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Alaska's Lumber-Drying Industry—Impacts From a Federal Grant Program

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Photos by

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Abstract

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A survey determined that installed dry kiln capacity in Alaska more than doubled to an estimated 220 thousand board feet (mbf) within 4 years (2000-2004). This increased ability to produce dry lumber and value-added products resulted from industry efforts to obtain federal funding to support a dry kiln grant program. This report reviews grantees' progress in implementing grant-supported projects and their impact on the production capabilities of the Alaska lumber drying industry. Data were collected in early 2005 by using a standard set of questions asked of 19 dry kiln owners. Much of the growth in drying and value-added processing capacity has been concentrated in south-east Alaska where there has been the greatest dry kiln investment. During 2004, the estimated volume of lumber dried in Alaska was 813 mbf, whereas potential annual capacity was estimated to be almost 6,600 mbf. This indicates that Alaska producers are drying just over 12 percent of their potential capacity. Factors that will increase the future production of value-added forest products in Alaska include a continuing supply of economically priced timber, the ability of the industry to support a reasonably priced grading service, and the ability of producers to move value-added products to domestic and export markets.

Keywords: Wood products, economics, dry kiln, dehumidification, lumber, employment, Alaska.

Contents

1	Introduction
3	Methods
4	Kiln Capacity and Lumber-Drying Volumes
4	Lumber Value
5	Capital Investment in Dry Kilns
5	Employment
6	Market Destinations
6	Potential Lumber-Drying Capacity
6	Results
6	By Geographic Region
12	By Dry Kiln Type
12	Potential Lumber-Drying Capacity
15	Discussion
18	Considerations
19	Glossary
20	Acknowledgments
20	Metric Equivalents
20	Literature Cited
22	Appendix

Introduction

The *Southeast Timber Task Force report* (Morse 1997) noted that rough, green lumber was the major product traditionally shipped from southeast Alaska. The same source stated that two small, but infrequently used dry kilns existed in the region. Likewise, the McDowell report (1998) noted similar facts and suggested an opportunity for small Alaska producers to substitute imported products with those manufactured locally. Some factors cited as necessary to develop this opportunity were access to technical expertise, grading services, dry kilns, and up-to-date machinery. Because of this industry pressure, in 2001 and 2002, the USDA Forest Service, Alaska Region State and Private Forestry program received \$4 million to fund a grant program for developing kiln drying facilities that would produce value-added products. In 2005, the Alaska Region offered another round of grants by using previously awarded funds from projects the grantees were unable to complete. This report reviews grant recipients' progress in implementing grant-supported projects and their impact on the production capabilities of the Alaska lumber-drying industry.

Prior to implementing the federal grant program, lumber drying in Alaska was limited to relatively few kilns drying small volumes of lumber primarily for local markets. In 2000, Alaska kilns had a combined installed capacity of only 94 thousand board feet (mbf) (Nicholls and Kilborn 2001). However, since 2000, installed dry kiln capacity in Alaska has more than doubled to an estimated 220 mbf, drying close to 813 mbf of lumber annually. These advances were driven largely by the federal grant program that helped fund dry kilns (fig. 1) and related equipment such as pre-dryer facilities, lumber storage buildings, planers, and moulders (table 1). Grant recipients were required to provide matching funds (cash



Figure 1—Dry kiln, interior Alaska.

Table 1—Selected grant recipients and project status for federal grant program in Alaska (current February 2006)

Grant recipient	Alaska region	Project summary
1	Interior	Purchase: 1 five-headed moulder, 1 dust collection system, 1 wood-fired boiler, 1 four-headed moulder with dust collection system, 1 dry kiln Construct: 1 building for wood shaping
2	Interior	Purchase: 1 planer/moulder
3	Interior	Purchase: 1 moulder/planer, 1 cantilevered lumber storage rack, 1 automated infeed/outfeed system Install: 1 wood energy system, kiln components, 1 insulated steel building Construct: 1 kiln building, 1 stickering rack, 1 air-drying T-shed, 1 storage building, 1 planer/dry lumber protection facility
4	Interior	Purchase: 1 Nyle kiln Construct: 1 drying shed and pre-dryer
5	South-central	Purchase: 1 planer, 2 dry kilns
6	South-central	Purchase: 1 planer Construct: 1 pre-drying and dry-lumber storage facility, 1 biomass boiler
7	South-central	Move: 1 kiln, planers
8	South-central	Purchase: 1 dry kiln system, 1 air dryer Construct: 1 dry-lumber storage facility
9	South-central	Purchase: 1 planer Construct: 1 lumber storage building
10	South-central	Purchase: 1 planer, 1 dry kiln facility Construct: 1 dry-lumber storage building
11	South-central	Purchase: 1 moulder, 1 grinder Install: 1 boiler Fix: 1 kiln Construct: 1 drying shed, 1 building for the moulder and dry-lumber storage
12	South-central	Construct: 1 dry-lumber storage building, 1 air-drying shed
13	South-central	Purchase: 1 dry kiln Construct: 1 planer building, 1 dry-lumber storage building
14	Southeast	Purchase: 1 Nyle kiln Construct: 1 dry-storage building
15	Southeast	Purchase: 1 planer
16	Southeast	Purchase: 1 sticker stacker, packaging equipment, 1 timber sizer Construct: 1 air-drying shed, 1 pre-dryer, 1 dry kiln and heating system, 1 power plant, 1 dry-lumber storage facility
17	Southeast	Purchase: 1 wood-energy system, 1 lumber dryer, 1 planer Construct: buildings for 1 pre-dryer, 1 planer, 1 dry-lumber storage, 1 wood- energy system
18	Southeast	Purchase: 1 moulder Construct: 1 air-drying facility
19	Southeast	Purchase: 1 planer, 1 profiler Install: 1 wood-energy system Construct: 1 dry kiln, 1 dry-storage building
20	Southeast	Purchase: 1 central boiler for existing kiln Construct: 1 covered storage building, 1 pre-drying facility

or in-kind contributions) of not less than 20 percent of the total project cost; however, most successful applicants achieved matches of at least 40 percent of project cost. Of 18 original projects, 3 were cancelled and the funds used toward 8 additional projects in 2005. From the remaining 15 projects, 10 projects are completed (or substantially completed), 2 projects are approximately 50 percent complete, and only 3 projects are less than 50 percent complete (status as of February 2006).

Further stimulus has been provided by a natural progression of new value-added products, developing markets for export and domestic trade, overall business savvy, operational skills, and determination of wood products manufacturers within Alaska. Over the past 5 years, many of these factors have intersected, resulting in broad successes for Alaska firms that produce and market secondary wood products of increasing quality and design innovation while also continuing with fundamental product offerings, including dimension lumber for construction. Indeed, if current trends continue, we could soon see a combination of niche products and commodity offerings, including a broad array of secondary products now emerging on the Alaska wood products landscape. These include tongue-and-groove lumber, hardwood flooring, architectural moulding and millwork, and furniture stock that were previously reserved for only the most specialized applications.

Has the federal grant program been an effective means of stimulating lumber drying and production of value-added products? What role will kiln-dried lumber products have in the future Alaska wood products industry, a traditional industry dating back to the early years of Alaska's statehood?¹ Is the Alaska wood products industry now at a collective turning point, poised for further success? The three primary objectives of this paper are (1) assess the effectiveness of the federal grant program as a means of stimulating lumber drying and secondary processing in Alaska, (2) compare Alaska's dry kiln industry in 2004 versus 2000 and summarize recent advances and key trends, and (3) offer perspective for possible future direction of this industry, including employment and new and emerging markets.

Methods

In February and March 2005, data were collected over the phone by using a standard set of questions asked of each dry kiln owner (app.). The survey included 19 dry kiln owners throughout Alaska, including some grant recipients and some owners not participating in the grant program. In each phone conversation, it was

If current trends continue, we could soon see a combination of products, including tongue-and-groove lumber, hardwood flooring, architectural moulding and millwork, and furniture stock.

¹ One of the first well-known dry kilns in Alaska started operation in 1963 in the Matanuska-Susitna Valley, drying birch lumber in a 22-mbf-capacity chamber. Newer units later replaced this kiln, and it now includes facilities constructed in 2003 by using federal grant funds described in this report.

emphasized that confidentiality would be preserved in that no data would be presented by individual mill. Rather, data would be aggregated by kiln type (dehumidification kilns, hot-water kilns, steam kilns, and “other” [including vacuum kilns and electrically heated kilns]) or geographic region (interior, south-central, and southeast Alaska) (fig. 2). Respondents were free to not answer any question at their discretion, and to stop the conversation at any point. It was assumed that respondents provided accurate and complete answers to the questions.

Kiln Capacity and Lumber-Drying Volumes

Certain parameters determined what kilns we included in the calculations of kiln capacity and lumber-drying volumes:

Our data collection **did include** the following:

- Kilns in which construction was completed (even if not yet actively drying lumber).
- Kilns under construction, if expected to be completed by the end of the year (2005).

Our data collection **did not consider** any of the following:

- Experimental or research kilns.
- Idle kilns.
- Proposed kilns, not yet under construction.
- Kilns that were active in 2000 but have since become inactive (about three).
- Kilns that we believe to be currently active, but whose owner could not be reached for comment (two).

Because this report includes only those firms remaining in business and actively drying lumber between 2000 and 2004, the 2000 results understate somewhat the actual dry kiln activity in Alaska for that year, as reported in previous studies (Nicholls and Kilborn 2001). Also, previous studies included two small research kilns that we did not consider here. It should be emphasized that our research did not incorporate firms that sell exclusively green lumber or air-dried lumber (i.e., firms not engaged in lumber kiln-drying). Therefore, our results are for kiln-dried lumber only, and should not be misconstrued as estimates of statewide lumber production.

Lumber Value

Softwood lumber values were based on average price for 2 by 6 and 2 by 8 lumber reported by Random Lengths for kiln-dried coastal-grown hem-fir dimension lumber (Random Lengths 2002, 2004). The average prices used for our evaluation

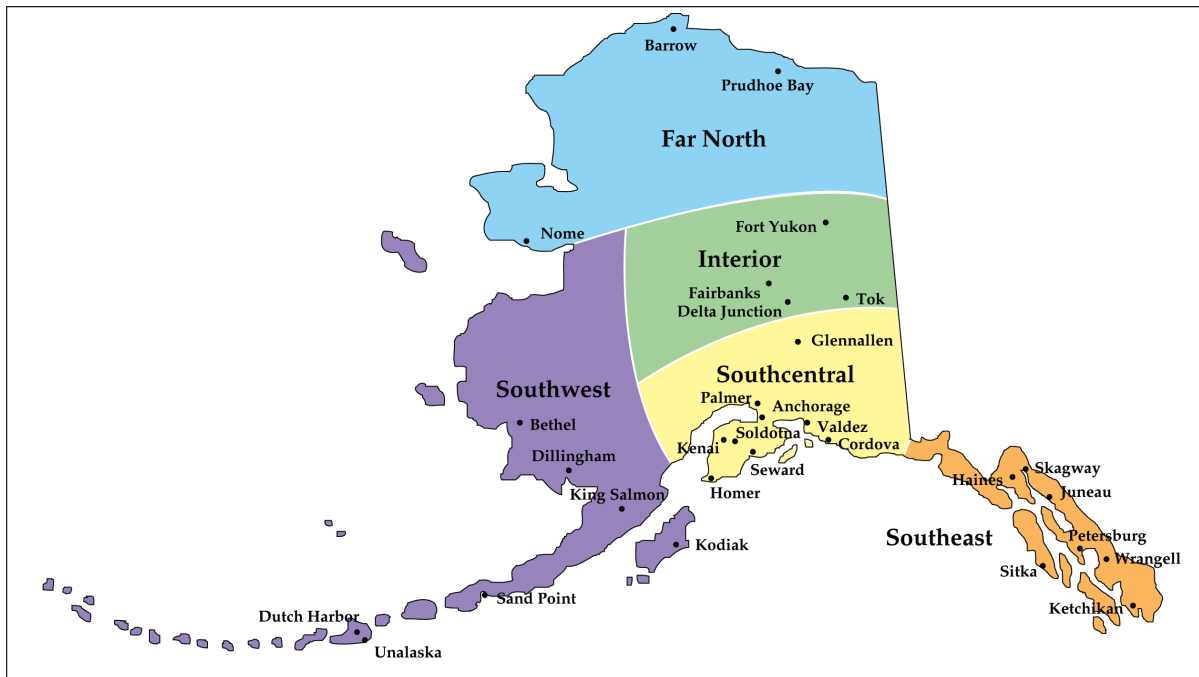


Figure 2—Alaska regions. Source: State of Alaska 2006.

were \$285 per mbf for 2000 and \$360 per mbf for 2004. Hardwood lumber values were based on market prices for birch (*Betula L.*) lumber (Hardwood Market Report 2006).

Capital Investment in Dry Kilns

Capital investment was based on the total project cost of lumber-drying systems, including dry kiln structure, process controls, heating system, and lumber storage facilities (if any). Not included was investment in planers, moulders, or other equipment ancillary to kiln drying.

Employment

Employment data is presented for both full-time employees (40-hours-per-week basis), and part-time employees (assumed to work 20 hours per week). Results include only employment directly linked to the dry kiln process (e.g., loading and unloading lumber, stacking lumber, and measuring moisture content), but not for related manufacturing activities (e.g., sawing or planing lumber). Respondents provided actual employment (as of 2004) as well as employment expected on completion of kiln projects currently under construction. In some cases, part-time employment was difficult to verify, as often these employees perform a wide variety of tasks.

Market Destinations

To determine market destinations, firms were asked to estimate the proportion of their kiln-dried lumber sold within three geographic areas:

- Locally (within immediate vicinity of their community)
- Within Alaska (but outside their local community)
- Outside of Alaska

Potential Lumber-Drying Capacity

We defined potential lumber-drying capacity as the volume of lumber that could be dried by kilns operated year-round, with no unscheduled down time, unexpected delays, or seasonal plant closures. Additional assumptions were made for drying times based on species, lumber thickness, and type of dry kiln. Lumber drying times were based on the *Dry Kiln Operators Manual* (Simpson 1991). For this calculation, we only used active kilns and did not apply idle kilns. In this context, potential lumber-drying capacity represents the volume and value of lumber that an operator could theoretically dry at 100-percent utilization of a dry kiln. This volume is often considerably more than the actual volume dried.

Results

By Geographic Region

On completion of these kiln projects, there will be close to a 336-percent increase in statewide capacity between 2000 and 2005.

Kiln capacity and lumber-drying volumes—

Installed kiln capacity in Alaska increased by 110 mbf between 2000 and 2004, from about 50 mbf to 160 mbf (table 2). By the end of 2005, an additional 60 mbf of capacity is expected, bringing this total to an estimated 220 mbf. On completion of these kiln projects, there will be close to a 336-percent increase in statewide capacity between 2000 and 2005. The greatest regional increase in installed capacity was in southeast Alaska (increasing from 20 to 109 mbf). The interior was the region that showed the smallest increase in kiln capacity, slightly more than doubling between 2000 and 2004 (table 2). The number of dry kilns has also increased substantially during this time.

The volume of lumber dried in Alaska also multiplied from 2000 through 2004 more than sixfold (table 3). As with installed capacity, the most dramatic changes occurred in the southeast region where an estimated 411 mbf of lumber was dried in 2004 (versus none in 2000).

Table 2—Estimated installed statewide capacity, number of commercial dry kilns, and volume of lumber dried in Alaska, by geographic region^a

Alaska region	2000 ^b		2004		2005 ^c	
	Kiln capacity	Number of kilns	Kiln capacity	Number of kilns	Kiln capacity	Number of kilns
	<i>mbf</i>		<i>mbf</i>		<i>mbf</i>	
Interior	16.0	3	22.0	4	34.0	4
South-central	14.5	3	61.5	6	77.0	6
Southeast	20.0	1	77.0	6	109.0	9
Total	50.5	7	160.5	16	220.0	19

Note: mbf = thousand board feet.

^a Does not include kilns that were idle at the time of data collection.

^b Includes only those kilns that were active in 2000 and remained active through 2004.

^c Includes dry kilns under construction that are expected to come on line by the end of 2005.

Table 3—Estimated volume and value of lumber dried in Alaska,^a by geographic region

Alaska region	Lumber volume dried		Estimated lumber value ^b	
	2000	2004	2000	2004
	<i>mbf</i>		<i>Dollars</i>	
Interior	96.0	248.0	27,360	89,280
South-central	24.5	153.5	6,983	55,260
Southeast	0	411.5	0	148,140
Total	120.5	813.0	34,343	292,680

^a Does not include kilns that were idle at the time of data collection.

Includes only those kilns that were active in 2000 and remained active through 2004.

^b Based on reported values from Random Lengths (2002, 2004) for kiln-dried coast hem-fir dimension lumber, average of 2 by 6 and 2 by 8 prices (2000 price = \$285 per thousand board feet (mbf); 2004 price = \$360 per mbf).

Lumber value—

In Alaska, the estimated value of kiln-dried lumber in 2004 was nearly nine times that in 2000, increasing from about \$34,000 to \$293,000. The increase resulted from a combination of increases in both lumber drying volume and value (table 3). The most notable increases came in the southeast region, with an estimated dried lumber value of almost \$150,000 in 2004 (versus none in 2000). South-central Alaska had the least lumber dried in 2004, and this could be linked to a continuing spruce bark-beetle (*Dendroctonus rufipennis* Kirby) epidemic in the region. The lack of a timber program on the Chugach National Forest could also be contributing to low regional lumber production and drying volumes.

Dry kiln employment growth mirrored that of capital investment, increasing substantially across all regions.

Capital investment in dry kilns—

Dry kiln investment differed considerably by geographic region, and was greatest in southeast Alaska for both total capital investment and average kiln cost (table 4), including one steam kiln and one vacuum kiln.

Average kiln costs in both south-central and interior Alaska were relatively low (averaging less than \$40,000 each kiln), owing to relatively small kiln sizes and choice of kiln technology. These regions favored the use of dehumidification and hot-water kilns, and also had a greater tendency for kiln owners to construct at least a portion of the kiln on their own (versus use of kiln vendors). In south-central and interior Alaska, several kilns primarily dry small quantities of birch lumber.

Employment—

Dry kiln employment growth mirrored that of capital investment, increasing substantially across all regions (tables 4 and 5). Our data indicate a statewide workforce of 37 workers (10 part-time and 27 full-time) dedicated to lumber drying. The greatest increases, as well as the greatest overall employment, came within southeast Alaska. We expect employment in this region to grow to approximately 5 part-time and 12 full-time workers upon completion of dry kilns in 2006. The lowest regional employment was in interior Alaska. This region had the fewest dry kilns, and also was characterized by smaller kilns primarily drying birch lumber.

Market destinations—

Most lumber dried in Alaska was sold locally (table 6). In 2000, local sales were estimated to be more than 71 percent of total lumber sales (versus more than 80 percent in 2004). The south-central region had the greatest proportion of kiln-dried lumber sold within Alaska (but outside of the local community), and southeast Alaska had the greatest proportion of kiln-dried lumber sold outside of Alaska. Interior Alaska had the greatest proportion of lumber sold locally, with close to 100 percent for both 2000 and 2004 (fig. 3). Because our data represent point-of-sale locations, it is possible that kiln-dried lumber later processed into gift and craft products by Alaska firms could lead to higher sales to market destinations outside of the state than is indicated by these results.

Table 4—Capital investment^a in dry kiln facilities, by geographic region (2004)

Alaska region	Regional total	Facility average	Number of kiln owners providing information
<i>----- Dollars -----</i>			
Interior	128,000	32,000	4
South-central	184,000	36,800	5
Southeast	1,145,000	143,125	8
Total	1,457,000	85,706	17

^a Includes construction of kiln buildings, kiln controls, and energy systems.

Table 5—Lumber dry kiln employment,^a by geographic region

Alaska region	2004		2005	
	Part time ^b	Full time	Part time ^b	Full time
<i>----- Actual ----- -- Total expected^c --</i>				
Interior	1	2	2	5
South-central	2	4	3	7
Southeast	1	7	5	15
Total	4	13	10	27

^a Includes only employment directly related to kiln-drying operations.

^b Assumed to be approximately 20 hours per week.

^c Expected total employment upon completion of dry kiln construction.

Table 6—Market destinations of lumber dried commercially in Alaska, by geographic region

Alaska region	2000 ^a			2004		
	Percentage of total lumber sales ^b			Percentage of total lumber sales ^b		
	Local, within community	Nonlocal, within Alaska	Sales outside of Alaska	Local, within community	Nonlocal, within Alaska	Sales outside of Alaska
<i>Percent</i>						
Interior	96.7	3.3	0	100	0	0
South-central	77.5	22.5	0	79	20	1
Southeast	39.6	10.4	50	63.1	11.2	25.8
Average	71.3	12.1	16.7	80.7	10.4	8.9

^a Includes only those kilns that were active in 2000 and remained active through 2004.

^b Percentage use reported by respondent (i.e., small firms and large firms weighted equally).



Figure 3—Kiln-dried Alaska birch lumber for retail sale, interior Alaska.

Species composition—

The drying of softwood lumber exceeded hardwoods by a considerable margin (table 7) (responding firms indicated the proportion of each that they dried, with small and large firms weighted equally). Hardwoods were most significant in the south-central region, owing to several mills processing birch; however, no hardwoods were reportedly dried in southeast Alaska. A minor shift occurred statewide toward proportionately greater softwood drying between 2000 and 2004.

Table 7—Species composition of lumber dried commercially in Alaska, by geographic region

Alaska region	2000 ^a		2004	
	Hardwood	Softwood	Hardwood	Softwood
	<i>Percent^b</i>			
Interior	26.25	73.75	32.13	67.88
South-central	63.75	36.25	50	50
Southeast	0	100	0	100
Average	30	70	27.38	72.63

^a Includes only those kilns that were active in 2000 and remained active through 2004.

^b Percentage use reported by respondent (i.e., small firms and large firms weighted equally).

Secondary processing equipment—

An estimated 39 planers and moulders are now processing lumber at Alaska dry kiln facilities. Not included are secondary manufacturers (such as cabinet and furniture producers) who may own similar processing equipment, but do not own dry kilns. Our statewide data indicate a ratio of more than two secondary processing machines for each dry kiln (table 8). The proportion of moulders relative to other secondary equipment was greatest in southeast Alaska (where six moulders were included with seven planers and nine dry kilns). The south-central region had considerably more planers (14 total) than either of the other regions, owing in part to a single facility having several planers. It should be noted that small, single-surface planers were not considered separately from more sophisticated equipment (such as planer/moulders) having much greater production capabilities.

Primary heating source of dry kilns—

Most dry kilns were heated by either electricity (about 61 percent) or by wood energy (about 33 percent), whereas only one kiln was heated by fuel oil (table 9). Electric heat was used for all of the dehumidification kilns, and predominated in the south-central region (heating five out of six kilns). Wood energy showed the greatest use in the southeast region (heating three dry kilns), and all of these were hot-water kilns. Anecdotally, several dry kiln owners have expressed an interest in converting to wood manufacturing residues (e.g., sawdust, slabs, trim, and edgings) as a continued fuel source. However, other energy options, including fuel oil, are often pursued during kiln startup.

Several dry kiln owners have expressed an interest in converting to wood manufacturing residues as a continued fuel source.

Table 8—Secondary processing equipment owned by firms in Alaska also having commercial dry kiln facilities, by geographic region (2004)

Alaska region	Number of dry kilns	Number of planers	Number of moulders ^a	Total planers and moulders
Interior	4	5	2	7
South-central	6	14	5	19
Southeast	9	7	6	13
Total	19	26	13	39

^a Includes machines having combined planing and moulding capability.

Table 9—Primary heating source for dry kilns, by geographic region (2004)

Alaska region	Number of dry kilns heated by fuel type		
	Wood	Electric	Oil
Interior	2	2	0
South-central	1	5	0
Southeast	3	4	1
Total	6	11	1

By Dry Kiln Type

Kiln capacity and lumber-drying methods—

Increases in kiln capacity were considerable across all types of dry kilns (table 10), and the most substantial increase in number of kilns was for dehumidification kilns (10 kilns in 2005 versus just 3 in 2000). The most substantial gain in lumber-drying volume was with hot-water kilns (table 11), owing to several kilns in different geographic regions that were in the startup phase during 2000, but are now fully productive.

Potential Lumber-Drying Capacity

The estimated volume of lumber dried in Alaska during 2004 was about 800 mbf (table 11), whereas potential annual capacity is estimated to be almost 6,600 mbf (table 12). This indicates that Alaska producers are drying just over 12 percent of their potential capacity. Similarly, actual statewide lumber value in 2004 (about \$293,000) is considerably less than potential value under a full production scenario (about \$2,778,000). The primary reason for this gap is that many of the kilns operate only part-time.

As of late 2005, several kilns were still in the startup phase or under construction. Once these kilns become productive, the gap between actual and potential production will narrow. However, there are still many barriers in Alaska to operating kilns at full production year-round, including weather-related factors, staffing problems, and transportation uncertainties, especially during winter.

Another factor potentially limiting the production of kiln-dried lumber is sawmill capacity. Our study indicates that each kiln facility in Alaska is associated with a sawmill providing green lumber to dry. In some cases, volume of lumber dried might be constrained by the productive capacity of these sawmills. Under this scenario, a sawmill could only provide lumber to dry kilns for intermittent drying, rather than continuous operation, as assumed in table 12.

Table 10—Estimated statewide capacity and number of commercial dry kiln facilities in Alaska, by kiln type

Kiln type	2000 ^a		2004		2005 ^b	
	Kiln capacity	Number of kilns	Kiln capacity	Number of kilns	Kiln capacity	Number of kilns
	<i>mbf</i>		<i>mbf</i>		<i>mbf</i>	
Dehumidification	14.5	3	46.5	8	74.0	10
Hot water	34.0	3	59.0	5	71.0	5
Steam	0	0	0	0	20.0	1
Other ^c	2.0	1	28.0	3	55.0	3
Total	50.5	7	160.5	16	220.0	19

Note: mbf = thousand board feet.

^a Includes only those kilns that were active in 2000 and remained active through 2004.

^b Includes dry kilns under construction that are expected to come on line by the end of 2005.

^c Includes vacuum kilns and electrically heated kilns.

Table 11—Estimated volume and value of lumber dried in Alaska, by kiln type^a

Kiln type	Lumber volume		Estimated lumber value ^b	
	2000 ^c	2004	2000 ^c	2004
	<i>Thousand board feet</i>		<i>Dollars</i>	
Dehumidification	24.5	140.0	6,983	50,400
Hot water	56.0	522.0	15,960	187,920
Steam	0	0	0	0
Other ^d	40.0	151.0	11,400	54,360
Total	120.5	813.0	34,343	292,680

^a Does not include kilns that were idle at the time of data collection.

^b Based on reported values from Random Lengths (2002, 2004) for kiln-dried coast hem-fir dimension lumber, average of 2 by 6 and 2 by 8 prices (2000 price = \$285 per thousand board feet (mbf); 2004 price = \$360 per mbf).

^c Includes only those kilns that were active in 2000 and remained active through 2004.

^d Includes vacuum kilns and electrically heated kilns.

Table 12—Potential annual lumber-drying capacity and lumber value in Alaska, by geographic region (2004)

Alaska region	Site	Installed drying capacity	Primary species	Potential			
				Average drying time ^a	kiln cycles per year	Potential lumber volume	Potential lumber value ^b
		<i>mbf</i>		<i>Days</i>	<i>Cycles</i>	<i>mbf per year</i>	<i>Dollars per year</i>
Interior	1	2	Birch	15	22	44	33,220
	2	2	Birch	10	33	66	49,830
	3	6	White spruce	14	24	144	51,840
	4	24	White spruce	10	33	792	285,120
South-central	5	4	Birch	21	16	64	48,320
	6	33	Birch	15	22	726	548,130
	7	8.5	Birch	21	16	136	102,680
	8	10	White spruce	14	24	240	86,400
	9	4	White spruce	14	24	96	34,560
	10	17.5	White spruce	14	24	420	151,200
Southeast	11	20	Sitka spruce, western hemlock	9	37	740	266,400
	12	20	Sitka spruce, western hemlock	9	37	740	266,400
	13	5	Sitka spruce, western hemlock	9	37	185	66,600
	14	8	Sitka spruce, western hemlock	12	28	224	80,640
	15	10	Sitka spruce, western hemlock	12	28	280	100,800
	16	2	Sitka spruce, western hemlock	12	28	56	20,160
	17	22	Sitka spruce, western hemlock	9	37	814	293,040
	18	20	Sitka spruce, western hemlock	9	37	740	266,400
	19	2	Sitka spruce, western hemlock	9	37	74	26,640
Total		220				6,581	2,778,380

Note: mbf = thousand board feet.

^a Lumber drying times based on *Dry Kiln Operators Manual* (Simpson 1991). Drying schedules were from table 7-20, "Time schedules for kiln drying softwood lumber at conventional temperatures." Average drying times for lower and upper grades were determined for 4/4 hemlock, 4/4 Sitka spruce, 4/4 white spruce, 4/4 birch, and these times were further refined after conversations with select dry kiln owners. Lumber loading and unloading time was assumed to total 1 day. Southeast Alaska producers assumed to dry 50 percent western hemlock and 50 percent Sitka spruce. Down time for routine maintenance and other needs was assumed to be 4 weeks per year (leaving 337 productive drying days per year for lumber drying). These estimates are only for active kilns and do not apply to idle kilns. Lumber-drying times for dehumidification kilns were assumed to be 33 percent longer than for hot-water kilns.

^b Softwood lumber value was based on reported values from Random Lengths (2002, 2004) for kiln-dried coast hem-fir dimension lumber, average of 2 by 6 and 2 by 8 prices (2004 price = \$360 per mbf). Hardwood lumber value for birch was based on recent market prices for 4/4 kiln-dried, Number 2A Common grade lumber (2006 price = \$755 per mbf) (Hardwood Market Report 2006).

Discussion

The recent federal grant program in Alaska has resulted in increased ability to produce dry lumber and value-added products. The full impacts of the program will not be known until all funded projects are operational (expected some time during 2006). Still, during the past 5 years, many Alaska producers, including those who had installed dry kilns during the 1990s, have advanced further up the “learning curve,” becoming more efficient and productive operators.

Since 2000, there have been significant statewide advances in lumber-drying capacity, number of dry kilns, volume and value of dried lumber, and employment. Key measures of success between 2000 and 2004 include gains in installed lumber-drying capacity (multiplying more than threefold), and gains in dried lumber volume (multiplying more than sixfold) (see tables 2 and 3). Softwood lumber drying continues to predominate, representing more than two-thirds of statewide volume; however, softwood generally has a lower value per board foot than hardwood lumber (see table 12).

These gains have been linked to the overall growth of the wood products industry in all three of Alaska's wood-producing regions. The following are noted dry kiln successes by region:

In interior Alaska, firms are:

- Meeting strong demand for secondary products, such as tongue-and-groove lumber, by drying and milling white spruce (*Picea glauca* (Moench) Voss) lumber.
- Selling “Alaska spruce” grade-stamped lumber per Western Wood Products Association grading rules for dried and surfaced lumber (fig. 4).
- Helping to enable a rapid expansion of their log cabin manufacturing business by using a new storage facility and moulder.

In south-central Alaska, firms are:

- Drying birch lumber in increasing amounts for secondary products such as flooring and interior moldings.

In southeast Alaska, firms are:

- Drying Sitka spruce (*Picea sitchensis* (Bong.) Carr.) mast and spar stock for export to European markets.
- Entering markets for kiln-dried log cabin material.
- Leveraging the use of kiln-dried lumber (dried by other Alaska firms) for their own operations, allowing them to hire five new employees.

Since 2000, there have been significant statewide advances in lumber-drying capacity, number of dry kilns, volume and value of dried lumber, and employment.



Figure 4—White spruce lumber, processed in Alaska, indicating Western Wood Products Association “Alaska spruce” grade stamp.

Several significant lumber-drying facilities in southeast Alaska (including one steam kiln and one vacuum kiln) are now reaching full production, and are expected to dry substantial amounts of lumber in coming years. The influence of even a few larger kilns on statewide lumber production can be substantial.

Capital investment in secondary processing equipment has also surged during this time. Recent additions include assorted planers, moulders, lumber storage buildings, and wood-fired heating systems. These advances enable greater use of kiln-dried lumber for secondary product manufacture while also stimulating innovation for new classes of wood products now within the capabilities of many Alaska firms. Newly installed planing equipment now allows for the local sale of kiln-dried, surfaced lumber. New lumber-drying technologies in Alaska help provide greater diversity in the types of lumber products dried while contributing to greater lumber drying efficiency and product quality.

Recent market-induced factors favoring greater value-added manufacturing have driven lumber-drying advances in Alaska. For the first time, Alaska wood products firms are now able to manufacture a range of value-added secondary products, including kiln-dried, surfaced, graded lumber for sale within local markets, the continental 48 states, or export markets. Greater drying and processing capabilities may also lead to new development of specialty products including glued-laminated beams or other engineered wood products.

As kiln owners in Alaska gain experience, they will likely explore new techniques to increase lumber quantity and quality. Some of these could include sorting lumber based on moisture content (e.g., Milota and Wu 1997, Warren and Johnson 1997), thickness, or grade, and developing specialized drying schedules based on species (e.g., Avramidis and Mackay 1988, Shupe et al. 1997, Simpson 1991). Successful dry kiln facilities will then serve as examples for potential adopters. We are already seeing evidence of this clustering effect across Alaska, where several regions have two or more kilns within a 15-mile radius.

Alaska lumber-drying firms in 2004 can be compared to firms on similar development paths in other regions of the country several decades ago. For example, the number of dry kilns in West Virginia increased by 230 percent between 1982 and 1992, and the annual volume of kiln-dried lumber increased by a factor of 2.9 during this period (Armstrong and Pahl 1994). In both West Virginia and Alaska, acceptance of new kiln drying technologies has been a key determinant of success (Armstrong and Pahl 1994, Nicholls and Kilborn 2001).

Barriers still exist. The processing efficiency of the Alaska wood products industry has traditionally been rated as poor (Kilborn 2002). Costs of labor, capital, and raw materials are high when compared to other regions. All of these factors relate to the unenviable competitive position of high-cost producers, often operating by necessity at the margins of profitability (Robertson and Brooks 2001). Other challenges relevant to timber-dependent communities in Alaska include finding suitable economic growth strategies that also provide a desired level of community stability (Tsournos and Haynes 2004). Lastly, many smaller firms, notably hardwood lumber producers, are challenged to find suitable market arrangements that are appropriate to the production levels commonly existing in Alaska (Nicholls 2001).

Despite these obstacles, recent positive changes in Alaska's lumber-drying sector are notable, and have been associated with the following statewide trends:

Greater drying and processing capabilities may also lead to new development of specialty products including glued-laminated beams or other engineered wood products.

- The Ketchikan (Alaska) Wood Technology Center has completed an in-grade lumber testing program, establishing new design values for Alaska species. Testing has been completed for Alaska yellow-cedar (*Chamaecyparis nootkatensis* (D. Don) Spach), western hemlock (*Tsuga heterophylla* (Raf.) Sarg.), Sitka spruce, and white spruce. Widespread promotion and recognition of these design values could result in increased opportunities, in both domestic and foreign markets.
- Previously underutilized timber species such as paper birch (*Betula papyrifera* Marsh.), Alaska yellow-cedar, western redcedar (*Thuja plicata* Donn ex D. Don), and red alder (*Alnus rubra* Bong.) are gaining favor by Alaska producers. Opportunities for using these species and others could lie primarily in character-marked lumber, lower grades of lumber, and material from standing-dead sources. (Donovan et al. 2003).

Considerations

Despite these gains and successes, more can be done to better use existing facilities and infrastructure. We estimate that Alaska dry kilns are being used at only 12 percent of capacity, based on potential volume dried under a scenario of year-round production. However, this ratio could soon improve as newly constructed kilns come online, adding to Alaska's lumber drying production. New kiln installations are expected to have overall greater efficiency and higher operating rates than the existing kilns, many of which are operated only part time. Also, increased use of other Alaska hardwoods can cause greater production. Hardwood lumber drying in Alaska has so far been limited to birch; however, red alder may soon become a viable product. Recent lumber price increases provide incentives for using red alder from southeast Alaska to complement Pacific Northwest sources.

Continuation of current trends can also positively impact Alaska's lumber-drying industry. First, new design values, as established by the Ketchikan Wood Technology Center, are expected to create new opportunities to market kiln-dried lumber for local construction in Alaska, as well as increasing export opportunities. The persistence of the cooperative effort among several federal, state, and private organizations in Alaska has also helped promote development within the wood products industry by providing technical assistance and facilitating the exchange of knowledge and ideas. These partners include:

- USDA Forest Service, Pacific Northwest Research Station, Alaska Wood Utilization Center
- USDA Forest Service, Alaska Region, State and Private Forestry
- Juneau Economic Development Council
- Ketchikan Wood Technology Center

- University of Alaska-Fairbanks, Cooperative State Research, Education, and Extension Service program
- Alaska Division of Forestry

In summary, several statewide trends can affect the future development of Alaska's dry kiln industry, including the ongoing impact of grant programs, the learning curve of new dry kiln operators, the presence of several larger dry kiln facilities, emerging markets for underutilized species, increasing demand for locally dried lumber, a continuing supply of economically priced timber, the ability of the industry to support a reasonably priced grading service for Alaska species, the ability of producers to move value-added products to domestic and export markets, and professional agency support among a diverse group of natural resource professionals in Alaska.

Glossary

board foot of lumber—A basic unit of measurement for lumber measuring 1 inch by 1 inch by 12 inches. When calculating board footage, nominal measurements as opposed to actual are used.

dehumidification kiln—A dry kiln in which lumber is dried by means of a dehumidification unit that draws moisture from the air within the kiln chamber. Most dehumidification kilns are electrically heated.

dry kiln—A heated chamber in which cut lumber is dried and seasoned. Dry kilns usually have temperature control, humidity control, and air control so that moisture can be removed in a controlled manner.

hardwoods—The wood of a dicotyledonous tree. Includes woods such as birch, red alder, maple, oak, and cherry.

hot-water kiln—A dry kiln in which hot water is distributed from an energy facility to the drying chamber, acting as the heat source to facilitate drying.

planer—A machine tool that is used to smooth, shape, or finish the surfaces of wood.

residual products—Products of minimal value that result from the lumber production process including bark, sawdust, chips, slabs, edgings, planer shavings, and trimmed ends.

softwoods—The wood of a monocotyledonous tree. Includes woods such as spruce, hemlock, cedar, and pine.

steam-heated dry kiln—A dry kiln in which steam is distributed from an energy facility to the drying chamber, acting as the heat source to facilitate drying.

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Metric Equivalents

When you know:	Multiply by:	To find:
Board feet, lumber scale	0.0024	Cubic meters, lumber
Inches	2.5	Centimeters
Miles	1.6	Kilometers

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Appendix

Questions asked of Alaska dry kiln facility owners

These questions were asked of the dry kiln owners, by phone, according to a standard script:

- 1A.** When did your dry kiln come online (i.e., start drying lumber commercially)?
Or
1B. When do you expect your kiln to come online (i.e., start drying lumber commercially)?
- 2A.** What was your total installed drying capacity in 2000? (mbf)
2B. What was your total installed drying capacity in 2004? (mbf)
Or
2C. What is your expected total installed drying capacity once your kiln comes online in 2005 (mbf)?
- 3A.** What volume of lumber did you dry in calendar year 2000? (mbf)
3B. What volume of lumber did you dry in calendar year 2004? (mbf)
- 4A.** What was the total grade distribution of lumber dried in calendar year 2000?
4B. What was the total grade distribution of lumber dried in calendar year 2004?
- 5A.** Is your lumber graded before being sold?
5B. If so, how is it graded? (i.e., visual appearance, National Hardwood Lumber Association grades, Western Wood Products Association)
- 6A.** What was your capital investment (dollars) in your dry kiln system? (including kiln structure, heating system, and lumber storage area)
Or
6B. What was your expected capital investment (dollars) in your dry kiln system? (including kiln structure, heating system, and lumber storage area)
- 7A.** How many new employees have you added to your business as a result of the new dry kiln system? (Include all new employees, full- and part-time.)
Or
7B. How many new employees do you expect to add to your business as a result of the new dry kiln system? (Include all new employees, full- and part-time.)

8A. Do you own a planer, moulder, or other secondary processing equipment? (If yes, please specify which one(s).)

Or

8B. Do you plan to acquire a planer, moulder, or other secondary processing equipment? (If yes, please specify which one(s).)

8C. What equipment (if any) was purchased with dry kiln grant funds?

9A. How many separate dry kilns (i.e., drying chambers) do you have?

Or

9B. How many separate dry kilns (i.e., drying chambers) do you expect to have?

10. What type of dry kiln do you have? (dehumidification, steam, hot-water, other)

11. How is your kiln heated? (electricity, wood/biomass, fuel oil, other)

12A. What proportion of your lumber dried in calendar year 2000 was sold in:

- Local markets? (percent)
- Within Alaska? (percent)
- Outside of Alaska? (percent)

12B. What proportion of your lumber dried in calendar year 2004 was sold in:

- Local markets? (percent)
- Within Alaska? (percent)
- Outside of Alaska? (percent)

13A. What proportion of total lumber dried in calendar year 2000 was hardwood (versus softwood)?

- Hardwood (percent)
- Softwood (percent)

13B. What proportion of total lumber dried in calendar year 2004 was hardwood (versus softwood)?

- Hardwood (percent)
- Softwood (percent)

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