Renewal

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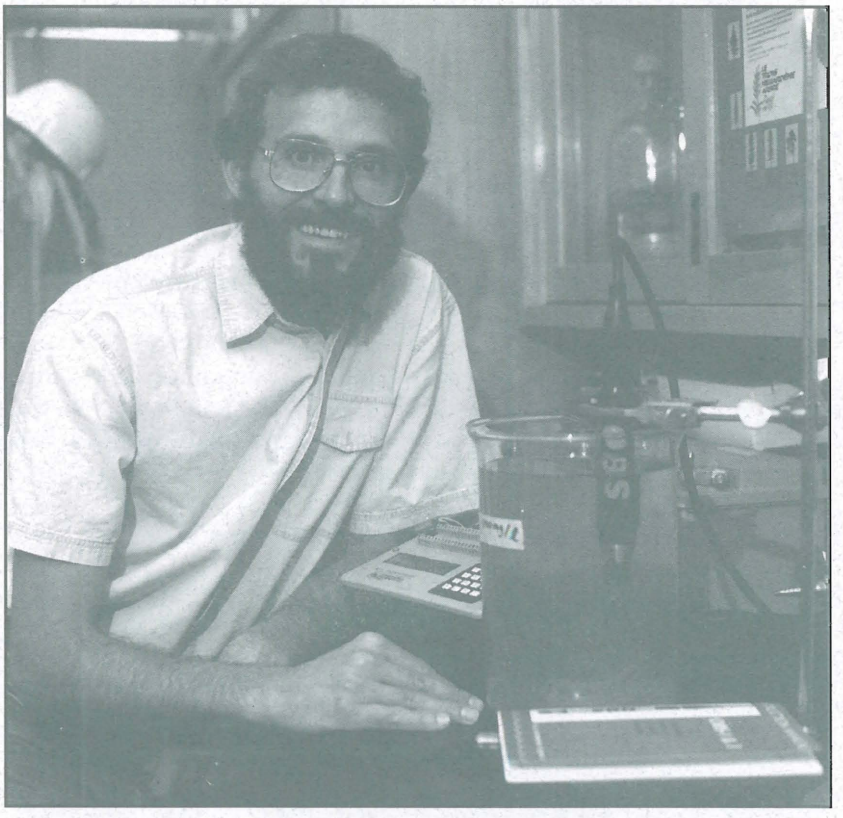
Soil erosion studied in the Redfish and Laird watersheds



Paul Commandeur, Alternative Silvicultural Systems researcher, is looking at how forest practices impact our creeks and rivers.

Generally, as Canadians, we no longer see ourselves as "hewers of wood and drawers of water". We prefer to think of ourselves as a sophisticated and technologically-advanced society.

Now researchers in southeast British Columbia say we've had it wrong all along. Hewing wood and drawing water is not nearly as simple as we imagined it to be. In fact, how we do one has tremendous implications on how we do the other — and on our community as a whole.

Drawing water, for example, is critically important to the dozens of families who rely on the Redfish and Laird Creek watersheds of the West Kootenays. They depend on those watersheds for their drinking water. Kokanee trout also spawn in the lower part of both of these watersheds; and as the habitats of the Kokanee trout are diminished, so are the local sports fishery and local tourism.

The problem is, all that water is running headlong into something else at least as important to the local economy — timber harvesting. More and more, we've come to realize the importance of examining what effects timber harvesting has on the soil along the banks of our creeks and rivers and what effect soil erosion has on water quality.

Researchers like Paul Commandeur of the Canadian Forest Service want to know what sediments are finding their way into creeks and rivers, and in what quantities, as well as what impact, if any, they have on the region's waterways.

"We're asking, 'What were the forest practices that resulted in these impacts? Can we somehow change those? Can we mitigate these?' Hopefully, from all of this, we can come up with better forest management practices," Commandeur says.

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watersheds *continued from p. 1*

Three years ago Commandeur and hydrologists from B.C.'s Ministry of Forests and Water Survey Canada began work at the West Arm Demonstration Forest in the West Kootenays to identify sources of sedimentation in the harvested areas of Redfish watershed and the mostly undisturbed Laird watershed. Using funds provided under the Partnership Agreement on Forest Resource Development (FRDA II) between British Columbia and the federal government, they set up 'climate stations' which reveal the kinds of precipitation that occur in different areas of the watersheds at different times of the year. The stations also measure temperature, wind speed, rain intensities, the depth of snow, even the rate at which snow melts. Researchers then correlate this with levels of sediment found in and along 'sub-tributaries' and at the mouths of the Redfish and Laird Creeks.

While it's still too early to draw any definitive conclusions, one potential trouble spot has already been identified — logging roads. Roads that are supposed to be designed to follow the natural contours of the terrain too often are built too close to a stream or cliff, resulting in a poorly-designed drainage system that allows silt, clay or sand to eventually end up in the creek bed damaging drinking water or spawning grounds.

Some solutions are obvious — like not building roads too close to streams, and using road-building materials other than sand which erodes quickly and in large volumes.

Other solutions are less obvious because soil erosion itself does not happen overnight. In comparison with partial harvest systems, a conventional clearcut with a network of roads, for example, might have different impacts on erosion and water quality. But how much is still uncertain.

To determine more precisely how logging roads affect sedimentation levels in streams in the Redfish watershed, Commandeur and other researchers conduct periodic erosion surveys of the roads. They also set up small scale 'traps' or dams to capture sediment at the tops of the watershed where the forest is undisturbed, and at the mouth of tributary streams and the main creek below where timber harvesting has occurred. They can then quantify the amount of sediment escaping into streams from logging roads and compare its impact with that of natural sedimentation on streams and creeks.

Results at Redfish will also be compared with data obtained at the Laird watershed which is, and will remain largely undisturbed. In this way, researchers will be able to compare the effects of sedimentation on water bodies in unexploited watersheds with those that have been harvested.

Eventually, says Commandeur, this information will help develop new tools to make better decisions about timber harvesting — such as a Geographic Information Systems which could identify areas of a landscape prone to soil erosion and affect where forest managers build their logging roads.

"You could easily predict then if you're going to run into a problem because a unit has a high erosion hazard and is too close to the stream," Commandeur explains.

Without this kind of information and the tools they spawn, people will go about the business of timber harvesting as they have always done, says Commandeur — without much thought for what they leave behind along forest roads or in the streams.

"That's where this information would be the most useful — in road construction and harvest planning. Somehow this information has to come out in a forum that will be useful at the planning stage. These studies provide that forum."

Peter Jordan, MOF Research Geomorphologist, and Ed Wass, Canadian Forest Service, inspect a plywood weir located on a tributary to Redfish Creek in the West Arm Demonstration Forest.

Forest Education Advisory Committee brings the forests to the classroom

Although to most of us scenes like this are commonplace, educators found that many children, especially urban, knew little about our forests.

For many adults, the forest conjures up images of the dense green of trees, the active singing of birds and the quiet passage of deer and other animals. But educators in B.C. have realized that the forest is seen very differently through the eyes of many children. They found that other than big trees and the impression that "logging is bad," the children in their classes, especially those in urban areas, really didn't know much about the forest at all.

To respond to the concerns of teachers and forest educators, the Forest Education Advisory Committee (FEAC) was formed. With the help of the Canada-B.C. Partnership Agreement on Forest Resource Development (FRDA II), the committee supports the development of forest education programs and offers guidance on project priorities and strategic decisions.

FEAC is the result of a 'think tank' by educators and forestry experts trying to meet the need for more forest education. Through FEAC, they could identify forest education materials that were currently available, pinpoint areas of need and offer guidance in the development of new forest education projects. "We envisioned a group of people with different perspectives working together," said FRDA II Public Information Officer Ruth Eppele-Dickens. "The cross-section of members, from industry, environment, government and native groups, with half to two-thirds of the members being teachers, would reflect the same values British Columbians want taught in their schools." Currently, about 12 members work together on FEAC.

So far, the creative mix of viewpoints has worked well for FEAC, and feedback from non-government committee members is generally positive. "I feel that this is a wonderful forum for getting agencies together, and the organizers are very sensitive," said Deanna Nyce, CEO of the Wilp Wilxo'oskwhl, a post-secondary institution in the Nass Valley run by the Nisga'a Tribal Council. "But as in anything run by finances, the committee is limited by certain parameters." She points to the fact that gathering members together can be expensive and time consuming, so the group is only able to meet a few times a year. This slows the process between the approval and implementation of projects.

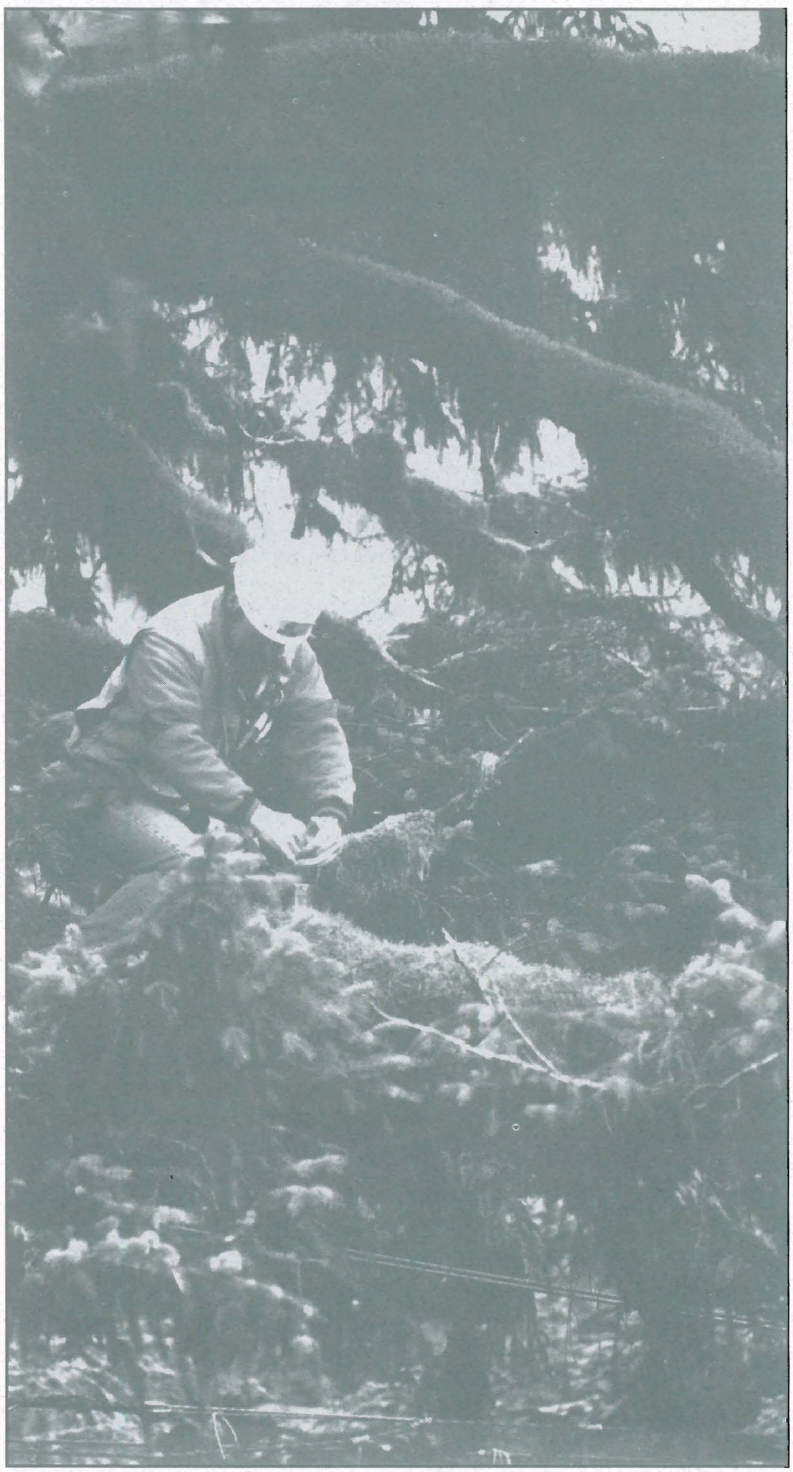
Even so, since its first meeting in 1992, FEAC has accomplished several of its goals. The first B.C.-specific forest education unit FEAC supported was *Wildlife Trees in British Columbia: Discovering Animal Inns.*The module provides teachers with information and suggests activites that increase awareness and understanding about wildlife trees in B.C. Like several other FEAC-sponsored efforts, *Wildlife Trees* complements existing environmental education programs designed for grades Kindergarten to 12, such as *Project WILD.*

As well as the development of units such as *Wildlife Trees*, FEAC helped kickstart a summer workshop at U.B.C. for B.C. elementary and secondary school teachers that helps them teach about forests in the classroom. FEAC also provides workshops for teachers on how to use the P*roject WILD* and *Backyard Biodiversity and Beyond* resource units. Upcoming plans include freenet and networking projects and a catalogue of forest education materials.

Although FEAC will not exist after the conclusion of FRDA II in March, 1996, Ruth Eppele-Dickens hopes that some of their work, such as *Wildlife Trees*, will continue. "We've supported some quality learning resources that have value beyond FRDA II funding," said Eppele-Dickens. "We feel these projects will be relevant into the future."

Applying the lessons from

Neville Winchester collects insects from the upper reaches of the Carmanah canopy.



"The idea is to stare straight ahead and not look down," says Dr. Richard Ring. "Once you get to the top, the dense canopy obstructs your view of the ground. You don't get the feeling of height once you're up there."

Perched 200 feet above the ground, Dr. Ring and his University of Victoria colleague Neville Winchester do manage occasionally to travel out beyond their giant Sitka spruce, but only by walking narrow alleys of mesh and rope called 'Burma bridges' which connect the main platform of their research project with the surrounding tree tops. But only Neville has done that so far.

Most of their work has been at the centre of that main platform. In the past two years, Ring and Winchester have collected 1.2 million specimens and perhaps more than 10,000 species of spiders, beetles, weevils, mites, parasitic wasps, flies etc.— just about one-fifth of the species of insects expected to be found in Canada can be found right here — in a massive 1000-year-old Sitka spruce forest in the heart of B.C.'s Carmanah Valley

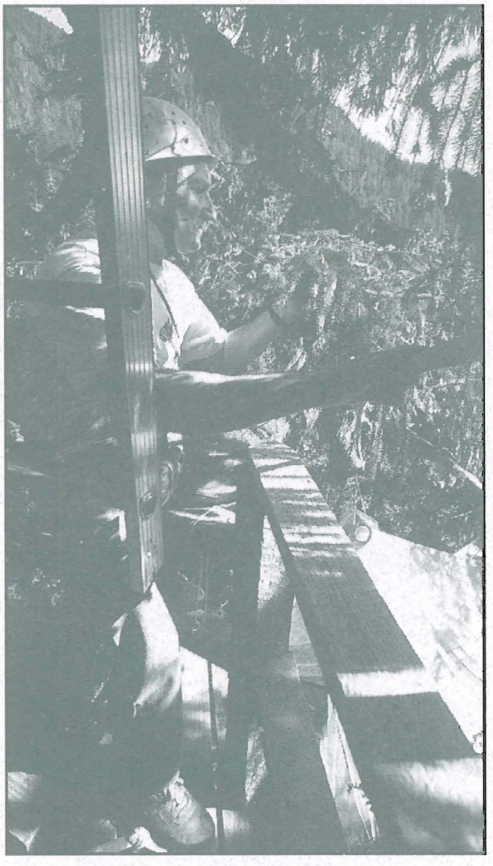
It's only very recently however, that some of the implications of their work have begun to sink in. Uncovering insects and arachnids previously unknown to North America such as some species of Dendrozetes mites, beetles, parasitic wasps, etc. has scientists speculating not only about what else might be out there in the temperate and tropical forests of the world, but also about what may have been lost and what remains to be saved.

The discovery, for example, that old-growth forests are remarkably resilient to outbreaks of pest insects like bark beetles or defoliating caterpillars may have profound significance for less-hardy second-growth forests. Foresters don't plant Sitka spruce in a lot of second-growth stands, says Neville Winchester, "because there's a weevil that gets into the plantations that kills a large proportion of seedlings."

Why doesn't this happen in old-growth forests? "We're finding that in these old-growth forests there's a huge set of natural

controls such as predators and parasites that seem to keep potential outbreaks in some sort of dynamic balance," Winchester explains.

Insects called parasitoids prevent damage to old-growth forests by laying their eggs on insects from other groups such as defoliating caterpillars. Those eggs hatch into larvae and the larvae devour the host caterpillars. Predators and parasitoids don't work separately. Nor do they wipe out the entire stock of offending caterpillars or weevils. Instead, they work in communities, or feeding guilds, killing just enough apparently, to strike a balance that protects the old-growth forest as a whole. They might do the same for second-growth forests, suggests Dr. Ring. "That's one of the big take-home lessons of this project — comparing those populations in old-growth forests with the insect communities in a regenerating forest, then asking "How could we possibly simulate that in our management plans for new forests?"



Dr. Richard Ring

With money provided under the Canada/B.C. Partnership Agreement on Forest Resource Development (FRDAII), we may eventually find the answers to that question. One of the focuses of FRDA is the development of new methods of forest management, particularly in regenerating second growth forest. The funding has enabled Ring and Winchester to set standards for biodiversity sampling — the trapping of insects — at similar projects elsewhere in British Columbia.

One of the most important projects to benefit from their work in the Carmanah lies outside Victoria on a 200 hectare piece of National Defence property near Pearson College. Lost to outdated logging practices and several decades of real estate development and other forms of human encroachment, less than one percent of the original old-growth coastal dry Douglas-fir remains. As such, it represents a rare ecosystem, rarer than the Carmanah, Neville Winchester maintains.

Winchester also predicts, "We'll find similar if not identical trends as we have found in the Carmanah. The species will be new, the names different, but will be consistently found to live in the same areas of the forest. So that's what we need to test. Is there a general principle here that applies to forests across the larger geographic region?"

Answering that question could have implications worldwide. At the International Canopy Research Conference in Sarasota, Florida in November 1994, Winchester and Ring revealed the results of their temperate rainforest studies to experts from other countries. Their main message: the decline in biodiversity is likely not limited to the rainforests of South America.

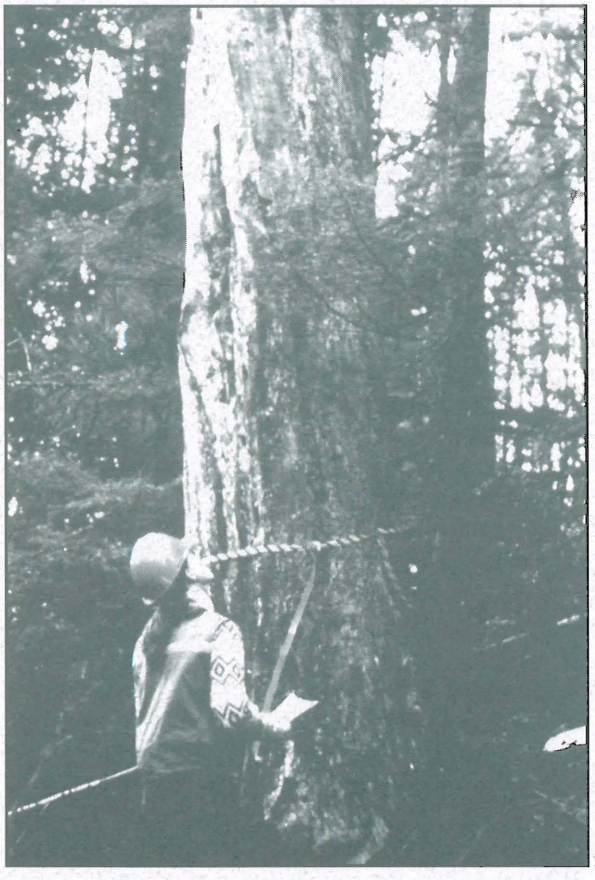
"We were very enthusiastically received," says Dr. Ring. "I believe that we've put B.C. on the map for canopy research." In fact, world canopy research scientists are so excited, they're planning another international canopy research symposium in two years and have asked Dr. Ring and Neville Winchester to organize a session solely on temperate rainforest research. By exploring and sharing this sort of information, countries like Canada may adopt a more knowledgeable approach to the issues of biodiversity and forest management practices.

If a tree falls...

Foresters learn to recognize hazardous trees... and when they should be left that way

A whack on the trunk with the butt end of an axe handle used to be the preferred method for determining a tree's soundness. If the tree was dead it was felled. Recently, however, thinking has been changing, and the dead tree that was previously considered a hazard, is now being looked at for its contribution to biodiversity. As well, foresters are learning to select living wildlife trees to be left standing as wildlife habitat.

Wildlife trees provide structural complexity to forest stands and function as nests, roosts, dens, perches, and feeding sites for more than 90 species of animals native to B.C. As they die and decay, wildlife trees supply coarse woody debris and litter to the forest floor, recycling nutrients and providing shelter and foraging substrate for various ground-dwelling organisms.



Foresters are now learning to select both living and dead trees to be left standing for their contribution to biodiversity and wildlife habitat.

To deal with the ongoing loss of wildlife tree habitat throughout B.C., the Wildlife Tree Committee (WTC) was formed in 1985. The committee consists of members from the Workers' Compensation Board, federal and provincial governments, industry and public conservation organizations. In turn, the WTC created, with the help of the Canada-B.C. Partnership Agreement on Forest Resource Development (FRDA II) and the Ministry of Forests' Silviculture Branch, the Wildlife/Danger Tree Assessor's Course — the first of its kind in North America.

The course combines information sessions and practical field experience in maintaining a safe work environment, and selecting and retaining wildlife trees and future wildlife tree habitat. The Wildlife/Danger Tree Assessor's Course offers half-day information seminars and three-day qualifying courses. So far, almost 1,000 operational people, WCB workers, fallers and those who assess the soundness of trees have gone through the course.

Stewart Guy, a biologist and environmental educator, and one of the coordinators of the WTC was the course designer/developer. "I consider wildlife trees to be the sentinels of biodiversity," said Guy. "While a minority of people still feel that growing big trees is all that matters, I think the majority feel that it's important to grow big trees, but also protect the intrinsic forest values."

Participants begin the course by learning how to identify wildlife trees, then move on to basic ecology, pathology and safety. Using a nine-stage tree-decay classification system developed for the course, assessors can determine which trees are suitable to leave standing. Because different species use wildlife trees at various stages of the tree's life and decay cycles, the course also teaches assessors to avoid fragmentation by leaving enough wildlife trees at different stages in the cycle.

Fifteen Canadian Forest Service (CFS) research staff from the Pacific Forestry Centre (PFC) in Victoria took the course and are now certified Wildlife/Danger Tree Assessors. Following the course, a one-day worshop was held at PFC where pathologists and other experts reviewed and updated some of the scientific material in the course manual. "The course offers a valuable standardized method for recognizing dangerous trees," said CFS scientist Dr. Eric Allen. "It will form the basis for the refinement of

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Scientists solve the mystery of slow-growing seedlings

Dr. Caroline Preston, member of the Salal Cedar Hemlock Integrated Research Program (SCHIRP)

The mystery began when seemingly healthy regenerating forests on northern Vancouver Island stopped growing. Following harvest and slashburning, the new forest flourished for more than five years, then inexplicably the trees yellowed and stopped growing. The most important clue was that the trees' declining health coincided with the regrowth of salal, a dense, leafy shrub that was present in the forest prior to logging and slashburning.

With the help of the Canada-BC Partnership Agreement on Forest Resource Development (FRDA II) and other partners, scientists from the University of British Columbia, Western Forest Products Ltd., MacMillan Bloedel Ltd., TimberWest Ltd., the BC Ministry of Forests and the Canadian Forest Service initiated a 10-year research effort called The Salal Cedar Hemlock Integrated Research Program (SCHIRP) in 1986. The purpose of SCHIRP was to find the cause of the poor growth of regenerating cedar, hemlock, amabilis fir and Sitka spruce on these old-growth cedar-hemlock forests cutovers.

The scientists began by learning more about the two forest types found in the area — cedar-hemlock (CH) forest characterized by stable old-growth uneven-

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If a tree falls... *continued from p. 6*

assessment procedures for hazard trees in urban and recreational settings. CFS scientists plan to continue working with the WTC, pursuing research related to tree soundness."

Future plans for the WTC and the Wildlife/Danger Tree Assessor's Course include working with B.C Hydro trying to figure out how to leave wildlife trees along hydro lines, and the seismic (oil and gas) industry, preserving wildlife trees along seismic exploration lines in the northeastern portion of British Columbia. As well, a practical field guide to wildlife tree users, sponsored by FRDA II, will be available in the fall of 1995. The guide will contain the essential biology for species that use wildlife trees, and will be useful to foresters, biologists, arborists, engineers, and those involved in planning and design of forest landscapes.

"The demand for the course is high," said Guy. "And as more foresters get into partial cutting and other silvicultural systems with a requirement to manage wildlife trees, the demand for the course will increase."

While the WTC originally dealt with wildlife trees in silvicultural practices, now it's tied in with harvesting and B.C.'s Forest Practices Code. This involvment includes new guidelines being developed for maintaining wildlife tree habitat in forest harvesting operations, and working in conjunction with larger-scale coastal and interior forest management and biodiversity guidelines. "In regard to wildlife trees, the WTC has planted a seed of recognition that has now become an integral part of forestry," said Guy. "An awareness of the importance of wildlife trees has been established from the chief foresters right through to those people cutting for firewood."

seedlings... *continued from p. 7*

aged stands of western redcedar, western hemlock and some amabilis fir, and an even-aged hemlock-amabilis (HA) type with vigorous stands of western hemlock and amabilis fir that originated following a widespread windstorm in 1906. While trees replanted on CH sites experienced the growth check, the HA site trees remained healthy and strong. The floor of the CH forest is a tangled salal jungle, while the HA forest understorey is a scattering of mosses and ferns. Researchers were left asking the question: is it the salal, the soil, or the windstorm origins of the HA forest that make the difference?

"When we started out, we thought we would find some simple identifiable key to the problem. We now know that a combination of many little factors is to blame," said CFS research scientist Dr. Caroline Preston. Scientists found that the growth check in replanted CH forests was caused by a lack of nitrogen and phosphorous in the soil. While the forest floors of the two types are similar in their overall composition, CH sites are wetter, have thicker organic layers, more decomposing wood and poorer soil aeration. All of these factors contribute to less food in the soil for the regenerating CH forest.

When salal regrowth starts after slashburning, with its widespread root mass that escapes the burn, the competition for nutrients heats up. Adding to the problem is the salal's mycorrhizae, a symbiotic fungus in its roots that take up nutrients from the soil, is antagonistic to hemlock mycorrhizae. Salal also releases chemical tannins and phenolics into the soil that slow seedling growth and nutrient uptake and check germination of tree seeds. By the time seedlings in CH forests fight the soil and the salal for nutrients they throw up the white flag of surrender and stop growing.

However, the SCHIRP team found there is hope for regenerating CH forests; salal cannot grow in the deep shade of a closed-canopy forest, such as an HA stand. Using inorganic fertilizers, sewage sludge or fish silage on replanted areas can help relieve the growth check in CH forests by adding nutrients and helping the trees attain crown closure. "So far the best solution has been burning, planting and fertilizing," said Cindy Fox, Project Forester for Western Forest Products. "We burn the top fines off the site which knocks back the salal and plant high stocking numbers of trees and fertilize where we can.

Looking at results obtained from 1989 Operational Fertilizer Monitoring plots we feel it may only take two fertilizer treatments to attain crown closure."

SCHIRP's success has implications for other regions of the province. Because much of the northern coast of British Columbia is a mosaic of CH and HA forests like those found on Vancouver Island, similar regeneration problems may be expected.

This is one of the reasons that SCHIRP has pushed forward with further research goals. Some of the projects include long-term studies on the operational use of organic fertilizers, testing other species such as yellow cypress on CH sites, the study of *Vaccinium* (huckleberry) which may cause similar nutrient problems in montane areas and research on mycorrhizae and the amount of nutrients cycling in the forests. As one mystery is solved, another begins for SCHIRP's scientific sleuths.

Renewal is the newsletter of the Canada/ British Columbia Partnership Agreement on Forest Resource Development: FRDA II.

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