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FORESTS AND FORESTRY IN NEW BRUNSWICK

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THE FORESTS of New Brunswick became commercially valuable about the beginning of the 19th century as a source of supply of masts and spars for the British navy. The utilization of the forests has since passed through various overlapping phases marked in turn by the production of hewn timbers, sawn lumber and pulp and paper. More than sixty per cent of the thirty-four million dollars worth of forest products exported in 1939 were in the form of paper, wood pulp and pulpwood. The sawmill industry seems to be holding its own at about one-quarter of the total exports.

Land has been available to colonists under various plans. Title to about sixty per cent of the total area of 28,000 square miles has been granted to individuals or corporations for colonization, the building of railways or other purposes. The Province obtained the right to administer the Crown lands in 1837 and retains this right in respect to 11,600 square miles which is largely forest land. Disposal of Crown land is now confined to colonists under terms of improvement and residence.

During the immigration period in eastern Canada agricultural development in New Brunswick was encouraged and made considerable headway. The area cultivated reached a maximum in 1911 of 8.1 per cent of the total area, but by 1931 had decreased 114,000 acres to 7.5 per cent of the total area. Since old fields usually return to a forested condition without artificial reforestation there has been a corresponding increase in the area of forest land. This trend has been reversed to some extent since 1930 by economic conditions which halted the migration of local young people to the west and the United States, and resulted in an increased interest in colonization. During the past decade 677 grants containing 66,000 acres have been issued and at least 300,000 acres are in process of colonization. This development has occurred largely in the north and east or French-speaking districts of the province and has probably offset any increase in the forests on abandoned farms in the older, English-speaking sections of the province during the same period.

Forest fires have taken a heavy toll of New Brunswick's forests. In spite of "an act to prevent the burning of woods by carelessly or wantonly firing the same" passed by the first New Brunswick Legislature in 1786 there was little organized forest fire prevention until the present century. Forest fires did not do much damage in the virgin forest except during extremely dry seasons which occurred periodically. In 1869, however, a hurricane blew down the timber in many localities in southern New Brunswick. Fires spreading from settlers' clearings into this windthrown timber during the next few years burned over large areas of forest and, according to the Surveyor-General

of that time, reduced by 90 per cent the cut of timber on many rivers. Other serious fires have occurred which tended to deplete temporarily our forest resources and disturb forest conditions. Fortunately, however, natural reproduction is good, particularly after the first fire. The area burned by the great Miramichi fire in 1825 produced sawlogs within 60 years on the best sites and has been the most important source of timber supply in that locality for the past twenty years. Some of the best of our present stands of spruce originated after the fires following the hurricane of 1869.

Another disaster which destroyed a great deal of timber and seriously disturbed our forests was the Spruce Budworm (*Cacoecia fumiferana*) epidemic which occurred between 1915 and 1923. Cutting had decreased the percentage of spruce, leaving stands composed largely of mature fir (*Abies balsamea*) upon which the insect developed to epidemic condition. It then spread over most of the province, wiping out many stands of mature spruce and fir timber and reducing others to a fraction of their former value.

Some mention should also be made of topography, soil and climate. A triangular area, based on the east coast and extending nearly to the westerly border of the province, is of Carboniferous origin with characteristic flat-lying sandstones and level or gently rolling topography cut by shallow valleys. To the north and south the rock is of pre-carboniferous origin consisting of "sediments and volcanics locally metamorphosed to slates, schists and gneisses." This country is more rolling and broken, rising to a maximum height of about 2700 feet above sea level. Streams are steeper and runoff more rapid. By the use of small timber dams on the headwaters of streams timber can readily be driven from the most inaccessible parts of the province.

New Brunswick is in the north temperate zone with an average precipitation of about 36 inches and a growing season of about five months. Snow is plentiful from December to April and the average season without frost lasts for about 125 days. This climate places the forest soils in the podsol zone. Leaching by organic acids is prevented to some extent in certain parts of the pre-carboniferous area by the lime content of the rock which neutralizes the acids and creates a soil condition similar to that found south and west of the podsol zone.

From this background we may proceed to a more detailed examination of the forests, their administration and the part they play in the economic life of the province.

THE FORESTS

Conifers have always been of greater commercial importance, partly because their floatability made them much easier to transfer to the mills. The growing use of mechanical transport has made it possible to use larger quantities of hardwoods, though many areas are still beyond the reach of economic operations for these species. A summary estimate of volume of standing timber in New Brunswick by species from bulletin No. 91 by the Dominion Forest Service in 1938 is given below. (Page 29, Forests of New Brunswick).

These species occur in various associations. In undisturbed conditions where climax types may be expected the tolerant hardwoods, yellow birch, sugar maple and beech, occupy the tops of the ridges. On the slopes these hardwoods are mixed with spruce, balsam fir and hemlock. Black spruce,

**SUMMARY ESTIMATE OF VOLUME OF STANDING TIMBER
IN NEW BRUNSWICK BY SPECIES**
Volume of Standing Timber

SPECIES	4 — 5" D.B.H. Thousand Cords	6 — 9" D.B.H. Thousand Cords	10" D.B.H. and Over Million F.B.M.	Total 4" D.B.H. and over Million Cu. Ft.	Percent- age of Total
Spruce,	9,909	20,474	3,102	4,234	38.19
Balsam Fir,	4,650	11,636	1,202	2,168	19.55
Cedar	511	1,835	843	459	4.14
White Pine	89	524	645	213	1.92
Jackpine	376	1,841	248	314	2.82
Red Pine	50	39	25	16	0.14
Hemlock	12	54	210	54	0.49
Larch	31	78	10	15	0.14
TOTAL CONIFERS	15,628	36,481	6,285	7,473	67.39
		52,109			
Yellow Birch	680	2,695	2,545	878	7.92
White Birch	2,859	12,437		1,453	13.11
Maple	628	2,615	947	515	4.64
Beech	444	1,261	508	273	2.46
Poplar	498	3,445		375	3.38
Other Hardwoods	115	482	297	122	1.10
TOTAL HARDWOODS	5,224	22,935	4,297	3,616	32.61
		28,159			
TOTAL.....	20,852	59,416	10,582	11,089	100
		80,268			

cedar and larch are usually found in the lower, poorly drained lands in mixtures with intolerant hardwoods. There are three species of pine native to New Brunswick, *Pinus strobus*, *Pinus resinosa* and *Pinus Banksiana*. These are usually found on sandy or gravelly soils.

Reproduction following fires varies with the nature of the ground and the intensity of the fire. Intolerant hardwoods and jackpine (*P. Banksiana*) are common as a first generation followed by spruce or spruce-balsam associations. White spruce and spruce-balsam types are common in old fields though pure stands of larch or cedar are sometimes found. There is an apparent increase in the percentage of balsam fir in new stands after cutting, windthrow or insect damage but since its normal life is much less than that of spruce a gradual return to the original association could be expected if left undisturbed.

FOREST ADMINISTRATION

The area of productive forest land in New Brunswick is about 21,800 square miles. The province retains title to and administers about 10,700 square miles of this. In addition it undertakes game protection and the general supervision of fire protection on all lands. The Dominion Forest Service is active in Forestry Research and has secured an area of some thirty-five square miles near Fredericton for this purpose.

Timber cutting rights on Crown lands are obtained by the purchase of a "License." These Licenses are of three types, (1) Pulp and Paper Licenses which are renewable annually for a period of fifty years, (2) Sawmill Licenses which are renewable for a period of thirty years, and (3) Timber Licenses

which are renewable for a period of ten years. All licenses convey exclusive cutting rights and are subject to timber regulations which may be fixed and determined from time to time by the Governor in Council. The length of tenure of licenses is thus dependent on the licensee's investment in manufacturing plant, but the Province retains the right to vary stumpage rates with market conditions and impose such restrictions regarding cutting as are considered necessary in the interests of silviculture and sustained yield.

Diameter limit regulations, designed to prevent excessive cutting, have been imposed since 1883. This did not prove to be an entirely satisfactory method of forest conservation for all types of forests under modern conditions. "Undersize" permits have been issued for many years to allow the cutting of smaller trees, thus avoiding waste and increasing the yield from such types of forest as mature slow-growing black spruce and decadent softwood. The demand for employment and the desire on the part of the Government to make operations possible have encouraged this practice considerably, sometimes beyond silvicultural justification.

In an attempt to promote the maximum use of existing forests without destroying the equity of future generations in these resources the Crown Lands Act was amended in 1937 to read as follows:

- "(1) No permission to cut trees smaller than the minimum diameters specified in the timber regulations in force shall be granted to any Licensee unless he makes application for such permission to the Minister and submits to the Minister a management plan concerning the Crown Lands which he holds under license made in accordance with the instructions of the Minister. Such plan shall be based on a proper inventory and shall set forth, inter alia,
- (a) an estimate of the total supply of timber available, properly classified,
 - (b) information as to the size, age and growing condition of such timber, and
 - (c) an outline of the proposed schedule of operations and methods of operating with reasons justifying same.
- (2) The Minister, upon consideration of such application, and upon being satisfied that such proposed management plan is in accordance with good forestry practice, having regard to the estimated annual growth and the principles of forest conservation and sustained yield, may grant to such Licensee so applying permission to cut certain classes of undersize trees, subject to such conditions as he may determine."

Arrangements have been made to bring operations on more than 80 per cent of the Crown Lands under the terms of this amendment. Plans are in the course of preparation and a large amount of valuable information is being accumulated.

It must be admitted that methods of operating leave much to be desired from a silvicultural standpoint. Some areas are being clearcut which should be thinned or cut selectively. Some stands are being cut before they are mature while stands of mature timber, more expensive to operate, are being left standing with no production of net increment. Sizes of timber suitable

for sawlogs are being made into pulpwood while in other localities small logs are being sawed into lumber with a large percentage of waste.

But the means for the correction of these errors is being prepared and a measure of regulation has been established. Utilization has been improved and waste in the woods reduced. Cutting is limited to estimated allowable annual depletion within units of forest area and our knowledge of our forests is steadily increasing. The ideals of efficient forest utilization and sustained yield are plainly before us and we can report some progress.

Sixty percent of the 11,100 square miles of privately owned forest land is in farm woodlots or other areas of less than 500 acres under one ownership. The balance of 4,500 square miles is owned by about 130 individuals or corporations. There is no legal restriction of cutting on private lands in the interests of silviculture or sustained yield. The enacting and enforcement of any such restriction must be preceded by a long period of education and demonstration to gain the support of public opinion.

Fortunately conditions are such that natural reproduction is rapid and plentiful and there is usually not much cause for concern on this score except after a severe or second fire. Nature soon heals the scars and covers up the mistakes which have been made. If efficient protection is provided there is little danger of lands becoming idle for long because of cutting. Yields can be increased by improved cutting methods but increased costs must be balanced against increased returns before intensive silviculture becomes practical.

FOREST FIRE PREVENTION

The New Brunswick Forest Service, a branch of the Department of Lands and Mines, is directly responsible for protecting the Crown Lands from forest fires and for the general enforcement of the Forest Fires Act. This Act provides for the control of woods travel and land clearing fires, and safety appliances in connection with mills, locomotives, and so forth. Municipalities and land owners are responsible for the suppression of forest fires on private lands. The Forest Service includes a permanent field staff of about thirty Forest Rangers and Inspectors in addition to temporary staff employed during hazardous periods or for special work. A large measure of co-operation is obtained from private land owners and Crown land licensees.

A fire detection system of 34 lookout towers with telephone communication supplemented by patrols is operated during hazardous periods. Skeleton fire suppression crews are maintained around which efficient fire fighting crews can be quickly organized. The average area burned during the past five seasons has been about 40,000 acres or about three-tenths of one percent of the forested area of the province. This includes some areas burned the second time and some areas of waste land which are more suitable for the production of blueberries than for forest production.

FOREST INSECT CONTROL

A forest insect survey is operated co-operatively by the Entomological Branch of the Dominion Department of Agriculture, the New Brunswick Forest Service and the Forest Industries. Samples of the forest insect population are taken regularly by field staffs and forwarded to the Entomological Laboratory for examination and identification. Any abnormal increase in the numbers of injurious forest insects can thus be noted and control measures taken before outbreaks reach epidemic stage.

Marked success has been achieved in the control of the European Spruce Sawfly epidemic in New Brunswick. Parasites were imported from Europe and reared in large numbers by the Dominion Entomological Branch. Some 250 million parasites have been released in New Brunswick during the past four seasons. These are rapidly becoming established and there is reason to hope that the epidemic will be controlled before extensive damage is done.

GAME CONSERVATION

Game Conservation has also received increasing attention during recent years in line with the increased appreciation of the recreation value of forests. This is also a responsibility of the New Brunswick Forest Service. Nine game refuges have been established covering 1086 square miles. Hunting and trapping are prohibited on these refuges and fishing is limited as to minimum size and maximum number of fish which may be taken.

One of the most notable results of increased game protection is the rapid increase in the number of beaver. These valuable animals were becoming rare. Their trapping has been prohibited and protection given during recent years. Since 1933 the estimated number of beaver in New Brunswick has increased from 162 to 6465. Besides their own value as a furbearing animal their practice of damming small streams helps to regulate stream flow and immensely improves feeding grounds and general conditions for game, wild fowl, fish and furbearing animals. In connection with game conservation the Game Branch has adopted the slogan "Save the Beaver and you Save All."

The number of non-resident hunters and fishermen and the number of guides employed has practically doubled in the last five years, which gives some indication of the success of the game conservation program.

FOREST INDUSTRIES

During the past decade the pulp and paper industry has become the most important forest industry in New Brunswick. Three pulp and paper mills and three pulp mills are now operating. The average value of pulp and paper products for the last three years has been more than \$15,000,000 and the mills have a capacity considerably in excess of this amount.

Several of the mills are located to draw part of their natural supplies from the Province of Quebec. On the other hand some 400,000 cords of pulpwood have been exported annually during the last three years to mills in other parts of Canada, the Eastern United States and Europe.

Newsprint paper and bleached sulphite pulp are the most important products of the industry, together accounting for nearly 80 per cent of the pulp and paper products exported.

The sawn lumber industry has suffered from the decrease in readily accessible supplies of suitable logs and the competition of cheap lumber from the west coast of North America via the Panama canal. It is now going through a period of adjustment to changed conditions. Its hope lies in more efficient methods of transportation, manufacture and marketing, and in the rapid recovery of cut-over forests. The present trend is toward smaller mills located nearer the source of supply. Much remains to be done in the improvement of production and marketing, but marked progress has been made in this respect during the past year.

Miscellaneous products such as railway ties, poles, piling, posts, spoolwood, barrelwood, and fuelwood, make up a substantial part of the crop of forest products but are largely consumed locally and do not appear in the table of forest products exported. Small quantities of mine timbers were being exported to the United Kingdom previous to the outbreak of the war. This business was expanded to replace supplies from other sources cut off by hostilities. Jackpine (*Pinus Banksiana*) and black spruce (*Picea mariana*) are the species preferred but small percentages of larch (*Larix laricina*) and fir (*Abies balsamea*) are also accepted.

FORESTRY EDUCATION

A Forestry Department was established in connection with the University of New Brunswick in 1908. Training in forest engineering has been emphasized since this field offered the greatest opportunities for employment. Recently a chair of Forest Entomology has been established and greater opportunity provided for the study of botany, biology and allied sciences. The University owns some six square miles of forest land on which the practical application of forestry and forest engineering is demonstrated. The degree of B.Sc. in Forestry has been given to 166 graduates and the school now has an undergraduate body of 75. Graduates have been employed by forest industries and government services and the school has established a reputation for producing well qualified, able men.

FORESTRY RESEARCH

The Dominion Forest Service has taken the lead in Forestry Research in New Brunswick since 1921 when it took over the work started by the Commission of Conservation. The New Brunswick Forest Service, the University of New Brunswick and private interests have co-operated in various projects. Studies of rate of growth and reproduction, cutting methods, thinnings, girdling and direct seeding have been made. A small experimental forest nursery is operated at the Acadian Forest Experiment Station where native and exotic species are studied.

One of the more recent research projects undertaken co-operatively is in connection with forest fire hazard. A research station has been established on the University property and fire hazard information collected for various forest types. From this work a general Danger Index scale is made available to forest protection services based on meteorological information collected by 28 weather stations and compiled by the Wright system developed by the Dominion Forest Service.

THE FORESTRY OUTLOOK

The province of New Brunswick is now in a period of adjustment between the exploitation of virgin forests and the practice of forestry on a sustained yield basis. Efficient forest protection is the first step and steady advances have been made during the past 25 years. Production has improved from a utilization standpoint but there is still room for greater co-operation between the pulp and paper and lumber interests in this connection.

Supplies of standing timber have of course decreased but there is reason to believe that they have reached or passed their low point. Eighty per cent of the area of New Brunswick is still productive forest and much of this is in

a position to produce increment rapidly. We must, therefore, hold the ground we have gained and attempt to advance toward our ideal of maximum sustained yield.

Much remains to be done in connection with protection and utilization, while silviculture, beyond general diameter limits, has scarcely been seriously considered. There is great opportunity for improvement in cutting methods but increased costs must be offset by convincing prospects of increased yield. Experimental work is necessary to determine practical silvicultural methods. Following that, a good deal of demonstration and educational work must be done to convince forest owners of the advantages of methods recommended. The interest and sympathy of the public and more particularly farmers and woods labour is steadily increasing and we look forward confidently to rapid progress in all branches of forestry.