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Management Recommendations
for the Hemlock and Associated Forest Types
of the Juan de Fuca Region
of Southwestern Vancouver Island

by

George S. Allen



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SUMMARY

1. Two broad silvicultural types are recognized in the hemlock belt of the Juan de Fuca region: the open type consisting of cedar-hemlock, hemlock-cedar, and hemlock-cedar-balsam mixtures, characterized by low volumes per acre, heavy underbrush, light advance reproduction, and heavy slash after logging, and found in general along the lower levels or near the coast; and the dense type consisting predominantly of hemlock and/or balsam, characterized by higher volumes per acre, light underbrush, heavy advance reproduction, and lighter slash after logging, and found inland from the coast on the upper slopes.
2. Silvicultural factors indicate burning of slash in the open type in order to decrease the slash and underbrush, to allow regeneration to take place, and to destroy sparse advance reproduction which might perpetuate the open type. It is believed that much of this type can be converted to better types by slash burning.
3. Silvicultural factors do not dictate burning in the dense type, but considerations of the danger of fire to reproduction may force a policy of burning all or part of the area after logging.
4. Operations can be planned in such a way that natural regeneration may be obtained over large cutting areas. Planning involves cutting into the prevailing winds of the fall and spring, that is, cutting towards the south and the east; marginal timber should be left standing to windward within one mile of any cutover area for two to five years: Efficient fire protection is essential, for once the timber margin has been moved back, areas beyond one mile have little chance of reseeding.
5. Fire hazard to green timber in this region appears to be relatively low, but the danger to reproduction should not be underestimated. It is believed that a non-burning policy would ignore the silvicultural requirements of a considerable proportion of the region; furthermore, it would ignore the safety of established reproduction unless fire protection were of the highest order.

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RESEARCH NOTE

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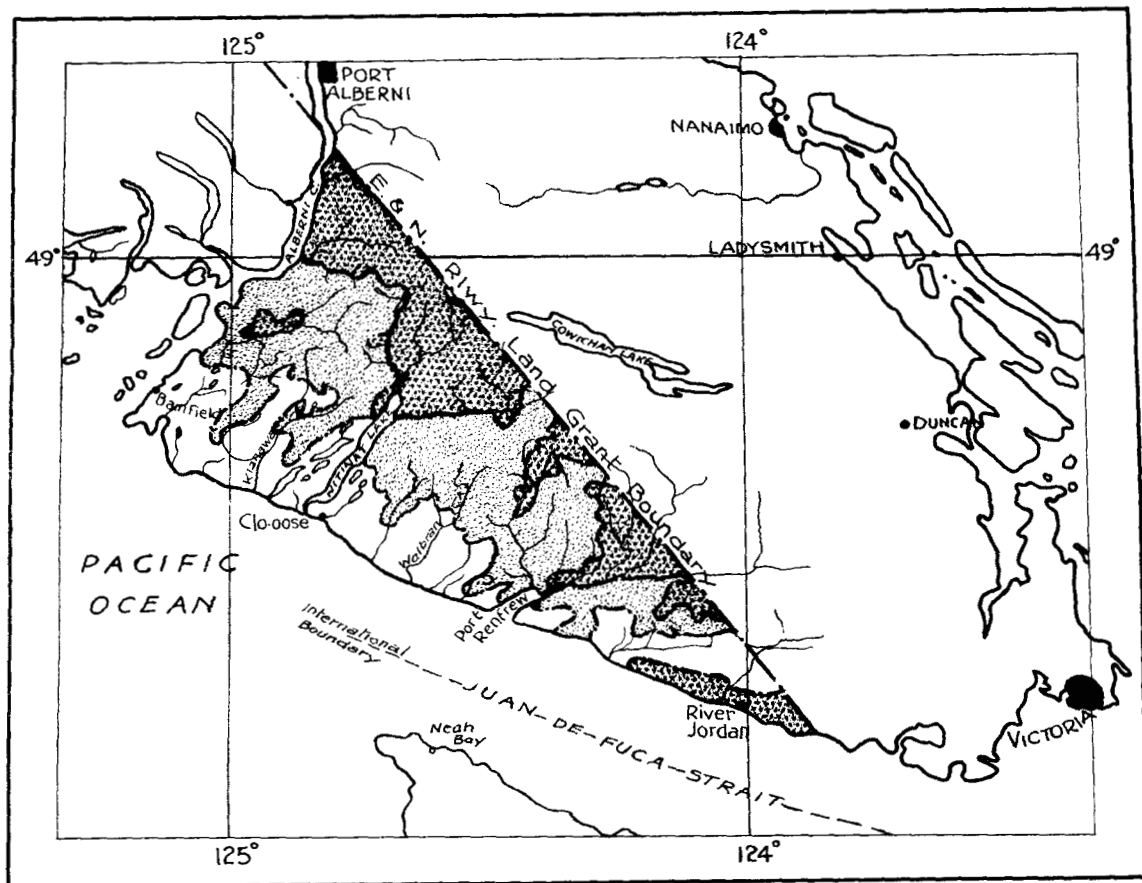
The silvicultural problems of the western hemlock types of the Pacific Coast have received relatively little attention. MacBean, in 1941, reported on his study of the cutover lands of the Quatsino region of Vancouver Island. Over 80 per cent of all logged lands were restocking satisfactorily and MacBean concluded that there existed no pressing silvicultural problems as judged by present management standards.*

In 1941 the forest survey of the Juan de Fuca region was completed and covered a large area of hemlock and associated forest types, some Douglas fir types, and some transition types between the main types. Most of the logging in this area has taken place in stands where Douglas fir or sitka spruce predominated, but several large operations are now in the transition types and approaching the main hemlock types of the region. It is certain that in the next few years a greater and greater volume of cut will come from the hemlock types as logging advances deeper into the region, and some advance planning is necessary for the proper management of this productive area.

The Region




The area under consideration is a strip some twenty miles wide paralleling the coast of Vancouver Island from Alberni Canal southeast to Port Renfrew. It is bounded on the southwest by the Pacific Ocean and the Straits of Juan de Fuca, and on the northeast

* MacBean, A. P. 1941. A study of the factors affecting the reproduction of western hemlock and its associates in the Quatsino Region, Vancouver Island, British Columbia Forest Service.



Scale: 14.3 miles to 1 inch.

FIG. 1. JUAN DE FUCA REGION.

-  Douglas Fir Types.
-  Pulp-sawlog Type.
-  Pulp-shingle-bolt Type.

by the Douglas fir types extending from the east side of Vancouver Island. Approximately the northeast boundary runs southeast from Coleman Creek on Alberni Canal, skirts the northeast end of Nitnat Lake, and ends between Port Renfrew and River Jordan where the fir and hemlock types merge.

Merchantable timber covers some 433,000 acres and the total productive forest land is about 450,000 acres. Ninety-five per cent of the merchantable timber is considered to be accessible. Fifty-eight per cent of the timbered area, and fifty-seven per cent of the merchantable timber are held by the Crown.

The Climate

Weather data are available only from points on the coast,* and may not be representative of the area as a whole.

Rainfall approximates 100 inches per year; temperatures are higher in winter and lower in summer than at Port Alberni or on eastern Vancouver Island in general.* Winds average about ten miles per hour from the southeast during September to April; and about seven miles per hour from the northwest during May to August.**

The climate, as judged by that of the coast, is thus characterized by a heavy rainfall and moderate temperatures, with winds stronger than those experienced by the eastern part of Vancouver Island.

The Forest Types

Silburn, in his forest survey of the Juan de Fuca region,*** has recognized three main types in the hemlock belt:

The pulpwood-sawlog type, consisting mainly of hemlock, hemlock-balsam, spruce, and spruce-hemlock mixtures.

* Climate of British Columbia. Report for 1941. Province of British Columbia. Department of Agriculture.

** Air Services, Meteorological Division, Department of Transport, Gonzales Observatory, Victoria, B. C.

*** Silburn, G. 1942. Juan de Fuca Region. Economics Division, B. C. Forest Service.

The pulpwood-shingle-bolt type, consisting of hemlock-cedar, hemlock-cedar-balsam, and cedar-hemlock mixtures.

The scrub type, which is not considered merchantable under present standards of utilization.



Photo: Photo-topographic Surveys.

Figure 2. Timber-covered slopes typical of the better types in the Juan de Fuca hemlock region.

There are 171,350 acres of the pulpwood-sawlog type with a total of 7,005,070 M f.b.m. merchantable volume. The Crown holds 53 per cent of this area and 55 per cent of the merchantable volume.

There are 261,370 acres of the pulpwood-shingle-bolt type with a total merchantable volume of 7,942,250 M f.b.m. The Crown owns 59 per cent of this area and 61 per cent of the merchantable volume.

Although these two merchantable types occur locally throughout the region, they are concentrated mainly into two belts as shown in Figure 1.

From the silvicultural standpoint, two general types can be recognized, corresponding approximately to the two types described above. For simplicity, the type corresponding to the pulpwood-sawlog type is termed the dense type, and that corresponding to the pulpwood-shingle-bolt type is termed the open type.

Management Types

The Dense Type

The main features of the dense type are high volumes per acre mainly of hemlock, balsam, or both; medium to heavy stand of advance reproduction of hemlock and balsam; medium to light cover of underbrush. The dense type occurs mainly on the upper slopes away from the coast and reaches the tops of many of the higher hills in the region (see Figure 2).

The Open Type.

The main features of the open type are low volumes per acre mainly of cedar, cedar-hemlock, or cedar-balsam; medium to light stand of advance reproduction of hemlock and balsam; medium to heavy cover of underbrush. The type occupies the coastal belt as a whole and reaches far inland along the Klanawa drainage and along the west side of Nitinat Lake where it touches the fir type from the east. In addition, this type is found within the dense-type belt at the lower elevations which are poorly drained or are well supplied with water, and on areas protected from storm winds. Some of the stands of this type appear to be climax; all tend to be open in character with widely spaced trees having large crowns and many limbs. Many of these stands are decadent as contrasted to the generally healthy condition of the dense type. The causes of these characteristics are not known; they probably include poor site, especially that due to poor drainage, opening up due to old age with reproduction inhibited because of very dense underbrush, and poor stocking at the time of origin due to heavy underbrush. Whatever the causes, the open type is a poorer type which may be improved by proper management, with some evidence that this may be possible. (See Figure 3.)



Figure 3. Open type along the Nitinat River flat -
typical of the lower, moister sites.

Photo: R. W. Hibberson.

Underbrush

The Dense Types

Generally speaking, underbrush is light in the dense types. Logging will damage it to an extent that it will not be a serious impediment to reproduction for several years. Given a good seed supply within a year or two of logging, the dense type should regenerate satisfactorily without need of special treatment.

The Open Types

Underbrush tends to be heavy on the open types, and although held back by logging, soon takes hold of the area. The mass of salal, salmonberry, and fern roots does not form a favorable seedbed; together with slash it may prevent reproduction completely. Data collected in the region indicate that a slash burn may remove the threat of underbrush to reproduction.

On cutover lands, of a total of 406 quadrats examined, 185 were classed as fireweed-bracken type of cover, and 221 as salal-salmonberry type. The fireweed-bracken type is usually brought about by burning; the salal-salmonberry type is made up of woody underbrush which was present in the original forest. Plots bearing the fireweed-bracken vegetation were 81 per cent stocked; plots with salal-salmonberry cover were 34 per cent stocked. Thus there is a direct correlation between the amount of reproduction and the type of cover vegetation. The type of vegetation depends in turn upon whether or not slash is burned: slash burning produces a type of herbaceous vegetation which appears to be more favorable to reproduction than does the woody underbrush typical of unburned areas.

Slash burning is indicated where underbrush is a serious factor; slash burning is necessary in much of the open type.

Advance Reproduction

The Dense Type

Advance reproduction is usually medium to heavy in the better stands, and 500 to 1000 young trees per acre is common in the dense type. Only the smaller reproduction - trees up to four or five feet tall - will survive logging without being damaged; larger trees of the sapling and pole type are scarred and badly damaged by logging,

they will not make good trees but will create a fire hazard as they blow down or die.

A good stand of advance reproduction, which has survived logging and is in good condition, may be sufficient to form the new stand; in such a case, providing that other factors are favorable, slash may be left unburned. A poorly-stocked stand of advance reproduction, however, may be more harmful than otherwise and may produce a limby, open stand of timber corresponding to the present open type. This is a real danger.

The Open Type

Advance reproduction is usually low in density with less than 500 trees per acre. Survival of a sparse stand of advance growth may perpetuate the open type and burning of slash may be justified from this standpoint alone. Furthermore, other factors may indicate burning in the open type and in most cases the factor of advance growth will not affect such a decision. From the data available, it is believed that new reproduction will produce a better type of stand than will the remnants of the advance growth; if slash is left unburned, it is not likely that new seedlings can complete the stocking because of the underbrush and slash factors.

Underbrush and advance-reproduction factors both indicate burning of slash in the open type.

Slash

The Dense Type

Many of the stands of the dense type are even-aged and the stems are clean and tall, ideal for close utilization associated with pulp operations. It is to be expected that slash will be relatively low on the better types, particularly with skidder logging. Slash will probably not be a serious factor insofar as natural reproduction is concerned and slash disposal will depend mainly upon the fire hazard of the local operation rather than upon the silvicultural effects of slash.

The Open Type

Trees in the open type are often limby, of poor form, and with large crowns. Slash will tend to be heavy, particularly in the poorer stands. Utilization will be relatively poor. Heavy slash will

have two important effects: it will produce a dangerous fire hazard and it will hinder or prevent natural reproduction. When associated with heavy underbrush, heavy slash becomes a decided silvicultural factor which must be removed.

Slash burning reduces the slash considerably; it changes the vegetation from harmful climax shrubs to less harmful, herbaceous, pioneer species; burning may be necessary in order to destroy poor advance growth which has survived logging.

Fire Hazard

Fire hazard in the fog belt is considered to be low and this may be true of the coastal area; it may not be true of the inland part of this region about which there is no information. At Neah Bay, Washington, which lies in the fog belt of the Olympic Peninsula, a fire occurred in July, 1937, which covered 2600 acres of cutover land. The weather records taken at the coast gave no indication of fire weather, but the fire started some four miles inland and ran out of control. The same fire did not run into green timber but it did destroy reproduction completely. Fire hazard to standing timber may be low in the Juan de Fuca region, but the hazard to slash and reproduction may be so great that it must be eliminated as far as possible, particularly away from the coast.

The Dense Type

If these remarks represent even an approximation of the truth, then fire hazard in the dense type may well be such that slash disposal will be necessary. The type is situated inland, away from the major effects of the coast fog, and it occurs on the upper slopes of a broken country characterized by high winds. It will be logged by skidder to a considerable extent and large contiguous areas of slash will be created. Slash burning, either partial or complete, may be necessary to prevent destruction of reproduction by unplanned fires. Such fires could be disastrous to permanent management plans since seed must come from marginal timber and the marginal timber will be continually receding. By careful planning, reproduction can be secured but it must be completely protected. Planned slash burns should cover relatively small areas each year, should be more beneficial than harmful to reproduction as a whole, and should render protection much simpler.

The Open Type

Fire hazard in the open type is increased by the heavy slash to be expected but decreased by the effects of fog near the coast. However, much of the type lies some distance from the coast and similar arguments hold as with the dense type. Predominating factors in this type, however, are silvicultural, and all point towards slash burning as a policy.

Reproduction

Very few cutover areas in this region are available as a guide to reproduction behavior. Two areas recently logged, one at Poetts Nook on Alberni Canal, and one at the head of Nitinat Lake, were examined in some detail. On both areas, sites logged and burned were 77 per cent stocked, sites logged only were 28 per cent stocked.* Burned plots averaged about 2000 trees per acre, unburned plots about 350 per acre. Areas left unburned will probably produce typical open types; burned areas have a good chance of producing dense types. Therefore it would appear that the type of forest obtained during the second rotation will be determined to a considerable extent by the treatment received after logging.

Management Recommendations

Rational forest practice requires a solid foundation of experience, research, and detailed knowledge of the region and forest types to be managed. Since all three prerequisites are lacking to a great extent, management recommendations can be regarded only as strictly tentative and of a very general nature. They may form a basis for initial management to be replaced or improved in the light of increased knowledge.

Permanent forest management depends to a very great extent upon the attainment of good regeneration after logging. The hemlock region is one of the best growing sites in British Columbia for the

* Stocking figures are based upon a stocked-quadrat method. Plots were 4-milacres in size; 4 seedlings and over per quadrat are considered fully stocked, 3 seedlings as 75 per cent stocked, and so on. Thus, a fully-stocked area would have at least 1000 established seedlings per acre well-distributed.

sustained production of pulp and sawlog forests. It has the advantage of a relatively low fire hazard; high winds during the fall and spring make possible satisfactory dispersal of seed over large cutting areas; hemlock seed is carried farther by wind than are most coniferous seeds and is produced more frequently than the seed of other conifers such as Douglas fir. The moist climate is conducive to good germination of hemlock seed; moist summers with moderate temperatures should lead to good survival of seedlings; and the seed is not subject to rodent attack as is the seed of Douglas fir. The natural factors of climate and species are favorable to natural reproduction; induced factors brought about by logging and subsequent treatment may or may not be favorable depending upon the soundness of the management policy.

Treatment of the Open Type

The main factors affecting natural reproduction and the quality of the new stand - underbrush, advance reproduction, slash density, and fire hazard - all indicate that slash should be burned. Unburned slash will probably perpetuate the open type: reproduction is sparse, the surviving advance growth tends to develop into wolf trees, underbrush is heavy and excludes reproduction to a great extent, and slash is heavy, tending to exclude reproduction and create a fire hazard. Proper, planned slash disposal followed by good protection and fire prevention, should convert much of this type to the dense type of much higher value. (See Figures 4 and 5.)

Treatment of the Dense Type

The dense type does not present the same picture. Fire hazard is probably the main factor to be considered; advance reproduction may be worth saving on some areas and underbrush is relatively unimportant in its effect upon regeneration. The slash disposal policy should be based upon protection of reproduction. If unplanned fires cannot be completely prevented, some form of slash burning is necessary. Large areas of slash will accumulate, marginal timber for seeding the cut-over land will be moved farther and farther back, and unplanned fires will sweep over large areas, destroying reproduction, and, still more important, rendering improbable the regeneration of these fire-swept areas.

Planning for Natural Reproduction

Regeneration on the large cutting areas created by skidder and by high-lead logging can be obtained by taking full advantage of the prevailing winds during the period of seedfall. Wherever possible, operations should advance into the wind, that is, towards the south and the east; good seed dispersal up to distances of one mile or more



Photo: Photo-topographic Surveys.

Figure 4. View of the coast near the mouth of Nitinat Lake. Most of this timber is the pulp-shingle-bolt type. Areas outlined, however, bear thrifty young hemlock stands which originated from windfall in the decadent cedar-hemlock type. In this case a conversion by nature from open to dense type has been effected. Figure 5 shows the nature of these second-growth stands.



Photo: G. Silburn.

Figure 5. Second-growth, pure hemlock resulting from windthrow in the poorer, open type near the coast. Such stands generally occur on the more exposed, better-drained locations.

north and west of marginal timber can be expected. If operations are planned so that marginal timber within one mile to windward of any cut-over area is left standing for two to five years, regeneration should take care of itself.

Fire Protection

Sustained forest production depends upon adequate regeneration after logging; furthermore, it depends upon good protection of that regeneration. Good reproduction can be converted into a sparse stand of wolf trees by unplanned fire - potential dense types may be accidentally converted to open types of far less value. Management of the hemlock region must be based upon a sound fire-protection basis.

Fire prevention is mainly a silvicultural measure in the Juan de Fuca hemlock region. Fire prevention is most easily obtained by burning slash, which in turn, is necessary for the proper regeneration of the open type. Slash burning in the open type serves two important purposes: to aid natural regeneration after logging, and to protect that regeneration from fire. In the dense type as a whole, slash burning will serve one purpose: to protect natural reproduction; in some cases it may serve the second purpose by destroying sparse advance reproduction and holding back the underbrush for several years.

Management recommendations for the hemlock belt can be summed up as "slash burning where silvicultural and protection factors dictate, intensive fire prevention, and planned operations." It is believed that such a policy, improved or modified in the light of increased experience, research and knowledge, can form the basis for sustained forest production in this valuable region.

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