

INFORMATION
FORESTRY

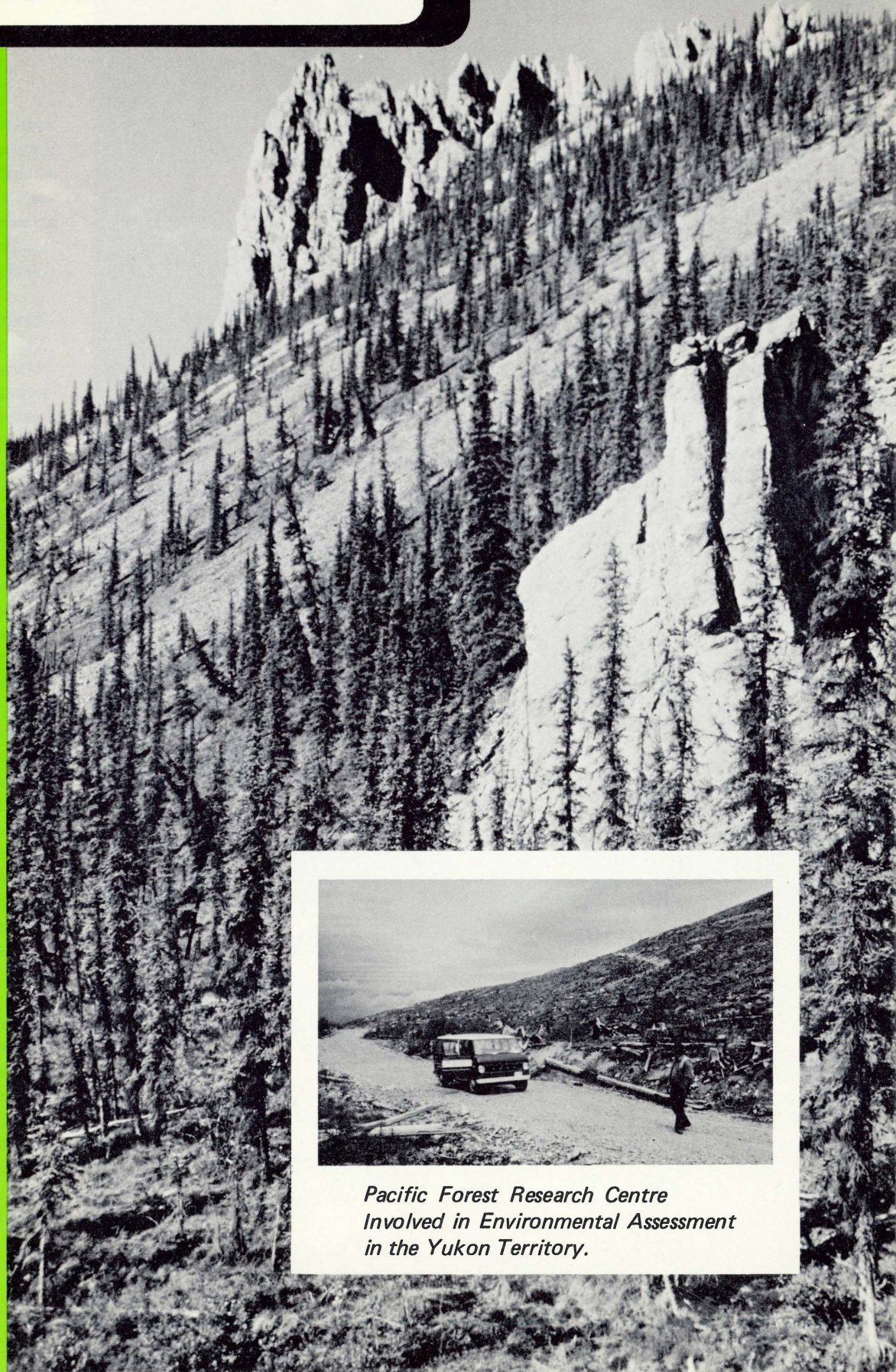


Environment
Canada

Environnement
Canada

Forestry
Service

Service
des Forêts



*Pacific Forest Research Centre
Involved in Environmental Assessment
in the Yukon Territory.*

Canadian Forestry Service
Pacific Forest Research Centre
506 W. Burnside Rd.
Victoria, B.C.
V8Z 1M5.

Vol. 6 No. 1
Spring 1979



Carnation Creek is a small salmonid stream on the west coast of Vancouver Island near Bamfield. Its watershed is the site of a major inter-agency study of the effects of logging on coastal streams and the fisheries resource. More specifically, the overall objectives of the project are to:

- improve understanding of undisturbed rain forest salmonid stream ecosystems;
- measure and explain the impacts of forest management practices (e.g., harvesting, road construction) on this stream ecosystem and its capacity to produce salmonid fishes;
- collect a solid inventory of facts on which to base guidelines for the many uses of watersheds.

A major feature of the Carnation Creek project, which sets it apart from many of the experimental watershed studies in North America, is the emphasis on stream biological processes and the attempt to answer the ultimate question of the significance of changes to the ecosystem caused by logging.

The watershed drains about 10 sq km and is characterized by old growth forest, chiefly hemlock and amabilis fir, high rainfall (260-350 cm) and rapid runoff from shallow, coarse-textured colluvial soils covering steep slopes. It is considered typical of western Vancouver Island and the coastal mainland of British Columbia. The creek produces coho and chum salmon, steelhead and cutthroat trout and two species of sculpins.

AGENCIES INVOLVED

The project was initiated in 1970 by the Federal Fisheries and

CARNATION CREEK

Experimental Watershed Project

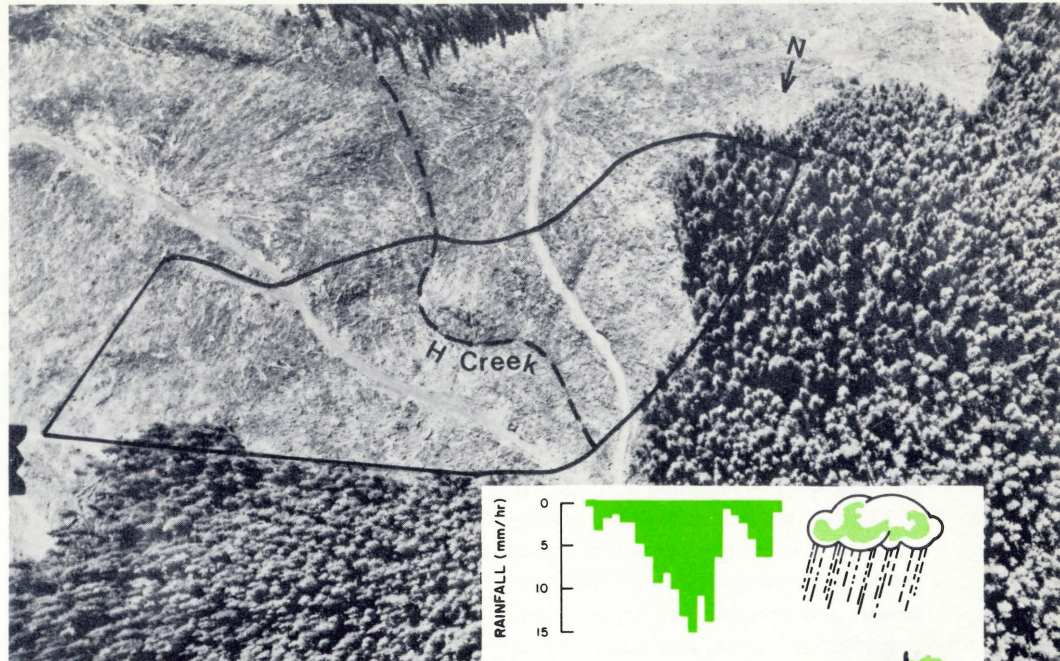
Marine Service and is now past the halfway point. Logging activity commenced in 1975 and will continue until 1981, after which 3 years of post-logging study is planned. The project is comprised of a number of separate but interacting component studies carried out by different agencies, including the Resource Services Branch of the Federal Fisheries and Marine Service, Canadian Forestry Service, Water Survey of Canada, British Columbia Ministry of Forests and MacMillan Bloedel Limited.

COMPONENT STUDIES

Pacific Forest Research Centre has been involved in four component studies: mountain slope hydrology by E.D. Hetherington (on-going), soil and vegetation classification survey by E.T. Oswald (completed 1974), plus establishment and monitoring of revegetation plots by R.K. King, and an economic analysis of road building and environmental protection by J. Ottens and J. Rudd (completed 1975). Component studies by other agencies include logging operations, soil disturbance surveys, meteorology and stream hydrology, hydrological modelling, dissolved and suspended solids, bedload, stream morphology, algae, leaf-litter and detritus, aquatic insects and fish.

To monitor basic hydrology, the watershed has been equipped with 5 hydrological weirs to measure streamflow, precipitation gauges at 9 sites, plus auxiliary meteorological instruments. Additional facilities include a cable car for sediment and discharge measurements during high flows, a fish enumeration fence and a permanent field camp.

Aerial view of H-watershed slope hydrology study area.

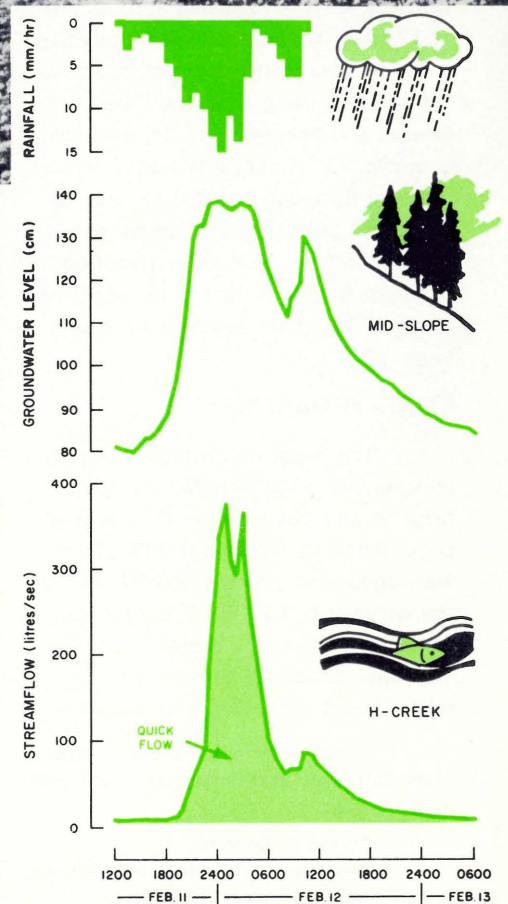


SLOPE HYDROLOGY STUDY

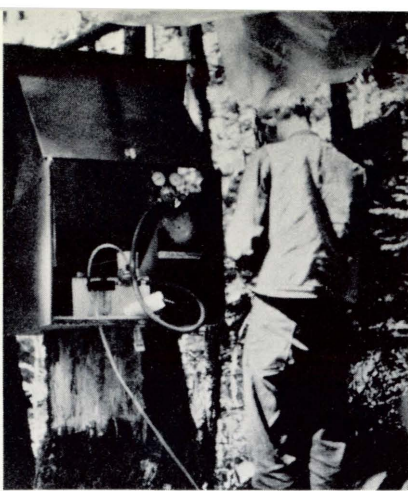
Dr. Hetherington's mountain slope hydrology study is designed to identify the nature, magnitude and causes of changes in sub-surface water regimes following harvesting and road construction. This information will be used to help explain any observed changes in runoff and streamflow patterns and point the way to procedures for avoiding or minimizing detrimental impacts on soil and water resources. It provides an important cause-effect linkage between aquatic studies and up-slope logging operations.

DATA COLLECTION

The 12 hectare watershed of H-Creek, a tributary in the headwaters area of the Carnation Creek drainage,



Graph shows rapid runoff response of H-watershed. 58% of rain appeared as stream flow within 39 hours (quick flow).



PFRC-constructed nitrogen gas bubbler recorder measures ground water levels.

is the focus of the year-round slope hydrology study. The major emphasis is on groundwater response to storm rainfall—the maximum height, rates of rise and decline of the water table on different portions of the slope. A network of piezometers (small diameter tubes) has been installed at over 40 sites to monitor groundwater levels in H-watershed and adjacent control areas. Readings are taken manually at all sites and are also recorded automatically at 17 sites. Variations in soil moisture levels are also being measured at a number of sites, using electrical resistance sensors and tensiometers. In addition, precipitation, streamflow, and watershed physical data will be used to develop relationships between soil water behavior, rain storm, site and streamflow characteristics as a means of detecting changes in runoff patterns following logging.

STUDY PROGRESS

The slope hydrology study in H-watershed was initiated in 1975, prior to any disturbance. Roads were constructed in 1976, and 90% of the watershed was clearcut logged during the winter of 1977-78. The first year of post-logging study is now underway. The data collected already are presently being processed and analyzed.

Further information on other aspects of the Carnation Creek Project can be obtained by writing to:

Dr. P.E.K. Symons,
Coordinator, Carnation Creek Project,
Pacific Biological Station,
Fisheries and Marine Service,
Box 100,
NANAIMO, B.C. V9R 5K6.



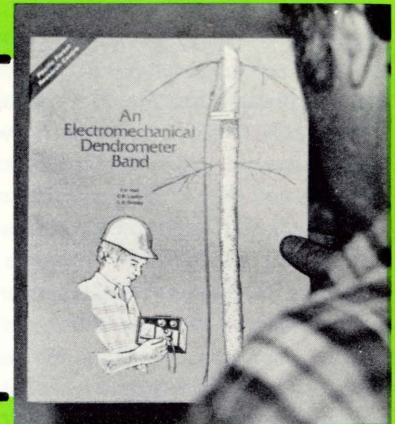
Copies of these publications may be obtained by completing the enclosed card and returning it to the Information Office.

BC-X-184

AN ELECTROMECHANICAL DENDROMETER BAND

by T.H. Hall, C.R. Layton and
L.D. Oxtoby

Used in tree physiology studies, this device is described and evaluated.

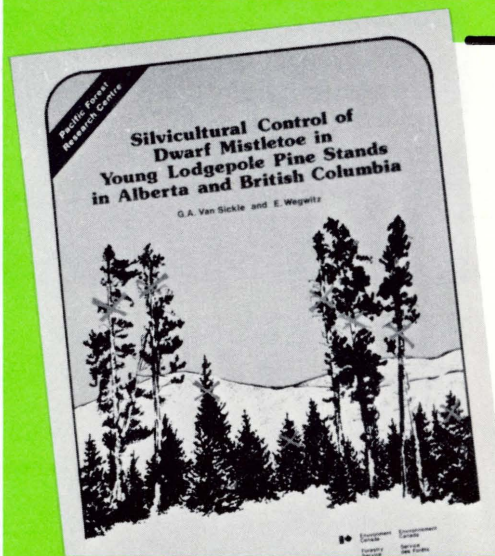


BC-X-180

SILVICULTURAL CONTROL OF DWARF MISTLETOE IN YOUNG LODGEPOLE PINE STANDS IN ALBERTA AND BRITISH COLUMBIA

by G.A. Van Sickle and
E. Wegwitz

Results of silvicultural treatments as a method of preventing or reducing the intensification of dwarf mistletoe are evaluated.



BC-X-182

EVALUATION OF LANDSAT DATA FOR FOREST PEST DETECTION AND DAMAGE APPRAISAL SURVEYS IN BRITISH COLUMBIA

by J.W.E. Harris,
A. Dawson, &
D. Goodenough

LANDSAT data provide, among other things, a compact overview of forest types for planning of more intensive pest surveys.

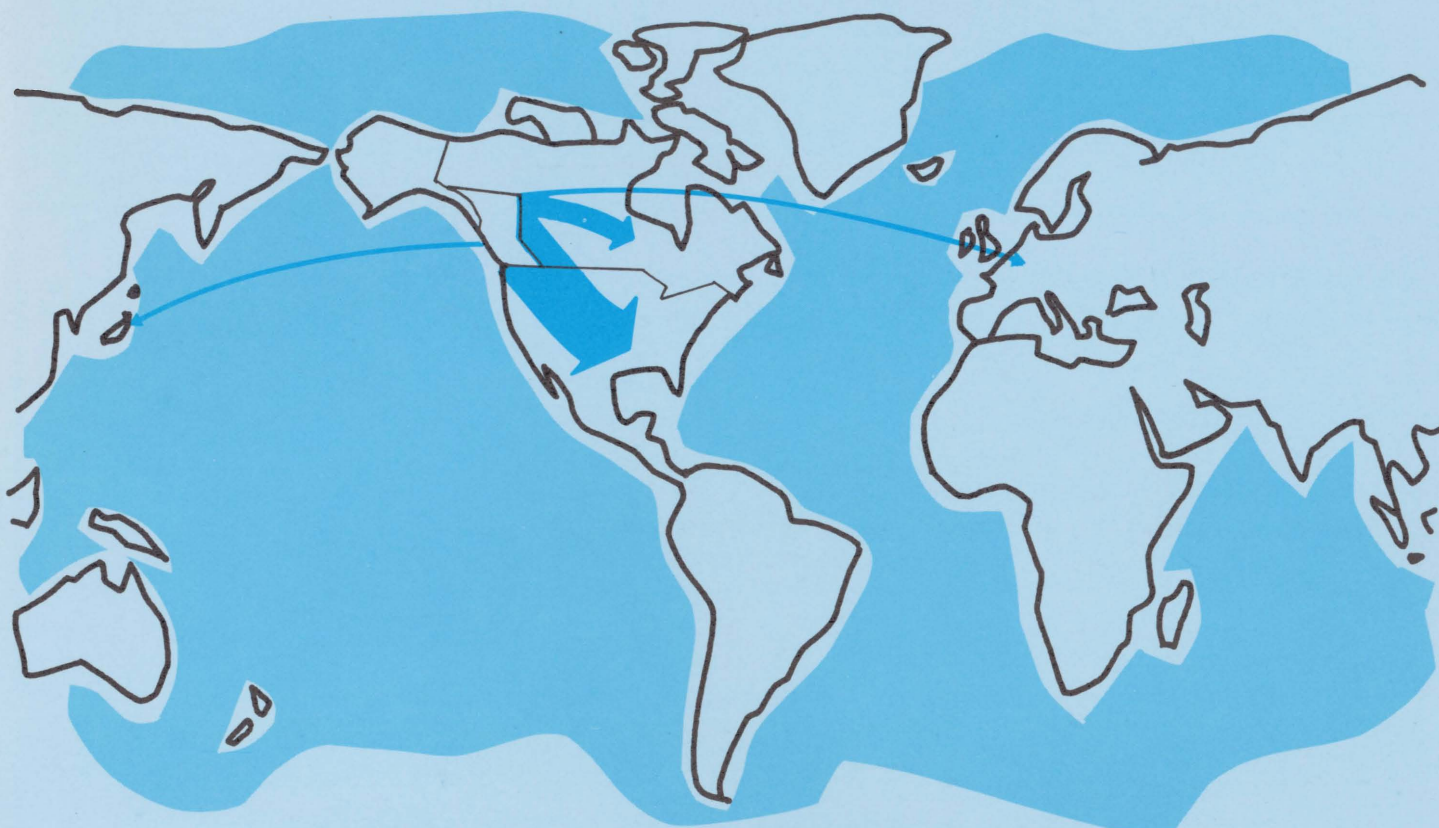


Information Forestry

A newsletter from the
Pacific Forest Research Centre
Canadian Forestry Service
Environment Canada

B.C. Forest Exports

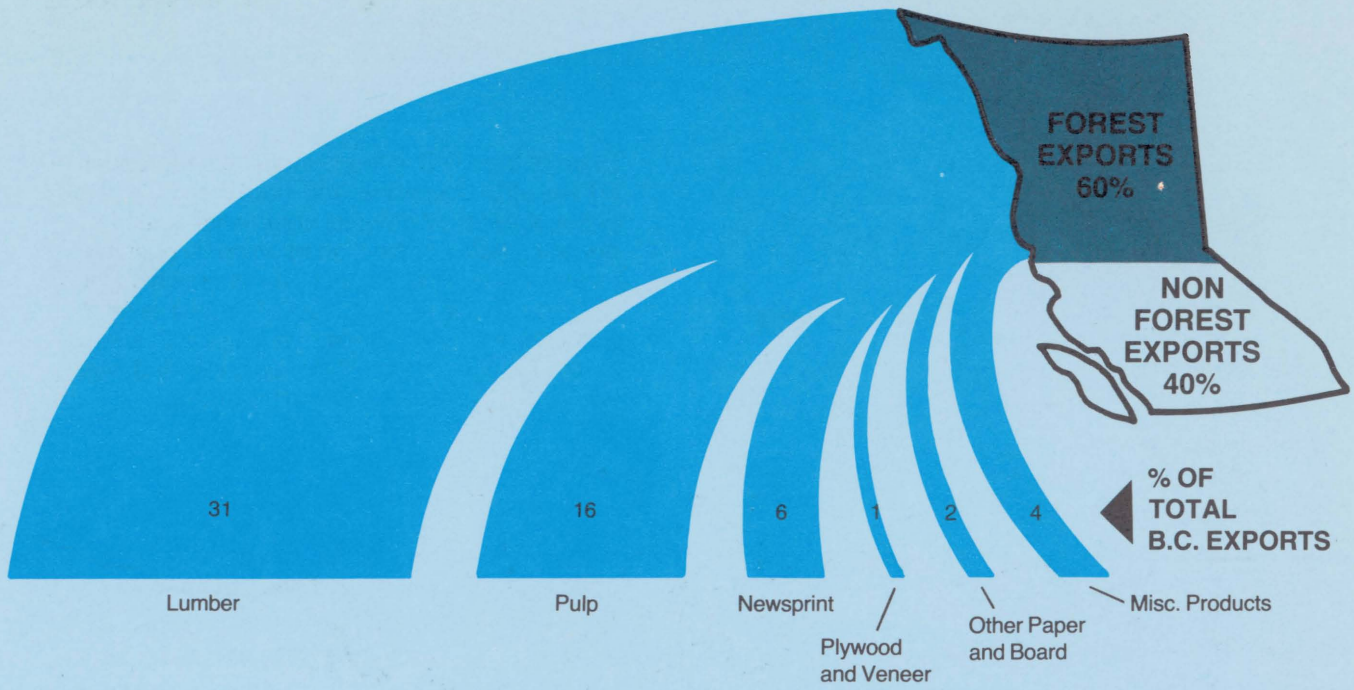
Exports from B.C.'s forest industries represent 60% of all B.C. exports, and more than 60% of the value of all forest industry shipments. With the declining value of the Canadian dollar pushing forest industry shipments to an all-time high, and world trade negotiations (GATT) culminating soon, interest in the export sector of B.C.'s forest industries is high. The statistics presented here document the importance of this sector.



Destination of British Columbia Lumber Shipments - 1977

	,000 m ³	% of Total
Canada	6,213	21.3
U.S.A. (incl. Puerto Rico)	18,985	64.9
E.E.C.	1,800	6.2
Other Europe	16	0.1
Japan	1,665	5.7
Australia	275	0.9
Other	275	0.9
Total	29,229	100.0

British Columbia Forest Exports - 1977

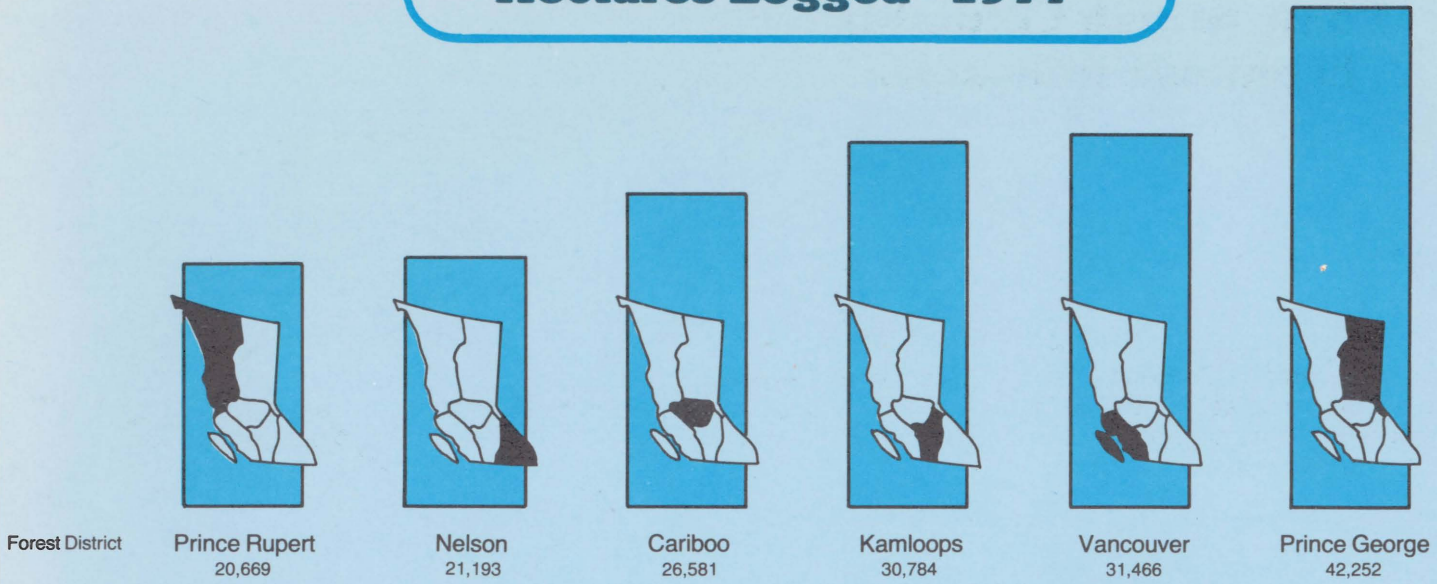


Destination of 1977 B.C. Forest Products Exports

(millions of dollars)

	U.S.A.	Japan	E.E.C.	Other	Total
Logs, Roundwood and Chips	41.7	32.6	0.7	1.6	76.6
Lumber	1,482.4	179.9	182.6	76.6	1,921.5
Other Wood Products	179.3	0.4	74.2	1.3	255.2
Pulp and Paper	655.0	150.6	471.8	243.9	1,521.3
Total	2358.4	363.5	729.3	323.4	3774.6

Hectares Logged - 1977



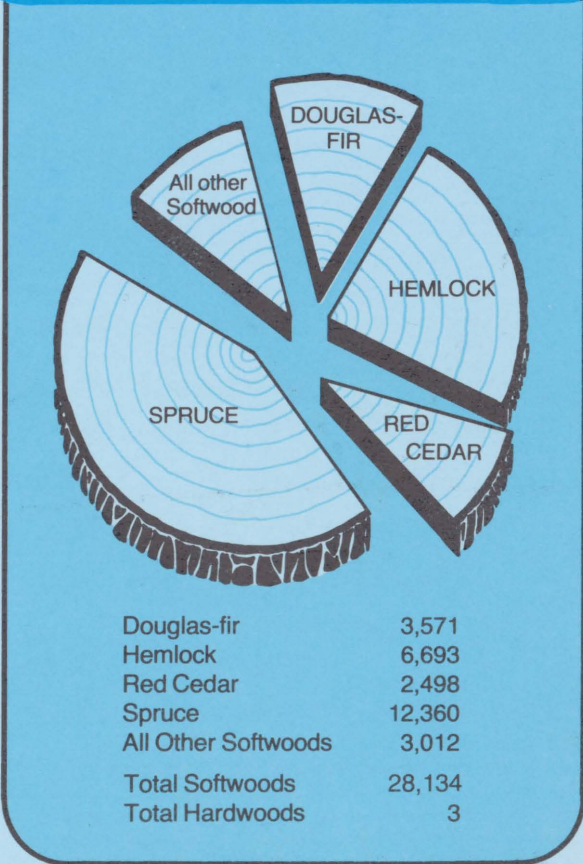
What's the Canadian Dollar Worth?

Country and Unit	Canadian \$/Unit
United States (dollar)	1.0972
U.K. (pound)	2.0342
France (franc)	0.2289
Germany (mark)	0.5101
Switzerland (franc)	0.5286
Japan (yen)	0.0046

(December 1977)

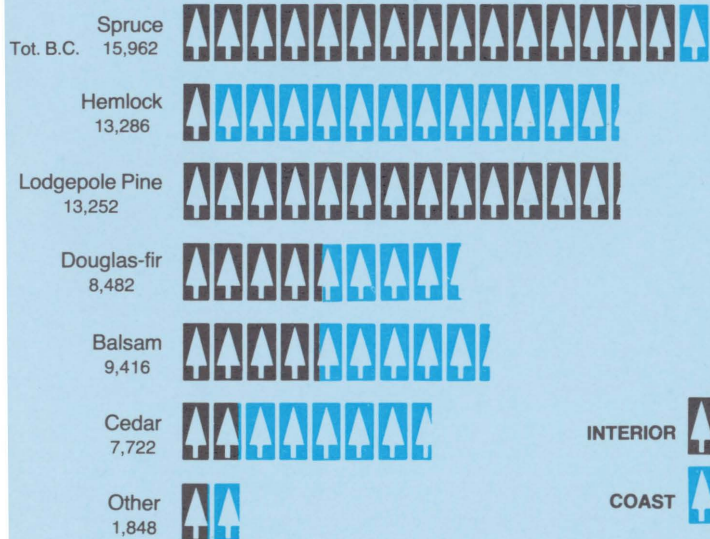
Production of Lumber by Species - 1977

(⁰⁰⁰m³)







Species Harvested 1977

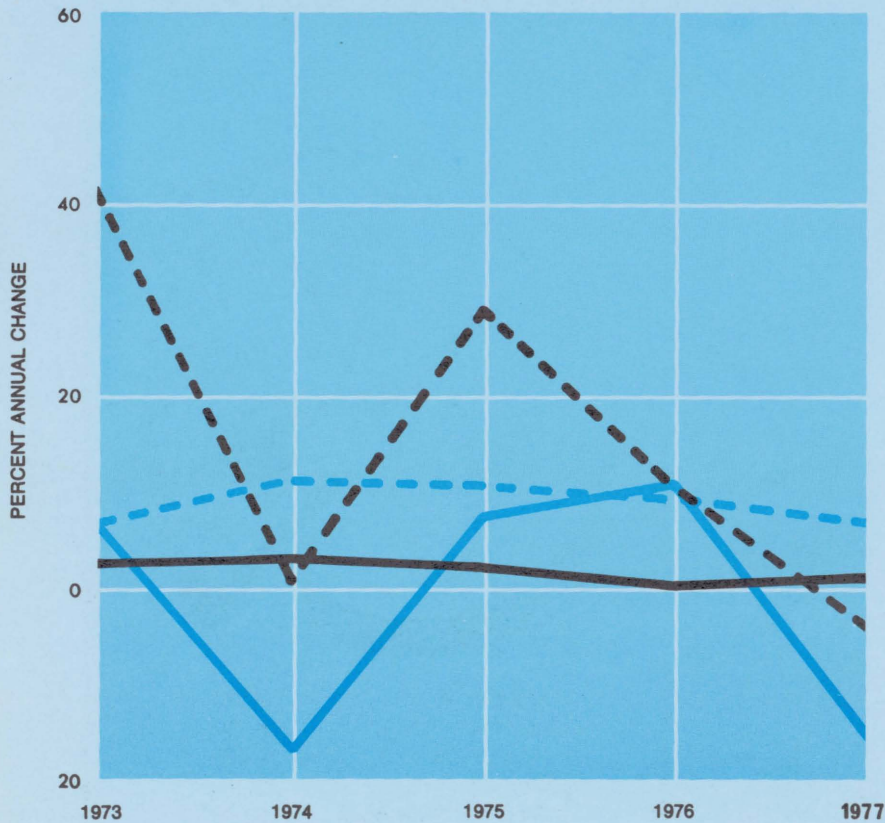
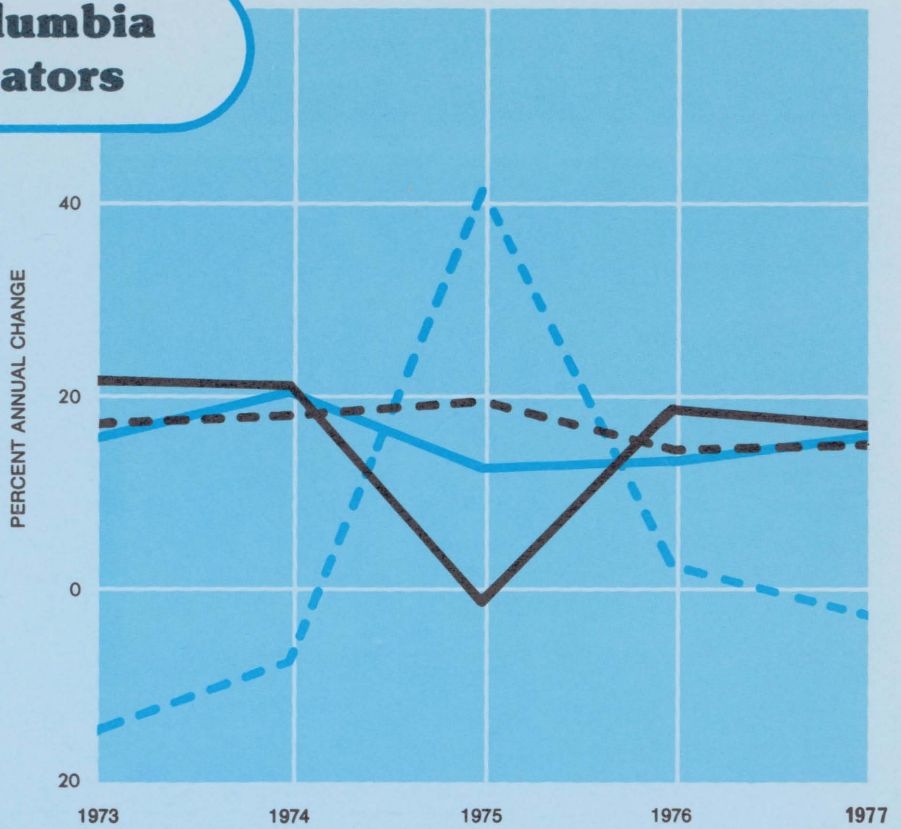
(⁰⁰⁰m³)





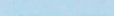

Some British Columbia Economic Indicators

Personal income, employment and the value of shipments are major factors that reflect the economic health of the forest industry.

-  Gross Provincial Product
-  Total Personal Income
-  Unemployment Rate
-  Selling Value of Factory Shipments



The growth of the economy is based, to a large extent, on the use of wood products.

-  Housing Starts
-  Value of Building Starts
-  Consumer Price Index (Vancouver)
-  Population

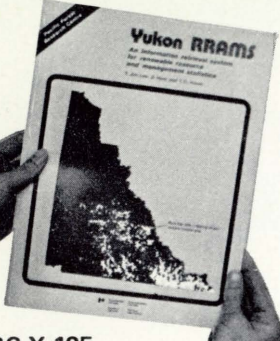


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Source
-B.C. Gov't.
-Stats. Canada
-CPPA

New Publications



YUKON RRAMS *An information retrieval system for renewable resource and management statistics*

by Y. Jim Lee, D. Hunt and T.G. Honer

This system provides the PFRC and the Canadian Forestry Service with efficient and up-to-date resource information for research and policy making.

BC-X-185



WEATHER IN THE CANADIAN FOREST FIRE DANGER RATING SYSTEM

by J.A. Turner and B.D. Lawson

This report, among other things, describes weather elements affecting the calculation of the Canadian Forest Fire Weather Index.

BC-X-177

CANKER DISEASES OF SPRUCE FPL 65

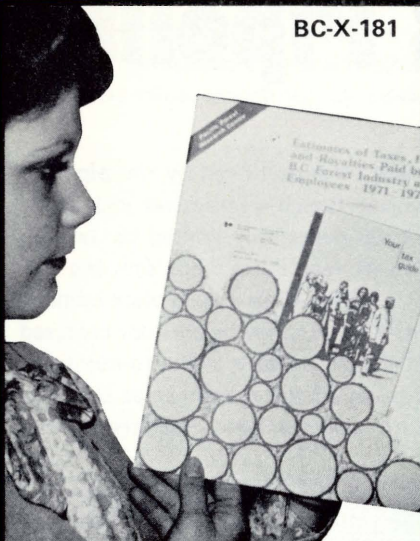
by A. Funk

A brief description of the most common canker diseases of spruces in the Pacific region are given.

WEATHER IN THE CANADIAN FOREST FIRE DANGER RATING SYSTEM BC-X-177

by J.A. Turner and B.D. Lawson

This report, among other things, describes weather elements affecting the calculation of the Canadian Forest Fire Weather Index.



BC-X-181

ESTIMATES OF TAXES, FEES AND ROYALTIES PAID BY THE B.C. FOREST INDUSTRY AND EMPLOYEES 1971-1975

by W.G. Howard

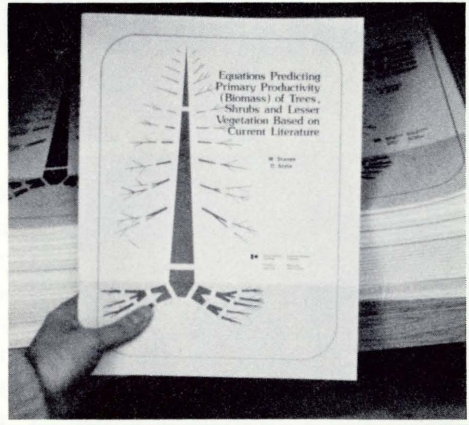
An insight into the taxes imposed on the B.C. forest industry and employees by federal and provincial governments.

BC-X-183

EQUATIONS PREDICTING PRIMARY PRODUCTIVITY (BIOMASS) OF TREES, SHRUBS AND LESSER VEGETATION BASED ON CURRENT LITERATURE

by W. Stanek and D. State

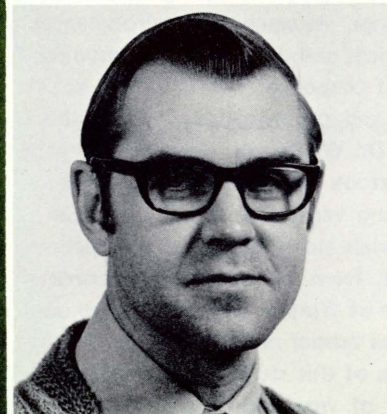
This publication contains regression equations of calculations of biomass of several Canadian forest species and their components.



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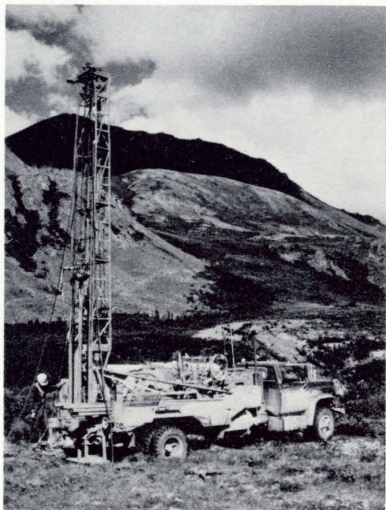


WINS INTERNATIONAL AWARD

Dr. Allan Van Sickle, a forest pathologist with the Pacific Forest Research Centre, Victoria, B.C., was awarded the Schlich Memorial Prize during a recent sabbatical at the Oxford School of Forestry in England. The prize, consisting of a bronze plaque and a set of books, is awarded to the individual making the best use of his or her time while attending Oxford University.



The Alaska Highway Gas Pipeline



Drilling explorations for terrain stability along Dempster Highway.

The Pacific Forest Research Centre is committed to environmental assessment concerned with site sensitivity to disturbance by gas pipeline construction in the Yukon Territory. As a result of a cabinet directive instituting the Environment Assessment process, baseline data are needed to provide background material for reviews of environmental impact statements, expert witnessing at public hearings, issuance of environmental practices and guidelines, and monitoring of proponent's construction activities and performance. Toward this end, Dr. W. Stanek, Research Scientist undertook an accelerated study of existing vegetation and of surficial materials along the proposed pipeline route, from the B.C.-Yukon border south of Watson Lake to the Yukon-Alaska border north of Beaver Creek. Focus of this study is upon relationships of vegetation communities to potential geotechnical difficulties which

might be experienced by the pipeline project. Specific objectives include but are not necessarily limited to: production of vegetation maps showing the distribution of described plant communities in a 6-km wide corridor centered on the proposed pipeline route; a description of the relationships between plant communities described and



In poorly drained permafrost terrain, pingos are formed by doming of permafrost or ice core formations by hydrostatic pressure.

mapped and certain mechanical soil properties, presence of permafrost and soils susceptible to rapid erosion, and/or the presence of sites particularly difficult to revegetate.

OTHER ENVIRONMENTAL ASSESSMENTS

The Pacific Forest Research Centre has been involved in environmental impact assessments created by realignment proposals for the Shakwak Highway between Haines, Alaska and Beaver Creek, Yukon Territory. PFRC soon will be involved in review of E.I.A. of proposals dealing with improvement of the Alaska Highway from Haines Junction to the B.C.-Yukon border south of Watson Lake.

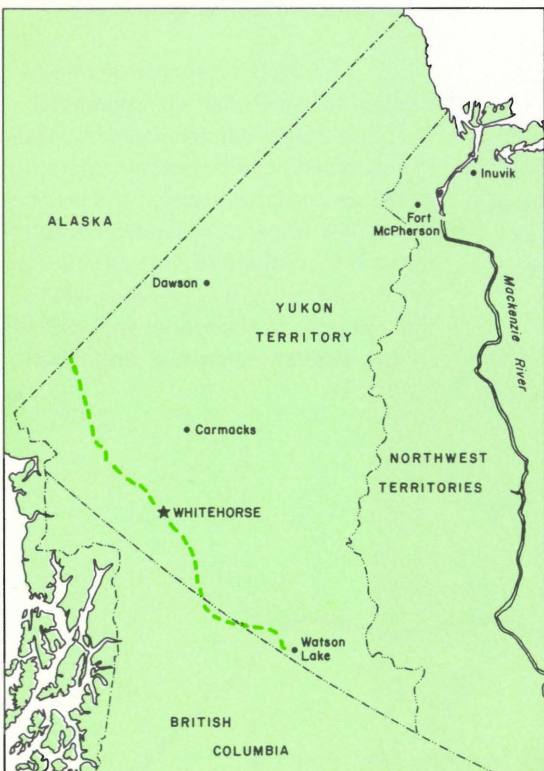
Each of these projects involves similar environmental impact problems; the damage created by removal of the forest and vegetation, which may cause erosion and thawing of permafrost and result in scarring of the landscape, solifluction, slides and a general decline in aesthetic value. Hopefully, by asses-



Tlingit Indian from Teslin Lake assists as casual field technician.

sing the environmental sensitivity before work is begun, many problems may be avoided or be mitigated by measures such as realignment of the pipeline route or revegetation of disturbed sites.

Drs. R.B. Smith and W. Stanek were consulted by the Canadian Wildlife Service with respect to optimal forest management of the Marshall-Stevenson and Rosewell Creek Wildlife areas on eastern Vancouver Island.



Proposed Alaska Highway Gas Pipeline

REPORT ON THE 5th CANADIAN SYMPOSIUM ON REMOTE SENSING

The 5th Canadian Symposium on Remote Sensing was held on August 27 to 31, 1978 at the Empress Hotel in Victoria, British Columbia. We are glad to report that in spite of the Air Canada Strike (or because of it), the Symposium was a success, and was much beyond the expectations of the local Organizing Committee. Two hundred and fifty one delegates, 91 spouses, 10 students and 9 daily attendants managed to reach Victoria. Only 22 of the 200 pre-registrants failed to come to the Symposium. We would like to think that all delegates and spouses returned home satisfied that their time and efforts were well-spent.



Jim Lee

The Technical Program included 8 presentation sessions (30 papers) and 2 poster sessions (57 papers) and covered 3½ days. Half a day

was spent on field trips for the delegates and their spouses.

The Proceedings of the Symposium will be printed in Victoria and should be available for distribution in early 1979. Those who wish to order a prepaid copy, please send a cheque for \$40, payable to "5th Canadian Symposium on Remote Sensing," in care of the undernoted.

A copy will be sent to you as soon as possible.

Dr. Y. Jim Lee
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and the Technical Program Committee
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Skidroad constructed on a steep slope.

IMPROVING STEEP SLOPE HARVESTING PRACTICES

Progress continues on the improvement of harvesting practices on steep, forested slopes in the British Columbia Interior. The multi-agency Nelson Region Steep Slope Committee formed in early 1974 is still active and, indeed, has fostered the formation of similar committees in the Kamloops, Cariboo and Prince George-Interior Prince Rupert Regions. These committees are now coordinated by the B.C. Interior Forest Harvesting Steering Committee. Members of this committee are W. Young, Chief Forester, B.C. Ministry of Forests; E.W. Robinson, formerly District Forester, Williams Lake (now retired - a replacement to be named shortly); J. Murray, representing the Interior Lumber Manufacturers Association; O.J. Anderson, representing the Cariboo Lumber Manufacturers Association, R.S. Jewesson, representing the Northern Interior Section of the Council of Forest Industries, and Chairman, J.A. McIntosh, Canadian Forestry Service.

INNOVATIONS DEVELOPED

The Nelson Steep Slope Committee has been instrumental in producing the "Handbook for Ground Skidding and Road Building in the Kootenay Area of British Columbia". It has promoted numerous studies on improved methods for harvesting steep slopes conducted by industrial and provincial agencies and by the Forest Engineering

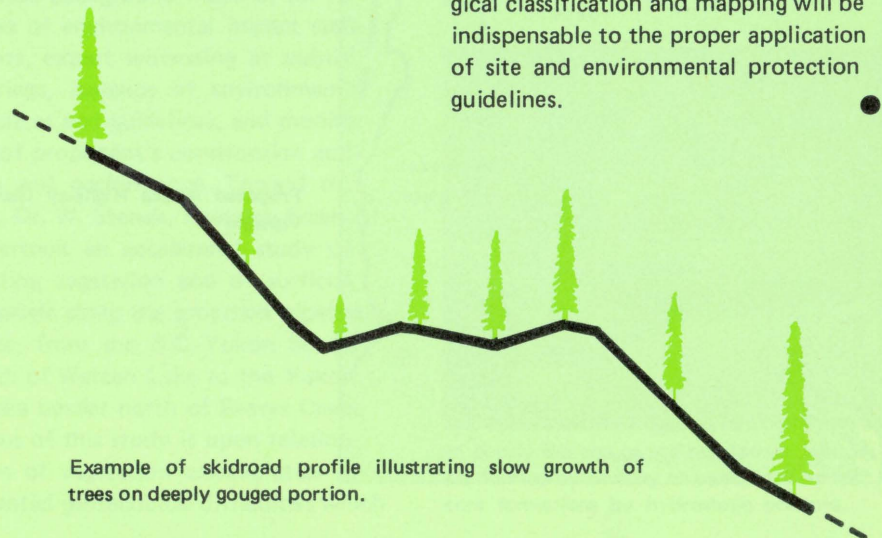
Research Institute of Canada. Innovations developed or tested include various cable-yarding systems, the use of small tractors for ground skidding, the FMC - a light-flotation skidder, snow blowing equipment to obtain low stumps during winter logging and systems for rating sites in terms of environmental sensitivity to harvesting practices.

PFRC INVOLVEMENT

Dick Smith, PFRC ecologist, has been an active representative on the Committee since its inception. He has conducted studies on the nature and degree of soil disturbance associated with the various logging methods and season of harvest. As these studies indicated that harvesting, particularly

ground skidding on bare surfaces, could result in considerable soil disturbance, further studies were initiated to determine effects on future site productivity. Eight steeply sloping clearcuts 9-22 years of age were studied in the Nelson Forest Region. Heights of Engelmann spruce and subalpine fir trees naturally established since logging on contour skidroads were compared with trees growing above and below the roads. Rates of height growth varied with position on skidroad, soil characteristics and aspect. It was generally slowest on the inner, deeply gouged portion of the skidroad (cutbank and inner track), indicating significantly decreased productivity, and increased toward the outside (outer track, berm and sidecast). On two clearcuts, growth of trees established on the outside portion of the skidroad was greater than on the "undisturbed". Overall adverse effects of skidroads on tree growth were most pronounced on medium- to fine-textured soils derived from calcareous parent materials. Beneficial effects of mineral soil exposure occurred on a cool (north-facing) slope with a moderately coarse, acid soil, possibly because of higher growing season soil temperatures.

Linking the response of sites to logging to particular environmental factors will allow adjustments of harvesting plans and post-harvesting treatments to reduce potential losses in site productivity. The current considerable efforts of the B.C. Ministry of Forests in ecological classification and mapping will be indispensable to the proper application of site and environmental protection guidelines.



Example of skidroad profile illustrating slow growth of trees on deeply gouged portion.