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Proceedings: Linking Healthy Forests and Communities—Successful Strategies and Future Directions

October 19-21, 2003

Anchorage, Alaska

Compiler

David L. Nicholls is a research forest products technologist, Alaska Wood Utilization Research and Development Center, 204 Siginaka Way, Sitka, AK 99835.

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USDA Forest Service
Pacific Northwest Research Station,
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Alaska Wood Utilization Research and Development Center

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The Linking Healthy Forests and Communities conference brought together a diverse group representing government agencies, traditional forest users, landholders, scientists, and small enterprises and other businesses related to nontimber forest products. The purpose was to exchange information, encourage cooperation, and raise awareness of environmentally and economically viable wood-products-related opportunities in Alaska. These proceedings include extended summaries of presentations by speakers and panelists at the conference. Summaries were compiled and edited by the USDA Forest Service, Alaska Wood Utilization Research and Development Center.

Keywords: Forest products industry, value-added wood products, nontimber forest products, manufacturing, marketing, Alaska

English Units

When you know:	Multiply by:	To find:
Inches (in)	2.54	Centimeters
Feet (ft)	.3048	Meters
Miles (mi)	1.609	Kilometers
Acres (ac)	.405	Hectares
Square feet (ft^2)	.0929	Square meters
Square miles (mi^2)	2.59	Square kilometers
Gallons (gal)	3.78	Liters
Pounds (lbs)	.454	Kilograms
Tons (ton)	.907	Tonnes
Degrees Fahrenheit	(F-32)/1.8	Degrees Celsius
British thermal units (Btu)	1,050	Joules

Summary

Small-business people, crafters, and community members from across Alaska joined with Forest Service representatives to share information and ideas at the second "Linking Healthy Forests and Communities" conference in Anchorage. Topics included what processes were working well for wood products producers, the role of both private and public sectors in forest management, various methods of utilizing birch, and the potential for developing underutilized resources. Most attendees work in the Alaska wood products industry, and they were able to discuss problems and possible solutions both in the formal sessions and afterwards.

Keynote speaker was Becky Hultberg, Special Assistant to Alaska Governor Frank Murkowski. The first afternoon split session featured several small businesses and crafts people. Speakers discussed how to successfully operate a small mill, the challenges facing Alaska's birch syrup industry, potential alternative energy sources, and productive uses of wood wastes.

The final session, on the second afternoon of the conference, featured four "Success Stories," Alaska wood products entrepreneurs who have each developed unique formulas for success in their businesses. Located from Fairbanks to Craig, these four businesses have prospered despite the challenges facing the state's wood products industries. Following the completion of the morning session, a tour of the Ulu Factory and Alaskan Wood Mouldings completed the conference.

Linking Healthy Forests and Communities: How Do We Measure Success?

Richard Haynes[1]

Introduction

The central concern of this conference is the link between healthy forests and communities. Another way to describe this is that we are concerned with the role that forests play in the economic development of a region and its associated communities.

This concern has long been of interest to the forestry profession where it is often expressed as community stability. The early manifestation of this interest was foresters who advocated forest management arguing that the sustained flows of timber coming from managed forests would provide a stable level of jobs and income for residents of communities near (or in) managed forests. The events of the last century have suggested a more ambiguous view (see Society of American Foresters (1989) for a discussion). Nevertheless, advocates of forest management have argued that development of forest resources offers some areas opportunities for economic growth. In addition the World Commission on Environment and Development (WCED 1987) report expanded the debate from sustainable forestry to sustainable development which now includes concerns about the social well-being[1] of associated human communities.

It is my purpose to explore how we measure healthy communities and what we know about the determinants of economic growth and development. This will provide some background for the other presentations.

Evolution in Terms

The past two decades have seen an evolution in the terms we use to depict communities that have distinct connections to forest resources. The evolution in terms such as community stability, forest dependence, forest-based, community capacity, community resiliency, and now with the Montréal Process[2], community viability and adaptability reflect an evolving emphasis on the complex, dynamic, and interrelated aspects of rural communities and the natural resources that surround them. The earliest terms dealt with the links between improved forest management and stable communities achieved through stable employment. By the late 1980s, the notion of community stability as reflective of sustained-yield timber management was being questioned (Schallau 1989, Lee 1990, Richardson 1996). Competing definitions of communities added further confusion. The earlier definitions relied on economies (defined by transactions to allocate scarce resources among people) and placed most

1 *USDA Forest Service, Pacific Northwest Research Station, Portland, OR*

2 *Well-being is used in the contemporary sense that reflects both jobs (economic well-being) and community attributes contributing to notions of community stability*

3 *The United States is a signatory participant of the Montréal Process for assessing progress toward sustainable forest management. See www.mpci.org for a description of the Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests*

emphasis on economic well-being often expressed in terms of jobs. Newer definitions for communities rely on concepts like sense of place, organization, or structure. The spatial configurations of both differ with economies generally being spatially the larger of the two.

These broadening definitions beyond employment indicators lead to more comprehensive attempts to assess community well-being (Kusel and Fortmann 1991, Doak and Kusel 1996). Concurrent with discussions about stability and well-being were discussions about the term *forest dependence*, including several attempts to redefine that term (Richardson and Christensen 1997). Forest and timber dependence were initially defined in terms of commodity production. Most communities have mixed economies and their vitality is often linked to other factors besides commodity production (see Haynes and others 1996, Horne and Haynes 1999). These mixed economies argue for redefining the term *forest dependence* to emphasized that economic conditions in some communities are not wood product-based, but reside in recreation and other amenities (Kusel 1996). Another concern was that the term *forest dependence* did not reflect the local living traditions and sense of place held by many communities (Kusel 1996). This broader connotation of the term *forest dependence* is often what is implied by the term *forest-based*.

New terms like *capacity*, *resiliency*, *viability*, and *adaptability* connote the ability of a community to take advantage of opportunities and deal with change (Doak and Kusel 1996, Harris and others 2000). They differ from terms such as *forest dependence* because they represent a projected condition or ability of a community over some period of time. Levels of resiliency are dynamic, just like external factors that might induce change within a community. Based on the work by Harris and others (2000), factors useful in assessing community resiliency or adaptability are:

a. Population size—resiliency ratings vary directly with population size,
   i. Small (and commonly low resiliency) less than 1,500 people,
   ii. Large (often associated with high resiliency) greater than 5,000 people,
b. Economic Diversity—resiliency ratings vary directly with population size,
c. Civic Infrastructure—high resiliency associated with strong civic leadership, positive attitudes toward changes, strong social cohesion,
d. Amenities—combines civic amenities and natural amenities,
e. Location—locations on major trade routes; near service centers; shopping, service, or resort destinations are associated with high resiliency. Spatial isolation is commonly a characteristic of low resiliency.

The evolution of terms combined with the results of recent and current work suggests that connectivity to broad regional economies, community cohesiveness and place attachment, and civic leadership are greater factors in determining community viability and adaptability than employment-based factors.

For example, the community viability and adaptability for various Boroughs and census areas in Alaska were recently assessed (see Haynes 2003) as part of the U.S. Second Approximation Report using the Montréal Process of Criteria and Indicators for sustainable forest management (Montréal Process Working Group 1998). The results are shown in table 1. In general, they show that about the same proportion (46 to 47 percent) of Alaskans as for the United States in general live in areas with high viability and adaptability. In Alaska, however, the remaining one-half of the population is about evenly divided between areas of low and medium viability and adaptability. In Alaska, roughly nine times as many people live in areas of low viability and adaptability than in the United States in general.

The ratings in table 1 reflect the viability and adaptability of Alaskan boroughs to changing economic conditions. They can be used to describe both economic dependency on forests and social well-being of areas. By inference to communities, social well-being would be a measure of both the capacity of communities to respond to changes and the socioeconomic status of people. Without systematic community level databases, it is difficult to assess specific community viability and adaptability. For example, the Kenai Peninsula Borough while it is rated medium contains 32 communities, which if rated individually would probably reflect the range of possible ratings. Still these ratings do provide information to help land managers understand the opportunities for working with local communities in collaborative projects.

Table 1--Viability and adaptability of Alaska boroughs and census areas

Area name	Composite	Composite rating[1]	Area (square miles)	Population	Percent forestland rating[2]
Aleutians East Borough	Low	3.5	6,988	2,697	2
Aleutians West Census Area	Low	3.5	4,397	5,465	2
Anchorage Borough	High	8.0	1,697	260,283	2
Bethel Census Area	Low	3.5	40,633	16,006	2
Bristol Bay Borough	Low	3.5	505	1,258	2
Denali	Low	4.0	12,750	1,893	2
Dillingham Census Area	Medium	4.5	18,675	4,922	2
Fairbanks North Star Borough	Low	4.0	7,366	82,840	2
Haines Borough	Medium	5.5	2,344	2,392	3
Juneau Borough	High	7.0	2,717	30,711	3
Kenai Peninsula Borough	Medium	4.5	16,013	49,691	2
Ketchikan Gateway Borough	Medium	6.0	1,233	14,070	3
Kodiak Island Borough	Low	3.0	6,560	13,913	2
Lake and Peninsula Borough	Low	3.5	23,782	1,823	2
Matanuska-Susitna Borough	Medium	5.0	24,682	59,322	2
Nome Census Area	Medium	4.5	23,001	9,196	2
North Slope Borough	Low	3.5	88,817	7,385	2
Northwest Arctic Borough	Medium	4.5	35,898	7,208	2
Prince of Wales-Outer Ketchikan Census Area	Low	3.5	7,411	6,146	3
Sitka Borough	Medium	6.0	2,874	8,835	3
Skagway-Hoonan-Angoon Census Area	Medium	4.5	7,896	3,436	3
Southeast Fairbanks Census Area	Low	4.0	24,815	6,174	2
Valdez-Cordova Census Area	Low	3.5	34,319	10,195	2
Wade Hampton Census Area	Low	3.5	17,194	7,028	2
Wrangell-Petersburg Census Area	Low	2.5	5,835	6,684	3
Yakutat	Medium	5.0	7,650	808	2
Yukon-Koyukuk Census Area	Medium	4.5	145,900	6,551	2

[1] Composite ≤ = low, 4.5 - 6.5 = med, ≥7 = high
[2] Forestland (percent) 0 = 0-5.0, 1 = 5.1-32.5, 2 = 32.6-66.2, 3 = >66.3

Source: Haynes 2003.

What Makes an Economy Grow?

When asked about what makes an economy grow or develop, most people rely on an intuitive approach (sometimes called neo-Malthusian) about the ways in which land (resources), labor and capital interact. Often the description centers on the way in which economic growth means more outputs based on greater utilization of land (resources), labor and capital. Economists (see Kindleberger 1965 for example) view growth and development synonymously but distinguish between just more outputs from the case where there are more outputs as well as changes in technical and institutional arrangements by which they are produced.

Southeast Alaska has often been seen as a place where the development of a forest products industry offered potential economic development activities that would increase the stability of local communities. The experience of the last several decades, however, suggests that a more comprehensive strategy than just the development of a timber industry is required. While there is genuine concern about the role of forests in the economic development of a region and its associated communities, it is difficult to measure how they contribute to economic prosperity. The shifts in comparative advantage from timber production to tourism have been accompanied by some painful community transitions.

Linking Healthy Forests and Communities: Measuring Success

Linking healthy forests and communities is a frequently stated goal for forest stewardship. But this raises the question, “How do we measure progress with respect to this goal?” First, we need to state our goal in a way that is measurable. For example, much of the current international discussion about sustainable development uses the goal to improve economic prosperity that is socially just and environmentally sound. This goal underlies much contemporary discussion about sustainable forest management.

Once we have developed and embraced a measurable goal, the next step is to consider how to measure, the indicators of economic prosperity, social justice and environmental conditions. Finally, to be successful we need to be explicit in our consideration of transitions. We need to recognize the dynamic nature of human and biophysical systems.

In closing, the tasks facing us are formidable because of the bias among natural resource managers that favors stewardship over community development. We are still heavily influenced by Solomon’s admonition that “one generation comes and another passes but the land remains.” Our dilemma is to reconcile competing visions for the links between forests and human communities.

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Direction of Forest Management

Forrest Cole[1]

State of the Industry

Who is the Industry?

Family owned and operated facilities tied directly to the communities.

- Viking Lumber Company, Klawock; Pacific Log and Lumber, Ketchikan; Silver Bay Logging, Wrangell; Icy Straits Lumber, Hoonah
- Mills 1-5 million board feet (MMbf) Annually-6-Scattered
- Mills <1 MMbf Annually-10-Scattered

What Infrastructure is Necessary to Maintain Operations?

- Integrated Industry Capable of Utilizing All Grades and Species of Logs and Residual Chips
- Road Maintenance and Construction Capabilities
- Timber Harvest Operations
- Marine Transportation
- Aircraft Capabilities
- Services and Supplies
- Schools
- Lending and Bonding

Current State of the Industry

- Less infrastructure available today affecting efficiency;
- Timber supply questions remain in place;
- Ketchikan veneer mill remains closed in need of funding and sustainable wood supply;
- Silver Bay Logging closing the Wrangell Mill until spring;
- Low grade sawlogs and chips difficult to sell;
  - Pacific Rim market showing signs of recovery (*The Economist*, August 30, 2003);
  - Viking Lumber Company and Pacific Log and Lumber installing new infrastructure;
  - Industry having some successes in niche markets;
  - Ketchikan Wood Technology Center testing Alaska wood properties for Alaska specific grading options.

State of Timber Supply from the Tongass

The main issue for industry now is a stable timber supply:

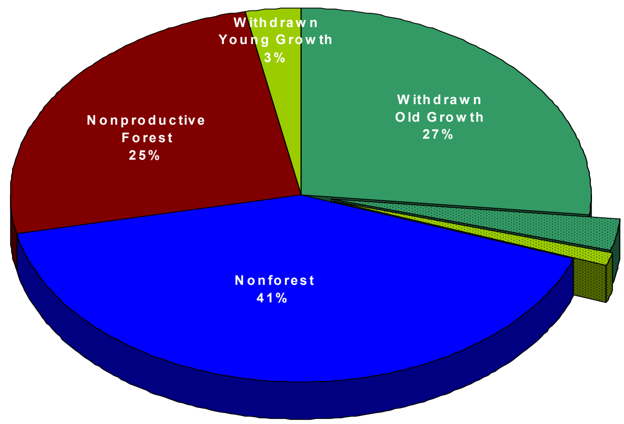
- 1979 Forest Plan-ASQ 450 MMbf
- 1991 Tongass Timber Reform Act-ASQ 418 MMbf
- 1997 Forest Plan Revision-ASQ-267 MMbf

[1] *Forest Supervisor, Tongass National Forest*

- 1999 Modified Forest Plan Revision-ASQ 187 MMbf
- Singleton Decision (Wilderness/1999 ROD)-ASQ <50 MMbf (Wilderness Analysis covered all unroaded)
- Roadless Conservation Rule-ASQ ~50 MMbf

State of Timber Supply from the Tongass

The 1997 Forest Plan Schedules Harvest on 676M Acres. Roadless Precludes Harvest on about 350M Acres. The Debate is Over about 2 percent of the Tongass.



Timber supply from the Tongass National Forest

What is the Forest Service Doing?

Forest Planning

- Defended 1997 Forest Plan in *Sierra Club v. Rey* (District Court of Alaska-Singleton)
- Produced SEIS that Upheld the 1997 Forest Plan Decision after Additional Wilderness Analysis and Sufficiency Language in the fiscal year 2003 Omnibus Appropriation Bill;
- Forest Plan Review to Determine if Changes Necessary to Implement Plan-October, 03;
- Amendment Process Should Changes be Applicable;

Timber Supply

- Canceled Gateway Forest Products Contracts for Alternative Volume Pending Roadless Outcome;
- Suspended ongoing Projects in Roadless and moved to Roaded Portions of the Forest to Sustain a Wood Supply;
- Offered 131 MMbf in fiscal year 2003 - One 10-Year Contract ;
- Offering ~190 MMbf in fiscal year 2004 with an Additional 10-Year Contract;
- Working to Remove Existing Uneconomical Volume Under Contract.

Volume Under Contract

- Currently 200 MMbf Under Contract;
- Approximately 100 MMbf Not Economical; Working to Cancel and Re-offer based on Today's Market and Processing Capabilities;
- Immediate Goal is 450 MMbf for Three-year Supply;

Priorities for the Immediate Future

- Stabilize Existing Industry as well as Supporting Infrastructure;
- Establish 450 MMbf of Economical Timber Sale Projects Under Contract;
- Provide Recapitalization Opportunities for New Investments in Existing Industry;
- Implement the 1997 Forest Plan.

Corporate Activities in Forest Products

Ronald R. Wolfe[1]

Sealaska Corporation: Who Are We?

- ANCSA regional corporation for southeast Alaska
- 17,000 Tlingit, Haida and Tsimshian shareholders
- Largest private landowner in SE Alaska, largest timber producer in State, largest single private employer in SE Alaska

Role In The Forest Products Industry

- Unique perspective of sustainability: biological criteria, economic role, cultural and sociological
- Sealaska is a leader in forest development, product marketing, and research

Sealaska's ANCSA Land Entitlement

- Entitlement has not been fulfilled!
  - Sealaska entitlement in Federal Register today: 310,691 Acres
  - Additional Sealaska 14(h)(8) Entitlement (Alaska Land Transfer Acceleration Act 2003): 55,000 Acres
  - Sealaska estimated final ANCSA land entitlement : 366,000 Acres
- How much more land do we get?
  - Sealaska expected land entitlement: 366,000 Acres
  - Acres conveyed to Sealaska to date: 290,000 Acres
  - Sealaska *Remaining* ANCSA Land Entitlement estimated to be 75,000 Acres

Land Exchange Proposal

- Sealaska proposes to exchange 125,000 acres for Forest Service lands
- 75,000 acre remaining entitlement
- 50,000 acres are Sealaska lands that are unique and have high public interest

Forest Products Markets

- Define our sustainability
- Develop new markets for Alaskan wood in Asia and in domestic markets
- Particularly low grade wood!

Strategic Market Analysis

- Japan is a mature manufacturing center
- China is an emerging manufacturing location with a huge potential domestic wood market
- Fumigation is a major issue

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[1] *Sealaska Corporation*

Wood Utilization

Wood residues: Bark, hog fuel, logging

Conversion Wood Residue to Ethanol

- Potential
  - use gasoline to enhance octane
  - renewable source of energy
  - improve manufacturing profitability
- Issues
  - residue saturated with fresh and salt water
  - not suitable for boilers without burn additives

Sealaska – Dept. Of Energy

- Evaluate physical properties of residues
- Evaluate alternative technologies: acid hydrolysis, enzymatic hydrolysis, gasification using modified bacteria
- Evaluate economic feasibility
- Results:
  - Sufficient to support an industry
  - Improvements necessary to be feasible
- Next steps: improve outputs from conversion technologies

Silviculture Program

- Shorten rotation
- Saw timber product
- Stewardship of other forest resources
- Treatments: tree planting, aerial seeding, pre-commercial thinning (PCT), basal pruning, fertilization, commercial thinning

Resource Research

- Fish habitat and forest practices
- Watershed management
- Silviculture management
- Wildlife management

Alternate Land Uses

- Develop uses that will create revenue and jobs
- Mitigation bank
- Carbon sequestration
- Others

Formulation Of Responsible Public Policy

- Use and management of forest lands, roads, and forest land access

Composting in Alaska: Full Utilization of Wood and Fish Wastes

Bob Mills[1]

Introduction

In more than two decades working for Kake Tribal Corporation and, before that, as a commercial fisherman, Bob Mills has seen a lot of wood and fish waste accumulate. Now, Mills and Kake Tribal are "mining" those piles of waste to make compost, which they hope to sell to gardeners and landscapers in Anchorage and the Lower 48.

Kake Tribal Corporation has processed fish since 1997, producing a variety of fresh, frozen and smoked items. They have become one of the leading fish processors in southeast Alaska. The village Native corporation is completing the last of its logging after 25 years of steady timbering. The community is finding itself long on wood and fish waste and short on jobs. So they have turned to compost.

All of the fish waste from the plant – which used to be dumped into the landfill or the ocean – is now put in the compost pile. Even crab backs are composted. And unsightly piles of trimmings from logs have found the perfect home as a bulking agent to mix with the fish waste.

"All my life growing up in our little village, I watched my elders put fish and kelp into their rhubarb and vegetables to help them grow," Mills said. "You wonder why it took 50 years for people to say, 'hey, why don't we try this on a large scale?'"

There From the Onset

When Mills started the composting project, one truck was available for hauling fish waste from the plant to the composting site. At first, they ground the fish waste, mixed it with water, and pumped it into a holding tank on the truck. Now, the pieces of fish waste are loaded at the compost site whole and/or ground.

At first, Mills bought wood chips from Wrangell at the reasonable cost of $4,500 per barge load. But when Wrangell could no longer sell the chips, Mills was unable to find another source where the shipping costs would not triple. So the wood waste piles in the Kake area became the alternative.

Besides Kake Foods contributing their own waste to the compost piles, the operation is taking fish waste from other processors in southeast Alaska and is paid a tipping fee for doing so. They have purchased several machines to grind waste, turn the compost piles, and screen the resulting material. But there is even more equipment to buy in the future.

[1] *Kake Foods, Kake, AK*

Fish Bake

The Kake operation uses windrows — piles of fish and wood waste 6 to 7 feet high and 16 feet wide. There are now about 4,000 square feet of windrows. Layers of ground wood waste are alternated with layers of fish waste; decomposition quickly begins. The piles reach 150 degrees in just a few hours and begin "cooking." The piles also change color from beige to dark brown in just a few days.

"You have just baked fish," said Mills of the project. "When you put these things in the pile after just about a day when you turn them it's just like you baked fish."

When the temperature of the pile drops to 100 degrees or less, the piles are turned with a machine that works down the width of the row. Once the row is "spun," Mills said, it will quickly rise in temperature. The big turning machines only take about 10 minutes to spin a windrow.

Once all of the material has been composted, the material is tested, then sent to a screening machine, where anything larger than one-half inch is sent back to the piles. Anything less than one-half inch is the product to be sold. Tarps are used at present to keep the piles from getting too wet, which can slow down the composting process.

Investing in Compost

Kake has received grants to help with marketing and labor costs. Mills said they have been working with marketing firms in Kake and in Washington and Oregon. One of the companies committing to the composting effort is Pacific Harvest, which already markets Kake Foods' seafood products. The corporation has invested about $1.5 million in equipment so far. Ultimately, they hope the composting operation will net the community 20-24 jobs.

The project's good effects included reducing the dumping of massive amounts of fish waste in the ocean — while Kake collects 5-7 cents per pound to take the waste. Mills said that it is satisfying to create a product that is good for the earth, "It's like giving back to the earth what you took ."

Fish plants sometimes must temporarily refuse to take fish because they have too much waste. With better waste management, those plants can continue to buy fish.

"All of these things are good for Alaska," Mills said. "Because if this works in our little community, it will work elsewhere. In Prince William Sound, they dump 30 million pounds of fish waste into the ocean every year." Such waste can form piles that rob the water of oxygen and retard the development of marine habitats.

Good Compost

By working with labs in the Pacific Northwest and in the State of Maine, Kake's compost can be labeled "all natural," as well as "made in Alaska." This provides a marketing edge over compost made from, for example, lawn clippings, where pesticide contamination is feared. The bags are also marketed as a Native product.

One industry member reported that the price for the compost ($3.50 for a 35-pound bag) was too low. He suggested a much smaller 8-quart bag to be sold for $3.50.

And there are still products to be developed. Right now, the runoff from the windrows is not captured. If the piles were on a non-permeable surface, such as an asphalt pad, the leachate could be collected and sold as a liquid organic fertilizer.

Mills hopes to more fully develop the infrastructure on the site, such as static piles. These piles, where aeration is mechanically controlled through pipes, require much less labor than turned windrows.

Windrow Design for High Rainfall Conditions: The Southeast Alaska Challenge

Tom L. Richard,[1] David L. Nicholls,[2] and Byung Tae Kim[3]

Introduction

Alaska is blessed with an abundance of natural resources, with fishing and timber major industries for the State. For local economies to thrive on a sustainable harvest of these resources, value-added processing is a critical need. From smoked salmon to custom furniture, value-added processing has tremendous potential. Organic by-products from these processes also present value-added opportunities, and transforming them from wastes to resources can create important multiplier effects that both improve the environment and sustain the small rural communities upon which Alaskans depend.

Composting of wood wastes in Alaska has become increasingly important in recent years as wood processors and other industrial waste managers search for environmentally sound and profitable outlets for their waste materials. Traditionally Alaska's sawmills have had dependable markets for their waste residues to supply area pulp mills with high-quality chips. The recent closure of two major pulp facilities in southeast Alaska has greatly reduced the demand for the region's wood manufacturing residues. Further north, the Kenai Peninsula of Alaska has experienced a recent spruce bark beetle epidemic leaving large volumes of standing dead timber.

Abundant seasonal fish wastes are produced during the summer commercial and sportfishing season in many parts of the State, including small towns on the Kenai Peninsula and throughout the south-central coast. Current fish waste management systems, including ocean discharge, are coming under increasing environmental and community scrutiny.

These are some of the factors providing incentives within Alaska for business managers and entrepreneurs to cooperate across traditional boundaries in seeking creative solutions to their waste management problems. For fish and wood wastes, composting seems a natural fit. High volumes of wood and fish waste provide an ideal mixture of substrates for co-composting projects, and the relatively thin northern soils create an inherent demand for organic soil amendments by gardeners and landscapers.

However, innovative marketing strategies must be developed for local composts to compete with imported products in Alaska's major markets, including Anchorage. Retail market opportunities include high quality compost for potting soil and fertilizer. The Anchorage metropolitan area represents a major market in south-central Alaska, and several area facilities are already producing compost products for local niche markets. High quality standards, including monitoring compost nutrient ratios, controlling composting times and temperatures, and careful screening are needed to produce this type of product for retail sales.

[1] *Iowa State University, Ames, IA*

[2] *USDA Forest Service, Pacific Northwest Research Station, Wood Utilization Center, Sitka, AK*

[3] *Daejin University, Kyungki-Do, Korea*

Other operational challenges must be addressed if composting companies are to succeed in Alaska. High rainfall combined with high transportation costs for moving compost components and finished product increase the cost of business in southeast Alaska. There is also the logistical challenge of matching seasonal supplies of fish waste with the year-round supply of wood waste

Compost producers in south-central Alaska have begun to recognize these opportunities and address the challenges. A wide range of composting projects have been proposed or are in various stages of development. In southeast Alaska, a wood and fish waste pilot composting project has been completed in Sitka, and at least one municipal landfill actively composts its waste using a windrow technique to form aerated piles. In metropolitan Anchorage, a recycling facility composts a variety of organic wastes, including horse wastes and lawn and garden wastes. The facility includes a 100,000 square foot composting pad, and finished compost is sold as several products ranging from wood mulch to potting soil. Other facilities in Alaska have developed techniques for composting wood wastes with peat moss for high quality soil amendments and potting mixes.

To encourage these developments, the USDA Forest Service's Wood Utilization Center, in Sitka, Alaska, has partnered with Iowa State University to develop strategies for composting fish and wood wastes in the Alaska environment. The study included physical and chemical characterization of feedstocks and mixtures, as well as pilot-scale composting trials. A key aspect of this study was understanding the impact of high rainfall on outdoor composting piles. That issue is the focus of the following.

Much of south-central Alaska is temperature rainforest. Figure 1 shows the long-term average annual precipitation data for four locations in the south-central region of the State where composting has been tried. Ketchikan tops this selection, with more than 150 inches per year, but some smaller communities in southeast Alaska get more than 200 inches per year. Things are drier in central Alaska, where Anchorage averages only 15 inches annually.

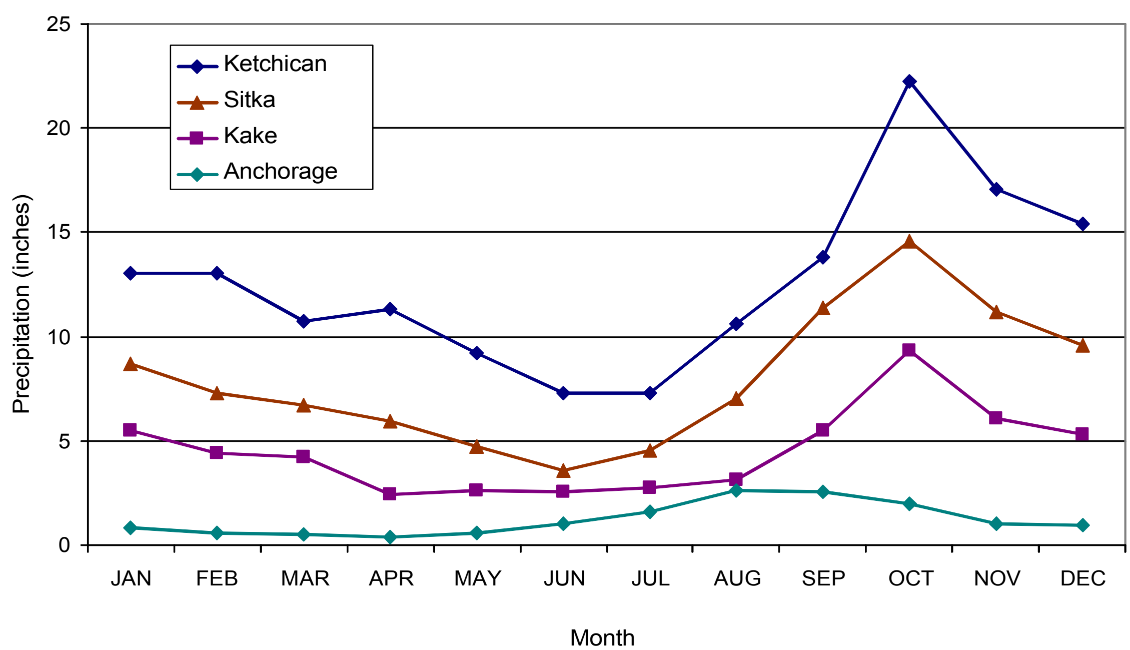

Figure 1--Monthly precipitation for four cities in south-central Alaska.

A number of strategies can be used to help composting systems succeed in the high rainfall regions of southeast Alaska. Composting under a roof is one option, but the costs required to cover large volumes of compost and stockpiled wood wastes make this an expensive solution. Windrow covers that are permeable to gas transfer but shed excess water have potential, as has been demonstrated at several facilities in the lower 48 states. In Kake, Alaska, a fish and wood waste composting site uses simple polyethylene tarps to shed water during the rainiest months. While these covers prevent air movement *through* the tarps, high winds at this exposed site on the coast seem to move adequate air *under* the tarps as they continuously flap in the breeze. Windrow covers cost considerably less than a roof, but do require additional management to remove and replace them during pile turning events. Other techniques, like shaping the windrows so that they have a distinct peaked ridge and steep sidewalls can help to shed some of the rain. While any of these strategies will reduce direct precipitation from getting into the top of compost piles, careful design and management of the composting site is also needed to keep the shed rainfall moving away from the piles so it cannot puddle and be absorbed at the base.

Fortunately, systems to reduce water inputs do not need to be 100 percent effective, because the composting process itself can evaporate considerably quantities of water through heating and convective airflow (Choi et al., 2001). Because of this drying activity, many composting systems located in less humid regions suffer chronically from lack of moisture.

In order for evaporation to be effective, however, the composting system must not be overwhelmed. Adequate water absorbing capacity must be available in the pile to ensure that it does not saturate and go anaerobic, which would reduce both heat production and air movement through the pile. To estimate the critical water holding capacity for fish and wood waste windrows, we first analyzed the physical properties of typical “fish and chips” mixtures at different moisture levels. By measuring the bulk density, moisture, and organic matter content we calculated the air-filled porosity ε_a (also called free air space) using the following equation (Richard et al., 2002).

$$\varepsilon_a = 1 - \rho_{tot} \cdot \left(\frac{1-DM}{\rho_w} + \frac{DM \cdot VS}{\rho_{vs}} + \frac{DM \cdot (1-VS)}{\rho_{ash}} \right)$$

This equation is based on the densities of water (ρ_w) , organic matter (ρ_{VS}) , and ash (ρ_{ash}), and knowledge of the dry matter content (*DM*) and bulk densities of the matrix (ρ_{wt}) (van Ginkel et al. 1999). The organic fraction (*VS*) was assumed to have a particle density (ρ_{VS}) of 1.6 x 10^3 kg m^{-3}, while the inorganic fraction (*ash*) was assigned a particle density (ρ_{ash}) of 2.5 x 10^3 kg m^{-3} based on previously reported values (Rahman 1995; van Ginkel et al. 1999). These relationships have held for a wide range of composts, and allow accurate prediction of air-filled porosity from easily measured characteristics of the substrate and matrix (van Ginkel et al., 1999; Richard et al., 2002). This equation provided an accurate estimate of air-filled porosity, as confirmed for this study by measurements using an air pycnometer (Richard et al., 2003).

We also measured the effect of increasing bulk density on matrix properties, and particularly the resistance of mixtures to forces of compaction. Resistance to compaction is strongly influenced by moisture content, with wetter materials deforming more easily and compacting more for any particular level of force. By calculating the weight of the overburden including the effects of successive compaction, we can determine the force applied at any particular depth. These results were used to estimate the impact of compaction on bulk density and porosity throughout a typical windrow profile. The air-filled porosities for six moisture contents are presented in figure 2.

It should come as no surprise that mixtures with a lower moisture content have more free air space, and that the free air space declines at greater depths from the surface. The increasing slope of this decline for the higher moisture samples is a reflection of their lower resistance to compaction.

The heavy dashed line in figure 2 indicates where the air-filled porosity is 30 percent. This value is widely recommended as a minimum air-filled porosity for composting. For this fish and wood waste matrix, air-filled porosity becomes problematic at moisture levels slightly below 70 percent (wet basis). Moisture levels less than or equal to 65 percent never drop below this threshold, maintaining air-filled porosities above 30 percent to depths of twelve feet or more. For this fish-wood chip mixture, 65 percent moisture appears to be a reasonable upper bound.

The amount of rainfall a composting windrow can absorb will be determined by the difference between its actual air-filled porosity and its minimum air-filled porosity, the later set at 30 percent for this analysis. Deeper piles can absorb more water, although compaction reduces this potential absorption somewhat. Figure 3 illustrates the amount of rainfall (in inches) that piles of different depths and different starting moisture contents can absorb. Dashed lines on the figure indicate the cumulative four-month average rainfall during the wettest time of the year for each of the cities previously discussed (see fig. 1). For Anchorage, this is July through October, while September through December are the peak months for the three locations in southeast Alaska. Four months should be enough time to complete the active composting phase, after which compost can be stockpiled in large piles or covered with a tarp to minimize water infiltration.

For this fish and wood chip composting mixture, figure 3 indicates that the 70 percent moisture case has very little room for additional water, and only then in the top part of the pile. Thus that line is flat beyond about two feet of depth, as additional water below this depth could cause leaching and/or anaerobic conditions. The lower moisture piles can absorb water throughout their depth, but not necessarily as much as might be needed. For Anchorage, a 65 percent moisture pile would need to be

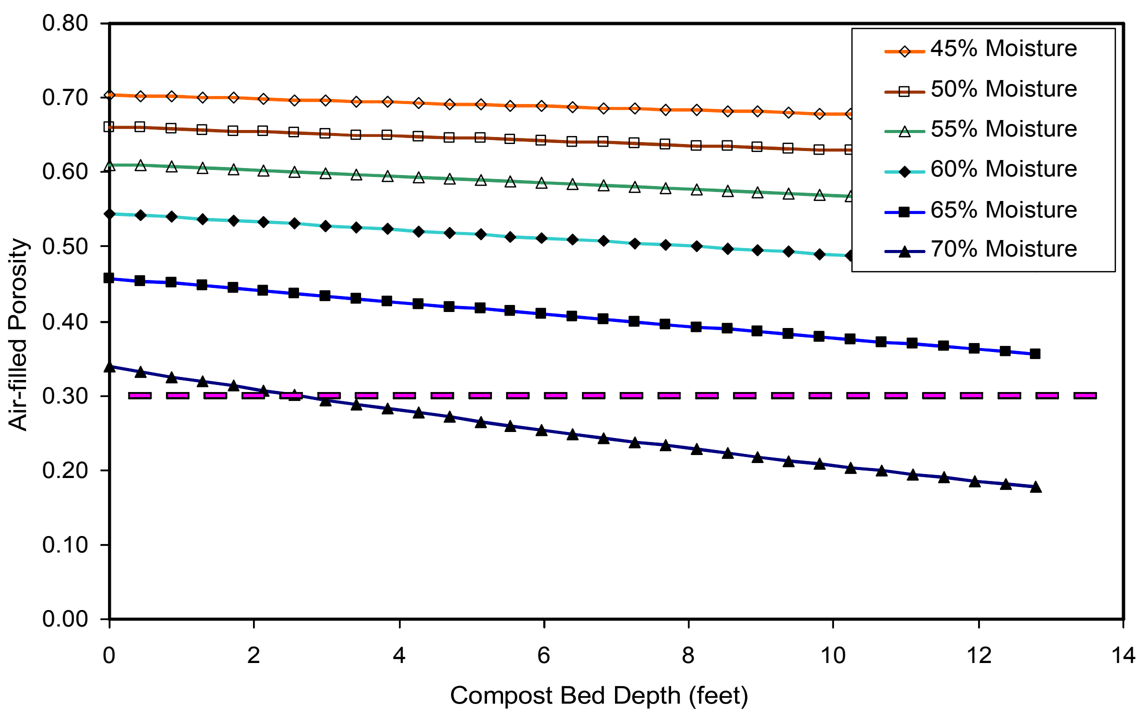

Figure 2--Air-filled porosity as a function of overburden compaction at different depths in a compost bed. The top of the pile (zero depth) is to the left.

at least 3 feet deep to absorb this moisture, while for Kake, a 60 percent moisture pile would need to be at least 7 feet deep. For Sitka conditions, the 55-, 50-, and 45-percent moisture piles would need to average 10, 8, and 7 feet deep respectively. Compost piles in Ketchikan, with its very high rainfall conditions, would need to average more than 10 feet deep and 45 percent moisture to absorb the typical 4-month rainfall amount.

The pile depths indicated in figure 3 assume a rectangular pile structure, such as is seen with extended windrow systems and some aerated static piles. For more typical windrows with slopes and aisles, these depths could be thought of as the average depth of the pile. The average depth for a triangular windrow would be half the height at the peak, while the average depth for more common trapezoidal or parabolic windrows would typically be 60 to 75 percent of the peak height depending on the top width and side slope (Rynk et al., 1992). While the average depth concept is a reasonable approximation of the water holding capacity of the pile, deeper parts of the pile would still be subject to greater compaction, as was illustrated in figure 2.

This figure illustrates not only that deeper or drier piles can absorb more water but also predicts how much rainfall a particular pile could absorb for any given moisture condition and height. This is useful both for designing mixture ratios at the beginning of the composting process and for predicting whether problems will occur during the composting process based on actual rainfall data.

This analysis does not account for the biological drying that normally occurs during the composting process (Choi et al., 2001). Although incorporating an estimate of drying would theoretically increase the rainfall absorption potential, this drying is essential to reduce the moisture content of the final product. Most compost markets want a product of 35 to 45 percent moisture. Since little additional drying occurs during the curing or maturation phase, allowing a composting windrow to finish the active composting phase at greater than 50 percent moisture may limit options for beneficial reuse.

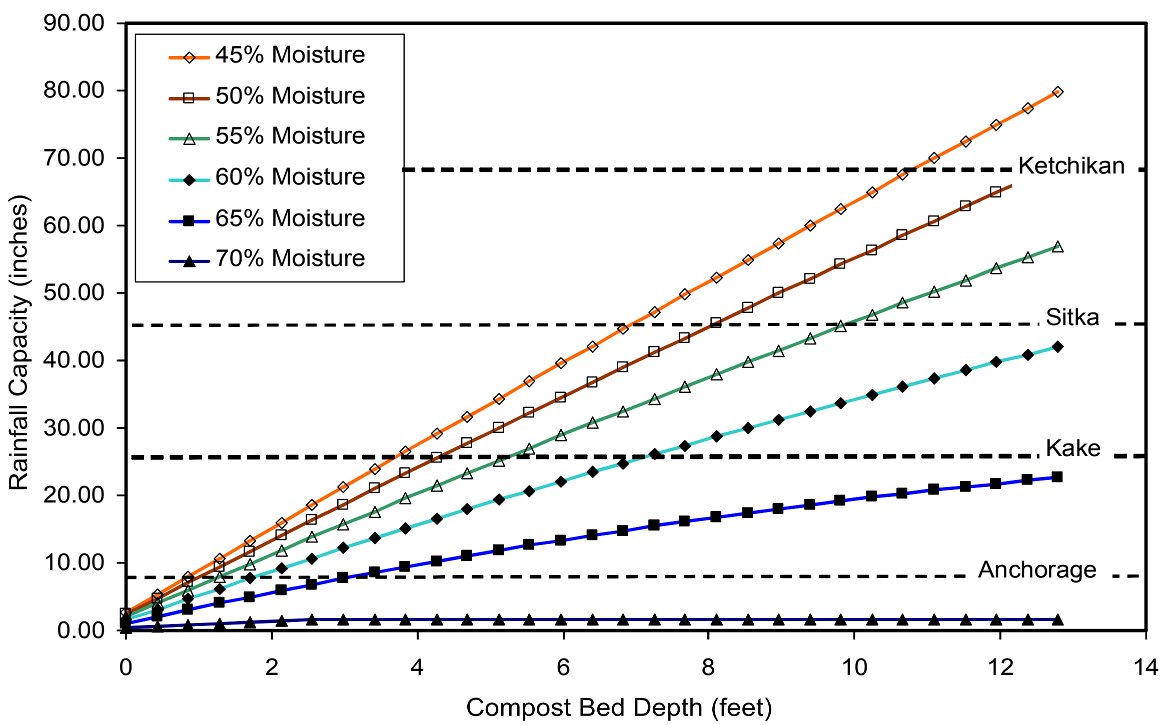

Figure 3--Cumulative rainfall absorption capacity for different depths of a compost bed, calculated for six moisture levels. The top of the pile (zero depth) is to the left.

Although this analysis is based on a mixture of fish and wood wastes produced in southeast Alaska, a similar analysis could be completed for any other feedstock mixture and climate. The critical parameter to measure for such an analysis is the resistance of the material to compaction, which varies widely among different materials and is much lower for bulking agents such as leaves and straw than it is for wood chips and sawdust. Other characteristics are readily easy to measure (such as bulk density, moisture and organic matter content) or can be estimated using published values. With time we hope this analytical approach can prove a useful tool for composting system design, analysis, and implementation with a wide range of feedstocks and climates.

Strategies for Success in Composting

- Be conservative with starting moisture
- Minimize water entry
  - Site design and maintenance
  - Windrow covers
- Maximize evaporation
  - Maintain high temperatures
  - Turn frequently or use forced aeration while hot
- Store in large, steep-sided piles or under roof

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Utilization of Wood Residues as Bioenergy for Alaska Communities and Small Industrial Applications

David L. Nicholls[1]

INTRODUCTION

Alaska has abundant wood residues, including material generated from sawmills and from forest management activities. Wood energy economic evaluations have been completed for two regions of Alaska having different wood resource types and availability. In southeast Alaska, wood wastes from manufacturing processes can be used as a fuel source for heating lumber dry kilns or providing community heat. Further north in the Kenai Peninsula, large volumes of standing dead timber have resulted from a bark beetle infestation. Here, salvaged wood may be collected from stands near communities and burned to heat community buildings. There is a strong incentive to utilize beetle-killed material before further deterioration renders it unsuitable even for wood energy.

WOOD ENERGY APPLICATIONS IN SOUTHEAST ALASKA[2]

The lack of transportation infrastructure and undeveloped markets for sawmill residues in southeast Alaska are among the factors limiting the use of these materials. This study considers the potential use of sawmill residues for 2 systems to produce energy for community heating and lumber drying in Hoonah, Alaska.

The proposed community heating system would be a direct combustion system, burning approximately 1,450 green tons of wood fuel per year to provide heating for seven centrally located buildings in Hoonah. Additional residues in another system would be used to provide process heat for a proposed 25 thousand board foot dry kiln. The Hoonah sawmill typically produces as much as 5 million board feet of lumber per year (primarily from western hemlock and Sitka spruce). The processing of 5 million board feet of lumber per year would result in an adequate volume of residue to provide a fuel source for the heating requirements of the proposed projects. Wood residue from the sawmill was assumed to be available at no cost other than for transportation.

Use of wood fuel for community heating would save an estimated 247,000 liters (65,000 gallons) of heating oil per year. Avoided fuel costs would be approximately $91,500 per year based on fuel oil no. 2 at a market price of $0.37 per liter ($1.40 per gallon). Based on a project life of 25 years and a contingency rate of 25 percent, the expected after-tax internal rate of return (IRR) for the community heating portion of the project is 14.4 percent. Total installed costs for the 500 kilowatt thermal ($kW_{thermal}$) district heating system, including distribution piping and its installation, are estimated to be $646,000.

[1] *Forest Products Technologist, USDA Forest Service, Pacific Northwest Research Station, Wood Utilization Research and Development Center*

[2] *Nicholls, D.L.; Zerbe, J.I.; Bergman, R.; Crimp, P. 2004. Use of wood energy for lumber drying and community heating needs in Southeast Alaska. Res. Note FPL-GTR-152. Madison, WI.; U.S. Department of Agriculture, Forest Service, Forest Products Laboratory*

For the lumber dry kiln, in the second heat generating system, economic results were even more favorable, with expected energy savings of $82,900 per year and an after-tax IRR of 42.9 percent (also assuming 25 percent contingency). Estimated installed cost of the 300 $kW_{thermal}$ dry kiln system was $187,000.

Wood energy applications in southcentral Alaska[3]

Wood energy can play an important role in helping meet the energy needs of Alaska communities that have access to abundant biomass resources. In the Kenai Peninsula, a continuing spruce bark-beetle *(Dendroctonus rufipennis (Kirby))* infestation has created large volumes of standing dead spruce trees *(Picea spp.).* For this evaluation, a site in the Kenai-Soldotna area was chosen for a small-industrial scale (4 million British thermal units (Btus) per hour) wood-fired hot water heating system, which could be fueled by salvaged spruce timber and also by sawmilling residues. Thirty-six different scenarios were evaluated using wood fuel costs ranging from $10 to $50 per delivered ton, alternative fuel costs from $1 to $2 per gallon, and fuel moisture contents of either 20 percent or 50 percent (green basis). In addition, two different capital costs were considered. Internal rates of return varied from less than 0 to about 31 percent and project payback periods varied from 4 years to more than 20 years. Potential barriers to the long-term sustainability of a wood energy system in the Kenai Peninsula include the availability of biomass material once current spruce salvage activities subside. The estimated wood fuel requirements of about 2,000 tons per year are expected to be easily met by spruce salvage operations over the short term and by sawmill residues after salvage inventories diminish. It is expected that a wood energy system this size would not significantly reduce overall fuel loads in the area, but it would be a good demonstration of this type of system while providing community benefits and energy savings.

[3] *Nicholls, D.L.; Crimp, P. 2002. Feasibility of Using Wood Wastes to Meet Local Heating Requirements of Communities in the Kenai Peninsula of Alaska. Gen. Tech. Rep. PNW-GTR-533. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 22 p.*

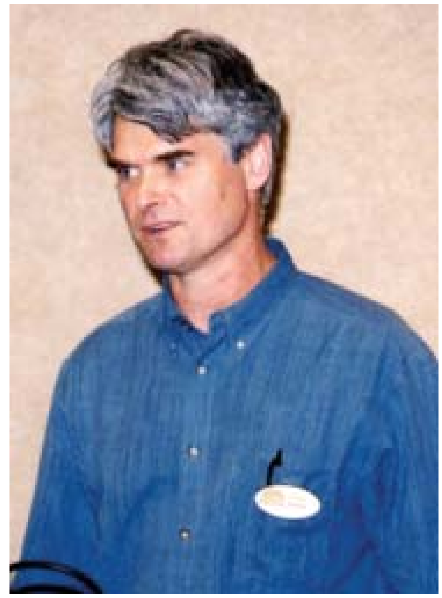
Wood Energy in Alaska: An Overview

Peter Crimp[1]

Introduction

Wood Energy Development can:

- Decrease energy costs
- Use local resources and benefit the local economy
- Keep "waste" products from the landfill
- Provide "green" fuels
- Displace imported diesel fuels, reduce potential oil spills in rural areas



Peter Crimp, Alaska Energy Authority

Alaska Energy Authority (AEA) – organization overview

- Public corporation with Alaska Industrial Development and Export Authority Industrial Development and Export Authority
- Infrastructure Owner: Anchorage-Fairbanks Intertie, Bradley Lake Hydro, Healy Clean Coal Plant
- Rural Energy Group: Tank farm construction, power system repair, alternative energy

AEA's Biomass Energy Program

- Promotes the use of waste and wood to generate power, heat, and processed fuels
- Funded by Alaska and U.S. Department of Energy

Current AEA Biomass Projects

- Fish Oil Biodiesel Trials
- Landfill Gas Utilization
- Wood Fuel Substitution

Wood-Fired Power

Advantages of using wood as a fuel source:

- Decrease energy costs
- Use local resources and benefit the local economy
- Keep "waste" products from the landfill
- Provide "green" fuels
- Displace imported diesel fuels, reduce potential oil spills in rural areas

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[1] *Alaska Energy Authority /Alaska Industrial Development and Export Authority, Anchorage, AK*

Wood-Fired Power ... Economically feasible when

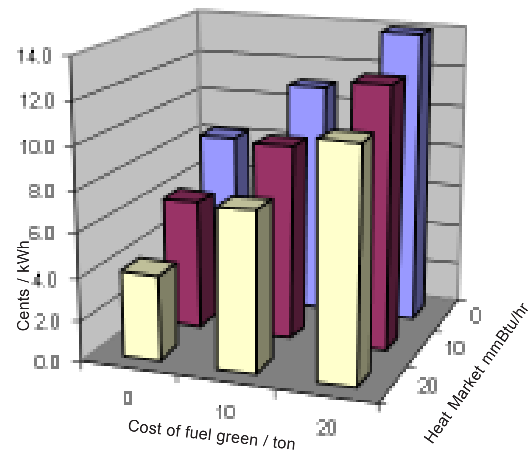
- Plentiful fuel available with a disposal cost
- Diesel power is displaced
- Substantial market for power and heat

Processed Liquid Fuels

- Southeast Alaska Ethanol Project
- Pyrolysis: "Bio-Oil"

Potential Project Funding for Wood Energy Projects

- AEA/US Department of Energy: Biomass Energy Program
- Denali Commission/AEA: Energy Cost Reduction Program
- USDA Rural Business Cooperative Service Development: Renewable Energy Initiative
- Mini-Grant Program



Cost of Wood-fired Power

Based on AEA solid fuel model for 3 mw plant

Dot Lake, Alaska – Wood-fired Energy System

- Heat exchanger off 4400 gallon hot water tank
- Preheats oil-fired boiler return water
- Supplies 2200' buried district heating system

Dot Lake System Economics (one-half of the heating oil was displaced by wood)

Wood System Installed Cost	$66,000
Wood Operation and Maintenance	
Labor	$1,330
Wood fuel ($35/cord x 47 cords)	1,654
Maintenance	812
Total	$3,797
Oil System Operation and Maintenance	
Labor/materials	$1,000
Fuel ($1.30/gallon x 7,750 gal)	10,075
Total	$11,075
Yearly Savings	$7,278

Conclusion

- Wood is cost-effective for space heating larger buildings.
- Wood fired boilers are simple and reliable, however, they require a commitment to somewhat greater operation and maintenance responsibilities.

Tapping Into Birch Syrup Opportunities

Marlene Cameron[1]

Introduction

"You can do anything with birch. From the top of the tree to the root, it's the best tree in the world," according to Marlene Cameron of Cameron Birch Syrup and Confections, Inc., a pioneer of the Alaska birch syrup industry. Cameron began working with birch syrup a dozen years ago. For centuries, birch trees have been tapped in Asia, Europe and North America. In Europe and Asia, birch sap was used to make a spring tonic or birch wine, and there is still a birch beer and wine industry in Europe and Asia. More recently, sourdoughs in Alaska made birch syrup, tapping the trees when no other sugar was available.

In the 1960s, Carroll Phillips started a small birch syrup company in Fairbanks. Manufactured with less than state-of-the-art equipment, Phillips' product was a small scale, local novelty. Later, at least three other Alaska operations began to experiment with birch syrup.

With financial help from the Alaska Science and Technology Foundation, manufacturing techniques and modern equipment were quickly mastered. "The technology and knowledge base expanded and we just kept adding more syrup producers," said Cameron. "The birch syrup industry is a viable new industry for Alaska." With its main competition the 250-year-old American and Canadian maple syrup industry, Alaska birch syrup, with fewer than 20 years in moderate production, is the newcomer.

Birch syrup producers formed the Alaska Birch Sugar Makers Association. The name was later changed to the Alaska Birch Syrup Makers Association (ABSMA). "This gave us presence and credibility." Cameron said. "We were not going to go out of business right away." ABSMA is working to standardize and certify methods of birch syrup production, from tapping the tree to labeling the product. Product consistency is a cornerstone of gaining market share. "It's neat to be on the ground floor of something like this," she said. "There's worldwide recognition and respect for this new Alaskan industry."

An Industry Grows

Seven birch syrup producers in the State are finding ways to refine sales of their product. "Value-added products are not just nice, they are required in the birch syrup industry," she said. "The birch syrup producers, unless they are bulk wholesalers, have found that the value-added products made with birch syrup increase both market share and the value of the tapped tree."

When it comes down to it, you can't make it on syrup alone. Value-added products from birch syrup being made in Alaska today include several kinds of candy and confections, baked goods, condiments (such as marinades, sauces and dressings), novelty syrups, ice cream, and wine. A number of high-end restaurants are experimenting with birch syrup in such dishes as glazed duck, planked salmon, wild rice pudding and champagne vinaigrette. The birch syrup producers may not agree on everything, but they agree that the versatility of birch syrup is just about unlimited.

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[1] *Cameron Birch Syrup and Confections, Inc.*

One of the great challenges to keeping Alaska birch syrup on the worldwide commodity market is to make enough of it. Cameron said Alaska could already use bulk producers, who could sell the products to other manufacturers. The primary challenge is to increase the statewide production of syrup. Although the industry is steadily growing, the industry still can't produce enough syrup for worldwide demand. People want more than we can produce.

This means action is needed on several fronts. There needs to be an organized and well-funded outreach education program for both the consumer and prospective entrepreneurs to continue the efforts already begun by the producers and ABSMA.

When you start a business, it's expensive, but when you start an industry, the cost is outrageous, because you have to tell people what you have and that means advertising. Cameron advises new producers to get their product exposure any way they can. Samples, press releases and newsletters could be sent to newspapers and magazines, hoping for a mention. Trade shows are a natural route, as are presentations to local schools and civic groups.

Don't make the mistake of hating your competition. More product brands cement the legitimacy of the product. In organizations like ABSMA, competitors have shown cooperation, as well. At first, we heard, "what is birch syrup?" and now we hear, "where can we get it?"

Self regulation and ABSMA certification need to be established as soon as possible to protect producers and well as consumers, because anybody can make birch syrup, and great stuff can be made at home. But we want to show that the operations have been inspected, and the trees are well tended. That the tapping and boiling methods are standardized and done in a way that is not going to harm the trees or the consumer. We're working on certification, and we'll be there shortly.

There needs to be an increased level of research and development by food chemists in the lab and by chefs in the field — beyond basic research and more deeply into the potential of Alaskan birch syrup.

"You can make a living from the birch syrup industry," Cameron said. "And the neat thing is you are part of this vast and growing nontimber forest products (industry). You create your own business, work with a renewable natural resource and maintain a responsible stewardship of the land."

"It's a fantastic opportunity to combine your vocation with your values. It's an opportunity that not many people have in life. When you get right down to it, it's just fun to be an entrepreneur. However, it's doubtful that the birch syrup industry alone will make you a wealthy entrepreneur."

Utilization of Birch Bark

John Zasada[1], Jan Dawe[2], Andriy Boyer[3]

Introduction

The white barked birches are one of the most versatile trees of the boreal and sub-boreal forests. There are documented uses for virtually every part of the tree. Sap is used as a spring tonic or concentrated by boiling to make syrup; roots were used in basketry and for lacing and lashing materials together; the inner bark is used as a food and medicine; and infusions are made from leaves and other parts of the tree and used in the treatment of various ailments.

The outer bark of the white barked birch is the most distinguishing and well-known feature of the birch tree. The shimmering white bark with its black ever-vigilant "eyes" helps to define the northern forest and distinguish it from more southern forests. The bark alone is one of the most versatile materials in the northern forest. As described by John Peyton in his book "The Birch—Bright Tree of Life and Legend," this bark served the Ojibwe people of North America in every aspect of their life and from birth to death. The same can be said of inhabitants of northern Europe and other parts of North America where birch occurred.

Plastic and paper products have replaced birch bark for almost all uses in modern times—one could say that it was the original Tupperware![4] But the bark is still used by artists and crafters to create decorative as well as functional objects. There is increased interest in the paper birch resource in North America as people seek to develop new ways of using the forest. A fledgling industry based on use of the sap is developing in Alaska. The interest in the use of bark for arts and crafts also is increasing at least in localized areas in North America.

Heightened interest also results from the concern over the health of the birch resource. It is a relatively short-lived tree and in the absence of disturbances that create conditions for good regeneration, old trees and forests are being logged and not replaced by regeneration and younger stands. Mortality can be very high in these stands because of their susceptibility to insects and disease.

How do we assure a continual and sustainable supply of birch bark for present uses and other uses in the future? More generally, how can we manage paper birch in pure or mixed stands to provide the mix of products and values potentially available from birch trees? The following discussion considers three points directly related to these questions:

1. What products are available from birch trees/forests and how do they change as the trees and stands develop/age?

[1] *Retired, USDA Forest Service*

[2] *Executive Director, Alaska Boreal Forest Council*

[3] *Alaska Boreal Forest Council*

[4] *The use of trade names or firm names in this publication is for reader information and does not imply endorsement by the U.S. Department of Agriculture of any product or service.*

2. What do we need to consider when harvesting materials from the birch tree to assure that the tree remains vigorous and capable of producing the same or different product in the future?
3. In the specific case of use of birch bark, how can we make best use of the material that is available?

Development of Birch Forests and Silvicultural Systems for Producing Multiple Products From Birch Forests

As forests comprised of birch or mixtures of tree species including birch develop and age, different products and values are potentially available. Products become available as the tree ages and increases in size. Examples of changes are increases in bark color, thickness and strength, ability to maintain vigor with periodic tapping for sap, chemical composition, and seed production. (Note: Products and values are narrowly defined here as those tree parts that can be harvested and utilized in some value-added way. Birch forests also provide important ecological services are not considered here)

A few points are particularly important. First, except for perhaps the earliest stages of regeneration, there are products that can be harvested and utilized at every stage of stand development. Most values increase as the forest ages, but small trees provide an opportunity for some uses, mainly decorative.

Second, harvest of materials like bark and sap from trees, that will continue to be a part of the stand, will have an effect on the tree. The long-term effects of these types of disturbances are not well known. The effects of bark harvest range from little damage to death of the tree. A key concern is to better define the interactions between various types of disturbances to the trees and stand, and the quality of future products. Forest managers need to know the cumulative effects of various types of harvesting to individual trees and the stand as a whole.

Third, commercial thinning and final harvest prior to regeneration of the stand will be times when multiple products will be available simultaneously or at least within a few years of each other. The focus will usually be on the wood products, particularly the higher value materials such lumber and veneer. But this focus should not blind managers to the importance of timing of the harvest to the quality of bark and other nontimber products. For example, the highest quality bark is obtained from trees while they are still standing. The best time for harvest of bark is mid-June to early July. This means that stands to be harvested need to be identified a year or more in advance so that at least one bark harvest season occurs before harvesting of the entire tree.

Careful Harvest

Careful harvest is defined as use of practices that have as little short- and long-term negative effect as possible to the tree or stand. It is important to recognize that harvest of raw materials such as sap and bark is a significant disturbance to the tree and one that will initiate a wound healing response in the tree. Important considerations for careful harvesting are summarized in the following points.

1. Always have permission from the landowner to harvest materials. Trespass and illegal harvest should not occur. It is best to have written permission from the landowner/manager. In the case of public lands, a permit is often required to harvest these materials. In some cases, a fee must be paid to obtain a permit.

2. Seek out areas where disturbance is planned in the near future. This would include but not be limited to logging operations, land clearing, road construction, and home construction sites. Take advantage of opportunities that occur as friend or neighbors cut trees in yards and other accessible areas.
3. If bark harvest will occur on areas where trees will not be disturbed in the near future, harvest should be done in a way that minimizes damage to the tree. Minimal damage occurs when the outer bark is harvested at the time when it is easily removed from the tree—this is usually from mid to late June through early July. At this time, the outer bark is easily removed with a vertical cut that does not damage the inner bark layer. It is almost impossible not to scar the inner bark, but care should be taken not to cut through the inner bark and into the wood.
4. Understand the type of material needed for your work. The characteristics of the bark differ from tree to tree. In some cases only a small percentage of the trees in a given stand will have bark suitable for ones needs.
5. Determining the best time for harvest means considering the age of the tree and time of year when harvest should occur. Tree age determines bark variables such as color, thickness, roughness, lenticel characteristics, and flexibility. The time of year when bark is harvested determines ease of bark removal, and texture and color of the inner most layer of the outer bark
6. Be open to new ideas relative to harvest method, bark handling and methods of using.

Harvest and Use of Birch Bark

Harvest, handling, storage and use of bark vary among users of birch bark. Following is a brief summary of the more common methods used.

Removal of Bark from the Tree

The most common method of removing bark from standing trees is to make a vertical cut through the outer bark, damaging the inner bark as little as possible, and slip the bark from the tree. During the "peak time" for removal, the bark almost falls off the tree once the cut is completed. Before and after this peak time, removal may take a lot of careful "urging." A flat wood or metal tool can be useful in carefully prying bark from the tree.

Another method of removing the bark from a standing tree results in a long strip of bark rather than a single sheet as described above. This method is particularly useful in smaller diameter trees that would yield a small sheet if removed. In this method, one removes a 3-4 inch continuous strip of bark by spiraling down the tree. The length of the strip is determined by the length of the stem from which bark is removed. To maximize bark strength over the length of the strip, the angle of the spiral should be as close to horizontal as possible.

People often need to remove bark from trees that have been felled and cut into sections. Sheets of bark on recently felled trees can be easily removed as mentioned above. A machine has been developed, but not commonly available, that removes a continuous strip of bark from 3-4 foot sections. This machine has a motorized mechanism that turns the log, as on a lathe. The bark is cut with fixed knife blades adjusted to the desired strip width.

Sections that are cut from trees several months or more before the bark is removed present a problem. Usually the outer bark is relatively tightly adhered to the inner bark. There does not seem to be any tried and true method for easily removing bark in this situation. Soaking the tree section in warm water helps to loosen the bark as does heat in a moist environment (for example in a sauna). Once the section has been treated in this way, one simply cuts the section lengthwise and works the bark off manually or with the help of a wide flat prying device.

Handling and Storing Bark

Bark can be moved from the area where harvested to the storage area in flat sheets or rolls. The bark tends to return to the shape that it had when on the tree. This needs to be prevented for most uses. If the bark is transported in rolls, the rolling should be done at right angles to the alignment of the lenticels. The edges of the bark should be kept from rolling up as well. Flat sheets of bark are often transported from the woods by placing them between two sheets of plywood or a similar material.

Bark can be stored in flat sheets or in rolls. It should be in a sheltered area out of the rain. If stored in an area where bark is exposed to direct sun, the inner layer of the bark may darken. For storage in flat sheets, the bark should be pressed between boards or a sheet of plywood or similar material. The edges of the bark sheet should be pinned down by the wood otherwise the bark will roll in the wrong direction and it is difficult to flatten these rolls one they have set up. For the first several weeks or so it is best to place weights on top of the flattened sheets.

Bark can be stored in rolls or as flat sheets for several years or more. Some bark remains as flexible as the day it was removed from the tree while other bark becomes crisp and breaks easily when bent. Flexibility can be restored to bark by heating or soaking in water. Warm, humid air is probably the best for this purpose. Heating for 15-20 seconds in a microwave oven works well for making small pieces of bark more flexible.

Types of Bark Use

Birch bark is used to make two- and three-dimensional objects. For example, different types of bark are used in basketry to create different shaped containers, thus illustrating the versatility of bark.

Baskets Made From Sheets of Bark

This type of basketry uses one or more large pieces of bark of different sizes and shapes. Basketry done by Ojibwe, Athabascan, and Cree Indians provides good examples of this use of birch bark. The bark may be cut to help shape the basket and materials such as spruce root, strips of birch, cedar or basswood bark, and sinew are used to lace or sew the basket together to retain the desired shape. Small diameter willow or dogwood stems are often used to help make a stronger rim or reinforce cuts in the bark. Watertight containers are made by folding the bark to develop the shape of the basket.

Woven Baskets

Containers of various types are made from woven strips of a desired width. Once the strips are cut, they are usually split several times to make them more flexible and easier to weave. Baskets can be made by either diagonal or horizontal weaving of strips. The weave can either be tight or open depending on the use of the basket.

Splitting the bark into several layers is an important step in weaving. The most desirable layer of bark is the innermost layer, but other layers of bark are also commonly used. Splitting the bark brings out the color variation in the bark. Each layer of bark differs from the other. The two sides of a strip may differ considerably in color. As with all bark characteristics, splitting the bark and the character of the various layers of the bark differs between trees.

Summary

Paper birch has served people of the northern forest for centuries. Virtually every part of the tree has been used at one time or another. Increased interest in birch in recent years brings more attention to management and utilization of birch for a range of wood products and nontimber values based on the sap and bark. We need to better understand how to coordinate the uses of birch throughout the life of the stand and develop silvicultural systems that incorporate all of the potential values and uses.

Successful Utilization of Alaska's Birch Resources

Lewis Bratcher[1]

Lewis Bratcher, after more than 30 years in the Alaska wood-products industry, said that "survival" may be a more important concept than "successful" for those entering the industry today. He warned that the road may contain heartbreak and lost jobs. "If Alaska is to be your focus," he said, "you may have to think of yourself as an indentured servant, hopefully not to exceed eight years."

On a practical note, Bratcher said to "get to know your banker" – even more than one. "Know how much you need (to finance your operation)," he said. "Take a little extra and don't spend it all. Keep in touch with your banks."

Great Alaska Bowls

Products at the Alaska Bowl Company are fashioned from stem pieces of logs, either "knotty" or "clear" grades. Knotty bowls are used for dry goods – like popcorn or fruit bowls. The clear bowls can be used for any function.

One of the Bowl Company's first tasks was creating the concept and packaging for a "family tree bowl set" – all cut from the same tree. The planning took a year, Bratcher said, and is now a successful product.

Another Bowl Company concept is the "burl bowl" made from the dramatically-marked burl wood. Bratcher said his company has also worked with an artist, who uses specific markings in the wood as part of his renderings of such subjects as whales and float planes.

"I've become resigned to not making a lot of money," said Bratcher. "It's important to be creative and to have the idea you're doing a unique job – and there are still a lot of Americans who haven't been exposed to the product."

Meeting Challenges

Bratcher said his work force goes from two year-round workers to as many as six seasonal workers.

Besides marketing concepts, the Alaska Bowl Company has had many technical problems to work out over the years. Foremost was finding a laser technology that would work on a concave surface. Another problem was the making of an elongated bowl. The company now uses both lasers and knives to cut the wood for a variety of shapes.

[1] *Alaska Bowl Company*

The bowls are cut from green wood, Bratcher said, when the birch is still at 60 percent moisture. Bratcher said that the real secret is in the drying. The kiln will reduce the moisture level of the wood to only 7 percent using a 6-day drying process. "At that point, it is as good of a piece of wood as there is in the world," said Bratcher. After that, the bowls are turned and finished, then packaged for shipping and sale.

Marketing Your Products

Bratcher advised entrepreneurs to use Alaska's colorful settings and their firm's quality to commitment as part of their marketing. Invite customers to come to the factory and see for themselves.

Good packaging is another must. Producers should have an excellent printed brochure and also use the Internet to distribute their product information.

Lewis Bratcher, Alaska Bowl Company

Innovation and Development of Forest Products in Oregon and Alaska

Eric Hansen[1]

The U.S. forest products industry faces its most significant challenges ever to remaining competitive. The industry has often maintained a commodity mentality and production orientation to its operations (Juslin and Hansen 2003). Research has shown that the majority of the industry actively pursues a low-cost strategy. Traditionally, work to drive costs out of the system has concentrated on increased fiber utilization. According to USDA statistics, the U.S. industry increased fiber utilization by nearly 40 percent during the 20th century (Ince 2000). Still, the industry struggles against foreign competition. Porter (1996) suggests that, "Competition based on operational effectiveness alone is mutually destructive, leading to wars of attrition."

As manufacturing jobs continue to move overseas, there has been a call for the industry to change (e.g., Schuler and Buehlmann 2003). One significant area for potential improvement is innovation. Innovation can take three general forms: product, process, and business systems (Hovgaard and Hansen 2003). Product innovation includes development of truly new products as well as adaptation or improvement of existing. The industry has long excelled at process innovation, improving throughput and increasing fiber recovery via technologies and improved techniques (e.g., quality and process control). Business systems innovations are growing in importance for the industry. E-business is an example of a business systems innovation, but traditional marketing and management techniques are equally important. For example, moving from a production orientation to a customer or marketing orientation may be critical for the future success of many in the industry.

Methods

This research was conducted in cooperation with the Forest Service in an effort to better understand the current innovation and focus in the industry and to compare practices between Oregon and Alaska. A two-stage study was conducted incorporating both qualitative and quantitative techniques.

Interviews were conducted with managers and/or owners of eighteen companies in Oregon and Alaska. The goal was to develop a better understanding of how company personnel view the concept of innovation. By recording and categorizing their views, it was verified that innovation can take the three general forms mentioned earlier: product, process, and business systems.

Using what was learned in the qualitative stage, a mail questionnaire was developed to assess industry practices with respect to innovation, especially product innovation. The sample included all firms that could be identified in Alaska and Oregon, regardless of industry sector. Questionnaires were mailed to 319 firms in Oregon and 366 firms in Alaska. Results discussed here include only

[1] *Associate Professor, Forest Products Marketing, Department of Wood Science and Engineering, Oregon State University*

those firms defined as secondary processors. This includes 57 firms from Oregon and 41 from Alaska. All of the responding firms from Alaska were smaller than 51 employees while 43 of the 57 Oregon companies were of this size.

Results

Few differences exist between firms from Oregon and Alaska with respect to innovation and new product development practices. Figure 1 shows the relative innovation of firms with respect to each of the previously mentioned forms of innovation. No differences exist between Oregon and Alaska, but firms in both states emphasize product and process innovation more than business systems innovation.

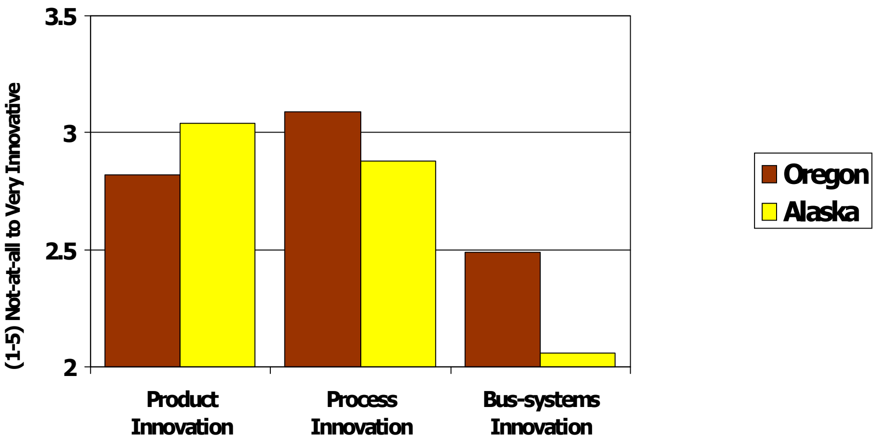

Figure 1--Possession of Three Elements of Innovation

An overview of the major drivers of innovation and the sources of innovative ideas is shown below. Upper management, retailers, and competitors were seen as both the major drivers of innovation and as sources of innovative ideas. Alaska firms rely more on their customers than firms from Oregon.

Drivers of Innovation

Oregon	Alaska
Upper Management – 23%	Retailers – 27%
Retailers – 16%	Competitors – 18%
Competitors – 15%	Upper Management – 10%

Sources of Innovative Ideas

Oregon	Alaska
Customers – 27%	Customers – 44%
Upper Management – 24%	Competitors – 10%
Employees – 15%	Upper Management – 9%

A product development process can be broken down into many incremental steps. To assess how structured the industry is with respect to product development, a scale including 15 potential product development steps was used. Respondents assessed of how often they conducted each of the following steps using a scale that ranged from ‘never’ to ‘always’ with ‘seldom as the midpoint.

1. Idea generation
2. Initial screening
3. Preliminary market assessment
4. Preliminary technical assessment
5. Detailed market research
6. Business/financial analysis
7. Product development
8. In-house product testing
9. Customer product tests
10. Test market/trial sell
11. Trial production
12. Pre-commercial business analysis
13. Production start-up
14. Market launch
15. Post launch evaluation

Figure 2 outlines the frequency with which these activities were undertaken. Few differences exist between respondents from the two states. The only item that was significantly greater than the midpoint of ‘seldom’ was idea generation. Apparently firms in these industry sectors do not consistently practice structured new product development.

Despite this apparent lack of structure, respondents actively improve existing products and create products that are both new to their firm as well as new to the industry. Figure 3 shows the number of products introduced during the last three years in each of four categories. Although rather large differences exist between the numbers, none of those differences are statistically significant.

Figure 4 shows a composite measure of firm performance as compared to the competition. Respondents were asked to compare their operation to other competitors during the most recent year. Alaska respondents perceived their firms to be competing at a lower level than did the Oregon respondents.

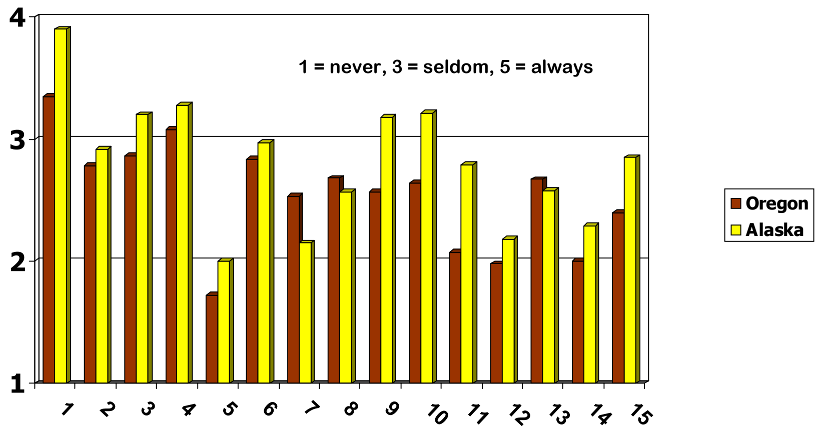

Figure 2--Frequency of Use – Various New Product Development Activities

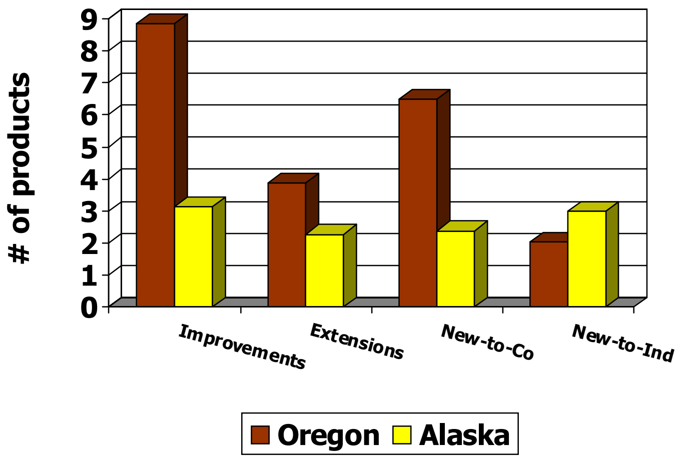

Figure 3--New Products Developed During the Past 3 Years

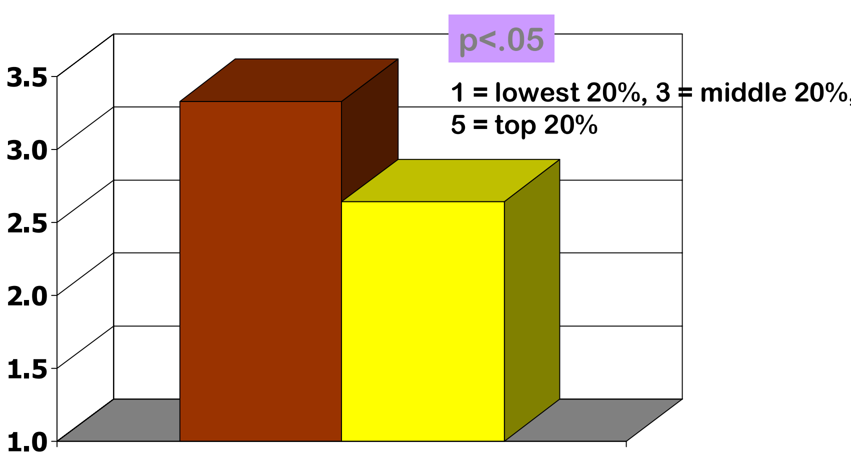

Figure 4--Performance Relative to Competition
(sales level, sales growth rate, cash flow, gross profit margin)

Discussion and Conclusions

The secondary forest products industries in Oregon and Alaska do not see themselves as particularly innovative. As a whole this may be an accurate assessment, but as with any industry there clearly are innovators that drive change in the industry. In addition, the view by respondents may be a bit myopic or even cynical. In other words, many innovative activities are undertaken by these firms on a day-to-day basis that are unrecognized or unquantified.

Evidence suggests that companies that consistently produce new products are more successful. In turn, a structured new product development process increases the probability of successful new product introduction. Respondents in this study are faced with a significant opportunity to improve their product development processes, thereby increasing their new product outputs and success.

Firms were weakest in the area of business systems innovation. Future competitiveness will likely be more dependent upon this form of innovation. Companies that have historically relied on process innovation for their competitive edge will need to consider investments in other areas as well. This is not to say that process innovation is unimportant, only that being a good processor will unlikely be a long-term source of competitive advantage. Instead, it will by a necessary prerequisite for competing.

Finally, one consideration at the beginning of this study was that the Oregon industry is more mature and might provide insights for improvement by the Alaskan industry. However, with respect to innovation and new product development, there appears to be few differences between companies in the two states.

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Sawmill Efficiency and Double-Diffusion

Kenneth A. Kilborn[1]

INTRODUCTION

The sawmill industry in Alaska faces many economic barriers that act together to reduce its competitiveness. Several of these barriers (such as high labor costs, road building costs, utilities and transportation costs) are beyond the control of the sawmill industry. There are, however, at least three areas of production and operation in which the sawmill industry can improve its competitive position:

- Delivered log costs,
- Recovery of saleable products per unit of log volume purchased, and
- Producing higher valued products from the delivered logs.


Ken Kilborn, USDA Forest Service

Recovery of saleable solid wood products per unit of log volume and producing higher valued products from the delivered logs will be the emphasis of this report. Lumber recovery studies were completed on 22 sawmills between 1997 and 1999. The statewide recovery study results will be reviewed as well as looking to see whether localized conditions across defined geographical areas of Alaska affect the recovery of saleable products. The major differences across regions of Alaska (southeast, interior, south-central) that may influence recovery are availability, quality and quantity of timber resources, and size of and distance to markets. Another goal was to determine whether size of the sawmill operation has an effect on recovery or to what effect different breakdown machines have on recovery. There is room for improvements in recovery in nearly all of Alaska's operating sawmills. This is very important considering timber supply constraints and the economic barriers in Alaska.

Many higher valued products may be produced from the State's sawlogs. The area emphasized here is the wood preservative treatment method called double-diffusion. There are several reasons why this treatment method is still being considered in Alaska:

- Nearly all species of Alaska's wood can be treated effectively with this process,
- Chemicals that are being recommended for use in this process are not on the U.S. Environmental Protection Agency's list of restricted wood treating chemicals, and
- It is a water-based method that does not require a large investment in property and equipment to establish an operating treating plant.

[1] *USDA Forest Service, Pacific Northwest Research Station, Wood Utilization Center, Sitka, AK*

History of Sawmill Efficiency in Alaska

Sawmilling in Alaska dates back to the early 1900s with most logs being sawn into lumber for building businesses and homes. Canneries were developed for Alaska's salmon and much fish was shipped out of state in wooden boxes. During World War I, high quality Sitka spruce was sawn into airplane parts. With the establishment of two pulp companies at Ketchikan and Sitka in the 1950s, a market was developed where top grades of logs were exported out of the State and mostly to Japan. As long as there was a good market for pulp and export products, improving recovery did not seem to be needed as there were few complaints from customers as to quality of the products produced. When the markets for pulp, export logs, and lumber were greatly reduced, the established sawmill industry had more difficulty finding profitable markets. Markets in the 48 contiguous states were requiring lumber that was dried, planed, and graded by an approved grading agency as well as at a competitive price to material they were buying from local sawmills and importing from Canada. It now became important to recover as much of each log that could be manufactured profitably. There were very few planers and dry kilns in Alaska. Lumber grading was only taking place at a few sawmills that could afford to bring a certified grader to Alaska.

Much interest has recently developed in establishing dry kilns and planing operations. The Alaska Forest Association was active in getting a federal grant project established for two years to assist in establishing dry kilns and lumber drying facilities. The Wood Technology Center was established in Ketchikan to show the users the true strength values of Alaska's wood species. The Forest Products program at the University of Alaska Southeast in Sitka was established to look at educational opportunities in the forest products industry and research needs of this industry. The Pacific Northwest's Alaska Wood Utilization Research and Development Center has been established in Sitka with a mission to identify and evaluate the opportunities for viable forest products industries in Alaska. The Center defines and describes "value-added" activities that provide the appropriate and durable mix of employment, profits and marketable products. We identify the type and scale of harvesting operations and manufacturing facilities that are consistent with the timber resources, economic conditions, market opportunities, and economic development objectives of communities in Alaska.

Now it is extremely important that the sawmill industry produces as high a quality product as the resource will allow. There are markets today for these properly manufactured products and reaching the maximum recovery of each sawlog into these products will contribute to the increased profitability of these operations.

Several sawmills in Alaska have made good advances over the last few years. With a reliable timber supply, the sawmill industry in Alaska should be able to better meet the needs of this State and have products for several export markets. Several dry kilns are being built or are planned in the next few years. There has been an increase in planer operations within the State. New and high recovery equipment has been added by several mills. The sawmill industry is heading in a good direction and with the assistance of support groups throughout the State, additional improvements are expected.

History of Double-Diffusion Treated Wood in Alaska

Records of the Agricultural Experiment Station (Station), University of Alaska at Palmer, Alaska shows that the Station was involved with wood preservation testing as early as May 1952. This first test was only white spruce and white birch fence posts treated with a solution of water and copperized chromated zinc chloride (CuCZCl). Later the same year, both aspen and cottonwood were added. In June 1953, testing included these four species treated with CuCZCl. Additional posts were tested by cold soaking in pentachlorophenol (Penta) and fuel oil, and still more posts were tested using a brush on creosote in fuel oil solution. All these posts were tagged and established in a fence line at the Station. (See University of Alaska, 1952; Matanuska Experiment Station, author and date written unknown.)

In July 1954, 12 peeled green fence posts of each species, white spruce, aspen, white birch and cottonwood, were treated with a Double-Diffusion process which included two separate solutions for the treatment. The posts were harvested and treatment started within 48 hours. The procedure followed was outlined by the USDA Forest Service, Forest Products Laboratory in their publication, "How to Treat Fence Posts by Double Diffusion" (Baechler 1953). The first soak was an 8 percent copper sulfate ($CuSO_4$) solution in water and soaked for 48 hours. These posts were rinsed with water then soaked for 48 hours in a solution of 11 percent sodium chromate (Na_2CrO_4) and water. The Double-Diffusion fence posts were also placed in the same linear fence line as the 1953 test at the Station (University of Alaska, 1956).

In 1986, these posts in the linear fence line were given a survival check by the agricultural engineer at the Station and all 12 of the aspen, cottonwood, and spruce posts were sound and 7 of the birch posts were still sound. The test site is in the Matanuska Valley approximately 40 miles northeast of Anchorage at an elevation of 255 feet above sea level. The mean temperature in the May through September growing season is 52.2 degrees Fahrenheit. The total mean precipitation during this time is 9.13 inches, but the field where these posts were placed is irrigated. No data on these posts since the 1986 survival check (Mayuer et al, 1995) could be found.

Fence Post Field Test

In September 1972, an additional wood preservation field test using the Double-Diffusion process was established by the Station with technical assistance from Lee Gjovik of the USDA Forest Products Laboratory (FPL) at Madison, Wisconsin. The study involved a total of 685 test samples. The Palmer plot included 601 samples and 84 samples were placed at Homer. Fence posts were the major part of the study with nearly an equal number of the following species: white spruce, white birch, aspen, and cottonwood. Of the 610 fence posts, 96 (24 of each species) were untreated controls. Twelve controls were placed in Homer and 84 controls were installed at Palmer. As in the 1954 test, the chemicals used were $CuSO_4$ and Na_2CrO_4 (University of Alaska, 1972). In an inspection in September 2002, one control (spruce) was still standing at Homer and one control (aspen) was still standing at Palmer. Both of these standing controls were about 6 inches in diameter. The remaining 75 samples were sawn products from white spruce and cottonwood measuring 2x4, 4x4, 8x8, and 2x10 inch by 4 foot long. Eight of these sawn samples were installed near Homer and the rest at the Station near Palmer.

During the October 1999, April 2001, and September 2002 inspections of the Palmer plot, a few treated posts failed the 100 pound pull test. In 1999 one cottonwood fence post failed. In 2001 two birch posts and one cottonwood post failed, and one birch post failed in 2002. Samples from these posts were examined for decay at FPL and no fungus was found. A spruce post is missing and there is no evidence as to why. It was on the end of a row and may have been removed to use in a different location.

At the Homer plot, which I first visited in 2002, there were no treated posts that had failed because of decay. One 4 inch x 4 inch cottonwood post was broken at the groundline but it appeared to be mechanical breakage possibly caused by farm machinery. Some posts at this test site were not found because we had no map showing the original layout. Station records did show the layout of the post plot at Palmer.

Railroad Tie Test

In 1985, 48 (7 inch x 9 inch x 8½ feet) western hemlock railroad ties were treated by the Double-Diffusion process using sodium fluoride and water in the first solution which is often heated to about 160 degrees Fahrenheit for about 8 hours and left in the solution fully submerged from one to three days. When taken from this first solution the charge is thoroughly rinsed with water before being placed in the second solution of copper sulfate and water where the charge is submerged for up to three more days. When the charge was removed from the second solution it was placed in storage and covered with plastic sheets and allowed to diffuse until the material has dried or put in use (Gjovik, 1986).

These ties were placed with Alaska Railroad (ARR) to be used in an active track. The ties were installed in an active track in 1988. I was shown where most of these ties were placed in ARR track and inspected them with scientists from FPL in October 1999. Only 29 ties from this test have been positively identified and another eight ties in this general area are probably from the 48 ties treated in 1985 but identification tags had been lost due to track cleaning and other causes. During the 1999 inspection, none of the 29 ties that were positively identified had failed. In September 2002, two scientists from FPL, the Chief Engineer from ARR, and I inspected these ties and found two that had failed because of mechanical breakage. Ties that failed would not have received the minimum grade required by the American Railroad Association to be used in an active track (West Coast Lumber Inspection Bureau, 1996). There were knot clusters under the rail of the track in both cases.

Plans for 2003 call for a “Bench Test” and an in-track “FAST Track Test” to be administered by the Transportation Technology Center, Inc. at Pueblo, Colorado for railroad ties produced from three Alaska softwood species: western hemlock, Sitka spruce, and white spruce. One tie from each species will be bench tested for cut spike insertion and extraction as well as for cyclic load. After passing the bench test, 100 ties of each species that pass the bench test will be placed in the “FAST Track” where a four mile circular track will have a live loaded train travel over the ties continually for 350 days. The 350 day test will show results to approximate 30 years of normal track usage. Once results are obtained from the test in Pueblo, the next step will be having ties from these species placed in a research project on active ARR tracks.

Timber Bridges Treated by Double-Diffusion

As part of the National Timber Bridge Initiative (NTBI), five white spruce and one Sitka spruce were treated by Double-Diffusion and placed in service in Alaska highways. An additional bridge (not part of NTBI) was placed on private land in Mat-Su Borough. In 2001, a bridge treated by Double-Diffusion and placed in service in 2002 allows traffic to cross the Alyeska Pipeline. All of the bridges, described above, were treated in Alaska by two private companies. Both companies used sodium fluoride (NaF) and water as the first solution and $CuSO_4$ and water as the second solution.

Summary and Results

Sawmill Efficiency

Sawmill efficiency is improving in Alaska. Improvements have been made in equipment, processing, and in producing higher valued products at several Alaska sawmills. There is still room for improvements at many mills. These improvements could provide mills with better returns on their investments. Many economic barriers facing this industry are not improving nor will they improve soon. So, hope lies in finding markets for higher valued products and getting the highest possible cost-effective recovery.

Double-Diffusion

The Double-Diffusion preservative treating process for wood has been used successfully in Alaska for nearly 50 years. It has been used for Sitka spruce, white spruce, western hemlock, paper birch, aspen and cottonwood. The only species where decay was found during testing was birch. The spruces are extremely hard to treat with other commonly used treating processes, but treat well with Double-Diffusion. Hemlock heartwood does not treat easily with most pressure treating methods, but treats easily with Double-Diffusion. The Double-Diffusion process is not used in many areas of the world because it is a slow process taking up to 6 days in treating tanks and needs to sit for a few weeks to thoroughly diffuse through the piece treated. It is the method that works well with all Alaska species and the cost of treating per unit of products is less than most other methods.

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Future of the Wood Technology Center

Kevin Curtis[1]

Before the advent of the Ketchikan Wood Technology Center, every time a project was mounted to provide research and development help to the Alaska timber industry, the administrative structure had to be built anew. Kevin Curtis said that he and Ken Kilborn of the Wood Utilization Center in Sitka discussed the need for organization devoted to helping the industry modernize and take full advantage of the unique qualities of Alaska timber. He said the Wood Technology Center came out of these discussions seven years ago.

“We decided to create the center as a kind of umbrella for doing the things that industry was telling us to do,” Curtis said. Those who sit on the advisory committee are tend to be technology driven, but the purpose is to listen to landholders, timber owners, and consumers. “The Center pulls all the threads together.”

Center in the Center

The Ketchikan Wood Technology Center is located at Ward Cove, on the site of the former Ketchikan Pulp Company and the Gateway Forest Products now-closed veneer plant. Those firms, and Ward Cove, once represented the heart of the southeast Alaska forest products industry – with Ketchikan the center of activity.

The Wood Technology Center was created to support a number of goals. One goal is to increase the knowledge base about Alaska species, in order to help timber sellers to find the top market. A lot of people in Alaska consider their resource to be a commodity, when they should be finding markets that will pay for Alaska timber’s unique features. “We want to develop a knowledge base that allows us to negotiate the highest price for wood and wood products,” Curtis said. It is important to develop an attitude of demanding top prices for a better product.

Another goal of the Wood Technology Center is to help introduce new technologies into the State. “For a lot of our past, we shipped pulp and log exports,” Curtis said. “I think the future is going to involve a lot more processing on our part.”

Secondary processing capacity in Japan has atrophied, and the opportunity exists for Alaska to fill that gap. For a long time, producers were getting paid twice the amount for logs than they could get for lumber. Curtis said those prices could be paid because the buyers were making even more money processing the logs themselves into high-value products.

“We need to move into the top part of the market,” Curtis said. “Instead of selling raw materials for the bottom dollar, we need to start getting the top of the dollar as well. That’s going to take technology. We need to stop shipping rough, green material. We need to stop shipping bark. We need to stop shipping water. We need technology for that.”

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[1] *Ketchikan Wood Technology Center*

The Wood Technology Center operates a low-pressure steam kiln for use in drying test samples and also as a demonstrator for private firms thinking of investing in a kiln. Does the firm need a dehumidification kiln, a hot water kiln or a low-pressure kiln for the markets that have been targeted? “People come to our center and learn about kiln technology,” Curtis said. “They can use our kiln to mimic other kiln types so they can make an informed decision when it comes to purchasing.”

Broad Support

The Wood Technology Center has been funded at $2.7 million through 2005. Support has come from Alaska Senator Ted Stevens, the USDA Forest Service and the University of Alaska Southeast, the primary partners. Help has come from the Ketchikan Gateway Borough and the now-defunct Alaska Science and Technology Foundation. The group is working also with the Alaska Department of Natural Resources, Division of Forestry.

Curtis said the Wood Technology Center was closely tied to the Forest Service’s Wood Utilization Center in Sitka. He said his group has access to the Forest Service’s Forest Products Lab in Madison, Wisconsin and the various resources of the University of Alaska. The Forest Service is the Wood Technology Center’s biggest supporter.

The Wood Technology Center is administered by the Juneau Economic Development Council, which is well accepted by the timber industry. The Center also is working with the Western Wood Products Association, which writes, inspects and certifies lumber products for official market grading. “We are working with them to grade uniquely Alaskan products so that they will command the high end of the market,” Curtis said.

Present Activities

“In the lab we are breaking a lot of wood to test its characteristics,” said Curtis. Large samples of Alaska wood are collected and then put under various stresses to test the wood’s strength.“ What we are finding is that we have been undervaluing our timber in terms of its engineering properties,” he said. “We knew that, but until we get (the wood) tested, we can’t prove it.”

It is important that Alaska starts getting the true value for its superior products. “We also need to transition from a pulp-chip focus,” Curtis said. “All of those things will remain part of the picture. Round log export will remain part of the picture. But we have to get into the higher value-added products for our timber, which is unlike any other timber on the market today.”

“We have some of the premium wood fiber in the world today,” Curtis added. “Because it is old growth, because its growth ring density is 100 rings per inch, it is a waste to put our wood into commodity stud material. If you build a wall with this stuff, you’ve wasted its potential. It’s better than that. We need to target up into the engineered wood market, where they depend on that kind of density.”

“This is where they will pay for that kind of density,” he concluded. “And instead of begging them to take a load from us, we’re deciding which of four buyers we want to sell it to. And that’s what’s going to happen if we get into the engineered wood market.”

Crossing Streams

One of the premier uses for Alaska wood would be as beams for bridges, where great strength is needed, but some chemically-treated glue-lam beams would be prohibited from use.

In Alaska yellow cedar, we have a wood with great strength, which also has natural decay-resistance. Outdoor structures made of Alaska yellow cedar would not require maintenance. Alaska yellow cedar beams would be perfect for stringers in the bridges crossing sensitive streams and drinking water reservoirs.

Here is Alaska, he noted wryly, Alaska yellow cedar is used for firewood. “We use it for firewood because it splits easily,” Curtis said. “And it splits easily because it has no knots. So you just chopped up a $5,000 log for firewood. “We need to market our stuff more efficiently. Right now, it’s not them doing it to us. We’re not doing our homework.”

Part of that homework is learning to use equipment like planes or kilns. Curtis said the Wood Technology Center is consulting with a former planing expert from Louisiana-Pacific. And they obtained the blade sharpening equipment from Gateway Forest Products in order to keep alive in Ketchikan the ability and knowledge of how to sharpen industrial machine knives.

Testing Strengths

Much of the testing that will lead to higher grades – and higher prices – for Alaska wood products is being performed right at the Wood Technology Center. Alaska is lumped in the general spruce-pine-fir designation. But species such as Sitka spruce and white spruce from Alaska perform much better than the general specifications suggest. The ultimate goal is to separate Alaska timber from Lower 48 timber of the same or similar species.

You can get design values for Alaska yellow cedar, which show its superior properties. Now engineers can begin to use Alaska yellow cedar in their designs in ways that no other cedar can be used. Curtis wants to see the same separate identity for Alaska hemlock instead of being lumped in with Western hemlock and Alaska Sitka spruce and Alaska white spruce.

“We’ve got to get away from the way species have been grouped and pull out the Alaskan production,” Curtis said. “And get away from marketability being determined by species that don’t even grow in Alaska.”

Because of the work of the Wood Technology Center and others, Alaska has pulled ahead of Canada in certifying its old growth species – giving Alaska a temporary head start. “We now have one of the better labs in the country for doing wood products testing,” he said. “We have a full-fledged independent testing facility in Alaska to certify the strength of Alaska’s timber species.”

Breaking Wood

At the old pipe welding shop where the center is located, state-of-the-art equipment is arrayed. A quarter of a million board feet of Alaska wood is to be stretched and bent to the breaking point – in fact, it gets broken all the time.

But, Curtis said, the machines have sometimes had a hard time breaking Alaska wood at all, because the wood so outstrips the strength of most wood and hence, what the machines were designed to do. A machine that exerts 100,000 pounds of force to pull boards apart has been unable to pull apart Alaska 2x8 inch beams, Curtis said.

He said the grade stamp for Alaska Yellow Cedar has already been obtained. Alaska hemlock will get its stamp at the end of 2004 and Sitka spruce and white spruce by 2005.

Curtis said while that will cover the wood harvested in southeast Alaska, wood from the entire westward region has not been tested. Anyone with contacts or interests in that should come forward, he urged.

Curtis said the Wood Technology Program is committed to finishing its grading program and continuing to offer grading services in the State.

“We’ve gathered a huge sample of material and we will know a lot more about our lumber by the time we get done than anybody with any species has ever done in the Lower 48,” he said.

The Center in the future will do more work with smaller diameter logs and on second-growth issues in general. “We have about 50 years of old growth material, but after that we should start looking at the qualities of second growth,” Curtis said.

Success Stories: Alaskan Wood Products Producers' Keys to Success

P. Alva Reed, Dick Jones, John Squires, Mark Stearns. Not shown: Richard Haynes, moderator.

P. Alva Reed, Masters Touch Manufacturing

Life is good these days for P. Alva Reed of Masters Touch Manufacturing, North Pole. Masters Touch manufactures a diverse line of specialty wooden products, including signs, refrigerator magnets, gift boxes for smoked salmon and distinctive wooden shot glasses and beer steins. Reed uses local Alaskan aspen and birch, often pieces that would otherwise be left on the forest floor to rot. Sales are brisk.

There *are* challenges. Reed finds increased competition from China, while fixed costs (such as worker compensation) go up. Reed had to cut his staff from five employees to one because of such costs and now struggles to keep up with demand.

Long in the construction industry, Reed turned to manufacturing as he got older. What he originally envisioned as a part-time supplement quickly turned full-time.

Keeping the production of value-added goods in Alaska is important to succeed. Too often whole logs are sent overseas and come back as manufactured items. According to Reed, that should stop.

Reed said that markets often come to him, but that doesn't mean he hasn't been widening his outreach. He recently began advertising on the internet. He also works with government agencies, such as the Forest Service Wood Utilization Center in Sitka.

In 5 years, Reed hopes to sell his business and retire. "We're picking up more accounts in the Lower 48 and every year it doubles and triples. If a young guy had a lot of energy and push, who knows where he could take this business to."

Mark Stearns, Alaska Wood Mouldings

Mark Stearns of Anchorage insists that the success of his business, Alaska Wood Mouldings, is directly due to the talent of his staff, most of whom have been with his company for five years or longer.

Stearns manufactures custom architectural millwork (moldings, trim, some cabinetry and specialty items like staircase railings) for schools, military bases, libraries, municipal buildings and courthouses. His customers are generally contractors.

One of the key things to success is finding and motivating good employees. You hear it all the time, but it really is true. Once you get good employees, you try and keep them. Because a lot of problem solving is necessary in such custom jobs. Stearns gives his employees the responsibility to make decisions and always stands behind them and their decisions.

Three basic variables must be balanced: quality of the merchandise, on-time delivery, and a good price. His company focuses on the first two, especially since his customers can easily lose thousands of dollars or more if an item is wrong or delivered late, disrupting the construction schedule.

Stearns has found that his customers are willing to pay a higher price for consistently receiving quality products on time. If you give them a good deal, but poor quality, they'll remember the poor quality, not the good deal.

Dick Jones, W.R. Jones and Son Lumber Co.

In the heart of southeast Alaska's Prince of Wales Island – the region's most active logging area – Dick Jones' company, W.R. Jones and Son Lumber, produces both green and dried rough slabs, flooring, paneling, trim and molding. Jones sells to several lumberyards and suppliers in the Lower 48, but his customers also come from as far as Hawaii.

"Seems like we're growing steady every year and I think there's a demand for our products out of Alaska," Jones said. "People pay extra money just to say they got Alaskan wood."

Jones said he gets many customers from word-of-mouth. He also sells his products locally.

In these precarious times for securing a wood supply, it is important for a company to remain nimble and use the species of wood that becomes available. It's no use for developing a high demand for Alaska yellow cedar, for instance, if no yellow cedar can be had.

Jones believes in developing value-added capacity and knowledge in Alaska. He waited two decades to get a kiln, but finally securing one has opened many new avenues for products. Investment in equipment can open new manufacturing opportunities. A simple 1 x 6 board, for instance, becomes much more valuable by several multiples if run through a molder to turn it into tongue-and-groove siding.

Optimistic about the future, Jones said he expects his business to triple over the next 5 years. He gave great credit toward that success to help given him by the Wood Utilization Center.

Jon Squires, Logging and Milling Associates

Jon Squires of Logging and Milling Associates said his moment of truth came when he and his four business partners realized that there were other small sawmills in Delta Junction and Tok already – how was a firm located far outside Delta going to compete?

Squires said he and his partners decided to specialize in custom, complete tongue-and-groove log home kits. And that business took off – with products sold from Soldotna to Prudhoe Bay.

“We couldn’t sell identical products,” Squires said. “We had to sell for less and provide better service just to stay in business. So we decided to sell a different product – the other sawmills were all doing end-peeled 3-sided house logs – that left the door open for tongue-and-groove.”

“We also have a field crew putting those kits up so we are able to utilize our own material and cut out the middleman,” Squires said. “Which is one of the reasons we are successful. We take the timber from State forest sales. We log it ourselves, we mill it ourselves, we dry it ourselves, plane and process it, and then actually build the home and install the products outside the home.”

Logging and Milling Associates manufactures products ranging from 1x6 trim items to 8x10 exposed beams and tongue-and-groove house logs. They have kits for recreational cabins using 6 x 6 logs and for deluxe homes using 8 x 10s.

About 90 percent of the company’s business is done with consumers in the Fairbanks area. Despite doing no advertising or marketing, his company is chock full of orders. The original five-person crew has increased to 14 employees. They sell about 10 homes per year and fill each season ahead of time through word-of-mouth referrals.

Squires wants to explore the production of glue-lam beams and other manufactured wood products.

“Innovation *is* our business. Being a remote business in Alaska, we innovate on a daily basis.”

Product Exposition

The conference exposition provided a forum for sharing information in an informal, interactive setting. Approximately 20 crafters, artists, university and governmental agency representatives participated. Products included hot tubs, wooden bowls, furniture, and speciality items such as birch syrup.

Conference Field Trip

The final afternoon of the conference featured a field trip to two Anchorage wood products companies. Nearly 30 conference attendees took part.

The ULU factory

The ULU factory is one of Alaska's leading gift and craft producers, and their wood bowls and cutting knives are a familiar sight in Alaska's gift shops. The company has 12 full time employees, has been in business since 1973, and operates from a 12,000 square-foot manufacturing facility near downtown Anchorage.

Gifts such as the ULU bowls represent a high value use for Alaskan woods. Local Alaskan woods play an important role in the manufacture of ULU products- the knife handles are made entirely of birch, and the bowls are constructed from both birch and walnut. Birch lumber sawn at local sawmills is used whenever possible.

Attendees on the field trip were able to watch through glass windows as bowls were produced. First, kiln-dried lumber was ripped to the desired widths, and then edge-glued. Next, the bowls were contoured by specialized woodworking machines developed by the ULU Factory. This innovative process uses a router which accurately profiles the bowls, so that the curvature of the cutting surface matches that of the knife. Next the bowls were sanded, followed by finishing with a food-grade mineral oil to complete the process. A separate process was used to manufacture the knives, made from a heat-treated stainless steel allow, followed by assembly with the Alaska birch handles. After the tour, attendees had time to browse through the gift shop located within the ULU factory.

ULU Bowls are among Alaska's most recognizable wood gift products, and are distributed to gift shops throughout Alaska.

The ULU factory in Anchorage, AK

ALASKAN WOOD MOULDINGS

Alaskan Wood Mouldings produces a wide variety of secondary manufactured wood products for both interior and exterior applications. Product lines include custom architectural millwork, flooring, paneling, and moulding for interior uses as well as numerous log home siding products and styles. The company has been in operation in Anchorage for nearly 15 years and has 5 full-time employees. Alaskan Wood Mouldings recently moved into a new manufacturing facility near downtown Anchorage.

During the field trip, owner Mark Stearns lead the group through his showroom and production facilities where several woodworking machines were in operation. The highlight of the tour was a demonstration of the Weinig moulder, a wood processing machine that can produce many types of profiled products in addition to flat-planed lumber. One of the company's primary products is profiled log home siding from locally harvested white spruce. Other products for residential markets include interior trim and siding, flooring products, and doors. Much of the profiled lumber produced by Alaskan Wood Mouldings serves local Anchorage markets for use in new home construction and remodeling.

The secondary processing equipment at Alaskan Wood Mouldings is a good example of value-added processing of local lumber, since profiled and moulded products are often considerably more valuable than flat-sawn lumber.

Alaskan Wood Mouldings continues to look for value-added wood processing opportunities, and a new lumber dry kiln is soon planned for start-up. The new dry kiln will be especially beneficial for the company's interior products, many of which must be kiln-dried to close moisture tolerances.

The processing equipment at Alaskan Wood Mouldings can produce a wide variety of profiled wood products and styles

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Pacific Northwest Research Station

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U.S. Department of Agriculture
Pacific Northwest Research Station
333 S.W. First Avenue
P.O. Box 3890
Portland, OR 97208-3890