Timber Products Output and Timber Harvests in Alaska: Projections for 2005-25

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Abstract

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Projections of Alaska timber products output, the derived demand for logs and chips, and timber harvest by owner are developed using a trend-based analysis. These are revised projections of those made in 1990, 1994, and 1997, and reflect the consequences of recent changes in the Alaska forest sector and trends in markets for Alaska products. With the cancellation of the long-term contracts and 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. Four scenarios are presented that display a range of possible future demands. The range in annual demand for timber from Alaska National Forests is 48 to 370 million board feet of logs annually. Areas of uncertainty include the prospect of continuing changes in markets and conditions faced by competitors, and the rate of investment and innovation in manufacturing in Alaska.

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

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Introduction

The United States Congress (RPA 1974) has charged the U.S. Department of Agriculture, Forest Service to maintain information relative to the future demand for forest products from the nation's forestlands. In addition, the Tongass Timber Reform Act (TTRA 1990) states that the Secretary of Agriculture will "…seek to provide a supply of timber from the Tongass National Forest which (1) meets the annual market demand for timber from such forest and (2) meets the market demand from such forest for each planning cycle." These requirements for the Tongass are more explicit than the general requirements posed by Forest Planning regulations that began in the early 1980s, requiring estimates of demand for national forest timber as part of land management planning. For the fourth time, we address the question of what is the demand for timber from the Tongass National Forest.[1]

Contextually, supply and demand for forest products is usually expressed by softwood and hardwood species (see Haynes et al., in press, for general discussion of supply and demand trends for forest products). Supply and demand are being used here in their economic sense. In the context of forest planning, they refer to a desire by producers to purchase timber in the region and sell products in the global marketplace. Ultimately, the volumes processed and sold depend on the ability of producers to provide products at a competitive price. In the development of land management plans, land managers will ask what the demand is for the various products that will be produced from the

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forest. From an economic perspective, the question becomes what is the derived (from final product markets) demand for stumpage from that forest.

Round logs and rough-sawn green lumber are the traditional products shipped from Alaska. Both export and domestic markets in the continental 48 states are large enough to absorb essentially unlimited volumes of round logs from the region (see Warren 2005 for a summary of U.S. log exports by customs districts). Prior to 2000, lumber shipments were linked to housing starts in Japan. Since 2000, the bulk of the lumber produced in Alaska has been sold in the domestic market. Given existing legislation, only limited quantities of round logs are exported from national forests. Other owners, primarily Native corporations, are the main source of log exports from the region. Because of these conditions, demand for lumber products is the most important determinant of demand for national forest timber.

This report projects the demand for Alaska National Forest timber using a trend-based analysis. These projections are revisions of previous reports in 1990, 1994, and 1997. Four alternative scenarios are used to display a range of possible future demand for Tongass timber from 2005-25.

Literature Review

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As part of the background for early Tongass Land Management Planning efforts, Haynes and Brooks (1990) assessed conditions in Alaska timber markets as of the late 1980s and early 1990s. They projected the derived demand for Alaska National Forest timber based on then existing conditions and trends (Brooks and Haynes 1990, 1994, 1997). Results of the previous analyses are presented in table 1. This series of projections were based on several assumptions, almost all of which were explicit. Additional important implicit assumptions assumed that there would be no structural changes in markets for Alaska timber (primarily Japan); in the regions competing with Alaska for Japanese markets (primarily other areas of North America); or, in the mix of the forest products industry in Alaska.

All previous studies recognized that Alaska had an integrated forest products industry. The industry included sawmills that processed high-grade logs and pulp mills that used round wood chips produced directly from low-grade logs for lumber production and residual sawmill chips. From 1970-97, the annual volume of material processed by sawmills ranged from 61 to 19 percent of total harvested volumes (average annual volume during this period was 39 percent). The remaining volume went directly to export (as logs) or the pulp mills.

In all of the previous projections, the main components of demand were markets for export logs, dissolving pulp, and lumber exports to Japan. Derived demand has been defined as the estimated volume of round wood harvest required to produce volumes of demanded products. From 1970-96, lumber exports from Alaska averaged 89 percent

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of lumber production (annual values ranged from 60 to 95 percent). During the same period, pulp exports averaged 79 percent of annual pulp production (annual values ranged from 70 to 90 percent).

In 1993, the pulp mill in Sitka, Alaska, closed. Brooks and Haynes (1994) prepared an updated report to reflect this fact. A number of improvements were also incorporated into the model during this update. Revisions included: improved estimates of harvest by private owners (Native corporations); correction of a double counting of import contribution to timber supply; improved estimates of overrun in lumber production; improved estimates of residue production; and changes to reflect that in some sawmills, a portion of the log import went directly to chippers without processing to produce lumber. With respect to these changes, the authors (Brooks and Haynes 1994) stated, "The changes implemented in this revision of our previous model—some of which are quite significant when considered individually—have little effect overall on the accuracy of the historical estimates of the derived demand for Alaska timber." Also, this report expected that negative changes in the competitive position of the Pacific Northwest's timber industry resulting from efforts to protect the spotted owl *(Strix occidentalis caurina*) and other species would provide a modest advantage to Alaska.

The 1997 update of demand for Alaska National Forest timber (Brooks and Haynes 1997) was necessary for two reasons. First, the pulp mill in Ketchikan, Alaska, closed that year. This resulted in the loss of local markets for residues and presented a major challenge to lumber producers in southeast Alaska (fig. 1). A reduction in industry scale

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was an additional effect of the mill closure. Second, updated estimates of demand were required in 1997 as part of the preparation of the final Tongass Land Management Plan.

The first change incorporated into the 1997 update was that new suppliers (primarily Scandinavia) were moving into the Japanese market. Simultaneously, traditional products manufactured from old-growth (baby squares) were being replaced with laminated wood products. Another change in this model resulted from the fact that efforts to protect the spotted owl and other threatened species in the Pacific Northwest had worked their way through the stumpage and product markets. In hindsight, the 1994 assumptions relative to a modest advantage to Alaska were proved overly optimistic. Reductions in federal timber harvests in Oregon and Washington eliminated the Pacific Northwest as one of Alaska's competitors in overseas and U.S. domestic markets. Canada, however, remained a significant competitor and quickly gained market share.

Brooks and Haynes (1997) characterized the future demand for national forest timber as, "...having a high degree of uncertainty because of the magnitude of the 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." They went on to state that level and reliability of timber supplies from the Alaska National Forests are only two of a number of sources of uncertainty. Other factors include: rates of economic growth in key markets; changing technology; tastes and consumer preferences; and, strength of competition.

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Recent Literature

The final 1997 Tongass Land Management Plan led to several follow-on studies related to economic topics. Crone (2005) provides a synthesis of these studies but the most relevant to our work was the study by Stevens and Brooks (2003). They examined the hypothesis that markets for Alaska lumber and logs are integrated with those of similar products from the US Pacific Northwest and Canada." Japan is the destination market for these three regions. Their study performs cointegration tests on paired log and lumber data. Results from the tests show that Alaska western hemlock (*Tsuga heterophylla* (Raf.) Sarg.) and Sitka spruce (*Picea sitchensis* (Bong.) Carr.) logs share an integrated market with logs originating in British Columbia and the U.S. Pacific Northwest. However, the authors note that the results for lumber proved strong but not unequivocal.

The overall conclusion from the cointegration tests confirms the assumption that Alaska's forest products exports and production share at least an imperfectly integrated market with Canada and the U.S. Pacific Northwest. Consequently, Alaska's forest products industry is "sensitive to international market conditions, including competition from other North American regions" (Stevens and Brooks 2003). The authors imply that, given the imperfect integration with competitors in North America, Alaska's high manufacturing costs of forest products play a key role in limiting the region's market share in Japan.

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Finally, the Stevens and Brooks (2003) study does not challenge the view that Alaska species represent unique qualities. The authors, however, consider that the high-value logs and lumber obtained from old-growth Sitka spruce and Alaska yellow-cedar (*Chamaecyparis nootkatensis* (D. Don) Spach) represent a very small amount of Alaska's total forest production. As a result, the uniqueness in the quality of Alaska species has very little bearing on Alaska's market share in the imperfectly integrated commodity markets within which Alaska competes.

Timber Industry in Alaska from 1997-2004

Here we present a brief review of local, national, and global events that have impacted the forest products industry in Alaska and the demand for timber in southeast Alaska.

Tongass National Forest

What is the most appropriate use for the lands in the Tongass National Forest? The controversy has continued both at the local and national levels. Various advocacy groups continue to litigate the Tongass Land Management Plan of 1997. As this report is written, litigation at the Ninth Circuit Court has been remanded back to the District Court Alaska. Simultaneously, specific offerings of the timber sale program have been continuously challenged creating uncertainty in the availability national forest timber sales.

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The Forest Products Industry in Alaska

Another outcome of the 1997 Tongass Land Management Plan was that since 2000, capacity and production information has been collected directly from producers. This information is reported in publications by Kilborn et al. (2004) and Brackley et al. (in press) and used in relating the demand for national forest timber to annual timber sale programs.

In 2000, total annual capacity of all mills in southeast Alaska was approximately 340 million board feet Scribner scale (mmbf) of logs. The actual volume of timber delivered to the mills in 2000 was 87 mmbf. Since 2002, the capacity has stabilized at 250 mmbf and annual volume of logs processed in 2002, 2003, and 2004 were 40 mmbf, 32 mmbf, and 31 mmbf, respectively. From 2002-04, production has been at a level of 12 to 16 percent of total capacity.

The latest capacity report (Brackley et al., in press) also indicates that there have been major shifts in the markets served by Alaska sawmills. Prior to 1997, up to 95 percent of production was exported to Japan. Since 2000, exports have fallen and the volume shipped to domestic markets has ranged from 60 to 83 percent of production. Western hemlock continues to be the major species processed by Alaska mills (50 to 56 percent). Shipments to the continental 48 states are destined for sale as shop lumber or as niche market specialty products.

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A federal grant program was approved ($4 million) in 2001 and 2002 to assist producers with the purchase of drying and secondary processing equipment. A recent review of the impacts of the grants (Nicholls et al., n.d.) determined that mills in Alaska now have the ability to dry approximately 6.6 mmbf annually. It is estimated that 0.8 mmbf of dry, surfaced lumber was produced in 2004. Producers drying lumber also reported that the dry, surfaced lumber was well received in local markets. One producer reported that the gain from drying and planning was marginal, but the ability to sell products has vastly improved. Given updated grading rules for Alaska lumber, some of the small mills are now selling dimension lumber and competing with local building supply stores.

Demand Projections and Market Developments

Traditionally, Japan has accounted for up to 90 percent of the economic activity in the region defined as "North Asia" by the Food and Agriculture Organization (FAO). For the period 1994-2010, FAO (1997, 1998) projected steady increases in production, imports, and consumption of sawn wood products in this region. Approximate rates of growth were as follows: production 1.2 percent; imports 7.7 percent; and, consumption 2.2 percent. Exports from the region were expected to decline.

In reality, the FAO projections overestimated demand for all round wood and sawn products. The Japanese banking crisis in the 1990s caused housing construction to decline to some of the lowest levels recorded in recent decades. Contrary to FAO projections, economic indicators associated with lumber production continue to fall. Real changes are masked by the increasing levels of substitution of laminated products

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for traditional solid wood products. These noted problems, however, are insignificant when compared to developments in China.

In the past 5 years, reported rates of growth for the Chinese economy have range from 12 to 17 percent. China has only recently joined international organizations such as the World Trade Organization (WTO) and FAO. Because of their previous isolated stance, reliable statistical information that defines economic conditions in China is not currently available and may not be available in the near future. However, we are aware of firms that are now shipping material to China instead of Japan. Value added manufacturing once done in Japan is now taking place in China. Finished goods (value added forest products) from China are now being shipped to Japan and other world markets. The current situation is chaotic, but experts agree that the emergence of China as a major producer, consumer, and exporter of forest products will most likely result in increased levels of demand for all forest products.

From 1997-2004, lumber imports into Japan declined 25 percent from 12.6 million cubic meters (5,250 million board feet) to 9.5 million cubic meters (3,958 million board feet) annually. During the same period, exports from the United States were reduced by 84 percent. In 1997, exports to Japan were in the form of solid wood products designed to meet the needs of Japan's traditional post and beam construction. At the same time, shipments of laminated products to Japan increased by 43 percent. The sources of the laminated products were Scandinavia and other nations. In summary, demand for

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traditional products decreased, but some of the reductions were offset by new sources of supply.

Methods

In this section we review the past methods and describe the current projection framework given the extensive market and production changes over the past decade.

Description of the Model

The original Brooks and Haynes (1990) model applied material balancing approach to calculate the derived demand for forest products produced in southeast Alaska. Its conceptual basis was the same as used for projecting regional demand for national forest stumpage in early planning efforts (Haynes et al. 1981). At that time, there was interest in understanding the possible price impacts of various levels of national forest harvest flows consistent with product demand and timber supplies from other landowners. A model was developed that combined several economic concepts and resulted in a regional (or in this case, forest) estimate of the stumpage volume demanded.

Mathematically, derived demand for national forest timber is the dependent variable of interest to users. It is developed by estimating the roundwood equivalent of all material used to produce products from Alaska and subtracting the volume harvested from other landowners. The remaining amount is the derived demand for material (logs) from the

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Tongass National Forest. Independent variables used to calculate derived demand include: statistics that describe volume of timber (consumed, produced, imported, and exported); volumes of pulp products; and conversion factors to determine raw material required to produce products. When considering market statistics, lumber and pulp are products that are consumed. Trade data are reported and tracked in terms of these products as opposed to raw timber. Given technical knowledge and understanding of production systems and associated conversion factors, the model works backward and calculates volumes of timber required to satisfy derived demand for products. After the fact, estimates of derived demand can be compared with historic data (actual volumes of timer harvested) to test the reliability of projections.

The original Brooks and Haynes model evolved from 1989-97 as a Lotus spreadsheet application (Lotus Software 1983). Figure 2 presents a diagram of the original model as it existed in 1994. At that time, the integrated industry used both high and low-grade logs. The major product produced from high-grade logs was rough-green lumber. Low-grade logs were chipped and processed by pulp mills to produce dissolving pulp. Almost all of the sawn (97 percent) and fiber products (80 percent) were exported to Japan.

Figure 3 presents a diagram of the revised model used in this project, which is now an Excel spreadsheet (Microsoft Corporation 1999). Portions of the model that describe pulp production no longer exist and as a result have been eliminated. The revised diagram also reflects assumptions relative to the flow of timber from various owners to

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mills in the region. It has been assumed, for instance, that logs from Native ownerships are exported and not available to local mills. This assumption is based upon historic conditions.

Description of Data

The major data sources are much the same as before and include: Pacific Northwest Research Station, Production, Prices, Employment, and Trade in the Northwest Forest Industries (Warren 2005); Japan Wood-Products Information and Research Center (JAWIC 2006); FAOSTAT of the United Nations (FAO 2006); and, United States International Trade Commission (USITC 2005). The basic information from the above sources was in almost complete agreement (exports volumes of lumber to Japan reported by one source agree with imports from that source as reported by JAWIC). The JAWIC report also provided detailed information relative to Japan's forest products industry that was not available from other sources.

The logical agreement of data from various sources results from a cooperative effort of international agencies such as the WTO. This, however, is a relatively recent development and has not always been the case. In the conversion process it became obvious that past data inconsistencies had been logically balanced to the most correct values. As updates were made to trade data, corrections were incorporated. Data users (economists, modelers, etc.) have a choice of updating data in the model or proceeding with the original values. In this project, we updated model values when they were reported as corrections in the published sources.

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Although data from the various sources were consistent, it was determined that the data relating to lumber exports from Alaska from 2000-04 were understated because of transshipments. That is, an increasing amount of lumber is shipped to Washington (reported as a domestic shipment) and then resold and shipped overseas. In the past, large volumes of lumber were shipped directly from Alaska ports to foreign markets. The export documents reflected these shipments. As the volumes of exports decreased, there has been an increase use of container shipments. Container shipments move by barge from Alaska to Tacoma, Washington, where they are reloaded for shipment to foreign ports. The export documentation is prepared in Tacoma and it is listed as the port of export. A comparison of the above noted data sources and the capacity reports (Brackley et al., in press; Kilborn et al. 2004) indicate that only approximately 10 percent of Alaska exports are reported in the traditional trade data.

Applicability of the Model for Current Use

Until 1997, Japan was the major market for Alaska forest products. The long-term cutting contracts were held by firms closely linked by ownership to Japan or a history of selling large volumes of product to Japan. Since 1997, these ownership interests have sold their holdings in Alaska. A new type of owner is producing forest products in Alaska. In some cases, the new owners have a history of selling products in the domestic market. In at least one instance, a firm with historic roots in the U.S. Pacific Northwest and long-term customer relationship in the region moved to Alaska in search

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of types of timber no longer available in Washington and Oregon. This firm's problem was supply and not markets. It appears that many of the small producers are finding that production of a dry, planed, and graded product is increasing their access to local markets. In addition to the changes in North America, the housing market in Japan has been dormant since 1998-99 and is just now showing signs of recovery. Regardless, it appears that the traditional link between Alaska and Japan may have become greatly diminished.

The Brooks and Haynes model was constructed based on the assumption that the major determinant of derived demand would be markets for lumber and pulp in Japan. All of the traditional elements of Japanese markets are in a state of flux. Just as in the United States, the high standard of living and associated costs of labor in Japan are resulting in the loss of many traditional jobs and the substitution of lower cost goods from China. As production shifts from Japan, the flow of resources is changing from Japan to China, or other low cost nations.

One logical solution for the suitability and continued use of the Brooks and Haynes model would be to revise it to represent recent changes in Pacific Rim forest products trade flows. Currently, this is not possible given the lack of available Chinese economic data.

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Origin of Demand Functions Used in Current Projections

In 2004, Japan's housing industry grew 2.5 percent (Nagahama 2005a) after a decade of little growth. In the same report, Nagahama noted that regardless of the increase in housing starts, imports of sawn lumber continued to decline. Nagahama (2004b, 2005b) and Japan Lumber Journal (2005) also reported that in 2004, imports of glulam increased at an annual rate of 13 percent. In addition, during the previous year China had captured 21 percent of the Japanese glulam market (Nagahama 2005b). China's share of the glulam market resulted from a rapid increase in production capacity supported by substantial Japanese investments in manufacturing in China. It is anticipated that similar shifts of manufacturing facilities to China will take place for many other engineered wood and value added products.

Sasatani et al. (2005) reviewed niche market opportunities for Alaska forest products in Japan. He concluded that there are numerous opportunities to market Alaska forest products in Japan given favorable economic changes (weakened U.S. dollar vs. yen) and Japan's traditional values for quality products.

Annual production of solid wood products in China was reviewed by Butterworth and Lei (2005). In 2005, marketable housing starts in China increased about 5 percent. The highlights of this report predicted that log, lumber, and wood-based panel productions were forecast to increase 5, 10, and 15 percent, respectively, in 2006.

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Based upon the above sources of information, there will likely be a high and almost unprecedented demand for forest products in the Pacific Rim market. For the first time in history, however, there is a question if the Pacific Rim price will be sufficient to compete with domestic markets. During the past several years, Alaska producers have found ready markets for their products in domestic (Alaska and continental 48 states) markets.

Many people and organizations in Alaska would like to return to an integrated industry that uses both high and low-grade material. An integrated industry results in better utilization and larger volumes of operable wood, which in effect lowers unit operating costs. Studies by McDowell Group (2004), Leonard Guss Associates (2005), and Brackley and Davis (2004) have reviewed problems associated with medium density fiberboard (MDF) production in southeast Alaska. Leonard Guss (2005) identified high-grade MDF in thin sizes as a fiber product in short supply in Japan and China. The Guss study also suggested that sufficient resources existed in southeast Alaska to support two medium size plants. Additional studies by Wahl (2004) and Nagahama (2004a) confirm the increasing demand for MDF products and noted that manufacturing of the product in Japan increased 2.4 percent in 2003. The increase demand for this product is caused by a shift from thin plywood to thin MDF. In general, MDF is a fiber based product that can be produced from low cost material in the form of low-grade trees and residual products. On the other hand, solid wood, a relatively expensive raw material, is required for production of plywood.

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Another uncertainty is the extent that sustained high prices for oil might force the development of alternative sources of energy. Biomass in the form of currently unused components of harvested trees (low-grade logs, small diameter stem material, branches, leaves, needles, bark, and various mill wastes) represent sources of material that have the potential to reduce dependency on oil. It is difficult to quantify the expected future demand for biomass material, but current legislation is designed to find uses for available material. It is possible that an integrated industry will return to Alaska as a result of the need to replace traditional sources of energy with some form of bioenergy.

Assumptions

The following assumptions have been made to facilitate the current demand projections:

- Historically, the major component of the previously defined FAO's North Asia market was Japan. The new Pacific Rim market includes Japan, Korea, China, India, and other nations. In this model, all projections of future demand are for the Pacific Rim market. The historic data for Japan represent demand generated by a population of 127 million people. The Pacific Rim represents a population in excess of 2,430 million people.
- Export products will be considered synonymous with high-value products. The products may be exported or shipped to domestic markets. Producers will select markets based upon price.
- Alaska producers have unlimited access to domestic markets, both in Alaska and the continental 48 states.

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- Lumber products shipped from Alaska have been classified as sawn wood. Large size solid sawn wood products are currently being replaced with engineered wood products (truss products, glulam, etc.) that contain small size solid sawn wood components. Projections in this report will be considered an aggregate of all traditional sawn wood and engineered products.
- The bulk of the production from southeast Alaska mills is assumed destined for sale as shop lumber or niche market products. Small amounts of lumber are milled and sold as dimension lumber.
- High quality logs harvested from Native lands will be sold to export markets.
- Existing chip markets are sufficient to use chips currently produced by southeast Alaska mills, until a local chip using industry is established. A result of this assumption is that in the short-term, Alaska mills will have little incentive to maximize chip production. The entire focus of the industry will be maximization of high quality and specialty lumber products.
- State lands will supply up to 6.8 mmbf of timber annually to mills in southeast Alaska. This figure is 6 mmbf less than the volume of available timber reported by the McDowell Group (2004). The 6.8 mmbf volume is adjusted to account for small and rejected sales.
- We assume that investment risk will be acceptable. Returns from forest products manufacturing will allow recovery of capital required to fund necessary improvements.
- In the rebuilt model, no attempt has been made to account for low-grade material. The model does, however, report chip volumes that are available from sawmill

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production. In the all-lumber scenarios (scenario 1 and 2), utility logs may be left in the wood, sent directly to sawmill chippers, or exported. Specific disposition of utility logs will depend upon market conditions at time of harvest and processing.

- The volume of sawn wood imports to the defined Pacific Rim market will increase over the next 20 years to a level equal to Japan's imports in 1997. Subject to the assumption about export products being synonymous with high-value products, Alaska lumber will move to export markets. Projections of expected Pacific Rim sawn wood consumption, imports, exports, and production are presented in figure 4.
- Proposed harvests may be increased by salvage operations required to remove dead trees resulting from attack by insect and disease. Projected harvests do not include salvaged volumes.

Results

The following sections report the updated projections for timber demand from the Alaska National Forests.

Alternative Projections

We developed four scenarios to display alternative futures of Alaska's forest sector and the resulting demand for national forest timber. These scenarios have been labeled as follows:

Scenario 1--Limited lumber production

Scenario 2--Expanded lumber production

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Scenario 3--Medium integrated industry

Scenario 4--High integrated industry

The model settings and characteristics of the scenarios are presented in table 2. Results of the model runs based on these four scenarios are listed in table 3, along with the Brooks and Haynes (1990, 1994, 1997) projections of demand for comparison.

The first two scenarios (limited lumber and expanded lumber) assume that lumber exports to the Pacific Rim will increase steadily over the projection period. The level of exports will increase to those experienced in the 1990s. With existing projections of future demand, this is a conservative view of expected exports to the Pacific Rim. In the limited lumber scenario (scenario 1), Alaska market share remains constant and increase in production is a direct response to Pacific Rim shipments. In the expanded lumber scenario (scenario 2), Alaska regains market share to a level that was experienced in the last decade. Given the lack of a market for low-grade and utility logs, the industry must process some low-quality material (see assumption relative to low-grade material). This is an implicit assumption, not reflected by the model settings.

The last two scenarios (medium integrated and high integrated) are based on slightly lower estimates of Pacific Rim lumber imports. In the medium integrated scenario (scenario 3), exports increase until 2012 and then remain constant. In the high integrated scenario (scenario 4), exports increase until 2012, remain constant from 2013-18, and then increase from 2019 onward. As presented in table 2, a facility that will use low-grade logs is added in 2008. In the high integrated scenario, a second

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facility that will use low-grade logs is added in 2012. An implicit assumption of these two scenarios is that given the increased level of harvest, a higher quality mix of logs will be available for sawmills. Improved log quality will result in reduced amounts of low-grade lumber production.

The integrated industry scenarios (scenarios 3 and 4) are based upon reports and recommendations by the McDowell Group (2004) and Leonard Guss Associates, Inc (2005). These reports discussed world demand for MDF and availability of raw material in southeast Alaska. It was implicitly assumed that the existing forest products industry in southeast Alaska could make the transition from current conditions to an integrated industry. In reality, a critical element of the transition is timing with respect to an evolving sawmill industry. Therefore, a feature of our analysis is expansion that roughly synchronizes with expanding sawmill chip supply.

The possible strategies for creating an integrated industry are functionally unlimited. With extremely high levels of demand, the implementation time could be reduced. We have selected the described scenarios as reasonable and possible, given the outlined assumptions.

Expanded Results Illustrated using the Medium Integrated Scenario

Table 4 presents an overall view of what will result from a future that moves in the direction of the medium integrated scenario. In this scenario, it is assumed that an integrated industry develops a use for the fiber produced from low-grade and utility logs.

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As stated earlier, it has been assumed that an MDF plant will be built sometime from 2007-12. Direct use of wood fiber for energy production or manufacture of fuels, such as ethanol, is an alternative industry that would use similar volumes of wood. Regardless of the specific industry that develops, estimations of timber harvest by owner, product, and the resulting volumes of products are included in table 4.

Key Market Share Values

Tables 5A and 5B present the market shares settings that have been used in the four scenarios. The initial step in the model operation was to set import and consumption patterns for the Pacific Rim region. These values have been set to reflect a return to the levels of lumber consumption and imports that occurred from 1995-2000. This growth has been distributed over 20 years. Given these settings, the model reflects a constant growth pattern over the next 20 years. North American (NA) market share and Alaska (AK) market share are a function of the described limited lumber scenario (i.e., a scenario where the NA and AK market shares are constant would show growth proportional to the base consumption and import levels).

Table 5A shows that both the NA and AK values are constant in the limited lumber scenario. In the expanded lumber scenario, the AK share increases at a rate so that it doubles in 20 years (0.4 to 0. 9 percent). In the medium integrated scenario, the AK market share increases from 0.5 to 1.6 percent over a period of 8 years and then remains constant. In the high integrated scenario, the AK share increases from 0.4 to 2.0 percent over 20 years. While the AK share of the market varies among the

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scenarios, the NA market share is held constant at 49.3 percent. The net impact of these simulations, given the previously listed assumptions, is that the market for high-value products displays moderate growth and returns to past levels. A marketing program is one way for Alaska producers to capture additional market share. The marketing program would be based upon superior quality (production of a dry, surfaced, and attractively packaged product) and strength values of the Alaska product.

Given these basic conditions (Pacific Rim consumption and imports, NA market share, AK market share), there are almost unlimited ranges of settings that can be tested using the model that would produce essentially the same results. We have selected these settings because they convey responses reported by economic experts in North America and on-site in Pacific Rim nations.

Sensitivity Analysis

Model sensitivity and response resulting from tables 5A and 5B values have been shown by comparing selected scenarios and independent variables (table 6). In table 6, the derived demand in the form of exports and domestic production are presented for the limited lumber, expanded lumber, and high integrated scenarios. For comparative purposes, the table also presents the North American share of Pacific Rim imports to give an idea of the relative size of the market available to Alaska producers.

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Stumpage Price Projections

Past timber projections have also reported price projections for Alaska stumpage. These projections have been developed from relations linking Alaska stumpage prices to stumpage prices in competing regions. The selection of competing regions has narrowed over time, reflecting changing markets for Alaska forest products. Currently, we use the U.S. Pacific Northwest market. Specifically, we develop stumpage price projections for southeast Alaska from softwood stumpage prices for timber harvested on the western side of Washington and Oregon. The underlying relations reflect how there is similar price movement in the two regions as the result of market arbitrage in shared markets for softwood lumber. 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.

In earlier sections we have described the growing role that Pacific Northwest softwood lumber markets have played for Alaska producers. After adjustments for the loss of log export markets and reductions in federal harvest flows, the Pacific Northwest is once again expanding softwood lumber production, especially in the commodity grades (see Haynes and Fight 2004 for a discussion of lumber production by grade). This expansion is largely supported by private timber whose volume is expected to increase and whose size and species mix are expected to remain roughly stable (Zhou et al. 2005).

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The historic and projected stumpage prices for southeast Alaska and the Pacific Northwest West (western Washington and Oregon) are shown in table 7. While not entirely obvious in the table, prices in the two regions diverged after 1990 as prices in the Pacific Northwest surged (peaking in 1993). During this time, federal harvests were first stopped by injunction and then reduced by the adoption of the Northwest Forest Plan. Projections of future softwood lumber markets can be taken from the RPA Timber Assessment Update (Haynes et al., in press). These projections envision a future where total U.S. forest products consumption increases 38 percent by 2050. Softwood lumber consumption is expected to increase 27 percent with U.S. production increasing by 21 percent. Increased lumber imports from a growing variety of sources continue to moderate lumber price increases. U.S. timber harvests grow by 30 percent with an increasing proportion coming from managed stands, mostly in the South and Pacific Northwest. These trends contribute to expectations that stumpage prices in both the South and Pacific Northwest will grow slowly in the next 5 decades, averaging 0.3 percent per year.

The data and projections shown in table 7 suggest relatively constant stumpage prices in the future. Chip prices can also be expected to remain constant in real terms. The recent price movements in southeast Alaska suggest that there is increasing variability around long-term average stumpage price, partially reflecting how small changes in quantities can have large impacts on stumpage prices. This is especially true in relatively small regional markets like southeast Alaska.

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Maximum Derived Demand

Maximum derived demand volumes of wood required by each scenario are presented in table 8. Alaska currently has an available supply of chips, but the volume in the southeast is not sufficient to supply the total resource needs of the recommended MDF plant size (capacity). Given this fact and an expectation of increasing chip production as a result of increase lumber production, the startup points for the proposed fiber using facility have been scheduled at times where a major portion of the required furnish is available in the form of sawmill chips. We have simulated the startup of the plants in 2008 and 2012 because this is an approximation of a point in time when chips should be available to partially fill the needs of each plant. There are other sources of fiber that might become available to the industry. First, when the pulp mills were active, low-grade logs from private (Native) lands were available as a source of raw material for pulp production. If these markets evolve again, logs from private lands may be available. Second, it is anticipated that increasing volumes of chips will be produced in south-central Alaska for export to Pacific Rim markets. While it is possible that material from this source might flow to southeast Alaska, it is more probable that someone would build a facility to use them in the port area. Given the above comments, it is estimated that the maximum wood requirement resulting from the scenarios is 370 mmbf of logs annually.

Most Probable Outcome

Given the high degree of uncertainty surrounding developments in Alaska, we have deliberately avoided labeling a “most likely” projection. Instead, our objective was to

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focus attention on key issues, such as competitiveness, efficiency, and predicted trends, 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.

The four scenarios represent possible future outcomes. Two conditions must exist if they are to develop. First, the supply of timber from the various ownerships has to be orderly and predictable. Second, capital must be available to support increases to existing capacity and construction of new facilities. This second condition depends on the first. A relatively secure supply of raw material is an essential component of scenarios that require new investment. A future that includes constant conflict that inhibits raw material flows will most likely create an unacceptable level of risk for investors and limit access to capital.

In the face of the various challenges implicit in scenarios 2 through 4, the outcome resulting from the limited lumber scenario (scenario 1) assumes greater likelihood of occurrence since it only depends on the continuation of the *status quo.* Implementing change is a major requirement in reaching the outcomes of the other scenarios. Each of those changes has its own likelihood of occurrence.

Conclusions

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From 1990-2004, the harvest of timber in Alaska declined by nearly 67 percent. During the same period, harvests from the Alaska National Forests have declined by 92 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. Our revised projections of average demand for Alaska National Forest timber from 2005-25 range from about 33 to 370 mmbf (table 3). Four broadly different scenarios display alternative futures for Alaska and the resulting demand for its 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 expanded lumber scenario, approximately two-thirds of the total potential harvest is used to manufacture lumber in Alaska. In the high integrated scenario, the entire saw log and utility log component of the timber harvest is assumed to be used to manufacture products in Alaska. The high integrated scenario may also require that low-grade timber from other owners (Native and state lands) become available to the industry, contrary to the assumption listed. This has happened in the past and could again occur in the future.

Critiques of projections for Alaska rest on different opinions about values for the major assumptions. For example, in the early 1990s the critical issue was projections of Alaska lumber exports. Jay Gruenfeld Associates (1991) expected Alaska lumber exports to Japan in the 1990s to average more than 400 mmbf. 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). A previous projection (Brooks and

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Haynes 1994) expected Alaska lumber exports to increase throughout the 1990s, but to average roughly 220 mmbf. From 1990-96, Alaska lumber exports averaged 118 mmbf. Projections in 1997 suggested that exports would increase 30 mmbf annually from the then current (1996) level and would range from 66 to 180 mmbf by 2010. Reported volumes of lumber exported from Alaska during 2000-03 averaged 18.4 mmbf. During the same period, shipments to domestic markets were 54.9 mmbf. The current scenarios estimate that lumber production by 2010 will average between 69 and 147 mmbf. All of our assumptions suppose there will be a timber sale program on the Tongass, as mandated by the current legislation. Obviously, if this assumption is rejected then the ultimate outcome will differ.

Suggestions for Future Research

During the conduct of this project, it became obvious that changing conditions in Alaska and world markets are rapidly making the existing model and approach obsolete. Future attempts to project demand for National Forest timber in Alaska will require new methods and additional information. Given identified problems, we recommend the following research projects:

- Small and medium producers are starting to sell dry, planed, and graded lumber in domestic markets. These producers are competing directly against local retail lumber suppliers. An effort should be started to collect and maintain lumber prices in this market so that competitive aspects can be defined.

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- The transshipment problem has been identified and an effort is needed to develop reliable estimates of lumber exports from Alaska.
- The relative values of products shipped to export markets (e.g., value in Japanese yen or Chinese RMB per cubic meter) as opposed to products shipped to domestic markets (price in U.S. dollars per board foot tally) are not generally available. A project should be initiated to address this issue.
- Transportation costs (methods and distances to export ports within Alaska and the Pacific Northwest) are becoming an important cost required to determine profit maximization marketing schemes. Research is required to develop methods to determine cost information and make it available.
- Lumber recovery factors for shop lumber may average 20 percent below those for dimension lumber due to differences in nominal values used in board foot calculations. To address this issue, two types of information are required. First, information is lacking on how lumber is sawn and graded (dimension rules vs. shop rules). Second, appropriate conversion factors should be developed for both modes of production.
- If there is a continuing need to periodically update the demand for National Forest timber in Alaska, the approach should include production, import, export, and consumption information for defined products. The approach should convert expected or projected product volumes to required volumes of standing timber. It should also be revised to include changes in domestic markets (within Alaska and the continental 48 states). From an economic perspective, the shift between markets should be controlled by expected real price.

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Metric Equivalents

When you know:	Multiply by:	To find:
Board feet, lumber scale	0.0024	Cubic meters, lumber

Footnotes

[1]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 mmbf) of the Alaska total. The Tongass National Forest in southeast Alaska accounted for 99 percent of timber harvest from Alaska National Forests in 1995.

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