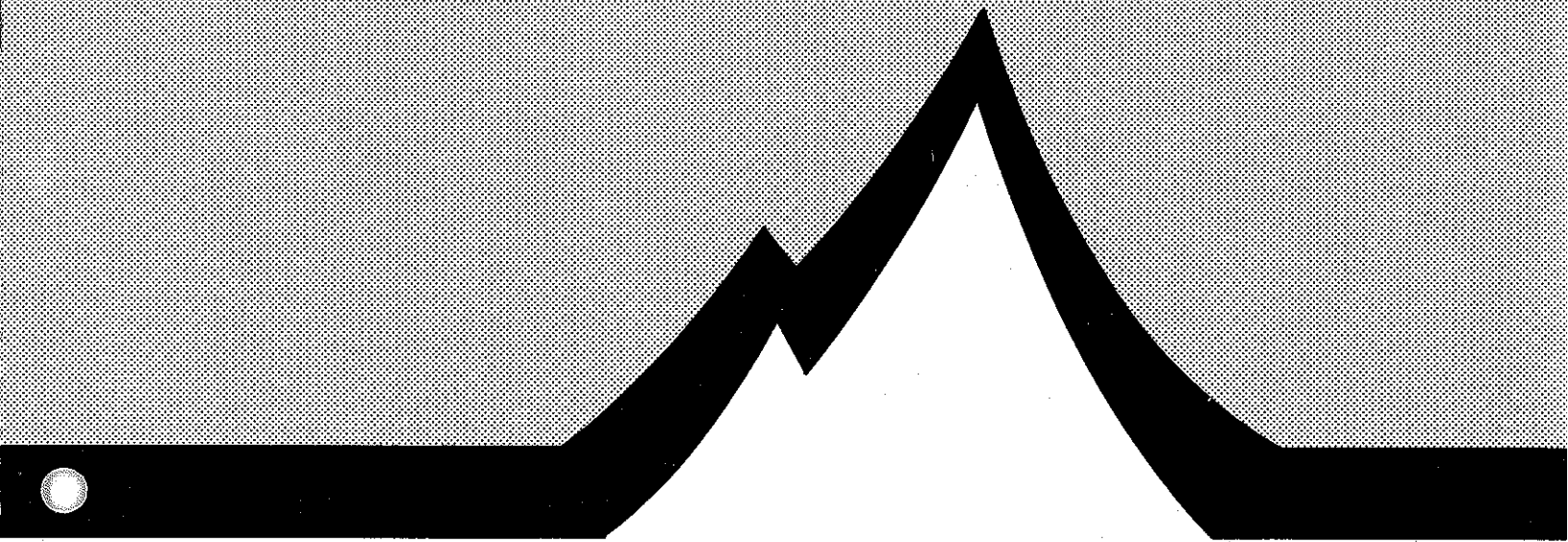


HIGH ELEVATION REFORESTATION PROBLEMS

IN THE VANCOUVER FOREST DISTRICT



INTERIM RESEARCH RESULTS NO. 1

Foreword

In November, 1973 a task force was organized by the Reforestation Board of the Tree Farm Forestry Committee to identify research needs associated with high elevation reforestation problems in the Vancouver Forest District. This task force prepared recommendations which were then acted upon by a working group consisting of the chairman of the Reforestation Board and members of the Canadian Forestry Service (PFRS) and the Research Division (BCFS).

The following interim progress report was prepared by the working group for 2 reasons:

(1) To inform potential users of the progress that has been attained.

(2) To explore ways and means of improving bilateral communication between researchers and users in the field.

The working group would appreciate any comments relating to the projects reported herein, or suggestions regarding additional research proposals which the reader may consider worthwhile. Such communications should be directed to the Chairman of the Reforestation Board, Pacific Logging Ltd., 468 Belleville St., Victoria.

Some of the progress statements presented here arise from closely associated projects being conducted in other Forest Districts. They are included here because the approach to the problem and the methodology are pertinent to Vancouver District problems. Some of the projects were initiated before the task force was formed.

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AMABILIS FIR ADVANCE REGENERATION.

L. Herring, Research Division, British Columbia Forest Service and Dr. D. Etheridge, Pacific Forest Research Centre, Canadian Forestry Service combined their talents to study the decay status and growth responses of advance amabilis fir regeneration following clearcutting. RESULTS OF THIS SUMMER'S WORK INDICATE A VERY LOW DECAY THREAT FROM INDIAN PAINT FUNGUS IN ADVANCE REGENERATION UP TO 30 YEARS AFTER LOGGING IN A PORTION OF THE VANCOUVER FOREST DISTRICT. The risk of decay by this fungus is much less than anticipated due to inherent characteristics of amabilis fir.

Growth data from 5 sites in the southern portion of the Vancouver Forest District indicated that long-suppressed amabilis fir can respond promptly after logging, and grow at an accelerated rate. Diameter growth after logging is sufficiently rapid to effectively seal most of the stem wounds incurred by logging. Consequently decay by wound parasites is infrequent, being confined to bigger trees where large wounds remain exposed for a considerable time after logging damage.

The data will be analysed to determine the effects of age, height, competition, and site upon growth response and health. Plans are underway to extend sampling to other parts of the Vancouver Forest District before recommendations will be made concerning management of high elevation forests.

Research Division, B.C.F.S. EP 745 P.F.R.C. Project 36-255

NATURAL REGENERATION ASSESSMENT AT HIGH ELEVATIONS.

J. Gilmour, L. Herring, C. Johnson, P. Robson, M. Waring, B.C.F.S. and M. Crown, C.F.S. tested three regeneration survey methods on logged-over areas at six locations in the Vancouver Forest District. Their objective was to develop survey methods for assessing the natural regeneration potential of species at high elevations. The three survey methods tested were: 1) The 'standard' 4 mil/acre plot; 2) An exploded 4 mil/acre in which each 1 mil/acre quadrat was ± 12 ft. from the other and 3) A continuous line plot system using 1 mil/acre circular plots at ± 24 ft. intervals on the line. It was agreed that

the 'standard' procedure for collecting data on operational regeneration surveys was not sufficiently detailed for assessing the natural regeneration potential of high-elevation species. ALL FAVOURED THE THIRD METHOD AS BEING THE ONE MOST LIKELY TO GIVE OPERATIONAL EFFICIENCY, ACCURACY AND A GOOD BASIS FOR MAPPING.

The three survey methods will be thoroughly tested against a variety of population distributions and stocking levels generated by a computer.

The ultimate objective in this work is to develop criteria for operational use in selecting the most appropriate course of action and to determine how logging methods may have to be modified to achieve the regeneration objective.

P.F.R.C. Project 36-256 Research Division, B.C.F.S. E.P. 745.03

SEED PRODUCTION CAPABILITIES OF HIGH ELEVATION CONIFERS.

Research was conducted on 3 projects by Dr. J. Owens, under contract with the Research Division, B.C.F.S. Dr. Owens continued with a project started in 1973, in which cones were hormonally induced on 1-0 seedlings and transplanted wildlings of yellow cedar. He found that considerable abortion occurred around the time of pollination on trees bearing a prolific crop. The remaining cones are showing normal embryo development. Observations will continue in 1975, since embryo development requires 2 years in yellow cedar. THESE RESULTS ARE VERY ENCOURAGING, AND GIBERELLIN STIMULATION MAY WELL OFFER A PRACTICAL METHOD OF PRODUCING CONES IN YELLOW CEDAR SEED ORCHARDS AT A COST WELL BELOW THAT INCURRED FOR WILD STAND COLLECTIONS.

A second project was aimed at experimentally determining the optimum number of hormone treatments required to induce cones; and to determine the effect of drought and daylength on sexuality of induced cones in both yellow cedar and mountain hemlock. In yellow cedar the control trees and those under drought treatment produced no cones, whereas all hormone-treated trees produced cones. Hormone-treated trees under long days produced 8 times as many pollen cones and 4 times as many seed cones as those under short days. Larger trees produced more cones and required fewer hormonal treatments. All treatments failed to produce cones on mountain hemlock.

A third project involved the study of cone initiation and

seed development of mountain hemlock in 2 mature stands at 3580 feet elevation on Mt. Seymour and at 3500 feet elevation on Green Mountain. The study was hampered by an almost complete failure in pollen cone production, probably due to cool, wet weather in the early part of the growing season. It was observed that seed cone buds are formed in July and that pollen cone buds differentiate before seed cone buds. Also, that cone buds of both sexes produced in spring are well developed in the fall, and resume development the following March. Pollen is fully developed by mid-June and seed cones are receptive for about 1 week with fertilization occurring about the first of July. Seed cones were fully developed by September, and seed dispersal commenced at the end of October, with only 55% of the seed being filled.

Research Division, B.C.F.S. E.P.'s 738, 739

IMPROVED ARTIFICIAL REGENERATION METHODS.

During the 1974 growing season, J. Arnott, C.F.S. developed preliminary cultural guidelines for producing six high-elevation tree species in a styroblock container nursery. These were: Douglas-fir, noble fir, amabilis fir, mountain hemlock, western white pine and yellow cedar. ALL BUT THE YELLOW CEDAR WERE SUCCESSFULLY GROWN TO OUTPLANTING STANDARDS IN A 26-WEEK PERIOD.

Lack of adequate information on correct stratification procedures for yellow cedar was the reason for failure with sporadic germination occurring throughout the 26-week period and beyond.

All other species were grown in a shelterhouse under various artificial lighting treatments; a) constant 18 hr. day b) several combinations of interrupted darkness and c) natural day lengths. The best height growth was obtained by the interrupted darkness treatment for all species except Douglas fir.

The Douglas-fir, mountain hemlock and western white pine grown in these cultural experiments were outplanted at high elevation test sites (3000 ft.) near Lake Cowichan. Further work is planned for next year.

P.F.R.C. Project 36-257

PROPAGATION OF YELLOW CEDAR.

Production of yellow cedar reforestation stock, from both seeds and rooted cuttings was studied by Dr. D.G.W. Edwards, C.F.S. Germination experiments have revealed that yellow cedar seeds respond well to compound (i.e. warm and cold) stratification procedures. The duration of the treatment remains lengthy (up to 6 months) but 75% GERMINATION HAS BEEN OBTAINED WITHIN ONE MONTH AFTER SOWING.

Five hundred cuttings were taken in mid-March from 13 seedlings 2 to 3 years old. Following treatment with IBA hormone the cuttings were planted in Styro-2 cavities containing a 2:1:1 mix of sand, peat and perlite and placed in a warm greenhouse. After 2 months, an average of 46% of the cuttings had rooted; rooting ability varied between 9% and 89%. After 3 months, 68% had rooted (varying 20% to 98%). Low rooting ability in some seedlings could be attributed to too strong a hormone treatment that "burned" the cuttings. In October, i.e. after 8 months, height of the rooted plants varied between 5 and 27 cms., with average of 10 cms.

Closely related rooting trials were conducted by I. Karlsson, Research Division, B.C.F.S. on 800 cuttings from 13 provenances of yellow cedar required for a breeding arboretum at Cowichan Lake Experiment Station. Cuttings from 3 to 10 year old trees were treated on January 8 with 'Rootone' and placed in Styro-8 cavities in a 1:1:1 mix of peat, sand and vermiculite. The cuttings were kept in a greenhouse just above freezing until February 25, and at 16°C thereafter. By April, 91% of the cuttings had rooted, and were transplanted in larger containers. The cuttings were moved outdoors in July. BY SEPTEMBER, 89% OF THE ROOTED CUTTINGS HAD ACHIEVED A ROOT/SHOOT RATIO CONSIDERED SATISFACTORY FOR PRODUCTION PLANTING.

P.F.R.C. Project 18-247. Research Division, B.C.F.S. E.P. 750

LODGEPOLE PINE PROVENANCE TESTS AT HIGH ELEVATIONS.

An extensive lodgepole pine provenance experiment was launched in 1967 by K. Illingworth, Research Division, B.C.F.S. While primary emphasis is being placed upon testing many provenances throughout the interior of the province (over 60 test sites already established) there is some interest in the use of lodgepole pine on sites with severe limitations in coastal forests.

Two test sites involving 45 provenances were established at high elevations near Boston Bar in 1972. First year survival averaged 98 percent. Height and survival data were obtained in 1974 and await analysis.

Research Division, B.C.F.S. E.P. 657

DOUGLAS FIR PROVENANCE TESTS AT HIGH ELEVATIONS.

Since 1968, Douglas fir provenance trials have been established on over 100 hectares distributed throughout south western British Columbia. Eight of these trials (25 hectares) were established at high elevations. Of these, 4 were established in 1974 by K. Illingworth, Research Division, B.C.F.S., to compare 4 selected interior provenances against 3 high elevation coastal provenances.

None of these plantations is old enough to yield reliable data, however, initial results at 6 years of age suggest that MUCH VARIABILITY MAY EXIST AMONG SEED SOURCES FROM WITHIN A SINGLE SEED ZONE. Some provenances perform consistently well at all test sites, some are always poor, and some perform well in one environment and poorly at another.

Research Division, B.C.F.S. E.P. 599

SOIL AND VEGETATION STUDY IN S.E. BRITISH COLUMBIA.

G. Utzig and K. Jones, Research Division, B.C.F.S. conducted both extensive and intensive investigations of soil and vegetation in 2 localities: Templeton River in the Windermere PSYU, and Grassy Creek in the Salmo PSYU. After pretyping of landforms on 1:63,360 air photos, the soils and vegetation types were mapped on 1:15,840 air photos. This was followed by ground surveys during which the soil units were identified and described, and their distributions established. All soil units were sampled for laboratory analysis, and each major parent material was sampled for determinations of engineering properties. Vegetation mapping units were also sampled, and a complete species list along with coverage estimates was prepared for each stratum.

Vegetation data are being coded and processed through formal routines applying a dissimilarity analysis technique.

Detailed grid network sampling was conducted in 2 contrasting forest types to test a method of studying the relationship between soil, vegetation, and stand productivity.

INTERPRETATION TABLES WILL BE PREPARED FOR EACH MAPPING UNIT, AND WILL INCLUDE THE FOLLOWING: MASS SOIL MOVEMENT; WATER BORNE EROSION; SOIL COMPACTION; HYDROLOGIC CHARACTERISTICS; NUTRIENT SUPPLY AND AVAILABILITY. Vegetation data will be applied to develop silvicultural, wildlife and recreational interpretations.

Research Division, B.C.F.S. E.P. 735-01

DEVELOPMENT OF MAPPING UNITS FOR HIGH ELEVATION LAND MANAGEMENT PRACTICES.

Dr. N. Keser, Research Division, B.C.F.S. is working on the development of mapping units for intensive forest management practices. In 1974 considerable work was conducted at high elevations in the Dewdney P.S.Y.U. in collaboration with the Inventory Division. Emphasis was placed upon defining limitations of mapping units in terms of forest harvesting practices, and post-logging problems affecting all resources.

Research Division, B.C.F.S. E.P. 733

ASSESSMENT OF LOGGING DISTURBANCE.

As part of the Interior Steep Slopes Logging Systems Study, Dr. R. Smith, C.F.S., conducted a survey to determine trends in the amount of significant damage and rates of vegetative recovery for ground skidding and cable logging methods. Areas included in the survey were Shelter Bay, New Denver, Slocan, Nelson, Creston, Canal Flats and Golden. Age of cutover varied from 1 - 12 years; slopes from 31-80 percent and elevations from 3,000 to 6,250 ft. Transects were run in the Douglas-fir, western hemlock and Engelmann spruce - Subalpine fir biogeoclimatic zones.

Disturbance by roads was about twice as extensive after summer ground skidding compared to a similar winter operation, most of the disturbance being created by skid roads rather than main haul roads. THE LEAST AMOUNT OF ROAD DISTURBANCE RESULTED FROM HIGH LEAD LOGGING AND MUCH OF THIS WAS ASSOCIATED WITH THE MAIN ROADS. In between road disturbance was low on unburned areas but was frequently encountered on burned sites, particularly those where fire had completely removed the organic surface layer.

Data analysis is continuing and further surveys are planned for high lead areas not slash burned and for geographic areas not sampled in 1974.

P.F.R.C. Project 25-253

ECONOMIC EVALUATION OF ENVIRONMENTAL PROTECTION CONSTRAINTS AND REGULATIONS.

H. Benskin under contract with the Research Division, B.C.F.S. is evaluating financial costs and benefits in relation to two sets of logging guidelines as they apply to high elevation forests in coastal British Columbia. (the 1972 Coast logging guidelines and the 1973 'severe site' guidelines). The study is being conducted in two sample drainages in the Chilliwack Provincial Forest. Costs and benefits relative to these guidelines are being considered on a cash-flow basis for the harvest period of the existing crop and for the successor crop, and discounted to the present for comparison.

Preliminary results indicate the considerable costs associated with increased road construction early in the harvesting sequence, holding large blocks of deferred timber, and with increased road maintenance and reconstruction. THESE COSTS TEND TO BE VERY LARGE WHEN COMPARED TO RELATIVELY MINOR BENEFITS OF IMPROVED REGENERATION PERFORMANCE AND A RELATIVELY SHORTER ROTATION PERIOD THAN WOULD OTHERWISE BE POSSIBLE. Indirect benefits of recreation, fisheries and wildlife will also be assessed.

The guidelines will be also analysed on a qualitative basis and specific problems of flexibility, utilization standards, 'Environmental Protection Forests', regeneration and logging technique will be discussed.

Research Division, B.C.F.S. E.P. 744

ENVIRONMENTAL COSTS IN LOGGING ROAD DESIGN AND CONSTRUCTION.

The Wilson Creek Forest Road project built during 1972 to 1974 in the Nelson Forest District was used as a case study by J. Ottens, C.F.S., to examine THE RECORDING, MAGNITUDE AND DISTRIBUTION AMONG DESIGN AND CONSTRUCTION TASKS OF THE COSTS INCURRED TO COMPLY WITH A SET OF ENVIRONMENTAL ROAD BUILDING CONSTRAINTS. The existing cost accounting system of the B.C. Forest Service Engineering Division was modified and expanded to compile the damage prevention cost.

Although this study was not carried out at a high elevation logging operation, it is felt that the results maybe have some application for upper slope road construction in the Vancouver Forest District.

Further work is being considered for the Carnation Creek study area. Efforts will be made to review all new work done on improved construction and design of road systems, particularly that completed by the industry.

P.F.R.C. Project 05-219

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