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Wood in the Mechanical Age

IT MUST NOT BE FORGOTTEN in this age of metals and plastics that our forests are still the basis for a very large part of our prosperity.

The story of man's progress from a primitive cave-dweller to the master of the civilized world cannot be told without frequent reference to his relationships with trees. In his earliest days the forest provided him with shade, shelter, protection, food, clothing, tools and fuel. In the Canada of Centennial Year the lumberjack is still part of history and life, a folk figure with great influence on our present economic life and our way of living.

At the time when there were only a few people with puny tools settling Canada the forest really seemed inexhaustible. With our increasing numbers, our insatiable demands, and our tremendous engines and machines, the situation is drastically different. We have it in our power to tear up our topsoil and wash it away; to bulldoze our forests; to pollute and silt up our waterways, in only a few years, leaving Canada as a desert.

The word "inexhaustible" is, therefore, an adjective which should be used sparingly with reference to our forests today.

Planning and action are needed if Canada is to retain her position as a forest country.

As things stand now we are in an enviable position. More than half of our land area is forested; only a fourteenth has been improved or is in pasture. More than half of our 1½ million square miles of forest are capable, under proper management, of producing continuous tree crops. Nine-tenths of these forests are owned by the people of Canada, and therefore are subject to public control.

In the accessible and productive forests some eighty per cent of the merchantable timber is composed of conifers, that is, evergreen softwoods. The largest stands are in British Columbia, Ontario and Quebec, in that order. There are 35 native coniferous species, and 136 broad-leaved species. These are described and illustrated in the Department of Forestry and Rural Development book *Native Trees of Canada*, available from the Queen's Printer, Ottawa, ($2.50).

The softwood forests supply most of the wood used in Canada, but the forests in the east contain valuable stands of hardwoods, such as birch, elm, ash, beech, and maple, that are widely used in the manufacture of furniture, flooring and for other special purposes.

The value of products derived from the forests is some $2,700 million a year. The industries that use trees to produce lumber, pulp, paper and other products, therefore form an important part of the Canadian economy. They employ many thousands of people and their commodities are exported in very large quantities, thereby helping our international balance of payments.

Not a passing need

The need for wood is not a passing stage in the development of mankind. The expanding world economy has given timber-land an ever-increasing importance. Wood in one or other of its myriad physical or chemical forms is indispensable to the production, distribution and utilization of just about every product consumed by civilized people. It is a material for which there can be no complete substitute. From its crude state as fuel to its highly sophisticated use as a precise engineering material, the tree brings benefits and services to the human race.

Wood is becoming more and more a material for conversion into other substances from which finished goods can be made, goods in which its identity is not obvious. By processing and by combination with other materials, it provides such things as paper, rayon, cellophane, photographic films, fibre building boards, paper dishes, artificial leather, cattle food, eye-glass rims, fountain pens, poker chips, insulation material, toilet articles, cardboard cradles which fold into flat shopping-bag size packets, and paper dresses that sell for a dollar. The door of the chemical utilization of wood has been opened just a crack, but there is evidence from the research laboratories that within a few years it will swing wide open.

What is the tree from which all these beneficial

products come? It can be described as a woody plant attaining a height of at least ten to fifteen feet, rising from the ground with a single stem, and developing a more or less definite crown shape. The substance of wood consists of the major elements of plant life, of which the principal is cellulose. In the cell cavities are oils, resins, sugars, starches, tannins, dyes, inorganic salts, and organic acids.

Lumber and timber

There are about eight thousand sawmills, big and small, in Canada, supplying lumber for a wide variety of uses at home and for export to every quarter of the globe. From a small beginning in pioneer days, when the manufacture of boards, planks, beams and other usable forms of wood was entirely a matter of hand labour with axe, hand-saw, sledge and wedge, lumber production has developed into a highly-mechanized industry.

British Columbia produced 72.9 per cent of the total Canadian output in 1963; nearly a quarter of the total is produced in Ontario and Quebec, and the rest is spread throughout the other provinces. A few sawmills are capable of cutting up to half a million board feet of lumber in a single shift; others are small enterprises, turning out five or six thousand feet a day.

Sawn lumber includes boards, framing lumber, beams, posts, flooring, decking, sheathing, siding and panelling. Sawn, hewn and round timbers are used in the galleries, shafts, drifts, stopes and other parts of mines. No satisfactory substitute for wood has yet been found for railroad ties. Wooden poles are used extensively for telephone, telegraph and electric light lines.

One provincial brief to the Royal Commission on Canada's Economic Prospects said that between 1955 and 1975 its number of men employed in the logging industry would increase from 16,000 to 22,000, and that all forest industries, logging and manufacturing, would increase from 70,000 to 110,000. *Canada Year Book 1966* gives the value of shipments of all sawmill products and by-products in 1963: $691 million.

Pulp and paper

Our pulp and paper industry is one of the major productive enterprises of the world. As a maker of newsprint, its output is more than three times that of any other country, and it furnishes about twenty-five per cent of the world's pulp exports.

More than 74 per cent of the wood pulp manufactured is converted to other commodities in Canada, the remainder being shipped abroad. Newsprint accounts for about 75 per cent of all paper products manufactured, but there are many other sorts of paper merchandise: bags and boxes, paperboard, building board, and roofing. In 1965 the total pulp and paper exports amounted to nearly $1,500 million, equal to 16.21 per cent of Canada's total exports.

Canada's first wood pulp plant was established as recently as 1864. Today, some 45 per cent of the free world's newspaper pages are printed on Canadian newsprint, and the demand is increasing so rapidly that by 1980 production is expected to be about double what it was ten years ago. Canada makes three and a half times as much newsprint as does the United States. The largest Canadian user is the *Toronto Daily Star* and *Star Weekly*, with nearly 66,000 tons a year; then follow *The Sun* and *The Province*, Vancouver, 44,161 tons; *The Telegram*, Toronto, 36,000 tons; *La Presse*, Montreal, 32,657 tons; *The Montreal Star*, 29,800 tons and *The Globe and Mail*, Toronto, 28,000 tons.

To produce this huge quantity of newsprint, highly developed and intricate machinery is needed. The newsprint machine is a marvel of mechanical ingenuity. It is longer than a football field, costs about $10 million, and turns out a continuous sheet of paper more than twenty feet wide at speeds up to half a mile per minute while controlling tolerances of ten thousandths of an inch.

Forest consumption

In the years 1958-1962 forest consumption in Canada averaged 3,241 million cubic feet annually. Of this, logs and bolts for the lumber industry represented 43.7 per cent; firewood and wood for charcoal, 9.3 per cent; poles and piling, round mining timbers, and miscellaneous products, 1.8 per cent; logs and pulpwood for export, 4.8 per cent; forest fires, 8 per cent; bolts for the pulp and paper mills, 32.4 per cent. From their one-third of the consumption, the pulp and paper mills created more national revenue than the other forest industries combined.

Not so many years ago, there was an abundance of accessible and unoccupied forest to meet the expanding demand for pulp and paper. Today, there are no large unoccupied pulpwood forests within range of existing mills — and a mill worth $50 million cannot be readily picked up and moved to a new forest. By and large, the mills must make do with their present limits. To make this effective the industry adopted in 1946 a forest policy of perpetual yield. The companies harvest their stands of timber on the assumption that a new crop of trees will be available on the same site every 60 to 120 years, depending on the species, and then they apply forestry art and science, planning, protection and good sense to the task of making this assumption come true.

In addition to introducing improvements in forest management, the pulp and paper industry is making more economic use of its wood resources. Wood suited to pulping goes to the mill for manufacture; other trees are converted into plywood; sawlogs become lumber; and the residue of the sawmilling is converted into chips for chemical pulping. In British Columbia, the wood residue from sawmills accounts for more than one-half of the wood requirements of the pulp and paper mills.

Better methods have resulted in the production of more pulp from a cord of wood than was possible a few years ago; better means of using bark as fuel have been developed; and a greater number of commercial "side" products like alcohol, tanning liquor, road binders, turpentine, and yeast, are being made from what formerly were waste materials of the pulping process.

The companies harvest about sixty per cent of the wood they use from the 183,000 square miles of forests which they lease from the provinces. They purchase much of the remainder from farmers, settlers, and other owners or operators of woodlands.

Whoever starts a woodlot or a tree farm must be prepared to wait for some years, depending upon the growth characteristics of the species planted and the climatic environment, before receiving returns on his investment. He may then count, given careful husbandry, on an annual or periodic crop of wood for sale. Research has shown that the woodlot can be maintained with little effort or experience, and that the financial returns are satisfactory.

Other wood products

Plywood is a composite wood substance consisting of layers of wood glued together with the grain in alternate layers at an angle, usually a right angle. This is an adaptable material, used for a wide and ever-increasing diversity of applications. It is strong, light in weight, decorative, and available in sheets of many sizes.

Laminated wood is a factory product obtained by bonding boards or planks together with structural wood adhesives. Structural members made in this way may be fabricated into curved arches of great size for use in churches, auditoriums and arenas where large unsupported roof areas are required, and these arches retain the natural beauty of wood.

Particle, or flake, boards, are sometimes used in building construction. These are formed by cementing small chips or flakes of wood together to form standard size sheets.

The manufacture of veneer has acquired a position of increasing importance. Veneers vary from less than one-fiftieth of an inch up to a quarter of an inch or more in thickness. Thin veneers may be applied to the surface of wood or flakeboard used in furniture, pianos, or other high-class cabinet work, to give a beautiful finish.

Excelsior, or wood wool — the curly shavings so widely used for packing fragile articles — is made by a machine which cuts short bolts of wood, usually poplar, with sharp steel spurs. Wood flour, an important ingredient in dynamite, some kinds of linoleum, and some of the new plastic products, is made by grinding shavings, sawdust, and other sawmill refuse, to a fine powder.

Charcoal, obtained from the heavier hardwoods, is used for starting fires and for cooking, as a deodorizer, and in many medicinal preparations. Tannins, which come from the bark of trees, are used extensively in the tanning of hides for leather, in the manufacture of ink, and to fix aniline dyes. Hitherto, Canada has imported almost all its tannin requirements, but domestic sources are being developed.

Other materials yielded by trees are cedar-leaf oil, used in the manufacture of insecticides, floor dressings, furniture polishes, perfumes, shoe blacking, and greases; Canada balsam, used in the optical industry, in the manufacture of spirit varnish, and as an antiseptic; yeast, which can be produced from wood hydrolysates in about the ratio of a quarter ton of yeast to a ton of wood, provides the opportunity for the production of vast quantities of edible protein, the greatest single lack in the diet of most of the world's population.

Conservation

We are in no position to waste our remaining forest resources. By thriftless, indiscriminate and unwise cutting methods in some areas we have often in the past left no opportunity for a second crop of trees to replace those we have removed. Our carelessness has been responsible for about eighty per cent of all forest fires, which on the average burn more than two million acres of land every year in Canada. In 1961, fire ravaged more than nine million acres of forest land.

We have been spending hundreds of millions of dollars to repair the ravages of the past hundred years; to reseed and replant forest land that had been indiscriminately cut over, or burned by the carelessness of men; to regulate the flow of rivers which up to our entry on the scene regulated their own flow with the aid of forest-covered basins.

Up to a point there is virtue in credit living, using today and paying tomorrow, but not when the user is not here to pay and the burden must be borne by his grandchildren.

Among the common meanings of reprehensible forest exploitation, according to Joseph S. Illick in his book *An Outline of General Forestry* (Barnes and Noble, New York) are: handling the forest without regard to the future; cutting the forest without making adequate provision for forest renewal; getting value, use and service out of the forest without regard to others, and using the forest beyond one's right or exclusively for one's own profit.

These are hard words, but it is a fact that only about forty per cent of the forests in use in the world are managed with a working plan for sustained yield. This means that cutting practices are apt to be to some degree destructive in sixty per cent of the world's forests.

Rational forest management means the continuously efficient handling and profitable use of the forest. Sustained yield management is the practice of growing

at least as much wood each year as is consumed by fire, pests, disease and cutting.

Preservation of the forest is not a new idea. In classical times the wood-nymphs were believed to perish with the trees which had been their abode. It was therefore an impious act wantonly to destroy a tree. As early as the thirteenth century forest conservation formed a definite part of public policy in Europe and at the time the Spaniards conquered Mexico they found that the native people had severe penalties against the destruction of trees.

Canada has at least made a start toward rational use of her forests. Efforts to protect the forests from fire, insects and disease have been intensified in all parts of the country. Access roads to carry fire-fighters and foresters quickly to locations where expert work is needed are being built. New interest is being shown by federal and provincial forestry departments and by big-scale industrial users of forest material in informing the public about the need for conservation, and conservationists are stressing the need to preserve forest cover of watersheds in order to preserve human life.

Much research is being done. As regards wood products, this falls into two broad classifications — fundamental and applied. The first provides the essential basic data on the mechanical, physical, chemical and anatomical properties of Canadian woods; the latter is directed toward the development of new and better uses for wood, improved practices, and a more complete utilization of the wood substance available from the annual timber cut.

These researches are fascinating detective stories, but they go beyond that: their practical consequences to every Canadian are staggering.

The Department of Forestry and Rural Development has seven regional establishments, including a number of forest experiment stations, where investigations are conducted on a wide variety of problems affecting the growth and regeneration of forests and methods of protection and management. The Department also operates two forest products laboratories and several research institutes at which studies are conducted in specialized fields to serve Canada as a whole and to complement the work of the regional laboratories.

Continuous fundamental and applied research into woodland and pulp and paper mill operations is carried out by the Pulp and Paper Research Institute of Canada. This is a non-profit corporation whose management is vested in a board of directors comprising representatives of the Canadian Pulp and Paper Association, McGill University, and the Canadian Government. Its projects touch every aspect of the industry from the first growth of young seedlings in the forest to the manufacture of the finished commercial articles.

The future

It is undoubted that technological developments will increase the degree to which timber reserves can be utilized. In the past forty years chemical research has made man's oldest material the basis of ultramodern industries. Mechanization, too, will have its effect by making economic the production of wood from sparsely forested stands where the old manual methods made logging impracticable.

At the National Forestry Conference in 1966, some forecasts were reported by R. M. Fowler, President of the Canadian Pulp and Paper Association, who was chairman of the plenary session. The demand for pulp and paper 34 years hence is expected to be 5½ times that of today; requirements of hardwood are expected to nearly double by 1975; the demand for softwood lumber and plywood is expected to grow by nearly fifty per cent by 1975 and to double the 1975 figure by 2000. "We can say", the chairman commented, "that a major effort is going to be needed to obtain these possible levels of demand. When we look to 2000 A.D. it is quite clear that with present methods and arrangements we will not have enough wood to meet the estimated demands."

That is the industrial aspect, but we must not forget that the forest has other uses and virtues. Visitors find the appearance of the woods enchanting, and every tree, taken singly, is beautiful. These visitors are consumers of goods and services. Their expenditures benefit merchants, farmers, labourers, hotels, and many others. The new money they bring into the country is an important factor in our balance of international payments, having the same effect as would additional exports of commodities.

As for ourselves, dwellers in this forest-endowed country, the natural beauty of wood refreshes our senses, stimulates our minds and soothes our troubled spirits. That beauty must not be allowed to perish.

The tree that is felled and floated or trucked away to the sawmill or pulp mill becomes the raw material of another existence, takes on a new life. A dead tree put to use becomes something lively and profitable. But it must be replaced by a living, growing, tree.

The forests are renewable. Nature will see to this if not interfered with. But they can be despoiled or killed, not to be renewed in mortal time. If we interfere with Nature's way in the forests then we must use our talent to maintain them.

Good forestry and human welfare go together. Without the products, influences and services of forests it would be impossible for the people of this country to maintain their present standard of living, physically or aesthetically.

Good citizenship calls upon every Canadian to require and support an enduring forestry programme, and to accept his own personal responsibility for forest conservation.

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