers may consider implementing training programs in rural areas or utilizing education programs that exist in BC. Second, while the Alaska DCED (1998) gathered demographic information about equipment used by Alaskan mills and production levels, it appears that more information is needed to understand why they have dated equipment and why they run below capacity. Are the mills dated because they lack funds, or is it a conscious decision by mill managers due to insufficient supply or insufficient end markets? Information of this type may direct future efforts to either initiate financing agreements to upgrade equipment, work to help mills establish foreign contracts, or develop methods for mills to access more raw materials. Only by understanding the details of why manufacturing costs are high, can an attempt be made to reduce them.

Attempting to supply foreign markets will require mill efficiency improvements, yet these improvements need to be focused on products with market potential. The opportunities to upgrade may be niche market oriented, therefore it is important to consider manufacturing efficiency in the context of supplying specific markets.

Survey of Alaskan Processors

A survey of mill demographics has been completed and analyzed by the Alaska DCED (1998). While the findings provide valuable information about firm demographics, and firm opinions, there is still little information available regarding export issues. More information is needed regarding what products firms are producing by species and grade, cost efficiency and log recovery information, where their main markets are, and the methods they use to get products to market.

In addition, there is little understanding by producers or shippers regarding how products are transported to foreign markets. Wood products are commonly transported to Seattle for transport to Asia, increasing the overall cost of shipping goods to Asia. According to shippers who work with producers in Alaska, there are shipping lines that ship directly, although the names of these shipping lines were not determined from interviews.

Survey of End-Users of Alaskan Wood Products in Japan

Japan is the largest export market for Alaskan producers, yet these producers are losing market share to other suppliers. In order to improve the competitiveness of Alaskan producers, a more complete understanding of how and where Alaskan products are being used in Japan and how these products are being distributed is needed. As noted by Eastin and Rahikaninen, (1997) and Eastin and Cunningham (unpublished report) understanding the Japanese distribution channel provides suppliers with substantial cost savings, increases competitiveness, and helps firms withstand market fluctuations. In order to understand the Japanese market for Alaskan products, a detailed survey of Japanese importers and builders should be implemented.

A research project of this type would include several components. First, researchers would analyze international trade data and Japanese import data in order to identify competing suppliers, species, and grades. Second, a questionnaire to be administered to Japanese importers and builders would be developed. The questionnaire would require translation into Japanese. Third, researchers would travel to Japan to administer the survey and acquire accurate information. Researchers should also visit construction sites to see how Alaskan timber species are utilized.

Centralized Broker/Processing Facility

As mentioned earlier, centralized processing could increase the economy of scale of manufacturing, while producing higher quality finished goods at a lower cost. Based on an informal survey of various sized sawmills in Alaska, interest in this type of venture appears strong. In order to attract a large firm or joint venture to initiate this type of facility, the state would likely need to provide inducements such as tax incentives as well as ensure that a stable supply of raw materials is available.

Further research should also assess the challenges as well as the opportunities associated with this type of venture, including the nature of processing in Alaska. Analysis of the cost

effectiveness of centralized processing should be considered as well as the feasibility of such a venture. A successful operation would require not only a consistent volume based on timber harvest availability, but also a consistent volume from local processors. According to the DCED survey, production among the state's mills is low and variable. It is not clear if this is based on timber availability or if mill owners have other income sources such as commercial fishing, and therefore vary production voluntarily.

A feasibility study should also examine the logistics and cost associated with transporting logs to a centralized broker or processing facility. Most mills are located in Southeast Alaska, yet communities in Southeast Alaska are separated by hundreds of miles and a physical geography characterized by islands and water. Reliable transportation is key to the success of centralized processing.

Feasibility studies should be only part of a larger in-depth analysis of Alaska's domestic processing infrastructure well as end-market potential for Alaskan products that involves understanding current and potential uses of Alaskan wood for the Japanese market.

Conclusion

Industry and Resource Advantages

Alaska's clear market advantage is its ability to supply high quality Sitka spruce. However, recent changes in the TLMP threaten to reduce harvests on the state's largest timber resource. In order to extract more value from available resources, policy makers are interested in promoting value-added processing among the state's firms and in improving the competitiveness of secondary processed goods international markets.

The Pacific Rim is the most likely end market for Alaskan producers. Japan is historically a prominent consumer of imported wood products and changes in building codes and trade policy have resulted in increased consumption in Japan of 2x4 wood frame homes and wood based building materials. While Japan's wood construction sector is expected to remain smaller than prior to the recession, it is still the most developed market in Asia. China's economy has grown uninterrupted by the recent Asian recession and consumer demand for wood products is expected to increase. Korea's economy is also stabilizing more rapidly than expected. Prior to the recession, demand for interior and structural wood products was increasing following economic restructuring and analysts already report a strong rise in expenditures on wood products. Domestically, producers in Washington and Oregon reportedly are seeking high quality raw materials from other regions as a result of harvest restrictions in the PNW.

The most promising market for Alaskan wood products appears to be the Japanese post and beam industry. Japanese consumers will pay high prices for high quality Sitka spruce, particularly products that are cut to meet Japanese post and beam construction requirements. Although the price paid for high quality Sitka spruce has declined since the Asian recession started, Sitka spruce still commands a price premium in niche markets.

Given the physical and mechanical properties of Sitka spruce, the option of producing engineered wood products might also be investigated further. Engineered wood products can take advantage of high-grade appearance grade logs as well as small diameter logs since the manufacturing process and physical structure of engineered wood products eliminates defects in the raw resource.

Challenges

While end markets appear promising, Alaskan processors face numerous challenges that compromise firm competitiveness relative to lower cost producers in BC and the PNW.

First, available timber harvest volumes and access to resources are declining. Recent changes to the TLMP have severely limited the volume of timber available for harvest. Proposed changes to the TLMP would further reduce allowable timber harvest, double the harvest rotation age, limit road density, and reduce the size of timber sales. Low harvest levels and high access costs will

substantially hinder Alaska's ability to become a prominent value-added wood product manufacturer and supplier in the international market. International customers value stable supplier relationships and constraints on Alaska's ability to harvest consistent timber volumes could jeopardize customer relationships.

Second, the geography of Alaska makes it difficult to transport goods, both within the state as well as to out of state destinations. Due to the low volume of goods transported from Alaska, few ocean transporters ship products directly from Alaska to Asia. Instead, wood products are commonly transported to Seattle for transport to Asia, reducing profits for producers. Even products destined for other regions in Alaska usually pass through Washington ports. Road transport from the timber source to mills and from mills to ports can also be difficult and costly due to the limited road transportation infrastructure.

Third, most of the firms in Alaska are small, making it difficult or nearly impossible for them to invest the time and resources required to sell their products to foreign markets. In order to sell products in foreign markets, firms must invest considerable time and resources to understand end markets, develop business relationships, and market products. In Asia, these relationships cannot be developed overnight, but instead require personal attention and after sales service. Even if a firm enlists the services of an export agent, attending to foreign markets requires additional time devoted to this line within a firm's production. In order to access foreign markets and improve firm competitiveness, methods to improve economy of scale should be considered.

The final and possibly most significant obstacle to developing Alaska's wood products industry involves inefficiencies in processing. Many sawmills in Alaska produce dimension lumber, yet few are efficient. According to an Alaska DCED survey of sawmills (1998), most of the 39 mills surveyed, operate well below capacity with only two mills operating two shifts per day and the remaining mills operating one shift per day or less. Out of 38 mills that responded to an inquiry about the equipment they use, only two mills operate dry kilns, and most mills use circular saws, a lower productivity method of milling. More automatic equipment for handling, milling, stacking, and drying is needed in order to lower production costs, increase efficiency, and compete more effectively in foreign and domestic markets. These types of mill upgrades are costly. In order to attract investment to upgrade production facilities, the state needs to consider offering a range of services including a consistent supply of raw materials, financing opportunities for small mills, export and marketing assistance, and promotion of Alaskan products in US and international markets. There is also much information that should be gathered before embarking on the costly endeavor of upgrading mills and promoting the industry. Analysts need to understand why manufacturing costs are high. When all of the cost components that go into manufacturing process are identified and the reasons costs are elevated are understood, only then could an attempt be made to reduce these costs.

Opportunities for Consideration

While Alaskan mills face several challenges there are a variety of opportunities that should be considered although most would require further research to reduce the risk and attract investment capital.

Given the value in Japan placed on high quality Sitka spruce, the Japanese post and beam market should be considered. While Alaskan producers do not appear to be able to compete in the dimension lumber market, they may be able to compete in the market for appearance grade and construction grade baby squares, used in the post and beam market.

Alaskan producers may also consider producing engineered wood products from Sitka spruce. While high grade Sitka spruce logs command the highest prices, logs that are #3 grade or lower account for almost half of the timber inventory on the Tongass. Engineered wood products can make use of a low-grade small diameter resource to manufacture a high-grade product by removing defects. Smaller diameter Sitka spruce has the same strength to weight ratio of large diameter Sitka spruce logs, which makes it a desirable material for structural or appearance grade engineered wood products. Engineered wood products processing increases the productivity of the timber resource compared to traditional sawmill practices, resulting in greater

use of a limited timber resource. Processing typically utilizes approximately 80% of a small diameter tree compared to 40% for traditional log sawmilling.

While small diameter timber can be utilized in engineered wood processing, the market for low-grade small diameter timber is limited. Research may need to be expanded to include the full use of residuals including methods to lower the high cost of energy.

Options discussed in this report range from producing planed lumber for the Japanese market to glulam lumber, veneer sheets, and LVL. While lumber is still the most widely used building material, engineered wood products are gaining market share as the available volume of high quality timber is declining, providing relatively defect free building materials from an otherwise inferior raw material.

The option of producing cedar decking and siding for the North American market should also be considered. Cedar comprises 7% of the timber in Alaska's National Forests, or approximately 3.2 million m³. At the same time, high quality redcedar is becoming increasingly scarce in the PNW. Reduced availability has contributed to a steady increase in redcedar prices.

Future Research

It is clear that methods must be developed to improve the economy of scale in production, transportation, and marketing capabilities within Alaska's forest product sector. To improve scale economies and, in turn competitiveness in international markets, a series of research and development tasks should be considered. It may be most practical to pool resources and expertise of several organizations such as the Wood Utilization Center, the Alaska DCED, and the University of Alaska. Similar cooperative research between government, academia, and industry associations in Washington State has been found to be beneficial.

First, manufacturing cost differences with BC and the PNW appear to be the largest contributor to the higher cost structure of Alaskan lumber. While stumpage prices in Alaska are the lowest among the three regions, manufacturing costs in Alaska comprise 50% of total lumber costs compared to 27% in BC and 21% in the PNW. While manufacturing costs may be higher due to dated or inefficiency machinery and higher labor costs, little detailed information is available regarding why this is the case. In order to increase the competitiveness of Alaska's secondary processing industry, policymakers must understand these factors. Are mills operating below capacity with dated machinery because they have insufficient supply or access to capital, or are mill owners employed in other lines of work and operate the mill below capacity by choice? Further understanding of why labor costs are higher is also needed. If wages are higher because skilled labor is scarce, steps to train the workforce may be considered. Information of this type could direct future efforts to either initiate financing agreements to upgrade equipment, work to help mills establish foreign contracts, or develop methods for mills to access more raw materials.

Another option to improve production efficiency is to provide financial incentives to centralize production. This type of activity would require large-scale investment from a private company or a group of companies. Currently a major forest products company is constructing a new veneer mill in Ketchikan, indicating that there is industry interest in locating secondary processing in Alaska. The goal of a centralized processing facility would be to increase the economy of scale of small producers and provide services to increase product competitiveness such as kiln drying, grading, and planing.

Once mill productivity is improved, firms may benefit from research and promotions activities provided by an industry association. Alaskan producers could take advantage of services offered by the SEC through the Alaska DCED membership. The SEC promotes US wood products by attending trade shows, identifying trade leads, and by accessing Foreign Agriculture support for expenses incurred through promoting US wood products in international markets.

Associations also facilitate communication between member companies to encourage cooperative work arrangements and timber sales. Promoting improved communication could take the form of workshops with producers to teach new processing technologies to methods of

effective marketing. Given the dispersal of mills within Alaska, and the small size of most mills, this type of information can also be disseminated on the Internet through on-line forums.

Second, Alaskan mills should be surveyed to develop a better understanding of the reasons behind the higher costs of processing and labor as well as to understand the mix of products firms are producing by species and grade. While the Alaska DCED gathered valuable information through a 1998 survey, more detailed information regarding processing and marketing may help develop approaches to improve mill efficiency and develop marketing strategies based on the products. For example, there is limited understanding among shippers and producers in Alaska regarding how products are transported to foreign markets. Improved understanding could help facilitate the movement of goods.

Third, Japanese importers and builders should be surveyed in order to understand how and where Alaskan wood products are being used, how they are being distributed in Japan, and the product's competitive position. This research includes identifying where Alaskan wood products are being used by grade and species, how they are being used, and what species and grades are being used as substitutes. Further, the distribution system for wood products is important in affecting firm success. Identifying the uses and distribution system for Alaskan wood may help expand demand to areas where Alaskan products are not currently used and may help improve market presence.

Fourth, research should be conducted regarding the economic feasibility of installing and maintaining a variety of engineered wood product plants and their respective potential profitability. Given present and projected harvest reductions, in-depth research should be performed to understand how much production would be required for Alaskan mills to be competitive with mills located in Canada and the Continental US, and how much raw material would be needed to sustain necessary production levels.

Finally, a feasibility study should be implemented to determine the viability of establishing a centralized processing facility in Southeast Alaska to improve the region's economy of scale. Analysis should consider transportation costs to move logs to the facility, the ability for sawmills to provide a consistent supply, long-term supply projections, financial incentives, and the competitive advantage that centralized processing would provide.

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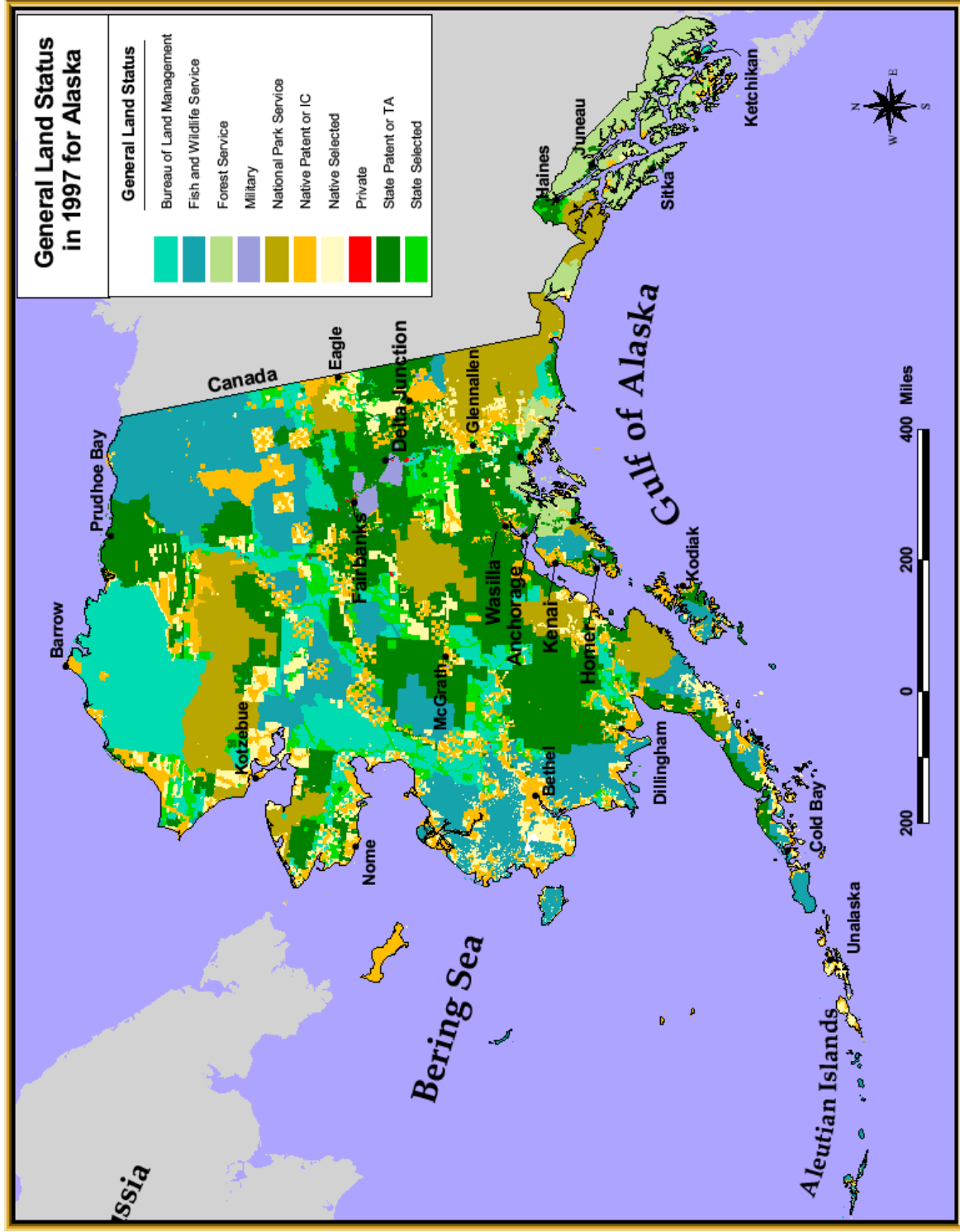
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Appendix A. Map of Alaska by Land Ownership

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Appendix B. Considerations for Exporters to Japan

A Japanese Market Profile and Sourcebook for Pacific Northwest Value-Added Wood Products Exporters ¹

The information presented in preceding chapters provides the demographics and recent trade data relevant to exporting U.S. value-added wood products to Japan. However, this background only provides some of the information. An exporter must understand the unique nature of doing business in Japan. Market success factors will be explained in the first section of this chapter, followed by an explanation of export and import distribution channels, tariff and non-tariff issues and some options available for financing the venture. All of these elements should be taken into consideration as an exporter develops a marketing plan.

Market Success Factors

Although there is no secret formula for successful exporting to Japan, chronicles of past experiences do provide valuable instruction. General guidelines have been established over the past several decades through a hit or miss approach. Repeated failures using the same approach have provided subsequent exporters with invaluable information that should not be ignored. First and foremost, an exporting company cannot effectively enter the Japanese market with a generic approach. The “we will make it and the people will come” sales mentality will leave exporters to Japan waiting for sales that will never develop. Even a well thought out marketing plan that has been tested and proven to work in a U.S. market must be put aside. An experienced exporter to Japan offers the following basic advice:

“A foreign company only should come to Japan with the ability to offer superior products that are price competitive...If a company has such products that it wishes to sell to Japan, then it enters the market *ready* to understand market needs and to offer products or services to meet those needs. To grasp these needs, there is extensive up-front research and then relentless, ongoing research and development.”

--Jackson N. Huddleston, Jr., *Gaijin Kaisha*

Entering the Japanese market is not an endeavor to be taken lightly. If done once improperly, future attempts could be met with a high degree of skepticism, further inhibiting chances for success in this difficult market. Exporters have to be committed to Japan as a critical part of their overall business. Exporters of value-added wood products have the potential to do a large percentage of their business in Japan. By providing components for better housing at lower prices, U.S. exporters could help to meet one of the greatest current demands of Japanese consumers *while* working to decrease the trade imbalance. Both of these elements are encouraged with government support from both sides. These external forces provide a positive environment for growth. With this potential for growth, exporters may find the justification to invest time and money on research and planning in order to capitalize on unique opportunities.

Several success factors are repeatedly discussed in literature and interviews regarding exporting to Japan. The following section will describe some of the most important issues and suggests further readings on these topics. The Japanese market demands some study, and increased familiarity with these issues will enhance the exporting experience.

Common Denominators

Many issues are common to all exporters to Japan, whether their products are automobiles, electronics, or wood mouldings. Factors in successfully exporting to Japan fall into three general groups for all types of products and services. These success factors are 1) high-quality products

¹ Theisen, Anne and John Dirks. 1996. CINTRAFOR Special Paper 23. Seattle, Washington. 101 pp.

and services modified to Japanese tastes, 2) excellent relationships with Japanese partners or distributors and 3) timing and commitment. Each of these issues will be discussed separately below.

Quality

The literature regarding exporting to Japan is filled with references about the importance of quality. Enough cannot be said, clearly, because foreign importers continue to deliver low-quality products to this highly sophisticated market. Because of the resistance to foreign products in general, any small flaw can drive a Japanese consumer towards a domestically produced product they have a higher level of confidence in.

“While people all over the world would, given a choice, desire products that look perfect, the Japanese are especially fanatical about it...The Japanese view is that cosmetic anomalies are an indication of something wrong in the manufacturing process that could lead to more serious problems.”

T.W. Kang in *Gaishi, The Foreign Company in Japan*

Japanese manufacturers take this quality criterion into consideration in every phase of product development and manufacturing. To compete, a foreign firm must do the same. Japanese manufacturers were the first to implement Total Quality Management, measuring defects per million, rather than defects per hundred. Maybe this is fanatical compared to U.S. standards, but it is the standard against which imported products will be compared.

“Foreign companies find that Japanese customers are among the most demanding in the world, and therefore they face difficulties in adapting to Japanese customs, habits, and tastes. It is quite obvious that in order for these companies to be successful in the Japanese market, they have to pay great attention to the demands and sensitivities of Japanese buyers toward product quality. The stringent quality controls imposed by image- and quality- conscious Japanese buyers have helped to improved their competitive position overall.

The motivation to improve quality for the Japanese market can also prove beneficial in other markets. Investing in quality will pay off in the long run, in Japan as well as in the U.S., and should be considered a prerequisite to exporting.

Product Service

Although product service deserves discussion here, product and product service are not actually separated in Japan. The comments regarding quality also hold true for service. Product service is assumed in Japan. When a product is purchased, a Japanese consumer expects that if there is any trouble with the item, a store representative will come to their home to fix it. Retailers expect the same from the manufacturers they represent. If a product is returned to a retailer, the retailer will return it to the manufacturer. The manufacturer is to pay for the related expenses and apologize for any defects.

In Japan, rules for service are similar to those spoken, but rarely followed, in the U.S. “The customer is always right.” “Meet the customer's needs as the customer sees them.” “Predict what the customer would like and deliver.” The difference between the U.S. and Japan is that in Japan these rules are followed precisely. Products must be able to stand up to the high levels of Japanese scrutiny and be a product a Japanese representative can describe with confidence. If a customer misuses a product, it is not considered his/her fault. The manufacturer is responsible for educating the sellers and buyers of the product on how to use it -- a good reason to have product literature printed in Japanese.

Pricing

Lower pricing is clearly the crutch that many U.S. manufacturers and exporters lean on. With the current exchange rate, one would think, that Japanese consumers should want to buy less expensive U.S. goods, and this cost-competitiveness should be capitalized upon. However, Japanese consumers are price sensitive in both directions. If a product is abnormally

inexpensive, an immediate correlation will be drawn to low quality regardless of whether or not it exists. Sacrificing quality for the sake of price is never a good idea in Japan, and care should be taken to see that no misperceptions are created by poor pricing decisions.

Entry Strategies

Many strategies exist for entering the Japanese market. The most popular are joint ventures and 100% foreign owned subsidiary or a combination of the two, where joint venture is set up for a limited time period, after which the company terminates the relationship and takes over complete ownership. Other alternatives include using either Japanese or American dealers, wholesalers, freight consolidators or exclusive agents, selling directly through retailers, or employing a trading company. Some manufacturers use more than one channel in order to increase their distribution.

Every one of these strategies has been proven by different types of companies. The first consideration of the exporter should be -- what are my needs going into this venture? Typically, the U.S. exporter needs one or more of the following in an exporting relationship:

- Japanese consumer market expertise
- Established links with clients
- Loyal local personnel
- Acquiring land or buildings
- Language and communication skills

Proportional to the level of needs will be the level of control sacrificed in order to obtain these things. Generally small to medium size firms do not have the resources to enter the Japanese market as a wholly-owned subsidiary, or even as a joint venture partner. The most common routes taken are using dealers and freight forwarders.

Using dealers, freight forwarders, wholesalers, exclusive agents or trading companies is an indirect method of getting products to the Japanese market without confronting all of the obstacles associated with starting a business in Japan. Many businesses specialize in exporting other firms' products to Japan. These businesses have already dealt with the issues of exporting, and can provide small and medium sized firms the opportunity to establish a brand image. The main drawback is the increased cost when the product reaches the retailer. Also, this process does not increase the manufacturer's understanding of what is required of an exporter to Japan, thereby limiting his/her expertise for future venture development.

Selling directly to retailers, the final option, is attractive to most beginning exporters. However, most retailers have established buying relationships that they are not anxious to challenge, especially by buying directly from a foreign manufacturer. Unless a relationship has been established previously, this method has not witnessed much success.

Timing and Market Presence

Regardless of sector, the Japanese market is touted as being the most competitive in the world. In order to achieve and maintain a position in the market, firms must provide high-quality and innovative products and services that address the demands of the market. In fact, most successful firms go one step further and attempt to predict what the Japanese consumer would want. Most importantly, the domestic firms are constantly observing and reworking to provide products in a timely manner.

As a foreign firm, this sort of research and development will be more of a challenge. Up-to-date information about market fluctuations and innovations by competitors is not readily available to a U.S. firm without local representation. Market presence becomes a very important consideration for the exporter. In order to be market aware and sensitive, a U.S. exporter must establish some sort of gauging mechanism. This might be a sales representative in Japan, a trading partner, or regular visits to Japan.

Having a sales representative in Japan, who is dedicated to your product, will provide the most valuable insight that is specific to your brand. A trading company or exporter will have

information about the general market for a product, but they will not be able to provide detailed information about the reception of your brand. If doing business in Japan, frequent visits will be necessary to establish the types of personal relationships they are accustomed to. During these visits, a great deal can be learned about the level of acceptance and need for improvement of your product. However, presumably, the length of stay will be limited, leaving a large portion of the year unmonitored. In the best situation, all three of these tactics could be employed to get the most valuable and timely information.

The market for imported value-added wood products in Japan is expanding rapidly. Getting involved now will promote your business development along with the sector as a whole. Because of the up-front commitment of time and resources necessary for future success, it is best to become involved as soon as the firm is prepared to offer high quality products and has established a strategy for delivering them to market.

Commitment

Although the time is right for many value-added wood products manufacturers to export to Japan, this may not be the best time for every company. An exporter must be not only ready but also committed to the Japanese market, in order for it to become a viable part of their operations. For many firms from the Pacific Northwest it has taken several years to become profitable, and some are still waiting.

“One of the areas in which the Japanese most often fault foreign companies interested in doing business in Japan is in commitment. They repeatedly point out, and rightly so, that anyone who wants to succeed in Japan - whether Japanese or foreign - must make a firm, long-term commitment. Many foreign companies that have come into Japan have given up before getting started or have withdrawn at the first serious setback.”

Boye Lafayette DeMente in *How to do Business with the Japanese*

Several reasons exist which promote the slow pace of new venture success. The amount of government bureaucracy can impede forward progress significantly. Language and structural barriers can also challenge a newcomer. The most time, however, must be invested in relationship building. Business relationships in Japan are the foundation of any successfully constructed business. Regardless of the type of product, regardless of its competitive price, if an exporter has not developed strong relationships with prospective customers, they are unlikely to be successful. An acceptable level of trust must be developed with Japanese business people, which can take years.

Although the system seems inefficient compared to the U.S., it works for Japanese business people because they understand it, and they use this to their advantage. The government, however, would like to promote the entry of more foreign companies into Japan. The government agencies are a good place to start developing relationships. Their advice and endorsement can testify to a new firm's commitment to the market.

Export and Import Distribution Channels

“If I import wood and other building materials from the United States (to Japan), they will just pile up in warehouses unless they are delivered to the construction site at the right time. I still have to pay the carpenters if things don't go smoothly. *The main problem is not how cheaply one can import materials, but how skillfully one can use the Japanese distribution system.*”

-- Representative of a Pacific Northwest prefabricated home manufacturer

Domestic Distribution

Exporters' number one complaint about doing business in Japan is the country's complex distribution system. Compared to the relatively clear distinction between builders and housing material suppliers in the U.S., the Japanese system is heavily stratified and extremely complex. High levels of regulation add to the confusion for newcomers, who may perceive the system as more of a sticky web than a smooth chain of distribution.

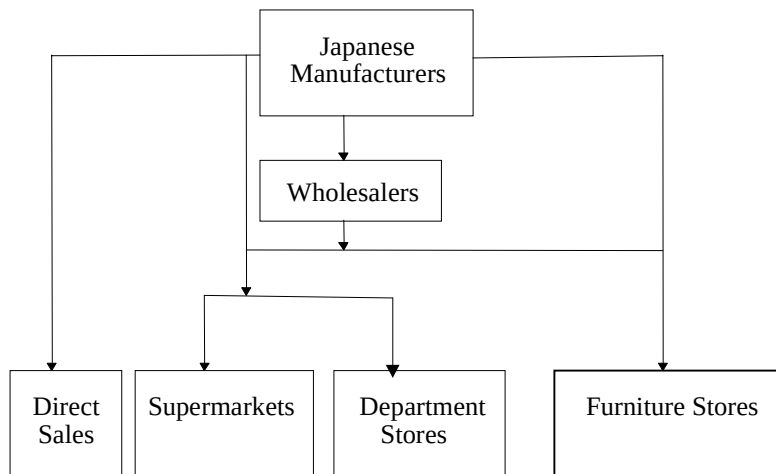
Before an exporter can adapt the distribution system in Japan to fit the needs of the company, the foreign businessperson must first understand how the Japanese system works. "Several of the marketing failures that have occurred in Japan happened because the foreign marketers felt that they were selling one thing, while the Japanese felt they were buying another," said a bilingual director of Pacific Marketing Japan, a research company. "The marketer must know not only how his product is inherently perceived, but also how it is viewed economically and emotionally, as well as from the viewpoint of its newness, uniqueness, and any previous history in Japan" (DeMente 1993). Distribution systems are different for nearly every product. An exporter must research the domestic system for similar product channels, and understand them in order to compete.

This is a daunting task for most exporters considering the recent past of American exports to Japan and Japan's willingness to accept change. United States auto manufacturers have and *continue* to make cars for export to Japan with the steering wheel on the left hand side of the car, when the country's standard is to drive on the right. Even though the entire world has accepted the transition to the metric system, U.S. manufacturers still export lumber in English measures. In order to sell the products once they arrive in Japan, they must reach a welcoming demand.

Distribution costs include transportation, storage, payment terms, and handling claims, each of which is higher in Japan than in the U.S. Because of the infrastructure in Japan, transportation of large items such as prefabricated homes or shipping containers is very difficult, and sometimes impossible without breaking them down into smaller units. The cost for hauling is higher than in the U.S., as is storage. Space is held at a premium by the Japanese, the first practitioners of Just-In-Time inventory systems.

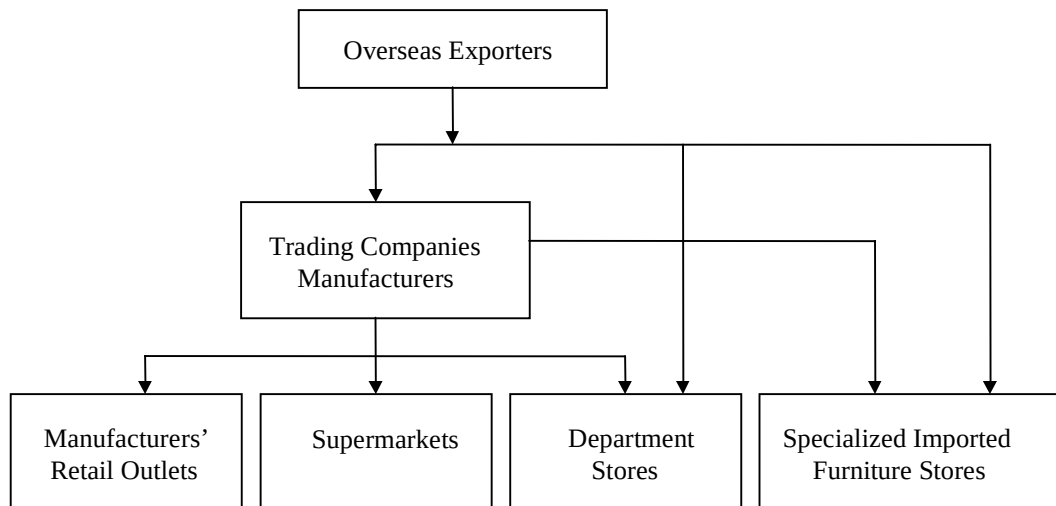
Housing materials exporters often have to see order receipts through a principal contractor, a sub-contractor, and a sub-sub-contractor. Each level adds cost and time to the process. Although the system is inefficient, it is well understood by the Japanese manufacturers and homebuilders and provides them with a competitive advantage. Regulations are being lifted or eased, but the distribution system will still be complicated compared to the U.S. Exporters must attempt to understand the systems in order to remain competitive.

As an example, a flow chart for the furniture distribution channel is provided in Figure 1. Although wholesalers occupy only one position in the chain, multiple wholesalers are often involved in the process. Interestingly, a Japanese supermarket is generally more diverse than its U.S. counterpart. Often a supermarket is broken down into stand-alone vendors under one roof. Furniture vendors are sometimes included in this venue.



Source: Federation of Japanese Furniture Manufacturers Association/Dodwell Marketing Consultants

Figure 1. Japanese wooden furniture distribution.



Source: Federation of Japanese Furniture Manufacturers Association/Dodwell Marketing Consultants

Figure 2. Imported wooden furniture distribution.

The advantages for this system include 1) close business relationships make it far easier for retailers/distributors to suggest product modifications and improvements, 2) the system encourages the sharing of information on product trends, innovations, competition, and overall market opportunities, and 3) business loyalty of the participants reduces fear of uncertainty and tension while contributing to a more cooperative business relationship. Although Japanese business people understand the system is complex, they do *understand* it, and they will only change it to the degree that is necessary for increased profitability. Many services are provided along the way to meet the needs of demanding Japanese consumers. Japan's distribution system accounts for 15% of overall domestic production and about 18% of the total work force (Czinkota and Woronoff 1991). There are a high number of very small retail stores that have no space for inventory throughout Japan. Therefore, it is important that the distribution system work to serve the needs of this highly dispersed clientele. There is a reason for the system to be operating the way it is and these issues cannot be overlooked for the sake of lower prices.

The system does complicate distribution for importers however. This is largely as a result of excessive government regulations and the traditionally weak application of the Anti-Monopoly Act. As an example of the excessive government regulations, a 10,000-square meter retail outlet

requires more than 60 permits and approvals before it can open for business. These regulations were formed in order to protect very small businesses, but also act to thwart new entrants. Laws have recently been relaxed, but regulation is still comparatively high. The Anti-Monopoly Act, enforced by the Fair Trade Committee (FTC), prohibits price cartels and resale-price maintenance controls. However, the FTC has been criticized repeatedly by foreign countries for failing to uphold the act, and as a result the Committee has increased its enforcement activities

Import Distribution

Although it is important to understand how the distribution system functions for domestic products, it is usually not the same channel an imported product would follow. Figure 2 demonstrates the Imported wooden furniture distribution channel. Compared to the domestic channels, this system is more reliant upon trading companies and manufacturers.

Trends in Distribution

The Japanese distribution system is in a constant state of flux due to the evolving demands of the Japanese consumer. Increasing pressure from the U.S. and other foreign governments is also affecting how channels work. Noticeable changes are occurring at the wholesale and retail levels; changes which could impact the Japanese and foreign manufacturer.

Wholesaling industry experts have noticed at least four major structural changes:

- Heightened competitive interests have generated increased emphasis on efficiency
- Horizontal and vertical integration is increasing to retain market power
- Restructuring is de-emphasizing business practices
- Emergence of new channel participants as a result of restructuring

All of these changes indicate that the process is becoming more streamlined. The new business being generated is supporting the wholesaling function, rather than adding another step to the process. Speed and efficiency are the primary motivators for these changes.

The retailing industry is also in the midst of restructuring as a result of the increased need for efficiency. The traditional small-scale retailers that are so well protected by the government are being encouraged to become part of a franchise by MITI's industrial policy bureau (Czinkota and Woronoff 1991). The voluntary development of chains works to provide greater access to technology, for purposes such as computerized inventory control or merchandise tracking.

Another structural shift is towards non-store retailing. Direct marketing and mail order retailing are becoming increasingly popular in Japan. Mail order is a relatively new form of marketing in Japan. Mail order sales as a result are only 1% of total retail sales versus 14% in the U.S. Some reasons for the limited use of this marketing channel include the high cost of mailing in Japan, and the difficulty in obtaining mailing lists.

Direct Selling

The typical cost of direct importation (an average for all industries) is 35% to 45% of product price, which includes freight, insurance, customs clearance, inland transportation, and import duties (Czinkota and Wotonoff 1991). Using the standard 50% mark-up leads to a store price of 250% to 290% of the manufacturers price. Importing through trading companies or to wholesalers will increase the price further, so that the end price can be as much as 350% of the foreign manufacturing cost. As a result, many imports have priced themselves out of the market and retailers must abandon the products. However, some larger retailers have started to purchase directly from exporters in order to avoid this extra mark-up.

Direct selling is an attractive option for most value-added wood products exporters. The problem is finding willing buyers (generally in the case of wood products this would be builders). As was explained in previous sections, the channels of distribution have been developed for a reason. Dealing directly with manufacturers is not an activity most Japanese builders are comfortable with. Moreover, dealing directly with a foreigner heightens their skepticism. Concerns generally revolve around the level of quality and service that will be provided by U.S. manufacturers. For

this reason, most exporters begin by dealing with a trading company or a manufacturer representative.

Trading Companies

The subject of trading companies often arises when discussing business in Japan. Although a small or medium sized firm may not be able to do business with a trading company, they will most definitely encounter them as competitors.

For large firms the simplest approach to exporting is to have a Japanese trading company or importer to receive and market goods on your behalf. Selecting a partner to function in this capacity is not simple however. The standard considerations that a business would make when becoming involved with another firm hold -- is the agent well-managed, financially sound, competent, and oriented with company's needs? Some other important issues must also be raised when dealing with Japan.

The intermediaries can vary considerably in size and nature. Some trading companies are actually manufacturers that also have a network of outlets that they supply. An importer that specializes in different types of value-added wood products may intuitively be the best choice. The distribution channels would be in place and sales personnel would have knowledge of the industry. However, if the importer is operating in this sector already, it probably handles competing products or manufacturers them, substantially decreasing their motivation to sell the imported products.

With over 10,000 trading companies in Japan, the scope of their efforts varies widely. The "Big Nine" general trading companies (*sogo shosha*) are the ones commonly referred to in popular press. They are widely diversified and account for as much as 75% of Japan's imports by volume (Czinkota and Woronoff 1991). They deal mainly in commodities or big ticket items like aircraft and heavy machinery. Smaller and less expensive items are handled by smaller traders (*senmon shosha*). Finding a good partner within this broad field will be a challenge.

A third consideration is the trading company's relationship with other companies. Groups of companies in Japan often work together, so that as a whole, the group is completely horizontally and vertically integrated. These groups, called *keiretsu*, will influence your success in Japan. If the trading company is a part of a keiretsu, it has easier access to all of the members and therefore an established customer base. However, an independent trading company is not relegated to dealing with only other keiretsu members, and therefore has access to a broader market.

Tariff and Non-Tariff Issues

Several characteristics of the Japanese wood product markets create barriers, both tariff and non-tariff in nature, that US exporters of these goods must be aware. Although the government is working to reform some of these obstacles, many still remain.

For housing, the Government Housing Loan Corporation (GHLC) imposes the largest obstacle for selling prefabricated homes and building materials. This Ministry of Construction-affiliated financial institution provides the bulk of low interest, fixed rate mortgages to homeowners and insists that homes be built from JAS approved building materials prior to granting a mortgage. Also prefabricated housing imports are currently subject to a 3.9% import tariff, although this may be abolished in 1995.

Once the product is in the country, satisfying Japanese consumers can create more difficulties. As discussed above, Japanese consumers demand high quality products with strong warranties and service policies. They are also accustomed to substantial design flexibility. These demands are legitimate, but often times overlooked by the potential exporter.

Other unforeseen complications include transportation of products within the country. Because of Japan's narrow roads, transportation of large containers or construction equipment to building sites is a huge challenge. Also, trucking in Japan is very expensive, twice as high as in the US.

Finally, the basic transfer of information enabling Japanese builders to understand how to use US products correctly and effectively has been a problem. More and better quality translated product manuals explaining the installation, use, and maintenance of the products must be provided, which can be a great expense. For the housing industry, western 2X4 style construction poses an even greater challenge in educating Japanese builders on these methods. Japanese immigration laws restrict US manufacturers' ability to send construction crews to Japan to train carpenters on 2X4 building techniques.

Financing the Venture

The expense of exporting to Japan might be more than a small to medium sized company can afford without financing. Fortunately, local banks and lending institutions have recognized the opportunity for exporters of value-added wood products, and they are anxious to support the new venture. With years of export financing experience, export bankers provide a valuable source of information. To better understand the nature of financing for this type of venture, included here are a few comments from a representative of a large local bank and a description of an alternative lending institution.

Comments from a Bank Representative

"A company that is either engaged in the manufacture of value-added wood products for export or a trading company involved in exporting value-added wood products will face certain challenges obtaining working capital financing from their bankers. Banks will typically lend against accounts receivable and inventory, but exclude foreign receivables and work in process. Even commercial letters of credit, when used as the payment mechanism, are not considered to be acceptable collateral or support for pre-export financing, given the fact that payment is contingent upon the beneficiary's ability to perform under the letter of credit.

The obvious solution for most smaller and medium sized companies is to rely on supplier financing for the bulk of their pre-export financing needs. This is particularly true for export trading companies. For example, sales to Asia are typically on letter of credit terms and the exporters will normally require less than 30 day financing to allow time for consolidation, shipment and preparation of the shipping documents for presentation to their banks for payment under the letter of credit. Younger companies with limited credit history may not be able to access adequate supplier credit. The same is often true for manufacturers that require longer lead times to convert raw material into finished products and ship.

It is important for an exporter to build a strong relationship with a bank that has international capabilities. Their account officer should be familiar with trade finance or have access to the international expertise necessary. At the same time, company management should insure that regular and credible financial information is available to their bankers as they can in turn build a financial history of the company. The banker will then have the information available to present options and make recommendations.

For example, the Export Import Bank of the United States (Exim Bank) has developed the Export Working Capital Guaranty Program for small exporters. For companies that qualify, Exim Bank will provide a 90% guaranty in favor of a commercial bank providing pre-export financing for exporters of US products. To promote US exports, Exim will assume a higher level of risk than commercial banks. This guaranty then allows the exporter's bank to accept a foreign receivable, a letter of credit, or even work in process as collateral for pre-export financing."

Cascadia Revolving Loan Fund

Another option for financing exists for value-added wood products manufacturers. Cascadia Revolving Loan Fund is a nonprofit organization that lends money to small businesses and

nonprofit agencies. The lending money is provided by individual investors, pooled, and relented to small business that provide some benefit to the community. The loan ceiling is \$150,000 to any single borrower. Loans have a variable interest rate, are short term (ranging from one to five years), and require some form of collateral.

Cascadia oversees a special fund, the Rural Development Investment Fund (RDIF), in partnership with WPCC, Inc., an Oregon secondary wood products industry association, Northwest Forest Products Consortium and WoodNet in Washington, and Black & Co. an investment banking firm in Oregon. RDIF provides investment capital to start-up and existing businesses involved in value-added wood products manufacturing, manufacturing from recycled materials, and other diversified industries located in the rural areas of the Pacific Northwest.

These loans are for businesses that have demonstrated they were unable to secure financing from traditional sources (banks). The loans are generally higher risk, and require a high degree of monitoring and are labor-intensive. Cascadia has access to pro bono legal council, accounting advice, and other technical assistance to help monitor the business and promote its success.

Summary

This appendix has touched briefly on a wide variety of topics to consider before exporting to Japan. Outside of this document, there are few articles to date on the specifics of successful exporting of value-added wood products to Japan. There is an increasing need for this Japanese-specific information. The export topic has been researched extensively, however, and many insightful books can be found that relate to the general subject. Several excellent primers are listed as references.

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Workshop Summation: Alaska Value-Added Forest Products

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We have the privilege of making closing comments on this two-day workshop with a few remarks. In this paper we'll do this by touching on four topics:

- Briefly highlight points raised by presenters and panels,
- Address the collaboration necessary to achieve advancement,
- Next steps from this workshop, especially for the Wood Utilization Center, and
- Acknowledge those who made the workshop possible.

Highlights from presenters

Keynote Presentation

Jamie Kenworthy's keynote did a good job of setting the stage by describing the status of the current situation. His major points were:

- The forest products industry's contribution to Alaska's economic base has dropped from 5% in 1965, to 2.3% in 1985, to 1% of Alaska's economic base today.
- There is a lack of a supply chain between producers, a theme repeated by many throughout the workshop.
- Alaska's wood needs are met almost completely by imports since only approximately 10% are produced within the State.
- He emphasized it is not just a lumber market; it is an engineered wood product market.

Mr. Kenworthy suggested improvements for the existing system with the following:

- 1) Need to build on success of lumber grading program through use of a grading system for the market you want to penetrate, as you won't penetrate that market unless you do.
- 2) Alaska needs kiln-drying capacity if it is to build a value-added capability that leverages its high quality resource.
- 3) Need to utilize low-end product and residue with viable markets. We should not treat it as waste to be disposed of at some cost. We need to see it as a potential profit center (e.g., sell as mulch or compost).
- 4) Develop a strategy to build supply chains between producers. Alaska's relative isolation amongst producers makes this a unique challenge.

Jamie's ideas were the beginning of a long list of suggestions throughout the workshop. For example, Phil Woolwine suggested offering smaller timber sales that smaller firms could purchase. We heard suggestions of the need for more careful merchandising to get the highest value products from the raw material. There were multiple requests, like Bernie Brown's, to develop design values for Alaska species so that they can successfully compete in the construction market. Also, Bob Loescher said, due to Alaska's position geographically, it is a global market player and many timber resources are difficult to sell in local markets under current conditions.

Economic Realities

Gunnar Knapp gave us a major dose of economic reality. Processing and product technologies are important but alone they can't solve the red ink on the bottom line. To be successful, we need to create an economic and political environment in which a healthy industry can evolve.

Economic feasibility must be established for each given set of resources, processing technologies, and markets.

Bernie Brown went further and said that subsidies provide a development crutch that keeps the industry from evolving to meet new challenges and thus subsidies keep it from growing stronger in the marketplace. Phil Woolwine helped to describe the reality that producers have to compete with substitutes, emerging markets, and new entrants into the market for the buyer's interest and business. This extends into the forest management and harvesting practices, as well as, the processing and marketing of products.

Forest Resource Management

Dick Zaborske discussed the importance of understanding the future resource situation. For example, under today's management plan we will still be harvesting old growth almost exclusively for the next 50 years. At that time, sizeable acreages of second growth will be coming on line for commercial thinning and smaller tracts of second growth will be available. We have a multitude of silvicultural decisions to make that will have a profound impact on the types of material available for future use. Systems available for use range from partial cutting (including small clearcut openings) to selective harvests. Alaska's high operational costs and environmental concerns with harvesting may leave us with few economically feasible options, but only if we can implement them to maintain biological diversity, address concerns about forest operations, and have a sound strategy for managing forests for all future needs.

Bob Deal gave us a look at past harvesting practices and partial cutting impacts through a 100-year retrospective evaluation of harvested sites. The bottom line from his results is that there are many viable choices about how to grow and harvest trees. We are not locked into a unique set of practices. He found partial cutting concerns about changes in tree composition, reduced stand growth and vigor, increased mistletoe infection, tree wounding, decay and mortality were largely unsubstantiated. Some evidence indicated moderate and heavy cutting intensities had caused some changes in plant communities and diversity.

Paul Hennon showed that we know a lot about forest ecosystems and how to manage them. His example focused on mistletoe and heart rots and concluded there are ways to mitigate them even when partial cutting rather than clearcutting. He also observed that partial cutting provides the options for managers to maintain these diseases at light or moderate levels so that key ecological functions in the stand are preserved. Deal's, Packee's, and Hennon's presentations gave us a glimpse of the increased compatibility between wood production and other forest values that are possible if we work on and actively manage it.

Timber Supply and Primary Product Recovery

There is clearly a lot of concern around the availability and predictability of timber supply. The views ranged from frustration by Dennis Egan and Wes Tyler with the past decisions to reduce federal harvests, to Bernie Brown's point that a stable timber supply is essential to capturing long-term markets for producers, to Jamie Kenworthy's point that timber supply is necessary but not sufficient alone. Ron Wolfe suggested we take a landscape look at supply and Bob Loescher suggested we look at a blended wood basket, not National Forests alone, as a basis for assessing the viability of primary industry and secondary processing options.

Ken Kilborn provided a history and overview of the primary sawmill industry. His analysis is that there are good people in Alaska's wood products sector who are working hard and making headway, but there is still not a state-of-the-art sawmill in Alaska. He advocated development of Alaskan drying capacity with low temperature kilns, determining design values for selective major species for competitiveness in structural grades, studying supply, demand, and markets for wood products, and completion of economic analyses for potential wood product processing operation.

Kevin Curtis did a good job of building on the current situation to see opportunity. He said the lack of a fully developed industry is an opportunity for us to mold an industry with resiliency for the future. Alaska has a high quality timber resource and technology from other regions to build on.

Eini Lowell presented the results of a long history of recovery studies, including studies for lumber, veneer, house logs, and pulp. There is a significant data pool of product yield upon which to build our processing models and economic feasibility results. In addition, she reported on some recent work with thinned stands of spruce and hemlock and found no significant improvements in yield or quality of lumber. Studies have involved work with wind-thrown, beetle-killed, and fire-killed resources. These are all part of the database available for evaluating product options.

Dave Green presented recovery information for lower grade “pulp” logs and showed that with the right manufacturing processes it is possible to gain substantial product yields, especially with good quality assurance, and the value-added possible with drying and planing of those products. He found over 70% of all green lumber produced was graded No. 3 or better and approximately 67% of that (50% of all green lumber) was graded as No.3 or better after drying and planing. The largest challenge cited in this work is to find markets for the lower grades of lumber (50% of all pieces) and the large volume of slabs, edging, sawdust and bark from these lower grade logs.

The bottom line from the recovery studies is that the resource has higher quality than previously assumed and may be marketable at higher levels. Initial investigations indicate that this may also be true of the second growth timber from thinning operations.

Secondary Processing

Jim Reeb described the evolution of the wood products industry in Oregon and Washington, which could, on some level, be a model that Alaska may follow. Harvest from public land in these states has declined, perhaps not as drastically as it has in Alaska. Although industry has found adequate timber supply there, transportation networks and processing facilities required modifications to accommodate new sources of raw material with different characteristics. In order to compete effectively, controlling costs is one of the most important areas on which to focus. Alaska has had many mills close and many jobs lost in the economic downswing that has accompanied the reduced timber supply from public lands. Unlike the preponderance of Oregon and Washington industry, the privately held timber in Southeast sells into a global market that competes aggressively for this high quality Alaskan timber, making it unavailable for sustaining the in-state industry. The survivors in Alaska are wood processors who have been able to efficiently compete through the supply and market fluctuations.

Dan Parrent discussed the ABC’s of planers, an expansion on the paper that will appear in the Proceedings where he addresses a multitude of options for secondary processing. This is a good example of the importance of manufacturing basics, the basics to produce a quality product, to keep costs low, and to keep safe. He also addressed the scale issue, i.e. how to scale equipment to the volume available and still produce a competitive product at a competitive cost. It was yet another example of the need for supporting business partnerships and supply chains.

Catherine Mater provided us with an excellent picture of the non-timber forest products, from Echinacea, salal, and Christmas boughs to character wood. A question: Is this a cottage industry or a major emerging primary market? Does it matter if it provides income? The economic opportunities that non-timber forest products can provide are to be balanced with the sustainable use of these resources. What was clear from Ms. Mater is that significant economic activity can be generated from other forest resources in addition to wood products. It was also another opportunity for showing compatibility and a demonstration that there are more choices.

Market Conditions and Competitiveness in Alaska

Lexi Hill provided us with an overview of the present industry in Alaska from a mill survey which covered aspects ranging from employment to end products. Her survey indicated approximately 240 MMBF of annual capacity in the state with 200 MMBF of that in Southeast. Actual production was 67 MMBF and 55 percent was exported outside Alaska. Tongass timber accounted for 90 percent of all logs used in the state. Suggestions from industry were solicited on the survey and responses included: more local timber sales, more dependable timber supply, and reduce costs for lumber drying.

Scott Miller talked about the potential to penetrate the in-state market for wood products. There are in-state markets, but producers need to do their homework. They need to do their “sales” job (e.g., know their cost structure and technical boundaries their products are suited to meet). Donna Logan, echoing Jamie Kenworthy, reported that Alaska wood products make up a small amount of total wood use in Alaska and some Alaska users had unsatisfactory experiences with Alaska products (most likely due to mis-manufacturing).

John Manthei said, however, that there are profitable in-state markets that can be successfully penetrated if you have a high quality product. Terry Lavalley emphasized the importance of having a sound marketing strategy and following through with marketing plans, customer feedback, and corollary business alliances for market expansion.

Bruce Lippke discussed competitiveness, as Alaska is the high cost producer in the markets it serves. At this time the Asian economic crisis created reduced demand for raw materials and Alaska was hit first. There are several reasons, including: high cost, small facilities, lack of modern equipment, poor use of residuals, transportation challenges, and secondary sector firms are sparse and small. The question is whether you can have a secondary product sector without a primary industry sector? The answer is “Not very easily.” He did list product opportunities such as niche Japanese post and beam markets, Western redcedar decking and siding in the US, engineered and glue-laminated wood members, and laminated veneer lumber.

Summary

When we put all of this together, one thing is clear: We need to be careful not to box ourselves in. A key element for any healthy industry is consistency in raw material supply. That supply needs to be economically viable and environmentally sustainable. Harvesting systems and other management techniques, whether for timber or non-timber forest products, must address these two criteria first, or there will be no potential for the industry to grow or evolve. We hold a lot of promise for value-added processing. It is just one option, and it’s a good one, from a community development standpoint, but only if it is an economically viable business. Several Southeast communities have supported emerging businesses and have taken risks with their limited capital.

In order for value-added processors to have a chance, we must recognize that a primary industry that cuts and processes timber and lumber is a requirement for having a secondary industry. Alaska’s secondary value-added businesses hold the promise of being an industry formed of an accumulation of small firms that can produce unique and high quality competitive products from a relatively small timber supply. It will likely have to rest on a more fully developed primary processing industry than exists now.

We also need to think in a broader context of “industry” than value-added secondary wood products alone. The non-timber forest products potential points out that we need to think of all natural resources in identifying economic opportunities. However, utilizing non-timber or special forest products (SFP) requires us to pay just as much attention to sustainability and harvesting practices as we would with timber. Although SFPs have traditionally been small business operations, the market value for many of these products has brought increasing numbers of entrepreneurs, most of them still operating as sole-proprietor or small businesses, into the forest to capture these market demands.

We can also identify a set of corollary needs for a healthy forest products (timber and non-timber) industry in Alaska. Required elements for business success are effective market research and business planning, production efficiency, business collaboration and marketplace alliances, and general infrastructure for the full range of community-based businesses. That infrastructure should include markets and economic forecasting, technical and economic feasibility support, and technical and business development assistance. The bottom line is that there are choices and there are opportunities. We aren’t captured by the past. Our job is to work together to create more choices by collaborating.

Collaboration

Building from the theme at this meeting of supply chains, the need for more fully developed market partnerships clearly shows that we need to work together. No one of us has all the answers, but each of us can contribute a piece of the whole. We need to recognize that there are options and we can create more options as follows:

- o It is clear that we need to connect users of the information in the industry, communities, and managers with the people who can provide the information.
- o PNW's Alaska Wood Utilization R&D Center here in Sitka can support that liaison role to bring parties together and to assemble information that helps users make informed choices and explore new opportunities.
- o We feel we can do that in an open interactive process rather than responding to a fixed advisory board.

To begin our dialogue, all that those of us in the information business can do is provide data, which others use to support their discussion. We can work with you in that discussion to better identify the data, information, and analyses you need to explore. Our research and development role should be one that provides factual and science-based responses to an evolutionary set of questions and options. In the end it is the land managers, the private sector firms, and the communities who need to decide if there really are opportunities or not.

Next Steps

- 1) The PNW Station will publish the papers submitted by the speakers at this workshop.
- 2) We are working with the University of Alaska Fairbanks to plan another similar workshop in the Interior during the year 2000.
- 3) We are in the final stages of staffing the Wood Utilization R&D Center with five people.
- 4) We are also still working to secure the funding for the Center. This past nine months we have been operating on funds gathered from all FS research stations. We are optimistic that the Center will have specific funding for its operations in the 2001 budget.
- 5) As staff gets on board and builds upon the ideas from this workshop, we will begin to focus the Center's priorities. We will engage further with users and other information providers in concluding priorities for the Center's plan of work.
- 6) As with other PNW Research Station efforts, like the Science Findings series, the Proceedings from this workshop will be published so it is available to a wide audience. All our publications will be available on our web page.

Acknowledgements

So many people and entities made this workshop the success it was. We salute the co-chairs, Dan Parrent and Bob Gorman, who worked with Ted Laufenberg and Bridget Brady to shape the sessions, speakers, and scope of the workshop. We also thank the session chairs that provided excellent facilitation for discussion and, lastly, the speakers, including those who shared their experiences by participating in the user panels.

We contracted with almost a dozen consultants this spring for the express purpose of consolidating and analyzing all current information for your benefit here at this workshop. Our speakers were exceptionally responsive to the short timeframe to prepare their reports and deliver these presentations. (Consider that only 5 months have passed since we began planning for this workshop.)

"Hats off " to our small business exhibitors and poster presenters at Monday night's session who bathed us in tangible, palpable, and, demonstrably economically viable products, crafts, arts, and services. We'd be remiss not to mention, with appreciation, all the contributions of a whole host of Alaskans who worked with the organizers to coordinate logistics, including the 3 days of sunshine, and made our gathering a most pleasant experience.

The sponsors were revealing in the diversity of their composition. They included universities, federal agencies, and state agencies, the City and Borough of Sitka and the Society of American Foresters and other NGOs. The real thanks go to the participants from the wood products industry, the communities, and the land managers who contributed their experience and are the real audience for the ideas generated. This workshop builds on those experiences before us and lends strength to our collaborative efforts that will follow.

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Appendix II. Program

Linking Healthy Forests and Communities Through

Value-added Alaska Forest Products

A Workshop on Technology & Utilization Opportunities

Sitka, Alaska

September 26, 1999 - **Westmark Shee Atika Banquet Room**

5:30 pm - Evening reception and registration

September 27, 1999 - **Harrigan Centennial Hall**

8:30 am - Opening Session - Thomas Mills, Session Chair

Welcome from the City of Sitka - Stan Filler, Mayor and Gary Paxton, Administrator,
City & Borough of Sitka

Workshop Opening Address: James Lyons, USDA Under Secretary for Natural
Resources and the Environment

Region 10 National Forests: Practices and Purpose in Evolution - Rick Cables,
Regional Forester

Pacific Northwest Research Station: A Laboratory's Role in Alaska - Thomas Mills,
PNW Station Director

Keynote Presentation: A Vision for Revitalized Industry

Jamie Kenworthy, Director, Alaska Science and Technology Foundation

Break - 9:45 - 10:00

10:00 am - Linking healthy forests, communities, and industry - Charles G. Shaw, Session
Chair

Natural resource use across ecological, economic, and political landscapes - Gunnar Knapp,
University of Alaska

Alaskan forest stewardship- Jim Caplan, Deputy Regional Forester, Region 10, Forest Service

Alaskan forests and community dynamics - Michael Johnson, State Division of Trade and
Economic Development

Societal views of forest products manufacturing when overlain with recreation, tourism, or other
non-consumptive forest uses - Bob Schroeder, PNW Forestry Sciences Laboratory

Users panel: Dennis Egan, Mayor, City and Borough of Juneau

Paige Else, Sitka Conservation Society

Bob Loiselle, Shee Atika Corporation

Lunch - 12:00 - 1:15 (on your own)

Afternoon - September 27, 1999

1:15 pm - Assuring future forest potential - Mike McClellan, Session Chair

The Southeast Alaska Timber Resource & Industry: What Might the Future Hold? - Dick Zaborske, FS Region 10

The Possibility of New Silvicultural Systems: A Retrospective - Bob Deal, PNW-Forestry Sciences Laboratory

Timber merchandising systems and timber sale implications - Phil Woolwine, Columbia Consulting

Fire, insect, and disease management:

Interior Forest Agents of Change - Bob Wheeler and Ed Packee, Univ. of Alaska

A Coastal View - Paul Hennon, S&PF and PNW Forestry Sciences Laboratory

Users panel: Ron Wolfe, Sealaska Corp.

Chris Maisch, Tanana Chiefs Conference Inc./State Department of Forestry

Lisa Winn, Tongass National Forest

Break 3:00 - 3:15

3:15 pm - Enhancing value in lumber and engineered timber products - Jamie Barbour, Session Chair

Sawmilling technology application in commodity products - Ken Kilborn, Sawmill Assistance Service

Lumber and veneer recovery and quality in Alaskan timber - Eini Lowell, Pacific Northwest Research Station

Grading options for western hemlock pulp logs - David Green, Forest Products Laboratory

Engineered wood products, components, and systems - Kevin Curtis, PE

Users panel: David Stein, Stein & Volk

Sally Mikkelsen, Arctic Log Homes

Wes Tyler, Icy Straits Lumber

5:30 - 8:00 pm - Evening reception and exposition of value-added forest products and services

Harrigan Centennial Hall

The following is our present list of poster presentations and displays. Please let us know if you would like to participate.

Manufacturers and artisans from Alaska:

- Log Homes - Sally Mikkelsen
- Bluster Bay Woodworks - Terry Lavallee and Kristie Sherrodd
- Furniture - Beth Antonsen and Steve Little
- Custom Woodworking - John Manthei
- Sea Otter Woodworks - Bill Finlay

Tongass special forest products - Phyllis Woolwine, Mary Stensvold and Bob Gorman
 PNW Special Forest Products - Becky Kernes and Leon Legal (Bridget Brady, contact)
 Forest Products Manufacturing Project and WWPA - Dan Parrent and Mike McGuigan
 USDA-FS Pacific Northwest Research Station - Cindy Miner
 Juneau Forest Service Library - Lillian Petershoare and Bernie Carrey
 Alaska Yellow Cedar potential - Paul Hennon and David Green
 Yellow Cedar Heartwood Stain - Mark Schultz, Paul Hennon(contact)
 Log sort yards potential and effectiveness - Gerry Jackson
 Double diffusion treatment for Alaska wood species revisited.- Doug Crawford, David Schuman,
 and Lee Gjovik
 Engineered wood systems and timber transportation structures - Lola Hislop and Jim Wacker
 USDA Foreign Agriculture Service, Global market and trade potential - Roseanne Freese
 UA-Fairbanks- Cooperative Extension Wood Products Program - Bob Wheeler
 UA-Southeast - Forest Products Training and Entrepreneurial Development Center - John
 Carnegie
 Mount Edgecumbe Trail - Annemarie LaPalme
 CINTRAFOR - Center for International Trade in Forest Products - Rosemarie Braden and Bruce
 Lippke
 Oregon State University Extension Networking Demonstration - Bob Love

September 28, 1999 Sheet'ka Kwan Naa Kahidi Community House, 200 Katlian Street

8:00 am - Maximizing value in secondary processes and specialty products - Susan LeVan,
 Session Chair

A Northwest perspective on secondary processing - Jim Reeb, Oregon State University

Value-added Alaskan potential through secondary processes - Dan Parrent, Wood Products
 Development Service

Specialty craft uses and special forest products - Catherine Mater, Mater Engineering

Users panel: John Manthei, Custom Woodworking

Phyllis Woolwine, Region 10 Special Forest Products Coordinator

Terry Lavalley, Bluster Bay Woodworks

Break 9:45 - 10:00

10:00 am - Assessing market conditions and Alaska's competitiveness - Richard Haynes,
Session Chair

Profile of the Alaskan industry: Capacity and composition - Alexandra Hill, University of Alaska

Primary and secondary market potential in Alaska - Donna Logan and Scott Miller, McDowell
Group

Pacific Rim and Global market outlook for Alaskan products - Bruce Lippke, CINTRAFOR

Users panel: Michael Johnson, Alaska Department of Commerce & Economic
Development

Bernie Brown, Alaska Spruce Products

Roseanne Freese, USDA Foreign Agriculture Service

Workshop wrap-up:

Future Directions for the Alaska Wood Utilization R&D Center - Ted Laufenberg

Closing remarks for the Value-added Alaska Forest Products Workshop - Thomas Mills

Lunch

1:30 pm to 4:30 pm - Special Session: Focus Group, Panel, and Discussion

Break 3:00 - 3:15

Future Timber Resources, Products, and Markets

This is a continuation of an August 24th & 25th workshop held in Juneau, Alaska, designed to
provide a future market perspective to forest management and silvicultural practices in
Alaska. Please feel free to participate in this open discussion.

Coordinated by:

The *NEW* USDA-Forest Service, **Alaska Wood Utilization R&D Center**

Evaluating opportunities for forest products industries in Alaska

Hosting sponsors:

USDA-Forest Service's

Pacific Northwest Research Station and Region 10

Forest Products Laboratory, Cooperative State Research Education & Extension Service, and
Rural Development

Wood Products Development Service- Juneau Economic Development Council

University of Alaska; Anchorage, Fairbanks, and Southeast

Alaska Science and Technology Foundation

Society of American Foresters - Sitka Chapter

City and Borough of Sitka

Appendix III. Author Biographies

Rose Braden

Rose Braden is an analyst for the Center for International Trade in Forest Products (CINTRAFOR). She analyzes trade patterns relating to forest products and competitive relationships between international suppliers. Recent research includes a competitive assessment and market entry strategy plan for structural and non-structural building products in South Korea and an analysis of the competitive position of western red alder in Europe. She holds a M.A. in environmental policy with additional work in forest products marketing from the University of Washington. She also worked for several years for the Department of Interior Office of Environmental Policy and Compliance in Anchorage, Alaska.

Bridget Brady

Bridget Brady has the distinction of being the first employee for the PNW's newest research location, the Alaska Wood Utilization Research and Development Center, in Sitka. She functions in a multitude of capacities at this evolving center: administrative support specialist, technical information specialist (focus on non-timber forest products), and workshop coordinator. Prior to joining the Center she provided editorial and technical support for a Tongass timber sale planning team. From 1990 through 1998 she served with the Tongass Chatham Area Engineering Team providing field inspection of contract work and was resident CAD specialist for developing drawings, plans, and specifications. Her engineering team projects included District Offices, seasonal housing units, road designs, campgrounds, and trails. Prior to her work in Alaska, she was a member of an elite Forest Service Hot Shot crew in Region 5 and worked on National Forests supervising and working as a member on trail crews utilizing wilderness pack trains, and servicing campgrounds. She earned a B.S. degree in Park Administration from Cal-Poly Pomona and an associate degree in Liberal Arts from Napa College. Her core interests include natural resource education, special forest products, herbal treatments and uses, and the development and health of small businesses.

Kyle Cunningham

Kyle Cunningham is a research assistant for CINTRAFOR, pursuing a graduate degree in forest products marketing at the University of Washington. His recent research includes analyzing the performance of Pacific Northwest firms exporting wooden building materials to Japan during the Asian downturn. His future research interests are the certification of forest products in developing tropical countries and developing markets for certified products. He holds a Bachelor of Forestry with a major in Wood Science from West Virginia University.

Kevin Curtis

Kevin Curtis is the owner of Alaska Forest Products Development based in Wasilla, Alaska. Prior to beginning his own consulting firm, he was on the faculty of the University of Alaska, Fairbanks. His expertise is in engineered structures and in advanced wood products processing and treatment. He holds a doctorate in engineering, is a registered Professional Engineer, and is a member of the Forest Products Society.

Bob Deal

Bob Deal received a B.S. in Biology from the Evergreen State College, a M.S. degree in Silviculture from the University of Washington and recently finished his Ph.D. from Oregon State University. He has been working in silviculture/forest ecology for 20 years including four years in western Washington and Oregon and the last 16 years in Southeast Alaska. His research interests are broad and include applied silviculture for multiple objectives, stand overstory/understory interactions, stand dynamics, regeneration and silviculture in general.

Ivan Eastin

Ivan Eastin has a joint faculty appointment with the College of Forest Resources and the Center for International Trade in Forest Products (CINTRAFOR) at the University of Washington. He teaches graduate and undergraduate courses in Forest Products Marketing and the International Trade and Marketing of Forest Products. His research interests include evaluating the factors that influence the introduction and acceptance of lesser-used timber species, exploring the substitution between softwood lumber and substitute materials in the US residential construction industry, and evaluating the factors that influence the transfer of North American 2x4 residential construction technology in Japan. He lived in west Africa for four years; first as a Peace Corps volunteer where he worked as a faculty member at the University of Liberia in Monrovia and later as a Fulbright scholar at the Forestry Research Institute of Ghana in Kumasi.

David Green

David Green is the project leader of the Engineering Properties of Wood research work unit at the Forest Products Laboratory, Madison, WI. Prior to coming to FPL, in 1979, he conducted research in private industry and was a university professor. He is an internationally recognized expert in the grading and mechanical properties of lumber and the effects of moisture content and temperature on lumber properties. He is a past Chair of subcommittee D07.02 (Lumber) of the American Society for Testing and Materials and is currently the technical advisor to the American Lumber Standards Committee. His current studies on Alaskan species include grade yields of lumber cut from western hemlock "pulpwood" and the properties of salvaged dead Alaskan yellow-cedar.

Gunnar Knapp

Gunnar Knapp has been a Professor of Economics with the University of Alaska Anchorage's (UAA) Institute of Social and Economic Research since 1981. He holds a Ph.D. in Economics from Yale University. He has written numerous research reports on the Alaska economy, Alaska resource management, and markets for Alaska resources. At UAA, he teaches courses about resource economics and the Alaska economy. He has prepared reports for the Forest Service on Native corporation timber harvests and for the State of Alaska on railbelt lumber markets and the effects of wildfire on Alaska resource values.

Paul Hennon

Paul Hennon is a Research Forest Pathologist in a shared position with USDA Forest Service: State and Private Forestry, Alaska Region and the Forestry Sciences Laboratory, Pacific Northwest Research Station, stationed in Juneau, Alaska.

Education:

B.S., San Francisco State Univ., Plant Ecology
M.S., Oregon State University, Forest Pathology
Ph.D., Oregon State University, Forest Pathology

Major research interests:

Biology and management of Alaska yellow-cedar

Causes and epidemiology of yellow-cedar decline

Evaluating the resource of dead yellow-cedar

Biology and management of dwarf mistletoe

Biology and management of heart rot fungi

Role of disease in small-scale disturbance and stand management

Alexandra Hill

Alexandra Hill joined the UAA's Institute for Social and Economic Research (ISER) in 1989 and has analyzed complex data sets for many projects, including studies of Alaska's timber industry, fisheries policy, and ISER's Fiscal Policy Paper series. She collects data, manages databases, writes reports, and creates graphics for ISER publications.

James Kenworthy

Jamie Kenworthy has been Executive Director of the Alaska Science and Technology Foundation since 1995. Prior to assuming this position, he managed the technology programs for the Michigan Strategic Fund, the state of Michigan's bank for long-term economic development. In that position he worked with auto manufacturers and universities to help establish a number of industry-university centers in manufacturing and materials processing. He served on the executive committee of NSF NET, the backbone of the Internet from 1987-1995, and the Board of the Environmental Research Institute of Michigan, a remote sensing organization.

Ken Kilborn

Education: Colorado State University, Fort Collins, Colorado

BS Wood Utilization, 1961

MS Natural Resource Administration, 1971

Professional Work Experience:

Colorado State Forest Service / Colorado State University

1961-1967, District Forester

1967-1973, Marketing and Utilization Forester/Extension Forester

1973-1975, Assistant State Forester

USDA Forest Service, Forest Products Specialist

1975-1977, Region 4, Ogden, Utah

1977-1984, Region 10, Anchorage, Alaska

1984-1988, Region 1, Missoula, Montana

1988-1994, Northeastern Area, Durham, New Hampshire

1994-1997, Region 10, Anchorage, Alaska

Sawmill Assistance Service, Consulting services for wood products industry

1997-1999, Anchorage, Alaska

Present – USDA Forest Service, Alaska Wood Utilization R&D Center

Professional Societies:

1959-Present, Forest Products Society

1964-Present, Society of American Foresters

Theodore Laufenberg

Ted Laufenberg was selected to lead the USDA Forest Service (FS) Pacific Northwest Research Station's (PNW) Wood Utilization R&D Center's programs, staffing, and partnerships during its inaugural year of operation (1999) in Sitka, Alaska. Prior to this assignment, he was at the Forest Products Laboratory (FPL) in Madison, Wisconsin. At FPL since 1980, he has participated in developing the material science and engineering principles for laminated veneer lumber (LVL), oriented strand board (OSB), and an array of structural fiber products. Other special assignments for the FS have concerned wood and paper recycling, forest products market development in Asia and Eastern Europe, and North American Free Trade. Prior to joining the FS, he worked for Boeing/McDonnell Douglas in advanced composite materials R&D for aerospace applications. He has authored/co-authored over 70 papers and books in the forest products and advanced composites fields. He earned his engineering degrees from the University of Wisconsin - Madison. He is a member of the American Society of Civil Engineers, Forest Products Society, American Society of Testing and Materials, and holds a Professional Engineer license and Emergency Medical Technician registrations in Wisconsin and Alaska.

Bruce Lippke

Bruce Lippke is the director of CINTRAFOR, the University of Washington's Center for International Trade in Forest Products in the College of Forest Resources, as well as the College's Associate Dean of External Initiatives. CINTRAFOR provides an interdisciplinary program of research, outreach, and teaching focused on international trade of forest products and its importance to the Pacific Northwest and the nation as well as the economic impacts of policies and supply constraints. The center works closely with industry, trade associations, and state and federal agencies.

Lippke was formerly the President of Wharton Econometrics in Philadelphia, the founding company in econometric forecasting, and for 12 years was the manager of Marketing and Economic Research at Weyerhaeuser. He served on many interdisciplinary teams responding to pollution and forest management regulations, and has provided frequent expert witness testimony on regulatory impacts, trade, housing, capital markets, and tax legislation. He holds an MS in Industrial Engineering from UC Berkeley, an MS in Electrical Engineering from New Mexico State University, has completed additional graduate work in economics and holds an Executive MBA certificate from the University of Washington. He was a co-founder of the National Business Economic Issues Council, a past chairman of the Conference of Business Economists, a member of the council of economic advisors under five governors for the state of Washington, and is currently a member of the National Association of Business Economists, the Forest Product Society, the Society of Wood Science & Technology, and the Society of American Foresters.

Donna Logan

Donna Logan holds a Master of Arts Degree in International Political Economy from the Norman Paterson School of International Affairs and a Bachelor of Arts Degree from the Institute of Soviet and East European Studies, both from Carleton University in Ottawa, Canada. Prior to joining the McDowell Group in 1998, she worked six years for the State of Alaska's Department of Commerce and Economic Development. As a trade specialist for the Division of Trade and Development, she was responsible for Alaska's export development for the markets of Russia, Canada, Europe, Central and Southeast Asia. Prior to moving to Alaska, she worked as a researcher for an international trade and investment consulting firm in Ottawa, Canada.

Eini C. Lowell

Eini Lowell received her B.S. degree in Forestry with a Wood Science and Technology emphasis from University of Maine at Orono. Her M.S. degree in Forest Products was obtained at Oregon State University. Following graduate school, she worked for the Maine Department of Conservation in the Forest Products Marketing and Assessment Program. During the mid-1980's, she had her own consulting business working with biomass energy companies on resource analyses. In 1987, She returned to Oregon to work for the Forest Products Department at Oregon State University, focusing on wood quality research. In 1990, she joined the Ecologically Sustainable Production of Forest Resources Team (formerly the Timber Quality Research team) as a scientist at the Pacific Northwest Research Station in Portland, OR. Her work has included studies on deterioration of dead and dying trees, utilization of hardwoods, and opportunities within ecosystem management for using small diameter trees with an emphasis on value-added opportunities.

James R. Lyons

James R. Lyons was sworn in as Assistant Secretary of agriculture for natural resources and environment on May 12, 1993. He was nominated by President Bill Clinton on March 9 and confirmed by the Senate on May 11. His primary responsibilities are to direct the policies and supervise the activities and programs of the U.S. Department of Agriculture's Forest Service and the Natural Resources Conservation Service (formerly the Soil Conservation Service). On October 20, 1994 as a part of the USDA reorganization, his position was elevated to that of Under Secretary for Natural Resources and Environment.

The Forest Service administers programs for applying sound conservation and utilization practices to the national forests and national grasslands, for promoting these practices on all forest lands and for carrying out extensive forest and range research. The Natural Resources Conservation Service has the responsibility for developing and carrying out a national conservation program in cooperation with landowners, community planning agencies and regional resource groups, and with other federal, state and local government agencies.

Before being appointed to his present position, Lyons served from 1987 - 1993 as a staff assistant with the House Committee on Agriculture, where he was responsible for the policy and legislative activities of the committee affecting forestry and natural resources, conservation, environmental issues, pesticides, and food safety. Within that period, from 1989 through 1991, he was also the agricultural advisor to former Congressman Leon Panetta (D-Calif.). From March through December 1986 he was the staff director for the Subcommittee on Forests, Family Farms, and Energy, Committee on Agriculture. From April 1982 through March 1986 he served as director of Resource Policy for the Society of American Foresters in Bethesda, Md. He was a program analyst with the U.S. Fish and Wildlife Service, U.S. Department of the Interior, 1979-82.

He received a B.S. degree in forest and wildlife management with high honors from Cook College, Rutgers University, in 1977, and a Master of Forestry degree from Yale University in 1979.

Catherine Mater

Catherine Mater is Vice President of Mater Engineering, Ltd. - a forest products consulting engineering and markets research firm servicing worldwide clients for over 50 years. She is a recognized expert in value-added wood products manufacturing and marketing and has assisted global corporations, governments, communities, and small processing operations in the field throughout North America, South America, Europe, and Asia.

In 1991, Mater was contracted by the USFS to conduct the nation's first major marketing effort in special forest products on national forest systems. In 1993, the President of the U.S. selected her

to present at the historic Timber Summit, and again in 1995 at the White House Pacific Rim Economic summit on value-added wood products and special forest products. In 1997, she was selected as a Senior Fellow of The Pinchot Institute in Washington D.C. for her leadership role in the U.S. in sustainable forestry policy and practices. She is a distinguished lecturer at Yale University, University of California Berkley, and Pennsylvania State University, and has co-authored *The Business of Sustainable Forestry* recently published by The John D. and Catherine T. MacArthur Foundation.

Mater received a BS in Political Science, and an MS in Civil Engineering from Oregon State University.

Scott Miller

Scott Miller holds a Masters Degree in Public and Private Management from the Yale School of Organization and Management. He joined the firm in 1997. Before that he was a Senior Associate with Brody & Weiser, a Connecticut-based consulting firm. His clients included the Ford Foundation, the James Irvine Foundation, American Public Radio, the Prudential Insurance Company and a variety of others. Since joining the McDowell Group in 1997, he has managed a variety of projects: the development of a fee model for the Alaska Department of Environmental Conservation, a study of in-state markets for Alaska wood products, and an assessment of Alaska's Guardianship System.

Thomas Mills

Tom Mills is the Director of the Pacific Northwest Research Station for the Forest Service. He received a B.S. in Forestry at Michigan State University in 1968 and continued on at Michigan State University in Forest Economics, receiving a M.S. in 1969 and a Ph.D. in 1972.

Mills started his Forest Service career with Forest Resources Economics Research Staff. In 1975, Tom moved to the Rocky Mountain Forest and Range Experiment Station in Fort Collins, Colorado where he continued working on the economic efficiency of silviculture and estimates of long-term timber supply. In 1978, he moved to the Pacific Southwest Forest and Experiment Station in Riverside, California. As Project Leader of the Fire Management Planning and Economics research work Unit, he spent 6 years studying the economic efficiency and risk of wildland fire management.

Mills returned to Washington, D.C. in 1984 to serve as Group Leader of Economics Research in the Forest Resources Economics Research Staff. By 1985 he became Staff Assistant for the Deputy Chief for Research, responsible for coordinating development of the Research annual budget. In 1988, he served as the Director of the Policy Analysis Staff before becoming the Director of the Resource Program and Assessment Staff. In May of 1990, he was named Acting Associate Deputy Chief for Programs and Legislation for the Forest Service, while the occupant of the position was on foreign assignment. In July of 1991, he became the Associate Deputy Chief for Programs and Legislation.

Edmond Packee

Edmond Packee received his B.S. of Forestry from the University of Montana in 1962, his Master of Forestry from Yale University School of Forestry in 1963, and his Ph.D. from the University of Minnesota in 1976 where his emphasis was Silviculture with a minor in Plant Ecology. He worked extensively throughout the western and northern United States and joined the USDA Forest Service on the Hayward District of the Chequamegon National Forest in 1966. In 1967 he joined MacMillan Bloedel Limited Woodlands Services as Silviculturist and finally Senior Silviculturist with responsibilities covering the west coast of British Columbia. He joined the University of Alaska Fairbanks in 1983 and is currently Associate Professor of Forest Management. He is a Certified Forester and Certified Professional Soil Scientist. He has authored/co-authored 8 juried

and 20 proceedings papers plus numerous other publications. He is the technical forestry consultant to Alaska Forest Refinery, Inc. investigating the feasibility of an Acid Catalysed Organosolv Saccharification Plant for the production of ethanol and other wood-derived chemicals for northeastern Alaska.

Daniel J. Parrent

Education:

State University of New York, College of Environmental Science and Forestry
Bachelor of Science, Forest Biology, May 1977
Major: Silvics and Silviculture
Minor: Entomology

Work Experience:

1998 – present: Forest Products Technical Specialist, Juneau Economic Development Council, Sitka, AK.
1988 – 1998: Senior Forester, Utilization and Marketing, New York State Dept. of Environmental Conservation, Bath, New York.
1996 Administrative Supervisor, CyTech Hardwoods, Amsterdam, New York.
(on leave from NY).
Senior Forester, Utilization and Marketing, and Coop Forest Management.
1985 – 1988: Catskill, New York and Cortland, New York.
1983 – 1985: Senior Forester, Cooperative River Basin Planning, Cortland, New York.
1981 – 1983: Forester, Utilization and Marketing, Stamford, New York.
1979 – 1981: Woods Supervisor, James M. Vardaman Co., Albany, Georgia.

Jim Reeb

Jim Reeb has a BS degree in Zoology and a MS degree in Forest Resources from Oklahoma State University. Prior to receiving his Ph.D. in Forest Products Operations Research from Texas A&M University, he was the Wood Products Extension Specialist at the University of Kentucky for four years. While at the Univ. of Kentucky, he worked extensively with eastern hardwood mills and value added wood products firms. Since 1994, he has been the Wood Products Extension Specialist at Oregon State University. His research and extension activities include process modeling, operations research, and exploring new techniques to add value to lower quality wood.

Robert A. Wheeler

Education: Ph.D. Forestry, Purdue University 1993

B.S. Science Education, Oregon State University 1986
M.S. Forest Genetics, Colorado State University 1978
B.S. Forest Management, Oregon State University 1973

Work Experience:

1997- present, Forestry Extension Specialist for the Alaska Cooperative Extension, University of Alaska Fairbanks. Emphasizing Forest Products and Forest Resource Mgmt. Editor of "Under The Canopy" Newsletter.
1995-1996, Timber Sales Specialist: Responsible for the development and administration of timber sales for the Southern Land Office.
1993 - 1994, Adjunct Professor of Forestry: Provided forestry instruction at Alemaya University in Ethiopia under contract with the World Bank. Courses taught include Forest Management, Economics, Surveying and Aerial Photography, Forest Policy, and Agroforestry.
1987 - 1991, Research Associate: Director of Field Research on Short Rotation Woody Biomass Project for the University of Hawaii in cooperation with the Hawaii Natural Energy Institute.

Phil Woolwine

Phil Woolwine has extensive management and consulting experience in the forest products industry. As a senior executive he has been responsible for operations encompassing timberlands, lumber manufacturing, specialty plywood products, pulp mills, silva-chemical products and export log sales to the Far East. Other industry experience includes development of timber management programs, capital planning, acquisitions and expansion projects. As a consultant, he has served many forest products companies as well as investor groups, financial institutions, governments and international agencies. Client projects include formation and development of new business ventures, negotiation of business agreements, international market investigations, purchase and sale of timberlands and development of company strategies and performance improvements.

Dick Zaborske

Dick Zaborske is the Group Leader for Silviculture and Inventory for the Alaska Region of the USDA Forest Service. He is also the Regional Silviculturist, a position he has held for the past five years. He has over 10 years experience in Alaska, serving as the Alaska Region timber Planner (two years) and three years on a planning team in Sitka. He has a Bachelors of Science Degree in both Forestry and Resource Management from the University of Wisconsin at Stevens Point (1977) and a Masters of Forestry Degree in Forest Engineering from Oregon State University (1988). He is a Certified Silviculturist with the Forest Service and a Society of American Foresters Certified Forester.

Metric conversion factors

English unit	Conversion factor	SI unit
inch (in.)	25.4	millimeters (mm)
foot (ft)	0.3048	meter (m)
square foot (ft ²)	0.093	square meter (m ²)
cubic foot (ft ³)	0.028	cubic meter (m ³)
board-foot (BF)	2.36×10^{-3}	cubic meter (m ³)
thousand BF (MBF)	2.36	cubic meter (m ³)
pound (lb) mass	0.454	kilogram (kg)
pound (lb) force	4.45	Newton (N)
pound per cubic foot (lb/ ft ³)	16.0	kilogram per cubic meter (kg/m ³)
pound per square inch (psi)	6.895	kilopascal (kPa)
acre	.4047	hectare (ha)
acre	4.047×10^3	square meters (m ²)
ft ² /acre	0.230	m ² /hectare
ft ³ /acre	0.070	m ³ /hectare
pint	473	milliliters (ml)
quart	.946	liters (L)
gallon	3.785	liters (L)
bushel	.03524	cubic meter (m ³)
barrel	159	liters (L)

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The Forest Service of the U.S. Department of Agriculture is dedicated to the principle of multiple use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research, cooperation with the States and private forest owners, and management of the National Forests and National Grasslands, it strives --- as directed by Congress --- to provide increasingly greater service to a growing Nation.

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