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W.J. Ondro and T.B. Williamson
Northern Forest Research Centre

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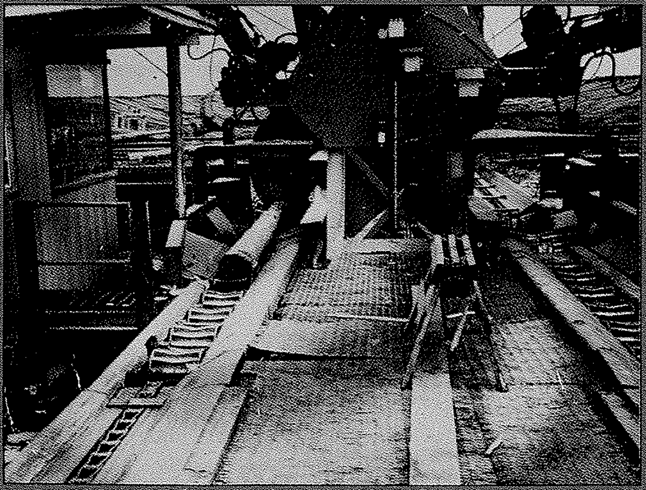

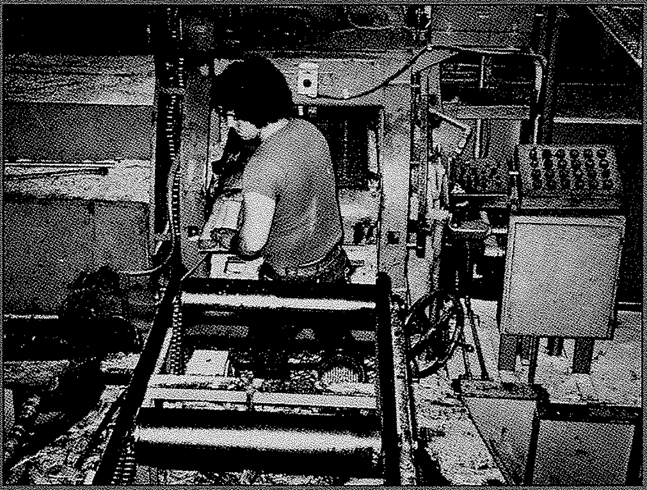

Front cover, clockwise from upper left: mechanized logging, log sort system, cut-off saw, and gang edger.

THE FOREST INDUSTRY IN THE ECONOMY OF ALBERTA, 1978-79

W.J. ONDRO AND T.B. WILLIAMSON

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ABSTRACT

The forest industry in Alberta was surveyed in 1979. The results are analyzed in this report in terms of forest resources, capital, employment impact, capacity and production, markets, annual revenues and expenditures, and socio-economic impact. Numerous tables and figures provide detailed information.

RÉSUMÉ

Les résultats d'une étude sur l'industrie forestière de l'Alberta réalisée en 1979 sont analysés dans ce rapport sur le plan des ressources forestières, des capitaux, des emplois, des possibilités et de la production, des marchés, des recettes et des dépenses annuelles et des effets socioéconomiques. On y trouve un grand nombre de tableaux et de données qui fournissent des renseignements détaillés.

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CHAPTER I

INTRODUCTION

The forest is one of Alberta's most important resources. The Green Area, which refers to the forested areas of the province, contains the vast majority of Alberta's forest resources and is administered and managed by the Alberta Forest Service (AFS), part of the Department of Energy and Natural Resources (Fig. 1)[1]. The mandate of the AFS is "the management of Alberta's forest lands to ensure a perpetual supply of benefits and products, while maintaining a forest environment of high quality" (Alberta Energy and Natural Resources 1980). AFS management of the forest resource is guided by three policies: the principle of sustained yield, the concept of multiple use, and a commitment to sound environmental practices.

Forest resources are limited. Should they be developed? At what rate? Who should receive the benefits? Who should pay the costs of forest resource development and management? Who should pay for forest renewal? These are questions that must ultimately be dealt with by the political process. Quantitative information, however, is a necessary tool for any policy formulation.

Currently, some forest industry statistics are provided by central data collection agencies such as Statistics Canada and the Alberta Bureau of Statistics. Although valuable, the information provided by these agencies does not meet the needs of all users of forest industry statistics. To fully understand the nature and economic impact of industrial utilization of the forest resource, a more comprehensive set of information is necessary.

This report provides detailed statistics on commercial utilization of the forest resource in Alberta. The data were collected for 1978-79 as part of a Canadian Forestry Service study with the broad objectives of describing the size and structure of Alberta's forest industry and quantifying its impact on the provincial economy.

The specific objectives of this study were:

1. to describe the forest land and resources;
2. to outline major forest production facilities and their capacity by region;
3. to evaluate employment in manufacturing and woodlands;
4. to survey and assess the fixed capital and its role in the forest industry;
5. to quantify the major forest products and identify their export by industry groups and regions;
6. to establish the major economic benefits of the forest resource to the regions and to the province; and
7. to examine the potential for industry expansion with a commitment of forest land to fiber production with high wood utilization practice.

In particular, this report discusses such aspects as wood supply, capital, employment, salaries and wages, physical output, exports, revenues, value added, expenditures, and community stability. The information is primarily presented by

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[1] In addition to the Green Area, the AFS is responsible for aspects of timber management and administration in areas directly outlying the Green Area. These are called "0" zones.

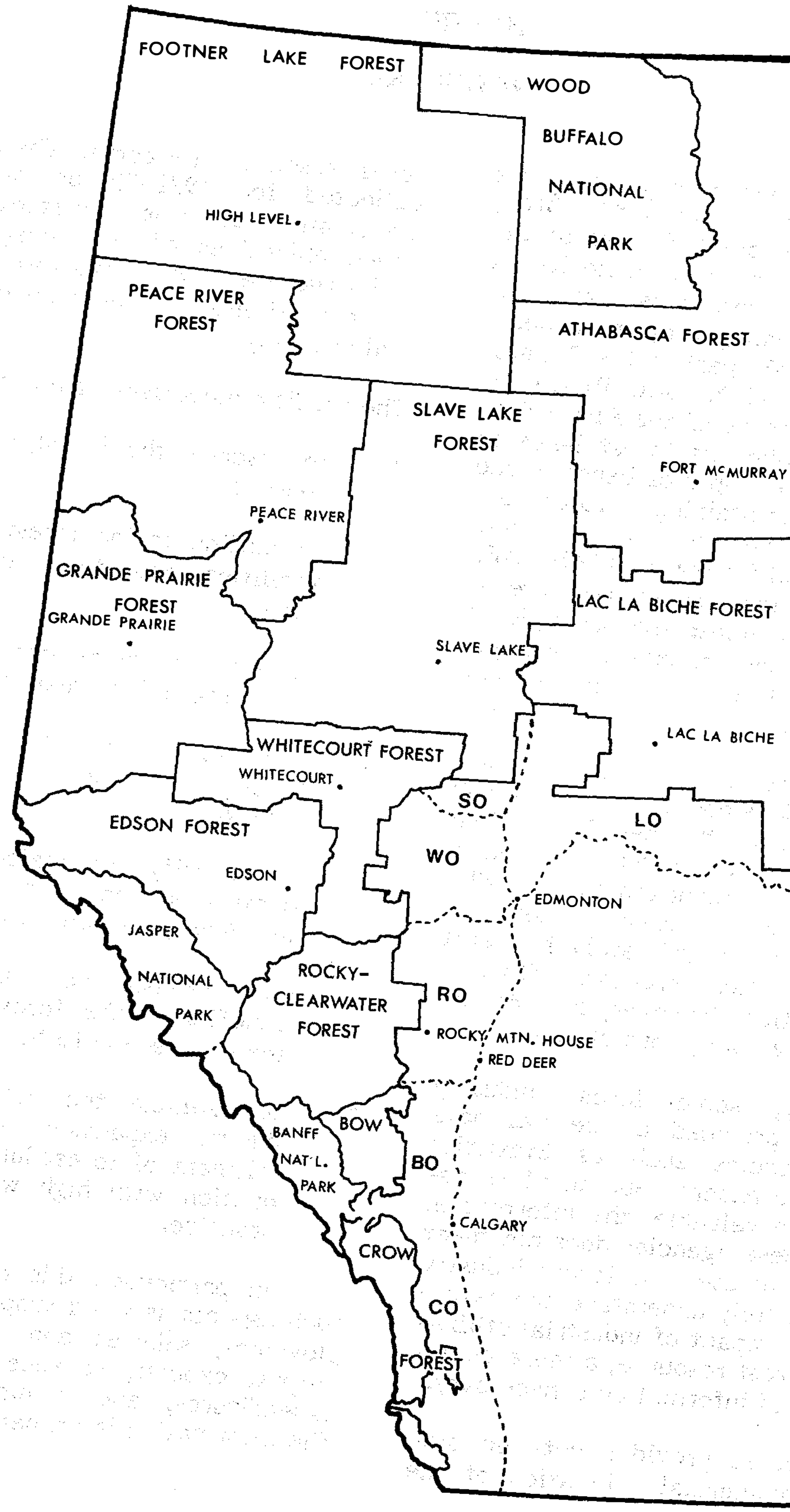


Figure 1. Location of provincial forests.

industry, region, or industry and region combined.

The information in this report covers both the fiscal year 1978-79 and the calendar year 1978, depending on the source. Since then, harvests, output of forest products, employment, and other economic indicators in Alberta have steadily increased to record levels in 1981-82.

The harvest from provincial forests in Alberta increased from 230.2 million cu. ft. (6.5 million m^3) in 1978-79 to 247.0 million cu. ft. (7.0 million m^3) in 1979-80, 249.8 million cu. ft. (7.1 million m^3) in 1980-81, and 260.8 million cu. ft. (7.4 million m^3) in 1981-82. This is an increase of 7.3%, 1.1%, and 4.4% for each year.

The current recession has lowered demands for forest products for both export and domestic markets and has reduced the demand for labor, even though harvest levels continue to rise.

Economic Assessment Variables

The variables traditionally used to assess the economic impact of the forest industry on the economy include production, value added, salaries and wages, and number of employees. Because these data are usually presented in an aggregate form, it was difficult to evaluate the impact of a single industry group or the collective industry in one region. Moreover, no single variable can conclusively measure all the economic and social factors important to policy formation and management decisions.

Economic impact variables used for assessment of an industry must

1. reflect the more important economic goals of the province;

2. be quantifiable; and

3. provide the structure of industry and its impact in various regions.

The majority of the economic impact variables are quantifiable, having direct or indirect effects on the economy. For example, when salaries and wages earned by forest industry employees are spent, they create additional jobs and income for workers in other parts of the economy as the demands for food, clothing, medical care, transportation, travel, and entertainment are satisfied. The magnitude of the demand depends on the overall level of employment and amount of earnings retained in the economy.

Economic impact variables are traditionally collected by Statistics Canada for medium- to large-sized industry complexes by province. This type of assessment neither represents the total economic impact of the industry nor contains sufficient detail for policy makers and management agencies.

In this report, data are summarized by industry group and by administrative region designated as *Forest* by the Alberta Forest Service. Emphasis was given to inputs of primary wood-using industries. Furthermore, special attention was paid to wood and labor inputs as well as types and quantities of forest products produced. Transportation distances from woodlands to mills and from mills to markets were summarized by industry group and region. A list of forest products was compiled that documented production of dimension and composite stock, timbers, boards, and other products. Cost of production, existing capital value of the industry infrastructure, and future needs were evaluated in light of regional wood supply. The output of forest products was tabulated by product group, production region, consumption region, and export destination. The present output of forest products was used to estimate adequacy of existing facilities and products and the need for new ones. The data were collected in Imperial measures since the forest industry has not yet changed to metric units. See Appendix 1 for conversion factors.

Classification of Forest Industry

This report uses specific meanings for the terms *forest industry* and *primary wood-using industry.* The forest industry includes all industries classified as major groups 4, 5, 25, and 27, divisions C and E (Logging and Forestry and Manufacturing Industries), of the Standard Industrial Classification Manual (Statistics Canada 1980). A list of these industries is given in Appendix 2.

In this report the term *forest industry* is limited to predominantly primary wood-using industries. It includes only those firms using roundwood or wood chips in their manufacturing processes. Data for the logging industry (Major Group 4, Division C (Forestry)) were included where applicable. Forest industry groups included in the NoFRC Forest Industry Survey are listed in Table 1. To preserve confidentiality of data from individual firms, asphalt roofing manufacturers and fiberboard plants were combined with the pulp mills for the purposes of analysis. Only asphalt roofing manufacturers utilizing roundwood or wood chips were included.

Data Collection and Survey Techniques

A scarcity of detailed data on economic indicators prompted the survey of the Alberta forest industry. The study was designed to collect information supplementary to that provided by the Forestry Statistics Section of the Manufacturing and Primary Industries Division of Statistics Canada.

A detailed questionnaire[2] was used along with personal interviews. The list of forest industry firms was taken from the *Directory of Primary Wood-using Industries in Alberta, Saskatchewan, and Manitoba 1972* (Teskey and Smyth 1973) and from the records of the Alberta Forest Service. A complete census of all forest industry groups was carried out; the response rate is indicated in Table 2. Originally, publication of a new directory was not planned; however, to accommodate a request of the Alberta Forest Service, the *Directory of Primary Wood-using Industries in Alberta, 1979* (Ondro *et al.* 1980) was published in the spring of 1980.

Sawmills were categorized into four groups according to 1978 production (in terms of foot board measure, fbm)[3]:

(i) *large* sawmills, output equal to or exceeding 5 MM fbm;

(ii) *medium*, output between 1 MM fbm and 5 MM fbm;

(iii) *small*, output between 100 M to 1 MM fbm; and

(iv) output less than 100 M fbm, also classified as *small.*

All sawmills were surveyed.

All planing, plywood, wood preservation, miscellaneous wood-using, and pulp, paper, and allied mills were surveyed, as were all log producers. This was done to identify the intra-industry log transfers while avoiding log production double counts. Locations of firms surveyed are shown in Fig. 2.

From January to March 1979, the survey questionnaire was designed and examined for suitability for data processing. Field interviews began in May 1979. Where possible, data were collected for the 1978-79 fiscal year; otherwise, data were obtained for the 1978 calendar year. After a short field trial, the questionnaire was slightly modified to clarify the questions for both interviewers and representatives of the firms. All question-

[2] Copies of the questionnaire are available on request.
[3] M = thousand; MM = million.

Table 1. Industries included in NoFRC's Alberta Forest Industry Survey, 1979

Industry group	Standard Industrial Classification Code (SIC)
Forestry	
Logging	041
Wood industries	
Sawmills and planing mills (except shingle mills)	2512
Wood preservation industry	2591
Veneer and plywood mills	2522
Paper and allied industries	
Pulp and paper mills	271
Asphalt roofing manufacturers	272
Miscellaneous	
Other millwork industries	2549
Wooden box and pallet industry	2561

Table 2. Survey population of forest industry groups in Alberta, 1979

Industry group	Total no. of firms	No. surveyed	% interview completion
Sawmills			
5 MM fbm and over	26	25	96
1 MM to 5 MM fbm	29	29	100
100 M to 1 MM fbm	128	128	100
Less than 100 M fbm	211	211	100
Independent planing mills	18	18	100
Plywood	3	3	100
Wood preservation	18	18	100
Miscellaneous	20	20	100
Pulp, paper, and allied	5	5	100
Independent log producers	-	-	-
Total	458	457	

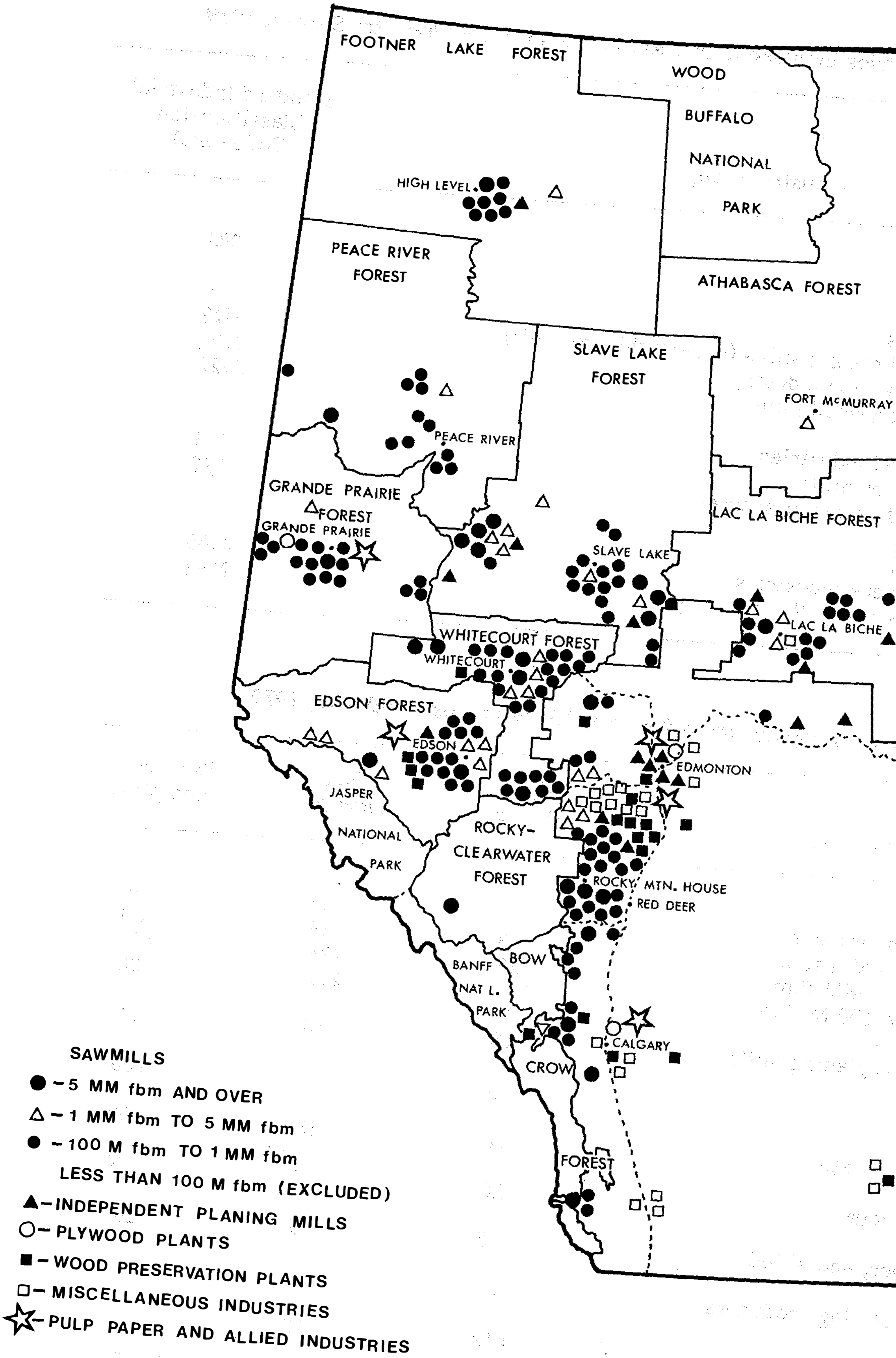


Figure 2. Distribution of forest industries by region, 1979.

naires were subjected to office audit to ensure completion, internal consistency, and accuracy. The field phase of interviews was completed in November 1979, with the office audit completed by March 1980.

Personnel from the Northern Forest Research Centre involved in the survey were W. Ondro, Senior Economist, and R. Bohning and G. Stevenson, Forest Economics Technicians. They received instructions on interpretation of questionnaires, techniques of conducting field and telephone interviews, and rationale for completing the questionnaires on the specified forms. The office review of the questionnaire was followed by field training to ensure uniform interviewing by enumerators.

The Alberta Forest Products Association and the Alberta Forest Service were most helpful in conveying the purpose of the study to the industries and in locating remote firms.

Analytical Procedures

In questionnaires with inconsistencies, follow-up calls were made, either in person or by telephone. A similar course of action was taken when quantities of production and total costs suggested averages that were not consistent for the given industry group. Corrections were made through confirmation with the firm representative. The data for each industry group were then tabulated and the summaries of number of observations, averages, and variances were examined for consistency.

Data for a number of industry groups were collected and summarized. In order to satisfy the requests of some firms and the confidentiality criteria set out by the federal statistics act, the data do not appear in disaggregated form in the report. Some of the important summary tables are provided in the appendixes.

Because data were collected in Imperial units and rounding off was common practice in conversions, some of the data may not add up exactly to the totals given.

CHAPTER II

THE ALBERTA FOREST INDUSTRY: A PERSPECTIVE

Historical Development of the Forest Industry

The first industrial use of Alberta's forest resources occurred in the early 1880s with the construction of Canadian Pacific Railway's transcontinental route (Environment Conservation Authority (ECA) 1977). Settlement of the prairies during and after construction of the railway was vigorous, creating a healthy local demand for ties, timbers, and lumber. The demand for these products was most pronounced in the major population centers of Calgary and Edmonton and, consequently, sawmilling activity was concentrated near these areas (Teskey and Smyth 1975). Figures on volume of wood harvested from provincial lands indicate that in 1913 a total of 50 million board feet was harvested and processed by 10 sawmills in the vicinities of Calgary and Edmonton (ECA 1977). Harvesting operations that supplied the Calgary mills were in the Bow and Kananaskis river valleys, and Edmonton-area sawmills were supplied by harvesting operations in the Edson area (Teskey and Smyth 1975). From 1900 to 1930, sawmilling grew rapidly.

The Great Depression of the early thirties caused a decline in forest industry activity, but production began to recover in the late thirties. By the forties, logging activity was extended into the Peace and Athabasca river districts (Teskey and Smyth 1975).

By 1951 sawmills were producing over 369 million board feet annually (Alberta Department of Lands and Forests 1952). This production was distributed among 33 sawmills with annual capacities of 2-10 million board feet per year and a large number of smaller mills (Davis *et al.* 1957). By this time the regional distribution of the mills had also shifted from the Edmonton and Calgary areas into the forested regions. The majority of the 33 large mills were located in the Grande Prairie and Slave Lake forests (Fig. 3).

Value added for forest products in the prairie provinces and in Canada showed a general increase during 1926-54 (Table 3). Although the numbers in Table 3 are not specific to Alberta, they provide an indication of the relative growth rate in the region during that period. For the prairie provinces, value added was 650% higher in 1954 than in 1926, while for Canada as a whole the increase during the same period was 480%.

In 1956 the first large-scale capital investment in the forest industry in Alberta was completed with the construction of Northwest Pulp and Power's (now St. Regis, Alberta) bleached sulfate kraft pulp mill at Hinton.

The year 1956 also marks the beginning of the diversification of forest products industries in Alberta. Prior to 1956 commercial processing of the forest resource was limited to the production of lumber required to satisfy regional demand. After 1956 the forest products sector diversified into pulp, plywood, wood preservation, and other miscellaneous wood-using industries.

At the same time, changes were also occurring in the sawmill industry. The implementation of the quota system in 1966 provided assurance of longer-term supplies of timber to sawmill facilities. Thus, investment in larger-scale, capital-intensive sawmill facilities was more attractive and made the sawmill industry more stable.

In 1974 a second major capital investment project was completed with the construction of Procter and Gamble's bleached kraft pulp mill at Grande Prairie.

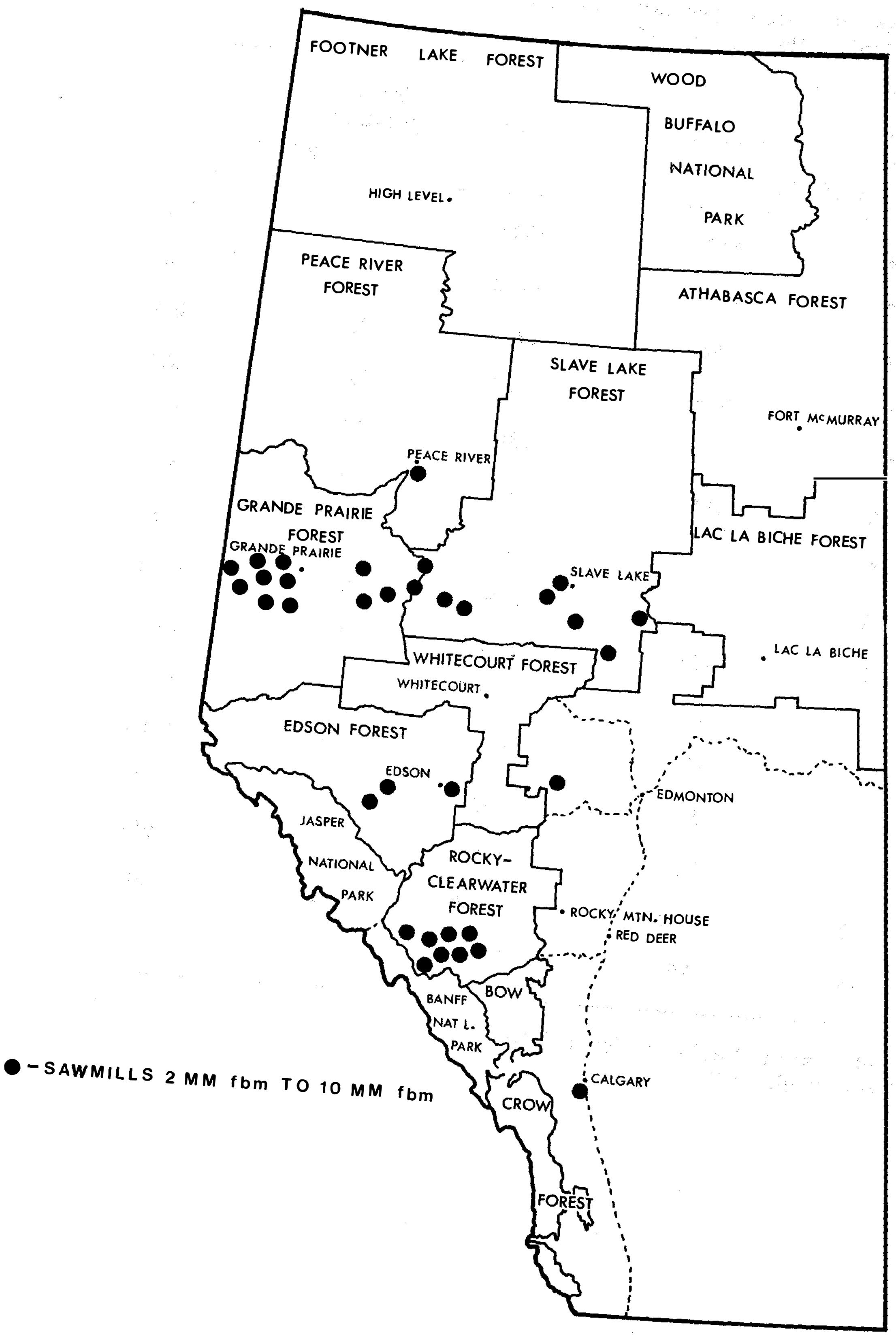


Figure 3. Location of sawmills producing 2 MM fbm and more in 1951.

Table 3. Value added of forest products in the prairie provinces and in Canada in nominal[a] dollars, 1926-54[b]

Year	Prairie provinces ($000 000)	Canada	Year	Prairie provinces ($000 000)	Canada
1926	14	413	1941	23	537
1927	19	421	1942	24	560
1928	20	448	1943	28	603
1929	25	466	1944	32	668
1930	24	417	1945	35	721
1931	18	298	1946	42	918
1932	9	205	1947	52	1220
1933	8	196	1948	61	1377
1934	9	233	1949	62	1373
1935	10	250	1950	71	1593
1936	12	290	1951	52	1965
1937	14	355	1952	94	1932
1938	12	310	1953	95	1988
1939	13	343	1954	91	1998
1940	18	459			

[a] Nominal dollars are not adjusted for inflation.
[b] Source: Davis *et al.* 1957.

Forest Industry Profiles

The Sawmill Industry

Alberta's sawmill industry shows a level of variability unparalleled in other forest industries because of the wide variation in the productive capacity of the mills. The sawmill industry is composed of operations with annual outputs ranging from less than 5000 fbm per year to 90 000 000 fbm per year (Table 4). Although there are more small sawmills, total production is largely concentrated in the largest size class. In fact, in 1978-79 the top nine sawmills (2.3% of all sawmills) produced 60% of the total sawmill output (Table 5). In comparison, in 1972 the top nine mills (4.2% of sawmills) produced 42% of the total output.

There is a clear trend toward enlargement of sawmill capacity. In 1972, average engineered capacity of the largest 26 sawmills was 61 M fbm per 8-hour shift. In 1978-79, average rated capacity of the 26 largest sawmills increased to 94 M fbm per shift.

Despite their relatively minor contribution to total output, the small sawmills play important roles in local economies for three reasons. First, the revenues generated by these operations are an important source of primary and supplementary income to both full-time and part-time independent operators. Second, they are an important source of supply of low-cost lumber in local economies. Third, they utilize isolated tracts of timber that may be considered uneconomical by larger operators.

Ownership in the industry varies from large multinational corporations to small single proprietorships: 4 plants are foreign owned, 6 are owned by companies with other national interests, and 78 are owned by companies with exclusively provincial interests. The remaining mills are either single proprietorships or partnerships (Table 6). Although the foreign-owned plants account for less than 1% of the number of plants, they account for 32% of total production.

Portable sawmills are prevalent in the small production classes. Of the total number of sawmills producing less than 100 M fbm annually, 61% are portable (Table 7). The proportion of portable mills declines in the larger mill categories and none of the mills in the large class was portable.

The decreasing availability of large-diameter logs, increased utilization of sawmill by-products, desire to maximize productivity, and availability of new technology have all caused a significant shift in the methods of production in the large sawmills. Comparing 1978 to 1972, a larger proportion of sawmills are now equipped with debarking, bucking, and chipping facilities, and there has been a decline in the proportion of mills using circular headsaws (Table 8). Innovation is also evident, with 19% of the largest sawmills using recently developed log processing systems such as Chip-N-Saws and Chipping Canters. In 1972, none of the mills in this production class used these methods of production.

The operating ratio is the ratio of normal output per 8-hour shift to engineered capacity per 8-hour shift. If the resulting value is less than one, then existing plant capital is underutilized (on a per-shift basis). If the value equals one, then any expansion in production requires either additional capital expenditure or an increase in the number of shifts worked. The engineered capacity of large-class sawmills (5 MM fbm and over annually) is 93 429 fbm per 8-hour shift. Average output is 60 200 fbm per 8-hour shift (operating ratio = 0.644). Sawmills with annual outputs of 1 MM to 5 MM, 100 M to 1 MM, and less than 100 M had operating ratios in 1978 of 0.73, 0.48, and 0.59, respectively.

The number of shifts per week is an additional factor dictating production with existing capital stock. The average number of shifts per operating week ranged from 7.9 in large sawmills to 4.7 in sawmills with production less than 100 M fbm annually (Table 9).

Table 4. Range of annual production in Alberta by forest industry group, 1978-79

Industry group	Lowest annual output	Highest annual output
Sawmills	5 M fbm	90 000 M fbm
Independent planing mills	10 M fbm	21 000 M fbm
Plywood (1/16-in. basis)	154 MM sq. ft.	694 MM sq. ft.
Wood preservation	10 M cu. ft.	3 722 M cu. ft.
Miscellaneous	10 M fbm	7 000 M fbm
Pulp, paper, and allied		
Building paper, roof felts	12 000 tons	30 000 tons
Fiberboard (1/2-in. basis)	48 MM sq. ft.	60 MM sq. ft.
Pulp	194 000 tons	280 000 tons

Table 5. Concentration of production in the sawmill industry in 1972[a] and 1978-79

1972			1978-79		
Cumulative no. of mills	Cumulative % of mills	Cumulative % of total production	Cumulative no. of mills	Cumulative % of mills	Cumulative % of total production
6	2.8	32.4	3	0.8	32.9
9	4.2	41.9	6	1.5	50.7
16	7.5	68.1	9	2.3	60.5
28	13.1	81.8	16	4.1	75.4
46	21.6	88.6	28	7.1	87.6
59	27.7	93.3	55	14.0	94.0
185	86.9	99.9	183	46.4	98.9
213	100.0	100.0	394	100.0	100.0

[a] Source: Teskey and Smyth 1975.

Table 6. Ownership in the forest industry groups, 1978-79

Industry group	Single proprietorship		Partnership		Limited liability companies					
					Provincial		Other national		Foreign	
	No.	% of mills	No.	% of mills	No.	% of mills	No.	% of mills	No.	% of mills
Sawmills										
5 MM fbm and over	0	0	0	0	16	62	6	23	4	15
1 MM to 5 MM fbm	5	17	0	0	24	83	0	0	0	0
100 M to 1 MM fbm	85	66	14	11	29	23	0	0	0	0
Less than 100 M fbm	188	89	14	7	9	4	0	0	0	0
Independent planing mills	6	30	1	5	12	60	0	0	1	5
Plywood	0	0	0	0	0	0	2	67	1	33
Wood preservation	4	22	0	0	9	50	4	22	1	6
Miscellaneous	8	40	0	0	12	60	0	0	0	0
Pulp, paper, and allied	0	0	0	0	0	0	3	60	2	40
Total	296		29		110		14		9	

Table 7. Portable and stationary sawmills and planing mills in Alberta, 1978-79

Industry group	Stationary		Portable	
	No.	%	No.	%
Sawmills				
5 MM fbm and over	26	100	0	0
1 MM to 5 MM fbm	25	86	4	14
100 M to 1 MM fbm	95	74	33	26
Less than 100 M fbm	39	39	61	61
Independent planing mills	9	45	11	55

Table 8. Distribution of lumber processing equipment in sawmills with 5 MM fbm and over annual production in 1972 and 1978-79[a]

Facility	1972[b] (% of mills)	1978-79[c] (% of mills)
Debarker	13	46
Cut-off saw (bucking)	16	73
Circular headsaw	81	58
Band, quad, or gang saw	64	61
Chip-N-Saw, chipping canter	0	19
Reman or resaw	35	65
Edger and trimmer	90	96
Chipper	13	19
Chipping edger	3	15
Planer	74	85
Kiln	35	38

[a] Source: Appendix 3.
[b] Total of 31 mills.
[c] Total of 26 mills.

Table 9. Distribution of shift hours, shifts per week, and employees per shift by forest industry group, 1978-79

Industry group	Average hours per shift	Average shifts per week	Average employees per shift
Sawmills			
5 MM fbm and over	8.5	7.9	42.4
1 MM to 5 MM fbm	8.2	4.9	10.4
100 M to 1 MM fbm	8.0	5.1	4.7
Less than 100 M fbm	7.6	4.7	2.6
Independent planing mills	8.2	5.1	7.4
Plywood	8.0	15.0	37.0
Wood preservation	8.0	5.2	25.1
Miscellaneous	8.0	5.3	3.3
Pulp, paper, and allied	8.8	20.4	46.0

Table 10. Ownership tenure by forest industry group, 1978-79

Industry group	Average length of current ownership (years)
Sawmills	
5 MM fbm and over	15.2
1 MM to 5 MM fbm	12.1
100 M to 1 MM fbm	11.7
Less than 100 M fbm	10.0
Independent planing mills	28.6
Plywood	20.7
Wood preservation	18.9
Miscellaneous	6.7
Pulp mills	15.0
Paper and fiberboard	10.0

Sawmill ownership has been relatively stable. The number of years of current ownership ranges from a high of 15.2 years for sawmills with 5 MM fbm and over annual output to a low of 10.0 years for sawmills with less than 100 M fbm annual output (Table 10).

The sawmill industry is well distributed throughout the province with the exception of in the undeveloped Athabasca and Footner Lake forests. The Whitecourt and Slave Lake forests have most of the larger sawmills, and the Grande Prairie Forest has most of the medium and small sawmills (Fig. 2). An interesting feature of location is the proportion of mills in small population centers: 65% of large sawmills and 68% of medium sawmills are located in towns with populations of less than 2500 (Table 11).

The Planing Mill Industry

In the production of dressed lumber the planing phase occurs after the sawing and drying phases.

Planing is a uniquely identifiable activity and can be considered an industry in itself. Because the logical location of planing facilities is near sawing facilities, a large number of sawmill operations have planing lines directly attached to sawing plants. All the employment generated, costs incurred, and extra revenues created by the planing process for these vertically integrated mills have been included in the figures for the sawmill industry.

There are 21 independent planing mill operations in Alberta. Important characteristics of the independent planing mills are the following:

1. Annual outputs of individual plants range from 10 000 to 21 000 000 fbm (Table 4).

2. Engineered capacities per 8-hour shift range from 10 000 to 90 000 fbm.

3. The average engineered capacity per 8-hour shift is 55 000 fbm, and the average output per 8-hour shift is 38 750 fbm (operating ratio of 0.70).

4. The average number of hours per shift is 8.2 and the average number of shifts per week is 5.1 (Table 9).

5. The average age of mill equipment is 26.0 years.

6. Current length of ownership averages 28.6 years (Table 10).

7. Sixty-five percent of the mills are limited liability companies and 35% are single proprietorships or partnerships (Table 6).

8. Forty-five percent of the mills are stationary and 55% are portable (Table 7).

9. Sixty-nine percent of the production is concentrated among the top three mills.

Miscellaneous Forest Industries

The 20 plants in this industrial category produce a variety of final products including pallets, lath, and building timbers. For convenience, the plants in this group have been placed in one industrial category.

Included within this industry group are nine pallet-producing plants, nine lath mills, and two building timber plants. All of the pallet-producing plants are limited liability companies. These mills are located in or near Edmonton, Calgary, Medicine Hat, and Lethbridge. All of the lath mills are single proprietorships located within a 50-mile (80-km) radius of Rocky Mountain House. The two building timber plants, located at Lac La Biche and Claresholm, are limited companies.

Table 11. Distribution of sawmills in relation to population centers, 1978-79

Population of nearest community	5 MM fbm and over annual production		1 MM to 5 MM fbm annual production	
	No.	%	No.	%
Greater than 5000	3	12	7	25
2500 - 5000	6	23	2	7
1000 - 2500	6	23	8	29
Less than 1000	11	42	11	39
Total	26	100	28[a]	100

[a] One of the mills in this class is too remote to be allied with any community.

Table 12. Concentration of production in the wood preservation industry, 1978-79

Number of plants	Cumulative % of plants	Cumulative % of total production
2	11	71
3	17	82
7	39	95
18	100	100

Wood Preservation Industry

Of the 18 plants within the wood-treating industry, 9 produce over 100 000 cu. ft. per year and 9 produce 100 000 cu. ft. or less per year of preservative-treated stock.

Two separate methods and three types of preservatives are used in Alberta. The two methods are the use of either open tanks or pressure-treating cylinders. The industry is equipped with 20 open tanks and 11 pressurized cylinders. The three primary preservatives used are pentachlorophenol, creosote, and chromated copper arsenate.

Some important characteristics of the industry are the following:

1. The average rated capacity is 4400 cu. ft. per 8-hour shift.
2. The average number of hours per shift is 8.0 and the average number of shifts per week is 5.2 (Table 9).
3. The average age of equipment is 8.7 years.
4. Current length of ownership averages 18.9 years (Table 10).
5. Seventy-eight percent of the plants are limited liability companies and 22% are single proprietorships (Table 6).
6. The industry is concentrated, with 11% of the firms accounting for over 71% of the production (Table 12).
7. Eighty-nine percent of the total wood inputs are purchased, and 50% of the total wood input is purchased from outside the province.
8. Plants are distributed throughout the province, with most located in major population centers.

Plywood Industry

The three plants that represent this industry account for 5% of the total national production of plywood (Department of Industry, Trade and Commerce 1979). A significant factor preventing the expansion of the plywood industry is the presence of a 20% tariff on Canadian plywood entering US markets. As a result, all plywood produced in Alberta is marketed within Canada.

Some important characteristics of the industry are the following:

1. Average rated capacity per 8-hour shift is 1728 M sq. ft. (1/16-in. basis), and average output per 8-hour shift is 1235 M sq. ft. (operating ratio of 0.71).
2. The average number of hours per shift is 8 and the average number of shifts per week is 15 (Table 9).
3. The average age of equipment is 17 years.
4. Current length of ownership averages 21 years (Table 10).
5. All three plants are limited companies (Table 6).
6. One mill is foreign owned and two are national corporations (Table 6).

Pulp, Paper, and Allied Industry

Two pulp-producing mills, two mills producing construction grade paper and felt, and one fiberboard mill comprise this industry group. The pulp mills dominate the group, with 87% of the total sales and 48% of the total sales of the entire forest products sector. Because of the significantly larger contribution of the pulp mills, the values characterizing the industry are separated between the pulp mills and the paper, felt, and fiberboard mills.

Important characteristics of the two pulp mills are the following:

1. The average rated capacity is 284.5 tons per shift, and there is an average output of 302.5 tons per shift (operating ratio of 1.06).

2. The average number of hours per shift is 8, and the average number of shifts per week is 20.4 (Table 9).

3. Current length of ownership averages 15.0 years and average age of equipment is 14 years (Table 10).

4. Both plants are foreign owned.

Important characteristics of the paper, felt, and fiberboard mills are the following:

1. The average rated capacity is 67 500 sq. ft. (½-in. basis) of fiberboard and 34 tons of felt and paper per 8-hour shift, and the average normal output is 65 000 sq. ft. (½-in. basis) of fiberboard and 37.5 tons of felt and paper per 8-hour shift.

2. There is an operating ratio of 0.96 for the fiberboard mill and 1.10 for the paper and felt mills.

3. The average number of hours per shift is 8.8 and the average number of shifts per week is 20.4 (Table 9).

4. The average age of equipment is 14 years, and current length of ownership averages 10.0 years (Table 10).

5. All plants are Canadian owned; however, the two Building Products Ltd. plants are owned by Esso Chemicals Canada Ltd., which is a subsidiary of a foreign-owned multinational.

Vertical Integration

Vertically integrated firms are those operations that carry out "successive phases of the same overall production process" (Thompson 1973). There are a number of advantages to vertical integration.

> Through vertical integration, a firm can achieve many of the economies of size while staying within the limitations of local raw-material supply. The further a firm carries the processing of its product, the wider is its potential market and the more favorable its sales position. Vertical integration assures a market for the plants in the lower stages of processing and assures a supply of raw material to high stages of production. (Worrell 1959)

In response to these incentives, a number of firms in the forest industry in Alberta have become vertically integrated. The number of vertically integrated plants by industry is shown in Table 13.

Horizontal Integration

Horizontally integrated firms are multiplant enterprises that own and manage a number of geographically distinct plants, each producing a relatively homogeneous product.

> Horizontal integration of similar plants permits a firm to enjoy the advantages of a larger size without suffering the locational disadvantages of concentrated production at one point. Two integrated plants may be operated with less than twice the cost for administrative, technical and maintenance overhead. Because of the larger amounts of supplies bought and money borrowed the integrated firm may be able to get more favorable terms on purchases and financing. (Worrell 1959)

Table 13. Vertical integration[a] of forest industry groups, 1978-79

Industry group	No. of mills				
	Logging, sawing, & planing	Logging & sawing	Sawing & planing	Sawing only	Total
Sawmills					
5 MM fbm and over	22	2	1	1	26
1 MM to 5 MM fbm	14	14	1	-	29
100 M to 1 MM fbm	54	71	1	2	128
Less than 100 M fbm	49	159	1	2	211
Total sawmills	139	246	4	5	394
	Logging, veneer, & plywood	Veneer & plywood	Plywood only	Total	
Plywood	2	-	1	3	
	Logging, sawing, & preserving	Logging & preserving	Sawing & preserving	Preserving only	Total
Wood preservation	4[b]	6	2	6	18
	Logging & processing	Processing only	Total		
Miscellaneous					
Pallet plants	-	9	9		
Lath mills	9	-	9		
Building timber plants	-	2	2		
Total miscellaneous	9	11	20		

Continued on next page.

Table 13. Concluded

	Logging & processing	Processing only	Total
Pulp, paper, and allied	2	3	5

[a] Many of the firms considered to be vertically integrated (with respect to logging) utilized (either in part or exclusively) contractors in their logging operations.

[b] Two of the plants in this group (specifically Rocky Wood Preserves Ltd. at Rocky Mountain House and Revelstoke Companies Ltd. at Sundre) harvest, saw, plane, and preserve some of their products.

Table 14. Horizontal integration of forest industry groups, 1978-79

Sawmills

Simpson Timber Co. (Alberta) Ltd.[a]
- Mill at Blue Ridge
- Mill at Fox Creek

Canadian Forest Products Ltd.
- Mill at Grande Prairie
- Mill at Hines Creek

Revelstoke Companies Ltd.
- Mill at Harlech
- Mill at Sentinel
- Mill at Sundre

Wood preservation

Domtar Inc.
- Plant at Cochrane
- Plant at Edmonton

Pulp, paper, and allied

Building Products of Canada Ltd.
- Plant at Edmonton
- Plant at Wabamun

[a] Simpson Timber Co. Ltd. has recently been purchased by Alberta Energy Co. Ltd. and is now called Blue Ridge Lumber (Alberta) Ltd.

Table 15. Conglomerates by ownership and industry group, 1978-79

St. Regis (Alberta) Ltd.
- Sawmill at Hinton
- Bleached kraft pulp mill at Hinton

Koppers Company Inc.
- Swanson[a] Lumber Co. Ltd.: sawmill at High Level
- Swanson Lumber Co. Ltd.: planer at Chisholm mills
- Koppers International Canada Ltd.: wood treating plant at Camrose

Canadian Forest Products Ltd.
- Sawmills at Hines Creek and Grande Prairie
- Plywood mill at Grande Prairie

Ziedler Forest Industries Ltd.[b]
- Lumber and veneer plant at Slave Lake
- Plywood mill at Edmonton

NOTE: Rocky Wood Preservers Ltd. and Revelstoke Companies Ltd. have wood preserving facilities at the same location as their respective sawmills at Rocky Mountain House and Sundre.

[a] Swanson Lumber Co. Ltd. has recently been purchased by Canadian Forest Products Ltd.

[b] Ziedler Forest Industries Ltd. has recently purchased the Imperial Lumber Co. Ltd. sawmill at Barrhead.

Within the Alberta forest industry five separate firms have horizontally integrated plants (Table 14). Three firms are in the sawmill industry group, one is in the wood preservation industry group, and one is in the pulp, paper, and fiberboard industry group.

Conglomerates

Conglomerates are multiplant enterprises in which each plant produces a unique product. Diversified production can benefit both society and the firm. Improved fiber allocation and economies of scale are two incentives for integration of plants by consolidated conglomeration. An additional incentive is that "Product diversification frees the business firm from the life-and-death cycle of either specific products or industries and provides an almost impregnable defense against secular shifts in demand and technology." (Thompson 1973).

Six firms in Alberta are conglomerates (Table 15).

Future Development

Alberta is in the enviable position of possessing a large, relatively undeveloped forest resource base, much of which is economically operable. In fact, based on the volume of economically accessible softwood timber reserve, Alberta ranks third in development potential in Canada (Table 16).

Currently, 58% of the coniferous annual allowable cut and less than 1% of the hardwood annual allowable cut are being utilized in Alberta (Alberta Forest Service 1980). In light of this underdevelopment, a primary goal of the Alberta Forest Service is "within a policy framework of sustained yield management and economic utilization . . . to achieve the fullest possible utilization of the

Table 16. Annual allowable cut, timber reserves, and economic accessibility for softwoods by province[a]

Province	Annual allowable cut	Average[b] depletion by harvesting	Physical reserve	Economically[c] accessible physical reserve
	('000 000 cu. ft.)			
British Columbia[d]	3509	2407[e]	1102	532
Alberta	402	229[e]	173	142
Saskatchewan	159	81	78	39
Manitoba	189	66	123	67
Ontario	982	623[e]	359	278
Quebec	1464	899	565	95
New Brunswick	227	255	-28	-28
Nova Scotia	113	114	-1	-1
Prince Edward Island	8	5	3	3
Newfoundland	202	116	86	43
Total	7255	4795	2460	1170

[a] Source: Reed and Associates Ltd. 1978.
[b] Average harvest is the average of the best 2 years in the 3-year period 1973-75.
[c] Economic accessibility is subjectively derived based upon criteria such as location, relative timber quality, terrain, and delivered wood costs.
[d] Includes hardwood volumes.
[e] Expressed as depletion of the annual allowable cut utilization standard, which results in the indicated average harvest being higher than the actual harvest in areas where removals fall short of the utilization standard originally assumed in the allowable cut calculation.

Table 17. Annual allowable cut (AAC) in the future timber development areas[a]

	Surplus net AAC ('000 000 cu. ft.)		
Development area	Coniferous	Deciduous	Total
Athabasca	34.9	43.1	78.0
Brazeau	46.0	15.3	61.3
Fort McMurray	52.3	35.1	87.4
Peace River	27.2	50.2	77.4
Fort Vermilion	29.1	57.5	86.6

[a] Source: Alberta Forest Service 1980.

resources".[4] To achieve this objective, the AFS has identified five potential Timber Development Areas (TDA) (Fig. 4). They are, in order of their probable development, the Brazeau, Athabasca, Fort McMurray, Fort Vermilion, and Peace River development areas. Table 17 shows the surplus annual allowable cut (AAC) in each area. The intended use of the TDAs is to identify areas suited primarily to forest management agreements. The scattered nature of the timber and the high cost of gaining success preclude the further expansion of timber quotas in the areas.

Combined, the TDAs can theoretically support two kraft pulp mills, four thermomechanical pulp mills, one waferboard plant, one particle board plant, plus a number of large-scale sawmills (Alberta Forest Service 1980). These proposals are based not only on the availability of raw material but also on proximity to basic infrastructure and labor supply, existence of suitable supplies of water (for kraft pulp mills), and the availability of transportation networks (such as railway lines).

As previously mentioned, less than 1% of the hardwood AAC is currently being utilized. A number of barriers have prevented intensive utilization of Alberta's extensive hardwood resource; however, with the increased scarcity of coniferous species (relative to demand), changing technologies, and shifting consumer preferences, hardwoods can be expected to play an increasingly important role in forest industry development.

One area that holds considerable promise for the industrial utilization of aspen is the production of market pulp by chemical-mechanical pulping processes using a 50/50 mixture of softwood species and aspen. The pulp can be further processed into printing and writing paper, high-quality tissue, and bleached paper board. A recent report by Woodbridge, Reed, and Associates for the Alberta Research Council suggests that "Alberta has the fiber to support 3.5 million tons a year of mixed hardwood-softwood CMP. This will mean a direct employment of about 6000 people" (Woodbridge, Reed, and Associates 1981).

[4] Alberta Forest Service internal report entitled *Location of Future Forest Industry*. Available from Alberta Energy and Natural Resources, Alberta Forest Service, Edmonton.

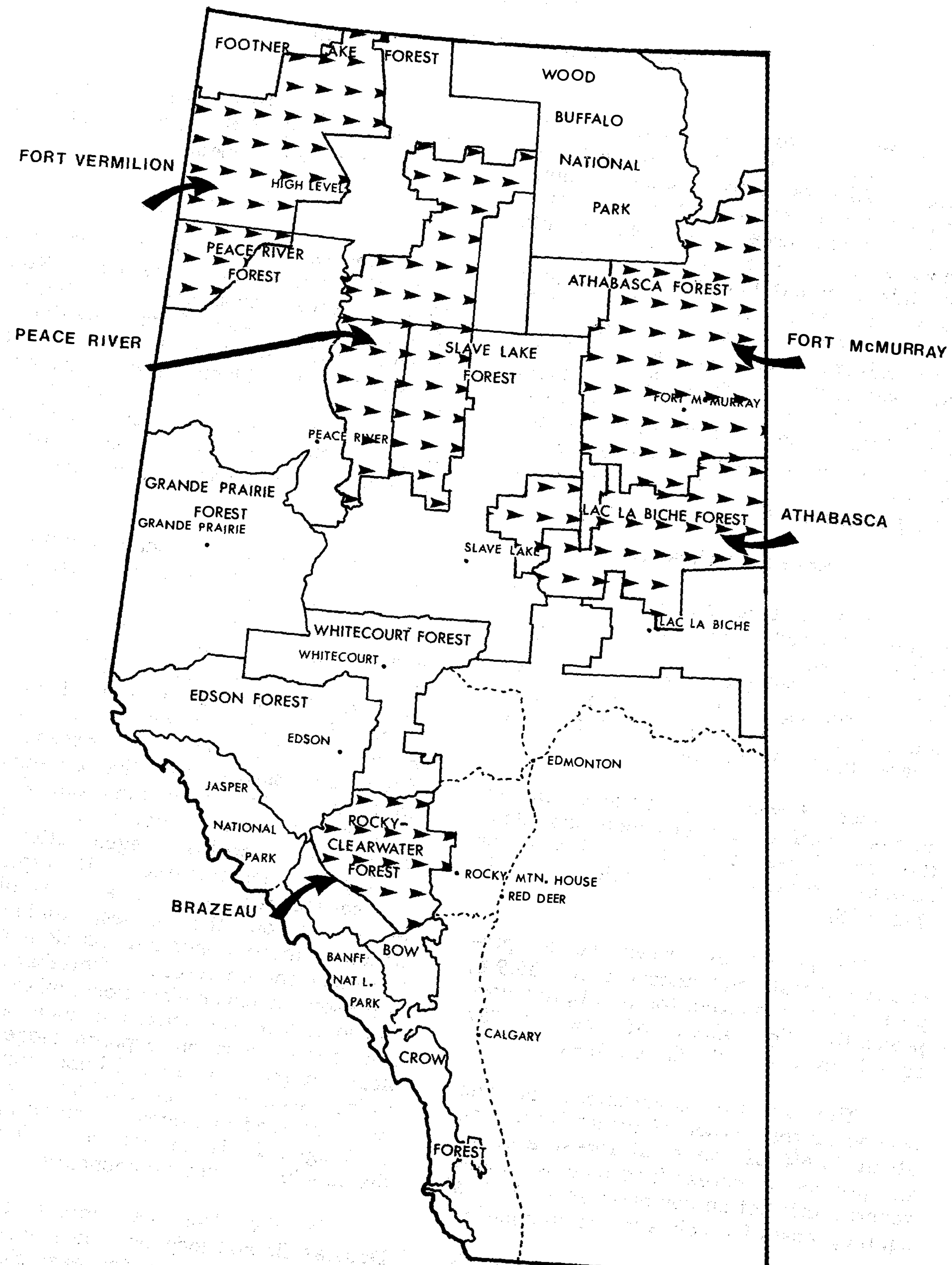


Figure 4. Future timber development areas.

CHAPTER III

ALBERTA'S FOREST RESOURCES

Alberta's forests contain over 57 000 million cubic feet of growing stock. Alberta ranks fourth among Canadian provinces in terms of both productive forest area and merchantable timber volume. The provincial crown is Alberta's principal landowner. The provincial government retains title to these lands and grants mineral and timber rights to the private sector under specific terms and conditions. Because the provincial crown land plays the most important role in wood supply and its potential allocation to the forest industry, this chapter examines the forest resources and harvesting on these lands.

Area Classification

The total area of Alberta is 255 285 sq. mi., of which land accounts for about 97.5% and water bodies account for 2.5% (Table 18). Forests cover 53.0% of the total area, agriculture occupies 30.0%, and about 14.0% is classified as urban cleared lands and wildlands.

Most forest lands situated in the northern half of the province and along the east slopes of the Rocky Mountains have been retained under public ownership (Table 19).

On provincial crown lands, productive forest land accounts for 39.9%, potentially productive for 16.3%, and nonproductive for 43.8% of the 171 087 sq. mi. of land in the Green Area.

The federal government is the second largest owner of forest land, with about 14.6% of the total forest area of the province. Forest land holdings under federal jurisdiction comprise about 24 886 sq. mi., most of which is in national parks.

Other forest lands in the province's Green Area are in Metis colonies (1951 sq. mi.) and Indian reserves (447 sq. mi.).

There are 10 964 sq. mi. of forest land, about 6.4% of the total forest area, that are privately owned.

Forest Regions

Alberta contains parts of three of Canada's major forest regions (Rowe 1972): Boreal, Subalpine, and Montane (Fig. 5). The Boreal Forest Region in Alberta is characterized by the presence of white spruce, black spruce, jack pine, and lodgepole pine, with balsam fir and tamarack as less common coniferous species. There is a general admixture of trembling aspen, balsam poplar, and white birch.

The East Slope Rockies Section of the Subalpine Forest Region occurs in the southwestern part of the province on the eastern slopes of the Rocky Mountains and adjacent rugged foothills at elevations of approximately 4500-6800 ft. This section is distinguished from the Upper Foothills Section of the Boreal Forest Region by the presence of Engelmann spruce and the Engelmann-white spruce hybrid combination. An important admixture species is lodgepole pine, whose prolific regeneration following fire has resulted in its replacing the spruce over large areas. At higher elevations on the slopes, alpine fir becomes more important, particularly in the older spruce forests. Whitebark pine is present at lower elevations, mixed with hybrid spruce and lodgepole pine, and is also conspicuous on exposed ridges and slopes at the tree line. Limber pine and alpine larch occur on similar sites in a few scattered locations. A small amount of Douglas fir is present on the fringe of the Subalpine-Montane boundary.

In the Montane Forest Region, Douglas fir and lodgepole pine occur in a few small patches on the east slopes of the Rocky Mountains. Only in the

Table 18. Area classification of Alberta, all areas combined[a,b]

Land classification	Area (sq. mi.)	% of total Alberta area
Forest land within the Green Area	102 040	40.0
Forest Management Agreement areas, provisional reserve	27 941	10.9
Vacant public land outside Green Area	6 026	2.4
Privately owned land	69 756	27.3
Public lands		
Leading to title	1 236	0.5
Not leading to title	10 972	4.3
Special areas	5 462	2.1
Parks, historic sites, wilderness areas, natural areas	3 019	1.2
Metis settlements	1 951	0.8
Indian reserves	2 536	1.0
Federally controlled lands	24 346	9.5
Total area of Alberta	255 285	100.0
Land	248 800	97.5
Water	6 485	2.5

[a] Green Area: Forest lands withdrawn from settlement and managed for forestry and other multiple uses.
Yellow Area: Lands located in the Peace River region. Public lands in this area are managed for multiple use, including agricultural uses, pursuant to The Public Lands Act and regulations.
White Area: The settled area of the province. Suitable public lands within this zone may be disposed of pursuant to The Public Lands Act and regulations, except for homestead sales dispositions.

[b] Source: Alberta Energy and Natural Resources 1982.

Table 19. Ownership and classification of forest land in the Green Area[a] of Alberta[b]

Land classification	Productive land	Potentially productive land	Nonproductive land	Total land	% of total land
	(sq. mi.)				
Provincial land, forest management units	55 509	21 851	48 041	125 401	73.2
"0" management units[c]	631	2 494	1 975	5 100	3.0
Provincial park areas	896	0	1 344	2 240	1.3
Natural areas	27	0	41	68	0.1
Department of National Defence and Air Weapons Range (Primrose,Suffield, and Wainwright)	631	693	699	2 023	1.2
Federal land, national parks area	5 012	0	15 870	20 882	12.2
Other federal lands (Research stations, Department of National Defence, etc.)	649	694	638	1 981	1.2
Private land in "0" management units[d]	3 837	1 864	5 263	10 964	6.4
Other land, Metis settlements	702	352	897	1 951	1.1
Indian reserves	329	0	148	477	0.3
Total	68 223	27 948	74 916	171 087	100.0

[a] Green Area: forested lands withdrawn from settlement and managed for forestry and other multiple uses.
[b] Source: Alberta Forest Service 1982.
[c] Management units under provincial government.
[d] Management units under private woodlot owners.

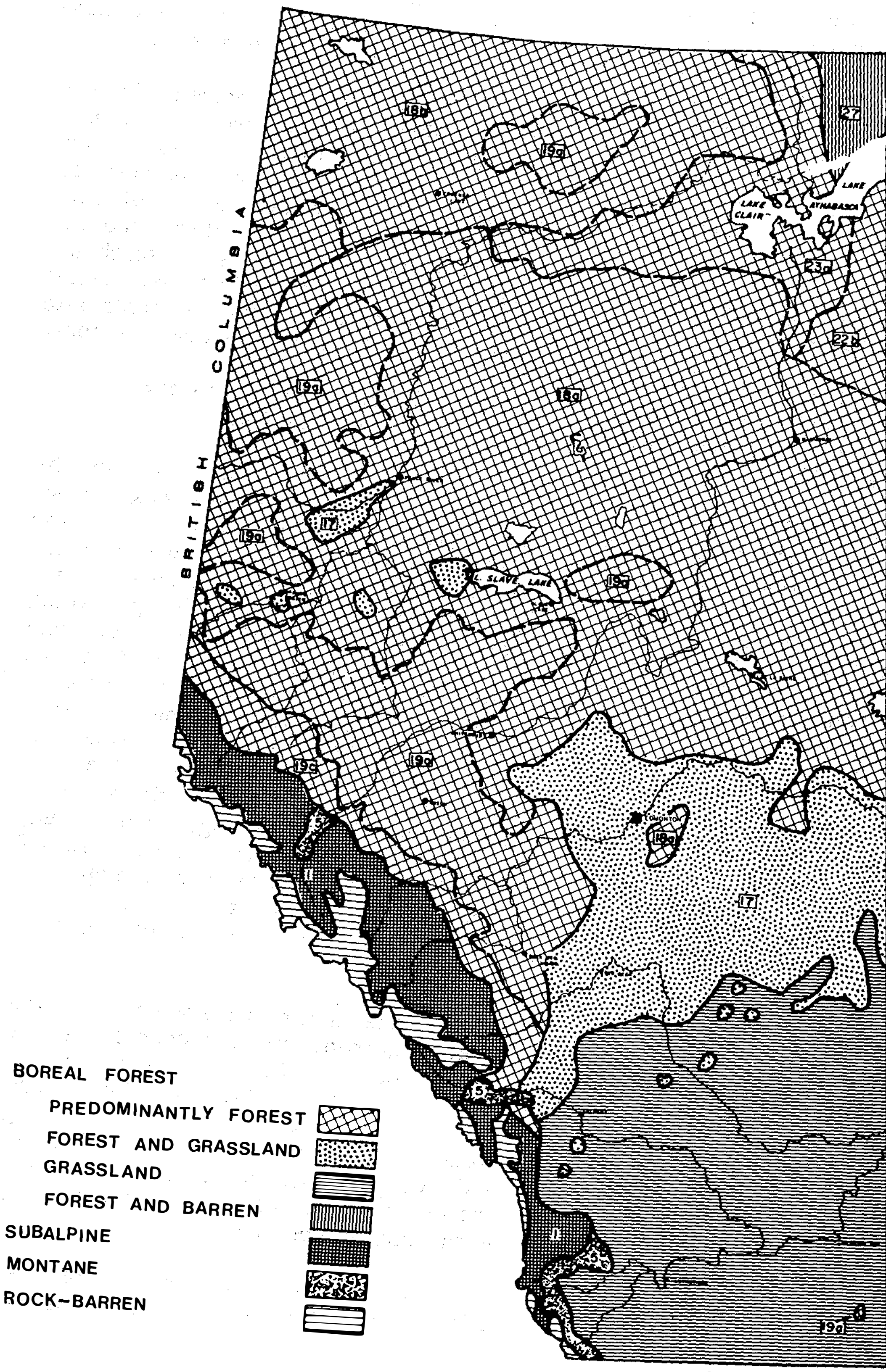


Figure 5. Forest regions of Alberta.

Porcupine Hills-Waterton Lakes district, however, do these species occur in concentrations of significance to Alberta's forest industry. The stands of Douglas fir and lodgepole pine occur mostly on warm, dry slopes, while the northern slopes and moister, shaded sites are dominated by white spruce. Engelmann spruce, alpine fir, and some limber pine occupy higher altitudes.

Volumes of Growing Stock by Species

Gross merchantable volume[5] for softwoods and hardwoods on provincial forest land is about 57 028 million cu. ft., or 1003 cu. ft. per acre (Table 20).

The areas and volume shown in Table 20 are estimates for crown lands managed on a multiple-use basis, primarily for industrial wood utilization. Within some forest management units (FMUs), there are small areas designated as provincial parks, natural areas, watershed protection strips, and other restricted areas, where only controlled harvesting is permitted.

The Grande Prairie Forest and the forests situated on the east slopes of the Rockies (Bow-Crow, Rocky-Clearwater, and Edson) are considered major industrial wood suppliers because they contain 33.0% of the provincial coniferous and deciduous growing stock on 25.5% of the productive forest land (Table 20). Stands and management units containing conifers are of high commercial significance since 44% of the total provincial coniferous volume is located in these four forests; about 30% of the provincial volume of conifers is located in the Edson and Grande Prairie forests. The volume of deciduous growing stock is higher than that of coniferous stock in the Lac La Biche, Peace River, Footner Lake, and Slave Lake forests, which account for 78.0%, 70.0%, 61.0%, and 61.3% of the total volume, respectively. The Bow-Crow and Rocky-Clearwater forests have only 4.7% deciduous growing stock.

Five species are present in sufficient volume to be recorded in the provincial inventory (Fig. 6). White spruce, lodgepole pine, and jack pine account for 46.6% or 26 607 million cu. ft. of total wood volume. Aspen, a smaller amount of balsam poplar, and some white birch account for 47.6%, and the less-used species of black spruce and balsam fir contribute 5.8% of the total growing stock inventory.

Growing Stock Inventory by Size Class

Volumes of growing stock in the Alberta forest inventory are broken down into two size classes: 4 to 9 in. and 10 in. and over diameter at breast height (dbh) (Fig. 6). Wood in the smaller size diameter class is suitable for pulpwood, posts, poles, fence rails, firewood, and other related products, while trees of larger diameter are usually used for sawlogs, peeler logs, poles, pilings, timbers, and railway ties, depending on species and grade. Changing technology in the sawmill industry has led to utilization of smaller and shorter sawlogs, so that many sawmills are logging trees as small as 6-8 in. dbh. As a result of this development, some of the volumes previously considered too small have gained value as sawtimber.

In the coniferous wood volume the smaller growing stock accounts for the higher share: 17 857 million cu. ft., or 31.1% of the total growing stock. Twenty-one percent of the total growing stock is found in the dbh class of 10 in. and over for softwoods. In each forest the major portion of coniferous volume is in the smaller dbh class.

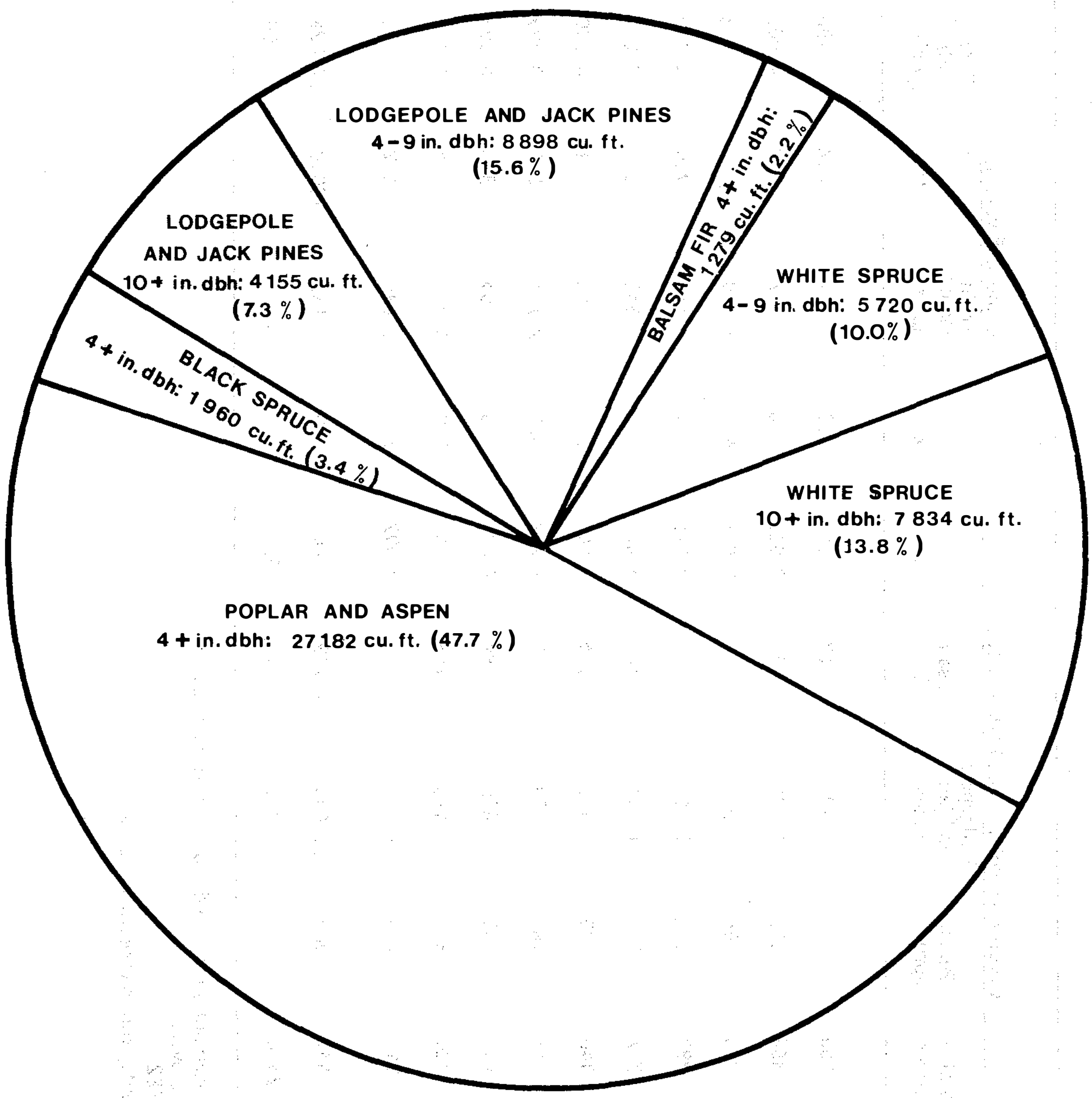
The deciduous volume is evenly distributed between the two dbh classes,

[5] Gross merchantable volume is the cubic foot volume of solid wood in all trees ranging from 4 in. diameter at breast height to 3 in. diameter at the top (inside bark).

Table 20. Area[a] and volume[b] of growing stock on productive and potentially productive provincial forest land by species[c]

Forest region	Area[d] ('000 acre)	Coniferous volume ('000 000 cu. ft.)						Deciduous[e] volume		Total all species	Average volume (cu. ft. per acre)
		White spruce	Black spruce	Lodgepole and jack pines	Balsam fir	Total	%	Total ('000 000 cu. ft.)	%		
Bow-Crow	2 026	360	10	829	87	1 286	4.3	204	0.8	1 490	735
Rocky-Clearwater	2 828	866	192	1 738	132	2 928	9.8	1 077	4.0	4 005	1 416
Edson	4 098	1 276	144	3 295	284	4 999	16.8	1 109	4.1	6 108	1 491
Whitecourt	3 126	1 293	143	1 266	116	2 818	9.4	2 154	7.9	4 972	1 591
Grande Prairie	5 571	1 707	217	1 791	160	3 875	13.0	3 351	12.3	7 226	1 297
Slave Lake	8 038	2 440	333	940	135	3 848	12.9	6 282	23.1	10 130	1 260
Lac La Biche	3 126	911	165	483	49	1 608	5.4	2 191	8.1	3 799	1 215
Peace River	6 866	1 437	230	869	94	2 630	8.8	3 765	13.8	6 395	931
Footner Lake	13 602	2 324	307	478	153	3 262	10.9	5 350	19.7	8 612	633
Athabasca	7 583	940	219	1 364	69	2 592	8.7	1 699	6.2	4 291	566
Total	56 864	13 554	1 960	13 053	1 279	29 846	100.0	27 182	100.0	57 028	1 003
% by species		23.8	3.4	22.9	2.2	52.3		47.7		100	

[a] Fire loss for 1979-81 (2 927 000 acres) not subtracted from forest regions.
[b] Diameter at breast height 4 in. and over.
[c] Source: Alberta Forest Service 1982.
[d] Includes "0" areas, Metis settlements, and management units.
[e] Poplar and aspen.



(In millions of cubic feet)

Coniferous	**29 846 cu. ft.**
Deciduous	**27 182 cu. ft.**
Total	**57 028 cu. ft.**

Figure 6. Volume of growing stock on provincial forest land in Alberta. (Source: Alberta Forest Service 1980.)

with 53% in the smaller dbh class and 47% in the sawtimber class. Trembling aspen and balsam poplar account for the bulk of the volume, and there are small amounts of white birch.

Average volume yield per acre varies with site conditions and by forest. The relatively low average volumes per acre in the Athabasca and Footner Lake forests are shown in Figure 7. In these forests, volume per acre for conifers was only half or less that in the Bow-Crow, Rocky-Clearwater, and Edson forests. Yields per acre for conifers were also low in the Peace River, Slave Lake, and Lac La Biche forests, with all of them having a high deciduous content.

Area and Volume by Maturity Class

For orderly utilization of wood materials and for continuous uninterrupted forest industry operations, a balance between area and volume of growing stock is imperative. Records of the Alberta Forest Service indicate that during 1976-80 an average of 52 987 acres of mature productive forest was harvested annually.

Alberta's productive forest could support harvest rates higher than current levels; however, the depletions, especially because of severe fires in 1979-81 (approximately 2.9 million productive acres burned), alter the availability of wood supply. Furthermore, the provincial government's new Phase 3 Inventory that started in 1970 is to be completed in 1984, and the old Broad (1949-56) and Detailed (1956-66) inventories are obsolete. In the Detailed Inventory there was a higher proportion (57%) of growing stock in conifers under 10 in., which would suggest that the productive forest could support expansion of pulpwood harvesting to higher annual cuts than those in 1980-81. The existing sawlog wood supply is also probably capable of supporting annual harvests higher than those in 1980-81. The availability of mature growing stock does not necessarily mean that forests with large supplies of mature and overmature stands also have large supplies of unassigned mature growing stock in large blocks. This might have been true until recently in the Edson Forest, but that changed in 1980 with the allocation of the Berland Creek Forest Management Agreement area. Some long-established firms hold supplies of mature forest too large for their present industrial capacity.

Forest Production in the 1970s

The total harvest in Alberta in the 1978-79 fiscal year was 230 million cu. ft. The volume cut increased by 8.7% to 250 million cu. ft. in 1980-81. In that year, 93.8% of the volume was harvested from provincial crown lands, 0.3% from federal land, and the balance of 5.9% from private lands. Production from these three supply areas during 1970-81 is shown in Table 21. Although the total volume harvested in the province increased by 70.7% during this period, the rate of growth was not spread evenly. Unfavorable market demand on domestic and export markets for lumber and pulp caused slow growth, leveling off, or slight reduction in harvests on more than one occasion. In 1973, for example, the harvest reached a plateau and remained practically unchanged for the next 3 years.

In the early 1970s the total cut expanded rapidly, reaching peak production in 1974. The pronounced upswing in the annual cut in 1972 (despite declines on federal and private lands) can be attributed mainly to healthy demand in domestic and US markets for both lumber and pulp products. The start of pulpwood logging operations on the Procter and Gamble Cellulose Ltd. lease area near Grande Prairie also contributed to the expansion of total cut.

The energy shortage in 1973 and 1974 and subsequent uncertainties regarding oil supplies and pricing were the main reasons for the overall decline in domestic and US housing, lower con-

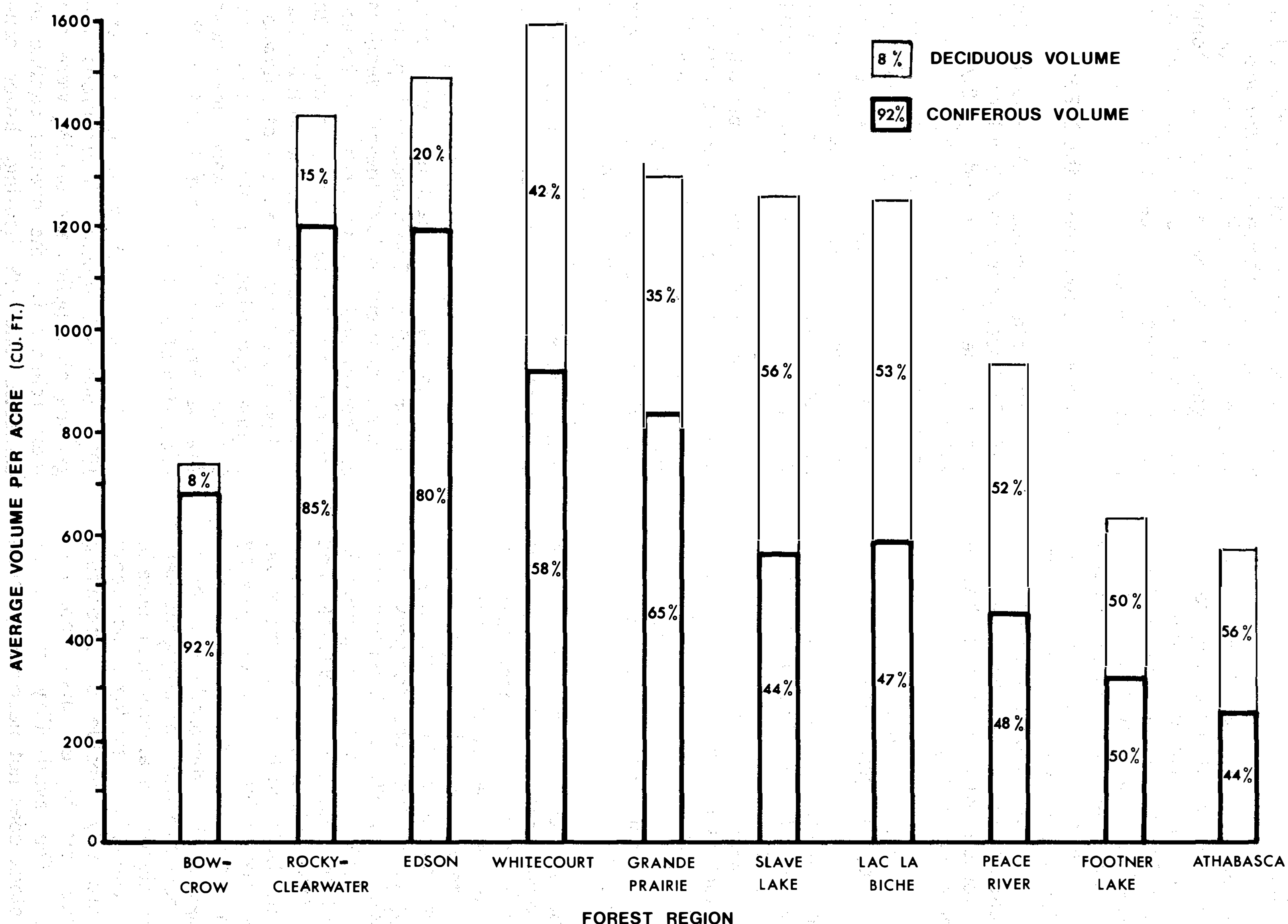


Figure 7. Volume per acre of growing stock 4+ in. dbh, by region.

Table 21. Annual harvest 1971-81

Fiscal year	Provincial crown lands[a] '000 cu. ft.	Provincial crown lands[a] % of total harvest	Federal crown lands '000 cu. ft.	Federal crown lands % of total harvest	Private lands '000 cu. ft.	Private lands % of total harvest	Total harvest all lands ('000 cu. ft.)
1970-71	120 694	82.5	9 558	6.5	16 079	11.0	146 331
1971-72	129 918	89.0	5 654	3.9	10 438	7.1	146 010
1972-73	163 945	95.0	4 173	2.5	4 179	2.5	172 297
1973-74	176 432	96.5	3 575	1.4	3 920	2.1	182 927
1974-75	169 628	95.0	892	0.5	8 080	4.5	178 600
1975-76	167 412	95.5	1 043	0.6	6 845	3.9	175 300
1976-77	190 206	95.7	1 224	0.6	7 270	3.7	198 700
1977-78	213 229	94.8	4 851	2.1	6 920	3.1	225 000
1978-79	196 092	85.2	6 538	2.8	27 570	12.0	230 200
1979-80	231 791	93.8	2 321	1.0	12 888	5.2	247 000
1980-81	234 271	93.8	645	0.3	14 865	5.9	249 781

[a] Source: Alberta Forest Service 1981.

struction starts, and a drop in demand for Canadian forest products. This was accompanied in 1975 and 1976 by low business confidence in the economy, which was affected by high interest rates.

Alberta's total harvest increased rapidly (8% per year) from 1976 to 1979. The strong market demand (especially for lumber) in the booming Alberta economy, an equally strong demand in traditional markets in the northeast and midwest US, and expanding markets in the southwest US were the main forces behind rapid expansion of harvests during this period. Market conditions softened, and demand for forest products began to level off or grow only slightly, causing the provincial harvests to increase by only about 0.8% in the fiscal year 1980-81.

The portion of the total cut from private land, only 2.1% in 1973-74, peaked at 12% in 1978-79.

Harvest statistics (Table 22) indicate that sawmilling in Alberta has been the prevailing industry. Teskey and Smyth (1975) stated that sawtimber accounted for at least 60% of the total cut in the 1960s. This was also true in 1971-73; however, since 1974 the portion of sawtimber has declined to about 45%.

Pulpwood has been the second most important product harvested from forest lands. The annual cut fluctuated during 1971-81, from a low of 23.9 million cu. ft. in 1970-71 to a high of 78.1 million cu. ft. in 1974-75. The sharp increase (89.5%) in pulpwood production from 1972-73 to 1973-74 was due mainly to the start of harvesting by Procter and Gamble at Grande Prairie. Previously, the major pulp cutter was St. Regis (Alberta) Ltd. at Hinton.

Posts, poles and pilings, railway ties, and firewood are other major products, although they are not significant in volume. In aggregate volume, the harvest for these products has not exceeded 10% of the total production from crown lands (Table 22).

Annual Allowable Cut

As a result of constant changes in forested areas, growing stock, and utilization standards, allowable cut calculations are valid for only a short time period. The annual allowable cut (AAC) in Alberta is calculated using the modified von Mantel formula, which is applied to the gross forest inventory volume in each forest management unit and uses 80-, 100-, and 120-year rotation ages for coniferous volumes and 70-year cycles for deciduous volumes.

A deduction for anticipated annual forest fire loss is also made from the gross annual allowable cut. An anticipated annual fire loss of 0.1% of the volume of each unit's growing stock was estimated and subtracted from the gross AAC.

Net annual allowable cut in Alberta for all species is 901.9 million cu. ft. (Table 23). In the forest management units, the coniferous allowable cut is 488.5 million cu. ft. and the deciduous cut is 413.4 million cu. ft. Comparison of the allocated and allowable cut for conifers by forest shows that 57.7% of the permissible cut was allocated.

On this basis, a surplus of 206.4 million cu. ft. of coniferous growing stock (wood supply) exists in Alberta. All regions (with the exception of Grande Prairie) have surpluses of conifers (based on 1980 production) ranging from 7.3 and 7.5 million cu. ft. in the Whitecourt and Edson forests, respectively, to a high of 43.7 million cu. ft. in the Athabasca Forest. The Rocky-Clearwater Forest also has a high coniferous surplus of 38.9 million cu. ft. A comparison of 1980 harvests by forest shows that the intensity of cut was lightest in the Athabasca Forest (13.5% of the permissible cut) and the Rocky-Clearwater Forest (13.7%) and was heaviest in the Grande Prairie (100%), Edson (91.3%), and Peace River (86.7%) forests. The combined harvest of the east slope forests and the Grande Prairie Forest, the regions with most of

Table 22. Output of forest products from provincial crown lands, 1970-81[a]

Fiscal year	Lumber and plywood logs: Coniferous	Lumber and plywood logs: Deciduous	Round timbers, poles, posts, pilings	Pulpwood (coniferous)	Fuel wood	Railway ties	Lath	Total[b] output	% change	Wood chips ('000 bone dry units)
	('000 cu. ft)									
1970-71	77 445	141	3 000	23 873	340	1 563	55	106 417	-	N/A
1971-72	80 800	1 801	2 000	26 945	425	1 124	49	113 144	+6.3	N/A
1972-73	95 350	3 037	3 000	35 527	680	993	51	138 638	+22.5	21
1973-74	103 543	1 660	3 000	67 310	340	517	46	176 416	+27.3	117
1974-75	60 176	1 801	5 000	78 116	425	1 192	31	146 741	-16.8	85
1975-76	75 644	918	3 000	61 130	425	1 709	21	142 847	-2.7	57
1976-77	91 077	1 059	6 000	55 833	1 785	1 244	N/A	156 998	+9.9	112
1977-78	101 848	459	8 000	58 305	1 700	972	47	171 331	+9.1	190
1978-79	103 684	883	2 882	54 632	2 134	766	11	164 992	-3.7	311
1979-80	138 116	636	6 051	56 044	2 275	483	3	203 608	+23.4	282
1980-81	134 019	3 743	18 581	46 827	2 348	831	2	206 351	+1.4	279

[a] Source: Alberta Forest Service 1981.
[b] Excludes wood chips from total.
N/A - Not available.

Table 23. Estimated annual allowable cut (AAC), allocated cut, and estimated timber surplus, by forest[a]

Forest region[b]	Estimated AAC ('000 000 cu. ft.)	Allocated to forest industry ('000 000 cu. ft.)	% of AAC	Estimated surplus ('000 000 cu. ft.)
Coniferous				
Bow-Crow	26.7	8.0	30.0	18.7
Rocky-Clearwater	45.1	6.2	13.7	38.9
Edson	86.5	79.0	91.3	7.5
Whitecourt	49.4	42.1	85.2	7.3
Grande Prairie	56.8	56.8	100.0	0
Slave Lake	60.9	31.2	51.2	29.7
Lac La Biche	24.8	4.2	16.9	20.6
Peace River	35.5	30.8	86.7	4.7
Footner Lake	52.3	17.0	32.5	35.3
Athabasca	50.5	6.8	13.5	43.7
Total	488.5	282.1	57.7	206.4
Deciduous				
Bow-Crow	3.2	0	0	3.2
Rocky-Clearwater	17.7	0.2	1.1	17.5
Edson	21.8	0	0	21.8
Whitecourt	39.0	0	0	39.0
Grande Prairie	54.2	0	0	54.2
Slave Lake	96.0	0	0	96.0
Lac La Biche	33.0	0	0	33.0
Peace River	47.4	0	0	47.4
Footner Lake	69.9	0	0	69.9
Athabasca	31.2	0	0	31.2
Total	413.4	0.2	0.05	413.2
ALL SPECIES	901.9	282.3	31.3	619.6

[a] Source: Alberta Forest Service 1980.
[b] Includes "0" areas, Metis settlements, and Indian reserves.

Alberta's forest industry facilities, amounted to 192.1 million cu. ft., 72.6% of the total coniferous wood harvested.

Hardwood growing stock in Alberta is virtually untapped. A total of 0.2 million cu. ft., largely sawtimber wood, was harvested in 1980. This harvest, all from the Rocky-Clearwater Forest, represented about 1.1% of the deciduous allowable cut of 413.4 million cu. ft.

CHAPTER IV

CAPITAL IN THE FOREST INDUSTRY

What is Capital?

In forestry the term *capital* has a wide range of meanings. A standard forest economics text (Deurr 1960) describes capital as the cultural resources of a firm as distinguished from natural resources (land and growing stock) and human resources (labor). In general, capital is used to mean a stock of money that is the result of past savings. Bannock *et al.* (1978) define capital as the stock of durable goods used in production and those goods that were a result of the production process.

Fixed capital is the stock of durable goods such as buildings, plant machinery, and equipment, whereas operating (working) or circulating capital is the money tied up in the stock of raw materials, payrolls, and supplies needed for daily operations. This chapter examines fixed capital as a cornerstone of Alberta forest industries.

Role of Capital

Traditionally, capital has been viewed as a static factor of production; capital assets are acquired, and the effectiveness of these investments is measured in terms of the anticipated return that they will yield to an entrepreneur over their economic life-span. Rickards (1981) suggests that what is often ignored is the role that capital plays as a catalyst in generating and enhancing the productivity of labor and material resources employed in the basic resources triangle, which is labor, resources (land), and capital. Capital productivity, therefore, can be viewed as a measure of output with reference to all invested capital.

Rickards postulates that the history of material progress and the high standard of living in North America are related to the availability and efficient use of capital and to the ability of management and labor to increase total productivity by rational use of investment capital as a major resource.

Inflation rates have risen from a modest 4.5% in 1968 to 9% in 1978 and a record 12% in 1981 (Rickards 1981). While the causes of inflation are the subject of much debate, some economists perceive government spending and subsidies of failing industries, increased wage demands, and drops in productivity as major factors contributing to inflation. The current inflation and high interest rates have inhibited a rise in capital investments.

Capital in the Forest Industry Groups

Forest industry groups in Alberta vary in the amounts they invest in new industrial infrastructure or capital facilities and operations. Some of the industry groups, by the nature of their operations, require greater fixed capital investment per unit of output and therefore are considered capital-intensive industries, e.g., the pulp and paper industry. Smaller sawmills require less fixed capital outlay per unit of output, which in the production process is usually substituted by labor, and therefore are labor-intensive industries.

The fixed capital formation process (the addition of private sector and government expenditures for construction and new machinery and equipment) is a very complex matter. The appreciation resulting from inflation for building, machinery, and equipment compared to their depreciation from use and physical age adds another dimension to the forest industry evaluation problem. Replacement, book, and market values were used in this study to evaluate the magnitude of capital investments in the forest industry and to compare their magnitude among the industry groups (Table 24).

Table 24. Replacement, book, and market values of the buildings, plant machinery, and equipment in the forest industry, 1978-79

Industry group	Number of firms	Replacement value ($000)	Book value ($000)	Market value ($000)
Sawmills				
5 MM fbm and over	26	171 067	145 424	135 143
1 MM to 5 MM fbm	29	23 308	11 873	16 222
100 M to 1 MM fbm	128	18 290	7 627	10 099
Less than 100 M fbm[a]	211	15 867	6 854	9 569
Independent planing mills	18	2 615	1 924	1 726
Total sawmills and planing mills	412	231 147	173 702	172 759
Plywood mills	3	24 941	17 928	21 450
Wood preservation mills	18	6 425	5 376	5 711
Building logs	2	602	451	493
Pallets	9	1 612	1 145	1 290
Lath	9	404	295	303
Pulp, paper, and allied	5	323 110	210 720	289 430
Total other	46	357 094	235 915	318 677
Total all mills	458	588 241	409 617	491 436

[a] Replacement value in these sawmills is based on the cost of a 48-in. circular headsaw, infeed deck, carriage, and a power unit, all of which costs approximately $52 000, and the cost of a John Deere tractor (#302, 45 horsepower), which is approximately $23 200.

The pulp, paper, and allied industry group was responsible for about 55% of capital expenditure in replacement value, while the sawmill industry group accounted for close to 40%. Sawmills with 5 MM fbm and over annual productivity, which manufactured 77.2% of all lumber products, accounted for about 74% of replacement value in the sawmill group (Table 25). The sawmill class of 1-5 MM fbm annual production accounted for about 10% of all sawmill capital and produced 7.5% of Alberta's total lumber.

The capital/production ratio increased from larger to smaller sawmills. The fact that more capital is needed to produce lumber in smaller sawmills should be attributed predominantly to part-time or seasonal use of machinery and equipment capital in these firms, rather than to more productive use of capital or labor in large sawmills.

The pulp, paper, and allied industry group required more units of capital per unit worker. This high capital/labor ratio makes this group the most capital-intensive forest industry in Alberta (Table 26). Large sawmills, although still relatively capital intensive, require considerably less capital to manufacture a unit of lumber. Lower capital investment in the infrastructure is needed for smaller sawmill operations. In these firms, capital is usually replaced by labor. A relatively high capital/labor ratio in the smallest sawmills should not be interpreted as an inefficient use of capital; instead, there was use of part-time labor while capital was idle or used in an activity other than forest production.

It is interesting to note that the plywood industry is rather labor intensive, although the capital requirements for this industry group are quite high. The rest of the forest industry groups, such as pallet plants, planing mills, lath mills, and building log and wood preservation plants, have lower capital requirements and should be classified as labor intensive. These firms usually have a great need for unskilled labor and a limited use for people with technical training or experience.

Forest industry groups distribute their capital according to the type of industry and size of the operation. All sawmills combined spent about one-third of their capital on mill machinery (Table 27). Mobile yard equipment absorbs up to one-third of capital in the smaller sawmills but was not as significant a factor in larger sawmills. Motor vehicles are also an important capital outlay for small sawmills, just as buildings and plants are for large sawmills. Haul roads represent a major capital investment for large sawmills but are of no concern to small sawmills, which use existing road systems. Logging equipment does not represent an important capital outlay for any of the firms in the sawmill group (Table 27).

Annual capital expenditures for new facilities varied according to industry group in 1978-79. The sawmill industry invested about \$2.9 million, which represents only about 1.3% of the replacement value of capital in all existing sawmills (Table 28). This rate of capital investment appears to be insufficient. Although this low rate will not significantly reduce the production capacity of the sawmill industry group within the next 5-10 years (because of the relatively new sawmill facilities at present), it could be a problem later on, when facilities deteriorate.

Over \$43 million, 13.5% of total replacement capital, was invested in the pulp, paper, and allied industry group. Capital outlay of this magnitude appears to be sufficient and is justified for this capital-intensive industry group, which is a high value added and high net sales earner.

Annual expenditures for repairs had a distribution pattern similar to capital expenditures. Table 28 shows that the sawmill industry group spent about \$814 500 for repairs in 1978-79, which represented about 0.3% of the capital replacement value. This amount of expenditure for repairs does not appear to pose any problem in the production ability of this industry group.

Table 25. Production ratio in replacement value (capital) in sawmills

Sawmill group	Production MM fbm	Production %	Replacement value $000	Replacement value %	Ratio of capital over production
5 MM fbm and over	661.6	77.2	171 067	74.0	0.26
1 MM to 5 MM fbm	64.1	7.5	23 308	10.1	0.36
100 M to 1 MM fbm	38.5	4.5	18 290	7.9	0.48
Less than 100 M fbm	8.8	1.0	15 867	6.8	1.80
Independent planing mills	83.5	9.8	2 615	1.2	0.03
Total	856.5	100.0	231 147	100.0	

Table 26. Capital-labor ratio by forest group, 1978-79

Industry group	Replacement value ($000)	Labor[a] (person-years)	Capital-labor ratio
Sawmills			
5 MM fbm and over	171 067	2 115	80.9
1 MM to 5 MM fbm	23 308	256	91.0
100 M to 1 MM fbm	18 290	312	58.6
Less than 100 M fbm	15 867	169	93.8
Independent planing mills	2 615	76	34.4
Total sawmills and planing mills	231 147	2 928	79.0
Plywood	24 941	402	62.0
Wood preservation	4 286	175	24.5
Building logs	602	24	25.1
Pallets	1 612	36	44.8
Lath	404	12	33.6
Pulp, paper, and allied	322 110	1 823	176.7
Total other	353 955	2 472	143.2
Total all mills	585 102	5 400	108.4

[a] Includes employees only, not contract workers.

Table 27. Allocation of capital in the forest industry, 1978-79

	Sawmills							
	5 MM fbm and over (%)	1 MM to 5 MM fbm (%)	100 M to 1 MM fbm (%)	Less than 100 M fbm (%)	Misc. (%)	Plywood (%)	Wood preservation (%)	Pulp, paper, and allied (%)
Buildings and plant	18.9	9.1	6.0	3.0	10.0	*	*	*
Mill machinery	27.4	32.3	37.0	33.0	36.4	*	*	*
Mobile yard equipment	11.6	13.7	29.0	40.0	24.6	*	*	*
Motor vehicles	7.0	12.4	16.0	18.0	22.6	*	*	*
Logging equipment	6.0	7.4	12.0	6.0	6.4	*	*	*
Haul roads	29.1	25.1	0	0	0	*	*	*
Total replacement capital ($000)	171 067	23 308	11 486	66	2 506	24 941	6 425	332 110

* Confidential.

Table 28. Annual capital and repair expenditures for plant machinery and equipment in the forest industry

Industry group	Total capital ($000)	Repair expenditures ($000)
Sawmills		
5 MM fbm and over	1 672.0	434.1
1 MM to 5 MM fbm	676.0	112.9
100 M to 1 MM fbm	547.0	153.0
Less than 100 M fbm	46.1	114.5
Total sawmills	2 941.1	814.5
Plywood mills	N/A	N/A
Wood preservation mills	N/A	N/A
Miscellaneous mills	N/A	N/A
Pulp, paper, and allied	43 655.0	5 870.0
Total	$46 596.1	$6 684.5

Forest region	Total capital ($000)	Repair expenditures ($000)
Bow-Crow	559.2	64.0
Rocky-Clearwater	419.4	63.0
Edson	35 133.4	3 875.0
Whitecourt	605.6	113.0
Grande Prairie	8 433.9	2 152.0
Slave Lake	699.0	124.0
Lac La Biche	372.8	209.0
Peace River	233.0	62.0
Footner Lake	93.2	22.0
Athabasca	46.6	0.5
Total	$46 596.1	$6 684.5

N/A - Not available.

The pulp, paper, and allied industry group expended about \$5.9 million on repairs, about 1.8% of the group's replacement capital value. This level of repair expenditure does not reduce the ability of the group to operate at its full capacity in the short run. This is especially true for firms with less than 15 to 20 years of operation with relatively new capital stock.

The average age of plant machinery and equipment used in the Alberta forest industry is low because of the relatively recent and continuing expansion of the industry in the province. Although some small sawmills were in operation before the turn of the century to provide local lumber for homesteads, an economically significant forest industry came only after the Second World War. The first big forest industry upsurge was registered during the mid-to-late fifties, and the second was recent, in the mid-to-late seventies. The first was attributable to general postwar immigration, and the second was due to the recent oil and gas boom.

In the sawmill industry, the average age of machinery and equipment increased as the size of operation decreased: from 8.7 years for sawmills of 5 MM fbm and over annual production to 21.9 years for sawmills of less than 100 M fbm annual production. In 1978-79 the average age of plant machinery and equipment for independent planing mills was 26.0 years and for the pulp, paper, and allied industry group was 14 years (Table 29). Forest industries in the Grande Prairie, Peace River, and Rocky-Clearwater forests had higher average ages of plant machinery and equipment.

The average age for forest industry facilities in the Slave Lake, Footner Lake, and Athabasca forests was lower than the provincial average. Large sawmills and the pulp, paper, and allied industry group in the Grande Prairie and Edson forests had the highest annual depreciation (Table 30).

Table 29. Average age of plant machinery and equipment in the forest industry, 1978-79

Industry group	Average age (years)	Forest region	Average age (years)
Sawmills		Bow-Crow	16.3
5 MM fbm and over	8.7		
1 MM to 5 MM fbm	13.0	Rocky-Clearwater	20.1
100 M to 1 MM fbm	19.3		
Less than 100 M fbm	21.9	Edson	16.1
		Whitecourt	17.9
All sawmills	19.5	Grande Prairie	23.4
Independent planing mills	26.0	Slave Lake	10.9
		Lac La Biche	19.2
Plywood mills	17.5	Peace River	20.8
Wood preservation mills	8.7	Footner Lake	9.1
Miscellaneous and wood-using industry	13.0	Athabasca	5.1
		Average age	19.0
Pulp, paper, and allied	14.0		
Average age	19.0		

Table 30. Annual depreciation in the forest industry, 1978-79

Industry group	Annual depreciation $000	Annual depreciation % of total
Sawmills		
5 MM fbm and over	4 289	93.0
1 MM to 5 MM fbm	143	3.1
100 M to 1 MM fbm	102	2.2
Less than 100 M fbm	76	1.7
Total sawmills	4 610	100.0
Independent planing mills	N/A	N/A
Plywood mills	N/A	N/A
Wood preservation mills	N/A	N/A
Building logs	N/A	N/A
Pallets	N/A	N/A
Lath	N/A	N/A
Pulp, paper, and allied	6 206	N/A
Total	10 816	N/A

Forest region	Annual depreciation $000	Annual depreciation % of total
Bow-Crow	584	5.4
Rocky-Clearwater	252	2.3
Edson	2 450	22.7
Whitecourt	1 557	14.4
Grande Prairie	4 333	40.1
Slave Lake	1 074	9.9
Lac La Biche	190	1.8
Peace River	190	1.8
Footner Lake	185	1.5
Athabasca	1	0.1
Total	10 816	100.0

N/A - Not available.

CHAPTER V

EMPLOYMENT IMPACT OF THE FOREST INDUSTRY

In 1979 the forest industry provided direct employment (in terms of a full person-year)[6] to 6417 workers. To arrive at the total employment impact, however, resultant indirect employment must also be calculated. The direct employment at mills and primary processing facilities was estimated to be 4502 workers, and there were an additional 1915 workers in logging and transportation (Table 31).

The direct employment operations of the forest industry create demands for inputs from other industry sectors that supply raw materials, equipment, supplies, and services; additional production and jobs are subsequently generated in these sectors. Because various forest industry groups create different inputs for material, supplies, and services, different employment multipliers have to be used to assess the total employment impact. The average multiplier used implies that the total direct and indirect employment impact from Alberta's logging and primary wood-using industries is approximately 15 420 person-years of employment. Sawmills producing more than 5 MM fbm per year and pulp, paper, and allied mills were the largest employers, providing 44% and 29% of all jobs, respectively.

Woodlands operations in Alberta are seasonal in nature (Fig. 8). Most of the logging, skidding, and hauling is carried out from mid-October to the end of March, although summer logging is on the increase. Woodlands employment was high during the winter season, with 2651 person-months in January. The employment level dropped sharply during spring breakup to 1420 person-months in April and remained seasonally low until October.

The overall employment in primary manufacturing mills was comparatively stable, with monthly levels fluctuating among seasons (Fig. 8).

Seasonality of employment tended to be hidden by employment aggregation of firms of different sizes. Larger firms that operated year-round with a reasonably stable work force masked the seasonality noticeable in smaller operations. The size of labor force and ability to support year-round employment varied by industry group. To show these differences, the data have been disaggregated for employment levels in sawmills, planing mills, wood preservation plants, plywood mills, and the pulp, paper, and allied industry group. These differences are illustrated in Appendix 4, Figures A-H.

The Grande Prairie, Whitecourt, and Edson forest regions top the list by providing 21.8%, 19.6%, and 18.2%, respectively, of the industry's total employment. The Athabasca, Footner Lake, and Peace River forests combined create only 7.4% of all forest industry jobs.

Sawmills and the pulp, paper, and allied industry group had difficulty obtaining qualified labor for their woodlands operations. Regionally, firms in the Grande Prairie and Whitecourt forests experienced difficulty obtaining qualified workers for their woodlands operations, while the same held true for mill operations in all south-central and central forests.

Approximately one-third of production workers in the large sawmills and the pulp, paper, and allied mills were unionized. More than two-thirds of the

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[6] A full person-year is defined as one person working 8 hours/day, 5 days/week, 52 weeks/year (2080 hours/year, 173.3 hours/month).

Table 31. Employment by forest industry group, 1978-79

Industry group	Person-years of employment Logging	Mill	Total	% of forest industry
Sawmills				
5 MM fbm and over	1014	1787	2801	44
1 MM to 5 MM fbm	84	213	297	5
100 M to 1 MM fbm	117	202	319	5
Less than 100 M fbm	80	89	169	3
Independent planing mills	1	77	78	1
Plywood	28	402	430	7
Wood preservation	23	198	221	4
Miscellaneous	0	133	133	2
Pulp, paper, and allied	451	1401	1852	29
Independent log producers	117	N/A	117	-
Total	1915	4502	6417	100[a]

[a] Logging accounts for 30% and mill for 70% of forest industry employment.
N/A - Not available.

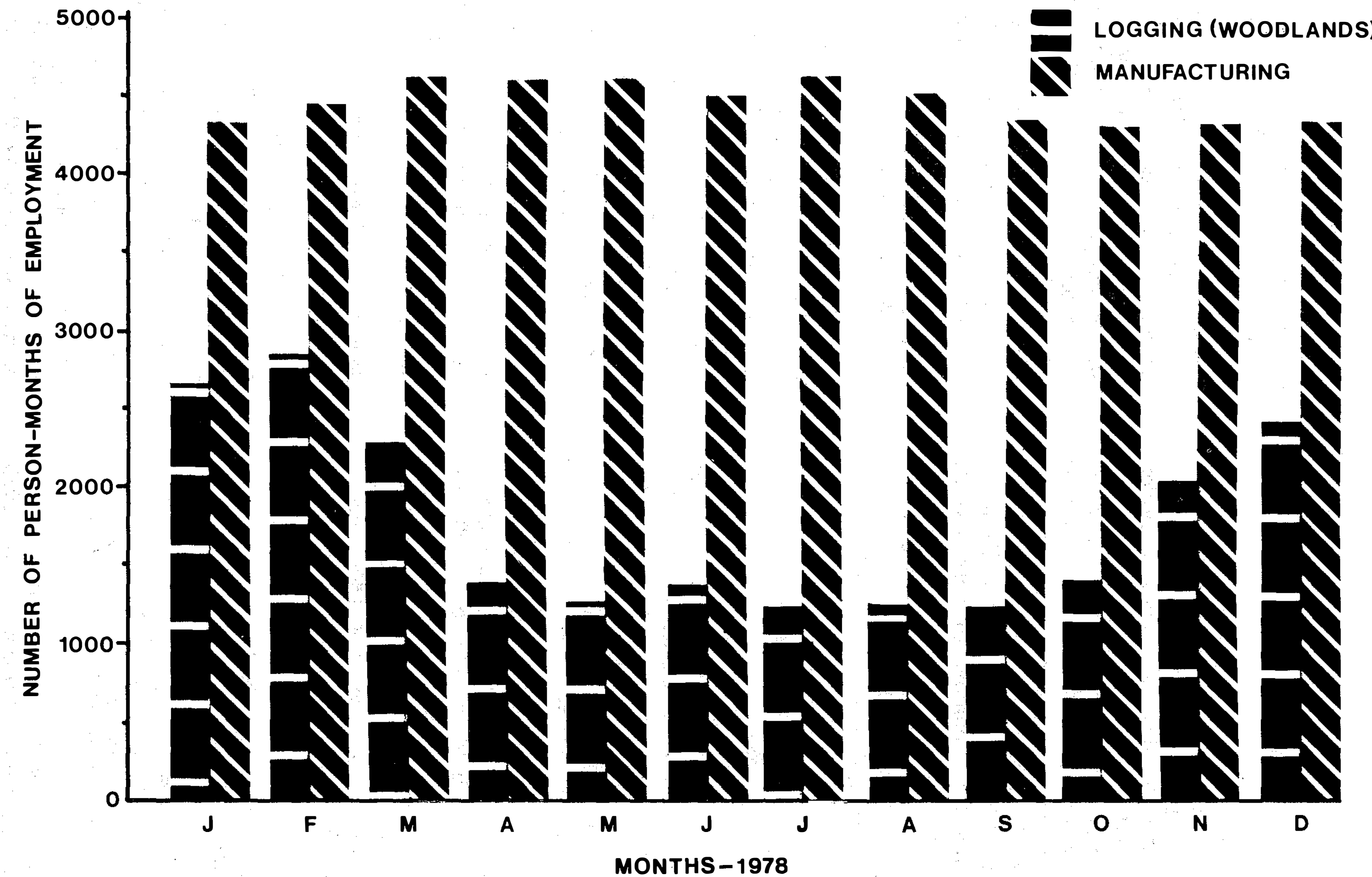

Figure 8. Seasonal employment in logging and forest industry manufacturing.

labor force employed in the forest industry in the Slave Lake Forest were of native origin. Sawmills producing from 1 MM to 5 MM fbm annually employed about 40% of the native workers.

EMPLOYMENT BY INDUSTRY GROUP

Sawmill Group

There were approximately 394 commercially operated sawmills in Alberta in 1979. The mills created 2291 jobs, while logging activities provided another 1295 jobs. Logging was carried out mostly during the winter months, while the employment in the mills varied from part-time, occasional, seasonal, and full-time in small operations to full-time, year-round in larger operations. Table 31 shows the total number of person-years created by the sawmill industry group in four production classes, and Appendix 4, Figures A-D, illustrate monthly employment in logging and manufacturing in 1978.

Sawmills Producing 5 MM fbm and Over Annually

This class consisted of 26 establishments that operated year-round in 1979. They created approximately 1787 full-time mill jobs, which represented about 78% of the entire sawmill labor force. Average monthly employment in logging and manufacturing for these sawmills is illustrated in Appendix 4, Figure A. Employment in these mills held steady at 1700-1850 workers year-round. Employment in logging operations directly associated with these mills was highest from November to May with 1200-1500 workers and declined markedly to a summer low of 650.

Sawmills Producing 1 MM to 5 MM fbm Annually

This class contained 29 sawmills that supported 213 jobs (9% of the total sawmill labor force). These mills were also responsible for 84 jobs in logging.

The majority of sawmills in this group operated year-round in 1979. Average employment for the year was 325 workers, peaking at 390 in January and dropping to 250 in May. The logging operations employed about 180 workers from December to March but either stopped or continued at a very low level from April to September (Appendix 4, Fig. B). Employment in manufacturing was reasonably stable at 200 jobs, peaking at 255 in April and declining to 235 by midsummer. Some planing facilities associated with this sawmill class operated during the summer and early fall.

Sawmills Producing 100 M to 1 MM fbm Annually

The 128 sawmills in this class supported 202 jobs in mills and an additional 117 jobs in logging (about 9% of all jobs in the sawmill group). Although many of these mills operated year-round, some of them were just winter or part-time summer operations (Appendix 4, Fig. C). During the winter, logging supported a peak of 300 workers in January; however, the annual average did not exceed 150. Spring and summer were usually devoted to manufacturing, with a peak employment of 300 workers. Fall was usually associated with either planing or custom sawing but in general represented an overall reduction in output and employment.

Sawmills Producing Less Than 100 M fbm Annually

This group, containing the highest number of mills at 211, supported 89 jobs, or 4% of the employment opportunities in the sawmill group. An additional 80 jobs were created in logging operations directly associated with this mill group. The majority of the mills were partly or entirely owned and operated by individuals to whom sawmilling was a supplemental occupation. Most of the production was used by the owner or sold in local markets. About 85% of the lumber that was used or marketed was not planed.

Logging and manufacturing took place simultaneously from January to March, declined sharply in the early spring, and were observed occasionally throughout the summer and early fall. Any summer operations usually took place to fill some immediate need by the owner-operator. In the majority of cases the owner-operator did his own sawtimber harvesting, skidding, and transporting. Logging and manufacturing operations peaked in February (Appendix 4, Fig. D).

Independent Planing Mill Industry Group

There were 18 independent planing mills operating in 1979. Although several mills operated year-round, the majority appeared to have periods of either reduced or no output. Because of the circumstances under which some of these mills operated, employment tended to fluctuate considerably throughout the year. In 1978-79, employment averaged 78 workers in this industry group, peaking at 80 in the summer and declining to 70 in the winter (Appendix 4, Fig. E).

Plywood Industry Group

Three firms with facilities located in Edmonton, Grande Prairie, and Fort McLeod form the Alberta plywood industry group. Appendix 4, Figure F, shows the seasonality of employment in the group in 1978. The number of workers employed in manufacturing during the year was stable at 402.

The average monthly employment in logging was 28 workers, primarily related to the Slave Lake-based Edmonton operation, since the other two firms receive their wood supply from other sources. Crestbrook Forest Industries at Fort McLeod imported all of its wood from British Columbia in the form of veneer, while Canadian Forest Products Ltd.'s Plywood Division at Grande Prairie purchased its peeler log supply from company-owned sawmills at Grande Prairie and Hines Creek.

Wood Preservation Industry Group

The seasonality of employment for the wood preservation industry group is shown in Appendix 4, Figure G. Since only six firms have pressure-treating tanks, establishments that treated roundwood or semiprocessed products by dipping into open tanks are also included.

The wood-preserving industry group and associated activities employed 198 workers in 1978-79. Difficulties encountered in the preservation process, such as frozen wood, high costs of heating oil, and inadequate wood supply, led to the curtailment of winter operations in many Alberta firms, particularly the dippers.

Employment in logging in this industry group is disproportionately small considering the preserved wood output. In 1978-79 logging employment averaged 23, with a maximum of 35 during the winter season and a minimum of 11 from April to August. The logging sector supporting the wood preservation industry was relatively small because most of the firms imported or purchased their wood supply from other sources.

Pulp, Paper, and Allied Industry Group[7]

Employment in the five mills that represented this industry group was very stable in 1978. Average monthly employment during the year was about 1480 workers in manufacturing and about 450 in logging activities.

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[7] To avoid disclosing confidential data, companies classified as Pulp and Paper Mills (SIC 271) and Asphalt Roofing Manufacturers (SIC 272) have been combined.

Not all of the five companies surveyed procured their wood from their logging operations. Some of them obtained wood in different forms, such as chips purchased from other establishments. Harvesting operations in this industry group remained strong through the summer, which was not characteristic of other industry groups. The seasonality of employment in the pulp, paper, and allied group is illustrated in Appendix 4, Figure H.

EMPLOYMENT STATUS

The forest industry firms employed predominantly their own workers recruited for woodlands and mill operations. Contract workers comprised about 6% of the labor force and were used mostly in logging, skidding, and transportation of logs to the mill in the sawmills of 5 MM fbm and over annual capacity and in some pulp mills.

The majority of loggers and skidders and approximately 85% of the labor force in mills were paid hourly wages. Management, supervisory, office, and sales staff were paid annual salaries.

More than 5.9% of employees in the 100 M to 1 MM fbm annual capacity sawmills were paid salaries, while less than 4.6% of workers were paid salaries in small sawmills (Table 32). The majority of workers in the plywood and the pulp, paper, and allied industry groups were paid hourly wages.

Length of Employment

The forest industry labor force displayed a high mobility typical of all primary industries and characteristic of the buoyant Alberta economy. High mobility occurred in woodlands and manufacturing regardless of type and size of industry. About 20% of the labor force in all sawmills and the pulp, paper, and allied industry group stayed with the same company for 5 or more years, while about one-quarter of the employees stayed that long with the same employer in planing and wood preservation plants (Fig. 9). Plywood plants retained 45% of their employees for 5 or more years.

When all industries are aggregated by region (Fig. 10), the forest industry firms in the Whitecourt and Bow-Crow forests proved to be the most capable of retaining their employees for 5 or more years. Firms in the Slave Lake and Edson forests were capable of retaining one-fifth of their employees for more than 5 years. These statistics suggest that the large companies in these regions provide more-attractive work environments. Industry employees in the Footner Lake and Athabasca forests showed the greatest mobility, with 90% and 60% of employees, respectively, staying with the same employer for only 3 months or less.

Supply and Demand of the Labor Force

Although the forest industry in Alberta is in general reasonably well supplied with a labor force, a number of responding establishments indicated varying degrees of difficulties in obtaining workers, especially highly skilled workers with progressive experience.

Sawmills and pulp, paper, and allied firms (with the exception of sawmills of less than 100 M fbm annual capacity) experienced a high degree of difficulty in recruiting and retaining qualified people for their mill operations (Table 33). In especially short supply were electricians, mechanics, plumbers, and welders; however, these occupations did not comprise a large portion of the labor force. Wood preservation plants and planing mills reported some difficulty attracting and retaining workers.

Most forestry industry firms did not indicate any difficulty obtaining labor for their logging operations, with the exception of larger sawmills, which

Table 32. Hourly paid employees in the forest industry, 1978-79

Industry group	% of employees paid hourly
Sawmills	
5 MM fbm and over	84.8
1 MM to 5 MM fbm	86.0
100 M to 1 MM fbm	94.1
Less than 100 M fbm	95.4
Independent planing mills	86.7
Plywood	95.8
Wood preservation	84.0
Miscellaneous	82.0
Pulp, paper, and allied	95.8

Table 33. Worker supply for the forest industry, 1978-79

Industry group	% of firms with difficulties attracting and retaining workers		
	Woodlands workers	Mill workers	Office and sales workers
Sawmills			
5 MM fbm and over	32	60	12
1 MM to 5 MM fbm	53	67	5
100 M to 1 MM fbm	16	42	0
Less than 100 M fbm	18	17	0
Independent planing mills	N/A	17	0
Plywood	IR	IR	IR
Wood Preservation	IR	25	25
Miscellaneous	IR	40	20
Pulp, paper, and allied	20	75	33
Independent log producers	N/A	0	N/A

N/A - Not available.
IR - Insufficient response.

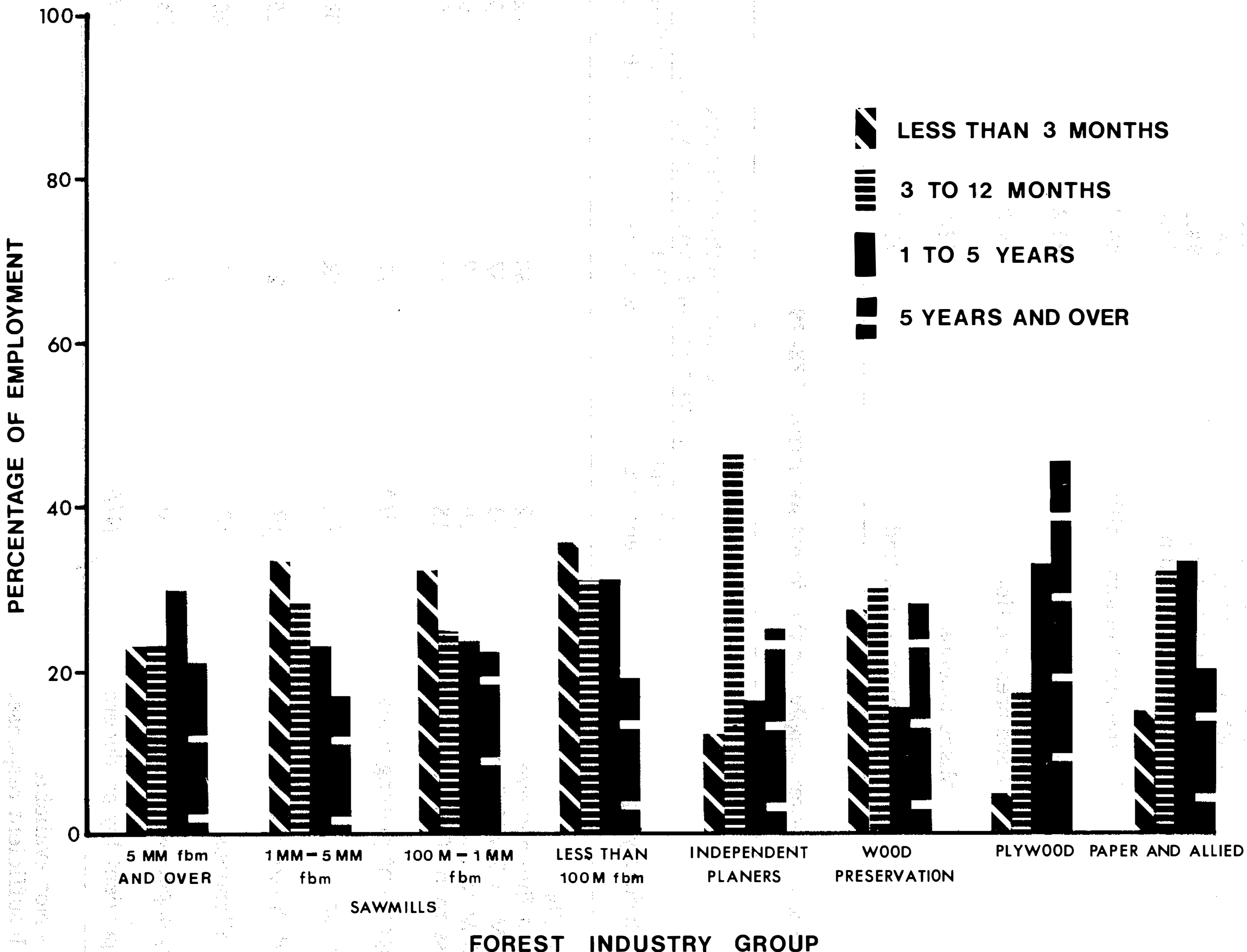

Figure 9. Employment tenure, 1978-79, by forest industry.

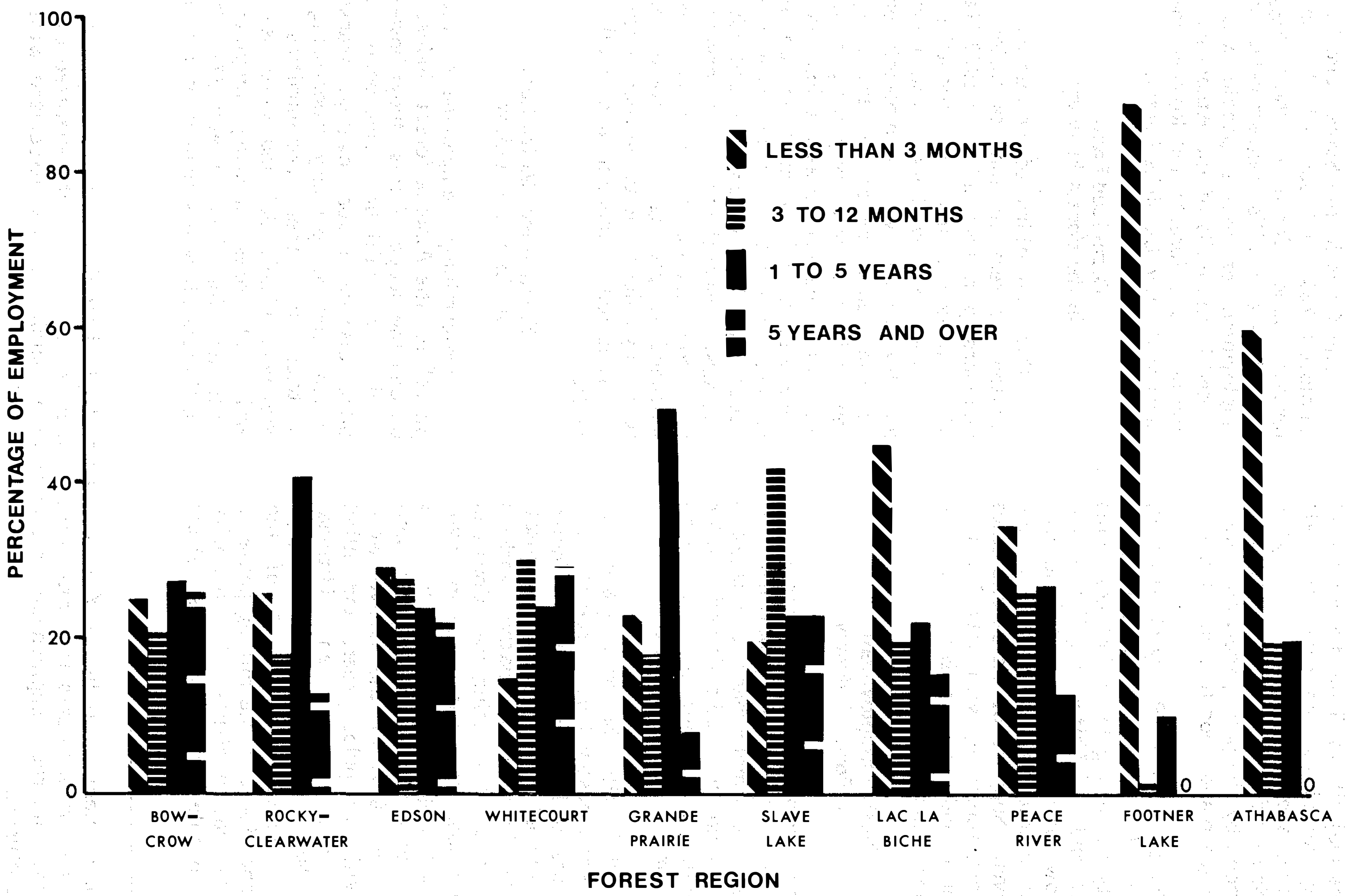

Figure 10. Employment tenure, 1978-79, by forest region.

had difficulty attracting skilled labor for logging.

The majority of firms did not report difficulty recruiting and retaining staff for office, supervisory, and sales positions. Some difficulties in this area were experienced by the pulp, paper, and allied industry group and wood treating plants.

Firms in the Rocky-Clearwater, Edson, and Peace River forests reported difficulty recruiting labor for their mills (Fig. 11), and the Whitecourt, Edson, and Bow-Crow forests experienced some problems in attracting workers for logging operations. Supplies of office and sales staff were adequate, with only firms in Whitecourt and Lac La Biche encountering appreciable difficulties.

Native Employment in the Forest Industry

The forest industry in Alberta provides opportunities for employment of native people. Employment for this group is usually found in woodlands and smaller mill facilities adjacent to small communities and native settlements.

In 1978, 969 jobs, or 15.1% of the total forest industry labor force (logging and manufacturing), were filled by Indian and Metis people (Table 34). Of the total, about one-third of the native workers were engaged in harvesting operations and transportation, while the remaining two-thirds were employed in the mills. The sawmill and planing industry group supported about 82% of the native work force, with the pulp, paper, and allied industry group creating an additional 10.4%. Natives were employed in plywood manufacturing, with 1% of the native labor force in the milling phase of wood preservation plants. The majority of native people worked for others, seldom creating self-employment or their own companies.

The firms in the Slave Lake Forest employed 76% and 66% of the native forestry labor force in their logging operations and mills, respectively. High employment of native people was recorded in the mills of the Athabasca and Footner Lake forests and logging operations of the Lac La Biche Forest.

Organized Labor in the Forest Industry

Over one-third of production and related workers in manufacturing had membership in labor unions in 1979 (Table 35). Six unions and one association represented 1568 workers. The plywood industry workers were completely organized in a union and an association representing 392 workers. Sixty-one percent of workers in the wood preservation industry were organized in a union and an association. In the larger sawmills and pulp, paper, and allied group, 36% and 35% of workers, respectively, were organized, and about one-quarter of employees in independent planing mills were represented by unions. No union representation was reported in medium and small sawmills.

Employment Multipliers in the Forest Industry

Determining employment multipliers[8] for the Alberta forest industry is beyond the scope of this study; however, employment multipliers have been calculated elsewhere for logging, transportation, and all primary wood-using industries in other communities and provinces (Table 36) and were used to arrive at forest industry employment multipliers for Alberta (Table 37). These multipliers allow assessment of the total

[8] An employment multiplier is a value that multiplied by the direct employment of a given industry indicates the total direct and indirect employment generated by that industry. Indirect employment results from economic activity associated with the manufacturing.

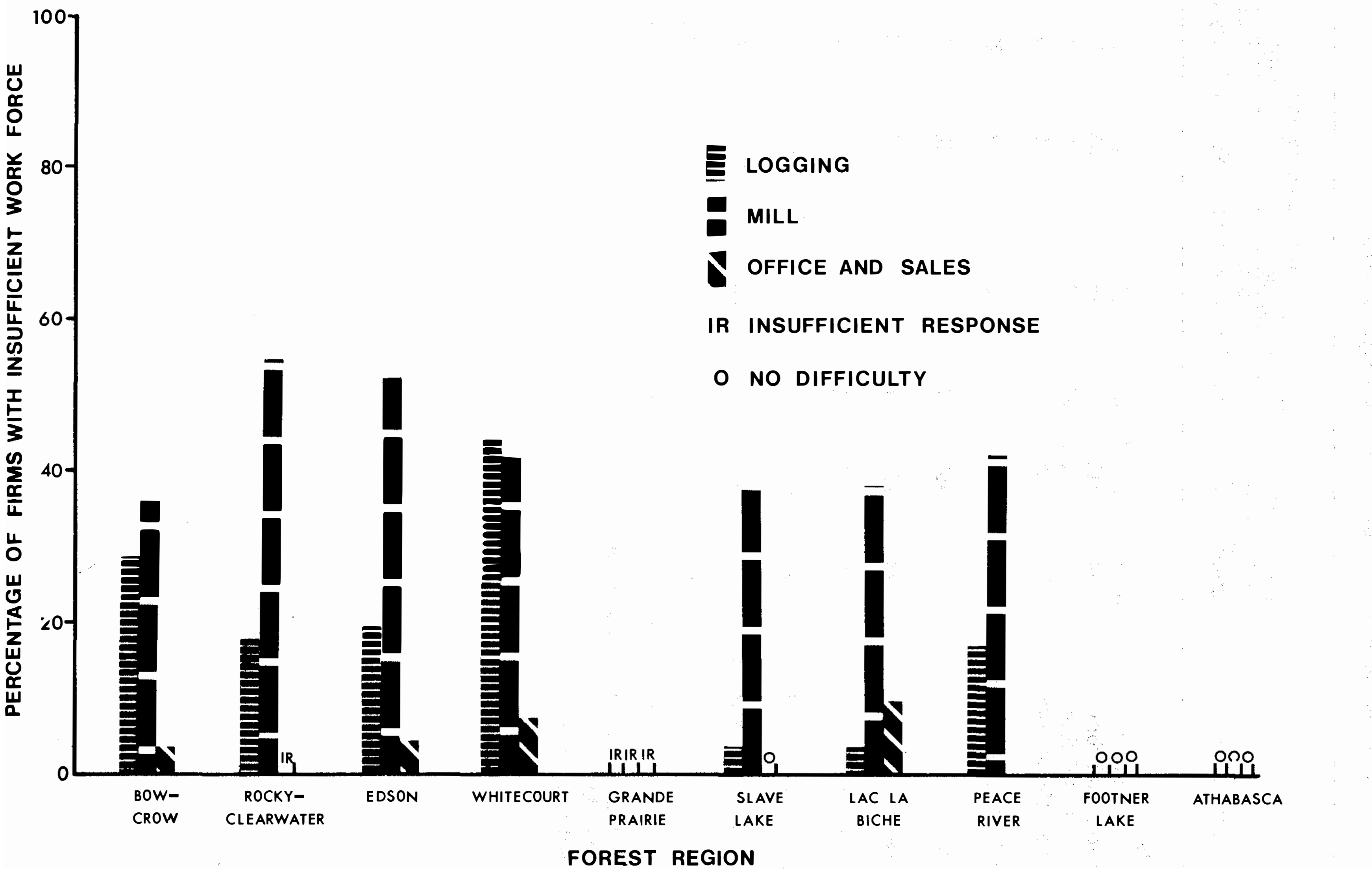

Figure 11. Degree of difficulty in attracting and maintaining workers for woodlands, mill, and office and sales.

Table 34. Native[a] employment[b] in the forest industry, 1978-79

Industry group	Total industry employment: Logging	Total industry employment: Mill	Native employment: Logging No.	Native employment: Logging % of industry total	Native employment: Mill No.	Native employment: Mill % of industry total
Sawmills						
5 MM fbm and over	1014	1787	203	20	429	24
1 MM to 5 MM fbm	84	213	37	44	83	39
100 M to 1 MM fbm	117	202	21	18	18	9
Less than 100 M fbm	80	89	1	1	6	7
Independent planing mills	1	77	0	0	17	22
Plywood	28	402	0	0	28	7
Wood preservation	23	198	0	0	2	1
Miscellaneous	0	133	0	0	0	0
Pulp, paper, and allied	451	1401	45	10	56	4
Independent log producers	117	N/A	23	20	N/A	N/A
Total	1915	4502	330	15.5	639	15.1

[a] Defined as Indian and Metis people.
[b] Person-years.
N/A - Not available.

Table 35. Organized labor by forest industry group, 1978-79

Industry group	Total number of production and associated workers	Number of union members	% of total workers	Union or association
Sawmills				1. International Woodworkers of America
5 MM fbm and over	1609	581	36	2. United Paper Workers International
1 MM to 5 MM fbm	213	0	0	3. Association of Employees of North Canadian Forest Industries (NCFI)
100 M to 1 MM fbm	202	0	0	
Less than 100 M fbm	89	0	0	
Independent planing mills	77	20	26	
Plywood	392	392	100	1. International Woodworkers of America 2. Association of Employees of NCFI
Wood preservation	173	105	61	1. Creosote and Miscelleneous Employees Union 2. Bell Pole Employee Association
Miscellaneous	133	44	33	1. International Woodworkers of America
Pulp, paper, and allied	1223	426	35	1. International Woodworkers of America 2. International Chemical Workers of America 3. International Brotherhood of Pulp, Sulphite and Paper Mill Workers
Total	4111	1568	38	

Table 36. Employment multipliers

Industry group	Estimated multiplier	Location
Logging	1.92	Ontario[a]
Sawmills and planing mills	1.63	Ontario[a]
Plywood plants	1.57	Ontario[a]
Miscellaneous	1.73	Ontario[a]
Pulp and paper	2.57	Ontario[a]
Pulp, paper, and allied	2.43	British Columbia[b] (Prince George)
Mixed forest industry	2.49	British Columbia (Okanagan)
All forest industry	2.80	British Columbia (province-wide)

[a] Source: Ontario Ministry of Natural Resources 1981.
[b] Source: Reed and Associates 1973.

Table 37. Direct and indirect employment[a] impact by forest industry group, 1978-79

Industry group	Direct forest industry employment	Employment multiplier	Indirect employment	Total employment
Sawmills				
5 MM fbm and over	2 801	2.35	3 781	6 582
1 MM to 5 MM fbm	297	2.35	401	698
100 M to 1 MM fbm	319	2.35	431	750
Less than 100 M fbm	169	2.35	228	397
Independent planing mills	78	2.35	105	183
Plywood	430	2.31	563	993
Wood preservation	221	2.15	254	475
Miscellaneous	133	2.39	185	318
Pulp, paper, and allied	1 852	2.59	2 945	4 797
Independent log producers	117	1.94	110	227
Estimated provincial forest industry multiplier		2.30		
Total	6 417		9 003	15 420

[a] Person-years.

employment impact of the forest industry.

A subjective approach, considering criteria such as size and structure of the industry, relative size of the service sector, sources of nonwood materials and supplies, income expenditure pattern of industry employees, and others, was used to calculate the multipliers. This approach was expedient, but such multipliers should be viewed only as practical approximations.

Indirect employment created by the Alberta forest industry in 1979 was 9003 jobs (Table 37). Fifty-five percent of these jobs were supported by the operation of the sawmill and planing mill industry group, and 33% were created by the pulp, paper, and allied industry group.

The average provincial forest industry employment multiplier was 2.30. This means that for each new job supported by the Alberta forest industry there were 1.30 jobs created elsewhere in the provincial economy. The total employment impact, direct and indirect, was 15 420.

Regional Impact of Employment in the Forest Industry

The opportunities for employment in the Alberta forest industry varied markedly by forest region. Sixty percent of the employment opportunities in forest industries were created in the Edson, Whitecourt, and Grande Prairie forests (Table 38). The Bow-Crow, Rocky-Clearwater, Slave Lake, and Lac La Biche forests supported 33% of all Alberta forest industry jobs. Forest industries in the Peace River and Footner Lake forests accounted for only 7% of the jobs, while a negligible amount of job opportunities was created by the industry in the Athabasca Forest.

Table 38. Regional distribution of native[a] and total forestry employment,[b] 1978-79

Forest region	Native employment			Total employment[c]			Native employment as % of total
	Logging	Mill	Total	Logging	Mill	Total	
Bow-Crow	34	28	62	225	524	749	8.3
Rocky-Clearwater	1	44	45	85	232	317	14.2
Edson	69	42	111	351	816	1167	9.5
Whitecourt	63	126	189	380	880	1260	15.0
Grande Prairie	17	38	55	420	980	1400	3.9
Slave Lake	131	272	403	172	411	583	69.1
Lac La Biche	45	27	72	140	326	466	15.5
Peace River	7	12	19	70	163	233	8.2
Footner Lake	0	51	51	67	158	225	22.7
Athabasca	0	6	6	5	12	17	35.3
Total	367	646	1013	1915	4502	6417	15.8

[a] Defined as Indian and Metis people.
[b] Person-years.
[c] Employment based on own employees, not including any contract employment.

CHAPTER VI

CAPACITY AND PRODUCTION OF THE FOREST INDUSTRY

There were 458 forest industry establishments (Table 39) in Alberta in 1978-79 (Fig. 2). The Whitecourt Forest has a strong industry presence with 83 establishments. The Rocky-Clearwater Forest, with 82 establishments, follows, although low-volume, small sawmills producing less than 100 M fbm annually account for 50% of all industries in this region. Similar situations prevail in the Grande Prairie and Peace River forests, where sawmills with less than 100 M fbm annual production account for 72% and 66%, respectively, of all industries in these regions. In these regions, more large sawmills are desirable from the standpoint of forest resource and employment development. The Bow-Crow, Edson, and Slave Lake forests show good distribution and structure of industries, with good representation of sawmills with production capacity of 5 MM fbm and over per annum. The low number of forest industries in the Lac La Biche, Footner Lake, and Athabasca forests and their low capacity reflect a high cost/low return to forest industry firms in these regions. These forests are considered a low-priority area for development by the province at this time.

Not every forest industry group and forest region contributed an equal share to the total production of a given product (Tables 40 and 41). Twenty-six large sawmills, 6.6% of all sawmills, produced 85.6% of the total lumber output. Twenty-nine firms in the next class of sawmills (1 MM to 5 MM fbm annual production), accounting for 7.4% of all sawmills, manufactured 8.4% of total lumber production. In the 100 M to 1 MM fbm annual production sawmill class, 128 firms produced less than 4.9% of the total lumber output, while the 211 sawmills in the less than 100 M fbm annual production sawmill class manufactured 1.1% of the total.

The large-class sawmills also produced 97.5% of all wood chips, while the medium-class sawmills accounted for 2.5% of this product.

Independent planing mills are predominantly market- or use-oriented. They are concentrated in regions of heavy use of planed lumber (e.g., Edmonton and Lac La Biche) or, less frequently, in regions of high lumber production (e.g., the Slave Lake and Edson forests). All but one of the planing mills were located in the southern and central parts of the province. Five large-class planing mills (27.8% of all firms) produced approximately 92.8% of all planed lumber.

Three plywood plants were located in the south-central part of the province in or close to large local and provincial markets and within easy access of out-of-province transportation routes. Two firms produced 88% of the Alberta plywood production.

Nine large- to medium-size wood preservation plants were concentrated in areas of heavy use of this commodity (Edmonton, Cochrane, and Medicine Hat) or areas of production (e.g., the Rocky Mountain House and Edson forests). The two largest firms produced 68% of all preserved wood in the province, while seven firms of medium size accounted for 26.8% of the production. Nine small-class firms (less than 100 M fbm annual production) manufactured about 5.2% of all preserved wood.

All but one of the pallet plants were located in the urban centers of Edmonton, Calgary, and Lethbridge, where most of their products are used. The two largest plants provided 50.7% of all pallet production, while three other smaller firms produced 3.7%.

Table 39. Distribution of the Alberta forest industry by forest region, 1978-79

Industry group	Forest region										
	Bow-Crow	Rocky-Clearwater	Edson	Whitecourt	Grande Prairie	Slave Lake	Lac La Biche	Peace River	Footner Lake	Athabasca	Total
Sawmills											
5 MM fbm and over	4	3	2	6	1	7	1	1	1	0	26
1 MM to 5 MM fbm	2	3	6	6	1	6	3	1	0	1	29
100 M to 1 MM fbm	9	17	12	26	15	16	14	12	7	0	128
Less than 100 M fbm	11	41	13	34	50	13	14	29	5	1	211
Total sawmills	26	64	33	72	67	42	32	43	13	2	394
Independent planing mills	0	2	1	3	0	4	7	1	0	0	18
Plywood plants	1	0	0	1	1	0	0	0	0	0	3
Wood preservation plants	3	7	5	3	0	0	0	0	0	0	18
Pallet plants	6	0	0	2	0	1	0	0	0	0	9
Lath mills	0	9	0	0	0	0	0	0	0	0	9
Building logs	1	0	0	0	0	0	1	0	0	0	2
Pulp, paper, and allied	1	0	1	2	1	0	0	0	0	0	5
Independent log producers[a]	29	65	32	65	54	40	28	34	10	0	357
Total forest industry[b]	38	82	40	83	69	47	40	44	13	2	458

[a] Individuals or firms producing roundwood for sale to other industry groups.
[b] Independent log producers not included in totals.

Table 40. Distribution of firms by production and forestry industry groups, 1978-79

Industry group	Firms No.	Firms %	Production MM fbm unless otherwise noted	Production %	Wood chips BDU[a]	Wood chips %
Sawmills						
5 MM fbm and over	26	6.6	661.6	85.6	309 212	97.6
1 MM to 5 MM fbm	29	7.4	64.1	8.4	7 600	2.4
100 M to 1 MM fbm	128	32.5	38.5	4.9	-	-
Less than 100 M fbm	211	53.5	8.8	1.1	-	-
Total sawmills	394	100.0	773.0	100.0	316 812	100.0
Independent planing mills						
5 MM fbm and over	5	27.8	68.2	92.8		
100 M to 5 MM fbm	10	55.6	5.1	7.0		
Less than 100 M fbm	3	16.6	0.2	0.2		
Total independent planing mills	18	100.0	73.5	100.0	-	-
Plywood (1/16-in. basis)	3		1325 MM sq. ft.	100.0	-	-
Wood preservation						
1 MM fbm and over	2	11.1	1.1 MM fbm lumber	68.0		
100 M to 1 MM fbm	7	38.9		26.8		
Less than 100 M fbm	9	50.0	9.9 MM cu. ft. preserved stock (62 MM fbm)	5.2		
Total	18	100.0	63.1	100.0	-	-
Miscellaneous						
Pallet plants						
5 MM fbm and over	2	10.0	11.0	42.6		
1 MM to 5 MM fbm	4	20.0	9.9	38.4		
100 M to 1 MM fbm	3	15.0	0.8	3.1		
Lath mills						
100 M to 1 MM fbm	1	5.0	0.2	0.8		
Less than 100 M fbm	8	40.0	0.4	1.5		
Building log plants	2	10.0	3.5	13.6		
Total	20	100.0	25.8	100.0	-	-
Pulp, paper, and allied	5		516 000 tons pulp paper 108 MM sq. ft. (1/2-in. basis paperboard)			
Independent log producers[b]	357		-[c]			
Total all industry groups	458		-		-	-

[a] 1 BDU (bone dry unit) = 2400 lb of bone dry wood chips.
[b] Individuals or firms producing roundwood for sale to other industry groups. Independent log producers not included in totals.
[c] Included as purchased wood in the sawmill-planing industries.

Table 41. Output of forest products in 1978-79 by product type and forest region[a]

Product	Forest region: Bow-Crow	Rocky-Clearwater	Edson	Whitecourt	Grande Prairie	Slave Lake	Lac La Biche	Peace River	Footner Lake	Athabasca	Total production
Dimension lumber--M fbm	65 692	37 400	75 346	179 279	82 491	133 418	44 699	43 528	87 698	766	750 317
Boards--M fbm	12 164	13 603	1 156	8 647	5 514	5 271	6 842	3 866	4 762	130	61 955
Timbers--M fbm	2 719	1 358	4 928	1 437	880	4 969	970	462	221	1 992	19 936
Ties (unpreserved)--M fbm	0	1 020	5 953	320	126	2 150	0	111	0	0	9 680
Preserved lumber and ties--M fbm	22 584	828	0	342	0	0	17 952	0	0	0	41 706
Pallets and containers--M fbm	13 490	0	0	6 000	0	0	2 200	0	0	0	21 690
Moldings--M fbm	1 015	0	750	0	0	0	0	0	0	0	1 765
Lath--M fbm	71	316	50	0	0	0	9	160	0	0	606
House logs--M cu. ft.	0	0	0	0	0	0	83	0	0	0	83
Posts (unpreserved)--M cu. ft.	95	83	384	50	1	10	4	0	0	0	627
Poles (unpreserved)--M cu. ft.	30	0	0	0	0	0	0	0	0	0	30
Logs--M fbm	1 350	102	876	4 566	528	0	0	0	0	0	7 422
Peeler logs--M fbm	0	0	0	0	0	0	0	9 890	0	0	9 890
Preserved posts and poles--M cu. ft.	1 680	394	121	133	0	0	65	0	0	0	2 393
Slabs--M cu. ft.	416	0	0	360	0	0	96	0	0	0	872
Firewood--cords	7 516	1 323	3 172	2 422	125	8 041	1 149	99	100	1 024	24 971
Plywood (1/16-in. basis)--MM sq. ft.	154	0	0	701	470	0	0	0	0	0	1 325
Preserved plywood (1/16-in. basis) --M sq. ft.	0	21 120	0	0	0	0	0	0	0	0	21 120
Insulation and fiberboard sheathing (1/2-in. basis)--MM sq. ft.	48	0	0	60	0	0	0	0	0	0	108
Pulp (bleached sulfate)--tons	0	0	193 986	0	280 000	0	0	0	0	0	473 986
Chips--BDU[b]	16 827	4 260	45 857	76 960	65 000	33 500	20 468	0	53 940	0	316 812
Shavings--bales[c]	134 409	17 000	20 700	0	0	0	15 996	0	0	0	188 105
Paper and roofing products--tons	12 000	0	0	0	0	0	30 000	0	0	0	42 000

[a] Source: NoFRC Forest Industry Survey, 1979.
[b] BDU - Bone dry units (1 BDU = 2400 lb).
[c] 1 bale = 30 lb.

Production of lath in the province was concentrated in the Rocky Mountain House-Caroline area. All the lath produced was sold and used locally. Manufacturing was done in small operations, although one firm produced about one-third of all lath manufactured.

Two building timber plants, located in southern and central Alberta, were rather small operations, primarily serving local markets.

Two large pulp mills located in the central and west-central portions of the province manufactured all Alberta pulp. Three other firms in this group, located in or near urban centers, produced building products such as paperboard, roofing material, and insulation board and products.

Normal Output vs. Engineered Capacity

In the last decade, production (output) totals of Alberta forest industries have been increasing steadily with the advent of new firms and additions to existing facilities. The full physical capacity of manufacturing machinery has not been used for a number of reasons, among them inadequate wood supply, labor shortages, and logging access during the summer.

Normal production in large sawmills (5 MM fbm and over annual production) achieved 64% of engineered capacity with an average of 7.9 shifts (8.0 hours per shift) per week (Table 42). Availability of wood supply (usually a function of logging costs and woods-to-mill hauling distance) was a major factor limiting increased lumber production or expansion for at least half of the large sawmills (Table 43). Some of the firms indicated that labor shortages and summer logging access were limiting factors. The problem of log yard stability could be overcome, however. About 30% of the sawmills in this group reported no factors limiting their operation or expansion.

Normal output in medium-class sawmills (1 MM to 5 MM fbm annual production) reached 73% of engineered capacity in five 8-hour shifts per week.

Normal production was only 48% of engineered capacity in sawmills with 100 M to 1 MM fbm annual production and output was only marginally higher (59%) in the sawmills of less than 100 M fbm annual production. Poor logging access, seasonal operation, and inadequate timber supply prevented the achievement of higher output. In the same sawmill size class, sawmill-planing complexes attained 6.0-21.5% higher normal production than sawmills without the planing operation.

Independent planing mills reached 70% of their engineered capacity. Some firms indicated an inadequate lumber supply as a factor limiting their operations and expansion. Plywood firms also cited inadequate wood supply as well as market demand for their product as factors limiting their operations.

The wood preservation industry group attained 68% of engineered capacity. Inadequate timber supply and market demand were reported as the main limiting factors for their operation and expansion.

The pallet, building log, and building product industry group found market demand the factor most limiting to their operations.

In the pulp, paper, and allied industry group, normal production exceeded engineered capacity by about 11%. No limiting factors for operations or expansion were reported.

Log haul distance from woods to mill does not appear to affect the operations or expansion of any industry group. The average weighted log haul varied by industry group (Fig. 12). The one-way haul distance declined with the size of the firm, from 53.6 miles for large sawmills to 10.5 miles for small sawmills. Plywood logs were hauled an average of 170 miles, while the average haul for pulp, paper, and allied industries was 40 miles.

Table 42. Engineered capacity, normal output, and operating ratios by forest industry group, 1978-79

Industry group	Average engineered capacity (per 8-hr shift) Sawmill (fbm)	Average engineered capacity (per 8-hr shift) Planer (fbm)	Average normal output (per 8-hr shift) Sawmill (fbm)	Average normal output (per 8-hr shift) Planer (fbm)	Operating ratio Sawmill	Operating ratio Planer
Sawmills						
5 MM fbm and over	93 429	105 800	60 200	81 833	0.64	0.77
1 MM to 5 MM fbm	30 778	73 889	22 568	58 889	0.73	0.80
100 M to 1 MM fbm	21 370	35 667	10 257	24 800	0.48	0.70
Less than 100 M fbm	8 062	-	4 753	-	0.59	-
Independent planing mills	-	55 000	-	38 750	-	0.70
Plywood (1/16-in. basis)	1 728 M sq. ft.		1 235 M sq. ft.		0.71	
Wood preservation	12 500		8 500		0.68	
Miscellaneous	IR		IR		-	
Pulp, paper, and allied						
Pulp mills	650 tons/day		720 tons/day		1.11	
Building paper, roofing material	38 tons		35 tons		0.92	
Fiberboard (1/2-in. basis)	68 M sq. ft.		63 M sq. ft.		0.93	

IR - Insufficient response.

Table 43. Factors limiting the operation and expansion of Alberta's forest industries, 1978-79

Industry	No. of firms	Factor ratings[a]	Limiting factors: Availability of timber	Labor shortage	Log yard stability	Logging access in summer	Dry kiln capacity	Escalating labor and energy costs	Market demands	% of firms reporting factors
Sawmills										
5 MM fbm and over	26	1	12	2	2	2	0	0	0	69.2
		2	1	1	1	1	0	0	0	15.4
		3	1	1	0	0	1	0	0	11.5
		4	0	0	1	0	0	0	1	7.7
Independent planing mills	9	1	3	0	0	0	0	0	0	33.3
Plywood mills	3	1	1	0	0	0	0	0	0	33.3
Wood preservation plants										
100 M fbm and over	9	1	2	0	0	0	0	0	0	22.2

[a] Indicates the order of importance of factors limiting the operation and expansion of forest industry, with decreasing importance from 1 to 4.

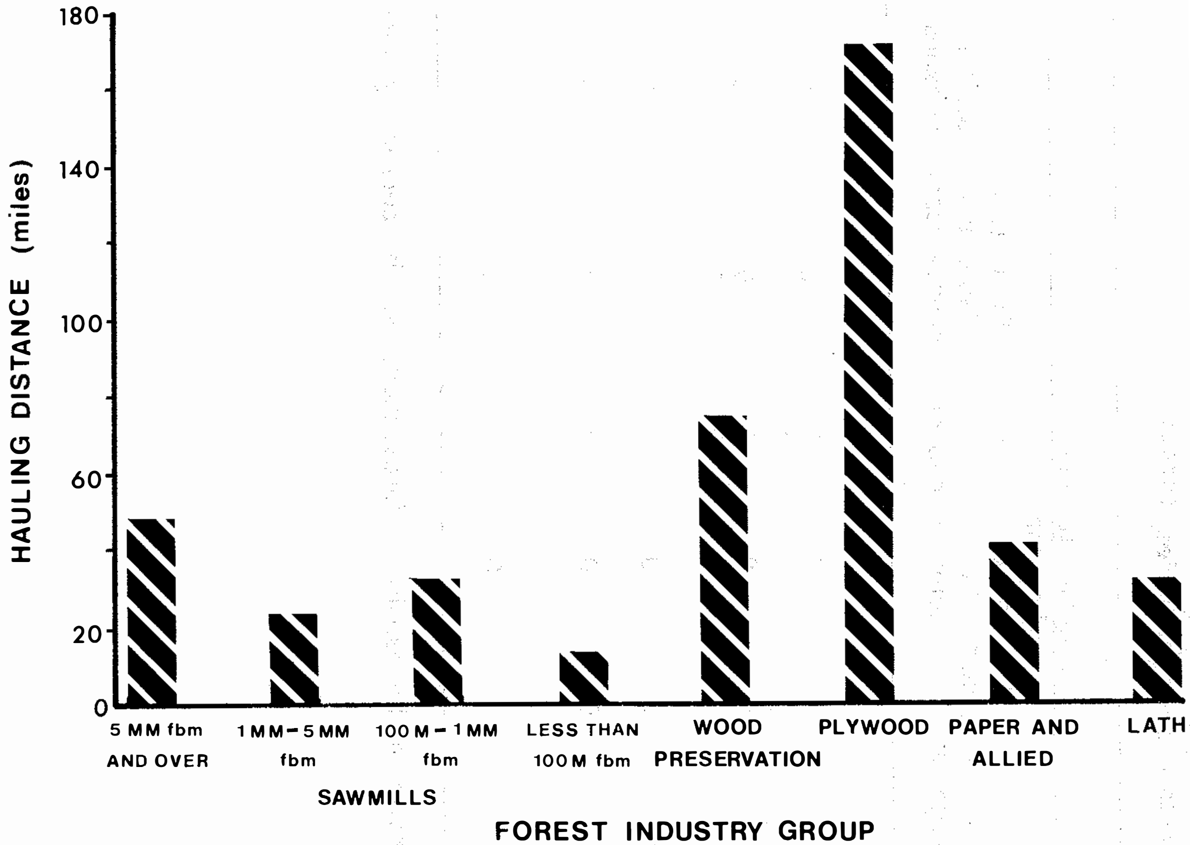

Figure 12. Average weighted log haul distance from woods to mill.

When aggregating the industries regardless of type and size, the Rocky-Clearwater, Lac La Biche, Edson, and Whitecourt forest industries hauled their mill inputs an average of 30-40 miles (Fig. 13). The Peace River, Slave Lake, and Grande Prairie forest industries transported wood for their mills an average of 59-76 miles.

Production of the Sawmill Industry Group

The 394 Alberta sawmills operating in 1978-79 produced 750 316 M fbm of rough-sawn dimension lumber[9], of which 677 273 M fbm (90.3%) was planed (Table 44). Dimension lumber was the mainstay of the Alberta forest industry, accounting for 87.5% of all lumber products. Board products (1-in. material) and timber (3+ in. material) represented 7.2% and 2.3% of all lumber products, respectively.

Preserved lumber and railway ties represented less than 1% of sawmill products, while the balance of sawmill production (approximately 2.5%) was in pallets, containers, and moldings (Table 45).

Large sawmills planed 94.1% of their lumber production, while small sawmills planed less than 13% of their total lumber production.

Large sawmills produced 78.1% of the total lumber, medium and small sawmills 7.4% and 5.7%, and independent planing mills 8.8%.

[9] Dimension lumber refers to all 2-in. thickness sawn material of any width and length.

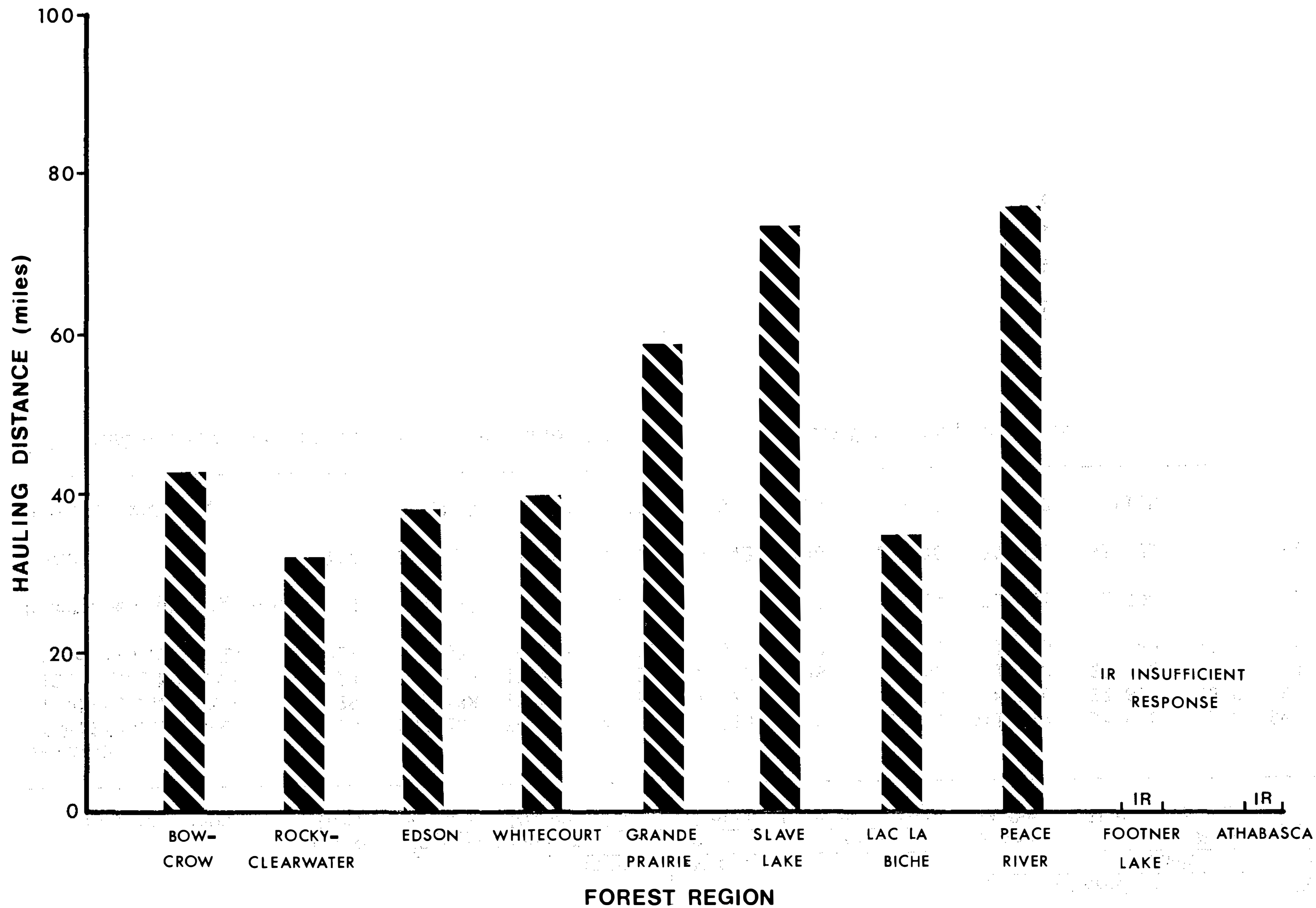

Figure 13. Average log haul distance for sawmills and the pulp, paper, and allied industry, by region.

Table 44. Rough and planed lumber production, 1978-79

Industry group	No. of firms	Product[a] (M fbm) Dimension lumber Planed	Dimension lumber Rough	Boards Planed	Boards Rough	Timbers Planed	Timbers Rough	All products Planed M fbm	All products Rough M fbm	Rough % of planed	Total final Lumber production M fbm	Total final Lumber production %
Sawmills												
5 MM fbm and over	26	567 809	34 690	44 005	1 313	0	2 053	611 814	38 056	5.8	649 870	78.1
1 MM to 5 MM fbm	29	35 188	13 965	3 808	1 171	0	7 476	38 996	22 612	36.0	61 608	7.4
100 M to 1 MM fbm	128	8 892	17 845	2 380	2 107	196	7 156	11 468	27 108	70.4	38 576	4.6
Less than 100 M fbm	211	636	6 543	487	451	0	551	1 123	7 545	87.2	8 668	1.1
Independent planing mills	18	64 748	0	6 233	0	0	2 504	70 981	2 504	3.4	73 485	8.8
Total	412	677 273	73 043	56 913	5 042	196	19 740	734 382	97 825	-	832 207	100.0
% planed and rough	-	90.3	9.7	91.9	8.1	1.0	99.0	88.2	11.8	-	-	-

[a] Dimension lumber accounted for 90.2%, boards for 7.4%, and timbers for 2.4% of total production.

Table 45. Lumber products from sawmills and planing mills, 1978-79

Lumber product	Size (in.)	Planed (M fbm)	Rough (M fbm)	% by size	% of all products
Dimension	2 X 2	2 111	0	0.3	
	2 X 3	11 072	677	1.6	
	2 X 4	437 434	38 533	63.4	
	2 X 6	130 880	19 848	20.1	
	2 X 8	52 819	8 610	8.2	
	2 X 10	40 527	4 794	6.0	
	2 X 12	2 430	582	0.4	
Total				100.0	87.5
Boards	1 X 2	75	2	0.1	
	1 X 3	35	1	0.1	
	1 X 4	21 755	1 778	38.0	
	1 X 6	21 046	2 056	37.3	
	1 X 8	10 270	863	18.0	
	1 X 10	1 940	257	3.5	
	1 X 12	1 792	85	3.0	
Total				100.0	7.2
Timbers	3 X 6	2	124	0.6	
	3 X 8	6	2 354	11.8	
	3 X 10	9	394	2.0	
	3 X 12	33	1 260	6.5	
	4 X 4	56	4 908	25.0	
	4 X 6	61	4 643	23.6	
	6 X 6	14	5 511	27.7	
	8 X 8	15	546	2.8	
Total				100.0	2.3
Preserved lumber and ties	-	-	1 110	-	0.1
Pallets and containers	-	-	21 690	-	2.5
Moldings	-	1 765	-	-	0.2
Lath	-	-	606	-	0.1
Slabs	-	-	139	-	0.1
Chips	-	316 812 BDU[a]		-	-
Shavings	-	188 105 bales[b]		-	100.0

[a] BDU (bone dry unit) = 2400 lb.
[b] 1 bale = 30 lb.

In the dimension lumber products, 2 X 4s dominated with 63.4% of the total, followed by 2 X 6s (20.1%), 2 X 8s (8.2%), 2 X 10s (6.0%), and other sizes (2.3%) (Table 45).

In the boards category, 1 X 4s and 1 X 6s accounted for 75.3%, 1 X 8s for 18.0%, and other sizes for 6.7%.

Aggregating all production by product and sawmill size illustrates the influence of large dimension lumber (stud) mills on the composition of lumber products manufactured. Studs were the single most important commodity, accounting for more than 63.4% of all lumber produced. The majority of these studs were kiln-dried, dressed (planed) on four sides with eased edges, and exported by rail in lifts (bundles) to the US, where they were precision end-trimmed to various lengths. The two prevailing lengths were 8 ft. and 7 ft. 8 1/2 in., with smaller quantities of 10, 12, 14, and 16 ft. Their major use in the US was for residential construction, with smaller but ever-increasing quantities going to the mobile home and trailer home industry.

Spruce was the most important lumber species in the Alberta sawmill industry (Table 46): 84.3% of timbers, 76% of boards, and 62.4% of all dimension lumber were made from white or black spruce. Lodgepole and jack pine accounted for about 36% in dimension lumber, 22% in boards, and less than 5.5% in timbers. Balsam fir and poplar each made up about 3.6% of dimension and board lumber, and poplar made up about 9.8% of timbers.

Except for the largest sawmills, where rail transportation of dimension lumber and boards assumed increasing importance, lumber was moved to markets mostly by truck and a small portion by barge (Table 47). For example, large sawmills moved 84.5% of their dimension products and 46.5% of their boards by rail, but no timbers. Smaller sawmills moved almost all of their products to markets by truck. Two factors are important in explaining this: 1) larger saw mills usually have a sufficient quantity of lumber to fill rail cars regularly and continuously, and 2) the lumber products from those mills are moved predominantly long distances to large export markets in the southwest and central US and to Manitoba and Ontario. Rail transport is more economical than trucking for long hauls. Firms using rail transport therefore are in a better position to compete in their existing markets and to penetrate new export lumber markets, especially in the US. Less than 10% of dimension lumber and a negligible quantity of timbers were moved by rail to the markets of the medium-size sawmill group. Little lumber was transported by rail to the markets of smaller sawmills and planing mills. In the medium and smaller sawmills truck transportation prevailed. These sawmills moved their lumber products shorter distances, such as to Saskatchewan export markets, the northwest or north-central US, or within the province to local markets.

Barge transportation of lumber, although low in total volume, was important for moving lumber products from medium-size sawmills situated near large rivers such as the Athabasca River and with limited road access to the markets in the Northwest Territories.

Pulp, Paper, and Allied Industry Group

With gross sales of $204.5 million, this industry group is the largest primary wood-using industry. Its five firms produced kraft pulp, fiberboard, insulation and roofing products, construction paper, and tall oil (Table 48). Products of the pulp, paper, and allied industry group were marketed in a variety of grades, shapes, and dimensions in Canada and in foreign export markets. Over 96% of kraft pulp produced was marketed in the United States and other foreign markets, and the balance was sold outside of Alberta in Canada. Tall oil, a by-product of the sulfate pulp process of resinous woods, was exported primarily to Japan.

Table 46. Species mix of lumber production, 1978-79

Mill size	Product	Total production (M fbm)	Species: Spruce M fbm	Spruce %	Pine M fbm	Pine %	Balsam fir M fbm	Balsam fir %	Poplar M fbm	Poplar %
Sawmills										
5 MM fbm and over	Dimension	602 499	379 575	63.0	217 502	36.1	5 422	0.9	0	0.0
	Boards	45 318	37 251	82.2	8 067	17.8	0	0.0	0	0.0
	Timber	2 053	2 014	98.1	0	0.0	0	0.0	39	1.9
1 MM to 5 MM fbm	Dimension	49 153	33 866	68.9	12 731	25.9	1 081	2.2	1 475	3.0
	Boards	4 979	3 719	74.7	976	19.6	264	5.3	20	0.4
	Timber	7 476	7 424	99.3	0	0.0	0.0	0.0	52	0.7
100 M to 1 MM fbm	Dimension	26 737	17 780	66.5	6 123	22.9	187	0.7	2 647	9.9
	Boards	4 487	2 432	54.2	1 386	30.9	76	1.7	593	13.2
	Timbers	7 352	4 705	64.0	1 014	13.8	74	1.0	1 559	21.2
Less than 100 M fbm	Dimension	7 179	4 408	61.4	1 443	20.1	50	0.7	1 278	17.8
	Boards	938	563	60.0	283	30.2	8	0.9	84	8.9
	Timber	551	172	31.2	81	14.7	0	0.0	298	54.0
Independent planing mills	Dimension	64 748	32 309	49.9	32 245	49.8	0	0.0	194	0.3
	Boards	6 233	3 178	51.0	2 905	46.6	0	0.0	150	2.4
	Timber	2 504	2 504	100.0	0	0.0	0	0.0	0	0.0
Total sawmills and planing mills	Dimension	750 316	467 938	62.4	270 044	36.0	6 740	0.9	5 594	0.7
	Boards	61 955	47 143	76.0	13 617	22.0	348	0.6	847	1.4
	Timber	19 936	16 819	84.3	1 095	5.5	74	0.4	1 948	9.8
Total		832 207	531 900	63.9	284 756	34.2	7 162	0.9	8 389	1.0

Table 47. Transportation of lumber products, 1978-79

Mill size	Product	Total production (M fbm)	Method of transportation					
			Truck		Rail		Barge	
			M fbm	%	M fbm	%	M fbm	%
Sawmills								
5 MM fbm and over	Dimension	602 499	93 387	15.5	509 112	84.5	0	0.0
	Boards	45 318	24 245	53.5	21 073	46.5	0	0.0
	Timber	2 053	2 053	100.0	0	0.0	0	0.0
1 MM to 5 MM fbm	Dimension	49 153	44 385	90.3	4 768	9.7	0	0.0
	Boards	4 979	4 979	100.0	0	0.0	0	0.0
	Timber	7 476	5 637	75.4	30	0.4	1 809	24.2
100 M to 1 MM fbm	Dimension	26 737	26 148	97.8	348	1.3	241	0.9
	Boards	4 487	4 402	98.1	0	0.0	85	1.9
	Timber	7 352	7 190	97.8	0	0.0	162	2.2
Less than 100 M fbm	Dimension	7 179	7 179	100.0	0	0.0	0	0.0
	Boards	938	938	100.0	0	0.0	0	0.0
	Timber	551	551	100.0	0	0.0	0	0.0
Independent planing mills	Dimension	64 748	55 230	85.3	0	0.0	9 518	14.7
	Boards	6 233	5 354	85.9	0	0.0	879	14.1
	Timber	2 504	2 504	100.0	0	0.0	0	0.0
Total sawmills and planing mills	Dimension	750 316	226 329	30.2	514 228	68.5	9 759	1.3
	Boards	61 955	39 918	64.4	21 073	34.0	964	1.6
	Timber	19 936	17 935	90.0	30	0.1	1 971	9.9
Total		832 207	284 182	34.2	535 331	64.3	12 694	1.5

Table 48. Production of the pulp, paper, and allied industry group[a], 1978-79

Product	Quantity	Gross sales
Pulp	473 986 tons	X
Paper and roofing products	42 000 tons	X
Insulation board and fiberboard sheathing (1/2-in. basis)	1 075 MM sq. ft.	X
Crude tall oil	5 200 tons	X
Total		$204 580 590

[a] Total of five mills.
X - Confidential.

Table 49. The plywood industry group production, 1978-79

Sheet thickness (in.)	Sheathing M sq. ft.	Sheathing %	Select M sq. ft.	Select %	Total (M sq. ft.)
5/16	49 189	83.9	9 443	16.1	58 632
3/8	52 697	85.6	8 886	14.4	61 583
7/16	2 933	80.0	733	20.0	3 666
1/2	26 752	82.8	5 554	17.2	32 306
9/16	2 281	80.0	570	20.0	2 851
5/8	15 504	81.2	3 597	18.8	19 101
3/4	10 386	77.3	3 057	22.7	13 443
Total (based on 1/16-in. thickness[a])	1 096 875	82.8	227 878	17.2	1 324 753

[a] Common denominator for totaling purposes.

Fiberboard and insulation and roofing products were marketed mostly in Manitoba and Saskatchewan, with large quantities being consumed by the Alberta construction industry.

Because the majority of products of the pulp, paper, and allied industry group are exported outside Alberta and Canada, the employment impact created by a secondary processing industry is correspondingly low. Relatively high wages and salaries in this group, however, generate more consumption per employee in this group than in other groups. A notable feature of this industry group is that Alberta firms sell their products in international markets that are very large and competitive.

Plywood Industry Group

This industry group included three firms with gross sales of $34.4 million. The group produced and sold 1096.9 million sq. ft. (1/16-in. basis) of sheathing and 227.9 million sq. ft. (1/16-in. basis) of select plywood. All plywood production was sold in the Canadian domestic market (Table 49). Sheet thickness ranged from 5/16 in. to 3/4 in. Sheet thicknesses of 5/16 in. and 3/8 in. accounted for 50% of all plywood produced, and sheet thicknesses of 1/2 in., 5/8 in., and 3/4 in. accounted for 19.5%, 14.4%, and 12.2%, respectively. These products are used predominantly for sheathing, underlay, and subflooring in residential and light industrial construction. Select plywood products command 20-25% higher selling prices than sheathing grade. Spruce was the prevailing plywood species, but small and ever-increasing quantities of poplar plywood were also produced.

Wood Preservation Industry Group

This group was represented by 18 firms, most functioning as separate industrial entities or, less frequently, as part of a sawmill complex. The firms in this group manufactured a wide range of preserved wood products. Larger firms produced pressure-preserved products, while smaller firms manufactured dip-preserved materials.

Custom-preserved ties were the most important commodity, accounting for 60% of all preserved products (Fig. 14). This product was manufactured by wood preservation plants located in southern and south-central Alberta.

Preserved lumber and timber have assumed important roles in this industry group in the last decade because of the rising replacement cost of wood and the cost of labor. Preserved poles and fence posts also retained their popularity. Pressure-preserved poles were used mainly by provincial telephone and hydro-utility companies, while fence posts were a high demand item with livestock farmers and other rural residents.

Most of the wood-preserving industry group used oil-borne pentachlorophenol or creosote in the pressure-treating process. Dip-preserving firms used either pentachlorophenol mixed with diesel fuel or chromated copper arsenate in the wood preservation process. Wood preservation generally increases the service life of the product by three to four times.

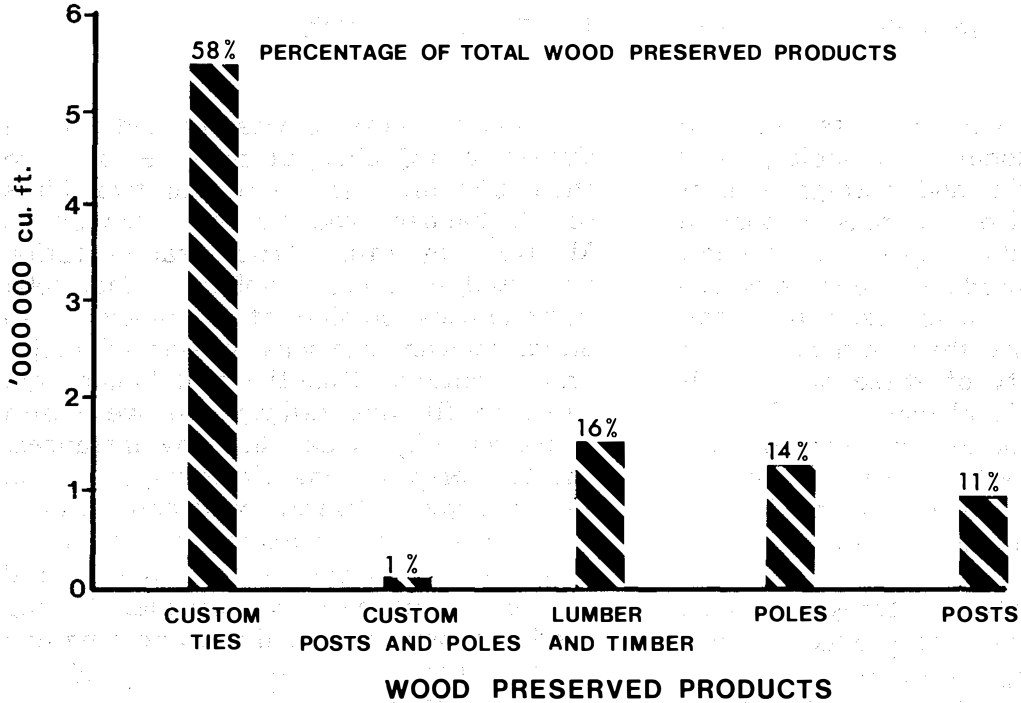

Figure 14. Volume of wood products preserved.

CHAPTER VII

MARKETS FOR ALBERTA FOREST PRODUCTS

Alberta's forest products are sold and used in local, provincial, and Canadian domestic and foreign export markets. A small but increasing portion of forest products, especially lumber, wood-preserved products, and miscellaneous goods, has been used by small producers to satisfy their own needs. A significant quantity of these products is also being sold in local markets. For this report, a local market is defined as a place where the product is sold or put into final use that is no further than 50 miles from the point of manufacture.

In the marketing of forest products, market demand, type of product, region of manufacturing, quantity marketed, mode of transportation, and distance to market play important roles. Market demand analysis is beyond the scope of this study; however, the other factors will be considered in some detail.

Lumber Markets

Large-class sawmills and planing mill complexes, located in south-central Alberta, exported 67% of their dimension products and 36.3% of their boards to US markets, while about 10% of their dimension products was marketed in Manitoba and Saskatchewan, and 5% in Ontario and Quebec (Table 50). Approximately one-quarter of Alberta's production of boards was marketed in Saskatchewan and Manitoba.

About 95% of the production of large sawmills was shipped by rail, at distances of 250 to 1000 miles, to North Dakota, South Dakota, Illinois, Iowa, Nebraska, and other midwest states (Table 51). A further 17% of Alberta dimension products and boards was marketed in the southwest states of Louisiana, Oklahoma, and Texas, with rail transport distances exceeding 1200 miles. Rail was virtually the exclusive transportation method for shipping Alberta dimension products to western and central Ontario and Quebec, at distances of more than 2000 miles, and more than two-thirds of all lumber products were moved to Manitoba by rail. Truck transportation was used to export lumber to Manitoba communities outside of Winnipeg or to Saskatchewan locations outside of major urban centers. Quantities of lumber too small to fill one railway car were also transported by truck. In a few instances, the lumber-producing firms were not on the railway network, produced insufficient quantities for export, or could not or chose not to compete for the limited number of railway cars available. During good economic times, the US housing and light industry construction demand for lumber exceeds the capacity of Alberta's lumber producers.

Timbers were not exported to the US because of limited supply and high demand close to the point of production. Manitoba and Saskatchewan import 15.3% of the timbers manufactured by large sawmills in Alberta, and these are used for construction of grain elevators and heavier industrial projects.

The balance of the Alberta lumber production, consisting of about 13.1% of dimension products, 23.3% of boards, and 84.7% of timbers, was sold in provincial or local markets. It is interesting to note that twice as many dimension products and boards were transported up to 200 miles (average of 100 miles) within the province than were sold and used locally within a 50-mile radius of the producer.

The medium-size sawmill group exported no boards to US markets and only 5.5% of its dimension products, which went mainly to the central states bordering Canada. These sawmills produced lumber predominantly for provincial markets (87% of dimension products and boards) and therefore generally used truck transport. Rail transport was

Table 50. Markets for lumber products, 1978-79

Mill size	Product	Total production (M fbm)	Destination of products: Local M fbm	Local %	Alberta M fbm	Alberta %	British Columbia M fbm	British Columbia %	Saskatchewan-Manitoba M fbm	Saskatchewan-Manitoba %	Ontario-Quebec M fbm	Ontario-Quebec %	United States M fbm	United States %
Sawmills														
5 MM fbm and over	Dimension	602 499	32 535	5.4	78 927	13.1	0	0.0	59 045	9.8	28 318	4.7	403 674	67.0
	Boards	45 318	5 257	11.6	10 559	23.3	0	0.0	10 831	23.9	2 221	4.9	16 450	36.3
	Timbers	2 053	0	0.0	1 739	84.7	0	0.0	314	15.3	0	0.0	0	0.0
1 MM to 5 MM fbm	Dimension	49 153	2 310	4.7	42 960	87.4	98	0.2	1 081	2.2	0	0.0	2 704	5.5
	Boards	4 979	558	11.2	4 376	87.9	5	0.1	40	0.8	0	0.0	0	0.0
	Timbers	7 476	3 192	42.7	3 215	43.0	7	0.1	1 062	14.2	0	0.0	0	0.0
100 M to 1 MM fbm	Dimension	26 737	12 246	45.8	13 903	52.0	0	0.0	0	0.0	0	0.0	588	2.2
	Boards	4 486	2 535	56.5	1 951	43.5	0	0.0	0	0.0	0	0.0	0	0.0
	Timbers	7 353	2 706	36.8	4 316	58.7	0	0.0	331	4.5	0	0.0	0	0.0
Less than 100 M fbm	Dimension	7 179	5 944	82.8	1 235	17.2	0	0.0	0	0.0	0	0.0	0	0.0
	Boards	938	848	90.4	90	9.6	0	0.0	0	0.0	0	0.0	0	0.0
	Timbers	551	347	62.9	204	37.1	0	0.0	0	0.0	0	0.0	0	0.0
Independent planing mills	Dimension	64 748	5 503	8.5	50 115	77.4	0	0.0	2 784	4.3	3 173	4.9	3 173	4.9
	Boards	6 233	841	13.5	4 569	73.3	0	0.0	256	4.1	280	4.5	287	4.6
	Timbers	2 504	2 504	100.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total sawmills and planing mills	Dimension	750 316	58 538	7.8	187 140	24.9	98	0.0	62 910	8.4	31 491	4.2	410 139	54.7
	Boards	61 954	10 039	16.2	21 545	34.8	5	0.0	11 127	18.0	2 501	4.0	16 737	27.0
	Timbers	19 937	8 749	43.9	9 474	47.5	7	0.0	1 707	8.6	0	0.0	0	0.0
Total		832 207	77 326	9.3	218 159	26.2	110	0.0	75 744	9.1	33 992	4.1	426 876	51.3

Table 51. Export[a] markets for lumber products, 1978-79

Mill size	Products	Total production (M fbm)	United States: Midwest[b] M fbm	%	Eastern[c] M fbm	%	Southwest[d] M fbm	%
Sawmills								
5 MM fbm and over	Dimension	403 674	163 566	40.5	175 841	43.6	64 276	15.9
	Boards	16 450	5 939	36.1	4 947	30.1	5 564	33.8
1 MM to 5 MM fbm	Dimension	2 704	0	0.0	2 704	100.0	0	0.0
	Boards	0	0	0.0	0	0.0	0	0.0
100 M to 1 MM fbm	Dimension	588	0	0.0	588	100.0	0	0.0
	Boards	0	0	0.0	0	0.0	0	0.0
Less than 100 M fbm	Dimension	0	0	0.0	0	0.0	0	0.0
	Boards	0	0	0.0	0	0.0	0	0.0
Independent planing mills	Dimension	3 173	1 633	51.5	807	25.4	733	23.1
	Boards	287	130	45.3	93	32.4	64	22.3
Total sawmills and planing mills	Dimension	410 139	165 199	40.3	179 940	43.9	65 000	15.8
	Boards	16 737	6 069	36.3	5 040	30.1	5 628	33.6
Total all products		426 876	171 268	40.1	184 980	43.3	70 628	16.6

[a] No timbers exported.
[b] Includes Illinois, Minnesota, North Dakota, South Dakota, Iowa, and Nebraska.
[c] Includes New York, Pennsylvania, North Carolina, South Carolina, Georgia, and Florida.
[d] Includes Arkansas, Mississippi, Oklahoma, Texas, and Louisiana.

used mainly for larger lumber quantities destined for Edmonton and Calgary. Timbers were in high demand in local and provincial markets (Table 50); consequently, only a small portion (14.2%) was exported to Saskatchewan and Manitoba.

The sawmill group of 100 M to 1 MM fbm annual capacity produced dimension stock and boards that were marketed and used in local and provincial markets. Timbers were more commonly sold in provincial rather than local markets, especially for use in oil rigs and gas drilling. A negligible portion of timbers was marketed mainly in rural Saskatchewan near the Alberta border. Local housing and light industrial construction were the main uses for dimension products and boards produced by these sawmills.

The small sawmills of less than 100 M fbm annual capacity produced 82.8% of their dimension products and 90.4% of their boards exclusively for the local market or their own use. Only a tiny share of their dimension stock and boards were transported and used more than 50 miles away from the production point. The lumber was used for home building and repair in nearby towns, hamlets, or farm communities. Timbers mainly were used by their producers or were sold locally to building contractors, farmers, and the oil and gas industry. All products in this industry group were transported by truck.

Plywood Markets

All plywood production was sold in the Canadian domestic market; 49.1% was sold and used in local and provincial markets (Table 52). The combined eastern Canada market of Ontario and Quebec purchased 45.3%, 3.9% was sold in British Columbia, and 1.7% was sold in the Manitoba-Saskatchewan region.

Markets for Wood Preservation Products

The production of custom treated ties was sold in the provincial (50%) and Saskatchewan-Manitoba markets (50%) (Table 53). Shipments were transported to Manitoba and to major urban centers in Saskatchewan by rail. About one-quarter or less of treated ties were moved to the markets by truck. Location of the production plants in the southern half of the province is undoubtedly an attempt by the producers to respond to local demand and reduce the transportation distances and costs to export markets. Prairie railway line construction and maintenance companies created most of the demand for this product.

The majority of preserved lumber and timber production (62.4%) was sold in the province, while just over one-third (37.1%) was sold in Saskatchewan and Manitoba (Table 53).

About two-thirds of the production of the pressure-preserved poles were sold and used in the province. One-fifth of the production was transported and sold in Saskatchewan and Manitoba, while the balance of 15% was exported to US markets. Montana, North Dakota, and South Dakota were the main US markets. This product was in high demand in domestic and US markets, supply being the limiting factor.

The majority of preserved posts (about 80%) was sold and used in Alberta. The balance of the production was sold in Saskatchewan and Manitoba, except for 1.6% that went to British Columbia. Preserved posts were a high demand market commodity in local markets. Limited supply and high demand for this product in Canada were the main reasons preventing export to the United States.

Eighty percent of the volume of preserved plywood manufactured in Alberta was sold within the province, while 15% and 5% were sold in Saskatchewan-Manitoba and British Columbia, respectively. Three plywood plants were located near local and provincial markets in south-central Alberta.

Markets for Pulp, Paper, and Allied Products

Two firms producing bleached kraft pulp export about 90% of their production to the United States (primarily Maine, New York, and Illinois). About 1.6% of all kraft pulp is marketed in West Germany, with the balance being sold in Ontario (Table 54). Tall oil is exported to Japan.

Approximately two-thirds of all building products manufactured by the other three firms in this group are sold in local and provincial markets. About 17% of fiberboard, insulation, and roofing products is marketed in Saskatchewan and Manitoba, while about 10% of these products is exported to US markets.

Table 54. Markets for pulp, paper, and allied industry group products, 1978-79

Market	Pulp		Paper and roofing products		Tall oil		Insulation board and fiberboard sheathing (M sq. ft., 1/2-in. basis)	% of all products
	Tons	%	Tons	%	Tons	%		
Alberta	-	-	33 600	80.0	-	-	80 000	74.4
Saskatchewan-Manitoba	-	-	6 000	14.3	-	-	18 000	16.7
Ontario	15 928	3.4	-	-	-	-	-	-
Total Canada	15 928	3.4	39 600	94.3	-	-	98 000	91.1
United States	450 287	95.0	2 400	5.7	N/A	N/A	9 500	8.9
Other foreign	7 771	1.6	-	-	N/A	N/A	-	-
Total foreign	458 058	96.6	2 400	5.7	5 200	100.0	9 500	8.9
Total[a]	473 986	100.0	42 000	100.0	5 200	100.0	107 500	100.0

N/A - Not available.

[a] Total value for all products, F.O.B. (freight on board) mill, was $204 580 590, which includes sale of products for which no information is available, such as roof felts, rolled roofing raw felts, asphalt coatings, etc.

CHAPTER VIII

ANNUAL REVENUES AND EXPENDITURES IN THE FOREST INDUSTRY

This chapter describes expenditures incurred and revenues received by the forest industry in 1978-79. Expenditures are divided between operating and capital. Operating expenditures are the direct and indirect (or variable and fixed) costs of production. Capital expenditures are incurred by firms for replacing used infrastructure and equipment, upgrading obsolete infrastructure and equipment, expanding the productive capacity of existing infrastructure and equipment, or constructing whole new production units.

The first section of this chapter discusses total revenues and operating expenditures by industry. Wherever possible, breakdowns of operating expenditures are provided[10]. The second section presents information on capital expenditures incurred by the sawmill and pulp, paper, and allied industry groups in 1978-79. These expenditures are broken down into a number of components. The third section provides information on the per-unit cost of wood inputs by sawmills and by region.

Operating Expenditures by Industry

The total revenue and detailed distribution of expenditures incurred by the sawmill, independent planing mill, and pulp, paper, and allied industry groups are shown in Table 55. Revenues and expenditures are presented for the plywood, wood preservation, and miscellaneous industry groups in Table 56. The *Other* rows in these tables include depreciation, municipal and corporate income taxes, other expenditures, and net profits. Other expenditures include costs that may occur but were not accounted for in the predefined categories (e.g., nonoperating overhead or prepaid freight).

Because of some intra- and inter-industry transfers of goods and services, some double counting of both costs and revenues is unavoidable. The measures of value added provided in the next chapter avoid this problem by determining the overall contribution of an industry group to the economic welfare of the province.

Sawmill Industry Group

With 37% ($159 441 569) of total sector sales, this industry group is the second largest in the forest industry. The largest expenditure in this group was for wages and salaries, requiring $45 303 696 or 28.4% of the total sales income. Payments to contractors was the second largest expenditure, totaling $36 528 782 (22.9% of sales income). Energy costs took 3.9% of sales income.

Independent Planing Mill Industry Group

Sales were valued at $5 853 542 in this industry group and represented only 1.4% of all forest industry sales.

The dominant expenditure in the industry was for purchased wood inputs, requiring $2 190 720, or 37.4% of sales income. Purchased wood inputs for the industry include rough sawn lumber that the planing mills purchase from the sawmills and in turn either plane or resaw and plane.

The second greatest cost was wages and salaries, with expenditures totaling $1 364 829 (23.3% of sales revenues).

Plywood Industry Group

The plywood industry group, with shipments valued at $34 436 000, ac-

[10] See Appendix 5 for details of expenditures by the forest industry.

Table 55. Revenues and operating expenditures for sawmills, independent planing mills, and the pulp, paper, and allied industry group, 1978-79[a]

	Sawmills		Independent planing mills		Pulp, paper, and allied	
	$	%	$	%	$	%
Value of sales (F.O.B. mill)	159 441 569		5 853 542		204 580 590	
Fuel and electricity	6 285 725	3.9	140 800	2.4	10 405 255	5.1
Materials and supplies	1 072 773	0.7	82 312	1.4	55 088 073	26.9
Maintenance and repair	8 354 010	5.2	201 706	3.5	15 149 000	7.4
Wood inputs (purchased)--roundwood or semiprocessed	3 397 329	2.1	2 190 720	37.4	9 700 000	4.7
Payments to contractors	36 528 782	22.9	0	0.0	2 179 000	1.1
Roads (operating cost)	3 597 817	2.3	0	0.0	2 855 000	1.4
Payments to provincial government (stumpage, etc.)	3 607 232	2.3	0	0.0	951 407	0.5
Wages and salaries	45 303 696	28.4	1 364 829	23.3	38 222 925	18.7
General and administration	6 874 810	4.3	280 728	4.8	7 680 343	3.7
Others[b]	44 419 395	27.9	1 592 447	27.2	62 349 587	30.5

[a] Source: Appendix 5.
[b] Includes depreciation, municipal taxes, and other unallocated residuals and profits.

Table 56. Revenues and operating expenditures for plywood, wood preservation, and miscellaneous industry groups[a], 1978-79[b]

	Plywood		Wood preservation		Miscellaneous	
	$	%	$	%	$	%
Value of sales (F.O.B. mill)	34 436 000		18 160 074		7 424 830	
Fuel and electricity	846 000	2.5	439 000	2.4	178 000	2.4
General and administration Materials and supplies Maintenance and repair Wood inputs (purchased) Payments to contractors Roads (operating cost) Payments to provincial government (stumpage, etc.)	16 625 000	48.3	9 400 000	51.8	3 675 291	49.5
Wages and salaries	7 082 548	20.5	3 046 100	16.8	1 850 320	24.9
Others[c]	9 882 452	28.7	5 274 974	29.0	1 721 219	23.2

[a] Detailed breakdown of expenditures for these three industry groups could not be provided because of the lack of response to the survey questionnaire.
[b] Source: Appendix 5.
[c] Includes depreciation, municipal taxes, and other unallocated residuals and profits.

counted for 8.0% of forest industry sales. Expenditures on wages and salaries amounted to 20.5% of sales income ($7 082 548) in the group.

Wood Preservation Industry Group

Sales totaled $18 160 074, or 4.2% of total sector sales. This industry group expended the lowest proportion of its final sales income on wages and salaries of any forest industry group: about $3 million, or 16.8% of sales income.

Miscellaneous Industry Groups

The total sale of products such as lath, pallets, building timbers, and house logs amounted to $7 424 830, or 1.7% of forest industry sales. Based on total sales, this was the second smallest industry category, leading only the independent planing mills. Expenditures on wages and salaries accounted for 24.9% of sales revenue ($1 850 320).

Pulp, Paper, and Allied Industry Group

With sales (F.O.B. mill) of $204 580 590, this industry is the largest of the forest industry groups and accounted for 48% of total sales. The major expenditure in this industry was for materials and supplies, at 26.9% of the value of sales. The majority of the cost of materials and supplies was for chemicals such as caustic soda, chlorine, and sodium chlorate. The second largest expenditure was for wages and salaries, taking 18.7% of the value of sales. Of all the forest industry groups, the pulp, paper, and allied group expended the largest proportion of its sales income on energy (5.1%).

Annual Capital Expenditures

As opposed to operating expenditures, which are costs of production, capital expenditures are investments that generate revenues and profits. Determination of rates of return is beyond the scope of this study; therefore, in this chapter the emphasis is restricted to annual 1978-79 capital expenditures by the sawmill and pulp, paper, and fiberboard industry groups[11]. (A more detailed consideration of capital was provided in Chapter IV.)

The pulp, paper, and allied industry group added $49.6 million to its existing capital stock in 1978-79 (Table 57); $43.5 million (88% of total expenditures) was spent on plant machinery and equipment.

Annual capital expenditures by the sawmill industry in 1978-79 amounted to $7 525 284. Again, the greatest expenditure was for plant machinery and equipment ($2 940 670, or 39% of total expenditures).

Cost of Wood Inputs

During the primary wood-using industry survey, no attempt was made to differentiate expenditures incurred in procuring wood from expenditures incurred in the final processing of wood. Many of the firms could not provide information on the exact proportion of specific types of costs (e.g., wages and salaries, fuel and electricity, and materials and supplies) expended in either woodlands or processing operations. As a result, all expenditures indicated in the first section of this chapter included both wood procurement and processing costs. The firms did, however, provide data on the per-unit cost of fiber inputs (an average of all costs incurred in harvesting and transporting the wood from the forest to the mill on a per-unit input basis).

The cost of roundwood supplied to the mill represents the greatest expenditure in relation to other specific costs (e.g., wages and salaries, fuel and elec-

[11] Information on capital expenditures made in 1978-79 was obtained only for the sawmill and pulp, paper, and allied industry groups.

Table 57. Capital expenditures for sawmill and pulp, paper, and allied industry groups, 1978-79

Type of capital expenditure	Sawmills $	Sawmills % of total expenditure	Pulp, paper, and allied industry $	Pulp, paper, and allied industry % of total expenditure
Plant construction	814 127	10.8	684 000	1.4
Plant machinery and equipment	2 940 670	39.1	43 655 000	87.9
Woodlands construction[a]	1 344 383	17.9	1 920 000	3.9
Woodlands machinery and equipment	2 426 104	32.2	3 390 000	6.8
Total	7 525 284	100.0	49 649 000	100.0

[a] Construction of logging roads and bridges.

tricity, and materials and supplies). This point has been emphasized in a number of other studies (Reed 1973; Teskey and Smyth 1975; Sandwell Management Consultants Ltd. 1977; Ontario Ministry of Natural Resources 1981). The importance of wood cost in the total cost of manufacturing forest products is emphasized in the Department of Industry, Trade and Commerce's *Review of the Canadian Forest Products Industry, 1979*:

> Wood represents the largest single cost component in the manufacture of lumber, pulp, newsprint and other primary products and therefore is a principal factor determining a manufacturer's competitive position in world markets. The fact that there appears to be less regional variation in the aggregate of all other manufacturing costs for plants of similar scale and vintage further illustrates the importance of competitive wood costs.

To show the variation in wood fiber costs in Alberta, information is provided for the sawmill industry group by size class and by region (Tables 58 and 59, Figs. 15 and 16).

The weighted average cost of roundwood delivered to the mill for Alberta sawmills is $46 per cunit (100 cu. ft. of roundwood) (Table 58). Based on the proportion of final per-unit product value spent in harvesting and delivering wood to the mill gate, wood costs amounted to 38% of the final sales. The average one-way haul for roundwood is 46 miles.

In the sawmill industry group a trend toward decreasing wood input costs with smaller mills is apparent (Table 58). The wood input cost for large-class sawmills is $47 per cunit. Sawmills in the smallest size category (production less than 100 M fbm per year) have an average wood cost of $26 per cunit. This trend can be partially explained by a higher average haul distance for larger mills than for the smaller mills. There is, however, an anomaly in the relationship

Table 58. Wood input costs as a proportion of final product value, by sawmill size, 1978-79

Sawmill size class	Weighted average wood input cost: $ per cunit[a]	Weighted average wood input cost: Range of $ per cunit	Weighted average one-way haul (miles)	Weighted average wood input cost ($ per M fbm)	Weighted average product value ($ per M fbm)	% of per unit product value spent on wood input
5 MM fbm and over	47	28-59	49	78	202	39
1 MM to 5 MM fbm	42	20-56	24	70	189	37
100 M to 1 MM fbm	34	8-60	33	56	170	33
Less than 100 M fbm	26	6-53	14	43	151	28
Total all sawmills	46	6-60	46	77	200	38

[a] 1 cunit = 100 cu. ft. of roundwood.

Table 59. Wood input costs as a proportion of final product value for sawmills, by forest region, 1978-79

Forest region	Weighted average wood input cost: $ per cunit	Weighted average wood input cost: Range of $ per cunit	Weighted average one-way haul (miles)	Weighted average wood input cost ($ per M fbm)	Weighted average product value ($ per M fbm)	% of per unit product value spent on wood input
Athabasca[a]	-	-	-	-	-	-
Bow-Crow	44	9-60	46	74	208	36
Rocky-Clearwater	41	21-53	31	69	220	31
Edson	31	6-52	21	51	189	27
Whitecourt	48	21-56	39	80	204	39
Grande Prairie[a]	-	-	-	-	-	-
Slave Lake	53	26-59	71	88	185	48
Lac La Biche	47	12-53	38	79	183	43
Peace River	43	18-55	65	71	199	36
Footner Lake[a]	-	-	-	-	-	-
Aggregate	46	6-60	46	77	200	38

[a] Information for these forest regions is not available because of confidentiality or because the regional response was inadequate.

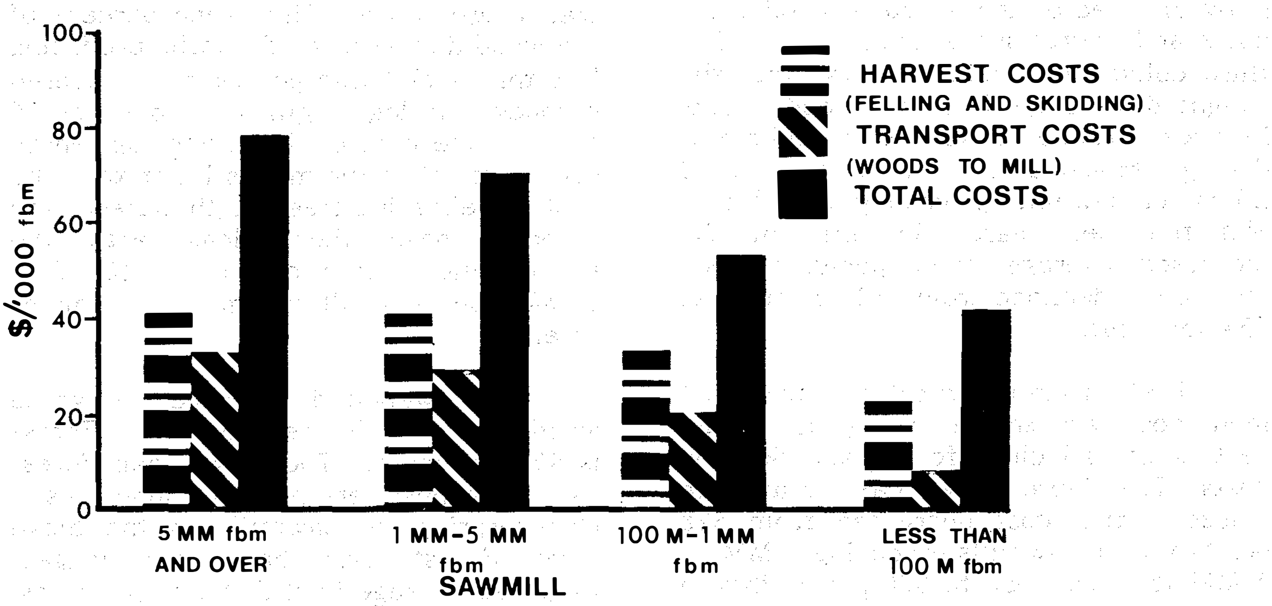

Figure 15. Wood cost components, by sawmill size, 1978-79.

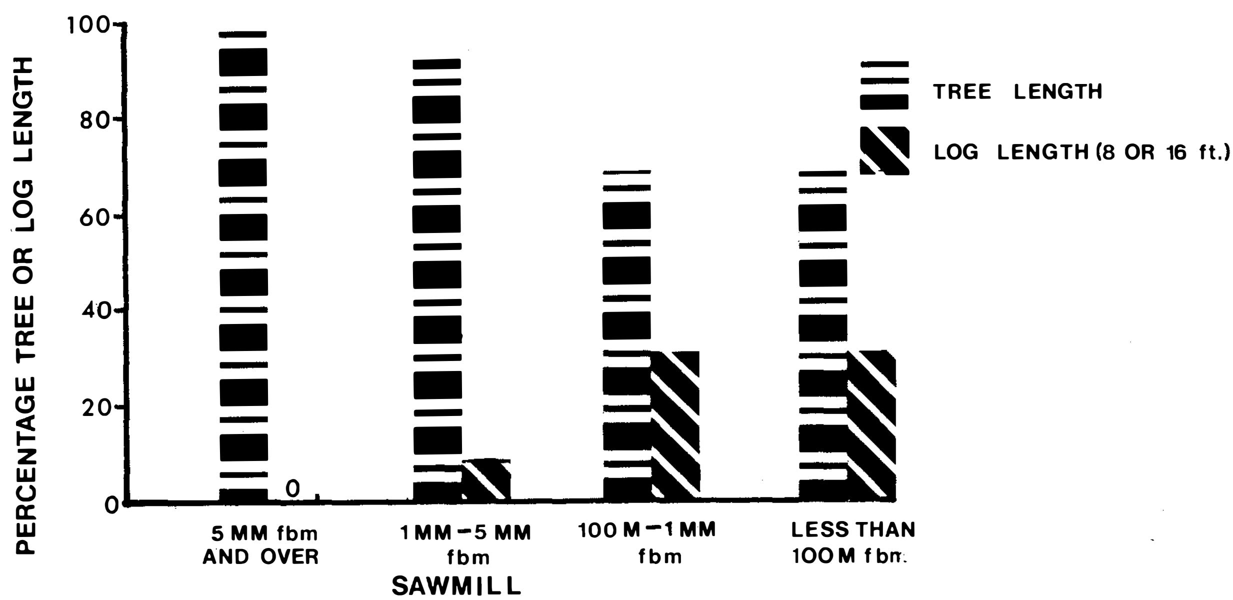

Figure 16. Proportion of total wood delivered in tree or log length, by sawmill size.

between decreasing average wood input costs and decreasing average haul. The third column of Table 58 shows that the weighted average haul of wood inputs increases from 24 miles for sawmills producing 1 MM to 5 MM fbm per year to 33 miles for sawmills producing 100 M to 1 MM fbm per year. In spite of the increased average haul, per-unit wood input costs declined from $42 per cunit to $34 per cunit.

The per-unit harvest and transport input costs are shown in Fig. 15. Harvesting costs include felling and skidding costs. The figure shows that the average transportation cost decreased from $28 per M fbm in sawmills producing 1 MM to 5 MM fbm per year to $20 per M fbm in sawmills producing 100 M to 1 MM fbm per year (even though the average haul increased from 24 to 33 miles). There could be a number of reasons for this seeming inconsistency; however, an important contributing factor could be the form of the raw material delivered to the mill gate (Fig. 16). Sawmills producing greater than 1 MM fbm per year deliver the majority of their total wood input in tree length form. Thirty-one percent of the wood delivered to the mills producing less than 1 MM fbm per year is delivered prebucked in log length form (8 ft. or 16 ft.). If the cost of delivering log length raw material to the mill is lower than the cost of delivering tree length material (on a per-unit basis), then at least part of the lower transportation cost in the 100 M to 1 MM fbm sawmill category is explainable.

The weighted average delivered wood input cost in the Slave Lake Forest is $53 per cunit. The Slave Lake Forest has the highest per-unit wood input costs. Not surprisingly, sawmills in the Slave Lake Forest also have the longest weighted average haul distance (71 miles) and the highest proportion of final product value spent on wood inputs (48%). The lowest wood input costs occurred in the Edson Forest: $31 per cunit. Sawmills operating in the Edson Forest hauled an average distance of 21 miles and expended 27% of the final product value on wood inputs. In general, wood input costs increased with greater haul distance in all of the forest regions.

CHAPTER IX

THE SOCIOECONOMIC IMPACT OF THE FOREST INDUSTRY IN ALBERTA

No single criterion exists with which to fully measure the socioeconomic contribution of a particular industry to a regional, provincial, or national economy. In this report, the economic contribution of Alberta's forest industry was measured using information on employment, wages and salaries, value added, value of direct and indirect output, value of provincial exports, and community stability.

Employment and Wages and Salaries

Employment created by the forest industry groups in Alberta was discussed in Chapter V. This chapter discusses the economic impact of the forest industry by relating aspects of forest industry employment (such as proportion of product value spent on wages and salaries, total number employed, total wages and salaries paid, and average income per employee) to other manufacturing industries in the Alberta economy.

The total employed labor force in Alberta in 1978 was 915 000 persons. The manufacturing sector employed 74 000 workers (8.1% of total employment). The forest industry (primary wood-using) accounted for 7.2% of the jobs and 7.3% of the total wages and salaries paid by all industries within the manufacturing sector (Table 60). The forest industry (primary wood-using) ranked seventh in average income per employee, fifth in total number employed, and fifth in total wages and salaries paid.

Total person-years of employment, including contract employment, total wages and salaries paid (including and excluding contract employment), and average income per employee for each of Alberta's forest industry groups are shown in Table 61. Although the sawmill industry group employs more people (2852 person-years) and generates the greatest income for employees ($56.9 million), the pulp, paper, and allied industry group ranks first in average income per person-year employed ($20 967 per person-year).

The percentage of the total value of shipments of goods of own manufacture expended on wages and salaries in different industry groups in Alberta's manufacturing sector is shown in Table 62. Relative to other industries, the forest products sector (which is a combination of primary, secondary, and tertiary wood-using industries) is labor-intensive. About 15% of the total value of shipments was spent on wages and salaries for all of the manufacturing industries combined, and 25.8% was spent by the forest products industry (Alberta Bureau of Statistics 1981b).

The proportion of final sales expended on wages and salaries for three of Alberta's forest industry groups was shown in Table 55. In the sawmill industry group 28% of final sales was spent as wages and salaries, and in the pulp, paper, and allied industry group the expenditure on wages and salaries was 19% of final sales. In the independent planing mills 23% of sales income was paid to labor. Payments for wages and salaries were the major cost of production in the sawmill industry group and the second greatest cost in the pulp, paper, and allied industry and independent planing mill groups. The forest products sector in general as well as these three forest industry groups spend a higher proportion per dollar of final sales on wages and salaries than the provincial average for the manufacturing sector.

Value Added

Value added is defined by Bannock *et al.* (1978) as follows:

> The difference between total revenue of a firm and the cost of bought-in raw materials, services, and components. It thus measures the value which

Table 60. Employment earnings and average income per employee by industry category in the manufacturing sector, 1978[a]

Industry category	Total annual wages and salaries paid $000	Total annual wages and salaries paid % of total manufacturing	Total annual wages and salaries paid Rank	Total employed No.	Total employed % of total manufacturing	Total employed Rank	Average annual income per employee $	Average annual income per employee Rank
Food and beverage	235 891	20.8	1	16 118	21.9	1	14 635	9
Rubber and plastic products	21 338	1.9	14	1 725	2.3	14	12 370	13
Leather	2 927	0.3	16	238	0.3	16	12 298	14
Textiles	11 278	1.0	15	905	1.2	15	12 462	12
Primary wood-using[b]	82 593	7.3	5	5 281	7.2	5	15 640	7
Secondary and tertiary wood-using[c]	160 365	14.1	2	11 115	15.1	2	14 428	10
Primary metal	66 209	5.8	8	3 755	5.1	8	17 632	3
Metal fabricating	133 312	11.7	3	8 372	11.4	3	15 924	6
Machinery	75 660	6.7	6	4 619	6.3	6	16 380	5
Transporation equipment	59 921	5.3	9	4 071	5.5	7	14 719	8
Electrical products	27 206	2.4	11	2 018	2.7	13	13 482	11
Nonmetallic mineral products	98 535	8.7	4	5 619	7.6	4	17 536	4
Chemical and chemical products	69 336	6.1	7	3 524	4.8	9	19 675	2
Miscellaneous manufacturing	24 290	2.1	13	2 046	2.8	11	11 872	15
Petroleum and coal products	41 255	3.6	10	1 990	2.7	12	20 731	1
Residual	25 652	2.2	12	2 273	3.1	10	11 285	16
Total manufacturing	1 135 768	100.0		73 669	100.0		15 417	

[a] Source: Alberta Bureau of Statistics 1981b.
[b] Includes sawmills, planing mills, and plywood, wood preservation, miscellaneous, and pulp, paper, and allied mills.
[c] Includes furniture manufacturing, wooden boxes, kitchen cabinets, etc.

Table 61. Employment, earnings, and average income per employee, by forest industry group, 1978-79

Industry group	Total employment (person-years)	Total wages and salaries ($)	Average income for employee ($/person-years)	Contract employment (person-years)	Estimated wages and salaries to contract employees ($)	Total estimated wages and salaries paid to contract and own employees ($)
Sawmills	2852	45 303 696	15 885	734	11 659 590	56 963 286
Independent planing mills	78	1 364 829	17 498	-	-	1 364 829
Plywood	402	7 082 548	17 618	28	493 304	7 575 852
Wood preservation	197	3 046 100	15 462	23	355 626	3 401 726
Miscellaneous[a]	134	1 850 320	13 808	-	-	1 850 320
Pulp, paper, and allied	1823	38 222 925	20 967	29	608 043	38 830 968
Total	5486	96 870 418	17 658	814	13 116 563	109 986 981

[a] Includes lath mills, pallet plants, and building timber plants.

Table 62. Sales in relation to wages and salaries in the manufacturing sector, by industry category, 1978[a]

Industry	Value of shipments of goods of own manufacturing ($000)	Wages and salaries ($000)	% of sales spent on wages and salaries
Agricultural processing	2 441 112	238 818	9.8
Petrochemical	2 098 505	131 929	6.3
Metals and equipment	1 323 399	362 308	27.4
Forest products[b]	940 518	242 958	25.8
Nonmetallic mineral products	460 184	98 535	21.4
Manufacturing industries	165 555	61 220	37.0
Total	7 429 273	1 135 768	15.3

[a] Source: Alberta Bureau of Statistics 1981c.
[b] See Appendix 6 for industries included in this category.

the firm has 'added' to these bought-in materials and components by its processes of production.

The value added created by a particular industry is a measure of that industry's contribution to the gross domestic product and is thus a valuable parameter for determining the economic contribution of the forest industry.

The gross domestic product in Alberta in 1978 was $28 900 million (Alberta Bureau of Statistics 1981c), the goods-producing sector accounting for 55.4% of that total (Fig. 17). The manufacturing sector accounted for 16.1% of the value added in the goods-producing sector and 8.9% of Alberta's gross domestic product. The forest industry accounted for 20% of the total value added created by all manufacturing industries in the Alberta economy. Primary wood-using industries accounted for 43% of all forest products industries and 8.6% of the manufacturing sector.

The position of the forest industry in the manufacturing sector in 1978 with respect to total value added and value added per person-year of employment is shown in Table 63. The primary wood-using group ranked sixth in total value added and fifth in value added per person-year.

The pulp, paper, and allied industry group ranked first in total value added and value added per employee (Fig. 18), contributing $100 572 000 in total value added and $55 000 on a per person-year basis. The sawmill industry group ranked second in total value added ($89 723 091) but only fifth in value added per employee ($31 460). The pulp, paper, and allied group and sawmill group accounted for 45.3% and 40.4%, respectively, of total forest industry value added.

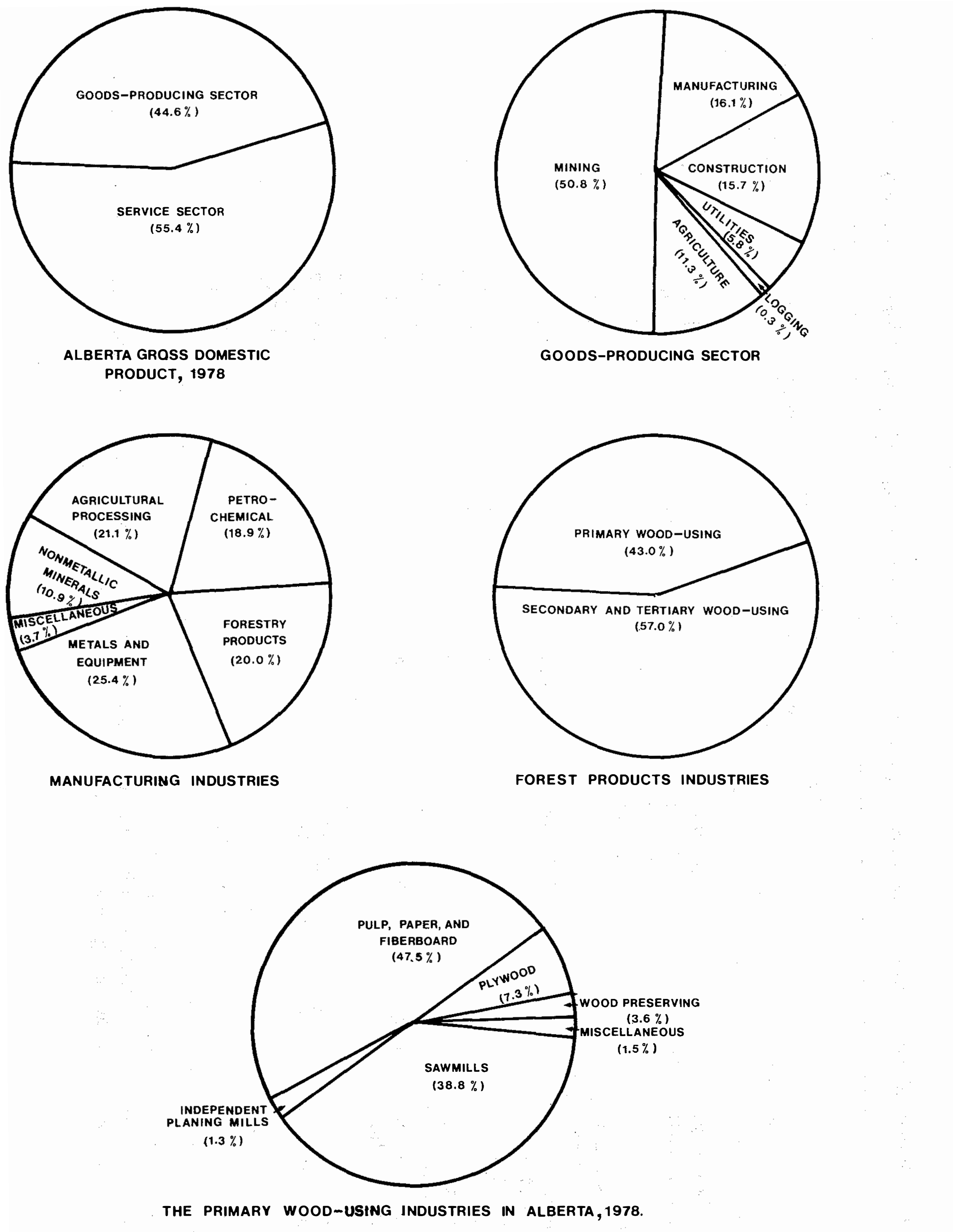

Figure 17. Relative position of the forest industry in 1978 in terms of value added. (Sources: Alberta Bureau of Statistics 1981b, c.)

Table 63. Value added and value added per employee in the manufacturing sector, by industry category, 1978[a]

Industry category	Total value added created: $000	Total value added created: % of total manufacturing	Total value added created: Rank	Average value added per employee: $	Average value added per employee: Rank
Food and beverage	508 938	20.9	1	31 576	7
Rubber and plastic products	37 034	1.5	11	21 469	11
Leather	4 599	0.2	16	19 323	13
Textiles	30 194	1.2	14	33 363	6
Primary wood-using[b]	210 050	8.6	6	39 775	5
Secondary and tertiary wood-using[c]	277 406	11.4	3	24 958	10
Primary metal	156 645	6.4	7	41 716	4
Metal fabricating	231 244	9.5	5	27 621	8
Machinery	119 154	4.9	9	25 796	9
Transportation equipment	78 818	3.2	10	19 361	12
Electrical products	32 816	1.4	12	16 262	14
Nonmetallic mineral products	266 184	10.9	4	47 372	3
Chemical and chemical products	277 705	11.4	2	78 804	1
Miscellaneous manufacturing	27 816	1.2	15	13 595	16
Petroleum and coal products	146 245	6.0	8	73 490	2
Residual	32 590	1.3	13	14 338	15
Total manufacturing	2 437 438	100.0		33 086	

[a] Source: Alberta Bureau of Statistics 1981b.
[b] Includes sawmills, planing mills, and plywood, wood preservation, miscellaneous, and pulp, paper, and allied mills.
[c] Includes furniture manufacturing, wooden boxes, kitchen cabinets, etc.

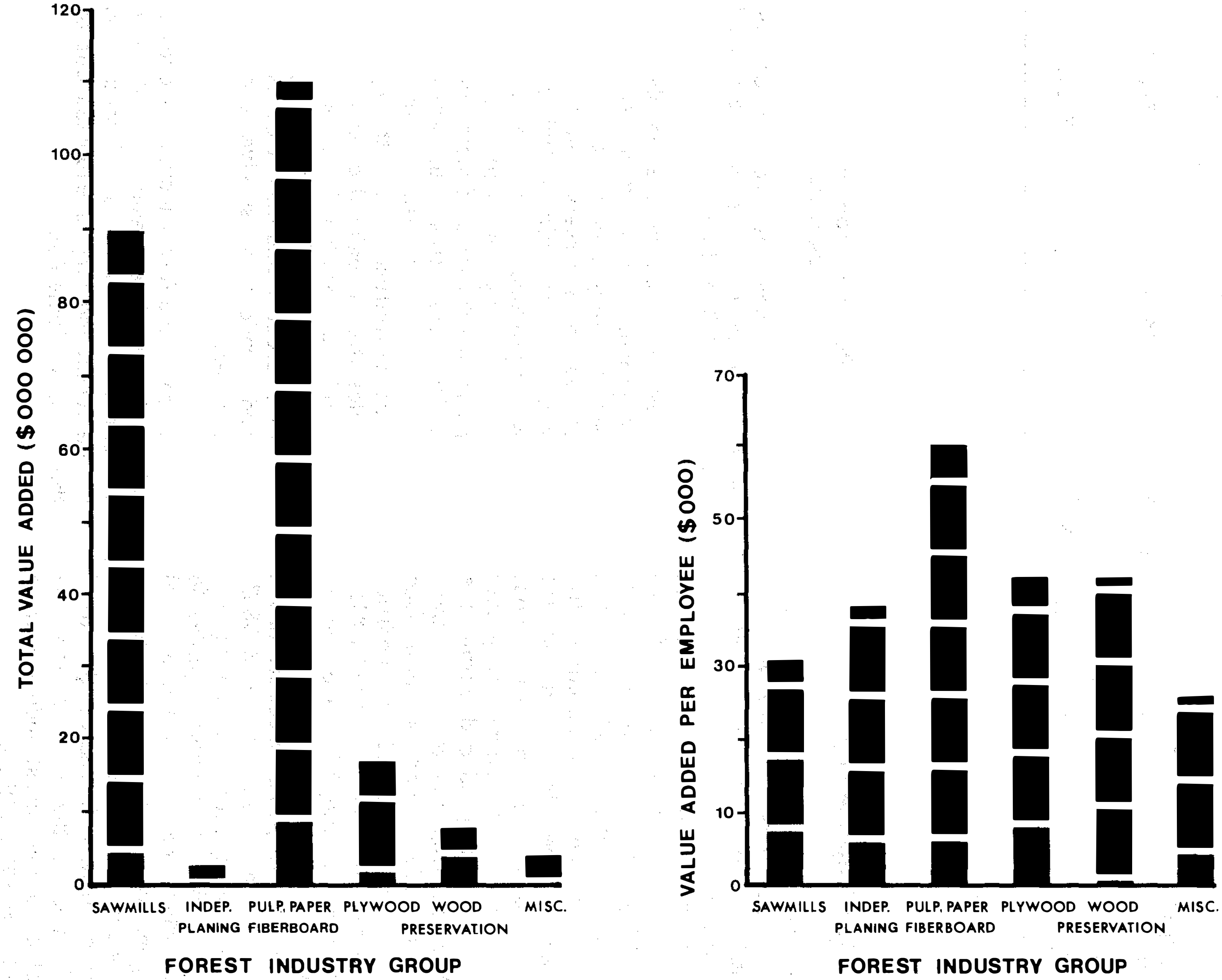

Figure 18. Total value added and value added per employee, by forest industry group.

Table 64. Direct and indirect value of output generated by the forest industry in the Alberta economy, 1978-79

Industry group	Total direct sales ($000 000)	Multiplier ($)	Indirect sales ($000 000)	Total value of final output ($000 000)
Sawmills	159.4	1.814679	129.9	289.3
Pulp, paper, and allied	204.6	1.813867	166.5	371.1
Total forest industry	429.9	1.81[a]	348.2	778.1

[a] Estimate.

The Output Multiplier

The ripple effect of industrial activity in the forest industry was discussed earlier in reference to employment and in terms of an employment multiplier. The multiplier concept is also applicable to output. The Alberta Bureau of Statistics (1981a) has derived output multipliers for an array of commodity groups in the Alberta economy. The output multipliers measure the direct and indirect effects of a dollar spent on Alberta goods produced within each commodity group: $1 spent for goods produced within the commodity classification termed lumber, sawmill, and other wood products (see Appendix 8 for a list of commodities within this category) will result in $1.8157 worth of output in the Alberta economy. Similarly, the commodity classification termed paper and paper products has a final demand multiplier of $1.813867. These two multipliers are among the highest in the Alberta economy (Tables 64 and 65). When the total value of final demand generated by the sale of primary wood products is considered (Table 64), the indirect effect increases the total value of sales in the Alberta economy attributable to the forest industry from $449 million to $778 million.

Regional Economic Base Analyses

The fundamental premise of regional economic base theory is described by Stewart (1978) as follows:

> Most communities are unable to produce all the goods and services they require so purchases are necessary from beyond. Economic activities which produce the external income to pay for needed imports are 'basic' or export activities while supporting activities are 'non-basic' or service activities. The theory holds that a regional economy within a developed national economy, and the latter also, must produce and export goods and services to survive and prosper.

Each of the forest industry groups in Alberta is considered basic. Seventy-nine percent of the total value of production of the forest industry is exported out of the province (Table 66).

Table 65. Indirect output multipliers for commodity groups[a] in Alberta

Commodity group	Multiplier ($)
Live animals	1.407531
Grains	1.407563
Other agricultural products	1.413463
Fishing and trapping	1.137027
Forest products[b]	**1.906686**
Mineral fuels	1.527063
Nonmetallic minerals	1.586593
Products relating to mines	1.527166
Meat, fish, and dairy products	1.787775
Fruit, vegetables, feed, and miscellaneous products	1.812259
Beverages	1.814490
Rubber, leather, and plastic products	1.810825
Textiles	1.788050
Knitted products and clothing	1.813622
Lumber, sawmill, and other wood products[b]	**1.814679**
Furniture and fixtures	1.810330
Paper and paper products[b]	**1.813867**
Printing and publishing	1.813574
Primary metal	1.814490
Metal fabricating	1.812366
Machinery and equipment	1.801092
Autos, trucks, and others	1.805700
Electrical and communications	1.613367
Nonmetallic mineral products	1.814064
Petroleum and coal products	1.706395
Chemicals and chemical products	1.814432
Miscellaneous manufactured products	1.739337
Construction	1.527959
Wholesale and retail trade	1.453444
Transportation and storage	1.610838
Communication services	1.315736
Other utilities	1.297406
Real estate rent	1.314662
Finance, insurance, and real estate	1.310040
Business, personal, and other	1.460400
Dummy commodity I	1.783909
Dummy commodity II	2.121258
Transportation margins	2.454315

[a] Source: Alberta Bureau of Statistics 1981a.
[b] See Appendix 7 for listing of commodities in the three forest categories in bold in the table.

Table 66. Value of exports by commodity and industry group, 1978-79

Industry commodity	Quantity		Estimated value of exports ($)
Sawmills and planing mills			
Dimension lumber	570 241	M fbm	119 225 988
Board lumber	30 533	M fbm	6 247 143
Timber	2 592	M fbm	565 056
Ties	454	M fbm	86 958
Posts	251	M cu. ft.	225 900
Poles	2	M cu. ft.	1 900
Total sawmills and planing mills			126 352 945
Plywood (1/2-in. basis)	112 625	M sq. ft.	22 727 760
Wood preservation			
Treated lumber, ties	19 602	M fbm	6 860 637
Treated posts, poles	503	M cu. ft.	616 175
Total wood preservation			7 476 812
Miscellaneous			
Pallets	17 000	units	-[a]
Trusses	800 000	fbm	-[a]
Total miscellanous			173 020
Pulp, paper, and allied			
Kraft pulp	473 986	tons	175 535 553
Fiberboard products (1/2-in. basis)	24 804	M sq. ft.	1 336 109
Paper and roofing products	8 400	tons	4 678 800
Total pulp, paper, and allied			181 550 462
Total value of exports			338 280 999
Total value of sales			429 896 605

[a] Confidential.

The Economic Stability of Alberta Municipalities

The forest industry is important to many regional and local economies as well as being an important basic activity provincially. In fact, many Alberta communities are one-industry towns relying either solely or heavily on the employment created by forest industry activity. An important factor regarding these dependent communities is that those employed in the forest industry are largely paid with dollars imported from outside the community. The imported dollars thus help to compensate for the drain of money that inevitably results from the purchases of goods and services imported into the community.

The relationship between the forest industry and the community can be considered in terms of the dependence of particular municipalities on forest industry activity for their continued economic and social welfare. The criterion used for judging economic dependence is the percentage of the total population of a particular community directly employed in the forest industry.

Hornberger (1974) suggests some general guidelines for ensuring community stability. He suggests that 25% of the population should represent the labor supply and that "a single industry should not employ more than 5 percent of the labor supply initially and 10 percent ultimately for the financial protection of the community." Thus if greater than 2.5% of the total population of a particular community is employed in one industry, the financial security of the community is subject to the continued vitality of that industry. To avoid overestimation of the number of dependent communities, this report adopted a more conservative estimate of 5% of the population employed in one industry as the guideline for determining economic dependence. Municipalities with 2.5-5.0% of their population employed by the forest industry are heavily dependent on forest industry activities, and municipalities with less than 2.5% employed are marginally dependent.

Many Alberta municipalities can be categorized as being dependent, heavily dependent, or marginally dependent on some forest industry activity (Table 67). Twenty-six Alberta municipalities with a combined population of about 40 000 are dependent on forest industry activity. A further 11 municipalities are heavily dependent. Within the dependent category, 3 municipalities have populations exceeding 2500, and 23 municipalities have communities with populations of less than 2500.

Although not listed, a further 84 communities were identified as having some proportion of their population base employed in the forest industry. These communities, however, were not listed either because less than 1% of their population was employed in forestry or because necessary population information was not available.

Table 67. Employment in the forest industry in some Alberta communities[a]

Employment center	Population	% of population employed by forest industry
Dependent communities		
Blue Ridge	195	158.0[b]
Enilda	164	77.0
Chisholm	60	70.0
Lodgepole	130	40.0
Hines Creek	503	36.3
Cowley	333	27.1
Grouard	233	24.0
Peers	162	15.4
High Level	2 043	13.6
Fort Assiniboine	182	12.9
Boyle	616	12.5
St. Lina	56	12.5
Hinton	7 319	12.3
Debolt	63	11.1
Niton Junction	55	9.1
Wabamun	581	9.0
Cochrane	1 761	8.7
Wildwood	360	8.5
Dixonville	56	8.5
Worsley	63	7.9
Grande Prairie	18 429	7.2
Guy	56	6.3
Slave Lake	3 561	6.1
Sundre	1 447	6.0
Bluffton	112	5.4
Fox Creek	1 811	5.2
Total	40 351	
Heavily dependent communities		
Barrhead	3 332	4.8
Fawcett	129	4.7
Spedden	66	4.5
Whitecourt	4 400	4.4
High Prairie	2 281	4.3
Caroline	374	3.9
Tees	53	3.7
Rocky Mountain House	3 731	3.7
Alder Flats	94	3.7
Wabasca	172	2.9
Jarvie	75	2.7
Total	14 707	

Continued on next page.

Table 67. Concluded

Employment center	Population	% of population employed by forest industry
Marginally dependent communities		
Willingdon	337	2.2
Buck Lake	169	2.1
Cayley	156	1.9
Winfield	206	1.9
Canyon Creek	138	1.8
Athabasca	1 838	1.7
Manning	1 140	1.6
Bezanson	65	1.5
Breton	513	1.4
Nampa	352	1.4
Lac La Biche	1 954	1.3
Edson	5 015	1.2
Donnelly	312	1.1
Fort Macleod	3 067	1.1
Smith	353	1.1
Spirit River	1 020	1.1
Desmarais	149	1.0
Total	16 784	

[a] Source: Travel Alberta 1981.
[b] The percentage of population employed by the forest industry is greater than 100% because a large number of employees commute into Blue Ridge from other areas (principally Whitecourt).

SUMMARY

The following summary provides highlights of the report.

Industrial Base

• Alberta's primary wood-using industry in 1978 consisted of 458 firms, including 2 kraft pulp mills, 3 fiberboard and building paper plants, 3 plywood mills, 18 wood pressure-treating plants, 18 independent planing mills, 394 sawmills, and 20 miscellaneous (lath, pallet, building timber) mills.

• The 394 sawmills varied in productive capacity from 4000 to 200 000 fbm per 8-hour shift.

• The 28 largest sawmills (7.1% of the total) accounted for 88% of Alberta's final lumber production.

• The primary wood-using industry accounted for 7% of all jobs and wages and salaries paid in the Alberta manufacturing sector in 1978.

• The total replacement value of the capital stock of Alberta's primary wood-using industries is over $588 million.

• The Whitecourt Forest accounts for the majority of operations (83) and is followed closely by the Rocky-Clearwater Forest (82). About 71% of the operations in each of these forests consists of small sawmills producing less than 1 MM fbm of lumber per year.

Resource Base

• In Alberta, 171 087 sq. mi. (69% of the total land area) are forest land. The Alberta Forest Service administers and manages 130 501 sq. mi., or 76%, of forest land. Productive and potentially productive forest land in the Green Area amounts to 76 360 sq. mi.

• Alberta's inventoried provincial crown land supports a growing stock of 57 100 million cu. ft.; 27 200 million cu. ft. are hardwood stock and 29 900 million cu. ft. are softwood. White spruce accounts for 45% of softwoods and lodgepole pine and jack pine account for 44%.

• The total harvest from forest lands in 1979-80 was 247 million cu. ft., 94% of which was extracted from provincial crown lands.

• The total softwood annual allowable cut is 488.5 million cu. ft., of which 58% is allocated to the forest industry.

• The hardwood annual allowable cut is 413.4 million cu. ft., of which only 1% is allocated.

• The Edson Forest has the largest softwood volume (5000 million cu. ft.) and is followed by the Grande Prairie Forest (3900 million cu. ft.).

• The forest with the greatest volume of hardwoods is the Slave Lake Forest (6300 million cu. ft.), followed by the Footner Lake Forest (5300 million cu. ft.).

Products Produced

• The primary wood-using industry produced 832 million fbm of lumber, 474 thousand tons of kraft pulp, 1325 million cu. ft. (1/16-in. basis) of plywood, 5.9 million cu. ft. of treated products, 108 million cu. ft. (1/2-in. basis) of fiberboard and insulation products, and 42 thousand tons of construction paper and roofing products.

• Dimension material was the major lumber product, representing 90% of total final production. About 88% of all lumber produced was planed.

• The species mix in lumber production consisted of 64% spruce, 34% pine, 1% poplar, and 1% balsam fir.

• The Whitecourt Forest produced more lumber than any other forest (23% of all lumber produced), followed by the Slave Lake Forest (17%).

• The pulp mill in the Grande Prairie Forest produced 59% of the province's kraft pulp, and the mill in the Edson Forest produced the remaining 41%.

Economic Impacts

• Gross sales of all products manufactured by the forest industry amounted to almost $430 million.

• Forest products exported to out-of-province markets brought an estimated $338 million in external income into the province.

• Total direct employment by the forest industry was 1915 person-years in logging and 4502 person-years in manufacturing. An additional 9003 jobs were supported indirectly by the industry.

• Indian and Metis workers made up about 15% of the forest industry labor force.

• The total direct payroll of the forest industry was $97 million, and the average annual income was $20 967 in the pulp, paper, and allied industry group, $17 618 in the plywood mills, $15 928 in the sawmills and planing mills, and $15 462 in the wood preservation group. Average annual income in Alberta's manufacturing industries in 1978 was $15 417.

• In addition to the total direct payroll, an additional $13 million was estimated to have been paid to contractors' employees.

• Value added by Alberta's forest products industry groups was $222 million. These industries accounted for 9% of the total value added for the manufacturing sector.

• Value added per employee was $55 169 in the pulp, paper, and allied group, $42 239 in the wood preservation group, $42 201 in the plywood group, and $31 631 in the sawmill and planing mill group. Value added per employee in Alberta's manufacturing sector averaged $33 086 per employee.

• Twenty-six Alberta communities, with a total population of 40 000 people, are economically reliant on the forest industry.

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APPENDIX 1

SELECTED METRIC (SI) UNITS AND CONVERSION FACTORS[a]

Imperial		Metric (SI)
1 inch	=	2.54 cm
1 mile	=	1.609 km
1 acre	=	0.405 ha
1 square mile	=	2.590 km^2
1 cord (85 cubic feet (cu. ft.) solid wood)	=	2.407 m^3
1 cu. ft.	=	0.028 m^3
1 cunit (100 cu. ft. solid wood)	=	2.832 m^3 (roundwood)
1 ton (2000 lb.)	=	0.907 t
1 cord (stacked) per acre	=	8.956 m^3 (stacked) per ha
1000 board feet	=	4.29 m^3 (roundwood)
1 M foot board measure (fbm)	=	1.523 m^3 (lumber)
1 bone dry unit (BDU) wood chips (2400 lb.)	=	1090 kg
1 bale of shavings (30 lb.)	=	14 kg
1 sq. ft. of sheet product (1/2-in. basis)	=	1.180 m^2 (1 mm basis)
1 sq. ft. of sheet product (1/16-in. basis)	=	0.147 m^2 (1 mm basis)
M = thousand		
MM = million		

[a] Source: Environment Canada. 1974. Selected metric (SI) units and conversion factors for Canadian forestry. Environ. Can., Ottawa, Ont. Unnumbered.

Conversion Factors for Timber Products

These factors are approximate values and may vary depending upon tree size, manufacturing practice, species, etc.

Timber product		Equivalent value
1 cunit (100 cu. ft.)	=	660 fbm (roundwood)
Grade #1 railway ties (7" X 9" X 8')	=	42 fbm
Grades #2, #3 railway ties (6" X 8" X 8')	=	32 fbm
1 bundle (50 pieces) of lath	=	9 fbm
Fence posts (per piece):		
6' X 3 ½" top diameter	=	0.4 cu. ft.
6' X 4 ½" top diameter	=	0.7 cu. ft.
6' X 5 ½" top diameter	=	1.0 cu. ft.
7' X 3 ½" top diameter	=	0.5 cu. ft.
7' X 4 ½" top diameter	=	0.8 cu. ft.
7' X 5 ½" top diameter	=	1.2 cu. ft.
8' X 5 ½" top diameter	=	1.3 cu. ft.
8' X 6 ½" top diameter	=	1.8 cu. ft.
8' X 7 ½" top diameter	=	2.4 cu. ft.
8' X 8 ½" top diameter	=	3.2 cu. ft.
Power and telephone poles	=	9-30 cu. ft. (depending on size)

APPENDIX 2

STANDARD INDUSTRIAL CLASSIFICATION LISTINGS FOR FOREST INDUSTRIES, 1980[a]

	Standard Industrial Classification Code
DIVISION C - LOGGING AND FORESTRY	
Major Group 4 - Logging	041
Logging	0411
Major Group 5 - Forestry services	051
Forestry services	
DIVISION E - MANUFACTURING INDUSTRIES	
Major Group 25 - Wood industries	
Sawmills, planing mills, and shingle mills	251
a) Shingle and shake industry	2511
b) Sawmills and planing mills	2512
Veneer and plywood mills	252
Sash, door, and other millwork plants	254
Wooden box and pallet industry	256
a) Wooden box and pallet industry	2561
Miscellaneous wood industries	259
a) Wood preservation industry	2591
b) Particle board industry	2592
c) Waferboard	2593
d) Other wood industries	2599
Major Group 27 - Paper and allied products industries	
Pulp and paper mills	271
Paper box and bag industries	273
Other converted paper products industries	279

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[a] Source: Statistics Canada. 1980. *Standard Industrial Classification Catalogue* No. 12-501E. Ottawa, Ont.

APPENDIX 3

Table A. Distribution of lumber processing equipment in large sawmills (5 MM fbm and over annual production) in 1978-79

Mill no.	Debarkers	Cut-off saws	Circular headsaws	Scrag, band, gang, and quad saws	Chip-N-Saw chipping canter	Reman or resaws	Edger and trim saws	Chippers	Chipping edger	Planer	Dry kiln
1	X		X				XX	X		X	
2		X	X	XX		X			X	X	X
3	XX	X	X	X	X	X	XX			X	XX
4	XX	XX		XX		XXX	XXX		X	X	XX
5			X	X		X	XX			X	
6			XX				XXX			XX	
7		X	X	X		X	XXX			X	
8		X	X				XX				
9	XX	X		X	XX		X			XX	XXX
10	X	X	X	X		X	XX			X	XX
11				XXX			X			X	
12		X	X	XX		X	XXX				
13	X	X	X	XX			X	X		X	X
14		X	X			X	X			X	
15		X	X			X	XX			X	
16	XXXX	XXXX			XX		XX		XX	X	XXX
17		XX	X	X		X	XX			X	
18	XXX	X		XX		XX	XX	X		X	
19				X			XXX			X	X
20	X	XX		X		X	XXX	X			

Continued on next page.

Appendix 3, Table A. Concluded

Mill no.	Debarkers	Cut-off saws	Circular headsaws	Scrag, band, gang, and quad saws	Chip-N-Saw chipping canter	Reman or resaws	Edger and trim saws	Chippers	Chipping edger	Planer	Dry kiln
21	XXX	XXXX			XXX	X	XXXX XXXX			XX	XXX XX
22			X			X	XX				
23		X	X			X	X			X	
24		X				X	XX			X	
25	XX			X	X	X	X		X	X	
26	X	XX		X			X	XX		X	X
Total no. of units	23	29	16	23	9	20	56	6	5	25	21
No. of mills with equipment	12	19	15	16	5	17	25	5	4	22	10
% of mills with equipment	46	73	58	61	19	65	96	19	15	85	38

X - Unit of equipment.

APPENDIX 3

Table B. Distribution of lumber processing equipment in large sawmills (5 MM fbm and over annual production) in 1973[a]

Mill no.	Debarkers	Cut-off saws	Circular headsaws	Scrag, band, gang, and quad saws	Chip-N-Saw chipping canter	Reman or resaws	Edger and trim saws	Chippers	Chipping edger	Planer	Dry kiln
1			X	X			X				
2			X				XX			X	X
3		X		XX			X				
4				X			XX				
5			X	X		X	X			X	XX
6			X	XX				X		X	XXX
7			XX				XXXX			X	
8			XX			X	XXX				
9			X	X		X	XX			X	
10			X	X			X			X	X
11			X							X	
12				X			XX				
13			X	X		X	XX				
14	X	XXX XX	XXX XXX	X			XXXX			X	X
15	XX	X		X			X			XX	XXX
16			X				X			X	XX
17				X			XXX			X	X
18			X				XX			X	
19			X	X			XX			X	
20			X				XX			X	
21			X	X		X	XX			X	
22	X		X	X				X		X	X

Continued on next page.

Appendix 3, Table B. Concluded

Mill no.	Debarkers	Cut-off saws	Circular headsaws	Scrag, band, gang, and quad saws	Chip-N-Saw chipping canter	Reman or resaws	Edger and trim saws	Chippers	Chipping edger	Planer	Dry kiln
23			X	X		X	X			X	
24		X	X	X			X	X		X	
25			XX				X			X	
26			XX	X		X	XXXX			X	X
27			X			X	X				
28		XX	X			X	XX			X	
29			X			X	XX			X	
30	X		X	X		XX	X	X	X	XXX	X
31				X			X				
Total no. of units	5	10	34	22	0	12	52	4	1	26	17
No. of mills with equipment	4	5	25	20	0	11	28	4	1	23	11
% of mills with equipment	13	16	81	64	0	35	90	13	3	74	35

[a] Source: Teskey, A.G. and J.H. Smyth. 1974. A directory of primary wood-using industries in west-central Canada, 1973. Environ. Can., Can. For. Serv., North. For. Res. Cent., Edmonton, Alberta. Inf. Rep. NOR-X-83.

X - Unit of equipment.

APPENDIX 4

SEASONALITY OF EMPLOYMENT, BY FOREST INDUSTRY GROUPS, 1978

A. Seasonality of employment in sawmills 5 MM fbm and over annual production.

B. Seasonality of employment in sawmills 1 MM to 5 MM fbm annual production.

C. Seasonality of employment in sawmills 100 M to 1 MM fbm annual production.

D. Seasonality of employment in sawmills less than 100 M fbm annual production.

E. Seasonality of employment in independent planing mills.

F. Seasonality of employment in the plywood industry.

G. Seasonality of employment in the wood preservation industry.

H. Seasonality of employment in the pulp, paper, and allied industry.

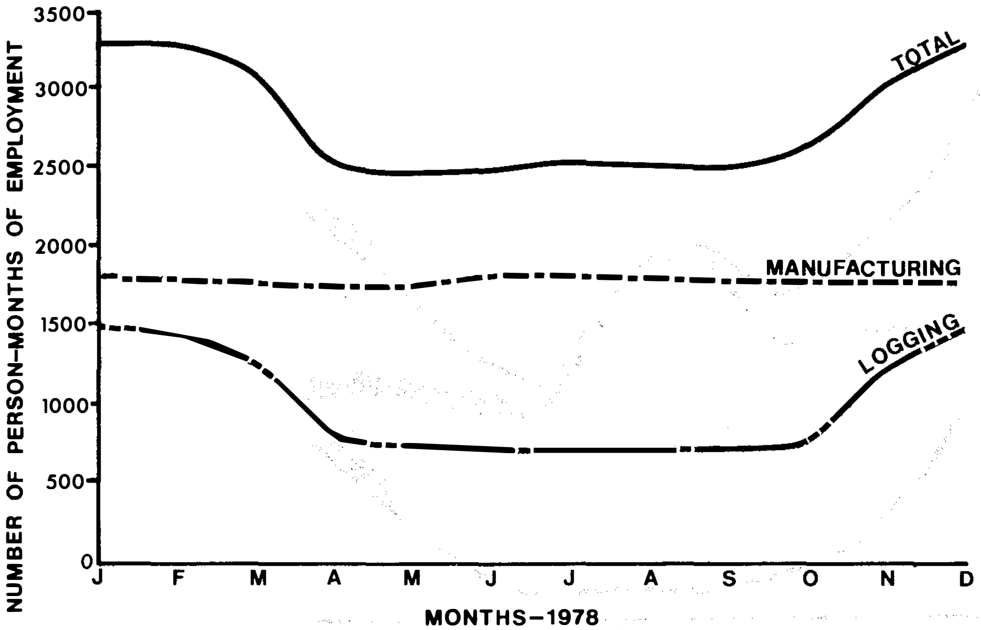

Figure A. Seasonality of employment in sawmills 5 MM fbm and over annual production.

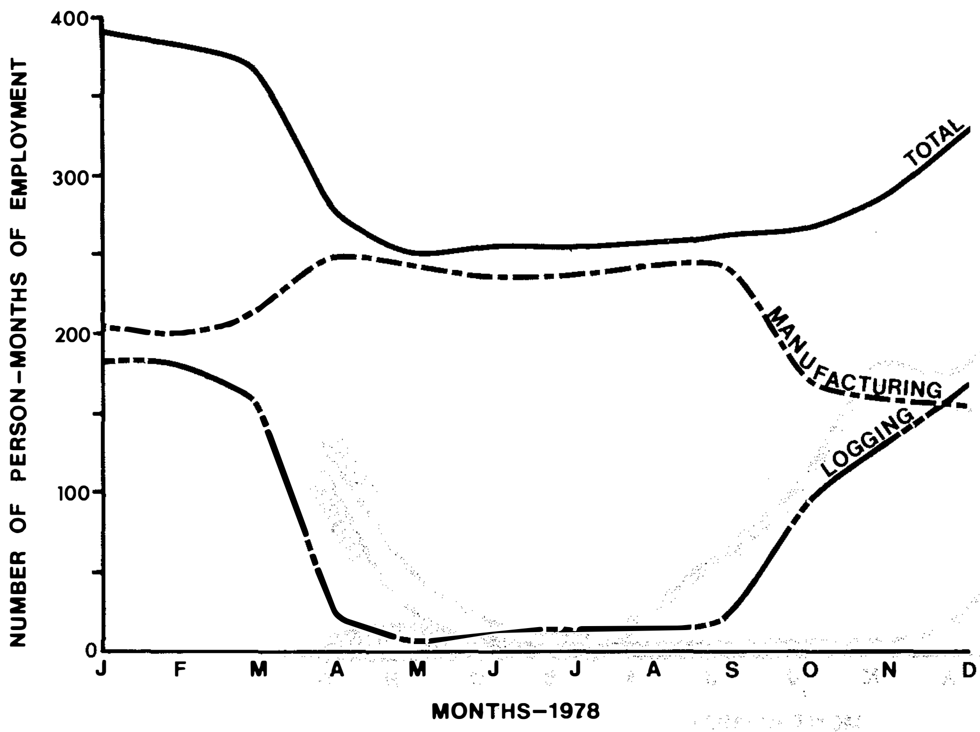

Figure B. Seasonality of employment in sawmills 1 MM to 5 MM fbm annual production.

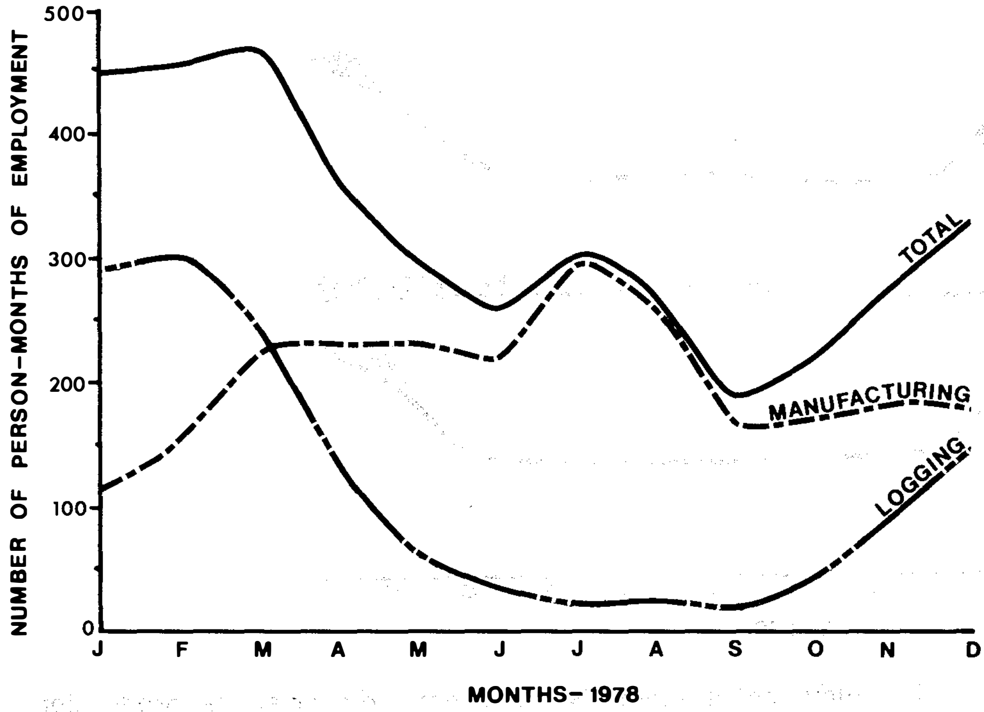

Figure C. Seasonality of employment in sawmills 100 M to 1 MM fbm annual production.

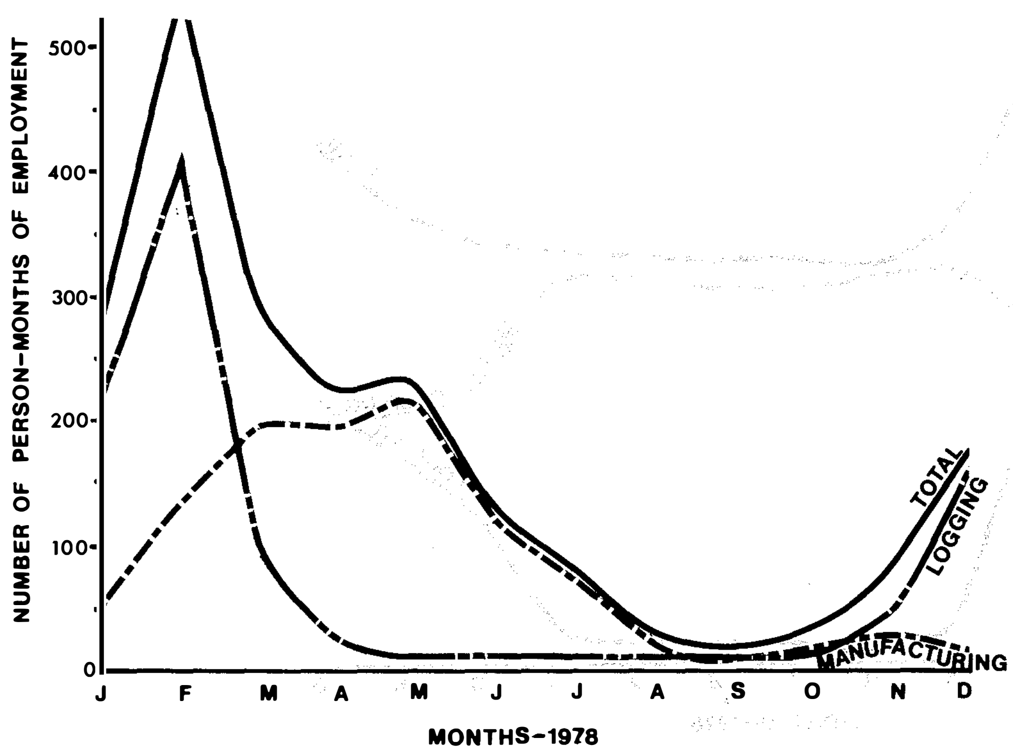

Figure D. Seasonality of employment in sawmills less than 100 M fbm annual production.

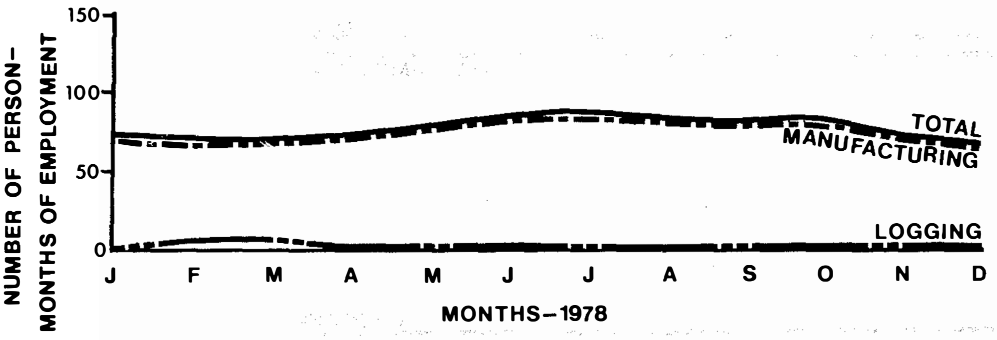

Figure E. Seasonality of employment in independent planing mills.

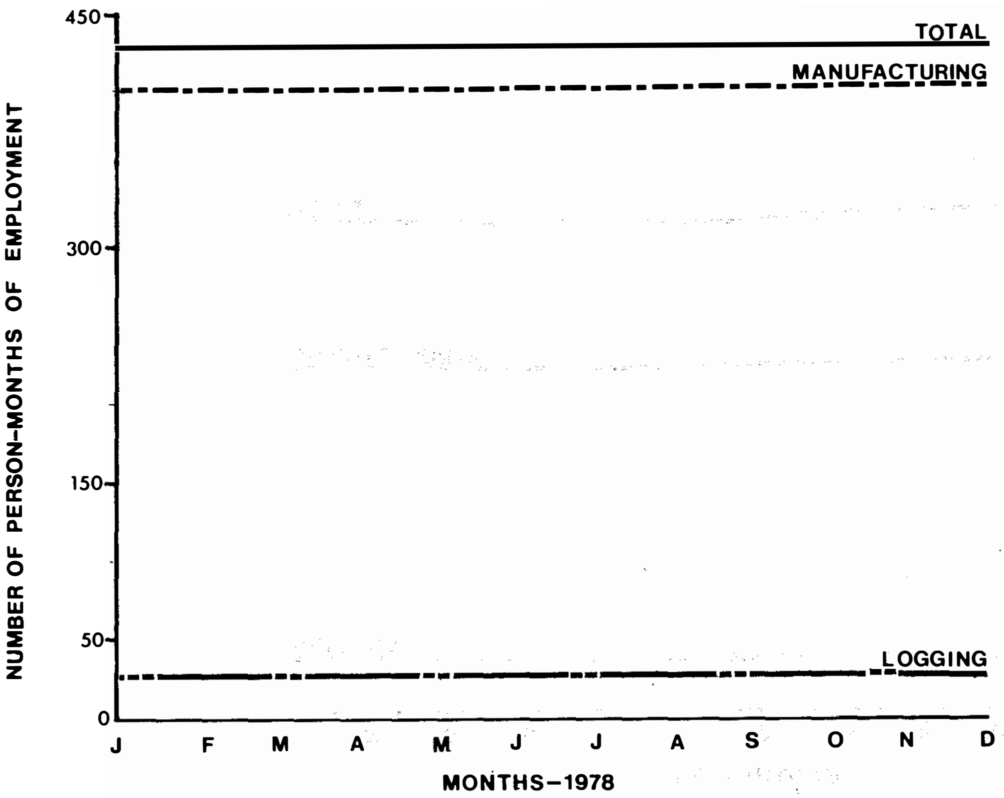

Figure F. Seasonality of employment in the plywood industry.

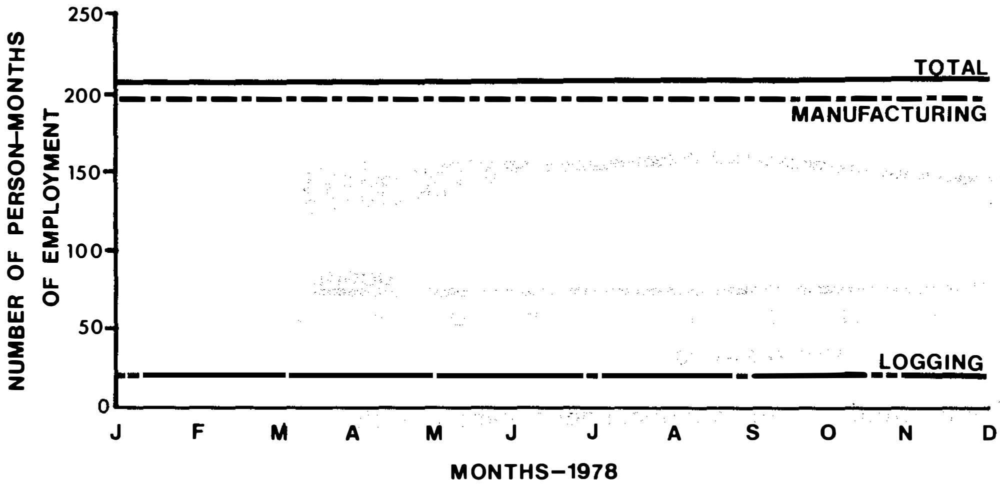

Figure G. Seasonality of employment in the wood preservation industry.

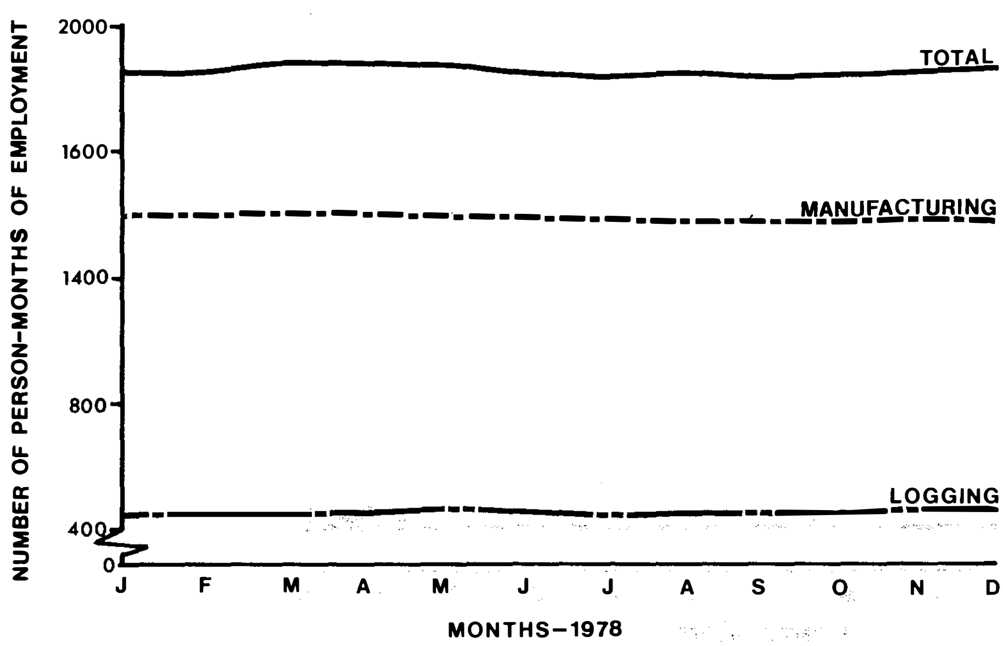

Figure H. Seasonality of employment in the pulp, paper, and allied industry.

APPENDIX 5

SALES, OPERATING EXPENDITURES, AND VALUE ADDED FOR THE FOREST INDUSTRY, 1978-79[a]

	Sawmills ($)	Planing mills ($)	Pulp, paper, and allied ($)	Plywood mills ($)	Wood preservation ($)	Miscellaneous ($)	Total ($)
Number of firms	394	18	5	3	18	20	458
Sales (F.O.B. mill)	159 441 569	5 853 542	204 580 590	34 436 000 (SC)	18 160 074	7 424 830	429 896 605
Operating expenditures							
Fuel and electricity	6 285 725	140 800	10 405 255	846 000 (SC)	439 000 (SC)	178 000 (E)	18 294 780
Materials and supplies	1 072 773	82 312	55 088 073 (E)				
Maintenance and repairs	8 354 010	201 706	15 149 000				
Wood inputs (purchased)	3 397 329	2 190 720	9 700 000				
Administration	6 874 810	280 728	7 680 343 (E)	16 625 000 (SC)	9 400 000 (SC)	3 675 291 (E)	189 491 333
Payments to contractors	36 528 782	0	2 179 000				
Road maintenance	3 597 817	0	2 855 000				
Payment to provincial government	3 607 232	0	951 407				
Value added	89 723 091	2 957 276	100 572 512	16 965 000	8 321 074	3 571 539	222 110 492
Depreciation	14 699 405	IR	8 018 915	IR	IR	IR	22 718 320
Wages and salaries	45 303 696	1 364 829	38 222 925	7 082 548	3 046 100	1 850 320	96 870 418
Local municipal tax	749 104	149 425	3 240 000	862 000 (E)	448 275 (E)	6 136	5 454 940
Unallocated residuals and profit	28 970 886	1 443 022	51 090 672	9 020 452	4 826 699	1 715 083	97 066 814

[a] Two separate sources were used to construct this table: Statistics Canada and the NoFRC forest industry survey, 1978-79. To the greatest extent possible, the information is based on the NoFRC survey; however, due to lack of response by some firms regarding costs of production, it was necessary to supplement survey data with Statistics Canada information. Statistics Canada information is not disaggregated to the same degree as the NoFRC data, thereby preventing the same detailed breakdown of costs for all industry groups.

SC - Value obtained from Statistics Canada.

E - Value estimated based on existing information.

IR - Insufficient response; value is included with unallocated residuals as an estimate.

APPENDIX 6

FORESTRY INDUSTRY GROUPS, 1981[a]

	Industry group	Standard Industrial Classification Code
1.	Sawmills and planing mills	2513
2.	Veneer and plywood mills	2520
3.	Sash, door, and other millwork, N.E.S.	2541
4.	Prefabricated buildings (wood frame)	2543
5.	Manufacturers of wooden kitchen cabinets	2544
6.	Wooden box factories	2560
7.	Coffin and casket industry	2580
8.	Wood preservation industry	2591
9.	Miscellaneous wood industries, N.E.S.	2599
10.	Furniture re-upholstery and repair	2611
11.	Household furniture manufacturers, N.E.S.	2519
12.	Office furniture manufacturers	2640
13.	Miscellaneous furniture and fixture manufacturers	2660
14.	Pulp and paper mills	2710
15.	Asphalt roofing manufacturers	2720
16.	Folding carton and set-up box manufacturers	2731
17.	Corrugated box manufacturers	2732
18.	Paper and plastic bag manufacturers	2733
19.	Miscellaneous paper converters	2740
20.	Commercial printing	2860
21.	Plate making, typesetting, etc., industry	2870
22.	Publishing only	2880
23.	Publishing and printing	2890

[a] Source: Alberta Bureau of Statistics. 1981. Alberta principal manufacturing statistics - 1978. Alberta Treasury, Edmonton, Alberta.

APPENDIX 7

COMPONENT PRODUCTS OF COMMODITY CATEGORIES[a]

Commodity group

1. Forest products
   a) Logs and bolts
   b) Poles
   c) Fence posts
   d) Pulpwood
   e) Custom forestry (logging)

2. Lumber and other wood products
   a) Pulp chips
   b) Wood waste
   c) Lumber, timber, and tiles
   d) Shingles
   e) Lath
   f) Custom mill work
   g) Plywood
   h) Wood fabricated materials

3. Paper and paper products
   a) Pulp
   b) Paper stock
   c) Other paper products
   d) Paper building products
   e) Converted paper

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[a] Source: Communication with personnel of Alberta Bureau of Statistics.