

5
1
25



College of Business
College of Forestry

Studies in Management and Accounting for the

FOREST PRODUCTS INDUSTRY

**Long-Term Timber Supply and Its Importance
in Strategic Planning**

**Philip L. Tedder
Richard N. La Mont
William E. Bruner**

Resource Economics International, Incorporated

**Monograph Number 28
March 1987**

Studies in Management and Accounting for the
FOREST
PRODUCTS
INDUSTRY

Long-Term Timber Supply and Its Importance
in Strategic Planning

Philip L. Tedder
Richard N. La Mont
William E. Bruner

Resource Economics International, Incorporated

Monograph Number 28
March 1987

Philip L. Tedder is President of REI since 1983. He was formerly an Associate Professor at Oregon State University. He has published over 60 articles on forestry economics, harvest scheduling, timber supply and demand. He is responsible for strategic analysis and timber supply and demand studies at REI.

Richard N. La Mont is Vice President of REI since 1983. He is the systems analyst for REI and has constructed several nationally known timber inventory and harvest scheduling computer models. He is responsible for new computer model development at REI.

William E. Bruner is Vice President of REI since 1983. He was formerly the Director of the Pacific Northwest Regional Commission Timber Supply and Demand Study. He is responsible for policy analysis at REI.

EXECUTIVE SUMMARY

The long-term timber supply situation in North America is in a tremendous state of transition. Although short-term demand and price projections are extremely important in the development of near-term strategy and business planning, long-range strategic planning should be developed using long-term projections, or secular trends, of timber demand and supply. Knee-jerk reactions to short-term fluctuations in the forest products markets that will dictate long-term company competitive position should be avoided. A careful, thoughtful, and comprehensive plan for future development is the key for the individual forest products company of the future. An integral part of that long-term strategic planning effort is a serious and exhaustive analysis of the future timber supply. The analysis of the long-term timber supply situation should not be limited to the immediate area of operation for the ability of the southern United States and elsewhere to produce lumber in the future will certainly affect the price for lumber received in the Pacific Northwest.

There are three areas of timber supply evaluated in this paper. Canada, the U.S. South, and the Pacific Northwest. A summary of the findings of the timber supply in those areas follows:

CANADA

The future potential timber supply is limited because of accessibility problems and an overall lack of regeneration effort. The latest U.S. Government model used to project future economically available timber supplies in Canada indicates a substantial shortfall from past projections.

SOUTH

Lack of effective regeneration efforts by private owners, who own 68 percent of the timberland base, poor forest management techniques, and an expanding pulp and paper industry indicate that future timber availability in the South will be one-half that of previous government projections.

PNW

The forest industry owner group's forest inventory is not capable of maintaining current harvest levels under current management. The non-industrial owner group can increase timber supply somewhat, but not much under current management. The anticipated declines in the National Forest harvest can not be made up from the other suppliers of timber.

Although it is a difficult task, each forest products company, whether small or large, must take into consideration the facts presented above and implement a strategic planning effort that will chart the general direction of the company for the long-term. Reaction to short-term fluctuations in price and demand causing permanent structural change should be avoided unless those changes dove-tail with long-term goals.

LONG-TERM TIMBER SUPPLY AND ITS IMPORTANCE IN STRATEGIC PLANNING

Over the last three decades, strategic planning has become a popular and useful activity for much of American business. The timber products industry, however, has not followed this trend. Bremner (3) suggests that timber firms are production-oriented, rather than market oriented, and have therefore emphasized efficiency in production rather than long-term planning as a strategy for maintaining or increasing profits.

Another possible reason for lack of strategic planning in the forest products industry is that such planning for timber firms is much more demanding than for firms in most other industries. If the "long term" is the period in which all factors of production are variable, the timber industry must plan over a period of several decades rather than over the five or ten years that would be characteristic of most industries. Another reason, according to Anthony and Deardon (2), is that in most companies, strategic planning usually relates to some part of the organization rather than to the totality. There are very few industries like the forest products industry that must rely on one strategic resource, timber, as the mainstay of the entire production process, therefore there must be some sort of totality planning undertaken. In addition to timber being the major resource or raw material in the production process, its location, extraction, and transportation requirements dictate that individual manufacturing facilities be located near the resource. Finally, depending upon the area of location, it takes between 25 and 80 years to grow a new crop. Therefore, these three unique problems associated with the timber resource of the forest products industry combine to make the task of strategic planning especially difficult and unparalleled in any other manufacturing industry. Conversely, because these three problems exist, it is imperative that the forest products industry develop a long-term strategic plan.

The purpose of this paper is as follows: first, to develop the conceptual framework for appropriate analysis of long-term timber supply in the context of strategic planning for timber products firms; second, to review information and techniques that are currently available for carrying out such analysis; and third, to review the timber supply trends of the Pacific Northwest and competing regions.

STRATEGIC PLANNING IN THE FOREST PRODUCTS INDUSTRY

In a recent article, Bremner (3) suggests eight types of data that forest products firms feel are important in long-term planning. Five of these deal explicitly with supply and demand:

- The type, size, species, quality, and ownership pattern of timber in the company's natural working circle.
- Current and projected long-term demand and pricing levels for selected wood products.
- Data on foreign and domestic markets, distribution channels, product acceptance, and consumer trends.
- Trends in government regulations, public forest management policy, and forecasted timber availability.

- Forecasted interest rates and inflation trends.

The analytical framework employed in the planning process must address all of these data items. It is important to distinguish between management control, a process that may be confused with strategic planning, and strategic planning. Anthony and Deardon (2) state that management control is the process of managing the operation of a particular aspect of the company. It involves planning for budgets, operation, and communication of objectives (short-term), policies, guidelines, decisions, and results throughout the organization. It is a highly structured process for which specific standards can be set to judge results. Strategic planning, on the other hand, is loosely structured, secret, and involves individuals who gather information and do analyses that will be used in the strategic decision-making. It is important to note that involving middle managers in the strategic planning process can be counterproductive in that it is a process that takes away from the management control process (on which the managers are evaluated). Results of a strategic analysis may not always reflect favorably upon certain aspects of a fully integrated business. Bremner's list of important data is information that can be utilized in management control and operational planning as well as in strategic planning, depending upon the viewpoint and mission of the individual or individuals analyzing the data. In the forest products industry it is essential to segregate the short-term operational or management control planning from the strategic planning process in order to insure, to the best extent possible, that the operating environment in 15 to 30 years will be what you envision it to be. It is incumbent upon upper management to perform strategic planning, because the trees that will be harvested 15 to 30 years from now have been growing for some period already.

Framework for Analysis

Though strategic planning for timber products firms must necessarily be most concerned with long-term timber supply, this does not mean that market trends can be ignored. In fact, it is the bringing together of supply and demand analyses that generates price trends, and prices are necessary for planning. Unfortunately, much of the timber forecasting that has been done has focused on supply while ignoring demand or on demand while ignoring or minimizing supply considerations. What is needed is a framework that traces the complex patterns of derived demand that exist in the forest products industry, while considering fully the current timber inventory, growth trends, management techniques, and harvest practices. Further, this process must recognize that markets for timber products are national and that there is competition among supplying regions. This is a tall order, and the apparent complexity of the analysis may well have kept many firms from doing the kind of planning that seems appropriate to the turbulent times that the industry has experienced over the past decade.

While the focus here is on long-term timber supply, a few words about demand analysis are in order. There are two demand-oriented models in current use that have the proper ingredients for long-term demand and price forecasting. These are the Timber Assessment Market Model (TAMM), utilized by the USDA Forest Service and outlined by Adams and Haynes (1), and FORSIM, developed by Resource Information Systems Incorporated (RISI). Both consider the full range of final uses for timber products by region

and translate regional consumer demands into demand on producing regions and then into demand for timber. Both models are self-contained in that they simulate timber supply and forecast prices of all products and of timber itself. However, the timber supply component of both models is too weak for serious use in long-term planning by a timber products firm.

This shortcoming has been overcome by matching the FORSIM model with a sophisticated timber supply model to produce long-term timber supply and price forecasts for the southern U.S. (4).

The timber supply analysis used in strategic planning must satisfy several criteria. It must be able to accommodate differing objectives of different owners. It must be able to deal with differences in species, land quality, age distribution, stocking levels, and management practices. And it must be able to do all of this at a level of sub-regional disaggregation that is meaningful to the individual firm, and to carry this level of detail over the period of the analysis, which may be as long as fifty years.

Long-term timber supply should not be confused with "timber availability" studies. "Timber availability" studies take an initial inventory and project that inventory into the future using some harvest scheduling rule, the result of which provides an indication of what a particular area is capable of producing under a variety of "what if" assumptions. Timber availability studies are an integral part of management planning, but long-term supply should be generated from an initial inventory and then projected into the future with a suitable computer model capable of carrying the level of detail necessary to insure that information needed for planning is present. As noted above, that supply is then operated in concert with a suitable timber demand model.

The necessary forest inventory data utilized in making supply projections are typically obtained from the USDA Forest Service Forest Survey units located across the country at the USDA Forest Service Regional Experiment Stations. These same Experiment Stations publish forest survey statistics on a periodic basis, but the information contained in those publications usually amounts to very general trends or changes, historic data, and a one-point-in-time estimate. Thus, for planning purposes it is generally necessary to acquire unpublished detail. In the Pacific Northwest, additional inventory information must be gathered from the National Forest System and the Bureau of Land Management.

Previously published timber supply studies, especially those prepared by the USDA Forest Service, must be used cautiously, if at all, in planning. These generally are based on assumptions, or are concerned with policy issues, that may be incompatible with planning requirements of a specific firm. In addition, these studies may often be "timber availability studies" that have nothing to do with market demands.

Timber Supply Detail

Depending on the scope of the firm's operations, long-term timber supply information may be necessary at several levels of regional disaggregation. These levels include sub-regional, regional and multi-region areas.

Sub-regional - For supply information to be suitable for use in strategic planning, the data presented must be in sufficient detail. It must include the amount of inventory at any time during the projection period by owner, forest type, site, and age class by a specific sub-regional location. This type of disaggregation is critical in order for companies to be able to predict the potential size and quality of timber that will be forthcoming under the given set of circumstances associated with the projection. Forest management trends and ownership patterns and trends must also be incorporated and visible in the results.

For example, a large forest products company located in a specific forest survey unit or county would be extremely interested in the amount of a specific type of timber by age or size class, or future anticipated impacts of any age-class gaps in the current inventory. Data on competitive mills in the area can then be analyzed, along with fee timber sources, to obtain an accurate picture of the current and future potential supply and demand. If the future timber supply of trees over 14 inches in diameter appears in doubt, construction of a large-dimensioned mill may not be feasible.

Regional - At the regional level, the analysis should be divided at least by states in order to provide a general outlook as to which state will have more or less timber volume in the future than other states in the surrounding region. At this level, it is possible to determine current capacity and resource availability and play that off against anticipated future demand, thus determining the possibility for expansion. The output of timber supply information should be in sufficient detail to allow the demand side to generate prices for the different stumpage products (pulpwood and sawtimber) and then develop final product outputs (plywood, pulp, etc.).

Multi-region - Reports at the multi-region level are extremely important for strategic planning purposes in that they provide the overall competitive structure of the different timber-producing regions. They will indicate which region will gain or lose inventory relative to another, based upon changing demand levels. Inventory levels should, however, not be reported as a single value such as total cubic feet. Instead, future inventory levels should be reported by size breakdown such as pulpwood or sawtimber. These types of reports should allow the planner to determine which of two competing areas will have the majority of a specific type of volume. Another statistic that should be available in a multi-region analysis is the capability to determine relative growth/drain ratios. These are simply the growth in any period divided by the drain or harvest and provide a quick analysis of the relative pressure on prices that any one area faces. Growth/drain ratios greater than 1.0 indicate no undue upward pressure on prices because inventories will be climbing, while ratios lower than 1.0 indicate a declining inventory base which will tend to push future long-term prices upward.

TIMBER SUPPLY OUTLOOK

THE PACIFIC NORTHWEST

This section applies the above general considerations regarding long-term timber supply analysis to the situation in the Pacific Northwest. Since there has been no recent comprehensive studies of timber supply and demand for this region, the analysis will be pieced together from a variety of sources.

The Pacific Northwest's current and future timber supply is in a state of transition for private owners. A great deal of timber of harvest age will shortly be available for harvest from Forest Industry lands. Tedder et. al. (5) indicates that given levels of projected demand suggested by the USDA Forest Service, timber inventories on forest industry lands will be three times greater than government forecasts indicate. However, Tedder and La Mont (6) indicate that the ability to produce timber in the PNW is much lower than previously indicated. The differences in timber inventory volume are the result of the use of a new timber inventory supply model that carries the timber inventory in sufficient detail to answer the type of questions needed by strategic planners. The basic difference in the results were caused by the ability of the new modeling system to pick up regenerated stands as they grow older and become eligible for harvest on a clear-cut basis. The USDA Forest Service approach was to cut a few trees off every acre every period, which failed to capture newly replanted acres.

The Forest Service's 1982 Timber Assessment was a key source of strategic planning information in the early 1980s and it was wrong about the Pacific Northwest. Private owners are facing lower available supplies from their timberland from now on, and it is estimated that the National Forest harvest will decline approximately 20 percent. The Bureau of Land Management and the other public ownership harvests are expected to be stable at best. The forest industry and other private timber supply capabilities are expected to decline, although there is potential for some increase in the other private owner group.

A brief summary of the current situation in the Pacific Northwest is helpful in determining the current status of the timber supply situation. Table 1 presents current growth and harvest for the different owner groups.

Table 1. Growth and harvest for the Pacific Northwest by owner group.

| Owner Group | Growth (million cubic feet) | | | Harvest | | |
|-----------------|--------------------------------|-------|--------|---------|-------|--------|
| | West | East | Total | West | East | Total |
| Forest Industry | 326.6 | 53.7 | 380.3 | 484.6 | 30.2 | 514.8 |
| Other Public | 206.5 | 22.8 | 229.3 | 228.2 | .1 | 228.4 |
| National Forest | 195.9 | 231.7 | 427.6 | 533.0 | 280.3 | 813.3 |
| Other Private | 199.2 | 30.4 | 229.6 | 127.8 | 32.7 | 160.5 |
| Total | 928.2 | 338.6 | 1266.8 | 1373.7 | 343.3 | 1717.0 |

Removals exceed growth by approximately 450 million cubic feet, but that figure is deceiving when the National Forest growth estimates are included. The National Forest removals are based partly upon future capable growth and not current growth. When public values are extracted, removals drop to 676 million cubic feet, with growth at 610 million cubic feet. These values, less the public statistics, better reflect the current situation of the private resource.

Viewing the age-class distribution of all private owners for the westside and eastside (Figures 1 and 2) provides further insight into the current and future problems of the private owner groups. Assuming an average rotation age of about 60 years on the westside, there is little or no ability for forest industry and private owners to increase their harvest above current levels. And, if current levels continue, the amount of harvest must drop sometime in the future. The age-class distribution for the eastside doesn't quite show the same distribution as the west; however, volumes per acre, stocking levels, and growth are much slower than the west. As a result, the eastside is in about the same shape as the westside.

In summary, the PNW private owner group's forest is reaching a state of regulation, on the whole, that will dictate the level of future harvests. Little or no ability to substitute private timber for public timber will exist. If National Forest harvest levels decline by the amount that has been suggested and no substitution can take place, the overall ability to harvest timber in the PNW will decline in a like amount, competition will increase, and prices will increase, assuming no change in demand.

THE SOUTH

Information for the South is based on a private study completed by Resource Economics International, Inc. and Resource Information Systems, Inc. titled "The Timber Situation in 12 Southern States" (4). This study indicates that softwood harvests in the South will be fairly stable over the period from 1986 to 2015. However, with a growth drain ratio of approximately .76 (growth divided by harvest), softwood inventories will decline from an initial level of 102 billion cubic feet to 74 billion cubic feet. An additional problem arises in that softwood pulpwood inventories will decline a modest amount, from 47 to 41 billion cubic feet, but softwood sawtimber inventories will decline sharply, from 54 billion cubic feet to 33 billion cubic feet, during the projection period. The ability of the South to competitively supply sawtimber and plywood grade trees in the future is in serious doubt. Some offset from plywood will be seen from substitution of hardwoods for OSB-type production, but the ability to produce sawtimber and plywood will be severely curtailed by the lack of raw material, or as the raw material is diverted to pulp.

Of the total timberland in the south, other private owners hold 68 percent of the timberland acres. They have done a poor job of management for timber production, as over 75 percent of the acres are less than fully stocked. Only 5 percent of the acres are in pine plantation, and as natural pine acres are harvested, they usually revert to a preponderance of hardwood acres. These statistics may not be surprising as a good deal of

FIGURE 1

ALL PRIVATE WESTSIDE ACRES
BY AGE CLASS

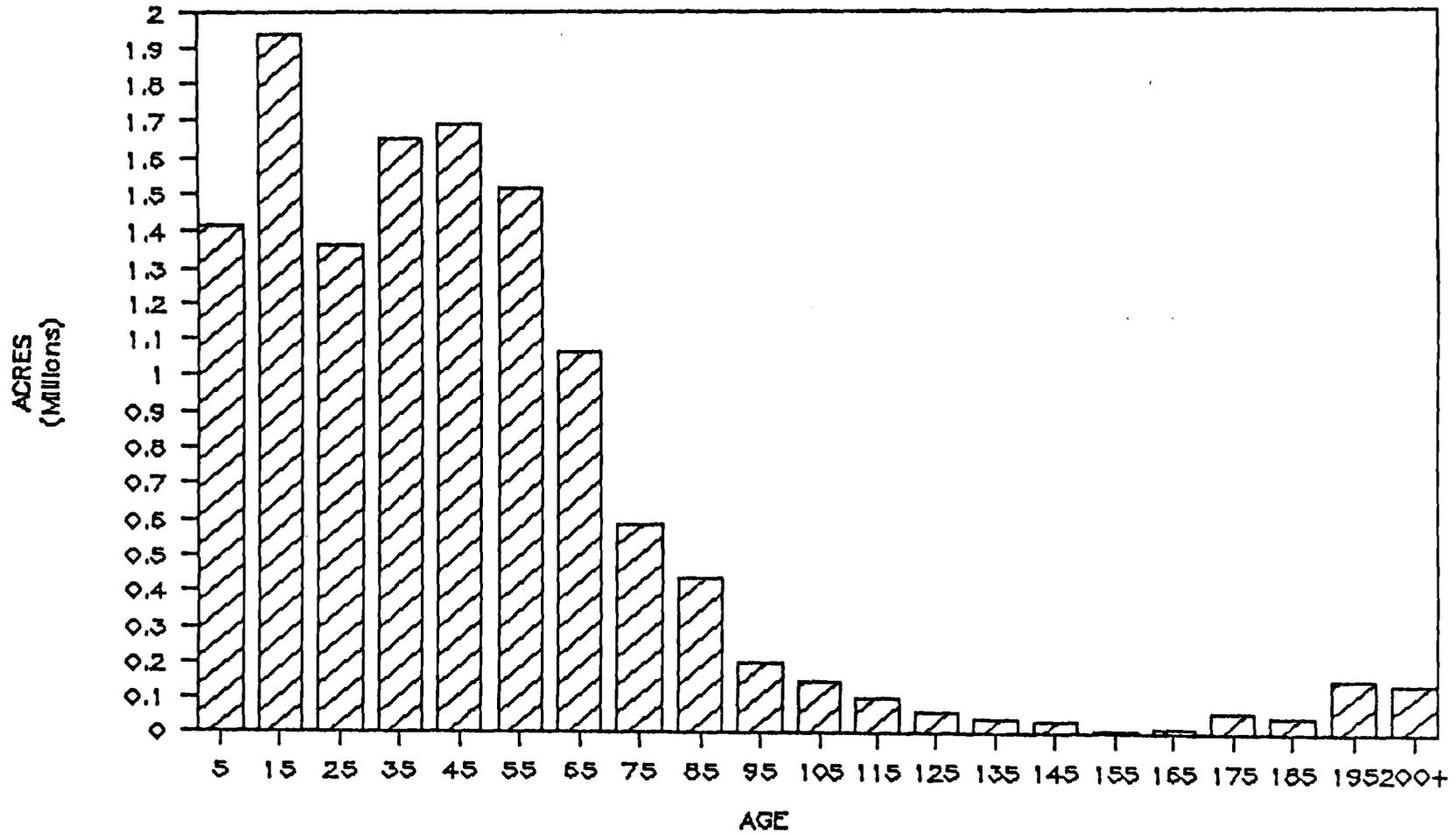
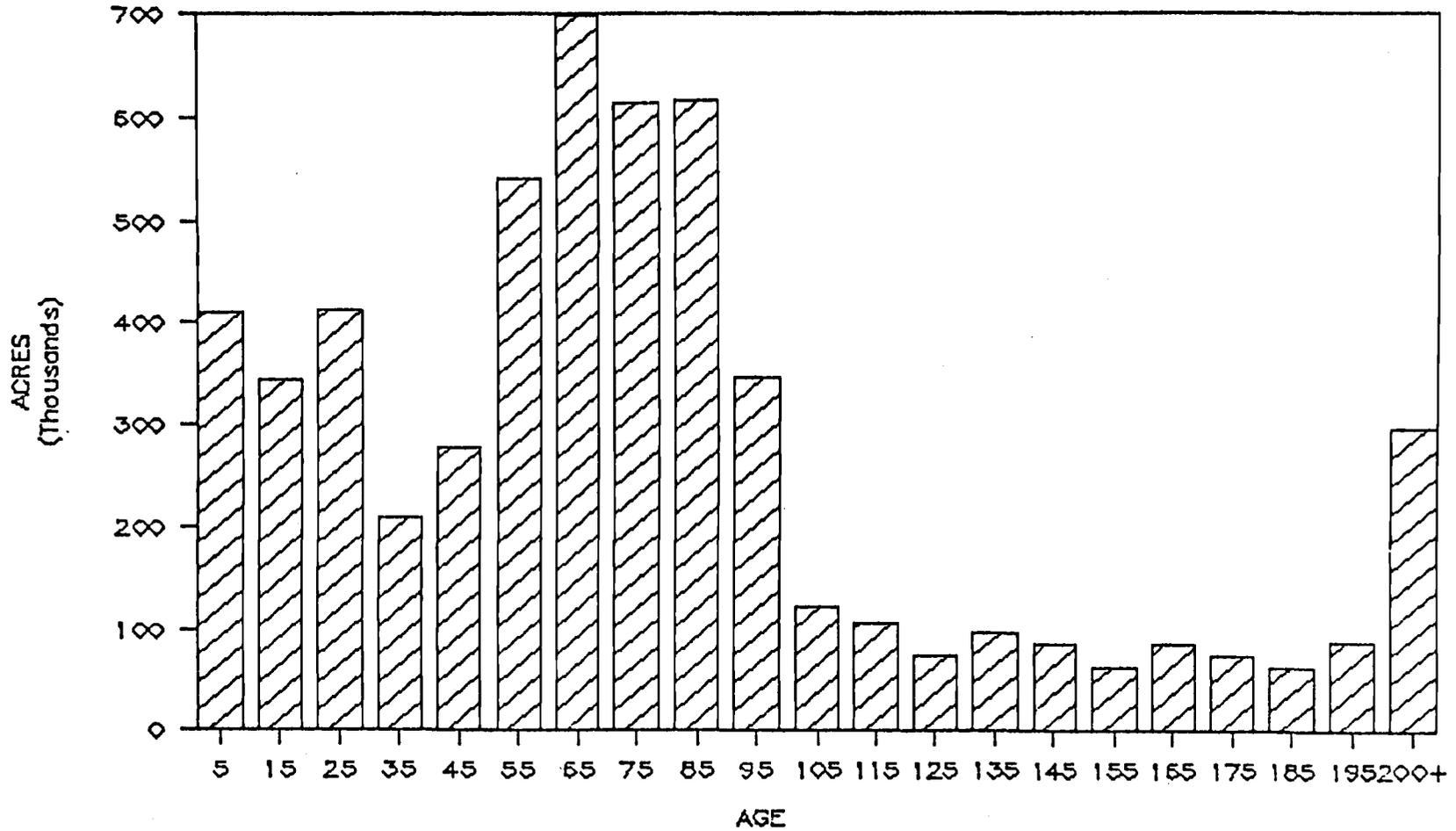


FIGURE 2

ALL PRIVATE EASTSIDE ACRES
BY AGE CLASS



the acres are held and/or treated the way they are for some of the following reasons:

1. Other objectives than timber management.
2. One-time harvest and then land sale.
3. Short- and long-term leases that do not include regeneration clauses.
4. Harvesting with no incentive or regulations to ensure regeneration.

As a result of these problems and a general lack of knowledge about timber management, the South has seen, and will continue to see, the majority of timberland harvested on other private ownerships convert to hardwood types.

Forest industry timberland acre base in the South is comprised of about 65 percent softwoods with 90 percent of the acres being in medium and high sites with 82 percent of those acres being medium stocked or better. The forest industry component in the South manages its timberland acreage fairly well, but not as well as is widely assumed. Average growth per acre per year on pine plantation sites can be as high as 125 cubic feet per acre per year; however the average is closer to 55 cubic feet per acre per year. Other private pine plantation growth is about 48 cubic feet per acre per year. Most of the timberland in good production on other private timberland is under long-term lease from companies that must have available resources because their self-sufficiency level is not as high as ordinarily would be desired. These efforts, however, barely make a dent in the overall problem of lack of regeneration on pine sites, which increasingly lowers growth rates.

A problem exists in the Southern timber inventory that causes even greater concern about the future of the timber supply. Capacity tends to congregate in particular areas such as northeast Florida and southeast Georgia. Forest inventory is spread over the whole 12 states and is not concentrated. Because of this, in most timber studies an acre of hardwood or natural pine in the mountains of Virginia or Tennessee carries the same weight in terms of volume (on a relative volume measure) as an acre located in the coastal plain of South or North Carolina.

In the analysis of the future of the 12 southern states, those acres in inaccessible areas and those acres containing low volumes and low-quality hardwoods and softwoods on other private acres were treated identically to acres with accessible high-volume and high-quality timber. As a result there are actually a tremendous amount of acres that are, in truth, not available for harvest now and most likely never will be. In addition, there are productive high-site acres owned by the other private category that are not available for harvest simply because they are managed for objectives other than timber production. An additional area of concern is acres that are available for harvest but only on a one-time basis. These acres would not affect the current projection, however future rotations would not be able to count on acres such as these for continued timber production.

In addition to the acreage problem, a certain degree of interest was generated in "The Timber Situation in 12 Southern States" about the degree of shifting of softwood capacity to hardwood capacity. The content of the concern centered on the amount of future harvest volume that would be forthcoming from the hardwood resource. In order to test an alternate assumption, increases in the amount of harvest forthcoming from hardwoods was cut in half. The remaining volume increase was added back to softwood removals. The timberland acre base used in this simulation was the reduced acre base and all other assumptions remained constant.

Simulations

In order to simulate the impact of this assumption upon the possible future timber supply level in the South, the acreage amounts on each owner group were reduced by the amounts indicated in Table 2.

Table 2. Percent reduction in acres for each owner and type.

| Type | Owner Group | | |
|---------------------|-----------------|---------------|--------|
| | Forest Industry | Other Private | Public |
| Natural pine | 2% | 10% | 5% |
| Planted pine | 0% | 0% | 0% |
| Mixed-pine hardwood | 5% | 15% | 10% |
| Upland hardwood | 5% | 15% | 10% |
| Bottomland hardwood | 5% | 15% | 10% |

In aggregate, the above percentage reductions amounted to a withdrawal of 19.3 million acres of timberland or a 10.4 percent reduction in total timberland acres. The reductions in acreages were then input to the basic inventory file and the simulation was conducted. The second simulation was made with the same reduced acreage base but the changes in hardwood and softwood removals were made. The resulting softwood and hardwood inventories over time are presented in Table 3.

Table 3. Softwood and hardwood inventories (all ownerships) over time for "The Timber Situation in 12 Southern States" (STS), reduced acres, and reduced acres and reduced hardwood timber harvest volumes.

| Period | STS | Simulation | | Reduced Hardwood Harvest | Percent Decline (from STS) |
|----------------------------------|---------|------------------|----------------------------------|--------------------------------|----------------------------------|
| | | Reduced Acres | Percent Decline (from STS) | | |
| Softwood (million cubic feet) | | | | | |
| 1985 | 101,509 | 91,392 | 10.0 | 91,392 | 10.0 |
| 1990 | 96,601 | 84,292 | 12.7 | 84,292 | 12.7 |
| 1995 | 91,537 | 78,058 | 14.7 | 77,468 | 15.4 |
| 2000 | 87,043 | 72,841 | 16.3 | 71,086 | 18.3 |
| 2005 | 83,335 | 68,728 | 17.5 | 65,059 | 21.9 |
| 2010 | 78,998 | 64,536 | 18.3 | 58,654 | 25.8 |
| 2015 | 73,639 | 59,484 | 19.2 | 51,219 | 30.4 |
| Hardwood (million cubic feet) | | | | | |
| 1985 | 107,830 | 96,416 | 10.6 | 96,416 | 10.6 |
| 1990 | 111,588 | 98,029 | 12.2 | 98,029 | 12.2 |
| 1995 | 114,919 | 99,904 | 13.1 | 100,432 | 12.6 |
| 2000 | 116,986 | 101,849 | 12.9 | 103,378 | 11.6 |
| 2005 | 115,831 | 103,328 | 10.8 | 106,503 | 08.1 |
| 2010 | 113,119 | 105,022 | 07.2 | 109,953 | 02.8 |
| 2015 | 109,391 | 106,778 | 02.4 | 107,030 | 02.2 |

Summary of Results

The softwood inventory under the reduced acreage assumption posted an initial percentage decline of 10 percent shifting over time to be 19.2 percent lower than the STS results. Projections of softwood inventory generated from the reduced acreage and reduced hardwood harvest indicated the same initial 10 percent decline, but the ending inventory was 30.5 percent lower than the STS results. Under the final simulation, softwood timber request was not filled in the last period of the simulation from the other private owner group because there simply was not enough softwood volume present. The available harvest fell short of the target harvest by 1 billion cubic feet and the ending softwood inventory for the other private owner group was 21.4 billion cubic feet. That value compares with 38.9 billion cubic feet projected in the STS results.

Softwood sawtimber inventory declined in these two scenarios in a greater amount than in the STS study and, as in the STS study, 95 percent of the sawtimber inventory was contained between the diameters of 9 and 10 inches by the end of the simulation.

The hardwood inventory in the reduced acre harvest generated peculiar results at first glance: constantly increasing cubic foot values throughout the projection period. These results seem counterintuitive until the total number of acres harvested from the softwood fibre types are analyzed. Because an increased number of acres were harvested from the softwood fibre type, an increased number of acres were regenerated in the hardwood fibre type, which in turn increased the amount of hardwood inventory. The second simulation (reduced acres, reduced hardwood harvest, and increased softwood harvest) produced the same pattern until the last time period. During the last period, the entire component of mixed-pine hardwood inventory was harvested in an attempt to meet the softwood demand, and as a result the hardwood inventory was reduced accordingly.

These results indicate that the outlook for the southern softwood inventory is, at best, not good. Even if intensive management on a large geographic scale were undertaken immediately, the yields from those efforts would not be available for another 20 to 25 years. Hardwood inventory will increase, but not substantially and the overall quality of that fibre resource is doubtful.

CANADA

Approximately 12% of world's forest are within Canada's borders and dominated by industrially useful conifers. In 1983, Canada's contributions to global production were: 12.2% of softwood lumber, 14.4% of wood pulp, and 7.5% of paper and paperboard. The U.S. received approximately 72% of all forest product exports from Canada.

Concerns about the ability of the Canadian forest resource to continue to meet the demands placed on it have been increasing over the past decade. These concerns stem from reductions in annual allowable harvest levels and from the prohibitive costs of accessing portions of the inventory.

Canada has 1,078 million acres of forest land, of which about 50% or 544 million acres are believed to be productive--capable of producing a merchantable stand within a reasonable length of time. Twenty-one percent of the total forest base or 232 million acres has not been inventoried and may contain an additional 109 million productive acres.

The known productive land base consists of 472 million acres available for harvest, 59 million nonstocked acres, and 13 million reserved acres (not available by law). The total productive base supports a volume of 8,139 million cunits, of which 6,925 million cunits (85%) are located on productive available forest lands. Of these acres, there exists a total softwood volume of 5,498 million cunits. The average softwood volume per acre averages 1,164 cubic feet.

The provinces own most of the productive forest lands (81%) with the remainder divided between federal agencies (10%) and private owners (9%). A summary of the forest statistics are contained in Table 4.

Table 4. Summary forest statistics for Canada.

| Province or Territory | Commercial Forest Area (million acres) | Coniferous Volume (million cunits) | Deciduous Volume (million cunits) | Average MAI cu.ft/ac/yr |
|-----------------------|--|------------------------------------|-----------------------------------|-------------------------|
| British Columbia | 102 | 2,626 | 143 | 33 |
| Alberta | 33 | 276 | 232 | 26 |
| Saskatchewan | 18 | 104 | 67 | 20 |
| Manitoba | 29 | 155 | 69 | 20 |
| Ontario | 82 | 733 | 396 | 24 |
| Quebec | 121 | 1,091 | 368 | 23 |
| New Brunswick | 15 | 119 | 63 | 27 |
| Nova Scotia | 7 | 48 | 23 | 23 |
| Prince Edward Is. | 1 | 8 | 4 | 24 |
| Newfoundland | 19 | 151 | 12 | 16 |
| Yukon Territory | 12 | 76 | 14 | 10 |
| Northwest Territory | 34 | 111 | 46 | 11 |
| Canada | 473 | 5,498 | 1,437 | 24 |

Annual Allowable Cut

Supply, as used here, refers to the quantity of timber that is either harvested in a given year (quantity supplied) or to the stock of timber that could be harvested in a year under prevailing biological, economic, legal, and policy constraints.

Timber supply is controlled largely through Annual Allowable Cuts (AACs) by the individual provinces and is determined by old formula methods or more recently by linear programming and simulation techniques.

Results obtained from a new modelling system developed by the U.S. Government to model the Canadian forest products industry determined the economic allowable cut levels for all provinces and territories given input from an initial simulation using the Timber Assessment Market Model. In the baseline simulation, the economically available annual cut of softwoods for all of Canada was set at 55.3 million cunits in 1980. The available cut level gradually declined to 54.8 million cunits in 1988 in response to reductions in available cut levels in regions where 1979 harvests exceeded calculated economically available allowable cuts.

From 1988 to 2030, the available cut level increases in response to assumed increases in the economically available portion of the annual allowable cut, and increases in utilization standards and will reach 58.6 million cunits in 2000 and 73.6 million cunits in 2030. Improvements in economic accessibility contributed 9.6 million cunits to potential harvests while improvements in utilization added 8.7 million cunits. The solution process calculated the future margins associated with the forest products industry and used as exogenous inputs demand levels of timber obtained from the Timber Assessment Market Model. In turn an evaluation of the economic allowable cut was developed. Softwood harvests in eastern Canada were

limited by the available cut levels from 1980 on. Available timber supplies did not limit harvests for all of Canada until 1984. The combination of shifts in production from eastern Canada, a sharp increase in lumber requests, continued increases in pulp and plywood requests, and declines in economically accessible timber supplies resulted in timber availability limiting harvests in interior B.C., western Alberta, Saskatchewan, and Manitoba in 1983 and in coastal B.C. and northern Alberta in 1984.

In short, even though margins for pulp and paper and lumber production were higher than previous estimates, demand levels of timber volume developed by the U.S. model could not be met by Canada's economic allowable cut base from almost the beginning of the projection. In addition, it is estimated that the cut may be overstated for three reasons:

1. The new modelling approach does not consider the nature or quality of the fiber contributing to the increased harvest levels.
2. Increased logging costs due to accessibility constraints could not be accurately projected.
3. The projection process includes all timber in the economic allowable cut base and assumes that all timber in the base is accessible to a conversion facility that can utilize it.

The study projected shortfalls from the original softwood timber harvest requested in the Timber Assessment Market Model of 9.5 million cunits (a 14% shortfall) in 2000 and 18.5 million cunits in 2030 (a 21% shortfall).

Thus, the Canadian softwood harvest may increase somewhat in the future. However, those increases, at best, will fall short of satisfying the demands that will be placed upon the resource. In addition, lack of current regeneration efforts and ever-increasing harvest and transportation costs all combine to point to substantial curtailments of Canada's future timber supply.

MULTI-REGIONAL SUMMARY

The overall effect of these regional trends is that declining softwood inventories in the South plus increasing extraction costs for British Columbia timber and potentially declining public harvests in the Pacific Northwest will push timber prices, and especially sawtimber prices, higher the next several decades. This estimate is made with the assumption that a certain degree of substitution of private timber and imports from other countries will accompany a decline in public timber. Timberland values and timber prices on lands suitable for growing high-quality sawtimber material will demand a premium. This will allow more Pacific Northwest timber from industry lands to be put on the market and may call out more production from British Columbia if prices rise enough to offset increasing extraction costs. If import quotas or tariffs are applied to Canadian timber, the value of domestic private timberland may increase to even higher levels.

Thus, the outlook for companies with a timberland base in the Pacific Northwest looks good. The forest industry in the region will soon be in the driver's seat for lumber production as their large amount of volume becomes available. This volume will also be economically available as it is second-growth material and transportation systems are in place. Therefore, transportation costs, and most probably extraction costs, will be favorable to the industry as a whole and relatively less than the competing regions.

However, a specter looms in the Pacific Northwest as a result of the potential decline in public harvest levels. If public harvests are cut drastically, those forest products firms not capable of being partially self-sufficient could see stiff competition for public sales, generating a potential cost-price squeeze that can not be overcome by the small marginal firm. Companies with establishments located in both the Pacific Northwest and the South are facing a tremendous period of change and upheaval in the raw material market as they face declining softwood supplies and increasing competition.

LITERATURE CITED

1. Adams, Darius M., and Richard W. Haynes. 1980. "The 1980 Softwood Timber Assessment Market Model: Structure, Projections, and Policy Simulations." Forest Science, Monograph 22, Supplement to Forest Science, Vol. 26, No. 3. 64 pages.
2. Anthony Robert N., and John Deardon. 1980. Management Control Systems. Richard D. Irwin, Inc., Homewood, Illinois. 724 pages.
3. Bremner, Steven S. "Developing a Strategic Plan for a Forest Products Company: A Case Study." Studies in Management and Accounting for the Forest Products Industries, School of Business, Oregon State University, Corvallis, OR. 7 pages.
4. Resource Information Systems, Inc., and Resource Economics International, Inc. 1985. "The Timber Situation in 12 Southern States- Volume II: Projections of Forest Area, Inventory, Growth, Harvest and Prices Through 2015." Resource Information Systems, Inc., Bedford, MA. 500 pages.
5. Tedder, P. L., D. D. Flick, and R. N. La Mont. 1986. "Private Timber Supplies May Rise Sharply in NW." Forest Industries, March 1986, pp. 18-19.
6. Tedder, P. L. and R. N. La Mont. 1986. "Projecting Timber Availability." Journal of Forestry, Vol. 84, No. 9, pp. 26-27.

INDUSTRY ADVISORY COUNCIL

Patricia Bedient
Arthur Andersen & Co.

David Dietzler
Peat, Marwick, Mitchell & Co.

Frank H. Eiseman
Arthur Young & Co. (Ret.)

George Funk
Sun Studs, Inc.

Wendell Hamilton
Coopers & Lybrand

William L. Hebert
Louisiana Pacific Corp.

Clayton W. Knodell
Willamette Industries, Inc.

Andrew R. Lessin
International Paper Company

Gill Miller
Nicolai Co.

Jack Sherman
Boise Cascade Corp.

UNIVERSITY COUNCIL

Jack C. Bailes
College of Business

Charles W. Dane
College of Business

John A. Drexler, Jr.
College of Business

Robert O. McMahon
College of Forestry

Charles Neyhart - Director
College of Business

Studies in Management and Accounting
in the Forest Products Industry

Oregon State University

| <u>No.</u> | <u>Monograph Title</u> |
|------------|---|
| 1 | "The Rush to LIFO: Is It Always Good for Wood Products Firms?" (1976). |
| 2 | "Accounting and Financial Management in the Forest Products Industries: A Guide to the Published Literature," (1977 and 1981). OUT OF PRINT - TO BE UPDATED |
| 3 | "A Decision Framework for Trading Lumber Futures," (October 1975). |
| 4 | "Capital Gains Tax Treatment in the Forest Products Industries," (June 1976). SUPERCEDED |
| 5 | "Measurement Difficulties in the Log Conversion Process," (June 1976). |
| 6 | "Capital Budgeting Practices in the Forest Products Industry," (March 1978). |
| 7 | "A Reporting and Control System for Wood Products Futures Trading Activities," (July 1978). |
| 8 | "Selected Issues of Financial Accounting and Reporting for Timber," (November 1978). |
| 9 | "Pool Log Transfer System," (August 1979). |
| 10 | "Fundamentals of Financing Major Timber Acquisitions," (February 1980). |
| 11 | "LIFO Inventories in the Forest Products Industry," (July 1980). |
| 12 | "Accounting Controls for a Forest Products Firm," (January 1981). |
| 13 | "Log Inventory Controls," (April 1981). |
| 14 | "Accounting Treatment for Wood Products Futures Trading Activities," (October 1981). |
| 15 | "A Reporting and Planning System for a Wood Products Operation," (November 1981). |
| 16 | "Boise Cascade's Productivity Improvement Program," (January 1982). |
| 17 | "Information Systems Planning in Weyerhaeuser Company," (August 1982). |
| 18 | "Developing a Strategic Plan for a Forest Products Company: A Case Study," (March 1983). |
| 19 | "Company/Employee Gainsharing Programs," (July 1983). |
| 20 | "Productivity Improvement Programs of Knowledge Workers in the Forest Products Industry," (November 1983). |
| 21 | "Microcomputer Modeling in the Forest Products Industry," (May 1984). |
| 22 | "Control and Measurement of Chips," (September 1984). |
| 23 | "Accounting for Buying Back Timber Cutting Contracts," (December 1984). |
| 24 | "Developing Cross-Hedging Strategies Based on Lumber Price-Change Variation and Seasonality," (May 1985). |
| 25 | "Unique Financial Reporting Considerations for Readers of Forest Products Companies Financial Statements," (November 1985). |
| 26 | "Improving Productivity Through Internal Contracting," (March 1986). |
| 27 | "Perspectives on the Timber Industry from a Lender's Standpoint," (October 1986). |
| 28 | "Long-Term Timber Supply and Its Importance in Strategic Planning," (March 1987). |

Studies in Management and Accounting for the Forest Products Industry

This series of monographs is published by the College of Business and the College of Forestry, Oregon State University, to disseminate information, research findings, and informed opinion about current problems and opportunities in the management of, and accounting for, enterprises in the forest and wood products industries. The views expressed herein are those of the author(s), and do not necessarily represent those of Oregon State University.

Additional information about these Studies may be obtained from the program director, at the College of Business, Oregon State University, Corvallis, Oregon 97331.

