United States
Department of
Agriculture

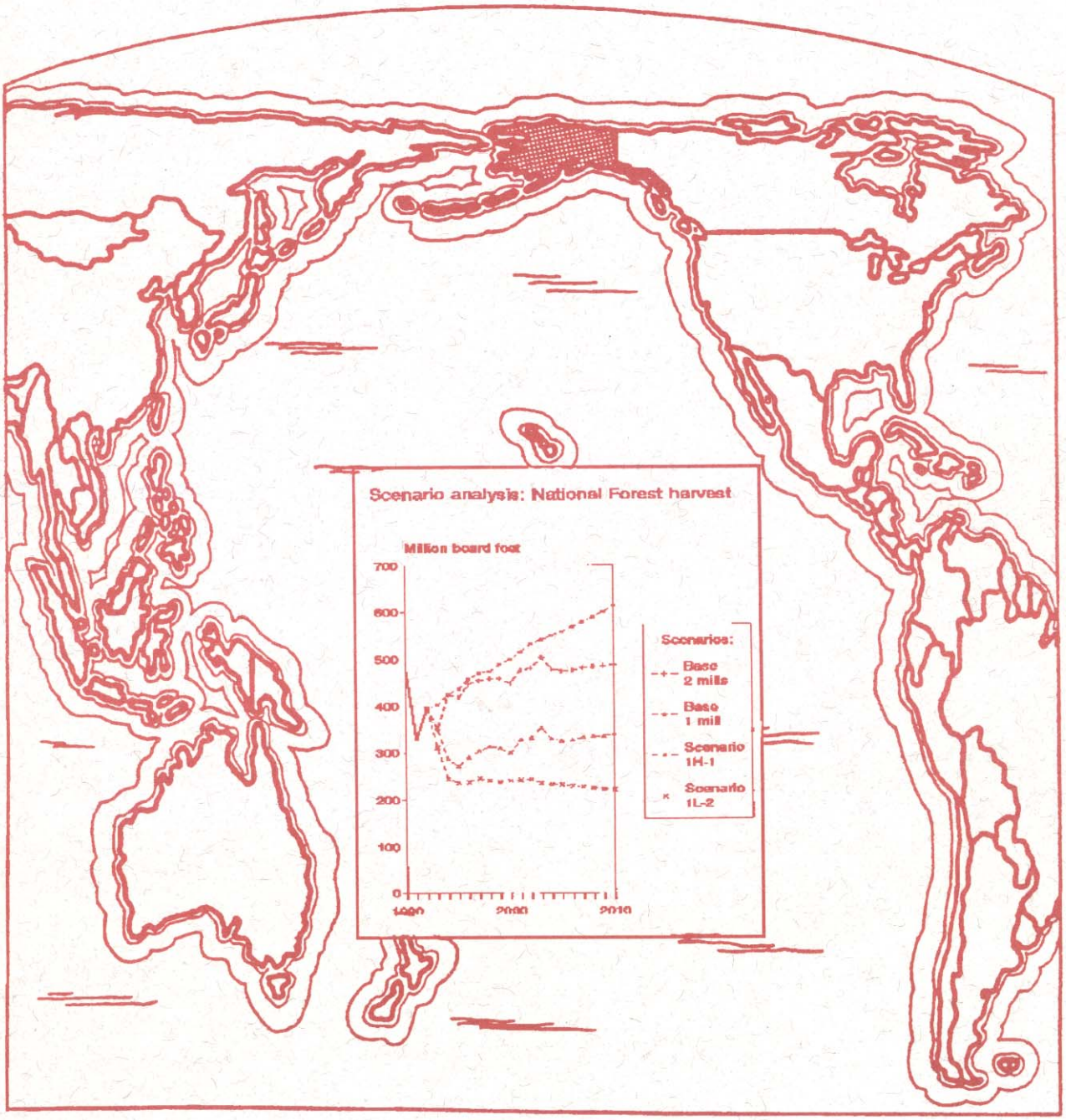
Forest Service

Pacific Northwest
Research Station

General Technical
Report
PNW-GTR-334
June 1994

Timber Products Output and Timber Harvests in Alaska: Projections for 1992-2010

David J. Brooks and Richard W. Haynes



Authors

DAVID J. BROOKS is a research forester, Forestry Sciences Laboratory, 3200 S.W. Jefferson Way, Corvallis, OR 97331; and RICHARD W. HAYNES is a research forester, Forestry Sciences Laboratory, P.O. Box 3890, Portland, OR 97208.

Abstract

Brooks, David J.; Haynes, Richard W. 1994. Timber products output and timber harvests in Alaska: projections for 1992-2010. Gen. Tech. Rep. PNW-GTR-334. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 32 p.

Projections of Alaska timber products output, the derived demand for raw material, and timber harvest by owner are developed from a trend-based analysis. By using a spread-sheet model, material flows in the Alaska forest sector are fully accounted for. Demand for Alaska National Forest timber is projected and depends on product output and harvest by other owners. Key assumptions are made explicit, and the sensitivity of model output to changes in assumptions is examined.

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

Summary

Projections of Alaska timber products output and timber harvest by owner are developed by using a trend-based analysis; these are revisions and updates of earlier projections reported by Haynes and Brooks (1990) and Brooks and Haynes (1990). New data (for 1989-92), revised assumptions, and revisions to the projection methods have resulted in changes in projections of demand for Alaska timber. Among the new data and revised assumptions reflected in these projections is the closure of one of Alaska's two pulp mills in 1993. Because future plans for this mill are uncertain, we provide two projections of future demand for Alaska timber: in one we assume that the pulp mill remains closed; in the other, we assume that the mill reopens in 1994. In the first case, the derived demand for National Forest timber is projected to average about 330 million board feet in the 1990s and remains at that level in the following decade. If the second pulp mill reopens, the derived demand for National Forest timber is projected to average about 420 million board feet in the 1990s, and about 480 million board feet in the following decade. These figures refer to total National Forest harvest, including both net saw-log and utility volume. Alternative assumptions regarding key elements of the projection are examined and alter results by no more than 15 percent over the next decade but by as much as 30 percent at the end of two decades. The reasoning behind projections of Alaska lumber exports—a critical element in the demand for National Forest timber in Alaska—is discussed, and the assumptions made to produce these projections are examined in detail. Finally, suggestions are made concerning improvements in data used to analyze Alaska timber markets.

Introduction

In two earlier reports, we assessed conditions in Alaska timber markets as of the late 1980s (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).[1] 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 Alaska timber markets (primarily Japan) or in regions competing with Alaska for Japanese markets. Projections of this type require regular review to examine the validity of assumptions, and revision to incorporate new information.

Significant changes in the Pacific Northwest (PNW) during 1989-92 may represent the kind of structural change in competitive conditions faced by Alaska mentioned above. Reductions in timber supply from National Forests in the PNW and further restrictions on log exports from public lands have resulted from efforts to protect the habitat of the northern spotted owl *(Strix occidentals)* and from the adoption of final forest plans for the National Forests in the region. In simulations of North American timber markets, these policy changes raise projected stumpage prices and stimulate a short-lived increase in private harvest that partially compensates for reductions in public timber supply (Haynes, in press). As a result of rising stumpage prices, the competitive position of the PNW deteriorates, profits fall, and lumber and plywood output and capacity drop. After 2000 in the Douglas-fir subregion, lumber output is roughly 1.2 billion board feet below levels in base projections. Plywood production is more variable, averaging about 0.5 billion square feet lower. Stumpage prices stabilize after 2015, about 20 percent higher than the base projection (Haynes, in press).

The expectation of changes of this sort in the competitive ability of the PNW is one among many factors cited by the Alaska Forestry Association (AFA) in their critique of the Tongass Land Management Plan Revision Supplement Environmental Impact Statement (TLMP SEIS).[2] This led the AFA to request an alternative outlook for Alaska timber from Gruenfeld Associates,[3] whose report makes direct comparisons with Haynes and Brooks (1990) and Brooks and Haynes (1990)—and adopts many equivalent assumptions. Their study differs from ours, however, in several important aspects and reaches conclusions that are substantially different.

This paper presents revisions to our earlier studies; the result is projections of the derived demand for Alaska National Forest timber that take into account data from the 1989-92 period and consider recent developments in domestic and offshore markets. As a result of changes in the intervening period, our revised projections differ from our earlier outlook.

---

[1] Most National Forest timber is harvested from the Tongass National Forest (southeast Alaska); however, we also include in these projections demand for small quantities of timber from the Chugach National Forest (south-central Alaska).

[2] Finney, D L. 1991. Correspondence to M. Barton, Regional Forester, dated November 22, 1991. On file with: Social and Economic Values Research Program, Forestry Sciences Laboratory, 3200 S.W Jefferson Way, Corvallis, OR 97331.

[3] Jay Gruenfeld Associates. 1991. Demand for Alaskan logs and lumber in the 1990s. Seattle, WA. On file with: Forestry Sciences Laboratory, 3200 S.W. Jefferson Way, Corvallis, OR 97331.

Like all projections, our outlook for the demand for National Forest timber depends on assumptions; as in our earlier studies, we base our conclusions on historical data and on judgments of likely developments. Because no one can know the future, however, differences of opinion are inevitable. In this review and revision, we isolate the main differences between our current outlook and the previous outlook; this is done to illustrate the projection process and support the reasoning underlying our assumptions. The validity of our conclusions can be best examined by reviewing the individual assumptions that combine to produce them. We conclude this report by suggesting the collection of additional data that may help reduce uncertainty in the outlook for Alaska timber production.

Approach

Brooks and Haynes (1990) describes the methods used to develop projections of Alaska National Forest timber harvests; our approach here is similar and takes into account the revisions described below. Our model is one in which the outlook for consumption underlies projections of forest products production and timber harvests. Conditions in markets, specifically total consumption and competition from alternative suppliers, are used to estimate production of lumber, pulp, and export logs in Alaska. Product output is converted into raw material requirements—timber harvest—by using conversion factors such as overrun in lumber production and pulp recovery rates. The use in pulp production of residues from lumber manufacturing is accounted for, as are imports and exports of raw material. Figure 1 summarizes the model structure, emphasizing conversion factors, material use accounting, and calculation of National Forest harvest. The volume of National Forest harvest is neither the likely volume nor, necessarily, the desirable volume; it is the volume of National Forest timber necessary to support projected consumption of Alaska products, given harvest from other sources in Alaska.

We revised the methods and data described in Brooks and Haynes (1990) in five areas. First, we revised estimates of harvest by private owners (Native Corporations) in Alaska. In our earlier work, we used data reported by Alaska Department of Natural Resources and the Alaska Region of the U.S. Department of Agriculture, Forest Service; these data were estimates, and probably were quite inaccurate in some years. In our revisions, we estimated private harvest by using data on total log exports, the portion of log exports contributed by the Tongass National Forest, and unpublished data reporting deliveries of pulp logs to Alaska mills. For years for which data were not available, we estimated private pulp log harvests. Revised data on Alaska timber harvests also are published by Warren (1992).

Adjustments were made in the methods described in Brooks and Haynes (1990). Examples of these adjustments include correcting a double counting of the import contribution to Alaska timber supply and the inclusion of an estimate of chip exports from private timber harvests (in addition to exports from manufacturing residues; see appendix 1, table 9). We also revised some estimates of other data such as conversion factors, overrun in lumber production, and the use factor for residues. The pulp recovery factor (see appendix table 6) now reflects a trend in the efficiency of wood use in pulp manufacturing; in the previous projections, this factor was held constant. We also revised the estimate of pulp recovery from chips (see appendix table 9a).

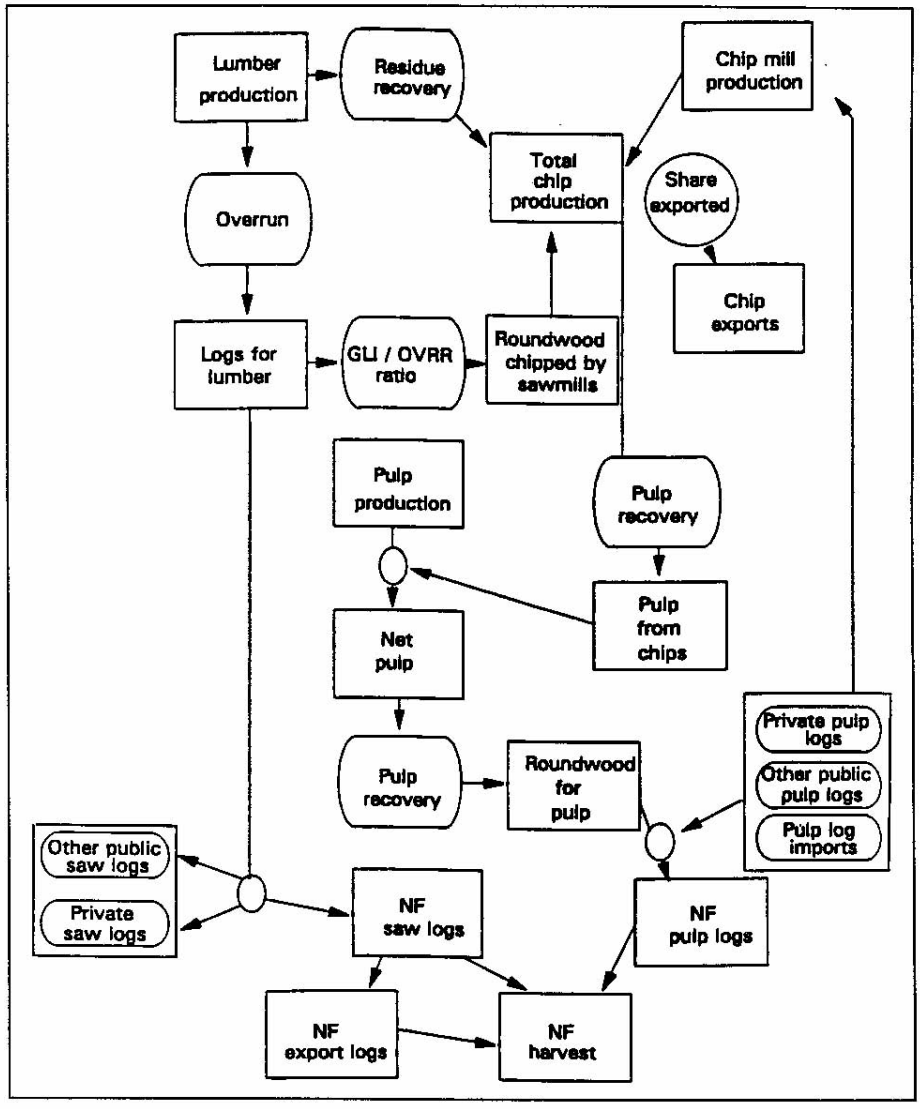


Figure 1—Model structure and materials accounting relation.

Estimates of overun in lumber production (board feet, lumber tally per board feet, log scale) were revised. In reviewing the information we used in our previous study, it was apparent that the term "overrun" has many meanings. In our use of the term, we mean "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. Overrun is also used in Alaska, however, to refer to the ratio of lumber production to log deliveries (gross log input) to sawmills. Because several Alaska sawmills produce chips from a portion of this log volume, this version of overrun produces a conversion factor considerably lower than one measuring the ratio of lumber production and logs used only for lumber production.

We therefore revised our projection methods to incorporate information on overrun (as traditionally defined) and gross log input to sawmills. We use data from Ernst and others (1986) to calculate the volume of logs used to produce lumber (appendix tables 7 and 8). We then use data from the Forest Service, Alaska Region to estimate the volume of logs processed by sawmills to produce chips (see appendix table 9).[4] As a result of changes in overrun, and because we account for chip production from round logs at sawmills, we lowered our estimates of use factors for residues from lumber production (appendix table 9). This change in treatment of overrun affects the categories for materials accounting in our model but has little net effect on the estimate of timber required to produce lumber and pulp in Alaska.

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 our historical estimates of the derived demand for Alaska timber. The average error of our estimates for the period 1970-92 is now 4.3 percent, compared to 3.1 percent previously; for details, see appendix 1, table 2 and compare this to table 2 in Brooks and Haynes (1990).

In this update, we also replaced projections with reported data for 1989-92. These revised data are especially important, as they establish trends and patterns for the early part of the current decade (1990-99). The most important of these data are Alaska exports of logs, pulp, and lumber, and Japanese production, consumption, and imports. The closure of one of two Alaska pulp mills in 1993 requires particular attention, as wood consumption by pulp mills has accounted for about half of Alaska timber harvest. Because future plans for the closed mill are uncertain, we constructed two "base" projections: in one we assume the mill remains closed; in the second, we assume that the mill reopens in 1994. These two base projections are identical in all other respects. Projections of lumber production, even at mills associated with pulp mills, are independent of projections of pulp production. As in the previous study, production estimates for Alaska (for lumber and pulp) are based on export data and explicit assumptions about the share of production shipped to U.S. domestic markets. We also revised projections of Alaska timber imports and harvest by other government owners.

Based on our own examination of new data, revised methods, and comments from reviewers, we revised the sensitivity analyses described in Brooks and Haynes (1990). In some of our alternative projections in that report, we made several changes, therefore making it difficult to assess the impact of changes in any single assumption. Although our intention in doing this was to reduce the number of alternatives presented—by constructing plausible sets of alternative assumptions—we recognize the validity of the criticism. In the alternatives presented and discussed here, we therefore alter only one assumption at a time. The fact that there are now two base projections against which any alternative projection should be compared creates, however, several alternatives to be examined. Therefore, we display the results of only a few cases, and generally characterize the results of others.

---

[4] Personal communication. 1992 Golnick, Don, U S. Department of Agriculture, Forest Service, Alaska Reqion, Box 21628, Juneau, AK 99802-1628.

Table 1—Alternative projections of the derived demand for Alaska National Forest timber

Year[a]	Original base[b]	Revised base, 2 mills[c]	Revised base, 1 mill[d]	Alternative scenarios[e]: Alaska share of exports to Japan, Higher share[c]	Alaska share of exports to Japan, Lower share[d]	Alaska chip exports, Higher exports[c]	Alaska chip exports, Lower exports[d]
				Million board feet			
1985	280.7	280.7	280.7	280.7	280.7	280.7	280.7
1990	382.0	413.5	413.5	413.5	413.5	413.5	413.5
1995	403.5	418.4	300.1	438.4	254.6	439.5	289.6
2000	403.2	464.5	315.3	501.6	240.2	489.2	302.9
2005	397.1	482.6	332.4	559.0	231.2	509.8	318.8
2010	400.8	485.5	335.3	600.4	222.6	513.0	321.6

[a] Years are midpoints of the period over which 5-year averages are calculated. For example, data shown for 1990 are the average for 1988-92.
[b] Data reported in Brooks and Haynes (1990).
[c] Assumes that both pulp mills operate 1994-2010.
[d] Assumes that only one pulp mill operates 1994-2010.
[e] See text for a description of alternatives; scenario data are shown in appendix 2. Note that these scenarios also incorporate different assumptions about the number of operating pulp mills.

Results

A comparison of the current and the previous base projections is shown in table 1; these data show that revisions in both data and our methods result in revised estimates of the derived demand for National Forest timber in Alaska. For the next decade (1993-2002), we estimate potential demand to be 10 to 20 percent higher, on average, than in previous estimates (Brooks and Haynes 1990) if both pulp mills operate in 1994-2010. This is within the bounds of the sensitivity analysis we described in presenting the earlier projections (Brooks and Haynes 1990). The increase in projected derived demand can be traced to a slightly higher projection for softwood lumber exports (compared to the previous projection, roughly 15 percent higher by the year 2000), a reduction in expected timber harvest from other public owners,[5] the elimination of timber imports, a reduced utilization rate for manufacturing residues (chips), and lower pulp recovery factors. Other assumptions underlying these revised projections are identical to those in the earlier projections.

[5] Public agencies other than the U.S. Department of Agriculture, Forest Service, including the State of Alaska.

Permanent closure of the Sitka pulp mill will result in a substantial reduction in the derived demand for National Forest timber. Even taking into account other factors that increase demand for Alaska timber (such as increased lumber exports), closing the Sitka mill results in a reduction in the derived demand of about 30 percent.[6] There also is a significant effect on the composition of timber demanded, thereby increasing the importance of saw logs that can be used to manufacture lumber that is competitive in export markets. If both pulp mills operate, these revised projections suggest that the derived demand for National Forest timber in the 1990s will be composed of roughly 210 million board feet for pulp production and 170 million board feet for lumber production; cedar *(Chamaecyparis* sp.) log exports are assumed to average about 45 million board feet for the decade. If only one pulp mill consumes Alaska timber, demand for timber for pulp falls to 120 million board feet.

Because we revised the way we account for logs used for pulp production but processed by sawmills, the derived demand for pulp represents a larger proportion of total derived demand than in the previous outlook (averaging 50 percent in the 1990s, if both mills operate). Over the course of this projection, the share of National Forest harvest used for pulp—as roundwood—is expected to decline from roughly 55 to 43 percent. If only one pulp mill operates for the remainder of the projection (1993-2010), the share of National Forest harvest used for pulp drops substantially—to about 20 percent by the end of the projection. In both cases, expected increases in lumber production, with associated residues suitable for use in pulp production, shift the derived demand for National Forest timber to saw logs from pulp logs. We did not examine the National Forest inventory to evaluate whether it is capable of supporting such a shift in the pattern of use. As in our previous projections, the derived demand quantities are expressed as a gross volume; in terms of National Forest harvest planning, the portion of this demand destined for pulp production can be met in part with utility logs.

Softwood lumber exports from Alaska are slightly higher in these revised projections; we estimate a higher share of softwoods in Japanese lumber consumption, and higher Japanese imports of softwood lumber. We revised some data series (see tables 4 and 5 in appendix 1) with the result that we project higher shipments of lumber from North America to Japan and higher shipments of lumber from Alaska to Japan. Our projection of the Alaska share of North American shipments is unchanged, however; we examine this assumption, as before, in the sensitivity analysis.

As a result OT changes in Canadian (British Columbia) timber supplies and timber supply policies, we reduced to zero the expected contribution to Alaska timber supplies from imports (all Alaska timber imports are from Canada). Timber harvests from lands managed by the State of Alaska account for nearly all timber harvested by other public owners. We reduced by more than half the projected contribution to Alaska timber supply from these sources. This revision reflects our expectation that competing uses will restrict timber production on some State lands, but that commodity production will remain a component of Alaska State land management policies. In these revised projections, total supply from imports and other government owners is less than half that projected previously (see appendix 1, tables 1,10, and 11).

[6] This is a comparison of the two revised base projections.

We also adjusted the estimated and projected utilization of manufacturing residues. In the previous projections, we estimated the use factor at a range from 0.90 to 1.0, thereby indicating use of all residues produced. In appendix 1, table 7, we estimate a lower use factor for the historical period and hold it constant for the projection period. The use factor for manufacturing residues is a less significant assumption than previously as a result of changes in our accounting for raw material processed by sawmills (see the discussion above, and appendix tables 9 and 9a). The lower use factor also implicitly accounts for possible shipments of chips to U.S. destinations outside Alaska.

We do not make any additional reduction in utilization to account for the cedar component of residues. Residues from Alaska manufacturing of cedar lumber are not used in Alaska pulp production but can be included in residues (chips) that are exported. In addition, cedar accounts for less than 2 percent of lumber exports (and, we assume, a similar portion of lumber production) and about 10 percent of standing timber. Therefore a maximum 80-percent utilization rate is, if anything, conservative.

We revised estimated and projected pulp recovery (tons of pulp per thousand board feet of wood raw material); see appendix 1, table 6. We lowered our estimate of recovery for 1987-91 and project a trend-based improvement in recovery for 1992-98, after which recovery is held constant. The maximum recovery rate in these revised projections is the highest rate reported for the historical period.

Alternative Projections

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 changes in two key assumptions are shown in table 1. Comparisons of the assumptions used in the base and these alternative projections are shown in appendix 2. Table 1 focuses on the Alaska share of North American lumber exports to Japan and the share of Alaska chip production (from lumber production) that is exported. The most substantial difference in the outlook results from changing the assumption about Alaska's share of North American lumber exports to Japan. If, for example, the Alaska share is doubled over the projection (from 4 percent in 1992 to 8 percent in 2010), the demand for National Forest timber increases by about 25 percent. If this increase in demand for saw logs is combined with demand for raw material for two pulp mills, the derived demand for National Forest timber would average 430 million board feet in the 1990s, and about 55 million board feet over the period 2000-10. In contrast, however, if only one pulp mill operates, and the Alaska share of North American lumber shipments to Japan continues to decline (as it did in the 1980s), the demand for National Forest timber would fall to 300 million board feet in the 1990s, and 230 million board feet in the following decade. These alternatives illustrate the extremes.

We also examined (but do not show here) changes in the share of Japanese consumption that is met by imported lumber, changes in private timber harvests, changes in Alaska's dependence on the Japanese market, and changes in Japanese dependence on North American suppliers of softwood (umber. In general, and as before, these alternative projections show that the derived demand for National Forest timber is not extremely sensitive to considerable variations in key assumptions.

Results from the alternatives we examined, but do not show in table 1, are quite similar to those shown. If private timber harvests were to decrease more slowly than we project, the impact on the demand for National Forest timber will be small, but noticeable. Pulp logs account for about 15 percent of private timber production in most years; we project this to increase to 35 percent by 2000. A less precipitous drop in private harvests will reduce the demand for National Forest timber by making more pulp wood available to Alaska mills. If Alaska were to diversify its lumber markets, the demand for National Forest timber would increase. Few expect much change in Alaska's dependence on Japanese markets, however, and there is little basis for expecting the dramatic changes necessary to substantially alter our projections. There also is little basis for assuming that Japan's dependence on North American lumber will increase significantly; North American producers currently supply about 85 percent of Japan's softwood lumber imports. In fact, it is perhaps more reasonable to assert that the Japanese market response to uncertainty in supplies from the PNW and Canada (whose producers supply a quantity of lumber to Japan that is more than 10 times that supplied by Alaska) will be increased imports from other sources—such as New Zealand. In this case, although Alaska might increase its share of North American exports, the net effect on the demand for National Forest timber would be little different from our base projections.

In terms of the current National Forest planning cycle, it is important to observe that none of these alternatives results in departures from demand (as projected in the base outlook) that are greater than 15 percent until well into the next decade. Put another way, any expectation that the derived demand for National Forest timber in the next decade (1993-2002) can be much greater than 500 million board feet, including utility volume (if both mills operate), or 400 million board feet (if only one pulp mill operates) can be built only on assumptions that depart sharply from patterns and relations observed through 1992. It is as plausible to construct scenarios in which the derived demand for National Forest timber falls to 300 million board feet (two mills operating) or about 200 million board feet (one pulp mill operating). Changes in assumptions that increase the derived demand for National Forest timber are no more likely than changes in these assumptions that decrease the derived demand for National Forest timber. It is our judgment that the assumptions incorporated in the base projections are more likely than those in the alternatives, and therefore the derived demand for National Forest timber is likely to increase only slightly over the next two decades. The key question, therefore, is whether the Sitka pulp mill will resume production.

Stumpage Price Projections

Changes in timber supply in the PNW will have 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 quantities has been observed for both timber and products in many studies of forest products markets. We expect Alaska markets to behave similarly. Historically, stumpage prices in Alaska are less than one-third of stumpage prices in the PNW, and with the exception of the last three years, prices in the two regions have moved together. Parallel movement in prices in the two regions is the result of arbitrage (buying and selling in two or more markets

to take advantage of—thereby eliminating—price differences) and common product markets.[7] Prices in the two regions have diverged in the last few years because of different movements in pulp prices and export log prices. Pulp prices have fallen from their peak in 1989, and now are at a level (in real terms) consistent with the average of the past two decades. In contrast, saw-log prices in both Alaska and the PNW increased over the period 1990-92. Because pulp is a considerably more important product in determining stumpage prices in Alaska compared to the PNW, average log prices in the two regions now differ markedly.

Because Alaska prices are determined both by conditions in pulp markets and by conditions in the PNW, our stumpage price projections for Alaska are based on projections of both stumpage prices for the PNW and those 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, market pulp prices, adjusted for inflation, have been roughly constant (although subject to cycles). For our projections, we assume that market pulp prices will remain constant at the average value (in constant dollars) for the period 1975-90 (this is about a 20-percent decline from the peak in 1989). Alaska prices are expected to increase from 1995 to 2010 as a result of projected increases in saw-log prices in the PNW, but the increase for Alaska is modest.

For the tabulation below, we revised the stumpage price projections made for the 1989 RPA Timber Assessment (Haynes 1990) to reflect the impact of adopting both final forest plans and the Interagency Scientific Committee strategy for protecting spotted owl habitat. The old (Haynes 1990) and new projections for Alaska stumpage price are as follows:

Year	1989 RPA	Revised
	1990 dollars per MBF	
	Actual	
1990		61
	Projections	
2000	39	72
2010	65	81
2020	77	74
2030	78	67
2040	75	70

[7] Some differences in prices among regions are based on transportation cost differences (to markets) and other factors; however, these differences are minimized through arbitrage.

Conclusions

In their critique of the TLMP SEIS, the Alaska Forestry Association relies heavily on the study done by Gruenfeld Associates (see footnote 3). That study and ours are similar in most respects, but differ in that Gruenfeld Associates discuss Alaska log and lumber markets as a single unit. Because only cedar logs are exported by the National Forests and the remainder of National Forest timber is used in lumber and pulp production in Alaska, we concentrate on the lumber and pulp components of Alaska markets in projecting the derived demand for National Forest timber. We also take into consideration the use of manufacturing residues in pulp production.

The critical difference between Gruenfeld Associates' and our projections is in projections of Alaska lumber exports. Gruenfeld Associates expect Alaska lumber exports to Japan in the 1990s to average more than 400 million board feet; this implies Alaska lumber production in 1990-99 will average more than peak production in the 1970s (lumber production in Alaska peaked in 1973), and by the end of the decade will be more than double the level at the beginning of the decade. Average lumber exports were 304 million board feet in the 1970s and 157 million board feet in the 1980s. We expect Alaska lumber exports to increase throughout the 1990s, but to average roughly 220 million board feet. In the first three years of the decade (1990-92), Alaska lumber exports averaged 173 million board feet. Our projections also incorporate the assumption that Alaska shipments to U.S. markets will increase, but we do not expect the sharp increase in Alaska shipments to U.S. markets observed in 1992 to be sustained.

Several factors support our general outlook. These include weakness in the United States and Japanese economies in the early part of the decade, an expectation of limited gains for Alaska from timber supply adjustments in the PNW, and continued or increased competition for all North American producers from log and lumber producers in Russia, New Zealand, and Chile. Perhaps most important, we see no basis to assume (as argued by Gruenfeld Associates [see footnote 3]), that reductions in Alaska log exports by private owners will automatically result in corresponding increases in Alaska lumber production and exports.

Effects of the U.S. Recession

The recession in the U.S. economy in 1990-91 had several impacts on the outlook for Alaska timber and forest products producers. The recession lingered in 1992 and is expected to be followed by a slow recovery (Wharton Economic Forecasting Associates 1991). During U.S. recessions, Alaska typically faces stiffer competition from producers in the lower 48 and Canada; U.S. producers who normally produce for domestic markets seek alternative, export markets. Similar factors increase competition from Canada. As a result, producers in both regions typically increase exports to Japan during U.S. recessions; data for 1991-92 indicate that the pattern of export push at Alaska's expense continues. In addition, in the late 1980s, increases in PNW and Canadian exports to Japan kept pace in percentage terms with increases recorded by Alaska producers. In both the PNW and Canada there has been a significant increase in the number of producers focusing on export markets, thereby resulting in a larger base of competitors faced by Alaska, compared to that in the 1970s.

Timber Supply in the Pacific Northwest

Although reductions in public timber supply in the PNW made the 1990-91 recession structurally different for the region from previous business cycles, we expect the potential gain for Alaska to be modest at best. Although total timber supplies in the PNW have been reduced and lumber producers face rising log prices, producers for the export market can be expected to weather these changes relatively better than producers for the domestic market. Quantity adjustments in the PNW exports therefore are likely to be considerably less pronounced than reductions in total regional production. In addition, the recession contributed a moderating influence on regional log price changes in the face of supply adjustments (see Flora and McGinnis 1992). As a result, and in spite of their potential significance to the PNW, changes in PNW timber harvests can be expected to have only a slight positive impact on Alaska in the 1990s.

Japanese Economic Growth

The Japanese economy also weakened in 1990-92. Japanese lumber consumption fell, thereby offsetting sharp increases in the late 1980s. General economic recovery in Japan is expected to be slow (as in the United States), and growth in lumber consumption is likely to follow this pattern. In addition to this slightly revised projection for Japanese consumption, we incorporate in our base 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. If anything, we may be too optimistic in projecting the increase in Japanese import dependence for softwood lumber. The base projection assumes that Japan sustains a level of import dependence that, in the United States, triggered intervention. A weak domestic economy in the early 1990s could lead to increasing pressure on the Japanese government for similar intervention to protect Japanese employment in lumber manufacturing.

Log and Lumber Interdependence

Flora and others (1990) examine the evidence for the "direct displacement" theory of Alaska log and lumber markets that characterizes projections of a robust market for Alaska lumber based on reductions in Alaska log exports. Put simply, this is the assumption that the increase in Alaska log exports in the 1980s was a direct (and sole) factor in the reduction in Alaska lumber exports over most of the decade. Gruenfeld Associates, for example, take the direct substitution between Alaska logs and lumber for granted, and assume that the relation is equivalent in periods when log exports increase and when they decrease. Based on this reasoning, and the widely expected decrease in Alaska log exports in the 1990s, Alaska lumber exports should increase sharply over the next decade. After examining in detail conditions at both the producer and consumer ends of this trade, however, Flora and others (1990) conclude that the relation between logs and lumber cannot be described by simple, direct displacement. Their work points out that the outlook for Alaska lumber can and perhaps should be considered separately from changes in Alaska log exports.

Flora and others (1990) point out that the recent past must be examined as two distinct periods in the relation between Alaska log and lumber exports. The first period, 1979-85, is characterized by rapid increases in log exports accompanied by decreases in lumber exports. In the second period, 1986-90, log and lumber exports from Alaska tended to move in parallel rather than opposite directions. Statistical evidence suggests that instead of competing, Alaska logs and lumber now complement each other (Flora and others 1990). They argue further that direct substitution can be reasonably asserted only for logs and lumber in the highest grades (selects). In the log export mix, these grades account for about 20 percent of the volume (Flora and McGinnis 1989). Although the grade distribution of Alaska lumber exports is not known, it is unlikely to be significantly different from the grade distribution of Alaska log exports. We conclude, therefore, that markets for Alaska lumber will respond only moderately to reductions in Alaska log exports. We see little basis to expect demand for all grades of Alaska lumber to increase at the same rate that log exports are expected to decline.

Competing Suppliers

Finally, 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 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, while shipments from Chile have been relatively constant. Although producers in New Zealand and Chile do not compete directly with Alaska timber in most markets—supplying generally lower quality logs and lumber—they have a considerable volume of timber that represents a substitution opportunity for Japanese (and other) consumers. At the very least, these competitors help define market prices and, for all but specialty grades, limit the ability of North American producers to assume an inelastic response to price changes.

Although there is little basis 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. The result may be an increase in Russian exports to Japan—returning to levels observed in the 1980s—as early as the mid-1990s. This, in combination with other considerations, simply weakens the case for seeing this decade as a time when lumber production in Alaska can expand rapidly and find markets at any price.

Improvements in Alaska Data

A source of continuing frustration and fuel for controversy is the inability to answer definitively some of the questions raised by the ATMS[8] studies and previous studies of Alaska timber markets. Although most planning is based on a choice of the most plausible assumptions, for Alaska, too few of these assumptions have been rigorously examined. The process of revising and updating our previous work reinforces this.

To subject some of the conflicting expectations and suppositions to closer scrutiny, additional data must be collected in Alaska. In the short run (1 to 2 years), it is unlikely that these data will significantly change our projections; however, we could expect additional data to improve our ability to foresee changes in Alaska markets and production in the mid term to long term.

[8] Alaska Timber Market Studies—see Haynes and Brooks (1990) for a description of the studies in this series

Areas for data collection include the following:

1. Improved monitoring of the quantity and disposition of private timber harvest. We feel reasonably confident in our estimates of private timber harvests for 1975-92. There remains, however, an element of uncertainty that could be reduced by the institution of a regular process for compiling and reporting private timber harvest.

2. Improved collection of data on the source of raw material for Alaska pulp production. In our earlier study, we had data for some years that reported purchases of pulp furnish by type and source (timber owner) for one mill. Data from the Alaska Region and data from both Alaska pulp mills were used in the revisions reported here. These data are not regularly compiled or reported, however.

3. Improved estimates of Alaska shipments of pulp and lumber to domestic markets. Export markets currently dominate in the shipment of Alaska products; production of pulp and lumber is estimated from U.S. Department of Commerce export data. There are cycles in Alaska shipments to lower 48 markets, however, and changes in these shipments could account for as much as 20 percent of pulp production and 5-10 percent of lumber production. Improvements in the outlook for Alaska products would be based in part on an understanding of Alaska's role in U.S. domestic markets as well as Japanese markets.

4. Information on lumber production and exports by grade. One of the most significant uncertainties in the outlook for Alaska lumber exports is the extent to which Alaska faces competition from producers in the PNW, Canada, and the South Pacific. An examination of this question will require detailed data on lumber exports that are not available from U.S. Department of Commerce records (data reported by Warren 1990). Primary data can and should be collected to assess the grade mix of Alaska exports, and the extent to which it has or will differ from exports of other regions.

Literature Cited

Brooks, David J.; Haynes, Richard W. 1990. Timber products output and timber harvests in Alaska: projections for 1989-2010. Gen. Tech. Rep. PNW-GTR-261. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 48 p.

Ernst, Susan; Plank, Marlin E.; Fahey, Donald J. 1986. Sitka spruce and western hemlock beach logs in southeast Alaska: suitability for lumber, pulp, and energy. Res. Pap. PNW-352. Portland. OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 25 p.

Flora, Donald F.; McGinnIs, Wendy J. 1989. Alaska mid-grade logs: supply and offshore demand. Res. Pap. PNW-RP-411. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 13 p.

Flora, Donald F.; McGinnis, Wendy J. 1992. Effects of new export rules, a spotted owl plan, and recession on timber prices and shipments from the Douglas-fir region. Res. Pap. PNW-RP-445. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 15 p.

Flora, Donald; Woller, Ulla; Neergard, Michael. 1990. Tradeoffs and interdependence in the Alaska cant and log markets. Res. Pap. PNW-RP-422. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 11 p.

Hartman, David A.; Atkinson, William A.; Bryant, Ben S.; Woodfin, Richard 0. 1981. Conversion factors for the Pacific Northwest forest industry. Seattle, WA: University of Washington, Institute of Forest Resources. 112 p.

Haynes, Richard W. 1990. An analysis of the timber situation in the United States: 1989-2040. Gen. Tech. Rep. RM-199. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 268 p.

Haynes, Richard W. [In press]. Changes in timber supply in the Pacific Northwest: Proceedings, 25th Pacific Northwest regional economics conference; 1991 May 2-4; Portland, OR. [Place of publication unknown]: [Publisher unknown].

Haynes, Richard W.; Brooks, David J. 1990. An analysis of the timber situation in Alaska: 1970-2010. Gen. Tech. Rep. PNW-GTR-264. Portland OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 33 p.

Warren, Debra D. 1992. Production, prices, employment, and trade in Northwest forest industries, third quarter 1991. Resour. Bull. PNW-RB-190. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 112 p.

Wharton Economic Forecasting Associates. 1991. U.S. long-term economic outlook. Vol. 1: trend/moderate growth scenario. Boston, MA. 180 p.

Appendix 1: Revised and Updated Projections

Table numbers in this appendix correspond with tables in Brooks and Haynes (1990). Table 9 in Brooks and Haynes (1990) has been modified and parts appear in tables 9 and 9a in this appendix. Tables 14-18 in Brooks and Haynes (1990) are not included in this appendix. Table 1 in the text of this publication is the equivalent to table 14 in Brooks and Haynes (1990). Any tables not included here can be requested from the senior author.

Table 1—Summary of historical and projected periodic Alaska timber harvest by owner, harvest by product, and production of forest products, 1970-2010[a]

1A—Timber harvest by owner and timber imports

		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	1,031.0	413.5	596.0	21.5	10.6
1995	650.1	300.1	335.0	15.0	0
2000	440.5	315.3	110.2	15.0	0
2005	447.4	332.4	100.0	15.0	0
2010	450.3	335.3	100.0	15.0	0

1 B—Harvest by product

		Product		
Period[a]	Total	Export logs	Lumber	Pulp
	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	1001.0	558.4	163.0	279.5
1995	650.1	343.2	174.3	132.6
2000	440.5	117.5	211.5	111.5
2005	447.4	112.0	234.9	100.5
2010	450.3	112.6	237.8	99.9

Table 1—Summary of historical and projected periodic Alaska timber harvest by owner, harvest by product, and production of forest products, 1970-2010[a] (continued)

1C—Production of forest products

Period[a]	Product			
	Export logs	Lumber	Pulp	Wood chip exports
	Million board feet		*Thousand short tons*	
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	378.4	48.5
1995	343.2	220.3	197.5	57.9
2000	117.5	267.1	182.5	68.7
2005	112.0	296.7	175.0	75.4
2010	112.6	300.4	175.0	76.2

ID—Average National Forest harvest by decade and component

Decade[b]	Component				
	Saw log	Log exports	Pulp	Total	Net saw log[c]
	Million board feet				
1970	238.1	27.4	230.2	495.6	421.3
1980	119.0	32.2	194.9	346.1	294.2
1990	171.5	42.2	118.3	331.9	282.1
2000	221.9	44.4	62.2	328.5	279.2

[a] Data are averages centered on the reported year, except 2010 which reports the average for 2008-10

[b] Data are averages for the decade; for example, data for 1970 are the average for the period 1970-79.

[c] Net saw-log volume is estimated as 85 percent of total volume

Table 2—Timber harvest estimated net demand and percentage of error of estimate[a]

Year	Total harvest	Estimated net demand	Error[b]
	Million board feet		*Percent*
1970	628.0	591.2	5.9
1971	574.9	544.2	5.3
1972	606.2	633.0	4.4
1973	655.9	655.7	0
1974	615.1	589.8	4.1
1975	451.9	477.1	5.6
1976	516.0	532.3	3.2
1977	518.6	549.6	6.0
1978	481.3	464.0	3.6
1979	620.5	619.5	.2
1980	663.7	652.1	1.8
1981	593.4	601.6	1.4
1982	660.5	600.2	9.1
1983	571.7	564.1	1.3
1984	552.0	515.0	6.7
1985	584.3	562.9	3.7
1986	668.9	629.4	5.9
1987	887.9	832.0	6.3
1988	958.1	952.0	.6
1989	1,155.1	1,072.9	7.1
1990	1,100.9	1,019.2	7.4
1991	921.1	974.1	5.8
1992	1,019.7	986.6	3.2

[a] Data are from table 8 (estimated derived demand) and table 11 (harvest by owner). Average percentage of error 1970-90 is 4.3 percent.
[b] Expressed in absolute terms

Table 3—Alaska forest products output, by product, 1965-91, and projected output for 1992-2010

Year	Export logs	Lumber			Pulp	Wood chip exports
		Exports	Share exported	Estimated production		
		Million board feet			*Thousand short tons*	
1965	11.0	78.1	0.95	82.2	na	0
1966	15.8	135.3	.95	142.4	na	0
1967	39.5	203.9	.95	214.6	na	0
1968	47.1	245.6	.95	258.6	na	0
1969	31.9	285.9	.95	300.9	na	0
1970	51.5	315.6	.95	332.2	281.1	0
1971	42.6	247.4	.95	260.4	294.3	19.6
1972	65.8	340.2	.95	358.1	290.1	20.2
1973	71.7	404.8	.95	426.2	255.6	0
1974	34.9	362.4	.95	381.5	332.0	34.8
1975	29.0	313.3	.95	329.8	274.0	32.4
1976	26.2	290.0	.95	305.3	305.9	107.7
1977	52.4	250.0	.95	263.2	326.4	107.4
1978	68.0	237.8	.95	250.3	319.2	31.8
1979	128.6	278.5	.95	293.1	333.3	83.7
1980	160.5	255.4	.95	268.8	346.7	151.3
1981	149.2	196.0	.95	206.3	367.0	77.6
1982	241.1	172.0	.95	181.1	269.1	74.2
1983	262.2	136.7	.95	143.9	323.5	6.6
1984	231.5	120.4	.95	126.7	271.3	16.5
1985	299.2	87.1	.95	91.7	266.1	0
1986	345.8	120.0	.95	126.3	304.3	0
1987	453.1	133.1	.95	140.1	349.7	0
1988	519.5	167.5	.95	176.3	392.3	11.5
1989	643.1	183.8	.95	193.4	378.4	85.9
1990	568.6	212.0	.95	223.2	383.8	28.3
1991	528.9	170.3	.85	200.4	353.3	101.3
1992	532.0	136.6	.60	227.6	384.0	15.5
1993	493.2	165.1	.75	220.1	262.5	55.3
1994	418.4	177.2	.80	221.4	175.0	55.6
1995	339.1	179.4	.90	199.4	181.3	57.9
1996	269.2	202.7	.90	225.2	181.3	59.2
1997	196.2	211.6	.90	235.2	187.5	61.4
1998	137.0	233.0	.90	258.9	187.5	66.8
1999	126.2	234.2	.90	260.2	181.3	67.1
2000	104.1	222.0	.90	246.7	181.3	64.1
2001	109.7	253.9	.90	282.1	181.3	72.1
2002	110.5	258.9	.90	287.6	181.3	73.3
2003	116.0	289.6	.90	321.8	175.0	81.1
2004	111.2	262.5	.90	291.7	175.0	74.3
2005	110.3	257.5	.90	286.2	175.0	73.0
2006	110.6	259.3	.90	288.2	175.0	73.5
2007	111.8	266.2	.90	295.8	175.0	75.2
2008	112.2	268.0	.90	297.8	175.0	75.7
2009	112.5	269.9	.90	299.9	175.0	76.1
2010	113.0	273.1	.90	303.4	175.0	76.9

na = not available.

Table 4—Japanese sawnwood consumption and Imports, 1965-91, and projections for 1992-2010

Year	Total consumption	Softwood share	Softwood consumpion	Import share	Softwood Imports
	Thousand cubic meters	*Percent*	*Thousand cubic meters*	*Percent*	*Million board feet*
1965	33,585	80.4	26,996	3.0	382.3
1966	36,192	80.2	29,010	3.9	531.2
1967	39,754	80.2	31,892	5.8	854.4
1968	42,682	79.1	33,749	7.0	1,094.3
1969	43,433	78.9	34,254	5.5	871.2
1970	45,428	77.9	35,395	7.6	1,257.7
1971	44,035	75.2	33,118	5.5	840.0
1972	45,495	75.5	34,353	5.9	947.0
1973	48,101	74.3	35,759	9.1	1,510.2
1974	44,092	74.2	32,699	9.7	1,481.4
1975	39,319	75.8	29,789	8.1	1,128.4
1976	42,496	76.9	32.693	9.2	1,401.4
1977	41,620	84.6	35,205	9.1	1.492.1
1978	42.657	80.0	34,134	10.1	1.598.1
1979	44,543	79.1	35.223	12.9	2,115.8
1980	42,310	82.5	34,913	14.1	2,275.3
1981	36,328	80.5	29,244	11.6	1,586.0
1982	37,320	82.4	30,745	13.8	1,974.4
1983	34,232	81.9	28,025	14.0	1,822.3
1984	33,049	83.1	27,475	13.4	1,710.0
1985	33,444	83.3	27,857	14.3	1,856.5
1986	34,470	86.1	29,685	15.0	2,065.3
1987	37,726	85.5	32,264	18.9	2,830.3
1988	38,856	86.0	33,435	20.7	3.226.4
1989	40,503	86.4	34,986	22.6	3,684.3
1990	39,126	87.2	34,133	22.2	3,527.3
1991	37,080	88.2	32,709	23.1	3,510.8
1992	36,169	88.8	32,133	23.0	3,439.9
1993	36.850	85.0	31,323	24.0	3,496.5
1994	37,956	85.0	32,262	25.0	3,751.4
1995	39,186	85.0	33,308	26.0	4,028.0
1996	39,460	85.0	33,541	27.0	4,212.2
1997	39,737	85.0	33,776	28.0	4,398.7
1998	40,015	85.0	34,012	29.0	4,587.7
1999	40,295	85.0	34,251	30.0	4,779.1
2000	40,668	85.0	34,568	31.0	4,984.2
2001	40,953	85.0	34,810	32.0	5,181.0
2002	41,239	85.0	35,053	33.0	5,380.3
2003	41,528	85.0	35,299	33.0	5,418.0
2004	41,819	85.0	35,546	33.0	5,455.9
2005	42,111	86.0	36,216	33.0	5,558.7
2006	42,406	86.0	36,469	33.0	5,597.6
2007	42,703	86.0	36,725	33.0	5,636.8
2008	43,002	86.0	36,982	33.0	5,676.3
2009	43,303	86.0	37,241	33.0	5,716.0
2010	43,809	86.0	37,676	33.0	5,782.8

Table 5—Softwood lumber exports and market shares for North America and Alaska, 1965-91, and projections for 1992-2010

	North America		Alaska				
Year	Share of Japanese imports	Shipments to Japan	Share of shipments	Shipments to Japan	Share of Japanese consumption	Exports that go to Japan	Total
	Percent	*Million board feet*	*Percent*	*Million board feet*	*--- Percent ---*		*Million board feet*
1965	78.1	298.5	26.2	78.1	0.62	100.0	78.1
1966	83.4	443.0	30.5	135.3	1.00	100.0	135.3
1967	87.4	746.7	27.3	203.9	1.37	100.0	203.9
1968	75.5	826.1	29.5	243.6	1.55	99.2	245.6
1969	80.2	698.5	40.9	285.4	1.79	99.8	285.9
1970	86.4	1,087.2	29.0	315.4	1.92	99.9	315.6
1971	84.2	707.1	34.8	246.0	1.60	99.4	247.4
1972	84.8	803.5	41.9	336.8	2.11	99.0	340.2
1973	78.2	1,181.6	34.2	403.9	2.43	99.8	404.8
1974	72.3	1.070.8	33.8	361.7	2.38	99.8	362.4
1975	81.8	922.9	33.9	313.0	2.26	99.9	313.3
1976	79.1	1,109.0	26.1	289.2	1.90	99.7	290.0
1977	76.6	1,142.3	21.5	245.4	1.50	98.2	250.0
1978	74.2	1,185.9	20.0	236.6	1.49	99.5	237.8
1979	78.2	1,653.8	16.5	273.6	1.67	98.4	278.0
1980	75.4	1,716.7	14.6	251.4	1.55	98.4	255.4
1981	86.9	1,378.9	11.7	161.8	1.19	82.6	196.0
1982	83.9	1,655.6	9.4	155.8	1.09	90.6	172.0
1983	81.7	1,489.5	8.0	119.7	.92	87.6	136.7
1984	85.6	1,464.3	8.0	117.4	.92	97.5	120.4
1985	84.4	1,566.3	5.5	85.9	.66	98.6	87.1
1986	83.6	1,727.2	6.9	118.9	.86	99.1	120.0
1987	85.1	2,408.0	5.4	130.7	.87	98.2	133.1
1988	84.7	2,732.7	5.8	159.8	1.03	95.4	167.5
1989	84.6	3,116.7	5.9	182.7	1.12	99.4	183.8
1990	84.2	2,970.0	6.8	200.7	1.26	94.7	212.0
1991	85.0	2,985.0	5.4	161.6	1.06	94.9	170.3
1992	86.8	2,985.1	4.3	127.5	.85	93.4	136.6
1993	85.0	2,972.0	5.3	157.5	1.08	95.4	165.1
1994	85.0	3,188.7	5.3	169.0	1.13	95.4	177.2
1995	85.0	3,423.8	5.0	171.2	1.11	95.4	179.4
1996	85.0	3,580.3	5.4	193.3	1.24	95.4	202.7
1997	85.0	3,738.9	5.4	201.9	1.29	95.4	211.6
1998	85.0	3,899.6	5.7	222.3	1.41	95.4	233.0
1999	85.0	4,062.3	5.5	223.4	1.40	95.4	234.2
2000	85.0	4,236.6	5,0	211.8	1.32	95.4	222.0
2001	85.0	4,403.8	5.5	242.2	1.50	95.4	253.9
2002	85.0	4,573.3	5.4	247.0	1.51	95.4	258.9
2003	85.0	4,605.3	6.0	276.3	1.68	95.4	289.6
2004	85.0	4,637.5	5.4	250.4	1.51	95.4	262.5
2005	85.0	4,724.9	5.2	245.7	1.46	95.4	257.5
2006	85.0	4,758.0	5.2	247.4	1.46	95.4	259.3
2007	85.0	4,791.3	5.3	253.9	1.49	95.4	266.2
2008	85.0	4,824.8	5.3	255.7	1.49	95.4	268.0
2009	85.0	4,858.6	5.3	257.5	1.49	95.4	269.9
2010	85.0	4,915.4	5.3	260.5	1.49	95.4	273.1

Table 6—Alaska pulp exports by type, estimated total production, and pulp recovery from roundwood, 1970-91, and projections for 1992-2010 [a]

Year	Pulp exports			Export share of production	Estimated total production	Pulp recovery[b]
	Dissolving grades	Other grades	Total			
	-- *Thousand short tons* - -			*Proportion*	*Thousand short tons*	
1970	194.3	25.0	219.3	0.78	281.1	1.0500
1971	181.0	25.0	206.0	.70	294.3	1.0500
1972	204.2	25.0	229.2	.79	290.1	1.1000
1973	174.4	25.0	199.4	.78	255.6	1.1000
1974	234.0	25.0	259.0	.78	332.0	1.1150
1975	183.2	25.0	208.2	.76	274.0	1.1200
1976	207.5	25.0	232.5	.76	305.9	1.1286
1977	229.6	25.0	254.6	.78	326.4	1.1286
1978	206.4	25.0	231.4	.73	319.2	1.1560
1979	251.7	25.0	276.7	.83	333.3	1.1606
1980	244.3	67.7	312.0	.90	346.7	1.1364
1981	246.4	39.8	286.2	.78	367.0	1.1567
1982	199.1	10.8	209.9	.78	269.1	1.2065
1983	238.1	4.5	242.6	.75	323.5	1.1860
1984	177.4	34.2	211.6	.78	271.3	1.1136
1985	192.7	6.9	199.6	.75	266.1	1.1547
1986	220.7	7.5	228.2	.75	304.3	1.1160
1987	253.1	26.7	279.8	.80	349.7	1.1515
1988	275.4	30.6	306.0	.78	392.3	1.1565
1989	280.7	22.0	302.7	.80	378.4	1.1615
1990	274.7	43.8	318.6	.83	383.8	1.1665
1991	276.2	17.1	293.3	.83	353.3	1.1715
1992	286.7	20.5	307.2	.80	384.0	1.1765
1993	200.0	10.0	210.0	.80	262.5	1.1815
1994	130.0	10.0	140.0	.80	175.0	1.1865
1995	135.0	10.0	145.0	.80	181.3	1.1915
1996	135.0	10.0	145.0	.80	181.3	1.1965
1997	140.0	10.0	150.0	.80	187.5	1.2015
1998	140.0	10.0	150.0	.80	187.5	1.2065
1999	135.0	10.0	145.0	.80	181.3	1.2065
2000	135.0	10.0	145.0	.80	181.3	1.2065
2001	135.0	10.0	145.0	.80	181.3	1.2065
2002	135.0	10.0	145.0	.80	181.3	1.2065
2003	130.0	10.0	140.0	.80	175.0	1.2065
2004	130.0	10.0	140.0	.80	175.0	1.2065
2005	130.0	10.0	140.0	.80	175.0	1.2065
2006	130.0	10.0	140.0	.80	175.0	1.2065
2007	130.0	10.0	140.0	.80	175.0	1.2065
2008	130.0	10.0	140.0	.80	175.0	1.2065
2009	130.0	10.0	140.0	.80	175.0	1.2065
2010	130.0	10.0	140.0	.80	175.0	1.2065

[a] Assumes production by one pulp mill.
[b] Air-dry tons per thousand board feet roundwood raw material.

Table 7—Conversion factors for sawn wood and residues[a]

Year	Lumber overrun	Board feet ratio	Lumber recovery	Volume factor	Residue factor	Residue generation	Use factor	Utilized residues
	Mbf, Lt / Mbf, Ls	*Bf,Ls / Cf, Ls*	*Bf,Lt / Cf,Ls*	*Bf, Lt / Cf, prd*	*Cf, Res / Cf, Ls*	*Bdt per Cf, Ls*	*Propor-tion*	*Bdt per Mbf*
1965	1.200	5.200	6.240	11.200	0.443	0.006	*0*	*0*
1966	1.200	5.200	6.240	11.200	.443	.006	*0*	*0*
1967	1.200	5.200	6.240	11.200	.443	.006	*0*	*0*
1968	1.200	5.200	6.240	11.200	.443	.006	*0*	*0*
1969	1.200	5.200	6.240	11.200	.443	.006	*0*	*0*
1970	1.200	5.200	6.240	11.200	.443	.006	*0*	*0*
1971	1.200	5.200	6.240	11.200	.443	.006	*0*	*0*
1972	1.200	5.200	6.240	11.200	.443	.006	*0*	*0*
1973	1.200	5.200	6.240	11.200	.443	.006	*0*	0
1974	1.200	5.200	6.240	11.200	.443	.006	.50	.484
1975	1.200	5.200	6.240	11.200	.443	.006	.50	.484
1976	1.221	5.200	6.350	11.200	.433	.006	.50	.465
1977	1.225	5.200	6.370	11.200	.431	.006	.50	.462
1978	1.225	5.200	6.370	11.200	.431	.006	.50	.462
1979	1.225	5.200	6.370	11.200	.431	.006	.50	.462
1980	1.225	5.200	6.370	11.200	.431	.006	.55	.508
1981	1.184	5.200	6.158	11.200	.450	.006	.60	.598
1982	1.196	5.200	6.221	11.200	.445	.006	.65	.633
1983	1.216	5.200	6.324	11.200	.435	.006	.70	.657
1984	1.169	5.200	6.076	11.200	.457	.006	.75	.770
1985	1.186	5.200	6.169	11.200	.449	.006	.75	.745
1986	1.175	5.200	6.110	11.200	.454	.006	.75	.761
1987	1.198	5.200	6.230	11.200	.444	.006	.75	.729
1988	1.220	5.200	6.344	11.200	.434	.006	.75	.699
1989	1.243	5.200	6.464	11.200	.423	.006	.75	.669
1990	1.265	5.200	6.578	11.200	.413	.006	.80	.684
1991	1.265	5.200	6.577	11.200	.413	.006	.80	.685
1992	1.264	5.200	6.571	11.200	.413	.006	.80	.686
1993	1.264	5.200	6.570	11.200	.413	.006	.80	.686
1994	1.263	5.200	6.570	11.200	.413	.006	.80	.686
1995	1.263	5.200	6.570	11.200	.413	.006	.80	.687
1996	1.263	5.200	6.569	11.200	.413	.006	.80	.687
1997	1.263	5.200	6.569	11.200	.414	.006	.80	.687
1998	1.263	5.200	6.568	11.200	.414	.006	.80	.687
1999	1.263	5.200	6.568	11.200	.414	.006	.80	.687
2000	1.263	5.200	6.568	11.200	.414	.006	.80	.687
2001	1.263	5.200	6.568	11.200	.414	.006	.80	.687
2002	1.263	5.200	6.568	11.200	.414	.006	.80	.687
2003	1.263	5.200	6.568	11.200	.414	.006	.80	.687
2004	1.263	5.200	6.568	11.200	.414	.006	.80	.687
2005	1.263	5.200	6.568	11.200	.414	.006	.80	.687
2006	1.263	5.200	6.568	11.200	.414	.006	.80	.687
2007	1.263	5.200	6.568	11.200	.414	.006	.80	.687
2008	1.263	5.200	6.568	11.200	.414	.006	.80	.687
2009	1.263	5.200	6.568	11 200	.414	.006	.80	.687
2010	1.263	5.200	6.568	11.200	.414	.006	.80	.687

Mbf = Thousand board feet; Lt = lumber tally; Ls = log scale; Bf = board feet, Cf = cubic feet; Prd = product; Res = residue factor, Bdt = bone dry tons.

[a] See appendix 1 in Brooks and Haynes (1990) for a description of conversion factors and the formulas used with conversion factors Overrun data for 1981-2010 are from Ernst and others (1986), data are for 1982. Other years are from unpublished data from the Alaska Region, Forest Service.

Table 8—Estimated Alaska timber harvest by product (derived demand), 1965-91, and projections for 1992-2010

Year	Total	Product			
		Export logs	Lumber	Pulp	Lumber and pulp
	Million board feet, roundwood equivalent				
1965		11.0	68.5		
1966		15.8	118.7		
1967		39.5	178.9		
1968		47.1	215.5		
1969		31.9	250.8		
1970	591.2	51.5	276.8	262.9	539.7
1971	544.2	42.6	217.0	284.6	501.6
1972	633.0	65.8	298.4	268.7	567.1
1973	655.7	71.7	355.1	228.8	584.0
1974	589.8	34.9	317.9	236.9	554.8
1975	477.1	29.0	274.8	173.3	448.1
1976	532.3	26.2	250.0	256.2	506.1
1977	549.6	52.4	214.9	282.3	497.2
1978	464.0	68.0	204.3	191.7	396.0
1979	619.5	128.6	239.3	251.6	490.9
1980	652.1	160.5	219.5	272.1	491.6
1981	601.6	149.2	174.2	278.2	452.4
1982	600.2	241.1	151.3	207.7	359.1
1983	564.1	262.2	118.3	183.5	301.9
1984	515.0	231.5	108.5	175.0	283.5
1985	562.9	299.2	77.3	186.4	263.7
1986	629.4	345.8	107.5	176.1	283.6
1987	832.0	453.1	116.9	262.0	378.9
1988	952.0	519.5	144.5	288.0	432.5
1989	1,072.9	643.1	155.6	274.2	429.9
1990	1,019.2	568.6	176.4	274.2	450.6
1991	974.1	528.9	158.4	286.8	445.2
1992	986.6	532.0	180.1	274.5	454.6
1993	854.7	493.2	174.2	187.2	361.5
1994	706.4	418.4	175.3	112.7	287.9
1995	621.0	339.1	157.8	124.1	282.0
1996	565.2	269.2	178.2	117.8	296.0
1997	503.4	196.2	186.2	121.1	307.2
1998	458.9	137.0	204.9	117.0	321.9
1999	443.8	126.2	206.0	111.6	317.6
2000	413.1	104.1	195.3	113.7	309.1
2001	441.1	109.7	223.4	108.0	331.4
2002	445.4	110.5	227.7	107.1	334.9
2003	467.2	116.0	254.8	96.4	351.2
2004	443.4	111.2	230.9	101.3	332.2
2005	439.1	110.3	226.6	102.2	328.8
2006	440.7	110.6	228.2	101.9	330.0
2007	446.7	111.8	234.2	100.6	334.8
2008	448.3	112.2	235.8	100.3	336.1
2009	449.9	112.5	237.5	100.0	337.4
2010	452.7	113.0	240.2	99.4	339.6

Table 9—Production of residues from lumber production, estimated volume roundwood chipped at sawmills, estimated chip mill production, and total woodchip production 1970-91, and projections for 1992-2010

Year	Residue factor	Residues generated in manufacturing	Log input ratio[a]	Ratio of overrun and input[b]	Volume chipped at sawmills		Chip mill production	Total chips
	Bdtper Mbf	*Thousand dry tons*			*M Mbf*	*- - Thousand dry tons - -*		
1970	*0*		1.0445	1.1489	41.2	111.3	0	111.3
1971	*0*		1.0445	1.1489	32.3	87.2	0	87.2
1972	*0*		1.0445	1.1489	44.4	119.9	0	119.9
1973	*0*		1.0445	1.1489	52.9	142.7	0	142.7
1974	.4839	184.6	1.0445	1.1489	47.3	127.8	0	312.4
1975	.4839	159.6	1.0445	1.1489	40.9	110.5	0	270.1
1976	.4649	141.9	1.0445	1.1692	42.3	114.2	0	256.1
1977	.4616	121.5	1.0483	1.1686	36.2	97.8	0	219.3
1978	.4616	115.5	1.0474	1.1695	34.6	93.5	0	209.1
1979	.4616	135.3	1.0377	1.1806	43.2	116.6	0	252.0
1980	.5078	136.5	1.0301	1.1892	41.5	112.1	13.5	262.1
1981	.5982	123.4	1.0636	1.1134	19.8	53.3	13.5	190.2
1982	.6334	114.7	1.0384	1.1521	23.0	62.2	13.5	190.3
1983	.6572	94.6	1.0499	1.1583	18.7	50.6	13.5	158.6
1984	.7700	97.6	1.0717	1.0904	9.8	26.5	13.5	137.5
1985	.7447	68.3	1.0258	1.1566	12.1	32.7	13.5	114.4
1986	.7607	96.1	1.0469	1.1224	13.2	35.5	13.5	145.1
1987	.7286	102.1	1.0507	1.1402	16.4	44.3	13.5	159.9
1988	.6990	123.2	1.0328	1.1812	26.2	70.7	27.0	221.0
1989	.6692	129.4	1.0402	1.1950	30.3	81.9	27.0	238.4
1990	.6844	152.7	1.0397	1.2167	38.2	103.2	27.0	282.9
1991	.6847	137.2	1.0445	1.2109	33.4	90.2	40.5	267.9
1992	.6863	156.2	1.0445	1.2098	37.8	102.0	40.5	298.7
1993	.6864	151.1	1.0445	1 2097	36.5	98.6	27.0	276.7
1994	.6865	152.0	1.0445	1.2096	36.7	99.2	27.0	278.2
1995	.6866	136.9	1.0000	1,2634	41.6	112.2	40.5	289.6
1996	.6867	154.6	1.0445	1 2095	37.3	100.8	40.5	295.9
1997	.6868	161.5	1.0445	1 2094	39.0	105.2	40.5	307.2
1998	.6869	177.8	1.0445	1.2093	42.9	115.8	40.5	334.1
1999	.6870	178.8	1.0445	1.2092	43.1	116.4	40.5	335.7
2000	.6871	169.5	1.0445	1.2092	40.9	110.3	40.5	320.3
2001	.6871	193.8	1.0445	1.2092	46.7	126.1	40.5	360.5
2002	.6871	197.6	1.0445	1.2092	47.6	128.6	40.5	366.7
2003	.6871	221.1	1.0445	1.2092	53.3	143.9	40.5	405.5
2004	.6871	200.4	1.0445	1.2092	48.3	130.4	40.5	371.3
2005	.6871	196.6	1.0445	1.2092	47.4	128.0	40.5	365.1
2006	.6871	198.0	1.0445	1.2092	47.7	128.9	40.5	367.3
2007	.6871	203.2	1.0445	1.2092	49.0	132.3	40.5	376.0
2008	.6871	204.6	1.0445	1.2092	49.3	133.2	40.5	378.3
2009	.6871	206.1	1.0445	1.2092	49.7	134.1	40.5	380.7
2010	.6871	208.5	1.0445	1.2092	50.3	135.7	40.5	384.6

[a] Gross log input, ratio of lumber production and log deliveries to sawmills (see text for explanation).
[b] Ratio of gross log input and overrun, units are board feet of logs chipped per board feet of logs used for lumber.

Table 9a—Chip exports, chips used for pulp In Alaska, estimated pulp production, and estimates of private pulp log harvests, 1970-91, and projections for 1992-2010

Year	Chip exports	Ratio of chip exports to production	Chips used for pulp[a]	Pulp produced[b]	Private harvest for chips	Private pulp log harvest
	Thousand dry tons	*Proportion*	*Thousand short tons*		*Million board feet*	
1970	*0*	*0*	111.3	48.4	0	0
1971	19.6	.225	67.6	29.4	0	0
1972	20.2	.168	99.8	43.4	0	0
1973	0	0	142.7	62.1	0	0
1974	34.8	.111	277.6	120.7	0	0
1975	32.4	.120	237.7	103.3	0	0
1976	107.7	.420	148.5	64.6	0	0
1977	107.4	.490	111.9	48.6	0	0
1978	31.8	.152	304.9	132.6	0	0
1979	83.7	.332	200.2	87.0	0	11.3
1980	151.3	.577	110.8	48.2	5.0	13.8
1981	77.6	.408	112.6	49.0	5.0	19.9
1982	74.2	.390	116.2	50.5	5.0	51.0
1983	6.6	.042	194.0	84.3	5.0	31.3
1984	16.5	.120	121.0	52.6	5.0	47.3
1985	0	0	114.4	49.8	5.0	46.8
1986	0	0	145.1	63.1	5.0	66.1
1987	0	0	159.9	69.5	5.0	93.9
1988	11.5	.052	209.4	91.1	10.0	51.3
1989	85.9	.360	152.4	66.3	10.0	69.5
1990	28.3	.100	254.6	110.7	10.0	96.6
1991	101.3	.378	166.5	72.4	15.0	70.3
1992	15.5	.052	283.2	123.1	15.0	87.8
1993	55.3	.20	221.4	96.3	10.0	30.0
1994	55.6	.20	222.6	96.8	10.0	20.0
1995	57.9	.20	231.7	100.7	15.0	20.0
1996	59.2	.20	236.7	102.9	15.0	20.0
1997	61.4	.20	245.8	106.9	15.0	20.0
1998	66.8	.20	267.3	116.2	15.0	20.0
1999	67.1	.20	268.5	116.7	15.0	20.0
2000	64.1	.20	256.3	111.4	15.0	20.0
2001	72.1	.20	288.4	125.4	15.0	20.0
2002	73.3	.20	293.4	127.6	15.0	20.0
2003	81.1	.20	324.4	141.0	15.0	20.0
2004	74.3	.20	297.1	129.2	15.0	20.0
2005	73.0	.20	292.1	127.0	15.0	20.0
2006	73.5	.20	293.9	127.8	15.0	20.0
2007	75.2	.20	300.8	130.8	15.0	20.0
2008	75.7	.20	302.6	131.6	15.0	20.0
2009	76.1	.20	304.5	132.4	15.0	20.0
2010	76.9	.20	307.7	133.8	15.0	20.0

[a] Chips used for pulp includes imports in 1978 and 1983, see table 7. An adjustment was made to allocate 1978 chip imports to 1978-79; 1978 = .8*IMPVOL(78); 1979 = .2*IMPVOL(78).
[b] Converted at 2.30 tons of chips per ton of pulp.

Table 10--Alaska timber Imports by product for 1970-91, and projections for 1992-2010

Year	Saw logs	Pulp logs		Wood chips	
	Thousand board feet	*Thousand cords*	*Thousand board feet*	*Thousand tons*	*Thousand board feet*
1970	0	0	0	0	0
1971	0	0	0	0	0
1972	0	0	0	0	0
1973	0	0	0	0	0
1974	0	0	0	0	0
1975	20.0	0	0	0	0
1976	0	0	0	0	0
1977	0	0	0	0	0
1978[a]	2.5	3.8	1.9	159.6	59.1
1979	3.8	0	0	0	0
1980	37.1	0	0	0	0
1981	21.5	0	0	0	0
1982	1.4	0	0	0	0
1983	21.0	41.0	20.9	42.0	15.6
1984	5.3	60.6	30.8	0	0
1985	16.5	3.2	1.6	0	0
1986	21.4	72.2	36.7	0	0
1987	0	5.4	2.8	0	0
1988	2.1	13.0	6.6	0	0
1989	0		34.8		0
1990	0		8.1		0
1991	0		1.4		0
1992	0		0		0
1993	0		0		0
1994	0		0		0
1995	0		0		0
1996	0		0		0
1997	0		0		0
1998	0		0		0
1999	0		0		0
2000	0		0		0
2001	0		0		0
2002	0		0		0
2003	0		0		0
2004	0		0		0
2005	0		0		0
2006	0		0		0
2007	0		0		0
2008	0		0		0
2009	0		0		0
2010	0		0		0

[a] Data for 1978-91 are from unpublished compilations of U S. Department of Commerce data, data for other years are estimated. Data for 1975 are based on data reported by Alaska pulp mills. Pulp log imports are converted from cords (reported units) at 1.965 cords per thousand board feet. Wood chip imports are converted from short tons (1978-88) and metric tons (1989-91) at 2.7 short tons per thousand board feet.

Table 11—Alaska timber harvest by owner and timber imports, 1965-91, and projections for 1992-2010

Year	Total harvest	Owner			Timber imports
		National Forest	Private	Other government	
		Million board feet			
1965	440.0	404.5		35.5	
1966	514.6	475.5		39.1	
1967	534.9	476.8		58.0	
1968	590.6	533.3		57.3	
1969	581.4	523.3		58.1	
1970	628.0	561.0		67.0	0
1971	574.9	529.4		45.5	0
1972	606.2	550.5		55.7	0
1973	655.9	591.6		64.3	0
1974	615.1	549.6	*2.0*	63.5	0
1975	451.9	413.1	4.2	34.6	20.0
1976	516.0	472.2	0	43.9	0
1977	518.6	420.7	31.1	66.8	0
1978	481.3	408.6	36.3	36.4	63.5
1979	620.5	459.5	125.2	35.8	3.8
1980	663.7	453.7	145.0	65.1	37.1
1981	593.4	387.5	151.1	54.8	21.5
1982	660.5	345.5	276.4	38.5	1.4
1983	571.7	251.9	278.0	41.8	57.4
1984	552.0	261.5	262.4	28.0	36.2
1985	584.3	265.7	304.7	14.0	18.1
1986	668.9	272.1	377.5	19.2	58.2
1987	887.9	352.2	509.7	26.0	2.8
1988	958.1	408.9	523.9	25.3	8.7
1989	1,155.1	461.9	671.6	21.6	34.8
1990	1,100.9	475.0	614.0	11.9	8.1
1991	921.1	326.5	579.7	15.0	1.4
1992	1,019.7	395.3	590.6	33.8	0
1993	854.7	349.7	490.0	15.0	0
1994	706.4	286.4	405.0	15.0	0
1995	621.0	271.0	335.0	15.0	0
1996	565.2	290.2	260.0	15.0	0
1997	503.4	303.4	185.0	15.0	0
1998	458.9	312.9	131.0	15.0	0
1999	443.8	308.8	120.0	15.0	0
2000	413.1	298.1	100.0	15.0	0
2001	441.1	326.1	100.0	15.0	0
2002	445.4	330.4	100.0	15.0	0
2003	467.2	352.2	100.0	15.0	0
2004	443.4	328.4	100.0	15.0	0
2005	439.1	324.1	100.0	15.0	0
2006	440.7	325.7	100.0	15.0	0
2007	446.7	331.7	100.0	15.0	0
2008	448.3	333.3	100.0	15.0	0
2009	449.9	334.9	100.0	15.0	0
2010	452.7	337.7	100.0	15.0	0

Table 12—Estimated shares of National Forest and private harvest exported and share of National Forest harvest used for pulp, 1965-2010

Year	Share of National Forest harvest		Share of private exported
	Exported	Used for pulpwood	
		Proportion	
1965	0.020	0.70	na
1966	.030	.70	na
1967	.060	.60	na
1968	.060	.55	na
1969	.060	.50	na
1970	.060	.45	na
1971	.060	.55	na
1972	.060	.45	na
1973	.060	.35	na
1974	.060	.40	0
1975	.060	.35	1.00
1976	.060	.45	0
1977	.035	.55	0
1978	.069	.55	0
1979	.024	.55	0
1980	.061	.53	.87
1981	.045	.58	.84
1982	.049	.57	.80
1983	.065	.56	.87
1984	.071	.57	.80
1985	.169	.57	.83
1986	.138	.51	.81
1987	.113	.60	.81
1988	.133	.55	.88
1989	.106	.58	.88
1990	.126	.51	.83
1991	.101	.44	.85
1992	.103	.48	.83
1993	.119	.40	.92
1994	.146	.27	.93
1995	.139	.31	.90
1996	.147	.26	.87
1997	.147	.26	.81
1998	.126	.24	.73
1999	.129	.23	.71
2000	.126	.24	.65
2001	.132	.21	.65
2002	.133	.20	.65
2003	.140	.16	.65
2004	.136	.18	.65
2005	.135	.19	.65
2006	.136	.19	.65
2007	.137	.18	.65
2008	.137	.18	.65
2009	.137	.18	.65
2010	.138	.17	.65

Table 13—Alaska timber harvest by owner and product

Year	National Forest				Private			
	Saw logs	Export logs	Pulp logs	Total	Saw logs	Export logs	Pulp logs	Total
	Million board feet, roundwood equivalent							
1965	50.8	8.1	345.6	404.5		0	0	0
1966	99.2	14.3	362.1	475.5		0	0	0
1967	149.8	28.6	298.4	476.8		0	0	0
1968	186.8	32.0	314.5	533.3		0	0	0
1969	221.8	31.4	270.2	523.3		0	0	0
1970	243.3	33.7	284.0	561.0		0	0	0
1971	194.3	31.8	303.4	529.4		0	0	0
1972	270.6	33.0	246.9	550.5		0	0	0
1973	323.0	35.5	233.1	591.6		0	0	0
1974	286.2	33.0	230.5	549.6		2.0	0	2.0
1975	255.2	24.8	133.0	413.1		4.2	0	4.2
1976	226.1	28.3	217.8	472.2		0	0	0
1977	178.1	14.6	228.0	420.7		31.1	0	31.1
1978	184.3	28.0	196.2	408.6		36.3	0	36.3
1979	219.6	11.1	228.8	459.5		113.9	11.3	125.2
1980	183.7	27.9	242.2	453.7		126.1	18.8	145.0
1981	144.1	17.5	225.9	387.5		126.2	24.9	151.1
1982	130.2	16.8	198.6	345.5		220.5	56.0	276.4
1983	95.3	16.3	140.3	251.9		241.7	36.3	278.0
1984	93.0	18.6	149.9	261.5		210.1	52.3	262.4
1985	69.6	44.9	151.1	265.7		252.9	51.8	304.7
1986	96.9	37.4	137.8	272.1		306.5	71.1	377.5
1987	102.7	39.8	209.8	352.2		410.7	98.9	509.7
1988	130.6	54.4	224.0	408.9		462.6	61.3	523.9
1989	143.7	48.9	269.3	461.9		592.0	79.5	671.6
1990	170.5	60.0	244.5	475.0		507.4	106.6	614.0
1991	150.9	33.0	142.5	326.5		494.4	85.3	579.7
1992	163.2	40.8	191.3	395.3		487.8	102.8	590.6
1993	166.7	41.7	141.2	349.7		450.0	40.0	490.0
1994	167.8	41.9	76.7	286.4		375.0	30.0	405.0
1995	150.3	37.6	83.1	271.0		300.0	35.0	335.0
1996	170.7	42.7	76.8	290.2		225.0	35.0	260.0
1997	178.7	44.7	80.1	303.4		150.0	35.0	185.0
1998	197.4	39.5	76.0	312.9		96.0	35.0	131.0
1999	198.5	39.7	70.6	308.8		85.0	35.0	120.0
2000	187.8	37.6	72.7	298.1		65.0	35.0	100.0
2001	215.9	43.2	67.0	326.1		65.0	35.0	100.0
2002	220.2	44.0	66.1	330.4		65.0	35.0	100.0
2003	247.3	49.5	55.4	352.2		65.0	35.0	100.0
2004	223.4	44.7	60.3	328.4		65.0	35.0	100.0
2005	219.1	43.8	61.2	324.1		65.0	35.0	100.0
2006	220.7	44.1	60.9	325.7		65.0	35.0	100.0
2007	226.7	45.3	59.6	331.7		65.0	35.0	100.0
2008	228.3	45.7	59.3	333.3		65.0	35.0	100.0
2009	230.0	46.0	59.0	334.9		65.0	35.0	100.0
2010	232.7	46.5	58.4	337.7		65.0	35.0	100.0

Table 13— Alaska timber harvest by owner and product (continued)

Year	Other government				All owners			
	Saw logs	Export logs	Pulp logs	Total	Saw logs	Export logs	Pulp logs	Total
	Million board \feet, rounofwood equivalent							
1965	17.7	0	17.7	35.5	68.5	8.1	363.3	440.0
1966	19.5	0	19.5	39.1	118.7	14.3	381.6	514.6
1967	29.0	0	29.0	58.0	178.9	28.6	327.4	534.9
1968	28.6	0	28.6	57.3	215.5	32.0	343.1	590.6
1969	29.0	0	29.0	58.1	250.8	31.4	299.2	581.4
1970	33.5	0	33.5	67.0	276.8	33.7	317.5	628.0
1971	22.8	0	22.8	45.5	217.0	31.8	326.1	574.9
1972	27.9	0	27.9	55.7	298.4	33.0	274.8	606.2
1973	32.2	0	32.2	64.3	355.1	35.5	265.3	655.9
1974	31.7	0	31.7	63.5	317.9	34.9	262.2	615.1
1975	19.6	0	15.0	34.6	274.8	29.0	148.0	451.9
1976	23.9	0	20.0	43.9	250.0	28.3	237.8	516.1
1977	36.7	6.7	23.4	66.8	214.9	52.4	251.3	518.6
1978	20.0	3.6	12.7	36.4	204.3	68.0	209.0	481.3
1979	19.7	3.6	12.5	35.8	239.3	128.6	252.6	620.5
1980	35.8	6.5	22.8	65.1	219.5	160.5	283.8	663.7
1981	30.1	5.5	19.2	54.8	174.2	149.2	270.0	593.4
1982	21.2	3.9	13.5	38.5	151.3	241.1	268.0	660.5
1983	23.0	4.2	14.6	41.8	118.3	262.2	191.1	571.7
1984	15.4	2.8	9.8	28.0	108.5	231.5	212.1	552.0
1985	7.7	1.4	4.9	14.0	77.3	299.2	207.8	584.3
1986	10.6	1.9	6.7	19.2	107.5	345.8	215.6	668.9
1987	14.3	2.6	9.1	26.0	116.9	453.1	317.9	887.9
1988	13.9	2.5	8.9	25.3	144.5	519.5	294.1	958.1
1989	11.9	2.2	7.6	21.6	155.6	643.1	356.4	1.155.1
1990	5.9	1.2	4.7	11.9	176.4	568.6	355.9	1,100.9
1991	7.5	1.5	6.0	15.0	158.4	528.9	233.8	921.1
1992	16.9	3.4	13.5	33.8	180.1	532.0	307.6	1,019.7
1993	7.5	1.5	6.0	15.0	174.2	493.2	187.2	854.7
1994	7.5	1.5	6.0	15.0	175.3	418.4	112.7	706.4
1995	7.5	1.5	6.0	15.0	157.8	339.1	124.1	621.0
1996	7.5	1.5	6.0	15.0	178.2	269.2	117.8	565.2
1997	7.5	1.5	6.0	15.0	186.2	196.2	121.1	503.4
1998	7.5	1.5	6.0	15.0	204.9	137.0	117.0	458.9
1999	7.5	1.5	6.0	15.0	206.0	126.2	111.6	443.8
2000	7.5	1.5	6.0	15.0	195.3	104.1	113.7	413.1
2001	7.5	1.5	6.0	15.0	223.4	109.7	108.0	441.1
2002	7.5	1.5	6.0	15.0	227.7	110.5	107.1	445.4
2003	7.5	1.5	6.0	15.0	254.8	116.0	96.4	467.2
2004	7.5	1.5	6.0	15.0	230.9	111.2	101.3	443.4
2005	7.5	1.5	6.0	15.0	226.6	110.3	102.2	439.1
2006	7.5	1.5	6.0	15.0	228.2	110.6	101.9	440.7
2007	7.5	1.5	6.0	15.0	234.2	111.8	100.6	446.7
2008	7.5	1.5	6.0	15.0	235.8	112.2	100.3	448.3
2009	7.5	1.5	6.0	15.0	237.5	112.5	100.0	449.9
2010	7.5	1.5	6.0	15.0	240.2	113.0	99.4	452.7

Appendix 2: Data Series Used in Alternative Projections

Table 1 of the text shows alternative projections of the derived demand for Alaska National Forest timber. Tables in this appendix display the data used in making these alternative projections, as well as the data used in the base projection. References to appendix tables (for base projections) are given.

Table 14—Pulp exports by grade, 1985-92, and projections of pulp exports 1993-2010 based on production by 1 or 2 mills in Alaska[a]

	2 mills			1 mill		
Year	Dissolving grades	Other grades	Total exports	Dissolving grades	Other grades	Total exports
1985	192.7	6.9	199.6	192.7	6.9	199.6
1986	220.7	7.5	228.2	220.7	7.5	228.2
1987	253.1	26.7	279.8	253.1	26.7	279.8
1988	275.4	30.6	306.0	275.4	30.6	306.0
1989	280.7	22.0	302.7	280.7	22.0	302.7
1990	274.7	43.8	318.6	274.7	43.8	318.6
1991	276.2	17.1	293.3	276.2	17.1	293.3
1992	286.7	20.5	307.2	286.7	20.5	307.2
1993	200.0	10.0	210.0	200.0	10.0	210.0
1994	250.0	20.0	270.0	130.0	10.0	140.0
1995	265.0	20.0	285.0	135.0	10.0	145.0
1996	275.0	20.0	295.0	135.0	10.0	145.0
1997	275.0	20.0	295.0	140.0	10.0	150.0
1998	270.0	20.0	290.0	140.0	10.0	150.0
1999	270.0	20.0	290.0	135.0	10.0	145.0
2000	270.0	20.0	290.0	135.0	10.0	145.0
2001	270.0	20.0	290.0	135.0	10.0	145.0
2002	270.0	20.0	290.0	135.0	10.0	145.0
2003	265.0	20.0	285.0	130.0	10.0	140.0
2004	265.0	20.0	285.0	130.0	10.0	140.0
2005	265.0	20.0	285.0	130.0	10.0	140.0
2006	265.0	20.0	285.0	130.0	10.0	140.0
2007	265.0	20.0	285.0	130.0	10.0	140.0
2008	265.0	20.0	285.0	130.0	10.0	140.0
2009	265.0	20.0	285.0	130.0	10.0	140.0
2010	265.0	20.0	285.0	130.0	10.0	140.0

[a] See appendix 1, table 6

Table 15—Alternative 1, Alaska share of North American lumber exports to Japan

Year	Lower	*Base*[a]	Higher
1990		6.8	
1991	5.0	5.0	5.0
1992	4.9	5.1	6.0
1993	4.8	5.3	6.2
1994	4.6	5.3	6.3
1995	4.5	5.0	6.5
1996	4.4	5.4	6.6
1997	4.3	5.4	6.8
1998	4.1	6.1	6.9
1999	4.0	5.7	7.1
2000	3.9	5.0	7.2
2001	3.8	5.5	7.4
2002	3.6	5.4	7.5
2003	3.5	6.0	7.7
2004	3.4	5.4	7.8
2005	3.3	5.2	8.0
2006	3.1	5.2	8.1
2007	3.0	5.3	8.3
2008	2.9	5.3	8.4
2009	2.8	5.3	8.6
2010	2.6	5.3	8.7

[a] See appendix 1, table 5

Table 16—Alternative 2, share of Alaska chip production that is exported

Year	Lower	Base[a]	Higher
1990		0.135	
1991		.549	
1992	0.10	.20	0.40
1993	.10	.20	.40
1994	.10	.20	.40
1995	.10	.20	.40
1996	.10	.20	.40
1997	.10	.20	.40
1998	.10	.20	.40
1999	.10	.20	.40
2000	.10	.20	.40
2001	.10	.20	.40
2002	.10	.20	.40
2003	.10	.20	.40
2004	.10	.20	.40
2005	.10	.20	.40
2006	.10	.20	.40
2007	.10	.20	.40
2008	.10	.20	.40
2009	.10	.20	.40
2010	.10	.20	.40

[a] See appendix 1, table 9a

Brooks, David J.; Haynes, Richard W. 1994. Timber products output and timber harvests in Alaska: projections for 1992-2010. Gen. Tech. Rep. PNW-GTR-334. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 32 p.

Projections of Alaska timber products output, the derived demand for raw material, and timber harvest by owner are developed from a trend-based analysis. By using a spread-sheet model, material flows in the Alaska forest sector are fully accounted for. Demand for Alaska National Forest timber is projected and depends on product output and harvest by other owners. Key assumptions are made explicit, and the sensitivity of model output to changes in assumptions is examined.

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

Pacific Northwest Research Station
333 S.W. First Avenue
P.O. Box 3890
Portland, Oregon 97208-3890

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