POST-WAR FORESTRY PROBLEMS OF THE LUMBER INDUSTRY ON THE WEST COAST

BY MAJOR L. R. ANDREWS

British Columbia Lumber and Shingle Manufacturers' Association.

TODAY, under the heading Post-War Reconstruction and Rehabilitation, exhaustive stock-taking of Canada's Resources, material and human, is being undertaken by many agencies. Federal and Provincial Governments, parliamentary committees, industrial and trade associations and technical societies are all busy with the object of cushioning the transition from war to peace. Much is being said about the ushering in of a new era after the war for better handling and fuller use of these resources for the national good.

Recently I happened on a pronouncement of Sir Clifford Sifton, Chairman of the Commission of Conservation in 1917, towards the close of World War I, as follows:

"Among the most remarkable results of the war has been the re-examination which each nation has been compelled to make with regard to its material resources. The gospel which we have been preaching for some years past has now been found to be true gospel. It has been found by hard experience that national safety demands that nations should not only possess resources but understand them and be able to utilize them economically. Whereas, a few years ago people listened to the discussion of this subject with polite but somewhat academic interest, they now know that no subject is of more importance to the national welfare, and that the lack of developed capacity to utilize every possible resource may, in certain emergencies, mean disaster."

The Commission of Conservation was at that date completing the first comprehensive inventory of the forest resources of British Columbia. The Commission itself was liquidated a few years later but some considerable progress has been accomplished in British Columbia towards more rational treatment of the forest resource.

It is to be hoped that constructive proposals brought out at this time, as World War II, 25 years later, approaches its climax, will bring concrete results along the line of application of scientific forestry principles in the principal forest regions of Canada. I think they will, personally. The vital part played by Forest Products in the national economy has been brought home to the people of this country as never before. Critical shortages during the war in this country of unlimited forest resource has been a profound shock, and the part now played and to be played in the future of world economics by "Wood," this renewable natural resource, its chemical derivatives, cellulose fibres and plastics, has seized the imagination of the Canadian people.

Canada, in my opinion, and particularly British Columbia, from a forestry standpoint, is coming of age. Public indifference and the old inhibitions of lack of money are being replaced by a demand to put Canada's neglected resource (her productive forest lands) as soon as possible on a paying basis.

In my opinion, two public misconceptions still persist in regard to the forestry problems of this country. The first misconception is that the real Forest Resource comprises the virgin merchantable standing timber only.

Few people realize that the true resource is basically the Productive Forest Land and, of course, incidentally, the virgin timber found on it and the second-growth which appears after cutting. The second misconception, in my opinion is that Lumbering and Forestry are still considered two opposite or opposing functions in forestry. On the one hand, Forestry is considered strictly the function of the Government to replant or reforest after logging. Lumbering is still considered the function of private enterprise to exploit the virgin timber for profit and then move on.

These conceptions of the Forestry Problems of this country are reflected in most of our Canadian forest laws today, and to a large extent, in the attitude of Governments towards the lumbering industries based on this resource. This is so in British Columbia. The Government disposed of over two-thirds of the original virgin stands growing on one-third of the productive forest soils under one form of tenure or another and then proceeded to encourage the mining of this resource to secure the greatest possible current revenue. Up to the present, insufficient of this capital liquidation has been put back to effectively insure future crops.

The public can see the productive soil in the agricultural picture. They can see crops harvested year after year. Both the Federal and Provincial Governments reflect a public consciousness of the necessity for soil conservation and the development of permanent agriculture. Millions of dollars have been spent annually by the Province and the Dominion for permanent improvements to open up and develop farm lands and establish permanent communities. Huge capital investments have been made for roads, railways, irrigation schemes and experimental farms. Large annual subsidies are paid and justified as encouragement to maximum productivity of the agricultural soils.

Contrast this with the annual appropriations for permanent development of productive forest lands. In Canada as a whole, there is probably about an equal acreage of productive agricultural land and productive forest land—probably about 600,000 square miles of each.

In the Coast Region of the Province of British Columbia this situation appears more striking because the total lands suitable for agriculture amount to less than 1 per cent of the land area, whereas the productive forest lands represent about 30 per cent of the total land area. On the Coast these productive Forest Lands comprise over 10,000,000 acres. This region has produced about half the total cut of sawn lumber of the Dominion of Canada in the last fifteen years. Forest Industries for many years have been the prime factor in the total economy of the Coast Region of British Columbia.

I do not mean in any way to disparage the work of the Provincial Forest Service since its inception in 1912. As a matter of fact, the Forest Branch of British Columbia has done a remarkable job within the limits that public opinion, as reflected by Government policy, has enabled it to do. The service has been practically free of political influence and particularly in the last twenty years has achieved remarkable progress in getting ready for a real Forestry Program when Public Opinion and Government Policy so dictate.

A fairly comprehensive inventory of forest resources on the productive forest areas is now available. This has been broken down into natural units and a start has been made on management plans on some specially selected units. Considerable progress has been made on basic factors of yield expectancy, silviculture, mensuration, management and soil surveys. The fire protection organization, for its size, is well equipped and trained. Initial nursery facilities have been established. A trained efficient technical staff has been organized which, except for personnel losses due to the war, is adequate to provide the nucleus to work out management plans on a sound practical basis.

In my opinion there is every indication that public opinion is becoming aroused to the necessity of more effective action in respect to cut-over lands for a permanent supply of raw material for the Forest Industries. This is evidenced, I think, by the appointment on January 4 of this year of a Royal Commissioner to make a comprehensive inquiry into all phases of Forestry and Lumbering in British Columbia.

The task ahead is a big one but in no respect impossible provided the efforts of all agencies in the Forestry picture are enlisted. The Government, in my opinion, cannot succeed alone. It will take the combined co-operation of the Government, the Forest Industries and the Public.

There is still sufficient cushion in the remaining stands of mature timber to provide raw material for permanent industries on at least present scale production and employment, provided effective steps are taken to reforest and protect the most productive cut-over areas.

In considering the subject of this paper, "Post-War Forestry Problems of the Lumber Industry on the Coast of British Columbia," I must take it, therefore, that Forestry in this region, as in all other virgin timber areas, begins with logging and includes the manufacturing and marketing of the products of the forest as well as the growing of a second crop. As far as logging, manufacturing and marketing are concerned, these essential forestry functions will always be best performed by private industry.

The chief burden, of course, of securing natural regeneration after logging on the present 600 to 1,000 large and small logging operations scattered over 40,000,000 acres of the Coast region, will fall on the Government. To the extent feasible, however, provision should be made at once to encourage industrial forestry and the securing of a second crop on as many holdings as possible where active lumbering operations are now being conducted. A number of these units are of sufficient size for sustained yield. Many now

support large established industries which have substantial communities dependent on them. These should be placed on a permanent basis as soon as possible.

In considering Post-War Problems, a very brief summary of Resources, Present Rate of Production of principal products and their distribution, and the general forestry position of the Coast Region might serve as a background.

The remaining stands of merchantable timber on the Coast occupy approximately 7,879,000 acres of the 10,000,000 acres of productive forest land. Of a total volume of 155,000,000,000 feet of timber, over 50 per cent is reported presently accessible. This inventory, of course, was based on pre-war or depression period, standards of utilization. This inventory, in my opinion, will prove ultra-conservative both as to quantity and accessibility.

Of this stand, better than one-third is Hemlock and Balsam, about one-third is Western Red Cedar and a little less than one-third is Douglas Fir. The cut by species in recent years, however, has been over 50 per cent Fir, about 20 per cent Hemlock and Balsam and 20 per cent Western Red Cedar.

In regard to ownership, 39 per cent of the merchantable timber on 54 per cent of the area is still held by the Crown. Of the merchantable timber, 47 per cent on 32 per cent of the area is held under timber Licences and Leases, and 22 per cent, on 14 per cent of the area is held under Crown Grant on Privately Owned land. In other words, 39 per cent of the remaining old-growth merchantable timber is in the hands of the Province and 60 per cent is alienated under one form or another. Crown holdings are being reduced, however, by the sale of around 300,000,000 feet of timber annually under short term timber sales on the Coast.

The annual cut from all private and Crown lands is around 3,000,000,000 feet, board measure, B.C. scale, of logs, in addition to a considerable quantity of piling, poles, hewn ties and fuelwood. Roughly 50 per cent of this annual cut of logs comes from operations on Crown Grant lands. The balance is cut from Licences, Leases and Timber Sales. The area cut over annually on the Coast is upwards of 100,000 acres.

The most heavily cut-over lands, therefore, are the Crown Granted areas which total only 1,100,000 acres or 14 per cent of the 7,800,000 acres of merchantable timber acreage. The total stands on these Crown Granted lands are estimated at 22,000,000,000 feet. They run heavily to the predominantly Fir type.

Of the 3,000,000,000 feet of logs cut annually, about 2,000,000,000 feet, or $\frac{2}{3}$, are sawn into lumber and lumber products. Roughly, 400,000,000 to 450,000,000 feet of Hemlock, Spruce and Balsam logs (15 per cent) are converted into pulp; 10 per cent of the total logs, or 300,000,000 feet of Red Cedar is converted into shingles; and about 250,000,000 feet on the average is exported annually in the log from Crown Grant exportable areas.

Of the 2,000,000,000 feet of sawn lumber produced annually, about $\frac{2}{3}$ to $\frac{3}{4}$ is Douglas Fir. The balance is Hemlock, Cedar and Spruce. Disposition of this sawn lumber is roughly as follows:

600,000,000 feet, or about 30 per cent only, of this lumber production is marketed and consumed in Canada, about half of this in British Columbia. Out of a total export of Sawn Lumber of around 1,400,000,000 feet annually, 200,000,000 feet is exported to the United States, nearly 1,000,000,000 to the United Kingdom and the balance to over fifty Overseas export markets.

Around 3,000,000 squares of shingles are produced each year, 90 per cent of which are exported to the United States.

Six pulp mills operate on the Coast consuming from 400,000,000 to 450,000,000 feet of Hemlock, Balsam and Spruce logs annually. Practically no pulpwood in cordwood size is produced or consumed at the present time. Over 500,000 tons of pulp and paper products are produced, 60 per cent roughly being newsprint.

In regard to the general forestry position of the Coast Region, the following quotation from "The Forest Resources of British Columbia, 1937" sums up the present situation as briefly and concisely as possible, and I believe is soundly based in regard to the "Sustained-Yield Capacity of the Coast:

"Dividing the volume of merchantable timber by the number of years required to grow a merchantable second crop and adding the mean annual growth in immature stands already established is a simple means of estimating the sustained yield. The figures are based on present utilization standards. These limit the gross Coast production to 1,836 million feet total, or 1,032 million from accessible areas, on a sustained-yield basis. That is to say, depletion by logging and fire should not exceed these figures. In 1936 depletion was 2,700 million feet.

But it is expected that a gradually increasing market for fabricated products, pulp and cellulose derivatives will be developed, and timber large enough for these purposes will be produced on an average site on the Coast in sixty years, yielding on fully stocked areas between 5,000 and 6,000 cubic feet per acre of small material (or 20,000 board feet, B.C. log-scale, in trees over 10 inches D. B. H.). If it be assumed that such timber, produced by 60-year-old trees on the Coast, will be merchantable as a chief product within the next half-century, then the old mature stocks can be utilized more quickly. The sustained annual yield capacity would thereby be increased by 1,050 million board feet to a gross total of approximately 2,900 million feet in the Coast region, including for this estimate all the timber now considered inaccessible. Increase beyond that yield will depend upon closer utilization of the mature stands and reforestation of denuded areas.

On the same assumption that 60-year-old trees will become merchantable within the next half-century, but without including any yield from areas now considered inaccessible, the sustained yield capacity of the Coast would be increased by 500 million feet to a total of 1,500 million feet.

It would seem that the Coast forests are being cut beyond their sustained-yield capacity, unless it can be increased by closer utilization in logging, more successful reforestation, protection of the immature stands,

and replanting of areas denuded in the past as quickly as this can economically be done."

THE LUMBER INDUSTRY

As you are aware, the lumber industry of Canada has been going full out during the war period. Demand for lumber and lumber products for war purposes in Canada and in the principal Allied nations has exceeded available supply. Production rose to an all-time peak in 1940-41. It has fallen off progressively since then due largely to man-power shortage.

On the Coast many important developments took place in the lumber industry during the war. While sawmill capacity was not expanded appreciably, substantial new investments were made in increasing the efficiency of sawmill facilities generally. Modern kilns were installed in many cases, also facilities for handling small logs efficiently with light, fast machinery.

The capacity for the production of plywood was more than doubled which means higher utilization values for a larger volume of old-growth logs suitable for peeling.

Extensive prefabrication facilities were developed both for prefabricating structural timber and for war housing projects.

Expansion also took place in box and shook factories and in the production of domestic and industrial fuel in the form of sawdust and hog fuel. The mill waste burner in the large majority of the industry has largely been eliminated.

Recent installations for the production of pulp chips from sawmill waste has further opened up important possibilities for the future.

Considerable expansion also took place during the war in pulp-mill capacity on the Coast.

As far as logging is concerned, a considerable number of new logging camps have been opened up during the war but little new logging machinery has been added to the producing units owing largely to difficulties of securing delivery. In 1943 shortages of tractors, heavy machinery and supplies, and a fall in labour efficiency, cut production by 25 per cent under the peak year of 1941.

In general, however, the lumber industry may be said to have no conversion problem, as far as plant and equipment is concerned, to turn from war production to peace-time production; at any rate, no handicaps that the release of equipment, supplies and man-power, no longer needed for the Armed Services, will not quickly correct.

The trend of direct industry employment over the war period is of interest in this connection. The peak employment in the lumber industry in 1939 was 23,871 with 832 firms reporting. In 1940 employment had increased to 25,263. In 1941 it again increased to 26,471. In 1942 it receded to 25,461. In 1942 there were 938 firms reporting, more than 100 increase over 1939, with an increase of 1,600 in employees.

PROBLEMS

The specific Post-War Forestry Problems of the Lumber Industry on the Coast might be enumerated as follows, more or less in the order of their immediate urgency:

- (1) Marketing;
- (2) Closer utilization of raw material in logging and manufacturing;
- (3) Forest Fire Protection;
- (4) Slash Disposal;
- (5) Reforestation— (a) Government Reforestation,
(b) Industrial Forestry.

1. Marketing

Manufactures—There is every indication that post-war demand for lumber and lumber products in world markets will continue for some time in excess of visible supply. In regard to softwoods, since the commencement of the present war, under the domination of Germany, the forests of Central Europe have been subject to excessive cutting. Depletion of Europe's resources generally has taken place at an accelerated rate. It is doubtful if for the first few years after the war, production in the exporting countries of Northern Europe, normally supplying exportable surpluses of around 8,000,000,000 feet a year, will much more than meet reconstruction demands at home. With the exception of Sweden, every producing country has been subject to extensive war damage and impairment of production facilities. War devastated areas in all the occupied countries will undoubtedly require much more than normal imports for reconstruction.

The indicated requirements in the United Kingdom are high. Normally 3/4 of its annual requirements of around 4,000,000,000 feet have come from Europe. For the past few years, pre-war, Canada has supplied about one-quarter. Immediate post-war supplies will have to be met partly from Northern Europe and partly from the North American continent.

Canada's share in supplying the post-war requirements of Australia, South Africa and other Empire markets, and the Orient, together with home requirements, may be expected, therefore, to tax the industry to capacity at least for the immediate post-war period and until Northern Europe, including Russia, swings back into full production for export.

Immediate post-war marketing problems of the lumber industry, therefore, will be largely to place available supplies where they will do the most good and to secure the highest returns by effecting the closest utilization possible from available raw material.

The long range problem of the marketing of the forest crop, however, should not be overlooked. The net returns from the forests depend to a large extent on intelligent marketing. More diversified and profitable markets will govern, to a large extent, the possibilities of higher utilization and greater net recovery.

The extent to which the Coast of British Columbia is dependent on export

markets has been indicated above. Roughly 70 per cent of the principal products for which the virgin timber of the forests of the Coast is best suited, that is, sawn lumber, must continue to find a market outside of Canada. Seventy per cent of the output of some 275 sawmills, 70-odd shingle mills and 200 wood-using industries, with an annual production valued at around \$80,000,000 to \$90,000,000, primarily is dependent on profitable export markets if full employment and the continued prosperity of the Coast Region is to be maintained in the future.

Trade Extension—During the ten pre-war years, from 1929 to 1939, intensive Lumber Trade Promotion work was carried on by the British Columbia Lumber and Shingle Manufacturers Association in co-operation with a group of loggers and the Department of Industries of the Provincial Government.

Under this joint aegis, special Timber Trade Commissioners were maintained in the United Kingdom, Australia, New Zealand, South Africa, the West Indies, South America and the Orient. Direct contacts were established between the actual producers in British Columbia and the overseas buyers and consumers. This was accomplished by exchange visits of delegations to and from many of these markets. As a result, on the part of the producers, extensive alterations of plant and refinements in manufacture were effected to meet buyers' requirements, and on the part of the buyer many Canadian standards were adopted.

A co-operative sales and shipping organization, wholly owned and operated by a majority of the principal producers, representing about 65 per cent of the total production of the Coast Region, has been highly successful for many years in the orderly marketing of the huge total export production of its members.

This organization, through its wholly-owned shipping subsidiary, operated some 146 ocean freighters under charter in 1939 and shipped close to 1,000,000,000 feet of lumber to overseas markets in that year.

The Shipping Problem—No factor in world trade has altered more drastically during the present war than has the character, operation and ownership of world tonnage of cargo vessels. Pre-war, reasonably adequate freight facilities were available to enable West Coast shippers to compete in most of the important world lumber markets. These freight services were provided either by way of Time or Trip Charter negotiated in a free charter market mostly through London, or on established regular British and foreign freight lines or by way of Canadian subsidized lines. Post-war, new and far-reaching shipping problems must be faced. Canada today, for the first time since the close of World War I, has a sizeable and growing merchant marine of her own.

Conceivably, however, and awaiting the outcome of world trade negotiations, no plans can be laid by the industry for an early return to private trading and free enterprise until ocean freighting conditions have crystallized.

Trade Agreements—In regard to post-war trading problems, there now appears little doubt that in the immediate post-war period the export trade of

Canada in most commodities, perhaps in all, for a time at least will move on a quota basis through official channels and under the general control of "Mutual Aid." Little if any private trading would appear possible until critical demands for food and shelter have been met, war surpluses have been adjusted, International Exchange rates have been stabilized or agreed on, and the decks cleared for Reciprocal Trade Agreements.

Canada's formal subscription of the principles of the Atlantic Charter and the more specific agreement between Canada and the United States has placed Canada definitely on the side of post-war economic development based on freer interchange of commodities. This broad change of economic policy is of vital concern to the future of the West Coast Industry.

The results of trade negotiations and trade agreements eventually to be entered into by this country with both Empire and foreign countries will profoundly influence the whole domestic economy of the West Coast Region.

Since the Imperial Economic Conference of 1932, Empire preferences have been the dominant factor in the direction and volume of the Lumber Export Trade. Where the elimination or extension of these lumber preferences is contemplated, compensating benefits for lumber in foreign markets must be provided if this Export Trade is to survive.

The West Coast of the United States will always have a surplus from Tidewater mills for waterborne export greatly in excess of British Columbia. If parity is to be accorded American exporters in Empire markets, such parity should be based on free entry of Canadian lumber into the United States. In the United Kingdom market, which pre-war took over 50 per cent of British Columbia Coast exports, lumber from North America must inevitably and at an early date meet competition from Northern Europe under the heavy handicap of a 9,000 mile haul and high wage standards. Continued recognition of this fact in the United Kingdom tariff structure or by other means is essential if any substantial share of the British timber market is to be secured by either Canada or the United States.

2. Closer Utilization of Raw Material in Logging and Manufacture

Logging Problems—The problem of securing closer utilization of raw material from logging operations is of prime importance. In this connection the experiment now being conducted on the Coast jointly by a logging company, a pulp mill and the Provincial Government, for the salvage of small material left after logging, is of particular interest and may have far-reaching possibilities.

It is perhaps too early yet to predict success, but apparently on a very ordinary site some 2,000 cubic feet per acre of material averaging about 6" in diameter and over 30' in length has been recovered at a cost of cutting, scaling and yarding in the neighbourhood of \$3.50 a cord, ready for loading on trucks.

The problem of the conversion of pulp mills from logs to the utilization of the hundreds of thousands of cords of this material available in the Coast

Region should continue to engage the earnest attention of all concerned to eventually release to the sawmills millions of feet of saw-size timber and prolong supplies of old-growth timber for the established sawmill industry.

This is a question, of course, of economics, but it would appear logical that material two or three centuries old should find its highest end use and greatest net return in the form of lumber and lumber products as in other parts of the world, while the small material which can be quickly replaced should go into pulp.

Professor R. B. Grondall, University of Washington, said at a recent Forest Conference in Seattle that the loggers and sawmill men have always had to take the brunt of public abuse because of the apparent waste in the woods and the mills, whereas the public does not see the waste that takes place in a pulp mill, mostly in the form of the waste liquors. He said that actually only about 40 per cent of the log emerges as pulp. This applies particularly, I think, to the chemical pulp mills on the West Coast, which, up to the present, have been operating on large logs which have to be broken down on large head-rigs, heavy type edgers and finally resawn to prepare the wood for the chippers with consequent heavy loss of saw kerf.

Actually, I am told, the yield, not only in quantity but quality of pulp, is much higher from second growth Hemlock and Balsam in cordwood size which can be produced, say, in 50 or 60 years, than from the old growth timber now used which is probably from 200 to 300 years old.

The use of pulpwood (cordwood) on the Coast is an economic question entirely. As long as there is no inducement by way of cheaper raw material in the form of cordwood, no change of course will be made in the present equipment and practice in the Coast pulp mills. On the other hand, it appears questionable whether the economics of this situation have not changed very materially in the last few years.

It is said that the reason the Scandinavians are so competitive in world markets, both in sawn wood goods and pulps and papers, is that the raw material is first sorted carefully for size and quality before being broken down to its highest end use, in other words, the highest net return. This, and the fact that the conversion plants diversify to a much greater extent than the industry on this continent, allows a closer utilization and better integration of the forests and wood-using industries.

In regard to the problem of closer utilization in the sawmills, the size of logs available has been decreasing progressively from year to year. Very large heavy logs are still coming into the standard sawmills but with these logs a greater percentage of small logs which cannot be handled economically on heavy head-rigs must be taken care of. This problem is being solved at some plants by the installation of fast light machinery and by sorting the logs in the mill-pond. The number of Swedish and American-type Gang Mills operating exclusively on small logs is increasing.

Many manufacturing problems must be met during the coming transition period of available supplies of raw material. The cut of Douglas Fir for

instance can be expected to progressively decline from now on, which means that many of the mills now cutting Douglas Fir must turn to Western Hemlock and Western Red Cedar. Both of these species fortunately have intrinsic merit which will make them equally acceptable in export markets when properly handled.

3. Forest Fire Protection

The forest fire problem in the Coast Region may be expected to increase rather than diminish as time goes on. Generally speaking, fire damage to virgin timber on the whole Coast Region is light, but with the increase in cut-over lands, the damage to established second growth, and even permanent damage to sites, is an increasing hazard.

Every year for the past number of years, 15,000 to 20,000 acres are burned over in the Coast Region by forest fires. Of this 3,000 to 5,000 acres of fully stocked young growth after logging is burned for the first time. The balance, 12,000 to 15,000 acres, constitutes successive burns on cut-over lands, slash fires and fires on areas not satisfactorily restocked but supporting, in the majority of cases, some second growth. This is equal to from 20 per cent to 30 per cent of the area cut over annually and is much too high a loss. Over 200 acres of new plantations have been burned over to date out of a net acreage planted of 22,452 acres. This problem must be tackled both by the Government and private operating companies.

The experience across the Border in the United States has proved conclusively that the ratio of fire costs and damage is in direct relation to the permanent and temporary fires staffs employed during the fire season for patrol, detection and control. As expenditures on intensive organization, equipment, patrol and detection are stepped up, expenditures on actual fire fighting and losses are reduced in direct ratio.

The areas covered by Ranger Districts on the Coast are obviously too large and the fire protection organization generally is badly understaffed during the peak of the fire season to handle the risks involved.

The permanent and temporary fire protection and fire patrol force in the Coast area, Government and private, including Rangers, Assistant Rangers, Patrolmen, Spark Catchers, Dispatchers and Lookouts, is about 100 men at the period of peak hazard. This means only about one man per 150,000 acres. Some 20 permanent rangers in the area of high hazard in the Southern Coast Region each cover on the average 700,000 acres.

The average cost of patrols, Government and private, on this area for the past few years has been in the neighbourhood of \$275,000 a year. The average annual fire fighting costs have been in the neighbourhood of \$165,000. Roughly, therefore, about 3c per acre is spent on fire prevention and the annual loss in terms of cut-over productive forest land is equivalent to from 20 per cent to 25 per cent of the total area cut over each year.

A network of emergency and permanent marine and land flying bases created during the war in this region would permit effective aerial patrol for detection and for quick fire control measures. Co-operation of the Do-

minion authorities as a contribution to fire protection in this region should be enlisted to establish such a service on a permanent basis.

Increased use of radio and higher mechanization of ground crews should be made available from war equipment, including bulldozers, tractors, jeeps and tank trucks. This problem should be tackled with vigour and determination and, in my opinion, a satisfactory insurable loss ratio on cut-over lands could be quickly established on a co-operative basis under the direction of Provincial authorities.

4. Slash Disposal

One of the most important problems in Coast logging is slash disposal. Considerable controversy has been carried on for years as to whether clear cutting in Coast forests should be condemned in the interest of a future crop and whether it is good or bad silvicultural practice.

The average stand now being logged is two to three centuries old. A good percentage of the trees are very large and the stands are heavy. Under present economic conditions, clear cutting has been found to be the only practical system to log out this old-growth timber. Heavy machinery is required to handle the big logs. Most of the understory and smaller trees may be downed in the process. Costs are prohibitive to handle small logs with this equipment and the high-priced crews that operate it.

Large quantities of debris, in the form of small trees, broken logs, tops, branches, are left on the ground. The quantities left are indicated by the experimental salvage operation previously referred to.

In many cases numerous dry dead trees (snags) are left standing. These, in the case of fire, become torches, in some cases throwing fire long distances.

Under present legislation, operators are arbitrarily required to burn their slash after logging as a fire protection measure under heavy penalty for non-compliance unless specifically exempted.

Without minimizing the fire hazard feature of this problem, it is the writer's opinion that insufficient study and research has been applied to this problem to secure the solution. To date I think it is obvious that silvicultural considerations have not been given sufficient weight as opposed to elimination of fire hazard.

One of the arguments in favour of broadcast burning has been that this practice favours re-establishment of Douglas Fir over other Coast species. In my opinion it has not been established that Douglas Fir is the most desirable species on all sites.

There is no evidence that slashings after logging in any way retard natural regeneration of any of the Coast species. It is a regrettable fact, however, that very serious losses to adjacent second growth through spreading of slash burning fires has accompanied the enforcement of present regulations year after year.

The Forest Branch, has, through its planned research program, acquired a pretty thorough working knowledge of the fundamentals of seed produc-

tion, seed dissemination, germination, survival of natural seedlings, artificial seeding and other factors governing natural regeneration.

Co-operative investigations have also been conducted by some of the logging companies with the Forest Branch by way of patch logging and strip logging to leave settings and secure maximum natural regeneration. An intensive full-scale research project on the slash disposal problem would appear to be urgently required in the immediate future.

5. Reforestation

Government Reforestation—The present capacity of the nurseries on the Coast is about 10,000,000 transplants per annum, sufficient to plant up about 10,000 acres a year. I believe the Government program for the past few years has been to replant about that acreage. Actually, only about 22,450 acres have been planted on the Coast to date, about 21,450 acres by the Government and a little under 1,000 acres by private logging companies.

According to the most recent inventories, there are roughly about a million acres of cut-over productive forest lands which are not satisfactorily restocked. Much of this will have to be planted, owing to the absence of natural seed sources or be subject to a long unproductive period. One-third of this cut-over barren land is owned privately and held under Crown Grants. The balance is cut-over timber Licences and Leases on Vancouver Island and the Mainland Coast, much of which has reverted to the Crown.

While this area of 1,000,000 acres roughly is only 10 per cent of the total productive forest lands on the Coast, it is the most accessible portion and on the average comprises the most productive sites. This million acres could and should be producing a mean annual increment of around 100 cubic feet or from 250 to 300 board feet per acre per year if fully stocked.

Of this million acres, 600,000 are reported to be virtually barren with no chance of restocking by natural means for many years. The planting up of this area of 600,000 acres at the rate of 10,000 acres a year, if the Government undertook to do it under their present program, would take 60 years. As long as action is delayed on this area, potential production of upwards of 300,000,000 board feet per year is lost to the community and a future supply of 15,000,000,000 to 20,000,000,000 feet of timber is denied to Coast forest industries over that period. That is the amount which could be produced if this productive forest land is put to work.

Direct expenditures reported by the Forest Branch on reforestation in 1939 totaled about \$15,000 out of total Forest Expenditures in British Columbia of \$922,000. In 1941 reforestation was approximately \$43,000 out of a total expenditure of \$1,000,000. In 1942 the total expenditures on reforestation were \$150,000 out of a total of \$1,180,000.

Total forest revenues for these years were as follows:—

1939	\$3,352,000
1941	\$4,172,000
1942	\$3,923,000

To speculate a little on the responsibility for this unsatisfactory state of conditions might not be amiss at this time. It is true that this area has been logged over in the past twenty or thirty years by the lumbermen and mostly on a clear cutting system of logging, which system, along with the operators, have been subject to considerable public criticism. Repeated fires have killed out a persistent volunteer second growth which in the main has followed logging. The return from the timber that was taken off this area produced profits for the lumbermen presumably. The wealth created by the conversion of the timber from this area was distributed throughout the community. A large percentage of it went for taxes to both the Provincial and Dominion Governments.

It is a fair guess, I think, in view of our Canadian tax system to assume that revenues, direct and indirect, to the Dominion Government might be in the ratio of ten to one to that received by the Provincial Government. The Provincial Government of British Columbia puts about \$1.00 back, roughly, for each \$3.00 or \$4.00 of direct revenue taken from the forests. The Dominion Government puts virtually nothing back directly into perpetuating this national asset.

If a direct subsidy of \$2.00 per acre per year to farmers not to grow wheat is justified, surely a Dominion Government subsidy of \$2.00 per acre for reforestation might have some justification.

Assuming an annual cut on the Coast of between 2,500,000,000 and 3,000,000,000 feet per year post-war, this will involve the clear cutting of around 75,000 to 100,000 acres per annum which will have to be reforested in addition to the 2,000,000-odd acres of old cutting. Roughly, half this old cutting is satisfactorily restocked and carries immature timber. Half is not restocked. Assuming that every effort is made on the current areas being cut over from now on to secure maximum natural regeneration and that fire protection can be improved to the point where insurable minimum of damage is done to the second growth, it would still appear discretionary to anticipate that 20,000 to 25,000 acres at least, or a quarter of the lands now being cut-over annually, will require planting or assistance by planting to insure reasonably stocked second growth.

Most of these areas again are the most valuable productive sites which will justify the necessary expenditures for planting and silvicultural treatment. Therefore, a planting program double the present one would, in all probability, just keep up with current requirements and would still leave 600,000 acres of barren potentially productive sites to be dealt with.

A minimum planting program of at least 40,000 or 50,000 acres per year involving an expenditure of \$400,000 to \$500,000 annually, would appear to be more in line with what is necessary. Nursery facilities would have to be expanded either through Government agencies or possibly by co-operative arrangement with industry similar to what is taking place in Washington and Oregon.

This would appear a tremendous load for the Provincial Government to

shoulder alone. Most of the current cutting, of course, will take place on timber Licences, Leases and Crown Grant areas. Those larger operators who have shown a desire or who may wish to undertake to manage their operations for sustained-yield should be encouraged to do so, the Government in the meantime undertaking the planting up of the old cutting.

This will involve amendments to the present legislation under the Forest Act in regard to tenure of Licences and Leases and for elimination of carrying charges during the long period of no returns until the second crop is harvested.

Private Reforestation—At the present time, approximately 30 per cent of all merchantable timber areas on the Coast Region of British Columbia are held under Provincial Timber Licences and Leases. These Licences and Leases comprise generally the better and more accessible sites and carry roughly 47 per cent of the remaining old-growth timber of the entire Coast Region. The latest inventory indicates a total stand of timber in the neighbourhood of 73,000,000,000 feet or close to 30,000 feet per acre on approximately 2,500,000 acres held under these Licences and Leases.

In a number of instances large areas are held under single ownership by operating companies. Large and diversified industries, employing many thousands of men, are based on the continuity of supply of raw material from these Licences. Heavy investments in plant and equipment for large-scale production are now being written off against the liquidation of the timber on these areas. Whole communities, in many instances, are entirely dependent on the conversion of this material for domestic use and to support large-scale exports of lumber and lumber products.

A number of these operators for some time have been very much interested in exploring the possibilities of revising their whole operating policy from total liquidation of timber and abandonment of licences to reforestation after cutting and for the establishment of second or successive crops under sustained yield management.

Under present tenure, however, Provincial Licences and Leases give only cutting rights to the holder. An annual rental plus a Forest Protection Tax of approximately \$175.00 per square mile per year, is levied as a carrying charge. When cut, the timber becomes subject to Royalty or Severance Tax. The apparent Government policy under these terms is to secure from the existing virgin stands of mature timber the highest possible return to the treasury and anticipates nothing further than the cutting of the timber. Under existing legislation, the possibilities of the holders of these licences converting to sustained yield is practically non-existent. The licence-holder's equity ceases when the original stand is cut off and there is no way under present laws that such areas can be held for forest growing purposes without a major revision of the Forest Act in respect to the tenure and terms of timber Licences and Leases.

The Government, of course, has two alternatives, the first being to repossess these timber licence lands immediately when cut over and to under-

take reforestation itself, or to protect them and trust to nature. The other alternative is to encourage private forestry and provide continuity of tenure to the operator on his cut-over Licence or Lease at least for the period of the proposed rotation and on favourable terms during the period of no returns and heavy risk.

It is quite probable that there are few contiguous areas of licences, leases or crown grants, however extensive, under one management, which present the elements of a complete natural working circle such as a complete drainage basin with natural boundaries. In most cases the holdings of large companies are somewhat scattered and may be located in more than one drainage basin or watershed with intervening fractions or blocks of other privately held or Crown owned timberlands.

On the other hand, these holdings of large companies have been or will be opened up under an integrated system of permanent improvements comprising either a network of main, branch and spur lines of standard gauge railways or a system of first-class truck roads, or a combination of both. Permanent and semi-permanent camp facilities equipped with ancillary community services along with rail terminals, dock facilities, log dumps, booming and storage grounds all are provided to take care of handling large scale production from woods or mill.

Under present conditions of tenure, these improvements of course have to be written off against the timber recovered from the original stand. With no prospect for continued use, the incentive for maintenance and upkeep ceases as soon as the original crop disappears. A very considerable economic loss is involved.

The maintenance and upkeep of main and branch line railways and roads is essential for access to establishment of a second crop under whatever agency, and would facilitate fire protection for the growing stock and avoid some future capital expenditure for harvesting the new crop. They would also provide means for recovery of any intermediate returns from improvement thinnings. Normally, bridges, culverts, and trestles quickly deteriorate without maintenance and washouts obliterate sections of the right-of-way and roads.

Conversion to sustained yield would involve a number of drastic changes in policy for the operating company. Operating costs would be increased in many directions. Measures to secure maximum natural regeneration through patch or strip cutting and the leaving of seed trees would slow up production and tie up capital and increase the capital cost of improvements.

Where planting was necessary, considerable financial burden would have to be met out of current production. Reduced to its simplest terms for appraising the various factors involved, the following is suggested as indicating minimum establishment costs and carrying charges to the end of the first rotation where planting is necessary.

It is assumed that planting costs would be about \$10 per acre. Fire protection costs per year are estimated at 10¢ per acre and management, supervision and insurance are 10¢ per acre per year. On a recovery of 40,000

feet B.M. per acre from the original stand, this would require the reinvestment for establishment of a new crop of a little over 25¢ per thousand out of profit or income from each acre logged, and in addition the carrying charges on each acre over the rotation less returns from thinnings, if any. With a yield expectancy on a 60-year rotation of 20,000 feet, board measure, (10" and over D.B.H.) per acre, or 5,000 to 6,000 cubic feet per acre, fully stocked, the future value of the above costs at 3½ per cent compound interest at the end of 60 years would be \$118.07 per acre. This indicates a stumpage value of \$5.90 per thousand or 21½¢ per cubic foot or \$1.84 per cord.

In view of the probable necessity, sooner or later, for co-operation with other operators and with the Government for the success of any such individual reforestation scheme, perhaps it may not be too visionary to suggest that the time may be ripe for those operators interested in sustained yield to form a private Forestry Association. This organization would be composed of private owners and operators along similar lines to those of private timber owners and joint stock companies in Finland and Sweden, or, in fact, along similar lines to the recent organizations in the States of Washington and Oregon. Such an organization would, of course, have to be officially recognized and probably have representation from both the Provincial and Dominion Governments in proportion to holdings and financial participation.