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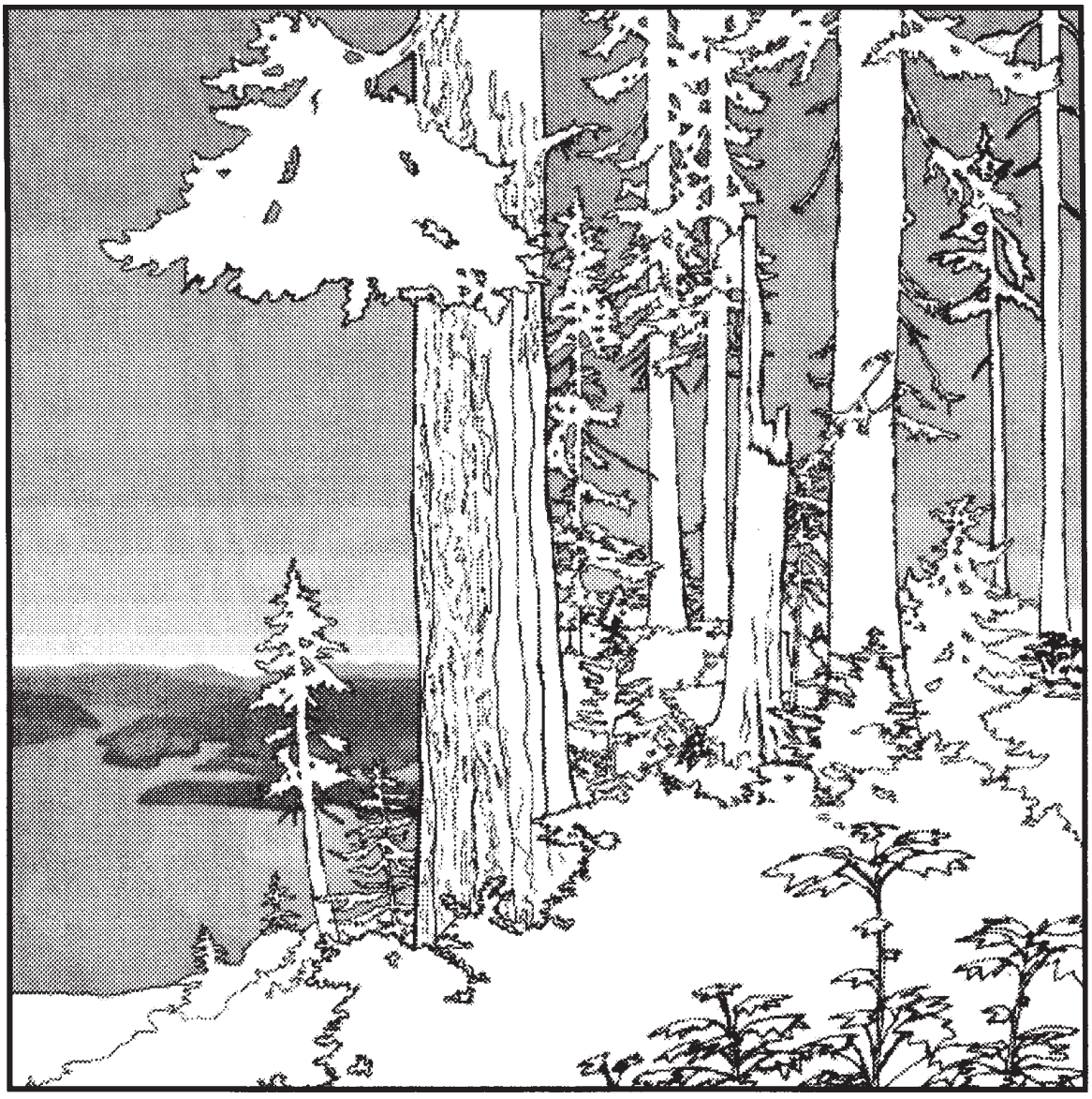
Timber Products Output and Timber Harvests in Alaska: Projections for 1997-2010

David J. Brooks and Richard W. Haynes



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Conservation and Resource Assessments for the Tongass Land Management Plan Revision

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Technical Coordinator

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Abstract

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Projections of Alaska timber products output, the derived demand for raw material, and timber harvest by owner are developed from a trend-based analysis. These projections are revisions of projections made in 1990 and again in 1994, and reflect the consequences of recent changes in the Alaska forest sector and long-term trends in markets for Alaska products. With the closure of the two southeast Alaska pulp mills, demand for Alaska National Forest timber now depends on markets for sawn wood and the ability to export manufacturing residues and lower grade logs. Three alternative projections are used to display a range of possible future demand. Areas of uncertainty include the prospect of continuing changes in markets and in conditions faced by competitors and the speed and magnitude in investment in manufacturing in Alaska. The sensitivity of model output to changes in key assumptions is displayed.

Keywords: National Forest (Alaska), forest sector models, lumber.

Summary

Projections of Alaska timber products output and timber harvest by owner were developed by using a trend-based analysis; these are revisions and updates of earlier projections. These revised projections include new data (for 1992-96) and revised assumptions. A spreadsheet model that provides a complete materials accounting for the Alaska forest sector is used to link information on products manufactured in Alaska, projections of market demand for these products, and assumptions about Alaska's share of these markets.

Among the new data and revised assumptions reflected in these projections are the closure of one of Alaska's two pulp mills in 1993 and the closure of the second pulp mill early in 1997. Although proposals have been made for mills that would, in effect, replace at least some of the demand created by these two pulp mills for low-grade saw logs, utility logs and manufacturing residues, these currently are no more than proposals. Our projections therefore are based on demand for National Forest timber that would be used in manufacturing sawn wood for both export markets and U.S. domestic markets; we also estimated the volume of low-grade saw logs and utility logs that would be harvested and exported or left as logging residues.

In addition to changes in the structure of the Alaska forest sector, there also have been changes in markets for Alaska products and changes in conditions faced by Alaska's competitors (the Pacific Northwest and British Columbia). Brooks and Haynes (1994) address these changes as of 1994, and the current projections update and revise that summary. Perhaps the most important changes have taken place in markets, especially the Japanese market.

In our revised projections, the derived demand for National Forest timber is projected to range from 96 to 130 million board feet for the remainder of this decade, and 132 to 223 million board feet in the next decade (2001-2010). These figures refer to total National Forest harvest, including both saw-log and utility volume. We assumed that timber sales and harvests will continue to include the lower grade material that accounts for 30 to 40 percent of Alaska's timber inventory, but our projections take into account the fact that existing mills may not be able to profitably use the low-grade saw logs and utility volume. Change in the portion of the saw-log inventory that will be used is an explicit element of the scenarios that we examined.

If clearcut harvesting continues to be the primary harvesting method, the ability to sell lower grade material will be a critical component of profitable (i.e., "above-cost") timber sales and logging operations. Similarly, the ability to sell lower grade lumber and manufacturing residues will be critical to profitable lumber manufacturing in Alaska. As part of all the projections, we assumed that low-grade saw logs and utility volume that are not used to manufacture lumber in Alaska are either exported or are left as logging residues; we also assumed that all manufacturing residues can be, and are, exported. Were new manufacturing facilities established in southeast Alaska that could use this material, low-grade logs and manufacturing residues could be diverted from export markets. A critical consideration, however, is the ability of any new industry to pay a competitive price for this raw material, including the cost of harvesting and delivery to the mill.

Three scenarios were developed to display alternative futures for Alaska's forest sector and the resulting demand for National Forest timber. One alternative (labeled "high") describes a future of higher levels of lumber production, log exports, and timber harvests in Alaska; this scenario is predicated on the development of a more efficient, more competitive industry in Alaska and on markets willing to pay a premium for lumber manufactured from old-growth logs. North American lumber was assumed to regain a greater share of the Japanese market (as compared to the "medium" scenario), and mills in Alaska were assumed to increase their share of North American shipments. By 1996, the Alaska share of North American softwood lumber shipments to Japan had dropped to less than 1 percent; in this scenario, we assumed that Alaska's share would increase to 4 percent by 2010. In addition, Alaska shipments to U.S. domestic markets also were assumed to increase. Sawmills in Alaska were assumed to be able to profitably use nearly the entire range of saw-log grades that comprise the timber inventory. Compared to the medium scenario, demand for National Forest timber is about 15 percent higher in the near term and 30 percent higher by 2010.

In the "low" scenario, Alaska was assumed to recover some of the markets lost to other producers; the recent trends in production and market share for Alaska are reversed but only to a limited extent. The niche in which Alaska is expected to be able to compete is small, in both domestic and export markets. Higher costs and competition were assumed to limit Alaska's opportunities; only small gains in technical efficiency were assumed and reinforce this low-competitiveness future. Sawmills in Alaska were assumed to be able to use only the higher grade saw logs that account for less than half of the timber inventory; as a result, the volume of low-grade saw logs and utility timber that is "excess" to the raw material requirements of Alaska mills is half of the total harvest. In this projection, demand for National Forest timber increases only slightly from the current (1996) level and is 30 percent lower than the "medium scenario" by 2010.

The medium scenario displays the consequences of an intermediate set of assumptions. Because of the relatively high degree of uncertainty surrounding developments in Alaska, we deliberately avoided labeling any of these scenarios as a "most likely" projection. Instead, our objective was to focus attention on key issues, such as competitiveness and efficiency, and to translate the range of views on these issues into a range of values for parameters in our model. The model is a framework for specifying assumptions about the future for Alaska and displaying their implications in terms of derived demand for National Forest timber.

In addition to the scenarios, the effects of changes in individual elements of the projection also are displayed. This sensitivity analysis shows model results to be most sensitive to relatively small changes in Alaska's share of North American shipment of softwood lumber to Japan. Therefore, one of the central issues facing the Alaska forest sector is competitiveness relative to producers in the Pacific Northwest and British Columbia.

Introduction

In three earlier reports, we assessed conditions in Alaska timber markets as of the late 1980s and early 1990s (Haynes and Brooks 1990) and developed projections of the derived demand for Alaska National Forest timber based on those conditions and trends (Brooks and Haynes 1990, 1994). Those projections were predicated on several assumptions, almost all of which were made explicit. We also made the implicit assumption that there would be no structural changes in markets for Alaska timber (primarily Japan), in the regions competing with Alaska for Japanese markets, or in the mix of the forest products industry in Alaska. Since 1994, events have altered nearly all these assumptions. We therefore have reexamined and revised our projections of demand for Alaska National Forest timber.

First, there have been changes in the Japanese market. Since 1990, new suppliers have emerged as significant competitors to North America; shipments from Europe (primarily Scandinavia) now account for more than 10 percent of Japanese sawn wood imports, compared to less than 0.3 percent in 1990. The importance of new suppliers is, in part, a consequence of changes in the market for lumber (especially for products particularly important to Alaska, such as baby squares and other hemlock [*Tsuga* spp.] products) as acceptance of laminated wood products and other engineered wood products increases (see, for example, Japan Lumber Reports 1997). The primary factor contributing to these market changes is, however, increasing prices. New suppliers and new products are natural consequences of the process of market adjustment to scarcity and higher prices. In addition to these changes in sources of supply, recent projections (Food and Agriculture Organization [FAO] 1997) of future Japanese lumber consumption are significantly lower than those used previously (Brooks and Haynes 1994).

A second major change has been in the structure of the Alaska forest sector. The permanent closure of one pulp mill in 1993 and the closure of the second Alaska pulp mill in March 1997 changed both the structure and the scale of the forest products industry in southeast Alaska. The loss of local markets for manufacturing residues presents challenges to lumber producers in Alaska. Because revenue from residues is, in some market conditions, the key to profitability, greater dependence on more distant and less certain markets changes the competitive environment for lumber manufacturing in Alaska.

The third set of changes is continuing developments in the Pacific Northwest and Canada. Efforts to protect the habitat of the northern spotted owl (*Strix occidentalis*) and other threatened species in the Pacific Northwest have more or less worked their way through stumpage market and product markets. In general, these changes have lowered total timber harvest and raised stumpage prices in the Pacific Northwest and in competing regions such as Alaska. Reductions in Federal timber harvests in Oregon and Washington have not, however, eliminated the Pacific Northwest as one of Alaska's primary competitors in overseas and U.S. domestic markets. Canada also remains a significant competitor. Although lumber exports to Japan from the Pacific Northwest declined by nearly 40 percent over the period 1989-95, increases in shipments from Canada to Japan more than offset this decline. As a result, from 1990 to 1996, total lumber shipments from North America to Japan increased by nearly 30 percent while shipments from Alaska fell by nearly 90 percent. Steady production in British Columbia and increasing lumber production in eastern Canada have helped to increase Canada's share of both the Japanese and the U.S. market,

and to moderate price increases, especially for middle and lower grade lumber. Canada's exports contributed to a net increase in North American shipments of softwood lumber to Japan, but because Japanese imports from other regions increased even faster, the North American share of the Japanese market declined.

The expectation that changes in the competitive position of the Pacific Northwest would provide a modest advantage to Alaska was one of the underlying assumptions of our previous projections (Brooks and Haynes 1994). In hindsight, this was optimistic. The prospective advantage was eliminated by higher costs, new competitors, and uncertainty in the level and dependability of timber supplies in Alaska. In addition, our earlier projections assumed the continued operation of at least one pulp mill; the closure of both pulp mills and the subsequent (but unrelated) decline in prices for manufacturing residues present challenges to profitable lumber manufacturing in Alaska. As a result of all these changes, these revised projections suggest a substantially different future for production in Alaska and in the derived demand for National Forest timber.

As for all projections, our outlook for the demand for National Forest timber depends on assumptions; in our earlier studies and again here, we have based our conclusions on historical data and on our judgments of likely developments. Because no one can know the future, and because there are competing interpretations of the past, differences of opinion are inevitable. In this review and revision, we have isolated the main differences between our current outlook and previous outlooks; this was done to illustrate the projection process and support the reasoning underlying our assumptions. We present our projections as three scenarios built on internally consistent but broadly different sets of assumptions regarding values for key elements of the model. The scenarios reflect three different views of the uncertainty surrounding demand projections. Because there is additional uncertainty associated with individual assumptions within each scenario, the scenarios cannot be taken as exact, even if conditional predictions of the future. The sensitivity of our projections to changes in individual assumptions is shown in a separate exercise.

We characterize the future for demand for National Forest timber as having a high degree of uncertainty because of the magnitude of recent changes in the Alaska forest sector, and because many of the factors that will determine the size and type of industry in the future cannot be predicted. The level and reliability of timber supplies from Alaska National Forests are only two among a number of sources of uncertainty; rates of economic growth in key markets, changing technology and tastes and preferences of consumers, and the strength of competition are among other sources of uncertainty.

Approach

Brooks and Haynes (1990) describe the methods used to develop projections of Alaska National Forest timber harvests; Brooks and Haynes (1994) describe revisions to the earlier model. The projections presented here are based on the methods described in Brooks and Haynes (1994) and on revisions to both data and assumptions. Our model is one in which the outlook for consumption underlies projections of forest products production and timber harvests in Alaska. Conditions in markets, specifically total consumption and competition from alternative suppliers, are used to estimate production of lumber in Alaska.

This model calculates derived demand based on trends in product markets; market shares are used as the critical measure of relative competitiveness. We based our projections of Alaska's future market shares on an evaluation of factors contributing to recent trends and our judgments of future developments in those factors. Relative prices (delivered to markets) and costs are the primary factors we considered in estimating future market shares. We convert expected product output into raw material requirements—timber harvest—by using conversion factors such as overrun in lumber production. The model structure and values for conversion factors were evaluated by comparing calculated derived demand with reported harvest for the historic period, 1970-96. In this update, we replaced projections with reported data for 1992-96. These revised data are especially important, as they display trends and patterns for the remainder of the current decade (1991-2000) and establish the starting point for subsequent projections. The addition of five more years of data has resulted in a slight improvement in the accuracy of our historical estimates of the derived demand for Alaska timber. The average error of our estimates for the period 1970-96 is now 4.1 percent, compared to 4.3 percent previously (1970-90).

As with our previous projections, the volume of projected National Forest harvest is neither the volume likely to be harvested nor, necessarily, the volume that ought to be offered for sale.[1] It is the volume of National Forest timber harvest that is consistent with projected consumption of Alaska products. Important assumptions that underlie the projections of National Forest timber harvest include the availability of timber from other sources, the mix of products produced in Alaska, and the efficiency of production. Markets will adjust (through changes in prices) to the quantity of timber ultimately made available. Although such adjustments are not an explicit, endogenous element of our model, we do not intend to imply that "gaps" will be created by levels of National Forest harvest that differ from our projections. The consequences of changes in Alaska National Forest timber harvests will be greatest in Alaska, and quite small elsewhere because Alaska contributes a relatively small share of regional timber production, and National Forests are only one source of timber in Alaska.[2]

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[1] In all the projections, timber supply from the Tongass National Forest was assumed to be reliable, predictable, and sufficient to meet the requirements of the industry. The projections were not done in reference to a proposed or prospective Allowable Sale Quantity (ASQ).

[2] Total timber harvest in Alaska in 1995 was 4 percent of the combined harvest in the greater Pacific Northwest (Oregon, Washington, and coastal British Columbia); National Forests in Alaska contributed 30 percent (200 million board feet) of the Alaska total. The Tongass National Forest accounted for 99 percent of timber harvest from Alaska National Forests in 1995.

In this projection, as before, we assumed that Alaska mills either cannot or will not compete for timber harvested from private land (Native Corporations) in Alaska. This is an important assumption: in the last decade (1987-96), private timber accounted for nearly two-thirds of all timber harvested in Alaska, and more than three-fourths of the private timber harvest occurs in southeast Alaska. Historically, nearly all the private timber harvest was exported in log form. The complete dependence of Alaska mills on National Forest timber could change (at least theoretically) as a consequence of changes in policies and changes in markets. Because the Japanese market is the primary destination of both Alaska log and product exports, increasing efficiency in Alaska mills and improved product marketing could lead to an ability to compete for logs currently exported, but we did not examine this possibility.

Our projection of private timber harvest was based on the assumption that harvest will decline as a consequence of declining timber inventories. As was the case in our first projections (Brooks and Haynes 1990, Haynes and Brooks 1990) we based our projections of private timber harvest on Knapp's (1992) analysis. In Brooks and Haynes (1994), we revised our initial projections, and we revise them again here.

In these revised projections of demand for National Forest timber, the most important new data are those for Alaska production and export of logs, pulp, and lumber, and for Japanese production, consumption, and imports. The closure of Alaska's pulp mills has a particularly large effect on demand for timber, with wood consumption by pulp mills accounting for about half of the Alaska National Forest timber harvest since 1970. In our previous model, projections of lumber production, even at mills associated with pulp mills, were more or less independent of projections of pulp production; therefore, the effect of the pulp mill closure on lumber production is through the demand for (and price of) manufacturing residues. For these revised scenarios, we assumed that alternative markets, either export or domestic, can be developed for chips, low-grade saw logs, and utility grade logs. In the absence of markets, low-grade saw logs and utility logs may be left as logging residues. Lumber production estimates for Alaska are based on projections of exports and an explicit assumption about the share of production shipped to U.S. domestic markets.

We started the process of revising our projections by collecting and incorporating data for 1993 through 1996; significant changes in markets are reflected in a number of data series. These include, for example, projections of demand for sawn wood in the Japanese market; our revised projections are consistent with the most recent projections published by FAO (1997). As a result of changes in the Japanese market, especially for hemlock, and the entry of new suppliers, the North American share of Japanese softwood sawn wood imports declined sharply over the period 1990-96. In addition, Alaska's share of North American exports to Japan also declined; in 1996, Alaska's share of North American softwood lumber shipments to Japan was less than 1 percent, compared to nearly 7 percent in 1990 and nearly 15 percent in 1980. Both shares were and continue to be important elements of our projections. We replaced previously projected data with reported data for 1992-96 and revised our trend-based projections for 1997 to 2010.

In our previous projections, we accounted for the increasing importance of U.S. domestic markets to Alaska lumber producers in the early 1990s, but we also expected export markets to be the primary market for Alaska. Based on data for 1990-96, we have revised this, and our projections of total lumber production are based on the assumption that 15 to 35 percent of Alaska's lumber production will be shipped to U.S. domestic markets.

To account for changes in the structure of the Alaska forest sector, we revised our estimates and projections of overrun in lumber production (board feet, lumber tally per board feet, log scale). Our use of the term “overrun” is as “the amount of lumber actually recovered in excess of the amount predicted by the log scale” (Hartman and others 1981), with log volume measured as it enters the production process. Because Alaska sawmills had an incentive (or in some cases, an obligation) to produce chips from a portion of the raw material they consumed, overrun in Alaska historically was lower than in, for example, the Pacific Northwest. In the previous projections, we assumed that overrun was constant for the projection period.

With the closure of the pulp mills, Alaska sawmills will have to increase their technical efficiency to be competitive; mills will have little or no incentive to produce residues (chips) at the expense of lumber recovery. In addition, decreasing average log size also will result in an increase in overrun. In our projections, we therefore assumed that overrun will increase by either as little as 10 percent (in the “low” scenario) or as much as 30 percent (in the “high” scenario) over the period 1997-2010. In the “medium” scenario, overrun was assumed to increase by 20 percent, but remains well below the current average for sawmills in the Pacific Northwest. Increases in technical efficiency in Alaska sawmills will require investment in equipment and training; in all three scenarios, we assumed that this investment will be made in an effort to maintain—or even increase—Alaska’s competitive advantage in domestic and export markets.

In all three scenarios, we incorporated what we believe to be the most likely trends in Japanese consumption and the associated model elements. The three scenarios differ in four key elements and, as a result, display broadly different views of the future for Alaska. In the low scenario, Alaska is assumed to face a future much like the recent past: increasing costs and increasing competition limiting both markets and Alaska’s ability to incorporate higher costs in product prices. North American producers as a whole are assumed to face continuing competition from other suppliers in the Japanese market; in none of the scenarios do we assume the possibility of a return to the market shares observed in the 1980s. Nevertheless, North America is assumed to supply 70 percent (in the low scenario) to 76 percent (in the high scenario) of Japanese softwood lumber imports in 2010.

In the medium scenario, Alaska is assumed to be able to regain some of the export market lost in the past few years, and U.S. domestic markets are assumed to continue to be important. In the high scenario, Alaska is assumed to be able to increase production and shipments to both export and domestic markets. In the low scenario, Alaska’s share of North American shipments to Japan was assumed to increase from current levels, but only to a limited extent. In none of the scenarios do we explicitly examine the possible emergence of new industries in Alaska. In all three scenarios, however, the projected level of National Forest harvest (and possible export) of low-grade saw logs and utility grade logs, and the production of manufacturing residues at Alaska sawmills is consistent with the raw material needed to support a small- to medium-scale facility producing, for example, medium-density fiberboard or ethanol.

Table 1—Alternative projections of the average annual derived demand for Alaska National Forest timber[a]

Period[b]	Alternative scenarios			Previous projections	
	Low	Medium	High	Brooks and Haynes (1990)[c]	Brooks and Haynes (1994)[d]
			Million board feet		
1983-87	281	281	281	281	281
1988-92	414	414	414	414	414
1993-97	189	192	201	404	300
1998-2002	96	113	130	403	315
2003-7	130	152	182	397	332
2008-10	132	174	223	401	335

[a] See text for a description of the scenarios; detailed data for the medium projection are shown in table 2 and scenario data are shown in table 3.

[b] Years are the period over which 5-year averages are calculated. For data shown for 1993-97, only data for 1997 are projected.

[c] Base projection.

[d] Base projection (1 pulp mill assumed to be operating).

Results

Table 1 compares the three scenarios and the previous base projections (Brooks and Haynes 1990, 1994). For the next decade and a half (1997-2010), we estimate demand to be significantly lower, on average, than in previous estimates (Brooks and Haynes 1990, 1994). The decrease in projected derived demand can be traced to the closure of the pulp mills, changes in the Japanese market for softwood lumber, and changes in Alaska's competitive position resulting from high production costs for both harvesting and manufacturing.

In the medium scenario, we assumed that North American shipments of softwood lumber to Japan increase in quantity and in their share of Japanese imports for 1997 through 2010, and that Alaska's share of those shipments also increases. Currently, Alaska accounts for less than 1 percent of North American shipments to Japan, but we assume that by 2010 this will increase to nearly 3 percent. In this scenario, Alaska is able to take advantage of the market niches in which it has a comparative advantage: products manufactured from old-growth spruce (*Picea* spp.) and, to some extent, old-growth hemlock. This projection also assumes that U.S. domestic markets are the destination of 25 percent of Alaska's production. Projected lumber production in Alaska increases from less than 30 million board feet (1996) to 158 million board feet in 2010. For this projection to be realized, Alaska manufacturers must successfully compete against North American and other producers in both markets; this depends, in turn, on improvements in Alaska's ability to manufacture and market forest products. Lumber recovery (overrun) is assumed to increase by 20 percent over the period of the projection (1997-2010).

Although the projected gain in market share for Alaska in the medium scenario is relatively small, any gain will be a reversal of trends observed over the past 20 years. Recent declines in Alaska timber harvests and market share may be partly a result of uncertainty and delays associated with management policies and litigation. To the extent that this is true, a more stable management and policy environment may enable Alaska to increase production quickly and competitively. The medium scenario assumes an ability to increase both harvest and lumber production, and that the cost disadvantages that Alaska currently faces in harvesting timber and manufacturing lumber (compared to the Pacific Northwest and British Columbia, for example) do not increase and may in fact decrease. Historically, lower stumpage charges and generally higher quality raw material have been partial compensation for this disadvantage for Alaska lumber manufacturing. Alaska's lumber production and market shares nevertheless have decreased steadily for more than 20 years, suggesting that the disadvantages may outweigh any advantage resulting from the value of Alaska's raw material.

The medium scenario displays significant changes in the composition of timber that will be used in Alaska. In particular, manufacturing in Alaska is expected to be dependent on saw logs used to manufacture lumber that is competitive in both export and U.S. domestic markets. Local (Alaska) markets are not expected to use low-grade logs or residues from lumber manufacturing. We assumed that this material will be exported (see table 2) but at the same time it is a potential source of wood raw material for new, small- to medium-scale industries in southeast Alaska; for example, we project that about 100-200 thousand tons (bone dry) of manufacturing residues and chips and 45-67 million board feet of low-grade and utility grade logs will be produced. Revenue from exports of manufacturing residues—or from local purchase— will be an important element of profitable lumber production in Alaska. Although there presently are no definitive proposals for new manufacturing facilities in Alaska, several speculative proposals have been made. These include, for example, ethanol production and medium density fiberboard. In raw material requirements, plants manufacturing both products could operate with the quantity of raw material we show as wood chip and low-grade log production. In all cases, the critical question is the cost of raw material.

Although costs and prices are not explicit in our model, the medium scenario is our estimate of the scale of production at which the cost of raw materials delivered to Alaska mills may be consistent with their ability to compete in product markets. Our analysis and projection of stumpage prices (see below) suggests that changes in regional timber markets are reflected in higher prices for raw material in Alaska, as elsewhere. Producers in Alaska benefit from higher product prices, but they are not immune from higher costs. The availability and cost of raw material is, however, only one of several factors that will determine the competitiveness of manufacturing in Alaska. We also assumed, for example, that all residues from lumber manufacturing can be marketed (as is the case for Alaska's competitors); given demand for wood raw material (especially chips) around the Pacific Rim, this is reasonable. Compared to mills in the Pacific Northwest, though, Alaska faces diseconomies of small scale and relatively higher handling and transportation costs for chips.

Table 2—Summary of historical and projected periodic Alaska timber harvest by owner, harvest by product, and production of forest products, 1970-2010 (medium scenario)

Timber harvest by owner

Period[a]	Total	National Forest	Private	Other public	Timber imports
			Million board feet		
1970	596.2	539.5		56.7	0
1975	551.5	489.4	9.3	54.6	4.0
1980	603.9	411.0	146.8	46.1	25.5
1985	653.0	280.7	346.5	25.8	34.5
1990	1,029.2	413.5	596.8	21.5	12.5
1995	770.3	191.8	560.8	17.8	24.4
2000	285.0	112.5	156.0	16.0	0
2005	243.2	152.2	75.0	16.0	0
2010	265.3	174.3	75.0	16.0	0

Harvest by product

	Total	Saw-log exports	Lumber	Pulp	Low grade/utility log volume
			Million board feet, roundwood equivalent		
1970	589.5	47.8	251.7		
1975	560.9	42.9	282.5	235.5	
1980	587.5	149.5	197.7	240.3	
1985	620.7	318.4	105.7	196.6	
1990	1002.2	558.4	167.4	275.0	7.2
1995	767.7	529.5	90.8	127.8	19.6
2000	285.0	166.0	73.7	0	45.3
2005	243.2	87.3	96.5	0	59.4
2010	265.3	88.6	109.4	0	67.3

Production of forest products

	Saw-log exports	Lumber	Pulp	Wood chip exports	Pulpwood/utility log exports
	– Million board feet –		*– Thousand short tons –*		*Million board feet*
1970	47.8	302.0	288.5	8.0	
1975	42.9	341.2	298.8	56.5	
1980	149.5	239.9	327.0	83.7	
1985	318.4	125.7	303.0	4.6	
1990	558.4	204.2	379.2	48.5	7.2
1995	529.5	110.9	173.5	109.0	19.6
2000	166.0	95.3	0	130.2	45.3
2005	87.3	133.0	0	186.6	59.4
2010	88.6	158.3	0	226.4	67.3

[a] Data are 5-year averages calculated with the year shown as the midpoint.

Historically, more than half of the timber harvested from the Tongass National Forest was used as raw material for pulp. In these revised projections, lumber manufacturing is the primary industry in southeast Alaska; the National Forest timber previously used for pulp is assumed to be surplus to the requirements of Alaska mills and may be exported, or left as logging residue. We assumed that changes in policies or management practices (including harvesting practices) will enable this. We estimated the volume of low-grade saw logs and utility timber that will be produced (or left behind) as a share of the timber volume necessary to support lumber production. Information describing the timber inventory and the species and grade distribution of future timber harvests was used to develop these calculations. This change in the industry of southeast Alaska shifts the derived demand for National Forest timber from pulp logs to saw logs. As in our previous projections, the derived demand quantities we report are expressed in gross volume.

As in our earlier studies, we examined the impact of changes in important components of our analysis. Changes in the derived demand for National Forest timber resulting from three scenarios based on changes in four key assumptions are shown in table 1. Table 1 also displays the range of demand for Alaska National Forest[3] timber based on divergent views of Alaska's ability to compete in lumber markets, (the range of values for the scenario elements is shown in table 3). The alternatives embed expectations for trends in relative prices and costs (Alaska as compared to its competitors) and display these expectations in changes in markets shares. Overrun, as a measure of technical efficiency, also is an important element of these scenarios.

In the scenario labeled low (table 1), higher costs are assumed to limit Alaska's share of markets. Historically, harvesting and manufacturing costs in Alaska were 30 to 50 percent higher than those in the Pacific Northwest. In addition to increases in harvesting costs resulting from changes in management practices, competition for timber and the elimination of long-term timber sales have increased wood costs for Alaska mills. The low scenario displays a future in which these disadvantages do not disappear. In addition, North American producers as a group are not expected to regain the share of the Japanese market that they had in the 1980s in this scenario.

In contrast, the high scenario presents a future in which Alaska has a more efficient and more competitive lumber manufacturing industry. Alaska mills are assumed to be able to compete in both niche markets and, to some extent, broader markets for lumber. Both the high-grade and the lower grade saw logs that are part of Alaska's timber inventory will be valuable raw material for this industry. As in both the medium and the low scenarios, manufacturing residues and utility logs are assumed to be exported.

Table 4 presents the results of an analysis of the sensitivity of the projected derived demand for National Forest timber to changes in individual assumptions, shown in table 3. In each case, all other values were as in the medium scenario, and only one element was changed. This approach is similar to that used in Brooks and Haynes (1994).

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[3] Historical data in table 1 include timber harvested from both the Tongass National Forest and the Chugach National Forest (south-central Alaska); harvest from the Chugach accounted for less than 3 percent of the total Alaska National Forest harvest over the period 1985-95.

Table 3—Historic (1990-96) and assumed (1997-2010) values for key elements of the low, medium, and high scenarios

Year	Alaska share of North America shipments to Japan			North America share of Japanese softwood lumber imports			Share of Alaska shipments to export markets			Overrun in lumber production		
	Low	Medium	High	Low	Medium	High	Low	Medium	High	Low	Medium	High
	Percent						*Proportion*			*Thousand board feet lumber, tally per thousand board feet, log scale*		
1990	6.8	6.8	6.8	85.7	85.7	85.7	0.95	0.95	0.95	1.220	1.220	1.220
1991	5.2	5.2	5.2	86.5	86.5	86.5	.85	.85	.85	1.220	1.220	1.220
1992	4.1	4.1	4.1	86.9	86.9	86.9	.60	.60	.60	1.220	1.220	1.220
1993	4.1	4.1	4.1	84.7	84.7	84.7	.70	.70	.70	1.220	1.220	1.220
1994	3.2	3.2	3.2	79.8	79.8	79.8	.60	.60	.60	1.220	1.220	1.220
1995	1.4	1.4	1.4	72.0	72.0	72.0	.82	.82	.82	1.220	1.220	1.220
1996	.7	.7	.7	70.4	70.4	70.4	.71	.71	.71	1.220	1.220	1.220
1997	.9	1.0	1.5	70.0	70.0	70.0	.85	.75	.65	1.226	1.237	1.247
1998	1.0	1.4	1.8	70.0	70.0	70.0	.85	.75	.65	1.233	1.255	1.274
1999	1.1	1.6	2.0	70.0	70.0	70.5	.85	.75	.65	1.239	1.272	1.301
2000	1.2	1.8	2.2	70.0	72.0	71.0	.85	.75	.65	1.245	1.290	1.329
2001	1.3	2.0	2.4	70.0	72.0	71.5	.85	.75	.65	1.251	1.307	1.356
2002	1.4	2.1	2.5	70.0	72.0	72.0	.85	.75	.65	1.258	1.325	1.383
2003	1.5	2.2	2.7	70.0	72.0	72.5	.85	.75	.65	1.264	1.342	1.410
2004	1.6	2.3	2.9	70.0	72.0	73.0	.85	.75	.65	1.270	1.359	1.437
2005	1.6	2.4	3.1	70.0	72.0	73.5	.85	.75	.65	1.276	1.377	1.464
2006	1.6	2.5	3.3	70.0	72.0	74.0	.85	.75	.65	1.283	1.394	1.491
2007	1.6	2.6	3.5	70.0	72.0	74.5	.85	.75	.65	1.289	1.412	1.519
2008	1.6	2.7	3.6	70.0	72.0	75.0	.85	.75	.65	1.295	1.429	1.546
2009	1.6	2.8	3.8	70.0	72.0	75.5	.85	.75	.65	1.301	1.447	1.573
2010	1.6	2.9	4.0	70.0	72.0	76.0	.85	.75	.65	1.314	1.464	1.600

The scenarios display a relatively wide band for possible future demand for National Forest timber; in proportional terms, this range is similar to the results shown in Brooks and Haynes (1994). The difference is in scale. The closure of the pulp mills, combined with changes in lumber markets produces lower projections of demand (as compared to Brooks and Haynes 1994), even in the high scenario. The trajectory for Alaska production, timber harvest, and demand for National Forest timber depends on trends in markets as well as investment, management, and policy decisions. Therefore, these are not projections of "likely" harvest, and we have not indicated a "base" (i.e., most likely) projection. Judgments on which of these scenarios is most plausible will depend, in part, on expectations for developments in Alaska, the Pacific Northwest, Canada, and Japan. This model provides a framework for making explicit at least some of these judgments—and their effect on demand.

Table 4—Sensitivity analysis: average annual derived demand resulting from changes in selected assumptions[a]

Period[b]	Medium scenario[c]	Alaska share of North American shipments		North American share of Japanese imports		Alaska shipments to domestic markets		Overrun in lumber production	
		Lower	Higher	Lower	Higher	Lower	Higher	Lower	Higher
				Million board feet					
1983-87	281	281	281	281	281	281	281	281	281
1988-92	414	414	414	414	414	414	414	414	414
1993-97	192	191	198	192	192	190	194	192	192
1998-2002	113	108	115	111	113	98	133	118	109
2003-7	152	142	163	148	156	133	178	165	142
2008-10	174	139	199	169	183	152	203	195	159

[a] See table 3 for data on the scenario elements; the medium scenario is used as the base for comparisons.

[b] Data reported are annual averages calculated over the period shown.

[c] See tables 1 and 2.

The medium scenario displays the consequences of a set of assumptions that is intermediate between a set that is more pessimistic (the low scenario) and a set that is more optimistic (the high scenario). We deliberately avoided labeling any of these scenarios as a "most likely" projection because of the relatively high degree of uncertainty surrounding developments in Alaska. Our objective is to focus attention on key issues, such as competitiveness and efficiency, and to translate the range of views on these issues into a range of values for parameters in our model. The model is a framework for specifying assumptions about the future for Alaska and displaying their implications in terms of derived demand for National Forest timber.

Our approach to incorporating and displaying uncertainty has two components. The first is the scenario analysis and the second is sensitivity analysis in which the effects of changes in individual elements of the projection are displayed. The sensitivity analysis shows model results to be most sensitive to relatively small changes in Alaska's share of North American shipments of softwood lumber to Japan. This highlights the importance of competitiveness relative to producers in the Pacific Northwest and British Columbia as one of the central issues facing the Alaska forest sector.

Stumpage Price Projections

In our past projections of timber harvest (Brooks and Haynes 1990, 1994), we reported projected prices for Alaska stumpage. These projections were developed from models linking Alaska prices to timber prices in the Pacific Northwest Region (Region 6, west side), and to world market pulp prices. In our first effort (Haynes and Brooks 1990), we estimated a model by using data for the period 1977-86; in the second effort (Brooks and Haynes 1994), we estimated a revised model by using data for 1977-90. As part of the efforts to revise our projections, we made further revisions to this model, including an expanded sample period.

Changes in timber supply in the Pacific Northwest have had a larger impact on stumpage prices (defined as the average price of timber sold) in Alaska than on projections of Alaska harvest. Greater response in price than in quantity has been observed for both timber and timber products in many studies of forest products markets. We expect Alaska markets to behave similarly. Historically, stumpage prices in Alaska were about one-third of stumpage prices in the Pacific Northwest, and with the exception of the period 1990-96, prices in the two regions have moved together. Parallel movement in prices in the two regions is the result of arbitrage and common product markets. Arbitrage is the process of buying and selling in two or more markets to take advantage of—and thereby eliminating—price differences. Some differences in prices among regions are based on differences in transportation costs (to markets) and other factors; however, these differences are minimized through arbitrage.

Changes in the mix of products produced in Alaska affect how closely changes in Alaska prices match changes in prices in the Pacific Northwest. Prices in the two regions diverged in 1990-92 and again in 1994-95, mainly because of opposite movements in prices for pulp and saw logs . Starting in 1990, pulp prices fell from their peak in 1989 to a level (in real terms) well below the average of the past two decades. In 1994, pulp prices increased for the first time in 5 years. In contrast, saw-log and export log prices in both Alaska and the Pacific Northwest increased over the period 1990-94. Average log prices in the two regions differed markedly over this period because pulp was a considerably more important product in determining stumpage prices in Alaska compared to the Pacific Northwest. In 1993-94, as a result of the closure of one Alaska pulp mill, trends in pulp prices were less important for Alaska, and prices in the two regions showed similar trends.

Our stumpage price projections for Alaska are based on projections of stumpage prices for the Pacific Northwest and projections of market pulp prices. Prices for dissolving pulp (the primary product of Alaska pulp mills) closely follow prices for all market pulp; over the past 15 years, there has been no trend in market pulp prices, adjusted for inflation, although there have been significant cycles in prices. For the projections, we assumed that market pulp prices will remain constant at the average value (in constant dollars) for the period 1975-94 (this is about a 20-percent decline from the price peak in 1989). Therefore, projected Alaska prices are based on changes in prices in the Pacific Northwest. Projected prices for timber in the Pacific Northwest are taken from Haynes and others (1995). As reported previously (Brooks and Haynes 1994), Alaska stumpage prices are expected to increase in the near term (1990-95), decline briefly, then increase again, following the pattern of projected prices in the Pacific Northwest (Haynes and others 1995). Stumpage prices in Alaska are expected to continue to be well below prices in the Pacific Northwest.

Table 5—Projected stumpage prices for Alaska

Year	Haynes and Brooks 1990	Brooks and Haynes 1994	Revised
	1990 dollars per thousand board feet		
		Actual	
1990		61	
		Projections	
2000	39	72	83
2010	65	81	96
2020	77	74	103
2030	78	67	102
2040	75	70	99

The very recent closure of the second pulp mill probably eliminates the need to include market pulp prices as an explanatory variable in our model of Alaska stumpage prices. Preliminary efforts to substitute chip prices for market pulp prices were not successful, and for the time being we have used the same model as before. The old projections for Alaska (Brooks and Haynes 1994, Haynes and Brooks 1990) and new projections for Alaska stumpage price are shown in table 5. In addition to the projections of stumpage prices, we have used the assumption that chip prices remain constant in real terms, at about $88 per short ton. Recent price movements in Alaska suggest that there may be increasing variability around the long-term average price.

Conclusions

Over the period 1990-96, harvest of National Forest timber in Alaska declined by nearly 80 percent. Factors contributing to this decline included changes in the structure of the Alaska forest sector, changes in markets for Alaska products, and changes in conditions faced by Alaska's competitors. Taking these changes into account, our revised projections of demand for Alaska National Forest timber over the next decade (1998-2007) range from 113 to 156 million board feet (see table 6). Three broadly different scenarios display alternative futures for Alaska and the resulting demand for National Forest timber. In addition to differences in the total quantity of timber demanded, these scenarios also differ in the use of the projected harvest. In the low scenario, less than half of the total harvest is used to manufacture lumber in Alaska; to provide the high-quality saw logs that are the raw material for this industry, either a larger area or (as we have assumed) a larger volume must be harvested. In contrast, in the high scenario the entire saw-log component of the timber harvest was assumed to be used to manufacture lumber in Alaska (table 6).

Table 6—Projected, average annual demand for National Forest timber, by scenario and harvest component[a]

Scenario[b]	Saw log	Cedar log exports	Low grade and utility[c]	Total harvest	Net saw log[d]
			Million board feet		
Low	50	7	56	113	93
Medium	84	8	41	133	109
High	118	9	29	156	128

[a] Quantities reported are the average annual demand over the period 1998-2007.

[b] See the text for a description of the assumptions underlying the scenarios.

[c] "Low grade" refers to saw-log grades that are not used in lumber production in Alaska. The range of grades included in this category differs by the scenario. See text for further explanation.

[d] The saw-log portion of harvest, net of utility volume; net saw log was estimated as 82 percent of total harvest.

Critiques of projections for Alaska rest on differences in major assumptions. For example, in the early 1990s the critical issue was projections of Alaska lumber exports. Gruenfeld Associates[4] expected Alaska lumber exports to Japan in the 1990s to average more than 400 million board feet; this implied that Alaska lumber production in 1990-99 would *average* more than peak production in the 1970s (lumber production in Alaska peaked in 1973). In our previous projection (Brooks and Haynes 1994), we expected Alaska lumber exports to increase throughout the 1990s, but to average roughly 220 million board feet. In the first 7 years of the decade (1990-96), Alaska lumber exports averaged 118 million board feet. Our projections suggest that exports will increase from the current (1996) less than 30 million board feet and will range from 66 to 180 million board feet by 2010. With shipments to domestic markets, our estimates of Alaska lumber production range from 78 to 261 million board feet (lumber tally) by 2010. We assume that shipments from Alaska to U.S. markets will increase (as compared to previous projections), but only in the high scenario do we expect the sharp increase in Alaska shipments to U.S. markets observed in 1992 to be sustained.

[4] Jay Gruenfeld Associates. November 11, 1991. Demand for Alaskan logs and lumber in the 1990s. Seattle, WA. On file with: Social and Economic Values Research Program, Forestry Sciences Laboratory, 3200 SW Jefferson Way, Corvallis, OR 97331.

Timber Supply in the Pacific Northwest

Alaska gained little from the reductions in public timber supply in the Pacific Northwest during the first part of the 1990s. Although total timber supplies in the Pacific Northwest were reduced by a third, lumber producers for the export market weathered these changes relatively better than producers for the domestic market. Although Alaska did gain some advantage in red cedar (*Thuja* spp.) markets, and broader markets during the period of high lumber prices (spring 1993) and high chip prices (spring 1995), for the most part these gains have not been sustained. For the foreseeable future, as in the past, producers in Alaska will face stiff competition from larger and generally more efficient producers in the Pacific Northwest and Canada.

Japanese Economic Growth

The Japanese economy weakened in 1990-92 and was very slow to recover. Japanese lumber consumption fell, offsetting sharp increases in the late 1980s and has yet to recover to previous levels. Current (FAO 1997) projections suggest that consumption in 2010 will not reach the level reported for 1990. While general economic recovery in Japan continues to be slow, there also are changes underway in markets for North American timber. In addition to the revised projection for total Japanese consumption, we incorporated in our medium projection the assumptions that Japan will continue to rely on offshore sources for most of its timber consumption, and that the import mix will increasingly favor lumber over logs. Factors that may make our medium projection (of Japanese lumber imports and the North American and Alaskan shares) too optimistic include further weakening of the Japanese market for hemlock and even greater acceptance of engineered wood products (based on domestic and imported raw material).

Competing Suppliers

Our expectation of modest growth in Alaska lumber exports is based on an outlook for competing supply regions that reflects their considerable timber volume and aggressive marketing strategies. Recent data (Japan Lumber Reports 1997) on Japanese softwood log and lumber imports indicate that Canada continues to be the most significant competitor supplying lumber to Japan. New Zealand has sharply increased both log and lumber exports to Japan, and shipments from Chile have been relatively constant. Although producers in New Zealand and Chile do not compete directly with Alaska timber in most markets—and supply generally lower quality logs and lumber—they have a considerable volume of timber that represents a substitution opportunity for Japanese (and other) consumers. The most dramatic change in the Japanese market in the last several years is the emergence of European producers as competitive suppliers of lumber and material for engineered wood products. In 1990, European suppliers accounted for a negligible share of Japanese lumber imports; in 1996, Europe accounted for 10 percent of total lumber imports and 12 percent of softwood lumber imports. The emergence of these competitors has resulted in considerably greater diversity in Japanese sources of softwood lumber and has moderated price increases in response to changes in North American production and exports.

Although we still are unable to do anything but speculate on the future for Russian timber production, the need for hard currency and consumer goods can be a strong motivating factor to overcome widely reported institutional and technical difficulties. In spite of the fact that total production and domestic consumption in Russia dropped sharply in the 1990s, exports (to all markets) declined less than production. In the early 1990s, Russian exports to Japan began increasing after a long period of decline; by 1996, Russian lumber exports to Japan were at an all-time high, and log exports were at the highest level in nearly a decade. This, in combination with the production potential elsewhere in the Pacific Rim and Europe, simply weakens the case for seeing the next decade as a time when lumber production in Alaska can expand rapidly and find markets at any price.

Prospects for New Industry

It is clear that southeast Alaska is in the midst of significant structural change in the forest products industry. With the demise of the pulp mills, the lumber mills face an uncertain future as they restructure themselves to compete for raw material and produce a different product mix. One contemporary policy question is how to develop an integrated mix of different types of industries to increase the value of the available wood resources. It is clear that markets such as the export log market exist for southeast Alaska, and Alaskan timber producers can compete in those markets. The important questions are, What other markets exist? and To what extent can producers in southeast Alaska compete in those markets?

There have been several recent suggestions about alternative industries based on the hope that they might increase the demand for timber (especially National Forest timber) in southeast Alaska. One of these suggestions is a possible ethanol plant in southeast Alaska that will use 35 million board feet per year (roundwood equivalent) of low-grade logs (or mill residues). Although economic feasibility will depend on capital availability and product prices, such a plant may find it difficult to compete with the export market for chips. Currently, chip export prices are about twice what can be paid for feed stock for an economically competitive ethanol plant, given current market conditions.

There also is hope that various value-added manufacturing industries (such as furniture) might develop in southeast Alaska. Experience in the Pacific Northwest suggests, however, that the development of secondary wood products industries depends on the existence of an appropriate infrastructure and entrepreneurial initiative and skills. In addition, the primary consequence of secondary manufacturing is an increase in employment (and income) for a given level of timber harvest, not additional demand for timber. Successful secondary manufacturing requires a primary industry that provides competitively priced products as raw material; therefore, the development of further manufacturing in Alaska is more consistent with our high scenario. Nevertheless, additional, secondary manufacturing in Alaska is possible at any of the levels of production and demand (for timber) displayed here.

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Projections of Alaska timber products output, the derived demand for raw material, and timber harvest by owner are developed from a trend-based analysis. These projections are revisions of projections made in 1990 and again in 1994, and reflect the consequences of recent changes in the Alaska forest sector and long-term trends in markets for Alaska products. With the closure of the two southeast Alaska pulp mills, demand for Alaska National Forest timber now depends on markets for sawn wood and the ability to export manufacturing residues and lower grade logs. Three alternative projections are used to display a range of possible future demand. Areas of uncertainty include the prospect of continuing changes in markets and in conditions faced by competitors and the speed and magnitude in investment in manufacturing in Alaska. The sensitivity of model output to changes in key assumptions is displayed.

Keywords: National Forest (Alaska), forest sector models, lumber.

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