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INFORMATION



What we don't know CAN hurt

The increasing pressures being applied to forest lands in British Columbia to serve uses other than for pure wood production has resulted in the Pacific Forest Research Centre undertaking a number of environment-oriented studies. Results of the studies will provide resource managers with information on the effects of forestry practices and methods of improving existing conditions, thus helping to meet the needs of tomorrow through research.

Paul Brett, Head of the PFRC Forestry Services Group has brought together a multi-discipline team of researchers that have accepted the challenge to provide answers to some of today's most pressing problems.

Mr. Brett reports that most studies are undertaken for, and in collaboration with forest resources management organizations both provincial and industrial. In fact, the initiation for many studies comes from the people who will use the answers.

Studies have centered on identifying, measuring and clarifying the effects of harvesting and site preparation practices on forest resources and values. The knowledge and information collected, in addition to existing

data, should provide a firmer base for rationalization of existing practices where feasible, plus the development of new practices where required.

This issue of Information Forestry reports on a number of studies that have already produced results. Future issues will carry more information as it becomes available.

High elevation tractor logging in the Kootenays - subject of a major environmental study.





Sidecast material reduces productivity by covering considerable down-slope area with coarse and relatively infertile subsoil and blasted rock.

IMPACT OF FORESTRY PRACTICES

Finding Solutions to Some Difficult Problems

Recently the Pacific Forest Research Centre established a multi-discipline team of environmental researchers. The objective was to provide answers that would assist resource managers to solve problems associated with the changing use and values of forest lands in British Columbia.

Although a number of reports have been issued on various aspects of the project, the following is a brief look at the overall progress to date.

Initial Appraisal

The first major task of the study group was to prepare an appraisal of the current situation regarding the impact of forestry practices on forest environments and values. The team, consisting

of specialists in silviculture, forest hydrology, wildlife, ecology and economics, conducted their study in most climatic, topographic and vegetative regions of the province. Interviews were held with foresters, biologists, industrial representatives, officials of various resource management agencies and universities. Workshops, field trips and literature reviews were also undertaken.

Initial results have been used to guide studies undertaken by the Pacific Forest Research Centre Environmental Group and, through contracts, by outside agencies. Further aids in the general area of research priorities have come from bibliographies prepared through contracts on the effects of initial spacing, thinning and fertilization on forest environments, and from a contracted critical review and bibliography on the effects of harvesting on forest environments.

Forests-Water Relationships

High on the list of priorities for environmental studies is the need to obtain more basic information on the impacts of forestry practices on water quality and supply.

The PFRC environmental project includes measuring the impact of forest fertilization on water quality. In a cooperative project with Pacific Logging Co. Ltd., Eugene Hetherington, PFRC forest hydrologist, is investigating post-fertilization changes in nitrogen concentrations in Lens Creek, near Cowichan Lake on Vancouver Island. Preliminary results indicate that increases in urea and ammonia levels were small and of short duration. Nitrate levels have remained above pre-fertilization values for a longer period, but concentrations are relatively low. The peak attained during the first major rain storm was short-lived.

Other Forest Hydrology Studies Include:

- **water flow on mountain slopes and response to road building and tree harvesting.** A cooperative project with federal fisheries, MacMillan Bloedel Limited, and other government departments. The study is designed to provide information that will avoid the detrimental impacts of logging operations on soil and water resources. The study area is Carnation Creek which flows into Barkley Sound on the west side of Vancouver Island.
- **hydrology of mountain slopes.** A PFRC contract study completed by **Dr. J. de Vries** and **T.L. Chow**, U.B.C. Dr. de Vries demonstrated that water movement in coastal mountain soils can be retarded by logging disturbance. One implication is that peak stream flow could be reduced if significant areas of the watershed are disturbed.
- the development of procedures to improve our ability to estimate the amount and distribution of storm rainfall on mountain slopes.
- **logging - water quality** of Dennis Creek, Okanagan Basin. Report on page 8.



Herbicides

One of the more contentious environmental issues today is the use of herbicides in forestry. The PFRC Environmental Study Group has completed a summary of the use of herbicides in British Columbia. The summary describes present and potential benefits and indicates where caution must be exercised. A more detailed report will be carried in the next issue of the Newsletter.

A PFRC contract study that produced a bibliography on the effects of herbicides on water and soil has resulted in a further contract being awarded to **Dr. J.P. Kimmins**. Dr. Kimmins will make a critical examination of all research that has been conducted on the subject to date, summarize pertinent results, and make recommendations where further research is required.

Logging Disturbance

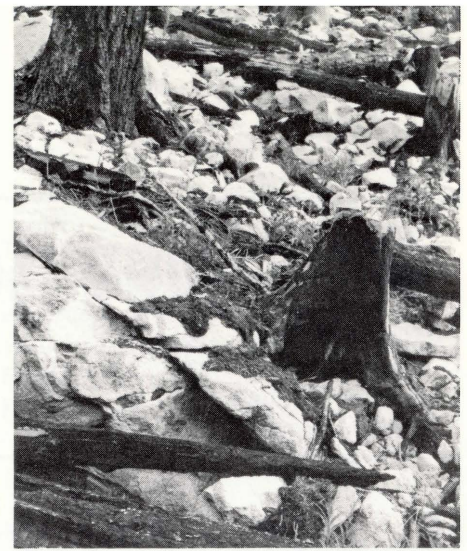
Impacts of logging and site preparation practices on soils and vegetation are receiving attention through both PFRC researchers and contracts with outside agencies. Methods of assessing soil disturbance and changes in soil chemical and physical properties as a result of logging, have been developed under PFRC contract by **T.M. Ballard** and **R.P. Willington** of U.B.C. The techniques developed have been tested in the Kamloops Forest District and are being used in part of the steep slopes study in the Nelson District. The steep slopes study is reported in detail on page 6.

A further PFRC contract study provided a survey of vegetation on disturbed land on sites representative of important forest zones in British Columbia. The contractor, **Dr. J. Thirgood**, identified the species that naturally vegetate disturbed land and assessed rates of succession. He described problem areas and demonstrated that slope, aspect, exposure and soil texture were important factors to satisfactory revegetation. Rather than have to rehabilitate disturbed areas artificially, it would be better to leave the site in a condition that would support plant life naturally.

Trees on High

Reforestation of high elevation coastal sites has been the subject of a multi-agency study. Objective is the production of conifer seedlings that would be suitable for severe sites at high elevations. **Jim Arnott**, PFRC forester, has developed preliminary cultural guidelines for producing six high-elevation tree species in a styroblock container nursery.

Logging road construction in silty soils serve as a tremendous sediment source for nearby streams.



Fragile sites include areas seriously damaged by burning, creating barriers to reforestation.

Growth and decay assessment of advance amabilis fir regeneration, and regeneration survey methods also received the attention of the PFRC environmental researchers.

Computer modelling

Data handling and simulation modelling, using computer techniques, are being developed to facilitate the analysis of the vast quantities of information being generated by various environmental studies.

Robin Quenet, a systems analyst, has already successfully demonstrated the formulation and testing of control strategies of the Sitka spruce weevil. He has also developed methods for analysing data from fertilization-thinning trials at Shawnigan Lake, and has made contributions towards modelling ecological processes at Carnation Creek and forestry-fishery interactions. Progress has also been made towards the development of simulation models for insect defoliators.

New Developments

Today's forestry research will uncover even better ideas for tomorrow.

A FIRST FOR THE YUKON

An artificial reforestation program and research project for the Yukon begins this Fall when 12,000 white spruce and lodgepole pine container-grown seedlings will be planted in the Watson Lake area. The work is part of the Yukon Lands and Forest Service program to establish a viable forestry resource and to rehabilitate logged and burned-over areas.

The 'first' seedlings were grown in greenhouses at the Pacific Forest Research Centre, Victoria, under the supervision of **Evert Van Eerden**, a forester with the Centre's Forestry Services Group.

Grown from seed collected last Fall in the Yukon, the seedlings will be moved to a pilot nursery at Watson Lake prior to outplanting in the Fall of 1975 and Spring of 1976, on sensitive river flats requiring immediate restocking.

The project will also provide information and experience on the production-transplantation of tree seedlings in the northern latitudes of the Yukon Territory.

In addition to giving the 'first' seedlings a start, the PFRC will assist the Yukon Forest Service in defining and clarifying



their reforestation needs. The ability of the Yukon Forest Service to pursue any reforestation program will depend largely on developing a sufficient supply of tree seed and adapting new reforestation techniques to meet northern conditions.

The transfer of servicing the Yukon's forestry research needs to the PFRC from the CFS's Edmonton Centre took place in 1974, with the re-alignment of the CFS within the Department of the Environment.

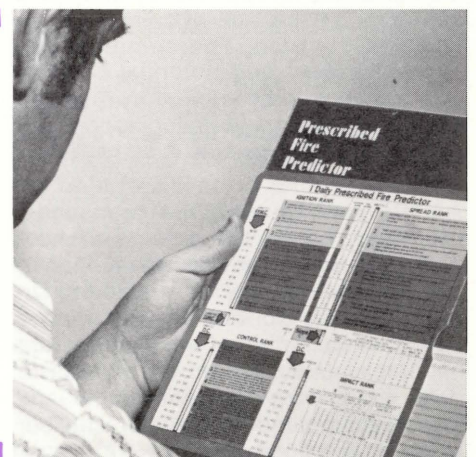
METRIC CONVERSION

Dr. T.G. Honer, PFRC Program Manager and Chairman of the Canadian Standards Association committee on scaling of primary forest products, reported excellent progress was made at the Association's second national meeting held at Harrison, B.C. Twenty-two (22) delegates representing producers (all provinces and territories), users (industry) and interested agencies (CFS and universities) came to a number of conclusions regarding setting national draft standards on cubic scale of logs, pieces and linear measure, and chip measurement, in addition to discussing other topics associated with metric conversion. There are a variety of measuring systems presently in use in Canada and the conversion to metric has encouraged a national standard for measuring forest products. Next meeting of the committee is set for November 18, 1975.



Fire! Predicting Risks

John Muraro, in collaboration with the B.C. Forest Service, has developed a 'prescribed fire predictor' which can be used to determine the ease of ignition, the rate of spread, and difficulty of control. Designed as a 'slide rule', the technique enables the burner-operator to make a quick and accurate assessment of conditions and forecast the risks involved. The 'predictor' also outlines the effects of a prescribed fire on the site in terms of hazard abatement or suitability for planting.

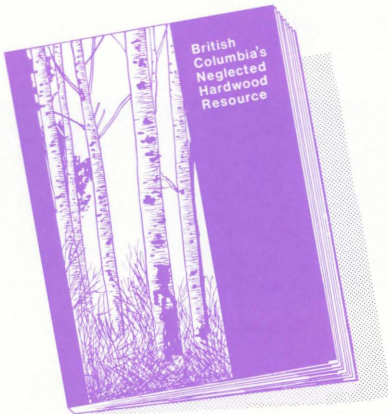


This Information Forestry Newsletter is designed to keep you continuously informed on the work undertaken on your behalf by the staff of the Pacific Forest Research Centre, Canadian Forestry Service, Victoria, B.C.

HARDWOODS IN B.C.

Major problems facing a hardwood industry in British Columbia are scattered volumes of timber and small firms. This was one of the points made in a special study recently completed by PFRC economist **Dr. Glenn Manning**.

Undertaken on behalf of the B.C. Forest Service, the study showed that the enhancement of product quality and prompt and accurate filling of orders could best be achieved by the establishment of a B.C. hardwood industrial association. Such an organization would provide a platform for product promotion, and to set and enforce product standards. Inventories, marketing and warehousing were other points emphasized in the report.



CONTAINER SYMPOSIUM - Reprints available.

Contributions by B.C. authors to the North American Containerized Forest Tree Seedling Symposium August 1974, are now available in a special collection provided by the B.C. Forest Service Reforestation Division and the Pacific Forest Research Centre. (limited supply).

NEW PUBLICATIONS:

Tree Improvement

- **Testing Silviculture Treatments by Computer Simulation.** - Frank Hegyi. 1975.
- **Fertilizer Application On An Operational Scale.** - M. Crown. (Papers presented at a workshop on Forest Fertilization in Canada - 1974.)
- **Fertilization and Thinning Effects in a Douglas-fir Ecosystem at Shawnigan Lake, Vancouver Island.** An Establishment Report BC-X-110. (Limited supply).

Protection

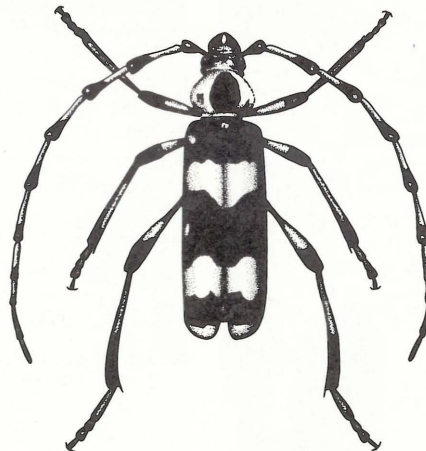
- **Spruce Cone Insects in British Columbia.** A.F. Hedlin. BC-P-14.
- **European Pine Shoot Moth.** - J.W.E. Harris & D.A. Ross. FPL No. 18 (revised).
- **Insect & Disease Survey Reports** for the Yukon and the 6 Forest Districts in British Columbia for the year 1974.

Other

- **A Preliminary Evaluation of ERTS Imagery for Forest Land Management in British Columbia** - From a paper presented at the second Canadian Symposium on Remote Sensing - Y. Lee, E.T. Oswald, J.W.E. Harris, 1974.

Copies of all reports and publications mentioned in the Newsletter may be obtained by contacting the Information Services office at the PFRC.

DON'T BE BUGGED!



If you have ants in the attic or powder post beetles in the basement, the booklet 'Insects Found In and Near the Home' will be of interest to you. Issued by the Pacific Forest Research Centre, Victoria, the publication describes more than 30 pests, related to forestry or manufactured forest products, that cause damage and destruction in British Columbia.

Authors **David Ruppel** and **Erica Pass**, research technicians at the Victoria Centre, have included how the homeowner can prevent and control a few of the more bothersome pests. Also they have included a chapter describing several causes of 'dry rot', a common decay to the west coast.

A free copy (one to a customer) is available from the Pacific Forest Research Centre, Victoria, B.C.

Steep

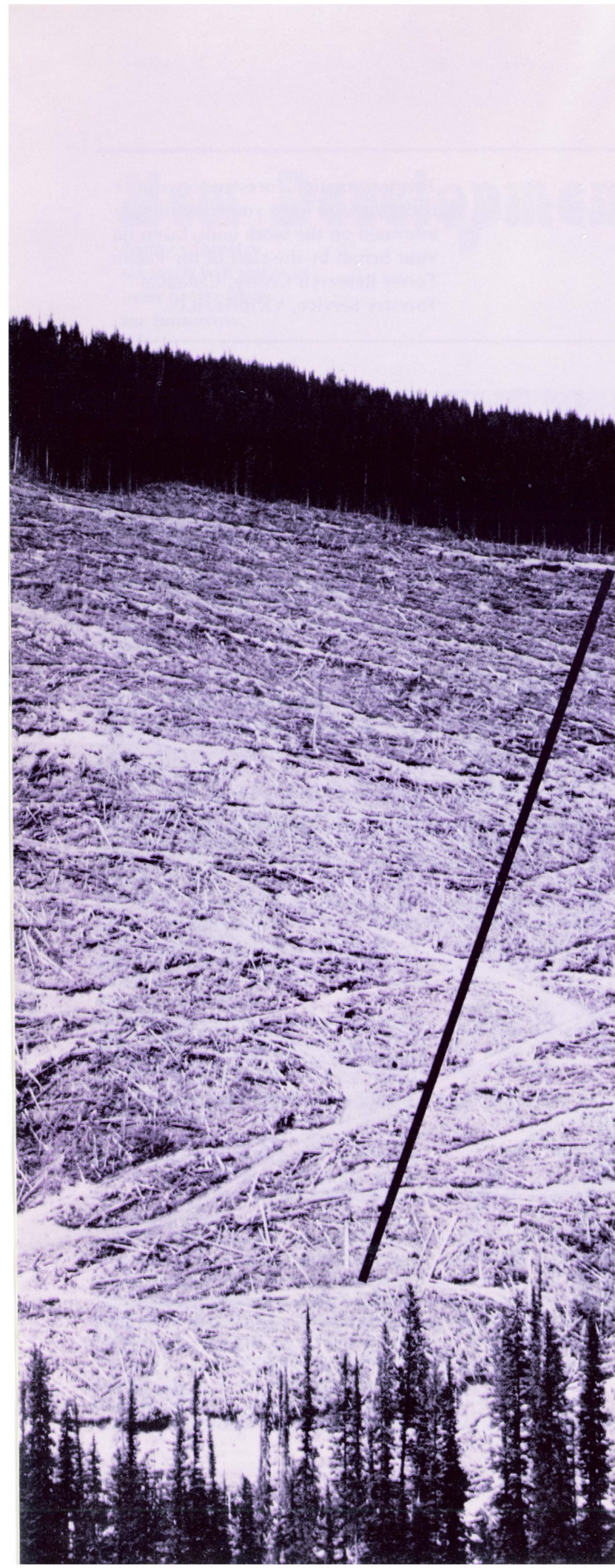
Provincial guidelines prohibiting skidder tractors on slopes steeper than 70 percent and restricting their use on slopes between 50 and 70 percent in the Nelson Forest District have been supported in part by preliminary results of a recent study undertaken by Dr. Richard Smith of the Pacific Forest Research Centre, Victoria, B.C.

The study, initiated by the multi-agency **Interior Steep Slope Steering Committee** was designed to provide information on the extent of soil disturbance caused by various logging methods on steep slopes in the Interior. The data will be used to improve existing methods and in developing new techniques.

The Steering Committee, chaired by **Jim McIntosh** of the Canadian Forestry Service's Management Institute, includes **Jack Solloway** of the Interior Lumber Manufacturers Association; **Bob Wright, C.D. Grove-White** and **Hans Waelti** of the British Columbia Forest Service; **Norm Sprout** of the E.L.U.C. secretariat; **Phil Cottell** of F.E.R.I.C.; **John Murray** of Crestbrook Forest Products; **Ray Hatch** of Triangle Pacific; **Brodie Swan** of Revelstoke Sawmills; **Bill Watt** of C.D.A.; **Rex Thorpe** of Canadian Cellulose; **Vern Wellburn** of U.B.C.; **Clay Anderson** of Andersen and Associates Ltd.; and **Dick Smith** of P.F.R.C.

< *Sampling on summer clearcut started at bottom and ran diagonally across the contour to the upper boundary. The survey employed transects with point and plot observations and measurements made at 3-meter intervals.*

Area affected by all types of roads is well defined in summer skid road patterns. High potential for concentration of surface-water runoff.



Slopes Study



Summer skidded clearcut at Grave Creek. Note irregular pattern of skidroads on more gently sloping area in the middle foreground.

Kootenay Logging

The soil disturbance study, one of 6 recommended by the steering committee, started in 1974 and is scheduled for completion this year. It is centered in the East and West Kootenays at elevations ranging from 2,750 to 6,250 feet and on slopes averaging 31 to 80%. A combination of five logging methods/post harvesting treatments includes summer and winter ground-skidding (burned and unburned clear-cuts) and summer high lead logging on burned sites.

Initial results show that skid roads and main haul roads cause the greatest disturbance to soil cover as opposed to logging activities, which disturb less than 5% of the clear-cuts on unburned sites. Burning increases disturbance to an average of 35%, mainly in the category of "litter burned to mineral soil". Skid roads were the prime disturbance factor in ground skidded clear-cuts and haul roads in high lead clear-cuts.

Winter Better Than Summer

Winter logging is less damaging than summer logging. Summer skidding exposes more than 41% of the mineral soil on a clear-cut area. This is double the disturbance caused by winter ground skidding. Deep disturbances, gouges or deposits over 25 cm deep, produced by roads amounted to 29% in the summer compared to 12% in winter ground skidded clear-cuts. This indicates that logging on snow reduces disturbance by almost half or to the extent of summer logging on gentler slopes in other areas. The least disturbance by roads was produced by high-lead yarding.

Of the slopes studied, no correlation was evident between degree of slope and amount of disturbance caused by summer skid roads. In contrast, winter skid roads produced almost twice as much disturbance on slopes over 60% compared to those of lower percentage.

Regeneration

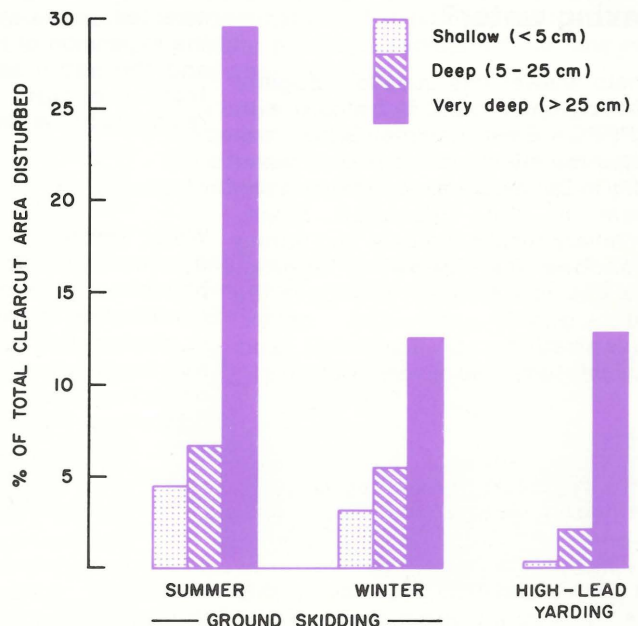
In general, natural regeneration of tree species in the areas surveyed was not being obtained promptly or adequately. However, regeneration was reasonably adequate on the Interior Western Hemlock/Engelmann Spruce-Subalpine Fir transition zones. Stocking levels of new regeneration were higher for all types of winter road surfaces than for summer roads.

Additional Work Required

Dr. Smith has recommended that the survey be expanded to include other areas in the Kootenays, the B.C. Forest Service skyline trial areas and on unburned cable (high-lead) operations. He has also suggested further study to determine the effect on tree establishment and growth and plant competition of the various road types with different degrees of disturbance on a range of soil textures and nutrient levels.

Future studies should investigate effects on streams and production of water supplies, as well as assess the economics and techniques of tractor logging on snow to encourage greater use of this less damaging practice. Guidelines, new equipment and techniques are required for ground skidding that will reduce skid road steepness in the area disturbed.

Dr. Smith said the second stage of his study will fill in some of the gaps in logging method/site preparation combinations. He will have the opportunity of examining high-lead logging that has not been slash burned and viewing regeneration of some of the older logged-over areas.



Extent and type of road-associated soil disturbance.



Dennis Creek

Logging vs. Water Quality

What effect does logging have on the quality of drinking water?

To help answer this question, **Eugene Hetherington**, a forest hydrologist with the PFRC's Environmental Group, has studied the effects of logging on water quality in Dennis Creek, a high elevation stream in the Okanagan basin. Preliminary results indicate that during the second year following logging, there was no significant change in the water quality of the creek. Concentrations of sediment and chemicals remained at very low levels.

Why

The study, a joint research project with **Northwood Properties Ltd.**, was designed to provide base-line information required by resource managers to solve logging-water quality conflicts brought about by increased demands made on watersheds and the lack of pertinent information.

Where

The Dennis Creek Watershed was selected as the study area because of the expansion of logging in the region, and the importance of water supply from the high elevation forests to residents in the Okanagan Basin.

Chemicals

Water sample analyses were made to determine concentrations of nitrate and phosphorous because of their potential contributing influence on algae growth in streams and lakes. Counts of these nutrients were so low that even detecting their presence presented difficulties. Within the reliability of the data, Dennis Creek water does not appear to have experienced significant changes in concentrations of either nutrient.

There were minor increases in other chemical parameters such as potassium and dissolved solids. This was attributed to increased leaching from the logged areas.

Sediment

There are three potential sources of sediment input to Dennis Creek as a result of logging operations. Two of these are the result of disturbance of small tributary creeks by skid trails. The third is a haul road crossing of Dennis Creek itself. Otherwise, the logged clearcuts were not a source of stream sediment. Concentrations below the logged area remained near the natural levels during the study period. This can be attributed, in part, to the excellent protection provided by the buffer strip left along the creek.

Mr. Hetherington indicated that these observations are obtained from a cursory look at the data collected during the study. However, the quality of Dennis Creek water appears to be little different from that of James Creek, an adjacent unlogged tributary. He said that a more comprehensive evaluation of the results of his study is presently underway and a final report will be available later this year.