ECONOMIC IMPACT OF THE NOVA SCOTIA FOREST INDUSTRY

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FOREWARD

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ABSTRACT

The purpose of this study was to identify and describe the status and utilization of the forest resources and to determine their economic contribution to the province of Nova Scotia. It was found that 84% or 10.8 million acres of the land area in the province is classified as forest land. A little over half of this is in small private ownerships of less than 1,000 acres, 21% is held in large private ownerships of more than 1,000 acres, and 26% is Crown land. Slightly over 50% of the forest land area is classified as softwood, about 17% is hardwood, and the remainder is mixedwood. There are an estimated 9.2 billion ft^3 of gross merchantable volume in the province with about 70% in softwoods and 30% in hardwoods. About 63% of the softwood volume is in trees 4-9 in. DBH and 37% in trees over 10 in. DBH.

In 1970, forest production was 113 million ft^3. The average for the province over the past 10 years has been about 105 million ft^3 or 10-11 ft^3/acre. Allowable cut estimates indicate that *theoretically* this cut could be increased in some regions, ownerships, and species without seriously impairing the growing stock. Comparison of the 1958 inventory data with those from the latest inventory indicates that there has been an increase in gross cubic foot volume for the province as a whole. There have been some minor changes in species composition and size class, but these changes do not appear to be significant.

A comparison of sawmills and pulp and paper mills showed that while total employment in sawmills was about equal to that in pulp and paper mills, the total wages and salaries paid by sawmills were only about half those paid by pulp and paper. Materials and supplies, value added, and value of shipments for sawmills were about one-quarter of that for pulp and paper mills.

It was further estimated that per unit of roundwood used, employment by sawmills was more than double that for pulp and paper mills, but salaries and wages paid were about the same. Value of inputs (and output) per unit of roundwood used for sawmills amounted to about two-thirds of that for pulp and paper mills.

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It was estimated that tree growing, harvesting, and manufacturing for the province in 1969 accounted for the direct employment of about 7500 persons. Salaries and wages were at least $34 million, value added was $80 million, and value of shipments was $154 million. This represented about 10% of the total employment in commodity-producing industries and about 15.5% of employment in the manufacturing sector. Pulp and paper mills ranked second and sawmills ranked fifth in value added for the manufacturing industries. Forest products exports amounted to about $73 million in 1970. This was about 36% of the total value of all exports.

CONTENTS

I. INTRODUCTION

A large proportion of the goods and services available in Nova Scotia are derived from or are dependent upon its forest resources. Forests provide a habitat for wildlife, regulate streamflow, contribute toward an aesthetically pleasing landscape, and serve as a raw material for a variety of products such as railroad ties, lumber, and pulp and paper. The export of a portion of these products provides income for the purchase of goods and services not produced locally.

Forest land and timber, however, are limited. Often the same area cannot be used for more than one purpose, as in the case of many recreation sites. Timber that is used for pulp cannot at the same time be used for lumber, and wood of a particular quality or species generally has limited uses.

Because there are a variety of benefits to be derived from these resources and because not all them can be realized at the same time, choices must be made. The criteria for these choices, however, depend on the decision-maker. This might be an individual woodlot owner, a sawmilling company, or government. It is important to recognize that goals of these individuals or groups might not be the same. The woodlot owner, for example, might be interested only in the income from the sale of stumpage; the sawmiller will probably be concerned with maximizing profit over some period of time for the company as a whole; and governments, for the most part, are generally interested in a wide spectrum of goals such as high level of employment and income, price stability, economic growth, environmental quality, and wildlife.

In recent years, governments have increasingly assumed responsibility for management of the forest resources. This is due in part to the continuing pressure for improvement in living standards, recognition of the variety of benefits - particularly indirect and extra-market benefits - accruing from resource development, and the increasing competition for these resources.

Increasing responsibility of governments is likewise more evident in industrial development. This can be seen from the variety of assistance schemes including grants for modernization of plants, "tax

holidays", and government-sponsored technical assistance programs. This expanding influence of governments has in turn made it necessary to review periodically how resources (in part forest land and timber) are being allocated or used and what the resultant benefits are. As demands change, policies must change if maximum net benefits are to be realized.

It is in this context that the Government of Nova Scotia, as well as most other provincial governments, is placed in relation to forest resource and industry development. Resources are limited. How can they be developed and how should they be distributed? How should the forest industry develop? Answers to these questions depend to a large extent on the consequences or impact on the welfare of the province of various allocation schemes and development programs.

This study was designed to determine the economic contribution of the forest resources and industries to the province given the current status of the resource and the utilization pattern. The specific objectives were:

(a) To describe in quantitative and qualitative terms the status of the resource from which the economic benefits are derived.

(b) To describe past and present utilization in order to more fully understand how the system transforms resource inputs into the goods and services which provide benefits.

(c) To provide a means of relating the forest resource and industry to the economy of Nova Scotia in terms of economic impact and social well-being.

(d) To provide economic analysis which industry and government in Nova Scotia can use to evaluate and suggest alternatives in allocation, investment, and management.

Much of the information used in this summary report has been presented in detail in a series of background papers which have been published separately (Stewart et al. 1972; Nacker et al. 1972a, b; Runyon et al. 1972).

This summary report is presented in seven major sections. The first is the Introduction. Part II describes the forest resource characteristics and ownership. This provides an indication of the forest land area, species composition, age-class distribution, and ownership. Most

of this information is new in that it has just been made available from the recent inventory.

Part III deals with that stage between timber growing and manufacturing - that is harvesting and transport - and includes a description of the products removed (poles, piling, sawlogs, etc.) and their source by geographic region and ownership, logging methods, and employment and incomes.

Timber growth and cut are examined in part IV. An attempt is made to determine whether there is overcutting or whether expansion is possible.

Part V is directed toward primary manufacturing or processing of the roundwood. Attention is mainly on sawmills and pulp and paper mills because they are the most important users of roundwood. An attempt is made to determine the quantity, value, and geographic origin of the major inputs used in manufacturing because the use of these inputs has a considerable economic impact on other sectors. The type and destination of outputs are also analysed. Special emphasis is placed on characteristics and numbers of employees because employment in the sawmilling industry presents some special problems.

In part VI, an effort is made to bring together and analyse directly the economic impact of the forest resources, harvesting, and processing. Impact is compared within the sawmilling industry and between sawmills and pulp and paper mills.

Part VII provides some perspective on the position of the forest resources and industries in relation to other sectors, such as agriculture.

Part VIII, the last, is a summary and a consideration of some problems and needs.

II. STATUS OF THE FOREST RESOURCE

Although there have been several descriptive accounts of the forest resources of Nova Scotia, the first detailed inventory was not completed until 1957. A continuous survey was started in 1964 and the entire province has just been completed. Information presented in this report is derived from this latest inventory.

To provide some regional perspective and a summary of the resource distribution, the province was divided into four broad areas: Western, Central, Eastern, and Cape Breton (Fig. 1). These regions are multiples of counties and inventory subdivisions.

A. LAND CLASSIFICATION

There are about 12.8 million acres of land in Nova Scotia and about 84% or 10.8 million acres are forested. The remaining 16% is classified as agriculture, bogs, marshes, roads, urban, and so on. Comparison of these figures with the 1958 inventory data indicates that the percentage of land forested has increased slightly. This appears to be due in part to reforestation of abandoned farmland; however, part of this difference might be due to different sampling procedures and definitions. The proportion of land that is forested does not vary significantly by region.

About 52.5% or 5.6 million acres of the forest land in the province is in small private ownerships (less than 1000 acres); 21.2% or 2.3 million acres is held in large private ownerships (greater than 1000 acres); and the remaining 26.4% or 2.8 million acres is Crown owned (this includes about 3% Federal Crown land).

Proportion of forest land by ownership class does not vary too much by region (Fig. 1). The proportion in small ownership varies between 48.0% in the Western region and 60.2% in the Eastern region. The proportion of forest land in larger private ownerships varies from 2.6% in the Cape Breton region to 32.7% in the Central area. Crown land as a percentage of the total is lowest in the Central region (15.6%) and highest in the Cape Breton region (42.3%).

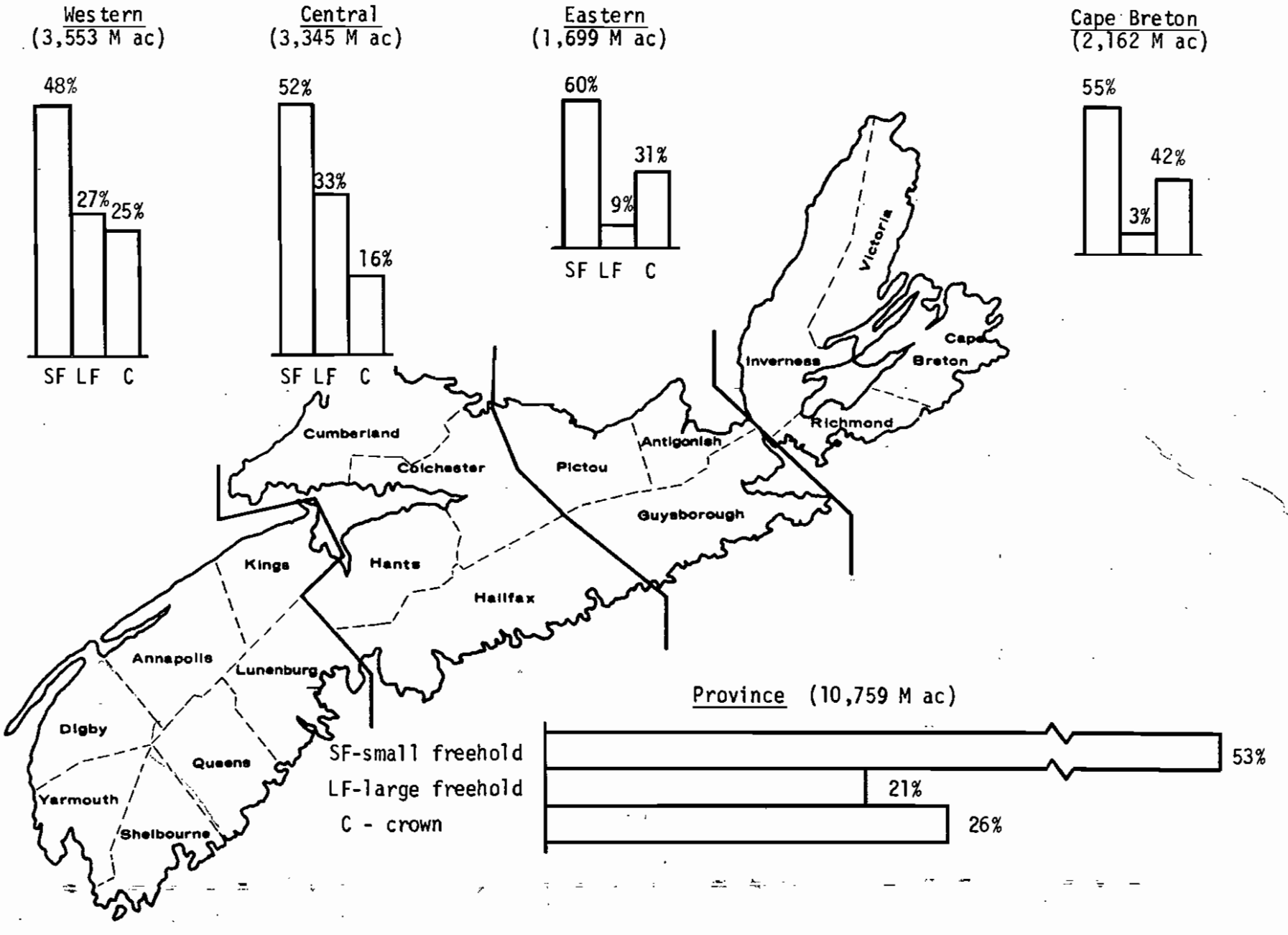

Fig. 1. Forest land ownership by region in Nova Scotia, 1969.

B. FOREST LAND COVER TYPE AND AGE CLASS

About 53% or 5.7 million acres of the province's forest land is classified as softwood (i.e. about 75% of the volume of this area consists of softwood species - mainly spruce, fir, pine, and hemlock); about 17% of the area or 1.9 million acres is classified as hardwood (birch, maple, and poplar); and the remaining 30% or 3.2 million acres is typed as mixedwood (Fig. 2).

By region, the percent of land classed as softwood varies from a low of 46% in the West to 60% in Cape Breton. The percent of land classified as hardwood cover type is highest in the Western region (19.1%) and lowest in the Cape Breton region (13.3%).

Comparison of the proportion of forest land area by cover type for the different ownership classes indicates that there is a slightly higher percentage of softwoods on Crown land (57%) than on private land (52%). The percentage of land in the three major forest cover types does not vary more than 1 or 2% between small and large private ownerships.

In terms of age class distribution, almost 42% of the productive forest area (for all species) is estimated to be covered by trees more than 60 years old. On about 40% of the area the estimated ages are, between 41 and 60 years, and about 18% of the forest land area are covered by trees less than 40 years old.

Analysis of the age distribution by cover type indicates that 38% of the land covered mainly by softwood species (total of 5.7 million acres) is in the age class 60+ years; about 42% of this area is covered by trees in the age class 41-60 years; and about 19% of the area is covered by the age class 40- years of age (Fig. 3). There is a slightly higher percentage of the area classified as mixedwood in the age class 60+ than in the softwood type.

Figure 3 shows that the Cape Breton region has the highest percentage (43.8%) of the area in the softwood cover type with trees over 60 years of age. The Eastern region has the lowest percentage in this age class (24.6%) but the highest percentage (29%) of area in trees less than 40 years of age.

A look at the age class distribution of softwood and mixedwood cover types shows that land in small private ownerships has a higher

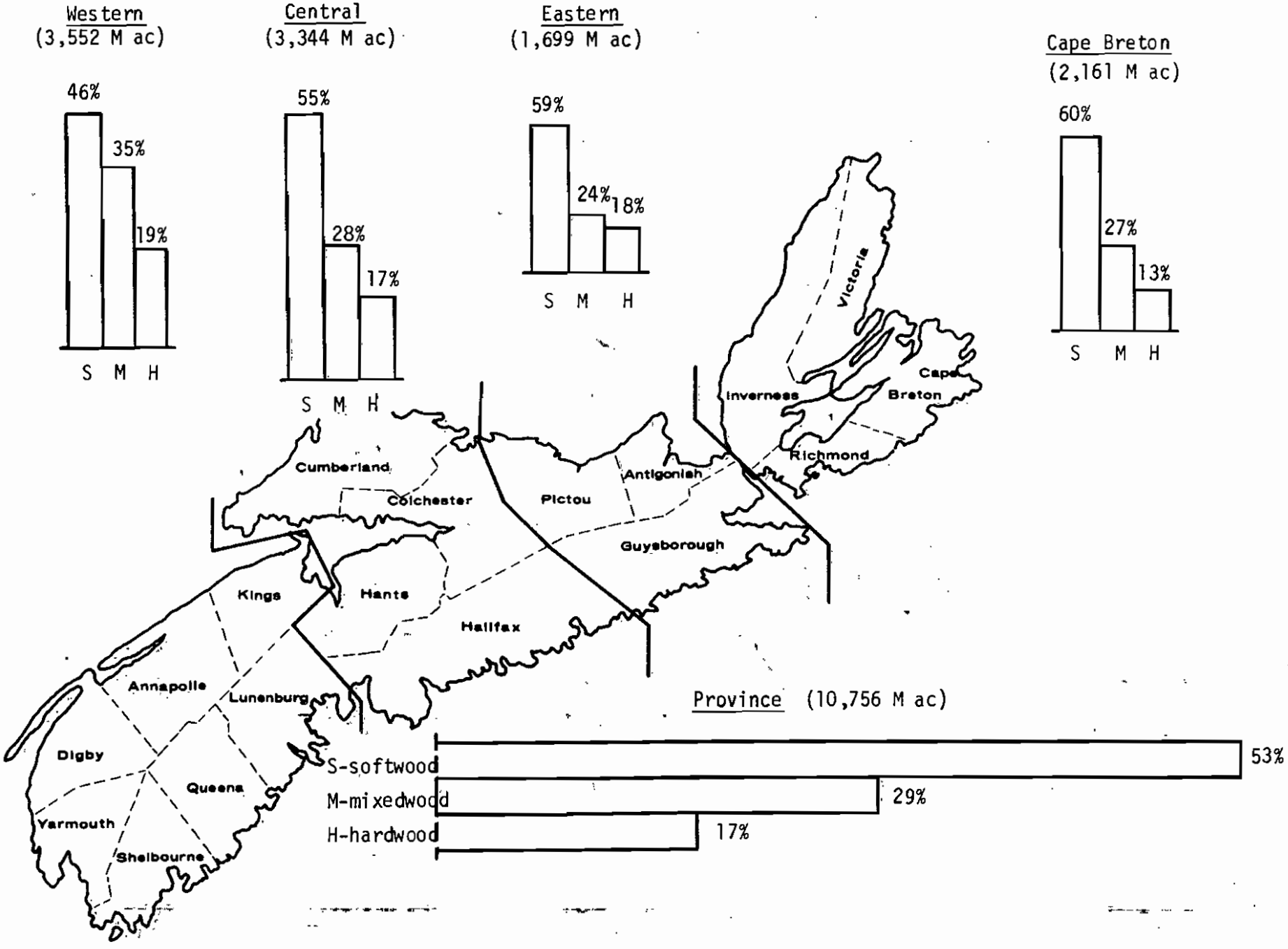

Fig. 2. Forest land cover type by region in Nova Scotia, 1969. (Because of rounding, total forest area does not equal that shown in Fig. 1.)

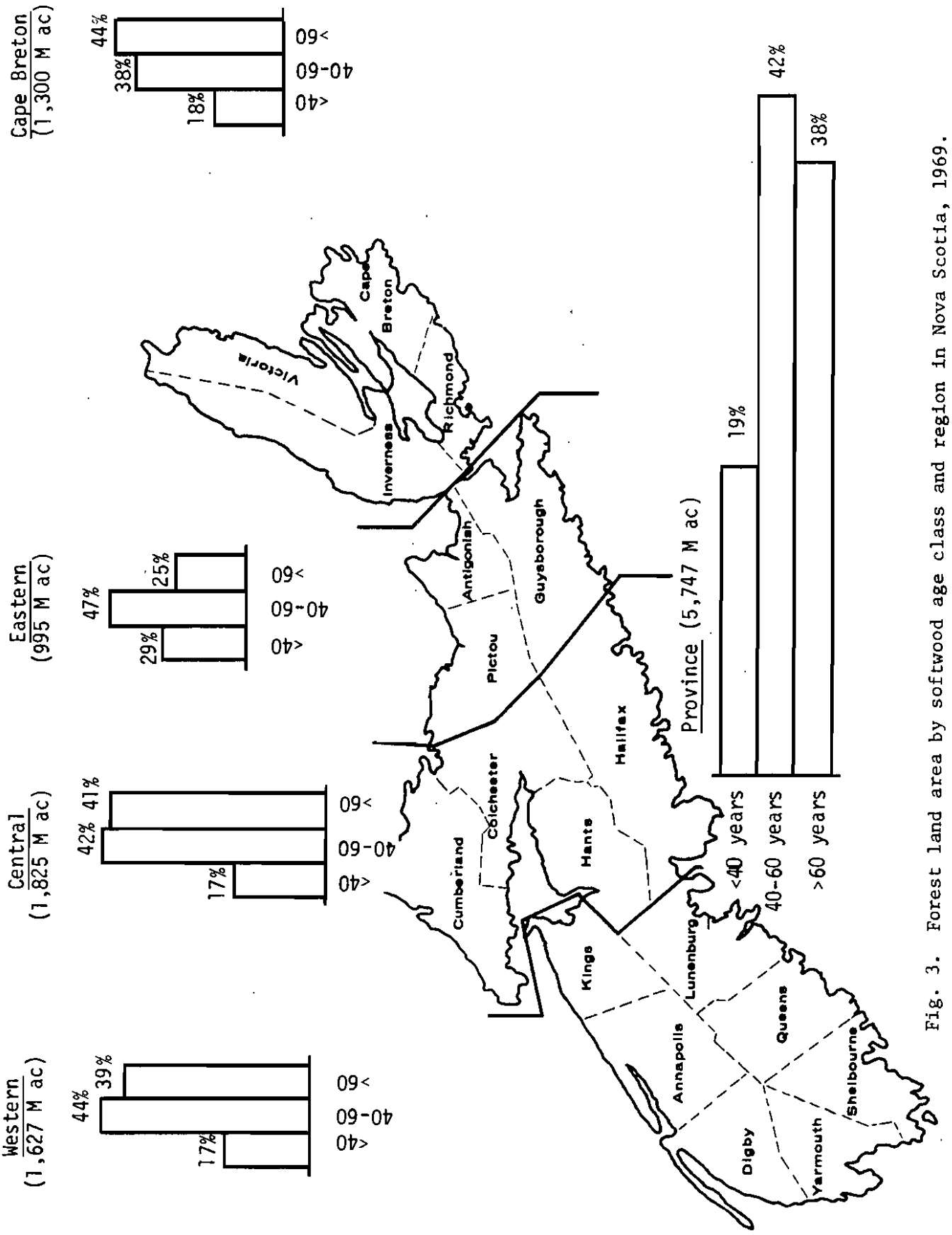

Fig. 3. Forest land area by softwood age class and region in Nova Scotia, 1969.

percentage of trees in the younger age classes, 66% stocked to 60 year old or less, than does land in large private or Crown ownership, 48 and 51%, respectively.

C. TIMBER VOLUME AND SIZE CLASS

Timber volume and size class are probably more relevant and meaningful from the point of view of current resource status and potential for development than is age class. The gross merchantable volume[1] of timber in Nova Scotia is estimated to be about 9.2 billion ft^3. About 6.5 billion ft^3 or 70% is softwood, mainly spruce and fir, and 2.7 billion ft^3 or 30% is hardwood, mainly birch and maple.

The distribution of softwood and hardwoods by volume and region are shown in Fig. 4. Gross merchantable softwood volume makes up about the same proportion of total volume for all regions.

For the province as a whole, about 63% of the softwood merchantable volume is in the 4-9 in. DBH size class (Fig. 5). The remaining 37% is in trees over 10 in. DBH. The Western region has 45%, the largest percentage in the 10+ in. DBH class. The farther east one moves, the lower the percentage of volume in the large diameter class becomes: only about 29% of the volume in the Cape Breton region is in trees in the 10+ in. DBH class.

Earlier it was shown that small freehold land (parcels less than 1000 acres) constituted about 52.5% of the total forest land area in the province; the area in large freehold was about 21.2%; and in Crown, about 26.4%. Analysis of the distribution of gross merchantable volume by ownership class shows that about 49% of the volume is on small freehold properties, about 26% on large freehold, and the remaining 25% on Crown land. Thus the average gross merchantable volume per acre is lower on small freehold and Crown land than on large freehold land for the province as a whole.

The distribution of gross merchantable volume by region and ownership class is shown in Fig. 6. Comparison of land held by the ownership group and the distribution of merchantable volume (Figs. 1

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1. Gross merchantable volume is the solid cubic foot content "... excluding bark, from stump height to a minimum top diameter of 3.6 inches outside bark (or larger if deformity or damage reduces the merchantable length)" (N.S. Dep. Lands & Forests 1968).

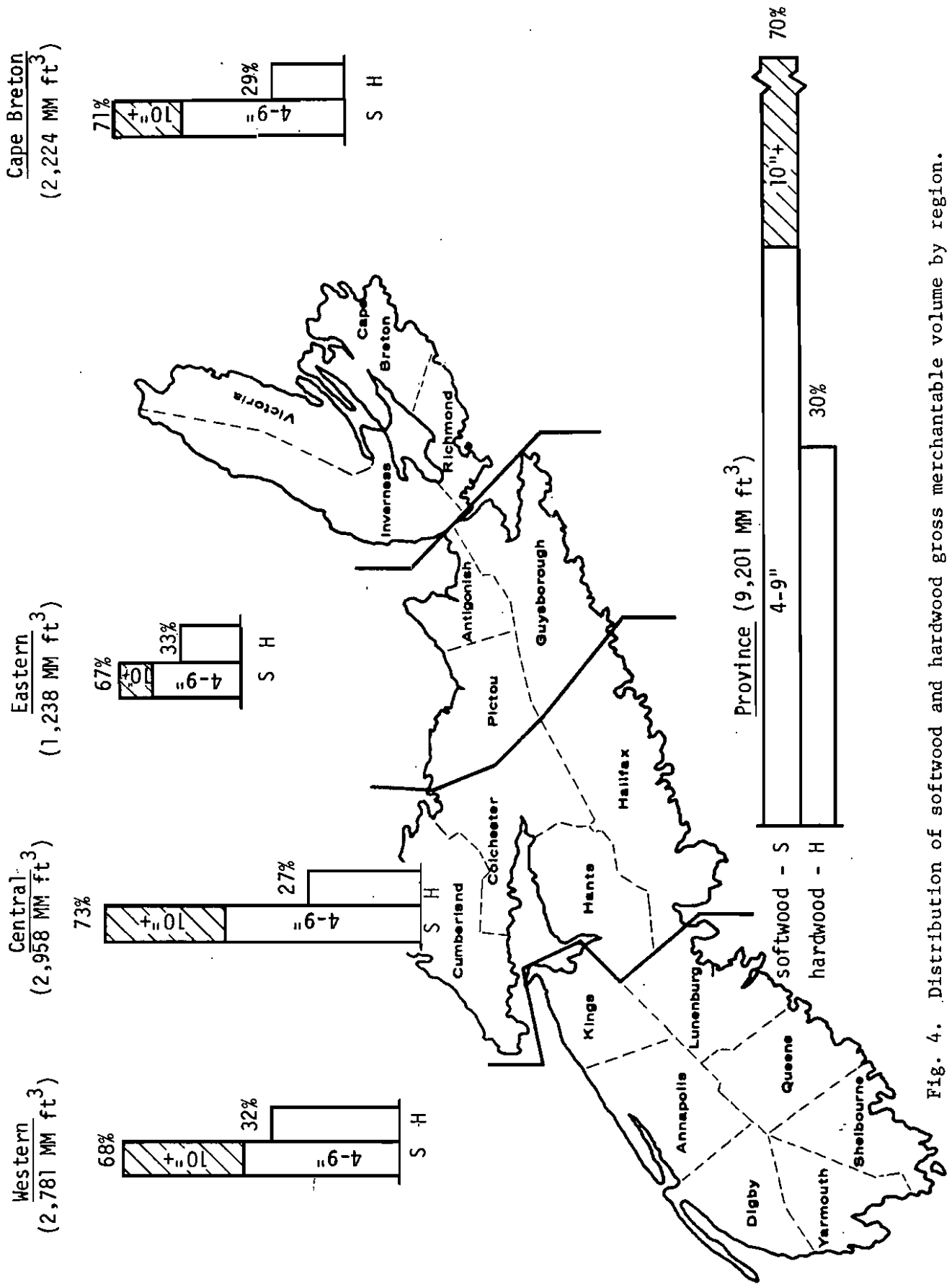

Fig. 4. Distribution of softwood and hardwood gross merchantable volume by region.

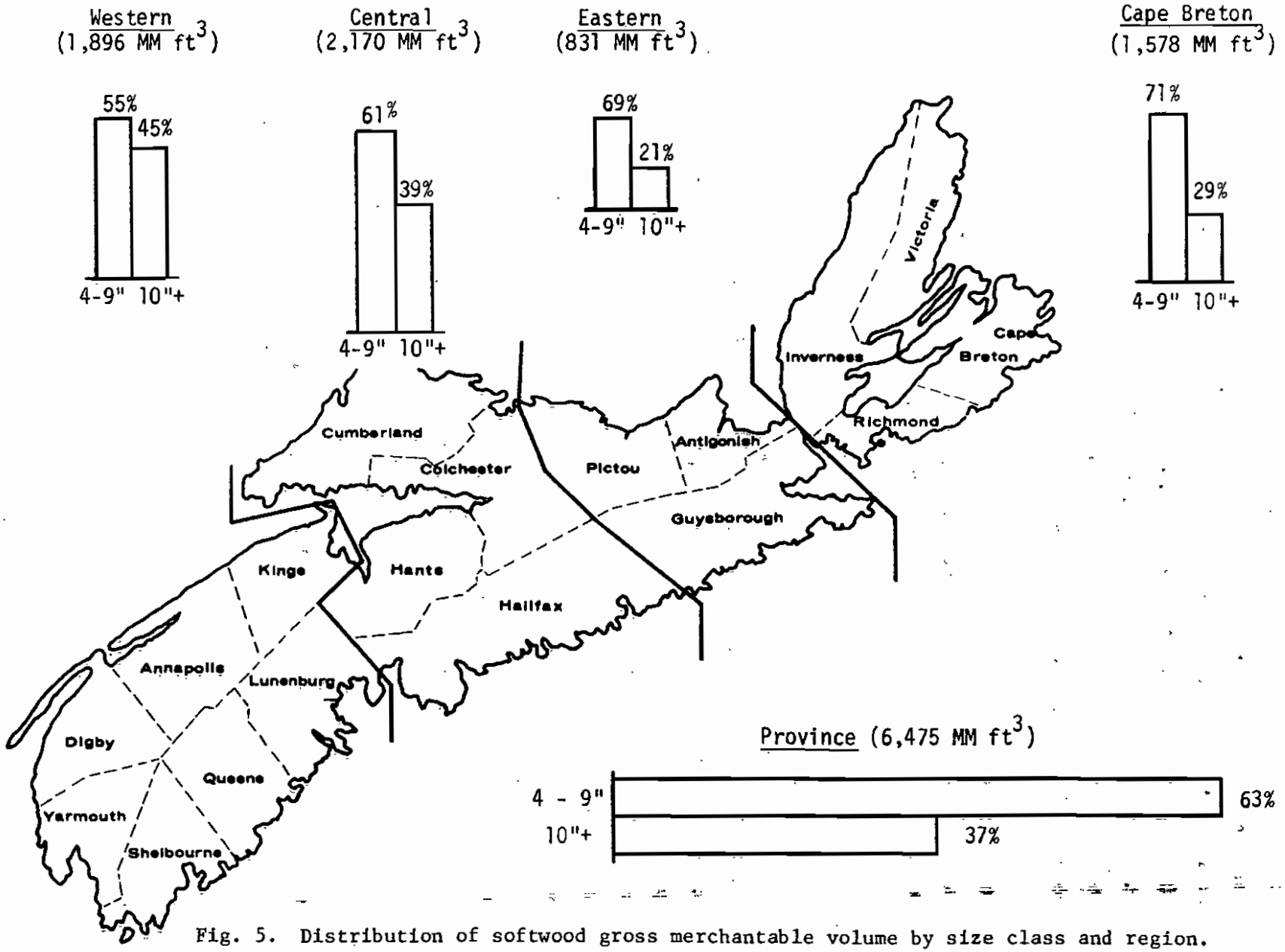

Fig. 5. Distribution of softwood gross merchantable volume by size class and region.

and 6) shows that, in the Western region, about 48% of the forest area is in small freehold and this area supports about 44% of the gross merchantable volume for the area. The area of land, for the same region, in large freehold is about 27% of the total, but this area has about 37% of the gross volume. A similar situation exists in the Central region. In the Eastern and Cape Breton regions, the proportion of land held by the various ownership classes corresponds closely with the proportion of merchantable volume on the areas.

About 75% of the 6.5 billion ft^3 of softwood merchantable volume is estimated to be privately owned. About 48% or 3.1 billion ft^3 is in small freehold. Of the estimated 2.7 billion ft^3 of hardwood, about 51% is held under small freehold and 24% in large freehold.

D. SPECIES

Spruce and balsam fir account for slightly more than 86% or 5.6 billion ft^3 of the gross merchantable volume of softwood in the province. Other less important species are white pine and hemlock. Spruce makes up a higher proportion of total softwood volume in the Western and Central region, while balsam fir is more prominent in the Eastern. In the Cape Breton region, balsam fir makes up about 65% of the gross merchantable softwood volume (Table 1).

Of the estimated 2.7 billion ft^3 of hardwood in the province, about 41% or 1.1 billion ft^3 is birch and sugar maple. Red maple accounts for about the same percentage. The proportion of birch and sugar maple to total hardwood volume varies from over 21% in the Western region to 66% in the Cape Breton region. Red maple on the other hand is more prominent in the Western region where it accounts for about 52% of the gross volume. In the Cape Breton region, red maple makes up 22% of the gross volume.

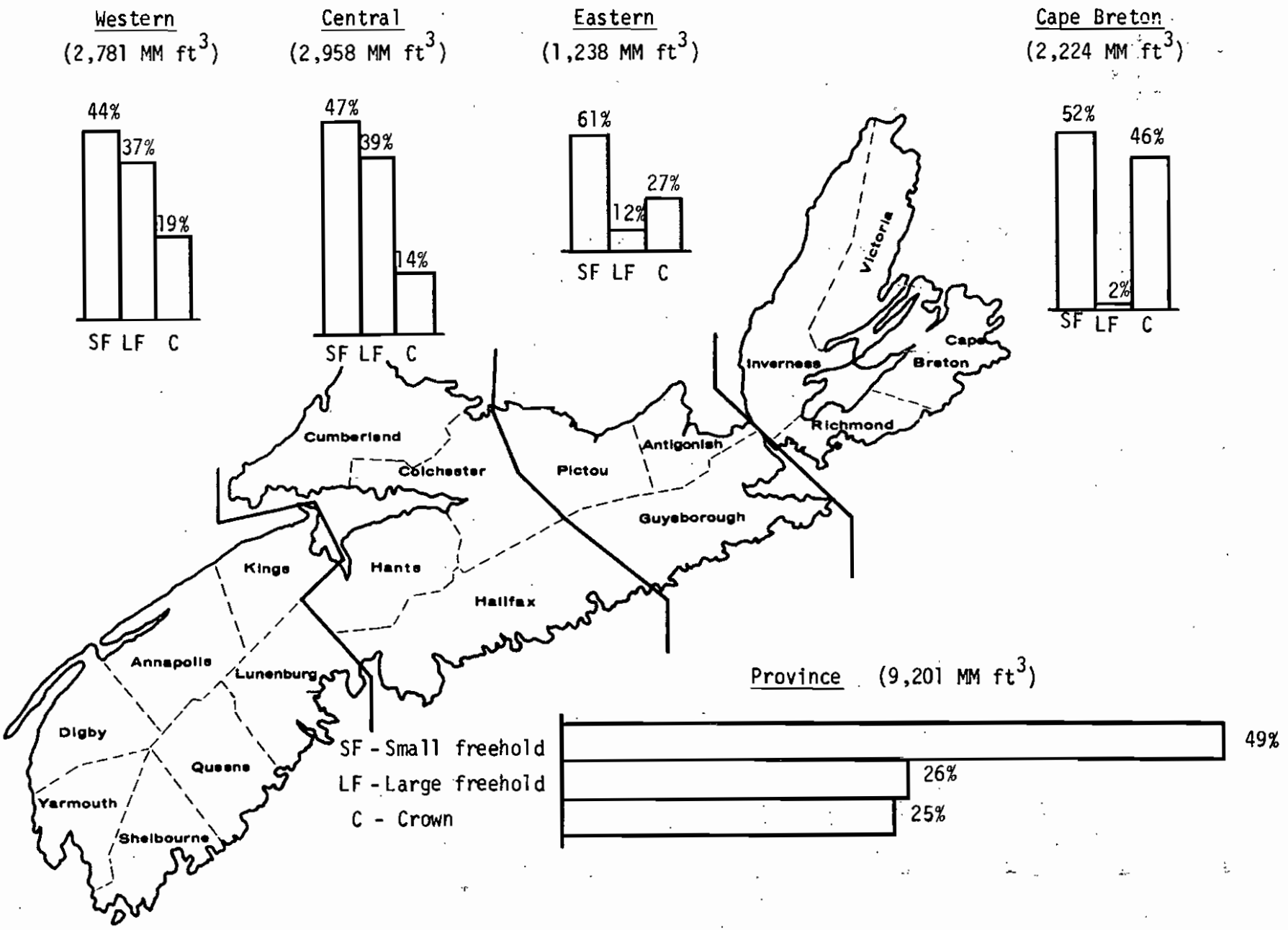

Fig. 6. Distribution of softwood and hardwood gross merchantable volume by owner and region.

Table 1. Distribution of gross merchantable volume by species and region

Species	Western	Central	Eastern	Cape Breton	Total	% of gross merchantable volume
	----------	----------	(MM ft^3)	----------	----------	
Softwood						
Spruce	1,032	1,273	413	485	3,203	34.8
Balsam fir	360	654	343	1,031	2,388	26.0
White pine	291	90	37	18	436	4.7
Hemlock	154	92	24	17	287	3.1
Other	59	62	13	27	161	1.7
Subtotal	1,896	2,171	830	1,578	6,475	70.3
Hardwood						
Birch & hard maple	190	307	204	426	1,127	12.2
Red maple	456	365	154	141	1,116	12.2
Poplar	79	69	23	12	183	2.0
Other	159	48	27	67	301	3.3
Subtotal	884	789	408	646	2,727	29.7
Total	2,780	2,960	1,238	2,224	9,202	100.0

Source: Stewart et al. 1972.

III. PRIMARY FOREST PRODUCTION

A. PRODUCTS

Total roundwood produced in Nova Scotia in 1970 was 112.9 million ft^3. During the 9 years from 1962 to 1970, production varied between 89.6 million ft^3 (1962) and 121 million ft^3 (1968), and averaged about 105 million ft^3. The average annual percentage increase for the period was about 3% (Table 2; Fig. 7).

These figures do not include wood cut for fuel, fence posts, and other products that are difficult to estimate. Volume of wood harvested for fuelwood in 1969 was estimated to be 3.9 million ft^3 hardwood and 1.9 million ft^3 softwood. Other non-commercial products harvested were estimated to be at about 0.2 million ft^3.

Softwood production amounted to about 105 million ft^3 or 93% of the total for 1970. About 36.7% or 41.4 million ft^3 was in sawlog material (that amount of roundwood required to produce sawnwood products -- lumber, boxwood, railway ties, etc.) and the remaining 71.5 million ft^3 or 63.3% was in roundwood products (pulpwood mainly, but also including materials for pit props, veneer logs, and poles and piling).

B. SOURCE OF PRODUCTS

In 1970, primary forest production was greatest in the Central region with 40.8 million ft^3 or about 36% of the total for the province. About 27.5 million or 24.4% was produced in the Western area, while the Eastern and Cape Breton regions produced 24.4 and 20.3 million ft^3, respectively.[2]

The Central and Western regions each produced about equal volumes of sawlog material and pulpwood or roundwood (Fig. 8). Production in the Eastern and Cape Breton regions was primarily roundwood for pulpwood and pit props.

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2. It must be kept in mind that sawlog production and source was estimated from processors, i.e. the sawmills, rather than from producers. It is possible that some of the wood sawn in one county was actually produced in another; therefore these volumes and sources of wood would indicate only the broad trends.

Table 2. Roundwood and chip production (M ft^3) in Nova Scotia, 1962-1970

	Sawlogs		Pulpwood		Sub-totals			
Year	Softwood	Hardwood	Softwood	Hardwood	Softwood	Hardwood	Total	Chips
1962	44,610	2,870	42,114	39	86,724	2,909	89,633	4,264
1963	47,180	3,109	41,295	261	88,475	3,370	91,845	5,108
1964	46,794	2,585	52,605	92	99,399	2,677	102,076	5,780
1965	47,632	2,853	59,392	87	107,024	2,940	109,964	7,241
1966	43,629	2,840	51,817	1,351	95,446	4,191	99,637	7,537
1967	37,638	2,249	58,057	1,298	95,695	3,547	99,242	8,230
1968	39,861	1,663	77,203	2,302	117,064	3,965	121,029	10,060
1969	44,530	1,741	67,365	5,598	111,895	7,339	119,234	10,309
1970	39,940	1,459	65,396	6,105	105,336	7,564	112,900	10,701

Notes: Lumber was converted from board feet to cubic feet of sawlogs at 200 ft^3 = 1 M.f.b.m.
Data does not include fuelwood, fenceposts, and other products that are difficult to measure.
Chips are all softwood.
Sawlogs includes lumber, boxwood, railway ties, mine packs, laths, shingles, staves, and headings.
Pulpwood includes pitprops, poles, pilings, and veneer logs.

Source: Stewart et al. 1972.

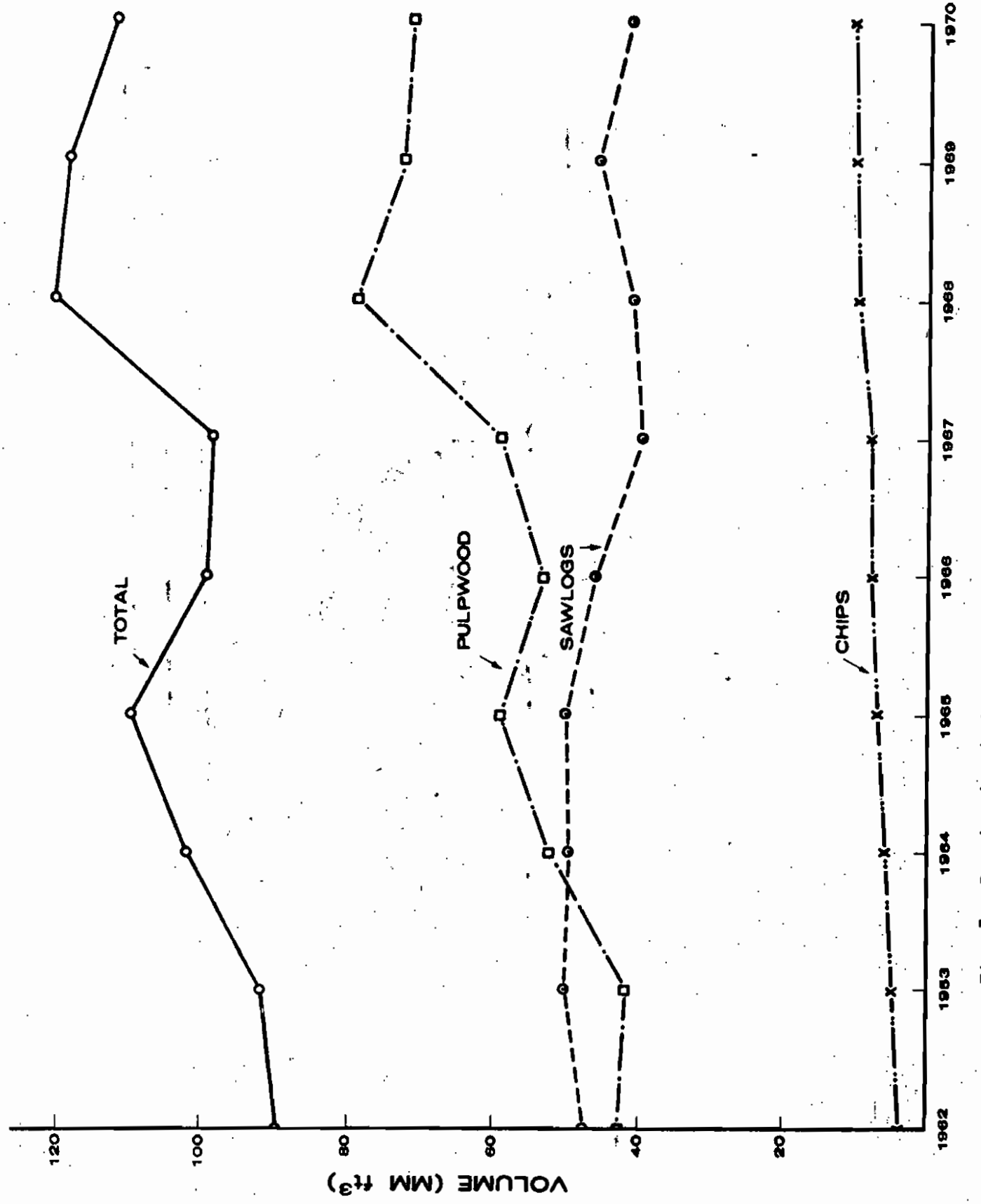

Fig. 7. Roundwood and chip production in Wood [illegible]

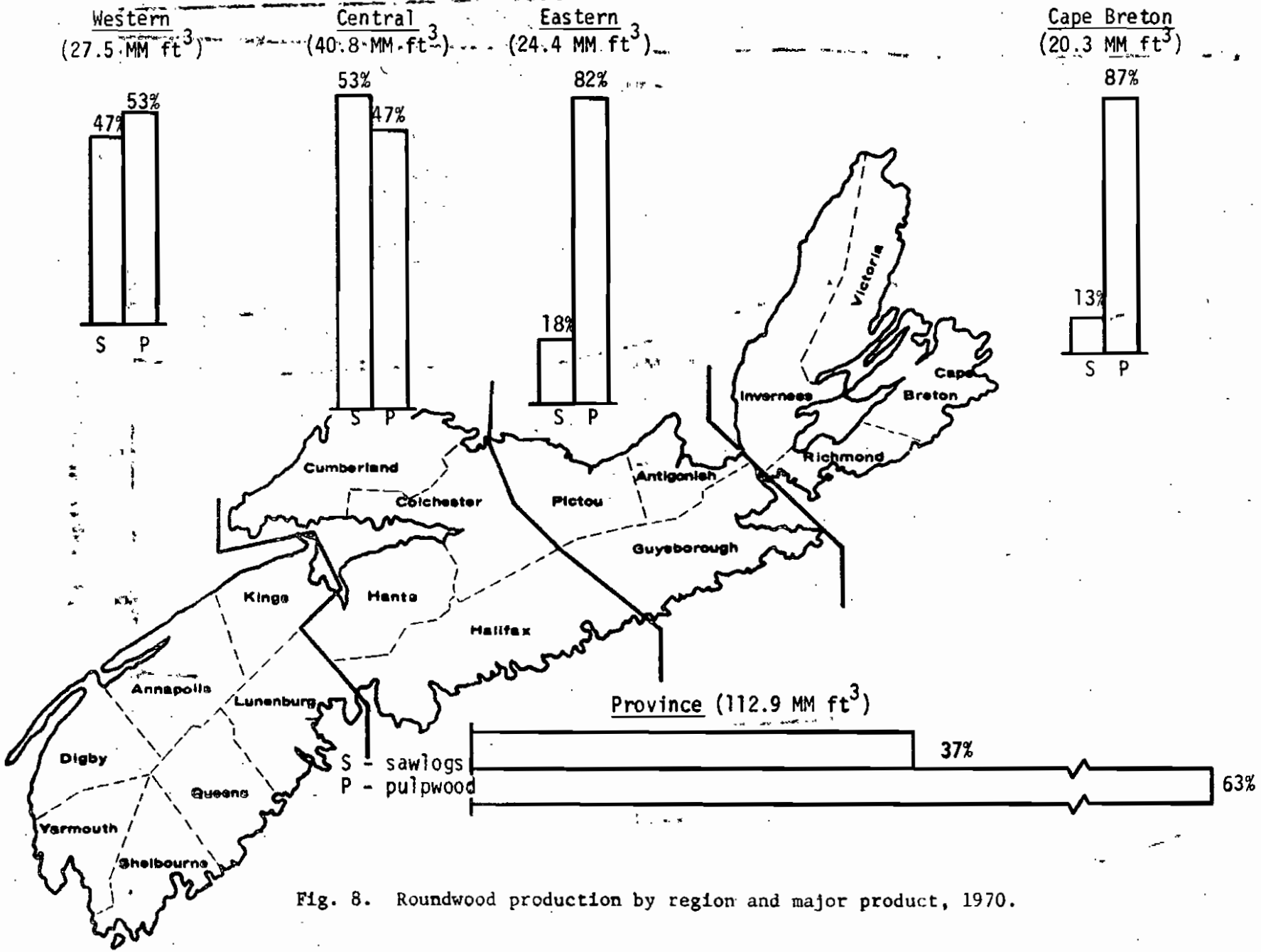

Fig. 8. Roundwood production by region and major product, 1970.

For the province as a whole, almost 57% or 64 million ft^3 was produced on small freehold ownerships; large freehold properties supplied about 32.5 million ft^3 or 29%; and the remaining 16.5 million ft^3 or 15% was produced on Crown land. For all regions except the Central, where it was only 42.5%, the percentage production of roundwood on small freehold properties was above 60%. The low level in the Central region is largely balanced by large freehold land which produced 51% of total roundwood in the region (Fig. 9).

By major product group, small freehold properties accounted for over 60% of the volume of sawlogs produced, while large freehold properties accounted for 31% and the remaining 9% was from Crown land. In this analysis, two points are noteable: the majority of pulpwood produced in the Central region was done so by large freehold properties; and, in the Cape Breton region, over 80% of the sawlog production came from small freehold properties.

An analysis of the source of logs for the sawmilling industry in 1969 indicated that the industry relied on small freehold properties for between 25 and 60% of their logs (varied by mill size class). Conversely, the percentage of sawlogs from their own land varied from 67 to 22%. Crown land stumpage accounted for up to 13% of the sawlog requirements, and up to 30% of requirements (by size class) were provided by pulp company freehold. No estimates of the origin of wood by ownership class are available for wood used by the pulp and paper companies.

C. TYPES OF PRODUCERS AND CONTRACTORS

The logging sector in Nova Scotia, as in most other provinces, is a very heterogeneous group. A considerable number of small woodlot owners who farm, fish, or have another occupation, also do some logging. There is a number of persons who are associated with a pulp mill or sawmill logging crew. And, there is a number of operators who are independent of woodlots or manufacturing firms.

In a review of small woodlot owner operations, Nacker et al. (1972b) estimated that there were about 27,000 small woodlot owners (less than 1000 acres) in the province. For a sample of 192 owners, the average size of woodland was 236 acres and the median was 165 acres.

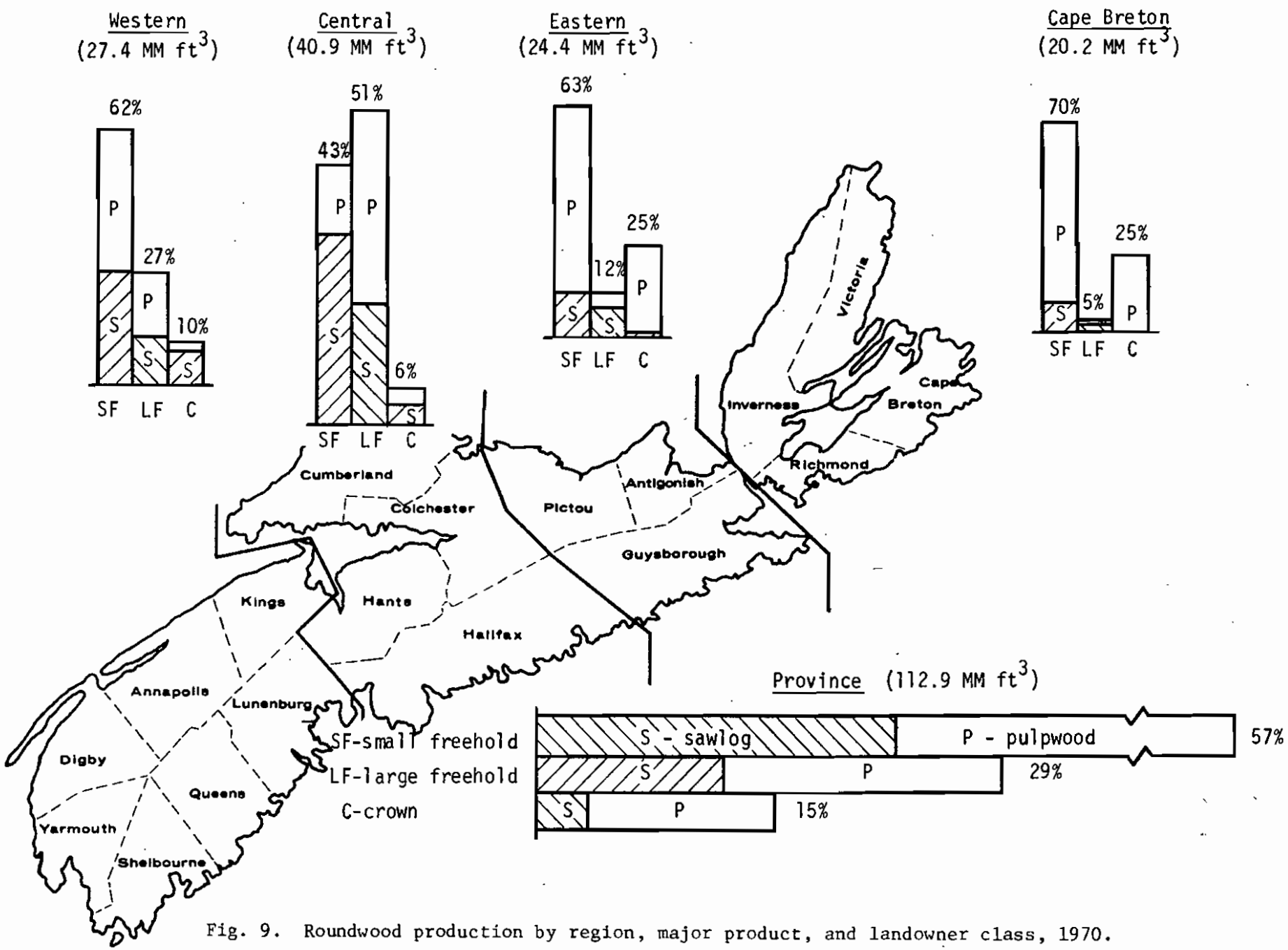

Fig. 9. Roundwood production by region, major product, and landowner class, 1970.

Table 3. Roundwood production (M ft^3) by region and major product, 1970

Region	Sawlogs[a]		Round products[b]		Sub-totals			
	Softwood	Hardwood	Softwood	Hardwood	Softwood	Hardwood	Total	Chips
Western	12,402	542	12,221	2,334	24,623	2,876	27,499	2,282
Central	20,885	629	17,332	1,913	38,219	2,542	40,761	6,943
Eastern	4,223	89	18,280	1,791	22,503	1,880	24,383	1,166
Cape Breton	2,430	199	17,561	67	19,991	266	20,257	310
Province	39,940	1,459	65,396	6,105	105,336	7,564	112,900	10,701

a. Includes logs going to lumber, boxwood, railroad ties, mine packs, laths, shingles, staves, and headings. The roundwood equivalent was calculated from the production of end products. For example, 200 ft^3 of roundwood was estimated to have been required per 1000 f.b.m. of lumber produced.

b. Includes pulpwood, pit props, poles, and piling.

Source: Stewart et al. 1972.

Each ownership averaged two parcels and about two-thirds of the owners lived on or adjacent to one of the parcels. Most of the annual timber harvest (by volume) consisted of softwood sawlogs (49%), softwood pulpwood (32%), and firewood (12%).

Major owners of small woodlots by primary occupation were wage earners (34%), farmers (21%), retired persons (19%), and widow-housekeepers (9%). Wage earners and farmers owned about 54% of the forest land in the sample but accounted for 72% of the total value of the forest products sold in 1969. Some 39% of the owners had not made a harvest cut in the past 5 years. In general, these involved smaller properties under 100 acres. Ownerships over 200 acres accounted for about 85% of the value of all forest products sold for the small woodlot owner sample.

The survey of the sawmilling industry (Runyon et al. 1972) indicated that most mills did some of their own logging, and it appeared that their own crews were responsible for about 50% of the mill requirements. Contract logging was an important source of logs only in the larger mills.

The pulp and paper mills in Nova Scotia reported that they produced on their own about 255 thousand cords or 28.5% of their total roundwood requirements in 1969. The remaining 71.5% or 640 thousand cords was purchased. The value of purchased wood (landed at the mill) was about $13 million and the value of the mills' own production was about $5.4 million.

Because of the heterogeneity of the logging sector, a survey was carried out to determine characteristics of the loggers who were more or less independent of woodlot owners and manufacturing concerns (Nacker et al. 1972a). This survey consisted of a questionnaire and personal interview of 43 people representing the major independent logging companies. About 70% of the people contacted indicated that their work was a full-time occupation. The logging companies in the sample produced 12.6 million f.b.m. or about 10% of the estimated total roundwood production for the province.

D. METHODS OF TIMBER HARVESTING

Only a limited amount of information is available on the techniques and equipment used in harvesting wood. It is well known that most of the harvesting on small woodlots is done without specialized equipment. Chainsaws are of course primarily used in felling and farm tractors for skidding. Most of the logging operations are carried out during the 4 winter months, December to March.

Logging methods used by operators associated with wood-processing companies varied considerably from those used by small woodlot owners. Most companies used more specialized equipment.

The survey of independent logging concerns showed that volume of production and equipment used varied considerably. For example, the range of output of sawlogs per contractor varied from 10 M.f.b.m. to 5,000 M.f.b.m. and, for pulpwood, from 15 cords to 13,500 cords. Methods of production varied from the use of horses for skidding to totally mechanized operations using tree processors. Obtaining sufficient capital for investment in equipment and obtaining trained woods workers were problems.

E. TIMBER HANDLING AND TRANSFER

As was noted earlier, a high percentage of small woodlot owners were involved in felling, bucking, and skidding of forest products; however, only about half these people participated in loading or hauling. It appears that this function was largely the responsibility of the contract loggers.

For woodlot owners, the majority of sales were for cut forest products, i.e. only 15 of the 192 persons interviewed sold stumpage. In the sale of sawlogs, the buyer generally measured the product. This was the practice for pulpwood sales as well. Most sales were paid for at the time of the purchase. It was found also that, in the case of the small woodlot owners, middlemen (brokers, exporters, concentration yards) were quite important. Survey results showed that half the individuals sampled sold to one or another of these agents. Most sales were made at roadside.

In the case of logging contractors, the terms of payment for products or services, were generally very informal. Only four companies

received a cash advance from buyers before logging, and these buyers were very large mills. Most contractors sold products at the mill yard rather than at roadside. In the case of sawlog sales, buyers were usually sawmills and very few dealers or brokers were involved. There was a slightly higher dependence on middlemen in the case of pulpwood sales.

With respect to hauling distance, contract loggers reported a range from 4 to 100 miles (one-way) for pulpwood. The average hauling distance was estimated to be 58 miles. No data was available for company operations. It was found that sawlogs were hauled shorter distances than pulpwood. The range was from 4 to about 40 miles, and the average was 23. Analysis of the sawlogs harvested by sawmills showed that the hauling distances ranged from 1 to 60 miles and averaged about 15.

IV. TIMBER GROWTH/CUT BALANCE

The land area and timber described in Part II constitute the forest resource. It is recognized that there are a variety of benefits derived from this resource; however, the concern of this study is primarily with timber production and processing, and the associated impact.

It is assumed that the maintenance and improvement of these benefits depends on some degree of balance, over time, between the volume of wood grown annually and that which is removed. An attempt was made to determine allowable cut using three different formulae (area/volume, Hanzlik's, and von Mantel's). Taking all forest land into account (10.8 million acres), it is estimated that an average annual cut between 164 million ft^3 and 258 million ft^3 could be sustained theoretically without seriously impairing the growing stock. The estimated allowable cut and actual cut by region are shown in Table 4.

The estimated actual cut for 1970 was below the estimated average annual allowable cut by about 109 million ft^3 (Table 4). What does this mean? This means that: if the growth and cut estimates are correct; if all areas are physically accessible; if all areas have sufficient stocking to permit economical harvesting; if all areas are stocked with species

Table 4. Estimated allowable annual cut and actual cut by region, 1970

Region	Estimated allowable cut[a]				Estimated actual cut[b]
	Hanzlik	Area/Volume	von Mantel	Average	
	(MM ft^3)				
Western	78.9	55.8	77.1	70.6	27.5
Central	75.8	51.5	82.6	70.0	40.8
Eastern	40.1	22.1	34.5	32.2	24.4
Cape Breton	48.9	34.8	63.5	49.1	20.3
Province	243.7	164.2	257.7	221.9	112.9

a. Net merchantable volume (softwood and hardwoods). Equal to gross merchantable volume adjusted by a cull factor.

b. Fuelwood and other non-commercial products are not included. These were estimated to be about 6 million ft^3.

Source: Stewart et al. 1972.

which are in demand; if there is no restriction of cut by different owners; if there is a suitable distribution of age classes and if there is no change in the level of management intensity; then the actual cut could just about be doubled without impairing the growing stock. We know, however, that some areas are inaccessible, that some hardwood species are in low demand, and that some owners simply are not cutting the equivalent annual growth each year. Since we do not know the extent of these limitations, the allowable cut estimates can only be used as a general indication of the relationship between actual cut and theoretical.

On a per acre basis, these estimates indicate that for the total forest area in the province a theoretical cut of about 20 ft^3/acre/year could be sustained (221.9 million ft^3/10.8 million acres). How does this compare with other estimates. The 1958 forest inventory report (N.S. Dep. Lands & Forests 1958) states: "If all the growing stock was to be used for pulpwood, the allowable cut would be about $^1/_6$ cord [14 ft^3] per acre per year for the total forested land of the province. If it were to be all used for the sawlog industry the allowable cut would be 22 feet board measure per acre per year." The report further indicates that during the period 1910 to 1955, the equivalent of about $^1/_8$ cord or 11 ft^3 per acre per year has been used by industry.

One way of checking the growth/cut or supply/demand balance is to look at the inventory data periodically and determine what changes are taking place. This is difficult, and it may not be too reliable particularly if a series of surveys covering a considerable time span is not available. Also, it is especially critical if survey methods are not comparable.

Initial comparisons of the 1958 and 1971[3] inventory data indicated that there had been relatively few changes in estimated gross merchantable volume over the period. Also, there did not appear to be any significant changes in the proportion of volume by cover type (softwood vs. hardwood), species, or size classes. These data, however, were not consistent with the estimated allowable cut/actual cut relationship. If actual cut had been only about half the estimated allowable, there

3. The 1958 inventory was carried out between 1954 and 1956 and published in 1958. The latest inventory was carried out between 1965 and 1971 and has been published in separate volumes beginning in 1965.

should have been an increase in volume over the survey period - assuming that mortality did not equal actual cut.

It is now estimated that the softwood volume in the earlier survey was overestimated by 10% and the hardwood volume by 20%. This would indicate that the volume of timber in the province has in fact increased. Estimates for six of the seven subdivisions (excluding Yarmouth) show that gross volume has increased by between 9.5 and 19.1% for five subdivisions, and decreased by 6.4% for the Antigonish subdivision. These percentage increases were only slightly higher for hardwoods than softwoods.

Analysis of the changes in species composition since the last inventory shows that, in general, gross volumes of the spruces, particularly red and black, have increased but those of balsam fir, white pine, and hemlock have decreased slightly. Changes in the proportions of hardwoods include a substantial increase in the volume of red maple, a slight increase in the volume of white birch, and a slight decrease in the volumes of sugar maple and yellow birch.

There appear to have been only minor changes in the proportion of material in the different size classes (e.g. 4-9 in. DBH material compared to 10+ in.). There is some indication that there has been a slight increase in the percent of gross volume in the 4-9 in. hardwood group.

Assuming that the inventory data are reasonably accurate, it appears that an average annual cut of about 10 ft^3/acre over the past 10 years has resulted in a slight increase in gross volume. This information reinforces the opinion that theoretically, at least, the actual cut could be increased without reducing the growing stock.

From a regional point of view, the Western region appears to be in the best position for possible expansion. The estimated actual cut for this region in 1970 was only about 40% of the estimated allowable. The estimated average cut per acre in the Western region was only about 7.5 ft^3 for softwood and 1.0 ft^3 for hardwood. The actual cut for the Eastern region was 15 ft^3/acre, or twice that for the Western region, and was about 76% of the estimated allowable.

V. PRIMARY MANUFACTURING

Some indication was given of the uses of timber in Part III. It was shown that, in 1970 for example, about 41.4 million ft^3 or 37% of total roundwood production was in the form of sawlogs, and the remaining 71.5 million ft^3 or 63% was in the form of pulpwood. Although some of the sawlog material was used for railway ties and mine packs, most was used in lumber production. Also, while pulpwood was the major use of the pulpwood-size material, other uses included poles and piling, veneer, and pit props. Because of this, major emphasis was placed on sawmills and pulp and paper mills whose locations are shown in Fig. 10.

A. SAWMILLS

1. Development and Current Structure

It is well known that sawmilling was one of the first industries to develop in Nova Scotia.[4] Records show that there were sawmills on the La Have river and at Lunenburg Bay in the 1630's. It is reported that by 1767, there were 27 mills on the peninsula of Nova Scotia. These mills, in addition to supplying local needs, exported deals and other products to England, the West Indies, South America, and Newfoundland.

By 1785, there were about 90 mills in the province. This increase presumably was due in part to the influx of Loyalists during and after the American revolution. There is little information on the volume of lumber production at that time; however, it is reported that exports to Great Britain rose from 565 loads in 1800 to 25,203 loads in 1812 (N.S. Dep Lands & Forests 1967). (A load at that time is thought to have been about 600 f.b.m., consequently, the volume shipped in 1812 was about 15 million f.b.m.)

In addition to trade, however, shipbuilding was an important outlet for lumber. It is stated that about 600 ships were built between 1815 and 1824. An additional 1000 vessels were estimated to have been built between 1831 and 1838.

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4. Much of the information in this section was taken from "Lumbering in Nova Scotia: 1632-1953" (N.S. Dep. Lands and Forests 1967).

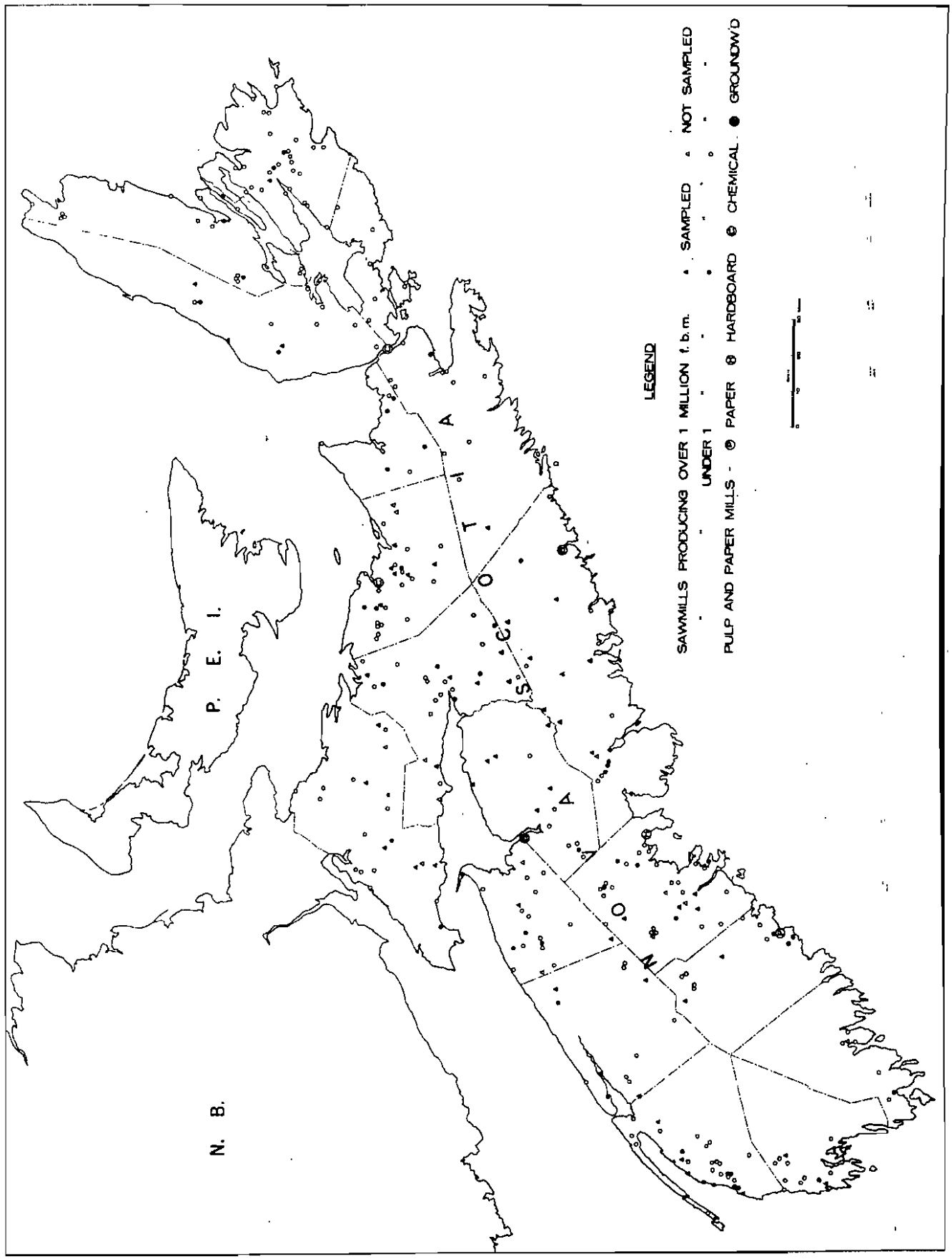

Fig. 10. Distribution of sawmills and pulp and paper mills in Nova Scotia, 1969, and sample size.

The first steam-powered mill in Nova Scotia is believed to have been built in 1845 by the Davidson Lumber Company. By 1851, there were an estimated 1153 sawmills in the province employing about 1786 men. In 1861, there were 1401 mills employing 2979 men.

The volume of lumber production during this time is not known, but in 1948, it was about 422 million f.b.m. Production rose to about 613 million f.b.m. in 1951 and dropped to 483 million f.b.m. in 1953.

In 1955, there were about 800 sawmills in Nova Scotia and lumber production was slightly over 350 million f.b.m. (Fig. 11). By 1961, the number of mills had decreased to 509 and lumber production was about 239 million f.b.m. From 1961 to 1970, there was a further reduction of the number of mills to 301, and volume produced dropped to 201 million f.b.m. Employment in this period, however, rose from 1,525 in 1961 to 1,636.

Although there has been a considerable reduction in the number of mills since 1955, the proportion in the various size classes has not changed significantly. The proportion of mills producing more than 1 million f.b.m. (18.3% to 16.3% of the number of mills) has decreased slightly as has the proportion producing between 0.1 and 1.0 million f.b.m. (40.9% in 1955 to 31.2% in 1970). However, the proportion of mills in the smallest size class, those producing less than 0.1 million f.b.m., has increased by 11%.

Several other trends can be identified. Since 1961, the average production of the mills in the largest size class (greater than 6 million f.b.m.) has increased from about 8 million f.b.m. to 14 million f.b.m. (Table 5). In 1961, mills in this size class produced only about 6.6% of total production; by 1970, they accounted for 28% of total production.

For the sawmill industry as a whole average production per mill has increased from 469 M.f.b.m. in 1961 to 669 M.f.b.m. in 1970.

2. *Capital Investment*

Capital invested (based on market value) in the sawmilling industry in 1969 was estimated to be about $10 million. About 51% or $5 million was attributable to mill machinery and equipment, 24% to motor vehicles, and the remainder to buildings and land. Average investment in mills ranged from about $5,000 to $358,000 (Table 6).

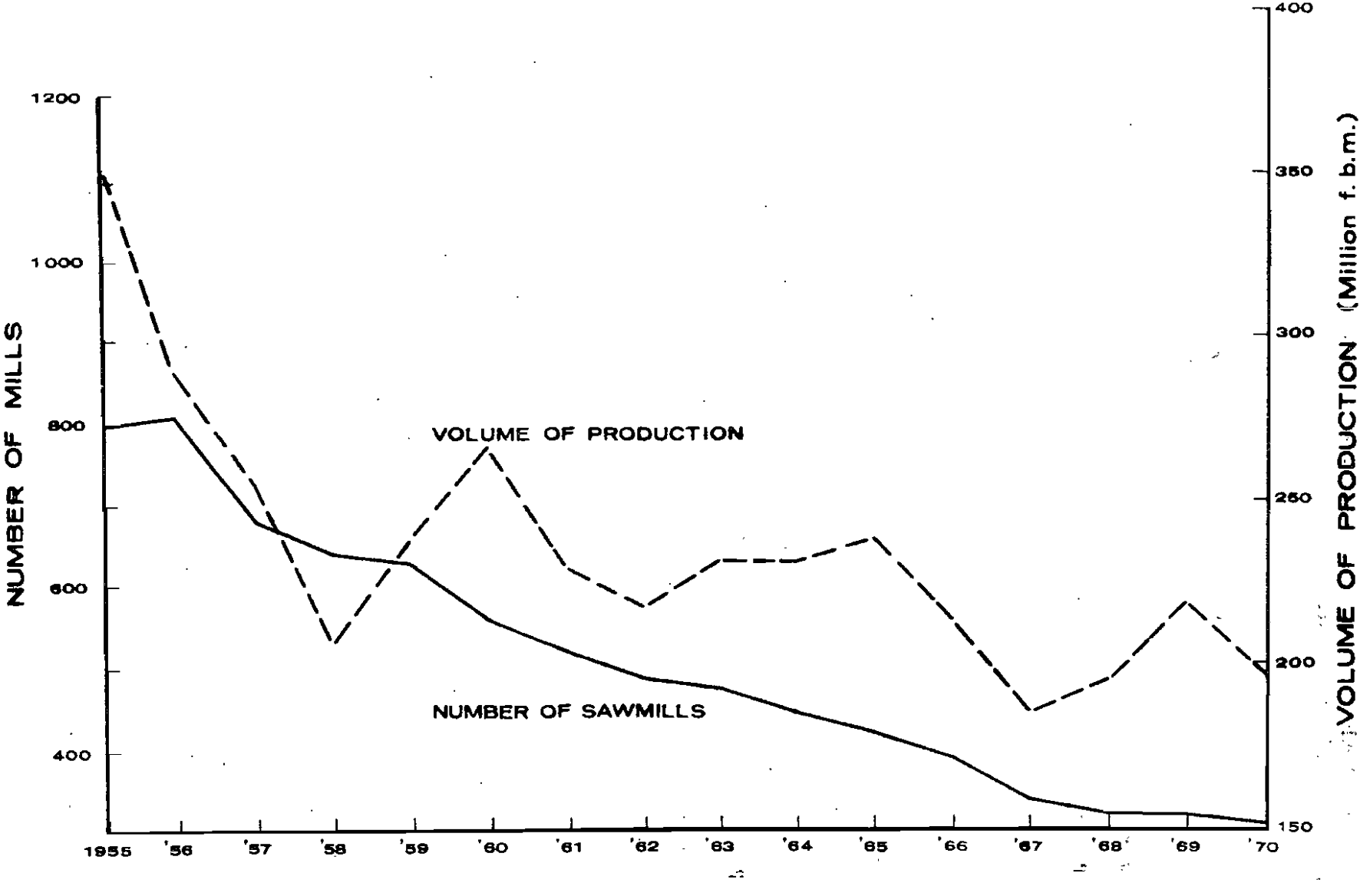

Fig. 11. Number of sawmills and volume of production in Nova Scotia, 1955-1970.

Table 5. Number of sawmills and lumber production[a] by size class for selected years

Mill size class (M.f.b.m.)	1961		1965		1970	
	No. of mills	Production (M.f.b.m.)	No. of mills	Production (M.f.b.m.)	No. of mills	Production (M.f.b.m.)
≥ 6001	2	15,814	4	43,042	4	56,380
3001-6000	9	31,353	11	42,747	12	46,555
2001-3000	17	40,578	15	37,133	7	18,826
1501-2000	18	30,493	11	18,604	12	20,501
1001-1500	27	33,140	28	35,383	14	17,119
501-1000	51	38,500	42	33,244	27	20,372
401-500	20	9,108	15	6,754	4	1,802
301-400	28	9,941	23	8,182	6	2,240
201-300	46	11,879	21	5,398	24	6,158
101-200	57	8,191	60	9,253	33	5,142
≤ 100	234	9,850	179	5,815	158	6,292
Total	509	238,847	409	245,555	301	201,387

a. Includes boxwood.

Source: N.S. Dep. Lands and Forests. Producers and production of forest products, various issues.

3. *Timber Acquisition*

It was pointed out earlier that the estimated roundwood produced in Nova Scotia in 1970 was about 112.9 million ft^3 and about 41.4 million ft^3 or 36.7% of this was in sawlog material. An analysis of the source of logs for sawmills in 1969 showed that the mills producing less than 6,000 M.f.b.m. relied on their own land for between 27 and 67% of their logs, from about 25 to 59% from small freehold, from 1 to 30% from pulp company freehold, up to 13% from Crown stumpage, and up to 6% from other large freehold.

Table 6. Estimated capital investment by sawmill size class in Nova Scotia, 1969

Mill size class (M.f.b.m.)	Number of mills	Sample size	Average production per mill (M.f.b.m.)	Capital investment ($'000)					
				Buildings	Machinery & equipment	Land[a]	Motor vehicles	Total for class	Average per mill
≥6001	4	4	13,685	250.8	880.1	66.8	234.0	1,431.7	357.9
3001-6000	14	14	4,142	458.0	1,241.0	90.1	685.0	2,474.1	176.7
2001-3000	12	11	2,653	181.3	788.2	58.2	350.6	1,388.3	115.7
1001-2000	34	15	1,401	289.3	864.6	77.2	515.4	1,746.5	51.4
501-1000	25	10	759	96.3	343.8	23.3	140.0	603.4	24.1
301- 500	19	7	451	80.8	171.0	41.5	71.3	364.6	19.2
101- 300	55	19	222	254.4	414.8	206.3	227.3	1,102.8	20.1
≤ 100	153	18	54	196.3	367.2	55.6	160.1	779.2	5.1
Total	316	98	760	1,807.2	5,070.7	629.0	2,383.7	9,890.6	31.3

a. Includes mills' sites only, not forest land owned by the mills.

Source: Runyon et al. 1972.

Analysis of the forest land owned by sawmills indicated that for a sample of 87 mills producing up to 6,000 M.f.b.m., the average forest land owned was slightly over 2,000 acres. Mills producing 3,001-6,000 M.f.b.m. (11 mills) owned an average of 5,355 acres of forest land. For this sample, about 40% of the forest land area had harvestable sawlogs. Mills in the size class 3,001-6,000 M.f.b.m. had on the average about 2,436 acres of forest land with harvestable sawlogs.

Many mills relied on their own logging crews for harvesting wood products in 1969 producing 21 to 82% of the total requirement; 17 to 56% was purchased; and only the larger mills relied to any extent on contract loggers.

The average hauling distance for logs used by sawmills was reported to be about 15 miles (one way); the range was between 1 and 60 miles.

4. Material and Service Requirements

Wood and labor accounted for about 80% of the value of inputs used by sawmills in 1969. Other requirements were fuel and electricity; materials and supplies, such as anti-stain dip and saw bits; services, including insurance, transportation, and equipment rental; etc.

5. Manufacture and Sale of Products

The major product by value of the sawmilling industry in 1969 was lumber which accounted for 87.3% of the total. Chips made up about 9.4% and the remaining 3.4% of value was accounted for by products such as slabwood, boxwood, and mine timbers.

Most of lumber sold in 1969 was softwood (97%). Of this amount, only 46% was planed and only a very small amount was kiln-dried. About 69% of all softwood lumber sold in 1969 was distributed in Nova Scotia and of the remaining 31%, about 14% went to the United Kingdom, 11% to other parts of Canada, and 3.2% to the United States.

About half the lumber distributed in Nova Scotia (77 million f.b.m.) went directly to the construction industry, about 26% went to retailers and brokers, 17% to planing mills, and 7.6% to other processors such as furniture manufacturers and treating plants.

B. PULP AND PAPER MILLS

1. History and Development

Although there was a wood pulp mill in Nova Scotia in 1875, major development of the industry did not get underway until 1925. The Scott pulp mill which was recently closed at Sheet Harbour was built in 1924 by the American Perforated Wrapping Paper Company of New York. The name of the company changed to Halifax Power and Pulp Co. Ltd. in 1933. It was acquired by Fraser Companies Ltd. in 1963 and by Scott Paper Co. in 1964.

The present Minas Basin Pulp and Power Co. mill at Hantsport is reported to have been built in 1928 by the Avon Power and Pulp Company at White Rock in Kings County. The mill was moved from there to its present location.

In 1928/29, the Mersey Paper Co. Ltd. purchased the holdings near Milton and built a newsprint mill at Liverpool. This mill was acquired by the Bowaters Corporation of North America and subsequently became the Bowaters-Mersey Paper Co. Ltd.

The Nova Scotia Forest Industries sulphite pulp mill at Point Tupper started production in 1961. Expansion of the pulp mill and the addition of newsprint production facilities have just been completed.

The Scott Paper Co. sulphate pulp mill at Abercrombie was built in 1967. In the same year, a hardboard plant was built by Anil Canada Ltd. at East River.

2. Capital Investment

Capital investment in the five pulp and paper mills plus the hardboard mill in Nova Scotia in 1969 is estimated to have been about $180 million. The Atlantic Development Board (1968) lists the mills by type of product, capacity, capital value, and so forth for 1965 (Table 7).

These data are verified by a report of the Nova Scotia Voluntary Planning Board (1966) which states, "The existing capacity has been estimated to represent a total investment (original capital plus repair and maintenance) of 120 million dollars. The capital investment in the

Table 7. Output capacity and investment of pulp and paper mills in Nova Scotia, 1965

Location	Type of mill	Capacity		Capital value ($ million)
		Per day (tons)	Per year ('000 tons)	
Liverpool	Newsprint	500	180.0	50.0
	Groundwood	-	-	-
	Sulphite	-	-	-
Hantsport	Groundwood	100	33.0	1.3
	Paperboard	40	12.0	1.7
Port Hawkesbury	Bl. sulphite	350	130.0	50.0
Sheet Harbour	Groundwood	100	26.5	1.3
Abercrombie	Sulphate	500	150.0	50.0
Total		1590	531.5	154.3

Source: Runyon et al. 1972

new mill [at Abercrombie] has been estimated at in excess of 50 million dollars, and that plus the value of the current expansion programme to the existing chemical capacity in the province, brings the total to about 175 million dollars".

Initial capital investment in the plant of Anil in 1967 was reported to be about $8.5 million. The expansion of the plant in 1970-71 was estimated to increase investment by $8 million.

Depending on the definition of investment, the value may vary considerably but for purposes of this report is assumed to be about $150-200 million. This does not include present expansion of Nova Scotia Forest Industries Ltd. at Port Hawkesbury which is expected to amount to about $60 million, nor does it include recent (March 1971) modernization of the paperboard mill by Minas Basin Pulp and Paper Co. Ltd.

3. *Timber Acquisition*

In 1969, the pulp and paper industry in Nova Scotia used about 1,043 thousand cords of wood; about 140 thousand cords of this was in the form of chips. Also, a small amount of wood was used in the form of wood pulp which was imported.

Of the total wood used by pulp and paper mills, about 88% was softwood. These mills used about 895 thousand cords of roundwood (as opposed to chips or pulp) and of this, they bought about 71.5% and produced the remaining 28.5% themselves.

4. *Material and Service Requirements*

Wood and labor made up about 48% by value of the inputs into pulp and paper mills in Nova Scotia in 1969. Chemicals accounted for the next largest single item amounting to 9% by value of the total. Major chemicals used were chlorine, sodium hydroxide, caustic soda, sulphur, and sodium chlorate. These five chemicals accounted for about two-thirds of the total chemical requirements in 1969.

Fuel and electricity -- mainly electricity and fuel oil -- made up about 5% of inputs to the industry. Other inputs included operating and maintenance supplies such as fourdrinir wires, fets, and spool heads. Values of inputs by type are presented in the next section (see Table 16).

5. *Manufacture and Sale of Products*

In 1969, the pulp and paper industry in Nova Scotia produced about $78.5 million of output. This included newsprint, paperboard, hardboard, and groundwood, sulphite, and sulphate pulp. As reported earlier, newsprint production facilities have been installed at Port Hawkesbury and hardboard production has been increased at the Anil plant at East River.

VI. ECONOMIC IMPACT OF THE FOREST INDUSTRY

In the foregoing sections, we have tried to identify and describe the status of the forest resource, where the resource is being distributed, how it is being utilized, and what happens to the converted products. In this section, we try to identify and describe the economic impact resulting from the transformation and use of the resource. Because the forest industry, as defined here, includes the growing, harvesting, and processing of trees, impact is analysed for each of these three stages.

To be consistent and to enable comparison with other sectors (e.g. agriculture), data from Statistics Canada were used. These data are not directly comparable with the data presented in the background report (Runyon et al. 1972). Since some data from the background report are used here, there are some discrepancies.

In 1969, the forest industry in Nova Scotia (including logging and tree growing) employed about 7,561 persons and paid $34.3 million in salaries and wages. The estimated value added by the industry was about $80 million and the value of shipments was $154 million (Table 8).

A. IMPACT OF TREE GROWING

The major economic impact resulting from tree growing is the income to landowners from the sale of standing trees. Although the amount of labor directly involved in tree growing appears to be small, a number of persons are employed by government in fire protection, nurseries, and general administration. These are referred to by Statistics Canada as forestry services. In addition, tree growing requires land, the primary cost of which has been taxes and interest.[5]

If we assume an average stumpage value for all sawlogs of $20/M. f.b.m. and for pulpwood of $3/cord, the value of tree growing in Nova Scotia can be estimated. The estimates for 1969[6] are shown as follows:

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5. These are costs to individuals or companies; the cost to government or to the people of the province is the output of other goods and services which are foregone.

6. 1969 data were used to permit comparison with data for other sectors for the same year.

Table 8. Summary of inputs and output of the forest industry in Nova Scotia by sector, 1969

Forest sector	Employment[a] Number	Salaries & wages	Fuel & electricity	Materials & supplies	Value added	Value of shipments
				($'000)		
Tree growing	900[b]	-	-	-	7,203	7,203
Harvesting	1,516	6,249	898	15,810	11,277	28,541
Manufacturing						
wood ind.	2,408	8,703	953	12,811	16,057	28,672
sawmills	1,817	6,509	782	9,199	11,910	20,900
other[c]	591	2,194	151	3,612	4,147	7,772
paper & allied	2,737	19,350	4,529	40,034	45,430	89,697
pulp & paper	2,080	15,964	4,130	34,762	39,797	78,561
other[d]	657	3,386	399	5,272	5,633	11,136
Sub-total manufacturing	5,145	28,053	5,482	52,845	61,487	118,369
Total, forest industry	7,561	34,302	6,380	68,655	79,967	154,113

a. Employment and salaries and wages are for total activity.

b. Includes government employees involved in fire protection, reforestation, and administration. Estimated by subtracting the estimated employment in harvesting from the total estimated employment in forestry by Statistics Canada.

c. Primarily miscellaneous wood industries such as wood preservation, wood turning and so on.

d. Includes asphalt roofing manufacturers, folding carton and set-up box manufacturers, etc.

Source: Statistics Canada 1972a.

Sawlog stumpage value = volume x average price

volume = 46.3 million ft^3 roundwood

= 231.5 million f.b.m.[7]

price = $4,630,000

Pulpwood stumpage value = volume x average price

volume = 73.0 million ft^3 roundwood

= 857.6 thousand cords

price = $2,572,800

Total stumpage value = $7,202,800

In 1969, about 106 million f.b.m. of sawlog material (45.8% of total production) was estimated to have been produced on small freehold properties; 111.5 million f.b.m. (48.2%) on large freehold, and; 14 million f.b.m. (6.0%) on Crown land. Using the average stumpage value for sawlog material of $20/M.f.b.m., the estimated value of sawlog stumpage accruing to small woodlot owners was $2.1 million; to large freehold owners, $2.2 million; and to the Crown, about $0.3 million (Table 9).

Value of pulpwood stumpage to the various owners for 1969 was about $1.5 million to small freehold, $0.7 million to large freehold and $0.4 million to the Crown.

Table 9. Estimated volume and value of stumpage by landowner class in Nova Scotia, 1969

	Sawlog		Pulpwood		Total
Owner	Volume (MM.f.b.m.)	Value ($'000)	Volume (M cords)	Value ($'000)	value ($'000)
Small freehold	106.0	2,120	483.5	1,451	3,571
Large freehold	111.5	2,230	235.3	706	2,936
Crown	14.0	280	138.8	416	696
Total	231.5	4,630	857.6	2,573	7,203

B. IMPACT OF HARVESTING

Tree harvesting or logging is defined here as the activity involved in moving trees from stump to mill or loading for export and includes felling, bucking, skidding, loading, hauling, and unloading.

7. Roundwood was converted as 200 ft^3 roundwood = 1 M.f.b.m.

The impact of these activities involves three identifiable groups: woodlot owners, independent logging contractors, and loggers associated with wood processors.

As stated earlier, small private holdings comprise over half of all forest land in the province and in 1969, contributed over half of all timber harvested. While some information is available in terms of the impact resulting from timber utilization on other types of ownerships, relatively little is known about the impact with respect to small freehold utilization, including sales, harvesting and transport.

The small woodlot owner survey (Nacker et al. 1972b) showed that dependency for income from timber sales varied widely. According to this survey, half of these owners in all regions except Cape Breton obtained 15% or more of their gross annual income from harvesting forest products on their woodlands. The median amount was between $650 and $750. Woodlot owners in Cape Breton reported a median of 5% or about $175. Both sales value and proportion of income increased with the size of ownership. Relative to other occupations, wage earners and farmers -- the two most important sources of timber products -- were not very dependent on these products as a source of income.

Many woodland owners are professional loggers and some have small sawmills. For those who depend on logging as their main source of income, the ownership of specialized equipment and full-time employees was a noticeable characteristic. Size of firm was not uniform and the normal rural pattern appeared to be one relatively large firm to four or five small firms. Most were full-time operations but about 25% were seasonal to another occupation. About three-quarters of the firms owned forest land. Average size was about 600 to 700 acres and in most cases it was being cut for forest products. Some loggers purchased stumpage or contracted for local landowners, but this was not common. In most cases, the loggers were heavily dependent on forest products manufacturing firms for contracts. These contracts were directed at large private holdings 43% of the time, small private 37% of the time, and crown lands 20% of the time. In addition to contracts, cutting on their own lands was a relatively important source of income.

These local firms are an integral part of the rural economy. This is supported by the fact that they obtained some 83% of their income

from logging and logged on the average only 13 miles from their base of operations. They employed about 10 people on the average and paid wages of about $2.00/hour.

Size of firm relates to some degree of economic advantage. Relatively large firms were responsible for 75% of the value of the sampled harvest but only 55% of the volume; probably because larger firms sold a higher proportion of sawlogs (as opposed to pulpwood) than the smaller firms.

In 1969, there were an estimated 194 logging establishments in the province (Statistics Canada 1972b). These establishments employed 1,516 persons, paid $6.2 million in salaries and wages ($5.6 million for production and related workers), and had an estimated value of shipments of $28 million. These operations would not include some of the logging activities affiliated with sawmills and other manufacturing firms (Tables 10 and 11).

Table 10. Summary of inputs used in logging for Nova Scotia, 1969

Type of input	Value ($'000)	% of total input
Fuel & electricity	898	3.2
Materials & supplies	15,810	56.5
a. wood	6,311	22.6
b. operating, supplies	1,780	6.4
c. amount paid others	7,719	27.6
Value added[a]	11,277	40.3
a. wages & salaries[a]	5,569	19.9
b. other[b]	5,708	20.4
Total value of inputs	27,985	100.0
Total value of shipments of goods of own manufacture[c]	28,541	-

a. Value added and salaries and wages are only for logging activity. This would not include salaries and wages paid to administrative sales employees.

b. Includes taxes, interest, depreciation, profit, and so on.

c. The difference between value of shipments and value of inputs is due to changes in inventory.

Source: Statistics Canada 1972b.

Table 11. Employment and wages in the logging industry in Nova Scotia, 1969

Category	Average number employed		Man-hours paid ('000)	Salaries and wages ($'000)	Average wage ($/hour)
	Male	Female			
Administrative & Office	88	16	NA[a]	654	NA
Sales & Distribution	-	-	-	-	-
Sub-total	88	16	NA	654	NA
Production & Related					
Logging	1,403	3	3,375	5,569	1.65
Other	6	-	NA	27	NA
Sub-total	1,409	3	NA	5,596	NA
Total	1,497	19	NA	6,250	NA

a. NA - not available.

Source: Statistics Canada 1972b.

Analysis of a number of sawmills which did some of their own logging in 1969 showed that felling, bucking, and skidding costs amounted to about $21/M.f.b.m., and loading, hauling, and unloading was about $12/M.f.b.m. Average hauling distance one-way was 15 miles.

Pulpwood logging costs (felling, bucking, and piling) as reported by a sample of logging contractors averaged $9.39/cord. The average hauling cost was reported to be $6.44/cord and the haul distance one-way was estimated to be 58 miles.

C. IMPACT OF MANUFACTURING

Sawmills and pulp and paper mills are the major users of roundwood in the province. Earlier it was indicated that while some material goes into mine packs, railway ties, poles, and piling, most wood is used for lumber or pulp production.

An attempt was made in this study to identify the quantity, value, geographic origin of inputs, and destination of products. As was stated earlier, Statistics Canada data were used to ensure consistency and to enable comparability with data for other sectors such as agriculture. Information from the background study has, however, been used to provide further detail to the data presented by Statistics Canada.

1. *Sawmills*

a. *Inputs*

The inputs used by sawmills in the province are summarized in Table 12. In 1969, wood and labor accounted for about 75% of the total value of inputs used by sawmills. Operating, maintenance, and repair supplies which included saw bits, metal strapping, and anti-stain dip, accounted for only about 5% of the total. With the exception of a small proportion of operating and maintenance materials, most inputs originated locally.

Table 12. Summary of inputs used by sawmills in Nova Scotia, 1969

	Industry survey		Statistics Canada	
Type of input	Value ($'000)	% of total	Value ($'000)	% of total
Fuel & Electricity	1,098	4.3	782	3.5
Materials & Supplies	14,139	54.8	9,199	41.5
Wood	13,093	50.8	3,424[a]	15.4
Operating supplies	1,046	4.0	NA[b]	NA
Other	0	.0	NA	NA
Value Added	10,560	40.9	12,206[c]	55.0
Wages & salaries	8,131	31.5	6,509[c]	29.3
Other	2,429	9.4	5,697	25.7
Total value of inputs	25,797	100.0	22,187	100.0
Total value of shipments[d]	24,197	-	20,900	-

a. Several sawmills produce some of their own sawlogs and do not keep a separate account. Therefore, wood purchased or transferred from affiliated logging operations as reported by Statistics Canada is not a good indicator of the volume or value of wood used.

b. NA - not available.

c. Refers to total activity.

d. Of goods of own manufacture.

Source: Runyon et al. 1972; Statistics Canada 1972d.

Table 13. Employment and salaries and wages in sawmills in Nova Scotia, 1969

Category	Average number employed		Man-hours paid ('000)	Salaries and wages ($'000)	Average wage ($/hour)
	Male	Female			
Administrative & Office	112	20	NA[a]	971	NA
Sales & Distribution	9	0	NA	70	NA
Sub-total	121	20	NA	1,041	NA
Production & Related					
Manufacturing	1,649	4	3,698	5,385	1.46
Other	23	0	NA	84	NA
Sub-total	1,672	4	NA	5,469	NA
Total	1,793	24	NA	6,510	NA

a. NA - not available

Source: Statistics Canada 1972d.

Employment and salaries and wages in sawmills in 1969 as provided by Statistics Canada (1972d) are summarized in Table 13. These data differ from those estimated by a sample survey. For example, the survey estimated that the industry employed about 2,261 persons (man-years) and paid $8.1 million in salaries and wages; Statistics Canada (1972d) reported 1,817 persons (man-years) employed and $6.5 million paid in salaries and wages. It must be remembered, however, that Statistics Canada data are obtained only from those establishments capable of reporting specific information such as this.

The survey of sawmill firms showed further that employment was quite seasonal and, in 1969, the number of persons employed varied from a low of 1577 in December to a high of 2892 in June.

Average hourly earnings in the sawmill industry were quite low, the highest was $2.11 paid to sawyers. As indicated in the Statistic Canada data (Table 13), the average wage for all employees for 1969 was probably not more than $1.50/hour.

A survey of 168 sawmill employees revealed that these people were characterized by a relatively high average age (48 years); that the number of years spent in mill work was quite high (average of 12 years);

and that the number of alternatives for these people outside this type of work were probably quite limited.

The survey showed that the people in the sample (about 7.5% of the estimated total) derived about 80% of their income from mill work. Also, mills producing less than about 2 million f.b.m. could not provide year round employment. It should be pointed out, however, that although many of the smaller mills do not employ persons year round in the mill, they do employ many of them in logging operations.

Table 14. Summary of output[a] of the sawmills in Nova Scotia, 1969

	Industry survey			Statistics Canada		
Type of product	Quantity	Value ($'000)	% of total	Quantity	Value ($'000)	% of total
Lumber (M.f.b.m.)	240,263	21,115	87.3	179,842	16,654[b]	79.7
Softwood	233,083	20,443	84.5	176,242	16,315	78.1
Hardwood	7,180	672	2.8	3,600	337	1.6
Chips (units)[c]	131,487	2,278	9.4	108,154	1,502	7.2
Slabwood	NA[d]	154	.6	-[e]	-	-
Other[f]	NA	650	2.7	NA	2,744	13.1
Total	-	24,197	100.0	-	20,900	100.0

a. Output is defined as sales for the industry survey and as shipments for Statistics Canada.

b. There is a discrepancy in the Statistics Canada data, the total does not equal the sum of softwood and hardwood.

c. One unit = 205 ft^3 by volume or 85 ft^3 of solid wood = 2 green tons. Statistics Canada uses the following conversion factors (oven dry): 1 unit = 1,650 lbs. for softwood and 2,250 lbs. for hardwood; 1 cord = 1,900 lbs. for softwood and 2,700 lbs. for hardwood.

d. NA - not available.

e. Included in "Other".

f. Includes boxwood, laths, mine timbers, ties, etc.

Source: Runyon et al. 1972; Statistics Canada 1972d.

b. Output

The value of output of the sawmill industry in Nova Scotia in 1969 was between $20 and $25 million. The industry survey (Runyon et al. 1972) showed that lumber accounted for about 87% of the total value, wood chips 9.4%, and other products such as slabwood and box shooks, 3.5% (Table 14).

Softwood lumber distribution is shown in Table 15. These estimates are only for the first destination. It is probable that some of the lumber sold to retailers and brokers is re-sold, therefore exports are probably slightly higher than indicated.

Table 15. Distribution of softwood lumber produced in Nova Scotia, 1969[a]

Destination	Volume (M.f.b.m.)	% of volume	Value ($'000)	% of volume
Nova Scotia				
Construction	76,897	34.2	7,665	35.5
Planing mills	26,321	11.7	2,270	10.5
Other processors	11,707	5.2	1,060	4.9
Retailers, brokers	40,104	17.8	3,648	16.9
Sub-total	155,029	68.9	14,643	67.8
Export				
Rest of Canada	24,730	11.0	2,594	12.0
United States	7,161	3.2	781	3.6
United Kingdom	31,401	14.0	2,964	13.7
Other	6,401	2.8	608	2.8
Sub-total	69,693	31.0	6,947	32.1
Total	224,722	100.0	21,590	100.0

a. Distribution is for first destination only.

Source: Runyon et al. 1972.

2. *Pulp and Paper Mills*

a. *Inputs*

The pulp and paper mills in Nova Scotia in 1969 used inputs valued at about $78.6 million. The major expenditure that could be identified specifically was for wood which amounted to $21.8 million or about 28% of the total inputs. Wages and salaries in pulp and paper manufacture were about $16 million or 20% of all inputs.

The majority of inputs used were obtained or purchased in the province. The expenditure for fuel, electricity, materials, and supplies was about $39.4 million; 70% of this, $27.5 million, was payment for goods estimated to be from within the province. The most important

Table 16. Summary of inputs used by pulp and paper mills in Nova Scotia, 1969

	Industry survey		Statistics Canada	
Category	Value ($'000)	% of total	Value ($'000)	% of total
Fuel & Electricity	4,091	5.2	4,130	5.3
Materials & Supplies	35,282	44.9	34,762	44.2
Wood	21,753	27.7	NA[a]	-
Paper stock	442	.6	NA	-
Chemicals	7,032	9.0	NA	-
Containers & pkg.	588	.7	NA	-
Operating supplies	4,814	6.1	NA	-
Other[b]	653	.8	NA	-
Value Added	39,188	49.9	40,012	50.9
Salaries & wages	15,965	20.3	15,965	20.3
Other[c]	23,223	29.6	24,047	30.6
Total inputs	78,561	100.0	78,904	100.0
Total value of factory shipments	78,561		78,561	

a. NA - not available.

b. Includes office supplies and amount paid others for work done.

c. Includes profit, taxes, depreciation, etc.

Source: Runyon et al. 1972; Statistics Canada 1972c.

goods by value that were imported were chemicals, containers and packaging, and operating and maintenance supplies (Table 16).

Employment in the pulp and paper industry in 1969 totalled 2,080 persons. Of this number, 1,557 persons were employed in production and related activities while the remaining 523 were involved in administration and sales (Table 17).

Table 17. Employment and wages in pulp and paper mills in Nova Scotia, 1969

Category	Average number employed		Man hours paid ('000)	Salaries and wages ($'000)	Average wage ($/hour)
	Male	Female			
Administrative & Office	426	87	NA[a]	4,633	NA
Sales & Distribution	9	1	NA	57	NA
Sub-total	435	88	NA	4,690	NA
Production & Related					
Manufacturing	1,521	3	33,538	11,063	3.13
Other	33	0	NA	212	NA
Total	1,989	91	NA	15,965	NA

a. Not available

Source: Statistics Canada 1972c.

b. Output

Output of the pulp and paper industry in 1969 was valued at $78.6 million. The main products are shown in Table 18. Only about 3.4% or $2.7 million of output was reported to have been sold within the province.

3. Impact of Sawmills Compared with Pulp and Paper Mills

Some indication was given in Table 8 of the relative impact of sawmills compared with pulp and paper mills. It was shown, for example, that employment in sawmills was about equal to that in pulp and paper mills, but wages and salaries paid was only about half. Materials and

Table 18. Capacity and output of the pulp and paper mills in Nova Scotia, 1969

Location	Product	Capacity per year	Output
		------'000 tons-------	
Liverpool	Newsprint	194.5	182.2
Hantsport	Groundwood	13.0	11.0
	Paperboard	20.0	14.0
Port Hawkesbury	Bleached sulphite	135.0	135.0
Sheet Harbour	Groundwood	34.5	34.5
Abercrombie	Bleached sulphate	187.0	187.0
East River	Hardboard	145.0[a]	145.0[a]

a. Capacity and output in million ft^2 ($\frac{1}{8}$ in. basis); equivalent to about 50,000 tons/year

Source: Runyon et al. 1972.

supplies, value added, and value of shipments of sawmills were about one-quarter of that for pulp and paper mills (Statistics Canada 1972a).

One of the main concerns of this study was forest resource allocation, therefore, an attempt was made to determine the impact per unit of wood used. It is frequently argued that timber should be allocated to that use which yields the highest stumpage value. This might be rational if one's aim is to maximize stumpage revenue. It might not be rational if one wants to maximize salaries and wages, employment, or social values.

Table 19 shows the effects or impact of a unit of wood allocated to sawmills as compared to pulp and paper mills for 1969. These effects are based on the volume and value of wood used and other inputs reported in the survey of sawmills and pulp and paper mills (see Runyon et al. 1972, pp. 73-74). The following cost estimates were used:

	Sawmills ($/M.f.b.m.)	Pulp and paper mills ($/cord)
Stumpage	21.50	3.00
Harvesting	21.00	11.00
Transportation	12.00	7.00
Value at mill	54.50	21.00

Table 19. Value of inputs and output per 1 million ft^3 of roundwood used by sawmills and pulp and paper mills in Nova Scotia, 1969

Input or activity		Sawmills	Pulp and paper mills
Inputs			
Stumpage	($'000)	122.2	35.3
+ Harvesting	"	119.3	129.4
+ Transportation	"	68.2	82.4
= Value of wood at mill	"	309.7	247.1
+ Manufacturing		300.0	641.0
employment (No.)		53	23
fuel & electricity	($'000)	26.0	46.0
materials & supplies (less wood)	"	25.0	153.0
salaries & wages	"	192.0	180.0
profit, taxes, interest	"	57.0	262.0
= Total value of inputs	($'000)	609.7	888.1
Output ($'000)			
Lumber		500.0	-
+ Chips		52.9	-
+ Other sawnwood		19.0	-
+ Pulp & paper products		.0	886.0
= Total value of output		571.9	886.0

Source: Runyon et al. 1972.

There is a discrepancy between total value of inputs and output (Table 19) because of the use of averages.

Per cubit foot of wood, stumpage value for sawlogs exceeds that of pulpwood. However, per-unit costs (and therefore wages and salaries paid, materials and supplies purchased, etc.) for harvesting and transportation of pulpwood are greater than for sawlogs. Therefore, if one uses stumpage value or value of wood at the mill as the criterion of impact, wood should be allocated to sawmills.

Analysis of inputs used in manufacturing in 1969 shows that employment per 1 million ft^3 of roundwood used was 53 for sawmills and only 23 for pulp and paper mills. Salaries and wages, however, were about the same for the two industries. Value of materials and supplies used, and profit, taxes, etc., were considerably more in pulp and paper than in sawmills. It must be remembered, however, that about one-third of the materials and supplies (excluding wood) used by pulp and paper mills were imported.

About 70% of lumber production, total chip production, and the majority of other sawmill products were distributed and used locally, that is, within the province. Only 3 to 4% of pulp and paper products were used locally.

These data indicate that if wood is a limiting factor (and it is to some extent in the sawmilling industry) and if employment is an important provincial goal, emphasis should be placed on the maintenance of an adequate supply of wood to sawmills. At the same time, it is evident that if higher wages and salaries is also an important goal, there must be considerable improvement made in the productivity of sawmilling (and thereby higher wages) or there must be increased expansion of pulp and paper production. These alternatives are discussed later.

These are not the only factors to be considered. Sawmills can be constructed at a scale or size which will permit considerably more geographical distribution, i.e. the production facilities are not as concentrated as with pulp and paper mills. This factor helps to minimize the dislocation of labor. At the same time, the sawmills provide a local market for woodlot products, and a local outlet for building materials. A lower concentration of production activity also appears to reduce the environmental impact.

It might be beneficial to encourage more concentration of production. Larger sawmills can justify debarking and chipping equipment. A larger size operation can, in many cases, justify pollution abatement facilities, whereas smaller ones cannot.

VII. ECONOMIC IMPACT OF THE FOREST INDUSTRY COMPARED TO OTHER SECTORS

The purpose of this section is to provide some perspective on the relative position of forestry and the forest industries in the provincial economy. As stated earlier, the goals of government are such that a number of different criteria or indices are generally used to describe the impact or contribution of a sector. An attempt has been made here to look first at direct effects, i.e. the number of persons employed directly in various industries or sectors, wages and salaries paid, and so on. Secondly, an attempt is made to describe indirect effects. Because industries buy goods and services from others, additional employment and income are created. The indirect effects vary by type of industry because of differences in the degree of processing and inputs required.

A. DIRECT IMPACT

1. Employment

The estimated population in Nova Scotia in 1969 was 763,000 persons, about 3.6% of the total for Canada. For the same year, the labor force was estimated to be 258,000, and the number employed was 244,000 or 94.6% of the labor force. The distribution of employment by sector is shown in Table 20. In 1969, about 7,500 persons were employed in forestry and the forest industry in Nova Scotia. This represented about 3.1% of the total employed.

It is important to distinguish between commodity-producing sectors and service-producing sectors. The former provide the basic employment upon which the service sectors depend. In terms of relative importance, therefore, it is not too meaningful to compare employment in the commodity sectors with that in the service sectors.

Employment in the forestry industry in Nova Scotia represents about 10% of total employment in the commodity-producing industries. The relationship for this group is shown in Fig. 12.

Table 20. Employment by sector in Nova Scotia for selected years

Sector	Year 1961	1965	1969	% change 1961-1969
	'000			
Commodity-producing sectors	74.2	81.2	78.5	+ 5.8
Agriculture	12.0	12.1[a]	8.8	-26.7
Fishing and trapping	12.6	13.1[a]	11.7	- 7.1
Forestry	2.9	2.4	2.4	-17.2
Mining	8.1	7.9	6.1	-24.7
Electric power	1.6	1.7	1.8	+12.5
Manufacturing	26.9	32.6	33.0	+22.7
Wood industries[b]	2.6	2.4	2.4	- 7.7
Sawmills	1.5	1.8	1.8	+20.8
Pulp & allied ind.[c]	2.1[d]	2.4[e]	2.7	+28.6
Pulp & paper mills	1.2	1.7	2.1	+75.0
Construction	10.1	11.4	14.7	+45.5
Service-producing sectors	141.8	147.8	165.5	+16.7
Transportation and Comm.	22.4	22.2	23.1	+ 3.1
Trade	25.1	28.9	33.1	+31.9
Finance, ins. & real estate	4.5	5.6	7.0	+55.6
Community business	40.0	45.0	57.1	+42.8
Public adm. & defence[f]	17.5	18.1	20.9	+19.4
Other	32.3	28.0	24.3	-24.8
Total, all sectors	216.0	229.0	244.0	+13.0
Total, forestry industry[g]	7.6	7.2	7.5	- 1.3
Forest industry as % of commodity-producing	10.2	8.9	9.6	
Forest industry as % of all sectors	3.5	3.1	3.1	

a. Figures refer to 1966.
b. Includes sawmills and planing mills; shingle mills; veneer and plywood mills; sash, door and other millwork plants; wooden box factories; coffin and casket industry; and, miscellaneous wood industries.
c. Includes pulp and paper mills; asphalt roofing manufacturers; folding carton and set-up box manufacturers; corrugated box manufacturers; paper and plastic bag manufacturers; and miscellaneous paper converters.
d. Includes Prince Edward Island.
e. Estimated.
f. Excludes non-civilian employees.
g. Includes forestry, wood industries, and paper and allied industries.

Source: N.S. Dep. Develop. 1971; Can. Dep. Reg. Econ. Exp. 1971; Statistics Canada, 25-202 (various issues).

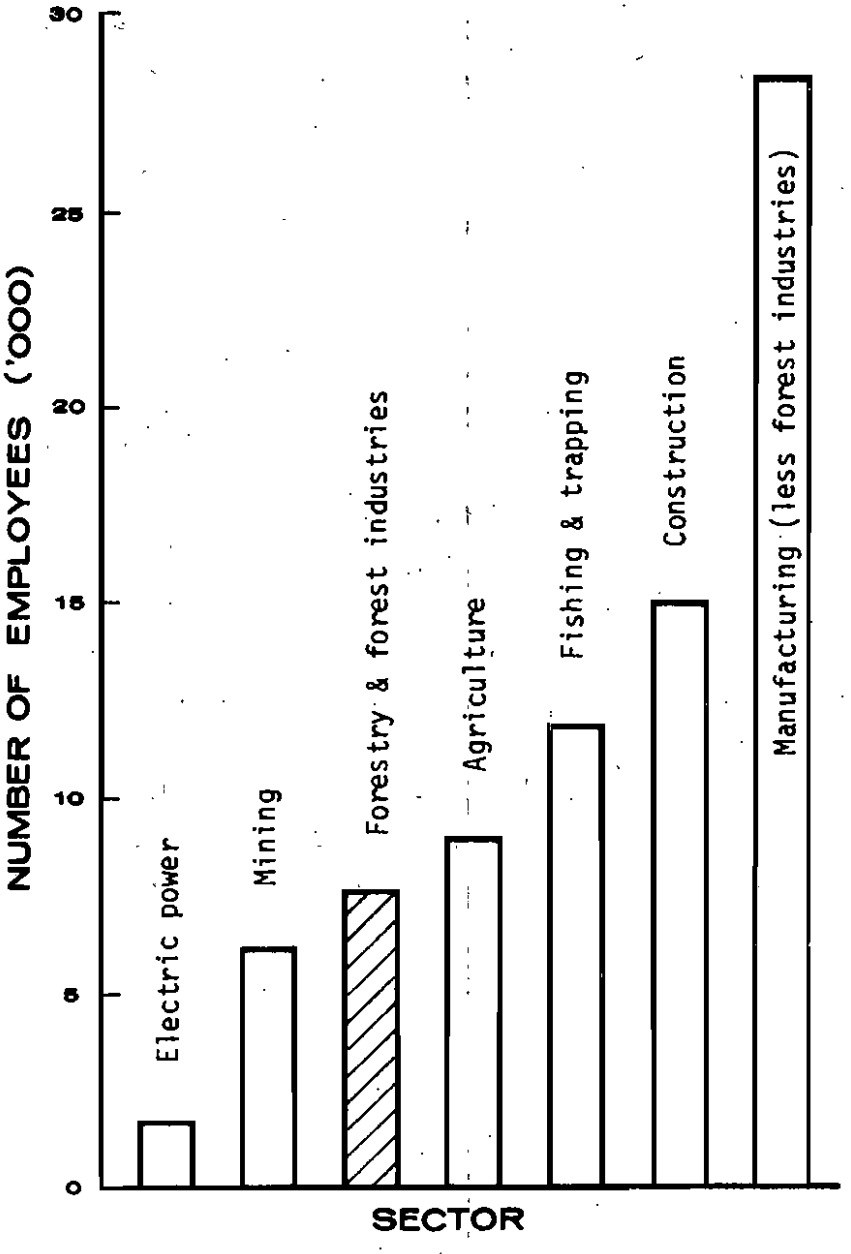

Fig. 12. Number of employees in commodity-producing industries in Nova Scotia, 1969.

2. *Salaries and Wages*

Because of the difficulty of obtaining comparative and meaningful data on income by sector,[8] only salaries and wages for manufacturing industries in Nova Scotia were analyzed. In 1969, there were about 850 manufacturing establishments in the province. These were classified into about 20 industries or groups by Statistics Canada. The 10 leading industries (or groups) ranked by the amount of salaries and wages paid are shown in Table 21.

Paper and allied industries in Nova Scotia ranked third in salaries and wages paid. This amounted to $19.4 million, or 11.7% of the total for manufacturing. Of this group, pulp and paper mills paid about $16 million, or 9.6% of the total for manufacturing.

The wood industry group (shingle mills, veneer and plywood, sash, door and planing, sawmills, etc.) ranked fourth with a salaries and wages bill of $8.7 million, or 5.3% of the total for manufacturing.

The forest industries combined (not including forestry, i.e. logging sector) paid out slightly more than $28 million in salaries and wages. This amount represented 16.9% of the total for manufacturing.

The number of employees and percentages in the various industries are also shown in Table 21. Paper and allied industries paid about 11.7% of the total wages and salaries but employed only 8.2% of the work force. The wood industry, on the other hand, paid only 5.3% of total wages and salaries but employed 7.2% of the estimated total in the manufacturing industries.

3. *Value Added*

Value added is one of the best single indicators of the contribution of an industry or sector to the provincial economy. It is roughly equivalent to net value of production. It is computed by subtracting value

8. It is difficult to obtain reliable and comparable income figures for agriculture, fishing, forestry, etc. because of the large number of small producers, and the difficulty of determining value of goods produced but used by persons themselves, such as farm produce.

Table 21. Leading manufacturing industries in Nova Scotia ranked by salaries and wages paid[a], 1969

Industry group & industry	Salaries & Wages $'000	Salaries & Wages % of total	Employees No.	Employees % of total
Food & beverage	44,081	26.6	11,074	33.3
Transportation equipment	27,179	16.4	4,501	13.5
Paper & allied	19,350	11.7	2,737	8.2
Pulp & paper mills	15,964	9.6	2,080	6.3
Wood industry	8,704	5.3	2,408	7.2
Sawmills & planing mills	6,509	3.9	1,817	5.5
Metal fabricating	7,635	4.6	1,376	4.1
Printing, publ., & allied	7,576	4.6	1,402	4.2
Electrical products	6,988	4.2	1,594	4.8
Non-metallic mineral prods.	5,029	3.0	876	2.6
Knitting	4,219	2.5	1,299	3.9
Textile	3,231	2.0	729	2.2
Other	31,648	19.1	5,233	15.7
Total, manufacturing	165,640	100.0[b]	33,229	100.0[b]
Total, forest industries[c]	28,054	16.9	5,145	15.5

a. Salaries and wages, and employees are for total activity.

b. May not add to 100.0 due to rounding.

c. Includes paper and allied and wood industries but not logging.

Source: Statistics Canada 1973a.

of fuel, electricity, materials, and supplies from the value of shipments (and adjusted for inventory changes). Value added therefore represents payments to labor (salaries and wages), depreciation on the working plant, profits, taxes, interest, and so on.

Value added for commodity-producing industries is presented in Table 22. These data indicate that the forest industry in Nova Scotia accounted for 10.6% of the salaries and wages, profits, taxes, and so on paid out by the commodity producing industries. These data further show that value added in the forest industry is larger than agriculture, fishing and trapping, mining, or electric power.

Table 22. Value added in commodity-producing industries in Nova Scotia, 1969[a]

Industry	Value added ($'000)	% of total
Agriculture	41,757	6.1
Forestry[b]	11,277	1.6
Fishing & trapping	56,895	8.3
Mining	34,145	5.0
Electric power	41,714	6.1
Manufacturing	298,534	43.5
Wood industries	16,057	2.3
Sawmills	11,910	1.7
Pulp & allied ind.	45,430	6.6
Pulp & paper mills	39,797	5.5
Construction	200,688	29.3
Total, commodity	685,502	100.0
Total, forest industry	72,764	10.6

a. Value added is for manufacturing activity.

b. Also referred to as "logging". This figure does not include stumpage, therefore, it differs from that presented in Statistics Canada, 61-202.

Source: Statistics Canada 1973b, 1972a (various issues).

4. *Value of Shipments*

Although value of shipments or output is one of the most commonly used indicators of an industry's importance, it can be misleading. Value of shipments represents the value of all the inputs used in the manufacturing process. If a high proportion of these inputs is imported, the value of shipments might be a poor indicator of contribution. Simply because the value of shipments of an industry is high, it does not follow that payments to that amount will flow to and remain in the province. Payments must be made for inputs which, if imported, go elsewhere. Keeping this point in mind, leading manufacturing industries in Nova Scotia ranked by value as shipments are presented in Table 23.

Table 23. Leading manufacturing industries in Nova Scotia ranked by value of shipments of goods of own manufacture, 1969

Industry group & industry	Value of shipments ($'000)	Value of shipments (%)	Value added[a] ('000)	Value added[a] (%)
Food & beverage	229,831	31.4	78,380	26.3
Paper & allied	89,697	12.3	45,430	15.2
Pulp & paper mills	78,561	10.7	39,797	13.3
Transportation equipment	83,125	11.4	36,754	12.3
Wood	28,673	3.9	16,058	5.4
Sawmills & planing mills	20,900	2.9	11,910	4.0
Metal fabricating	20,561	2.8	8,956	3.0
Electrical products	19,303	2.6	9,070	3.0
Non-metallic mineral products	19,082	2.6	10,485	3.0
Printing, publ. & allied	18,231	2.5	14,016	4.7
Knitting	15,037	2.1	8,086	2.7
Textile	14,489	2.0	5,666	1.9
Other	193,446	26.4	65,632	22.0
Total, manufacturing	731,475	100.0	298,533	100.0
Total, forest mfg. ind.[b]	118,370	16.2	61,488	20.6

a. Value added is for manufacturing activity.

b. Excludes the logging sector

Source: Statistics Canada 1973a.

Paper and allied industries ranked second and wood industries ranked fourth in terms of value of shipments. The two forest industry groups combined (excluding value of shipments of forestry, i.e. roundwood products) amounted to $118.4 million in 1969. This represented 16.2% of the total for manufacturing industries.

5. Exports

Most provinces and regions import goods and services which are not produced locally or which may be obtained more cheaply outside. These purchases are made possible by the exportation of locally produced goods

and services. In 1970, the value of exports from Nova Scotia was estimated to be about $206 million. This was made up primarily of fish, wood pulp, paper and paperboard, metal fabricated products, and so on in that order of importance. The major exports are shown in Table 24 and Fig. 13.

Table 24. Value of exports from Nova Scotia for major products, 1970

Products	Value ($'000)	% of total
Fish	67,760	32.9
Wood pulp	38,484	18.7
Paper & paperboard	25,721	12.5
Metal fabricated basic products	14,548	7.1
Non-metallic minerals	9,791	4.8
Industrial oils & chemicals	5,284	2.6
Wood fabricated materials[a]	4,615	2.2
Crude wood materials & fibres[b]	4,408	2.1
Other	35,317	17.1
Total	205,928	100.0
Total, forest products	73,228	35.6

a. Includes lumber, shingles, laths, ties, and millwork products.

b. Includes logs, pulpwood, chips, and other.

Source: N.S. Dep. Develop. 1971.

B. INDIRECT IMPACT

The direct impact of various industries was identified in the previous section. We know, however, that manufacturing firms hire labor and buy goods and services, thereby creating additional income and employment. "Industries such as sawmilling and pulp and paper hire labor to which they pay salaries and wages. These salaries and wages are spent by labor for groceries, rent, and so forth. Consequently, grocers are employed and landlords receive rents. In addition to labor, mills buy wood, gasoline, insurance, and so on. Loggers, fuel distributors, and insurance salesmen are employed. Payments to labor and purchases of

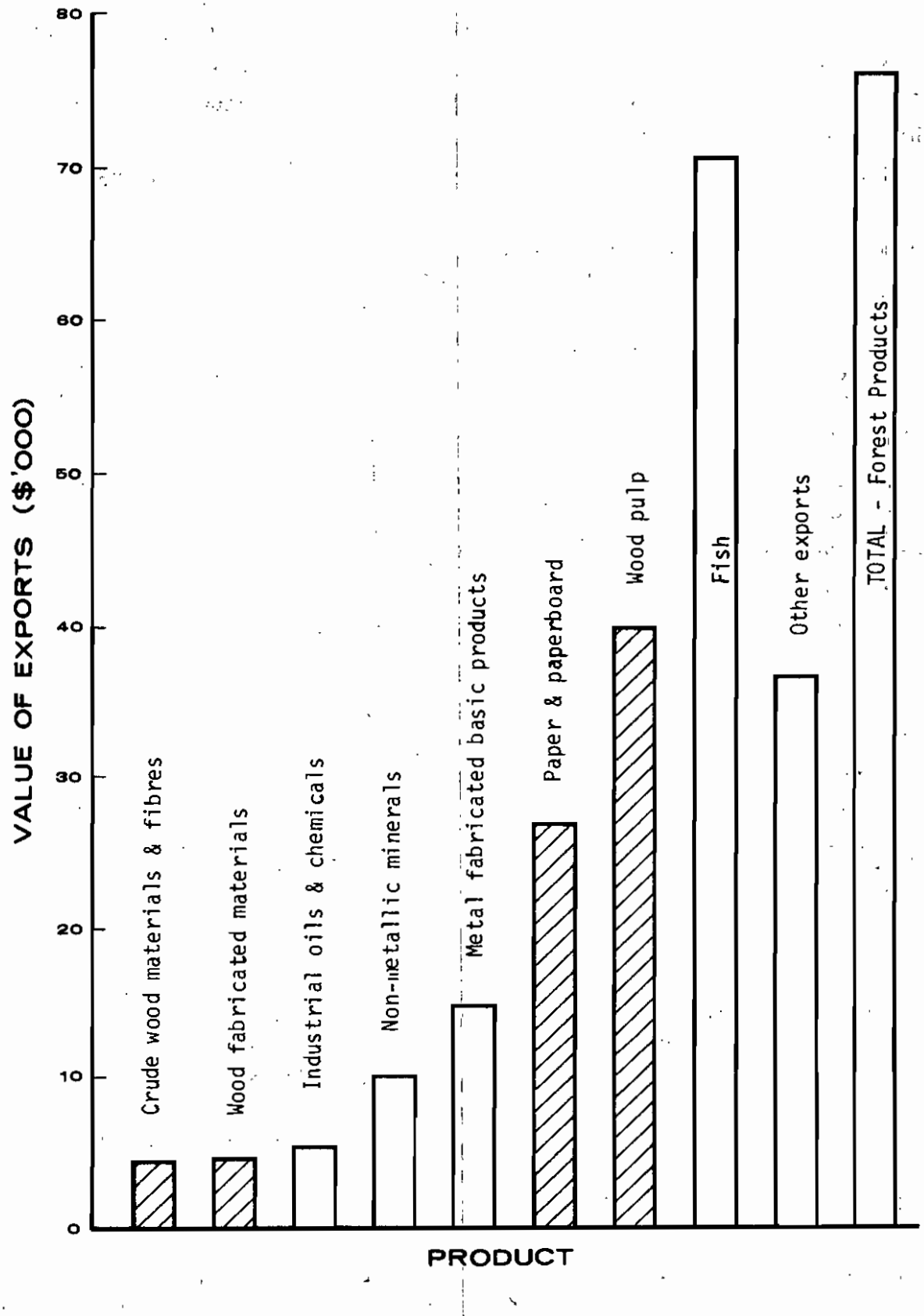

Fig. 13. Value of exports from Nova Scotia for major products, 1970.

goods and services have a multiplying effect" (Runyon et al. 1972).

It is possible to analyze all these interactions simultaneously by a technique called "input-output" analysis. The result is a summation of all the repercussions of say an additional $1,000 output of an industry. This type of analysis has been done for Nova Scotia; however, data are only available for 1960.[9] Information on employment is presented in Table 25.

Table 25. Direct and indirect employment per $1 million of output for selected industries in Nova Scotia, 1960

Industry	No. of employees			Ratio total/direct
	Direct	Indirect[a]	Total[a]	
Agriculture	46	124	170	3.7
Forestry	167	100	267	1.6
Coal mining	181	127	308	1.7
Poultry processing	46	143	189	4.1
Shellfish products	80	264	344	4.3
Feed manufacturing	22	68	90	4.1
Clothing	136	82	218	1.6
Sawmills, sash[b]	86	189	275	3.2
Misc. wood prods.[c]	337	135	472	1.4
Furniture	142	128	270	1.9
Pulp and paper	59	148	207	3.5
Paper products	68	102	170	2.5
Petroleum ref.	6	25	31	5.2
Electric power	54	140	194	3.6
Hotels & rest.	158	142	300	1.9

a. Indirect and total employment computed from the ratio and direct employment using Model III of the input-output tables.

b. Includes sawmills; sash, door, and planing mills; wooden box factories; and coffin and casket plants.

c. Includes wood preserving plants, wooden-ware firms (stepladders, tubs, etc.), and wood turning plants.

Source: Runyon et al. 1972.

9. The 1965 input-output tables were confidential at the time the background report was being completed. It is possible that this information is now available.

This table shows that there were 167 persons employed directly and 100 persons indirectly in the forestry sector for each $1 million of output in Nova Scotia for 1960 (Table 25). The ratio, total/direct (1.6), is commonly referred to as the multiplier. This figure indicates that for every 1 person employed directly, there are 0.6 persons employed indirectly.

Similar figures are presented for the indirect salaries and wages generated (Table 26). For each $1000 of output of sawmills in 1960, about $237 in salaries and wages was paid out directly (i.e. to mill workers) and about $545 was estimated to have been paid out indirectly (Table 26). This results in a salaries and wages multiplier of 3.3; that is, for every $1 paid out directly by sawmills about $2.30 was paid to persons who were indirectly dependent.

These ratios can be compared with other sectors or industries, however, their implications and the qualifications should be kept in mind.

Table 26. Direct and indirect salaries and wages per $1000 of output for selected industries in Nova Scotia, 1960[a]

Industry	$ per $1000 output			Ratio
	Direct	Indirect	Total	total/direct
Agriculture	95	371	466	4.9
Forestry	455	273	728	1.6
Coal mining	682	409	1091	1.6
Poultry processing	91	400	491	5.4
Shellfish products	220	550	770	3.5
Feed manufacturing	61	214	275	4.5
Clothing	258	258	516	2.0
Sawmills, sash	237	545	782	3.3
Misc. wood prods.	166	398	564	3.4
Furniture	333	400	733	2.2
Pulp and paper	258	439	697	2.7
Paper products	196	333	529	2.7
Petroleum ref.	40	84	124	3.1
Electric power	228	433	661	2.9
Hotels and rest.	286	429	715	2.5

a. Source and footnotes as in Table 25.

VIII. SUMMARY AND CONCLUSIONS

The purpose of this study was to identify and describe the status of the forest resource in Nova Scotia, how the resource was being used, and what the impact was on the provincial economy. Within the scope of the study, this identification and description has been reported on the previous pages. The information can serve as a basis for owners and users of the resource to direct forest policy and plan for the future.

Because of the complexity of the task and the time limitations of the study group, only a basic descriptive analysis was undertaken. If any major changes in utilization or allocation are to be considered, additional investigation of the cause and effect of more specific relationships would no doubt be required.

In looking at the existing resource, its use, and the resultant impact, we were able to identify some areas where problems exist or were developing. Where possible, we have suggested alternatives or possible courses for improvement that should be considered in plans for the future.

A. STATUS OF THE FOREST RESOURCE

Nova Scotia has about 10.8 million acres of forest land. Of this, 5.6 million acres (53%) is concentrated in small private holdings of less than 1000 acres; 2.3 million acres (21%) is held in large private ownerships of more than 1000 acres; and 2.8 million acres (26%) is Crown owned (including 3% Federal Crown land). The ownership pattern by region is fairly uniform except that the eastern half of the province has slightly more Crown land and less large freehold land.

About 53% of the forest land is softwood, 17% is hardwood, and 30% is mixed softwood and hardwood. In 1969, the estimated gross merchantable volume of timber was 9.2 billion ft^3 -- 70% softwood and 30% hardwood. Small timber (4-9 in. DBH) accounted for 63% of the softwood volume and 55% of the hardwood volume. Hardwoods are slightly more prevalent in the eastern half of the province and the timber is generally smaller.

Some differences are noticeable in the ownership of merchantable volume on a regional basis. In the Cape Breton region, average volumes per acre are higher on Crown lands and lower on freehold lands.

In the Eastern region, the reverse is true. In the Central and Western regions, large freehold properties have the highest average volume per acre.

Spruce and balsam fir account for more than 5.6 billion ft^3 (86%) of the gross merchantable volume of softwood in the province. Spruce makes up a particularly high proportion of the total softwood volume in the Western and Central region. In the Cape Breton region, balsam fir makes up 65% of the gross merchantable volume.

B. PRIMARY FOREST PRODUCTION

Primary forest production in Nova Scotia from 1962 to 1970 averaged 105 million ft^3. Production in 1970 was 113 million ft^3. About 105 million ft^3 (93%) was softwood and 8 million ft^3 was hardwood. Sawlog production accounted for 41.4 million ft^3 (37%) while pulpwood and other roundwood products made up 71.5 million ft^3.

Production by region was: Western - 40.8 million ft^3 (36%); Central - 24.4 million ft^3 (24%); Eastern - 24.4 million ft^3 (22%); and Cape Breton - 20.3 million ft^3 (18%). The Western and Central regions produced about equal volumes of sawlog material and pulpwood, production in the Eastern and Cape Breton regions was primarily roundwood for pulpwood (82 and 87%, respectively).

In 1970, production on small freehold ownerships was 64 million ft^3 (57%), large freehold 32.5 million ft^3 (29%), and Crown land about 16.5 million ft^3 (15%). Therefore, small freehold land constituted 53% of the total forest land area, supported 49% of the gross merchantable volume, and supplied 57% of the cut. Large freehold properties amounted to 21% of the forest land, had 26% of the gross merchantable volume, and supplied 29% of the cut. Crown land made up 26% of the forest land area, had 25% of the gross merchantable volume and supplied 15% of the cut.

These figures and others indicate that the intensity of harvest from Crown land appears to be low relative to that on both large and small freehold land. This is probably the result of the low quality of Crown land much of which is cut-over and recent burn. The harvest per acre averaged 6 ft^3 for Crown land, 11 ft^3 for small freehold, and 15 ft^3 on large freehold. For the province, the average cut/acre for 1970 was 10.5 ft^3.

The average cut/acre for 1970 was lowest in the Western region (7.5 ft^3) and highest in the Eastern region (14.4 ft^3). The low average cut for the Western region was due primarily to the low cut on large freehold (7.7 ft^3/acre) and Crown land (3.2 ft^3/acre).

It might be expected that lower cut per acre would result because of lower quality land or lower stocking, but estimates of average gross merchantable volume on large freehold land in the Western region shows almost 1,060 ft^3/acre as compared to 713 ft^3/acre for small freehold and 610 ft^3/acre for Crown land. There is however a large differential in the amount cut per acre and stocking on Crown land in Cape Breton. The estimated cut for 1970 was only 5.6 ft^3/acre while the average gross merchantable volume was about 1,110 ft^3/acre, the highest stocking in the province. No attempt is made here to explain why average cut varies by region and ownership or whether there should be increased cutting on some areas. Accessibility, size class distribution, species composition, and so on should be further analysed.

C. TIMBER GROWTH/CUT BALANCE

Estimates of annual allowable cut were made using three different approaches. These indicate that the province could theoretically sustain an annual cut of between 164 million ft^3 and 258 million ft^3. It was shown earlier that the average annual cut for the period 1962 to 1970 was about 105 million ft^3. On a per acre basis, the estimated annual allowable cut (theoretically) is about 15 to 24 ft^3/acre/year. The actual cut has been about 10 or 11 ft^3/acre/year.

Comparison of the 1958 inventory data with that just completed shows that there probably has been an increase of 10 to 15% in the gross volume of softwood and slightly more than that for hardwoods in the past 10 or 15 years for most areas of the province. However, there appears to have been a decline of about 6% in gross volume (both softwoods and hardwoods) in the Eastern region.

On the basis of the most conservative estimate of annual allowable cut (164 million ft^3), it appears that the Western region offers the best potential for expansion. In this region, the Area/Volume allowable cut approach indicates that a theoretical cut of about 56 million ft^3 could

be sustained. The average annual cut from 1962 to 1970 was 29.1 million ft^3 or about 50% of the allowable (the actual cut for 1970 was 27.5 million ft^3).

Comparison of the allowable annual cut to actual cut for the Eastern region indicates that this region has the least potential for expansion. The allowable cut (conservative estimate) is 22.1 million ft^3. The average annual actual cut (1962-1970) was 20.7 million ft^3 or 94% of the allowable (the actual cut for this region in 1970 was 24.4 million ft^3).

Average annual cuts for the Central and Cape Breton regions for the period 1962 to 1970 were about 35.0 million ft^3 and 20.4 million ft^3, respectively. Conservative estimates of the annual allowable cuts are 51.5 million ft^3 for the Central region and 34.8 million ft^3 for Cape Breton.

This analysis indicates that theoretically there is an opportunity to increase utilization at least in all but the Eastern region. As is well known, however, the allowable annual cut concept is based on a number of biological, economic, and social assumptions. These estimates can, however, provide broad guidelines for further, more specific, investigation and planning. The provincial Department of Lands and Forests is currently undertaking a comprehensive analysis of the latest inventory data. This information should provide much more specific data.

D. MANUFACTURING

1. Sawmills

The number of sawmills in Nova Scotia has been declining steadily since 1955. At that time, there were 794 mills in the province. From 1961 to 1970, the number declined from 509 to 301. During this latter period, lumber production decreased from 238 million f.b.m. to 201 million f.b.m.

In 1969, sawmills used about 41 million ft^3 or 37% of the round-wood produced in the province. Sawmills producing less than 6 million f.b.m./year relied on their own land for between 27 and 67% of their logs; small freehold land for 25 to 59%; pulp company freehold for 1 to 30%; Crown land stumpage for up to 13%; and other large freehold for about 6%.

Wood and labor accounted for about 80% of the inputs (by value) used by sawmills in 1969. Lumber was the major output by value (87% of total value) followed by chips (9.4%). About 70% of all lumber produced

was sold within Nova Scotia; 14% went to the U.K.; 11% to other parts of Canada; and the rest was shipped elsewhere. About 46% of the lumber was planed, and only a small proportion was dried.

2. *Pulp and Paper Mills*

Although there were pulp mills in Nova Scotia before 1900, there was no substantial production until 1925-30. During this period, mills were built at Sheet Harbour, Minas Basin, and Liverpool. In 1961, the N.S. Forest Industries sulphite pulp mill was built at Point Tupper. The Scott Paper Co. sulphate mill at Abercrombie and the Anil Canada hardboard plant at East River were built in 1967.

In 1969, the pulp and paper industry in the province used 88.7 million ft^3 (1,043 thousand cords equivalent). About 895 thousand cords were in the form of roundwood, 140 thousand cords in the form of chips, and the remainder in the form of wood pulp. Of this wood, 88% was softwood. The companies purchased slightly less than 75% and harvested the remainder themselves.

Value of shipments by the industry has increased from $21.7 million in 1961 to $75.7 million in 1970 and included groundwood, sulphite, and sulphate pulp, newsprint, paperboard, and hardboard. Employment during this period increased from 1,198 to 2,207 persons.

E. ECONOMIC IMPACT OF THE FOREST INDUSTRY

Employment in the Nova Scotia forest industry in 1969 was about 7,500 persons. About 66% (5,145) were employed in manufacturing, 20% (1,516) in harvesting operations, and 12% (900) in tree growing. Sawmills and pulp and paper mills employed 1,817 (24%) and 2,080 (28%) respectively.

Wages and salaries paid by the industry were at least $34 million; value added was $80 million; and value of shipments was $154 million. Comparison of the impact of sawmills with that of pulp and paper mills indicates that while sawmills employ about the same number of people as pulp and paper, wages paid by pulp and paper are about twice that paid by sawmills. Per unit of wood used, sawmills employ more than twice as many people as pulp and paper mills, but pulp and paper mills use more fuel and

electricity, materials, and supplies and pay out more in taxes, interest, and profit.

In addition to providing employment for about 7,500 people directly, the forest industry provides a base on which many of service sectors rely. Data for 1960, show that for every 1 person employed directly in sawmills and pulp and paper mills at least 2 people are employed indirectly in jobs such as logging, equipment manufacture, insurance, and so on. In addition, for every $1 paid out directly in salaries and wages by these two industries about $2 is paid out indirectly. Relative to other industries, such as agriculture, fishing, and manufacturing, the forest industry accounted for about 10% of the jobs.

In 1969, the wages and salaries paid out by all manufacturing industries was $165.6 million. At least $28.1 million of this or 17% was accounted for by forest products manufacturing. Forest products accounted for about the same percentage (16.2%) of total value of shipments for all manufacturing ($731.5).

Forest products exports combined amounted to $73.2 million or about 36% of all exports in 1969.

F. PROBLEMS

1. Primary Forest Production

It was estimated earlier that small private ownerships in Nova Scotia (less than 1,000 acres) comprise about 53% of the forest land area and supplied 57% of the total volume of wood in 1969. Although these figures appear to indicate that this area is being fully utilized, there is sufficient reason to believe that this is a result of concentration of cutting on the larger holdings (over 200 acres). The woodlot owner survey showed that while the ownerships of less than 200 acres made up about 26% of the forest land area, they accounted for only 15% of the value of forest products sold in 1969. Those ownerships over 200 acres, on the other hand, comprised 74% of the land area but accounted for 83% of the value of products sold. This utilization pattern is substantiated by the frequency of cut by ownership size class. About 39% of the ownerships had not been cut in the last 5 years and, in general, these were properties under 100 acres in size.

There are probably a number of reasons why utilization on these ownerships of less than 200 acres is not as high as it might be. There are indications that the value of wood (i.e. stumpage) and the wages involved in harvesting are not sufficiently attractive on a small scale as a source of income. This is no doubt influenced by the occupation of owners, alternative sources of income, and benefits put on recreation, wildlife, and so on.

Based on this evidence, it might be that greater emphasis should be put on improvement and more intensive management of the larger holdings (i.e. greater than 200 acres). These data are admittedly weak and the problem should be looked at more closely and in a socio-economic context.

2. Sawmilling Industry

There is little doubt that one of the main problems in the sawmilling industry in Nova Scotia (and in other provinces) is one of obtaining a sufficient quantity and quality of sawlogs. It is felt, however, that this problem is really a symptom of a more basic one -- the industry structure. Many of the problems faced by the industry, such as inadequate sawlog supply, insufficient working capital, and poor management, appear to be a result of the large number of small to medium sized firms.

Many of these firms are too small to raise the capital required to purchase enough forest land to ensure a sufficient sawlog supply over time; the production is too small to warrant debarking and chipping equipment and therefore the mills cannot economically use slabs and edgings for chips; and many of the firms are too small to justify full-time employment of specialists such as accountants and marketing people.

Most sawmills in Nova Scotia own only a small proportion of the forest land required to provide a continuing supply of quality sawlogs. Forest land owned (with harvestable sawlogs) for 21 mills sampled in the 2,000-6,000 M.f.b.m. size class averaged slightly over 2,000 acres per mill. Assuming an average yield of 0.5 cords/acre/year, this area would provide the equivalent of about 500 M.f.b.m./acre/year or less than 25% of the yearly sawlog requirements. Mills in this size group reported that they relied on their own land for about 20 to 30% of their log supply. About the same percentages were received from pulp company freehold and small freehold.

Pulp companies and small freehold properties do not provide an assured supply of sawlogs. In most instances, there are no contracts. Without this assurance of a continuing supply of quality logs, it is not feasible to invest in debarkers, chippers, planers, or drying equipment; nor is it feasible to modernize and expand production facilities.

Without debarking and chipping equipment, slabs and edgings are used for fuelwood or not at all. Only about half of the lumber produced in the province in 1969 was estimated to have been planed and a much smaller proportion was dried. When the lumber market is strong there is a demand for lower quality lumber but demand drops off sharply under weak market conditions. In the long term, lower quality lumber production will tend to encourage competition from other provinces and ultimately other products.

Without modernized and expanded capital equipment (or higher quality sawlogs), increased productivity and average hourly earnings in the industry are limited.

3. Pulp and Paper Industry

Wood supply is also a problem for the pulp and paper industry; however, the current problem is obtaining the labor required in harvesting. In 1969, the companies reported that they purchased about 640,000 cords or 72% of their roundwood input.

G. ALTERNATIVES AND COURSES FOR CONSIDERATION

It is not the responsibility of this study to recommend the courses of action that government should take in its forest resource allocation policy. Government decisions must be weighted by overall goals (e.g. expansion of employment, income, environmental concerns, and private ownership) and policy proposals for other sectors.

Even assuming these considerations were taken into account, it must be remembered that the analysis presented here is static, that is, it is based on the current industry structure and market conditions. It would be unrealistic to make proposals without considering in greater detail expected changes in the market or demand for forest products.

Therefore, it is felt that an analysis is needed of the future demand and price for lumber (and secondary wood products) and pulp and paper products both locally and for export.

In conjunction with this it is felt that a *more detailed analysis is needed of timber supply both the degree of utilization and potential by landowner class*. Data presented above showed that small freehold properties comprised 53% of the total land area and accounted for 57% of the volume produced in 1970. This yield per unit area would not seem high if all this land area were being utilized for timber production. However, there was some indication that there had been a harvest cut on only about 60% of these ownerships in the past 5 years. This suggests that there has been some over-cutting on a portion of the small woodlots.

1. Alternatives for the Sawmilling Industry

In light of the problems faced by the sawmilling industry, there are a number of alternatives available for consideration by the provincial government. Some of these are: a) do nothing; b) reallocate the volume of sawlogs now being used to fewer mills; c) reallocate all material of sawlog quality to sawmills (and at the same time ensure that pulpwood from sawlog harvesting is made available to pulp and paper mills; d) increase silvicultural inputs to expand sawlog production; and e) some combination of these.

If the government were to do nothing, there would probably be a further reduction in the number of sawmills, a continuing slight decrease in the volume of lumber production, and eventually a decrease in employment. In addition, assuming a reasonably strong demand for lumber, there would probably be an increasing proportion of lumber output produced by mills affiliated with pulp and paper companies. Several of the pulp and paper companies own, or have access to, sufficient forest land to ensure a continued supply of sawlog material. An integrated sawmill--pulp and paper mill complex can be a complementary set-up in that chips from slabs and edgings can provide a substantial portion of the wood requirements for a pulp mill and lumber can add diversity to a company's product.

Another alternative would be for government to redirect the existing supply of sawlogs to fewer mills - in other words, to redirect the 40 million ft^3 of roundwood currently being used to say 25 mills

instead of to 300. While this would provide material for initial expansion of individual plants, it would not ensure a continuous supply.

A supply of quality sawlog material could be maintained or expanded by a number of alternatives depending on the time limits. In the short term (over the next 10 years), there is the possibility of requiring that all sawlog quality material be restricted to lumber production. In the medium term (15 to 20 years), sawlog production could be expanded through stand improvement. In the long term (40 to 50 years), it would probably be possible to ensure a supply by planting and more intensive management.

Under the assumption that there will continue to be a reasonably strong demand for lumber both locally and for export, that there are relative benefits in maintaining a viable sawmilling industry (considering employment, regional nature of manufacturing operations, etc.), and that both employment and higher wages and salaries are important provincial goals, it is proposed that some combination of these alternatives should be considered.

Specifically, we feel that the alternatives and effects of reallocation of sawlog material within the sawmilling industry should be considered further. In 1969, there were 4 mills in the province producing more than 6 million f.b.m.; 14 mills producing from 3-6 million f.b.m.; and 12 mills producing from 2-3 million f.b.m. These 30 mills produced about 140 million f.b.m. of softwood lumber or 60% of the total. Most of these mills have chippers and debarkers and they produced about 120,000 units of chips (each unit is equivalent to 1 cord or 85 ft^3 of solid wood). Although some of the mills (about 10) with an annual production of less than 2 million f.b.m. of lumber produced chips, the majority did not. If chips were available from the sawlog material used in producing the remaining 85 million f.b.m. of lumber there would be an additional 75,000 cords equivalent (each 1000 f.b.m. of lumber produced yields also about 0.9 cord of chips). In 1970, there were 4 mills in the province producing more than 6 million f.b.m.; 12 mills producing from 3-6 million f.b.m.; and 7 mills producing from 2-3 million f.b.m. These 23 mills produced a total of 121.8 million f.b.m. or 60% of the total. If the remaining sawlog material were available, it would mean in addition to 80 million f.b.m. of product, there would be 14 million ft^3 of roundwood available for chips.

It is difficult to make specific comments as to the optimum size of sawmills from the point of view of the provincial government. There are two overriding considerations which are important, however. First, it is important that mills be economically viable over a period of time; and, secondly, within that group, it is necessary to recognize those mills which have the highest beneficial impact on the provincial economy.

There appear to be several viable sawmill operations in the province, but many of these operate for only a few years when the market is good. Many of these mills are able to operate only because average wages are low, the sawlogs are harvested on their own limits, a realistic stumpage rate is not being charged, and equipment is not depreciated. The impact of these mills is quite low because wage rates are low, employment is not stable, working conditions are poor, and there is inefficient use of the sawlog because in many cases, the slabs and edgings are not used.

These criteria can help to establish some guidelines as to the optimum size of mill. First, a mill should be of sufficient size to justify debarking and chipping equipment. On the basis of the mills that currently have this type of equipment, it would appear that a minimum size is about 1.5 to 2.0 million f.b.m. The potential chip production from an additional 85 million f.b.m. of lumber production would be about 75,000 cords. This amounts to about 7% of the total wood requirement for the pulp and paper industry in the province in 1969.

Secondly, it is felt that a mill should be of sufficient size to warrant year-round operation. Most mills producing less than 2 million f.b.m. did not operate year-round while those above this production level did. Larger, more modern, mills can in most cases provide better working conditions and higher average wages.

It is relatively easy to formulate guidelines, but it is another matter to come up with realistic alternatives for implementation. Assuming it is desirable to redirect the available sawlog material to fewer larger mills, there appear to be two more-or-less distinct approaches. One is through control of the resources and the other is through control of the mills.

One very real obstacle to the control of resources as a means of reorganizing industry is the land ownership pattern. Analysis of the

distribution of softwood gross merchantable volume indicates that there are an estimated 2.4 billion ft^3 of material in the size class 10+ in. DBH in the province. About 70% of this or 1.7 billion ft^3 is in the Central and Western regions. Of this 1.7 billion ft^3, about 38% is in small freehold ownership, 47% in large freehold, and only about 15% in Crown ownership. It is not known what proportion of this volume is on Crown land that is leased. Although control of the resource by government can be obtained by purchasing more land, this is relatively costly and time consuming.

Reorganization of the sawmilling industry by government control of mill operations through licensing was recommended in the BAEQ development plan (Can. Dep. Forest. & Rural Develop. 1967) for the Gaspè region of Quebec. It was proposed that there should be about 30 mills in the region rather than the existing 100 plus. Mills cutting less than 4 million f.b.m. annually were to be phased out and a compensation of $8 per M.f.b.m. of annual production was to be paid. This proposal was not implemented: however, legislation was passed which required that a mill have a permit before it could expand production. A permit is also required before new mills can be built. This legislation is strictly enforced and carries a possible fine of $200 per day. In addition to legislation, the sawmilling industry is partially controlled by the availability of wood from Crown land.

The Government of Nova Scotia is obviously now attempting to control the resource distribution by its land purchase and timberland loan program. Any attempt to license and restrict sawmills might not be politically acceptable. This will depend, however, on how realistic the program is. It must be kept in mind that a local outlet for woodlot products and a local supply of lumber are important. However, while some concentration of production might present some inconvenience, it would probably also result in higher prices for roundwood (as a result of higher efficiency) and in a higher quality of product.

Another possibility is the encouragement of a cooperative sawmill operated by a number of small woodlot owners. Small woodlot owners have traditionally not been able to capitalize on the returns from wood processing, and the returns from wood growing (i.e. stumpage) simply have not justified more intensive management. This type of operation could provide the incentive

to small woodlot owners to practice more intensive management; it could provide the organization through which forest improvement funds by government could be effectively channeled; and, more importantly, it could provide the means for improving the standard of living of a substantial number of small woodlot owners.

2. *Alternatives for the Pulp and Paper Industry*

It was earlier stated that wood supply in itself did not appear to be a current problem in the pulp and paper industry but that there was a shortage of labor required in harvesting. If this continues to be a problem, and the trend toward more mechanization continues, there probably will be considerably more justification for government-sponsored training programs. In addition, with more mechanization, additional forest improvement such as cleaning would appear to be warranted.

Very little has been said about the volume of pulpwood exported from Nova Scotia. From 1965 to 1970, however, the average export was about 108 thousand cords. In 1970, the volume exported was 97.7 thousand cords or about 10% of total used in the province. These trends and alternatives should be evaluated closely in the light of current problems and future planning.

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