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Combating Dwarf Mistletoe

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Natural Resources Canada
Canadian Forest Service

Ressources naturelles Canada
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Canada

Canadian Forest Service Scientist Receives Prestigious Award

"The award recognizes significant contributions in pest management, extension-consultation, research, and teaching."

Dr. Les Safranyik, recently retired research scientist at the Canadian Forest Service, Pacific Forestry Centre, has been awarded the prestigious Western Forest Insect Work Conference (WFIWC) Founders' Award.

The WFIWC, an organization committed to the science and practice of forest entomology in North America, bestows the Founders' Award to an individual who has made an outstanding contribution to forest entomology in western North America. The award recognizes significant contributions in pest management, extension-consultation, research, and teaching.

Dr. Safranyik **(available at: lsafranyik @pfc.cfs.nrcan.gc.ca)** received the award at the 53rd Annual Western Forest Insect Work Conference that was held April 23-25, 2002 in Whitefish, Montana. Having worked for over 35 years with the Canadian Forest Service, Dr. Safranyik is respected internationally for his knowledge and extensive research in bark beetle biology, population dynamics and management. As a research scientist in entomology at the Pacific Forestry Centre, Dr. Safranyik has an outstanding record of service to western forest entomology. He has authored or co-authored over 170 publications on a variety of science topics which have been widely cited by colleagues world-wide.

"Dr. Safranyik has shown consistently high standards in his personal conduct and in his contributions to the field of forest entomology," says Peter Hall, provincial forest entomologist with the BC Ministry of Forests. "He has provided inspiration to many who now work actively in managing bark beetle situations; his research and his perspectives have provided the basis of many management activities that would not otherwise have been possible. Dr. Safranyik is widely acknowledged as one of the world experts on bark beetles."

Adds Dr. David Wood, professor emeritus of entomology and professor of the graduate school, University of California at Berkley, "His research on bark beetles, in particular, stands out as Dr. Safranyik's most significant contribution to science. His studies on the population dynamics of the mountain pine beetle, the most destructive bark beetle in North America, include a great diversity of topics. Dr. Safranyik is held in highest esteem by his colleagues throughout our world-wide forest entomology community."

During his career, Dr. Safranyik received numerous honours and awards from a variety of organizations including the Entomological Society of BC, the Entomological Society of Canada, and the Entomological Society of America. He has been greatly admired for his outstanding contributions to professional organizations as well as for his generosity in sharing his expertise among colleagues and the scientific community.

"Dr. Safranyik has served on the supervisory committee of many of my graduate students," says Dr. John Borden, professor, Department of Biological Sciences, Simon Fraser University. "Through sharing his knowledge and insight, he has greatly enriched their development as researchers, and through his encouragement he has helped them to reach their full potential. He commands my profound respect. I know of no one more worthy of receiving the Founders' Award."

In his acceptance speech, Dr. Safranyik talked about his early years in Hungary and how he became a forest entomologist, concluding with his observations on important aspects of mountain pine beetle population dynamics. He then received a couple of standing ovations from the crowd of about 150 forest entomologists.

Dr. Safranyik says that in his retirement he will continue working with bark beetles and related problems because he finds the work interesting and stimulating. "I had a fulfilling career working on an important and highly challenging problem. At the end, most of us will conserve only what we love, love what we understand and understand what we are taught."

Dr. Les Safranyik received the Western Forest Insect Work Conference Founders' Award for his outstanding contributions to forest entomology.

Harvesting and Climate Effects on Organic Matter

"By studying changes in the nature and fluxes of carbon and nutrients in stands as they go through the stages of growth, we can get a clearer idea as to how forest disturbance impacts site carbon balance and future tree growth."

Studying the effects of *harvesting* and climate on forest organic matter depends on *cutting-edge* research.

Although there have been many studies worldwide which measure carbon mass in forest ecosystems, few have examined how the characteristics of such organic matter change with disturbances such as logging. At the Canadian Forest Service, Pacific Forestry Centre, researchers are using advanced chemical techniques to understand how harvesting and climate effect organic matter in BC coastal forests.

Using solid-state nuclear magnetic resonance spectroscopy, Dr. Caroline Preston **(available at cpreston@pfc.cfs.nrcan.gc.ca)**, a research scientist at the Pacific Forestry Centre, has been studying key forest nutrients such as carbon and phosphorous to determine how they differ in various types of forest sites. As part of the Coastal Forest Chronosequence project (http://www.pfc.cfs.nrcan.gc.ca/ecology/chrono/index_e.html) – a Pacific Forestry Centre project looking at ecosystem functioning from regeneration to old-growth – Dr. Preston examined four sites on the east coast and four sites along the west coast of southern Vancouver Island.

Sampling the harvest floor.

"Forest disturbance can change both the quantity and nature of organic matter pools, with possible consequences for ecosystem carbon balance and sustainability," explains Dr. Preston. "By studying changes in the nature and fluxes of carbon and nutrients in stands as they go through the stages of growth, we can get a clearer idea as to how forest disturbance impacts site carbon balance and future tree growth."

The time it takes for a forest to become "old-growth" (greater than 200 years) is far beyond the human lifespan. Naturally, this limits the ability of researchers to track changes in the forest from regeneration to over-maturity. To compensate, scientists study sites within a particular area that have been harvested at various times and therefore are of differing ages. This offers researchers the opportunity to examine, over a period of a few years, long-term changes in forest succession. On Vancouver Island, the Coastal Forest Chronosequence project was established on sites in four different stages of growth: regeneration (three to eight years old), immature (25 to 45 years old), mature (65 to 85 years old) and unharvested old-growth.

"Our research indicates that there is little difference in the nature of carbon in all four age ranges," says Dr. Preston. "This could be because BC coastal forests have such high accumulations of organic matter, in particular coarse woody debris, that one harvesting may not have much of an impact. We also found that natural biogeoclimatic forces still dominate in these sites."

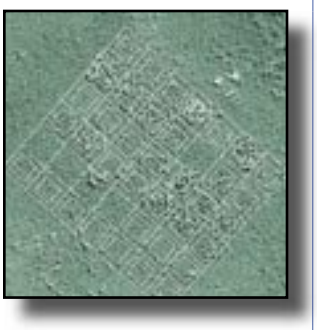
Research indicated that climate plays a greater role than harvesting in determining characteristics of organic matter. The wetter, cooler conditions found in the biogeoclimatic subzone of the west coast of Vancouver Island was found to be associated with greater growth, less decomposition, and less history of fire than the drier east coast. Although greater amounts of carbon and nitrogen were found on the west coast, there was a lower availability of phosphorous, another element essential to tree growth.

"Although climate seems to have had a greater effect on organic matter than one harvesting on these sites," cautions Dr. Preston, "repeated cycles of human disturbance and intensive logging may be expected to perturb the nature of the organic matter, and hence the functioning of these forests. Specifically, the lower stocks of carbon and nitrogen in the east may indicate a greater sensitivity to disturbance and intensive management; by contrast, the west side may be more susceptible to a loss of phosphorus."

By studying the effects of disturbance and climate on forest ecosystems, sound forest practices can be developed to protect productivity and ecosystem carbon balance as forests mature.

Levels-Of-Growing-Stock Cooperative Study in Douglas-fir

"Research focussed on how the amount of growing stock retained in repeatedly thinned young Douglas-fir stands affects cumulative wood production, tree size and growing stock ratios."



Aerial view of the Shawnigan Lake LOGS installation.

The word LOGS has long been associated with forestry but for more reasons than you might think. For the past forty years, LOGS has been the acronym for the international, multi-agency, long-term research project, Levels-Of-Growing-Stock Cooperative Study in Douglas-fir.

Through the LOGS project, Canadian and American forest researchers have been examining the relationship of growth to growing stock on a stand and individual tree basis. Research focussed on how the amount of growing stock retained in repeatedly thinned young Douglas-fir stands affects cumulative wood production, tree size and growing stock ratios. Nine installations were established across BC, Oregon and Washington, and results from these studies have been used extensively in a number of growth models in the Pacific Northwest.

The two installations in Canada – in the Sayward Forest and Shawnigan Lake areas on the east coast of Vancouver Island, BC – are operated by the Canadian Forest Service in partnership with the BC Ministry of Forests. The Sayward installation was established in 1969 in a 22-year-old Douglas-fir plantation and the Shawnigan Lake installation was established in a 25-year-old Douglas-fir plantation in 1970. Both installations contain twenty-seven 0.08-ha plots. Groups of three plots were given eight thinning regimes, with the growth of unthinned plots used to determine the basis for treatment.

"After the treated plots were given a calibration thinning to a common stocking density, growth was controlled using a percentage of the gross basal increment of the unthinned control plots," explains Dennis Beddows, a silviculture technician at the Pacific Forestry Centre. "Then thinning treatments were applied over five subsequent periods and each period interval was defined as the time the stand required to grow 3.05 meters in height."

The Sayward installation received thinning treatments at age 22, 26, 30, 34, and 40, with the final thinning in 1993 at age 46. The installation was measured again at age 52 after another 3.05-meter stand height increment. Thinning treatments occurred in the Shawnigan installation at age 25, 31, 37, 44 and 51. There is as yet another 10 years of treatment planned for the installation.

"Results in the two Canadian installations indicate that volume growth is strongly related to growing stock," says Beddows. "Thinning treatments have produced pronounced differences in stand development through tree size distribution and live crown development affecting stand and log value. Gains due to thinning, such as increased individual tree sizes, are offset by volume reductions. However, periodic annual increments in volume are two and three times the mean annual increment, indicating the potential for productivity gains through extended rotations. From a practical point of view, the results validate and clarify the benefits of thinning in stand management and offer a number of options in influencing productivity and value."

Results to date from both installations are similar to results from the seven other LOGS cooperative installations. Generally, they differ from the more productive sites only in the rate and degree of response associated with a lower site quality.

"The LOGS study, through the cooperative, has answered a number of questions relevant to timber production first posed in the 1960s," says Donna Macey **(available at dmacey@pfc.cfs.nrcan.gc.ca)**, an ecophysiologist at the Pacific Forestry Centre who is the contact person for the project as Beddows retires this summer after 35 years with the Canadian Forest Service. "Today, the silvicultural value of the installations continue to increase with the passage of time, and these sites have the potential to answer other questions raised by today's industrial, environmental, and social issues."

Coordinated by the United States Forest Service Pacific Northwest Research Station at Portland, Oregon, the LOGS cooperative includes the United States Forest Service, Weyerhaeuser Company, Washington Department of Natural Resources, Oregon State University, British Columbia Ministry of Forests, and the Canadian Forest Service.

A copy of the current LOGS report, "Levels-Of-Growing-Stock Cooperative Study in Douglas-fir: Report No. 16 - Sayward Forest and Shawnigan Lake" is available through the Canadian Forest Service bookstore at: http://bookstore.cfs.nrcan.gc.ca.

Fungi Provide Potential for Combating Dwarf Mistletoe

"Researchers have been searching for a biological control strategy to manage the most widely distributed species of mistletoe in BC."

Not to be confused with Christmas mistletoe, dwarf mistletoe is a parasitic plant that causes swelling of tree stems and irregular branching patterns. Infected trees can result in suppressed growth, decreased wood quality and reduced seed crop production. Dr. Simon Shamoun, a research scientist at the Canadian Forest Service, Pacific Forestry Centre, has been searching for a biological control strategy to manage the most widely distributed species of mistletoe in BC, western hemlock dwarf mistletoe (*Arceuthobium tsugense*) and lodgepole pine dwarf mistletoe (*Arceuthobium americanum*).

Basically, the biological control strategies being developed are aimed at reducing the dispersal and spread of dwarf mistletoe seeds. Potential biological control agents are applied on affected trees which border openings in stands created by harvesting or silvicultural activities. Threshold mistletoe ratings related to stand attributes are identified and only those areas exceeding this threshold require treatment. This way, although not eradicated from the entire stand, there is a significant reduction of dwarf mistletoe seed production and spread to adjacent new plantations.

"Our goal is not to eradicate the parasitic plant completely," says Dr. Simon Shamoun **(available at sshamoun@pfc.cfs.nrcan.gc.ca)**, "but to manage dwarf mistletoe by reducing seed production. We are trying to develop biological control methods that use fungi to parasitize dwarf mistletoe, thereby reducing seed dispersal. Significant research and development is still required for the development of a biological control strategy as an operational tool."

Cover Story:
Lodgepole pine dwarf mistletoe.

Biological control research concerning lodgepole pine dwarf mistletoe centers around fungi that are native to a particular ecosystem and that target only the parastic plant. Dr. Tod Ramsfield has spent the last few years as a graduate student working on lodgepole pine dwarf mistletoe research with Dr. Shamoun and Dr. Bart van der Kamp, Professor of Forest Pathology at the University of British Columbia. He has been focussing studies on the potential of *Colletotrichum gloeosporioides* – a fungus native to BC – as a potential biological control agent to reduce lodgepole pine dwarf mistletoe.

"We chose *C. gloeosporioides* because not only was it found in the range of lodgepole pine that we surveyed," says Dr. Ramsfield, "but it can be readily cultured and abundant inoculum can be easily generated."

Field trials near Lytton in the interior of BC indicated that under natural conditions, all lodgepole pine dwarf mistletoe was susceptible to *C. gloeosporioides*. When the fungus becomes established it can cause extensive damage to all parts of male and female lodgepole pine dwarf mistletoe infections.

"*Colletotrichum gloeosporioides* interfered with the lifecycle of lodgepole pine dwarf mistletoe by causing a reduction in seed production," says Dr. Ramsfield, who has just accepted a position as scientist at Forest Research in New Zealand **(Tod.Ramsfield @ForestResearch.co.nz)**. "It was found that the mistletoe at all crown positions was equally susceptible to the fungus, indicating that if the inoculum contacts the *A. americanum*, probability of establishment is the same at all canopy positions."

Unfortunately, during field trials, the fungus did not interfere with seed production enough to prevent spread to uninfected trees. However, this does not rule out *C. gloeosporioides* as a potential part of a biological control strategy. Dr. Ramsfield explains that a higher inoculum concentration of an isolate more favourable to biocontrol or different environmental conditions could produce different results in further research.

"Although results indicate that *C. gloeosporioides* is a promising candidate for reducing lodgepole pine dwarf mistletoe, further studies will need to be completed before the fungus can be used commercially as an inundative biological control agent," says Dr. Ramsfield.

This research was a collaboration between Natural Resources Canada, Canadian Forest Service and the Department of Forest Sciences at the University of British Columbia.

The Economic Contribution of Secon

"According to the Canadian Forest Service study, market success will require accurate strategic development, tight cost control in manufacturing and product positioning, nimble management, complementary public policy and a degree of serendipity."

There was good reason to be optimistic about secondary manufacturing in the BC forest industry until the United States International Trade Commission (ITC) sent shockwaves through the sector.

The secondary manufacturing sector of the BC forest industry consists mainly of small and medium-sized enterprises that rely on easy-to-saw wood such as pine and spruce, known as softwood lumber. Primary mill wood or wood-based materials are processed into semi-finished or finished products. These include remanufactured products, millwork, engineered wood products, cabinets, furniture, pallets and containers, other wood products, panelboards, and shakes and shingles.

In recent years, this sector of the BC forest industry has been growing rapidly as the province worked towards a more balanced use of public forestlands. Sales increased 21 percent between 1997 and 1999. When the industry reached $4.68 billion total sales in 1999, this amounted to 26 percent of forest product sales for the year. That same year, remanufactured products accounted for 36 percent of sales, similar to 1997. Panelboard sales grew from 22 percent of the market share in 1997 to 31 percent in 1999. Engineered wood product sales remained about the same over those years, as did pallets and containers, at one percent, while all other business types were down slightly.

In 1999, the number of firms involved in secondary manufacturing in BC was estimated at 774 and the industry employed over 20 000 workers.

BC has had a number of strengths to grow on: high quality fibre, competitive energy costs, an established position in major market research and development facilities, worker training facilities, and institutional support. The latter has included programs such as the British Columbia Ministry of Forests Small Business Forest Enterprise Program and the value-added program of Forest Renewal British Columbia delivered in cooperation with producer associations.

The secondary manufacturing sector of the BC forest industry consists mainly of easy-to-saw wood such as pine and spruce, known as softwood lumber.

ndary Manufacturing in BC's Forest Industry

In a Canadian Forest Service study by Bill Wilson, Brad Stennes, Sen Wang and Louise Wilson, *The structure and economic contribution of secondary manufacturing in British Columbia, 1990 - 1999,* it was noted that 73 percent of the value-added wood companies reporting had sales to the United States, representing 46 percent of total sector sales. Dr. Wilson is the Director of Industry, Trade and Economics Research at the Canadian Forest Service, Pacific Forestry Centre.

On 2 May 2002, the United States ITC voted 4 to 0 that the United States softwood lumber industry is threatened by imports of softwood lumber from Canada that the United States Department of Commerce claims is subsidized and sold in the United States at less than fair value. Resulting anti-dumping and countervailing duty orders on 23 May 2002 required substantial cash deposits for estimated duties on all softwood lumber exports including many secondary manufactured products.

As part of a response package, the Honourable Herb Dhaliwal, Minister of Natural Resources Canada, announced an investment of almost $75 million to support several initiatives to help Canada's forest industry remain prosperous and competitive. "They will help us achieve our goals of diversifying our markets and branding Canada worldwide as a preferred source of top-quality and innovative forest products," said Minister Dhaliwal.

The initiatives included $29.7 million for the Canadian Wood Export Program, $30 million to support research and development activities and $15 million for the Value-Added Research Initiative for Wood Products.

As the industry adjusts to the American decision and to the future, short-term optimism is hard to find. As the processes work themselves out, governments will have to review their policies and programs. Changes will be inevitable as institutional settings evolve to complement and promote sustainable growth in secondary manufacturing while staying within future free trade and within what the World Trade Organization dictates.

According to the Canadian Forest Service study, market success will require accurate strategic development, tight cost control in manufacturing and product positioning, nimble management, complementary public policy and a degree of serendipity.

Manufacturers can assume that the demand for industrial timber will increase with forecasted rising incomes, population growth, and the inherent renewable nature of timber. However, social concerns on commercial forestry practices, market segmentation, competing substitute products, rapid technological change, and highly competitive markets may temper this demand.

Businesses must make effective responses to the market, wood supply, pricing challenges and the real costs of labour in order to build on the existing strengths in the industry. Developing and implementing these will not be easy and there is no easy formula for success. However, research may make it easier for industry to promote sustainable growth in secondary manufacturing.

"By providing timely, accurate, and comprehensive information on the magnitude and trends of secondary manufacturing in BC, our findings make it easier for decision-makers to assess opportunities and options to complement the sustainability and competitiveness of this industry," concludes Dr. Wilson **(available at bwilson@pfc.cfs.nrcan.gc.ca)**. The study also illustrates the challenges to realizing the sector's opportunities.

New Web Site on Defoliating Insects of Conifers in BC

"The information on this web site is designed to enable non-specialists to identify any defoliator occurring on a coniferous host in BC."

The spruce budworm, blackheaded budworm and hemlock looper are all well known forest defoliators that frequently cause extensive damage to Canada's forests. But there are also less common defoliator species which, although usually innocuous and sometimes rare, are important elements of forest biodiversity. Until now tools that would enable forest stakeholders to accurately identify this important group of insects have not been available. Yet such tools are essential if field foresters, biologists, researchers, naturalists, environmentalists and educators are to appropriately manage damaging species and develop a greater understanding of the roles defoliators play in the forest ecosystem.

The Canadian Forest Service, Pacific Forestry Centre has recently launched a new web site, *Conifer Defoliating Insects of British Columbia* (http://www.pfc.cfs.nrcan.gc.ca/entomology/defoliators). The web site describes both damaging and non-damaging insects that feed on the foliage of any of the 24 species of conifers native to the province. The site currently includes about 30 percent of the 140 defoliator species known to feed on conifers in BC.

"The 40 species currently posted on this web site represents the first segment of an upcoming comprehensive guide that will ultimately include all conifer defoliators known to occur in BC," says Bob Duncan **(available at rduncan@pfc.cfs.nrcan.gc.ca)**, an insectary biologist at the Pacific Forestry Centre. Since 1972 Duncan has been providing insect diagnostic services for the Canadian Forest Service. Thirty years of working with forest stakeholders in government, industry, the scientific community and the general public uniquely qualifies Duncan to produce this guide. The guide will be of interest to anyone interested in forest health, biodiversity, environmental or conservation issues.

*Western pine elfin (*Callophrys eryphron*).*

"The information on this web site is designed to enable non-specialists to identify any defoliator occurring on a coniferous host in BC," says Duncan. "And it will allow them to quickly locate information on the hosts, distribution, biology, abundance, feeding habits and economic importance of each species."

An ability to identify defoliating insects can be useful in determining the cause of tree damage and can be a first step in developing a management program to prevent severe pest damage. But just as importantly, identification of defoliating insects aids in developing a greater understanding of complex forest ecosystems.

"All insect species play an important role in the ecological relationships of the forest," says Duncan. "Insect defoliators – primarily caterpillars and sawfly larvae – are important elements of forest health and biodiversity. Some species periodically go into outbreak causing considerable economic loss to the forest resource while other species are rare and may require conservation efforts."

Duncan explains that identifying the immature stages of many species can be difficult because few larval keys exist and those that do cover only a few of the defoliating species occurring in BC. Also, these keys are widely dispersed in the taxonomic literature and are not illustrated with colour photos. The new web site, *Conifer Defoliating Insects of British Columbia,* however, includes larval descriptions, life history data and colour photographs for each species.

The web site lists defoliators not only by common and scientific name, but also by family and host tree. Defoliating insects occurring on the following hosts are described on the web site: western redcedar, yellow-cedar,

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The BC Community Forestry Forum

"Interest in community forestry is greater than ever in many countries and regions world-wide, including Canada and BC."

You may think that an event called the BC Community Forestry Forum would interest only those in BC. But since human relationships with forests is emerging as one of the greatest concerns of the twenty-first century, the BC Community Forestry Forum gathered delegates from across Canada, the United States, Africa, Asia and Latin America.

Held in Victoria March 14-16, 2002, the forum was the largest community forestry meeting ever held in BC. Approximately 240 community forestry practitioners and advocates, First Nations and community leaders, government officials and policy-makers, educators, researchers and students met to discuss how communities can play a greater role in decisions concerning local forests. Community forestry – communities having direct and meaningful involvement in local forest stewardship – has been advocated as a means of increasing community economic development, providing employment and capacity building, and enhancing stewardship of natural systems. Internationally, governments are acknowledging that local citizen participation has an important role in sustainable forest management and conservation.

"Interest in community forestry is greater than ever in many countries and regions world-wide, including Canada and BC," says Dr. Bill Wagner **(available at wiwagner@pfc.cfs.nrcan.gc.ca)**, Model Forests Coordinator at the Canadian Forest Service, Pacific Forestry Centre. "Phrases like community forestry, community-based ecosystem management, communities of place, good science, forest health and biodiversity all apparently have positive implications. Yet, these same phrases often initiate a conflicting response from interest groups holding more traditional viewpoints. So the forum was an excellent opportunity to identify and discuss issues and concerns but also to learn of the successes of others and gain an understanding of both the benefits and challenges of community forestry."

Three common issues emerged from discussions at the forum: forest tenure and the availability of land and forest resources; availability of and access to competitive markets; and frustration with top-down command and control institutional artifacts leftover from colonial eras. In BC, the main concerns centered around capturing the attention and interest of government; community capacity building; revenue sharing arrangements between the province and communities; and provisions for rights other than timber and botanical products.

"The forum was a fascinating experience for me and I was struck by the similarities, across the globe, in concerns over land tenure, globalization, and inclusion of traditional knowledge," says Beth Rose Middleton, a United States Delegate at the forum. "At the same time, the differences in how community forestry is construed – even just between the U.S. and Canada was also interesting."

The BC Community Forum was an initiative of the Canadian Forest Service, the POLIS Project on Ecological Governance at the University of Victoria, the Southern Interior Forest Extension and Research Partnership, and the BC Ministry of Forests. Proceedings of the forum are available at: www.cf-forum.org.

Dr. Bill Wagner (far right) at the BC Community Forestry Forum which gathered delegates from across Canada, the United States, Africa, Asia and Latin America.

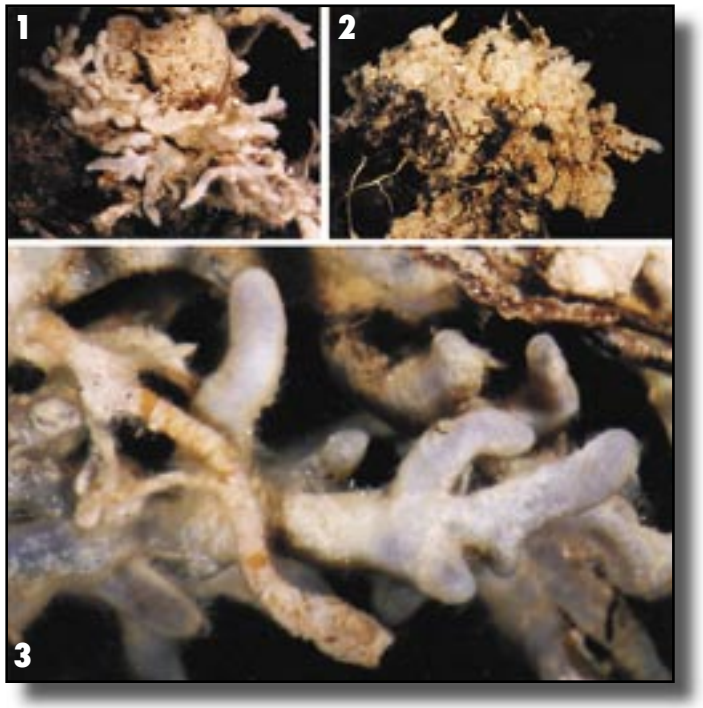
From Fungal Fruiting Bodies to Fungus Finder

"One of the many advantages of the MMPNW is the ability to compare species."

What began as a study on the morphological features of ectomycorrhizae –a symbiosis of plant root and fungus – has *mushroomed* into a new taxonomic tool for fungi in general.

Dr. Tony Trofymow, **(available at ttrofymow@pfc.cfs.nrcan.gc.ca)**, a research scientist in soil ecology at the Canadian Forest Service, Pacific Forestry Centre, had been updating and revising an on-line manual and database on ectomycorrhizae (www.pfc.cfs.nrcan.gc.ca/biodiversity/ecto) when he came across the CD-ROM, Matchmaker: Mushrooms of the Pacific Northwest (MMPNW) while meeting with members of the local mycological society. Teaming up with Dr. Alan Thomson **(available at athomson@pfc.cfs.nrcan.gc.ca)**, a research scientist at the Pacific Forestry Centre who specializes in the development of diagnostic expert systems, an on-line version of MMPNW was produced.

"To identify the fungal species of the ectomycorrhizae, a specimen has to be traced physically or by DNA matching to the fruiting body of the fungus that is associated with it," explains Dr. Trofymow. "Therefore, for our manual and database on ectomycorrhizae we were very interested in finding useful taxonomic tools for identifying fungal fruiting bodies – mushrooms. This quest led to Matchmaker: Mushrooms of the Pacific Northwest and the creation of an on-line version that's available to anyone interested in identifying mushrooms."



Ectomycorrhiza. Cantharellus formosus *Corner. 1. Coralloid system partially cleaned, with mycelial strand. 2. Coralloid system minimally cleaned, with mycelial strands. 3. Part of coralloid system, with large mycelial strand.*

Gills of a mushroom, Cantharellus formosus *Corner.*

As an interactive web site, MMPNW (http://www.pfc.cfs.nrcan.gc.ca/biodiversity/matchmaker) lists over 2000 gilled mushrooms of BC, Washington, Oregon, and Idaho. Each mushroom listed includes a detailed description supported by a glossary. Many are paired with a full-colour illustration.

To identify a mushroom through the web site, the user enters the particular characteristics of the specimen and does a search to prepare a list of fungi matching those characteristics. If the mushroom has features common to many mushroom species, a Best Characters option is available to narrow the search. This option lists particular characteristics that are useful in distinguishing among matching species as well as providing the percentage of species that do not have that particular characteristic.

"One of the many advantages to the MMPNW is the ability to compare species," explains Dr. Thomson. He supervised student Wendy Alexander who created the web site.

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Recent Publications

Expérience sur la régénération du pin blanc – Conclusions d'intérêt pour les aménagistes. 2002. Burgess, D.; Pinto, F.; Wetzel, S. Ressources naturelles Canada, Service canadien des forêts, Centre forestier du Pacifique, Victoria, C-B. Notes De Transfert Technologique 28. 6 p.

First Nations Forestry Program newsletter/Bulletin du programme des premières nations. 2002. Natural Resources Canada, Canadian Forest Service, Headquarters/Ressources naturelles Canada, Service canadien des forêts, Administration centrale. Ottawa, ON. Vol. Spring 2002/Printemps 2002.

Levels-of-growing-stock cooperative study in Douglas-fir: Report no. 16 – Sayward Forest and Shawnigan Lake. 2002. Beddows, D. Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre, Victoria, BC. Information Report BC-X-393. 67 p.

Nun moth – *Lymantria monacha*. 2002. Humphreys, N.; Allen, E.A. Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre, Victoria, BC. Exotic Forest Pest Advisory 6. 4 p.

Publications Digest 2001. **Abrégé des publications 2001**. Anon. Natural Resources Canada, Canadian Forest Service, Headquarters/Ressources naturelles Canada, Service canadien des forêts, Administration centrale. Ottawa, ON. (2001).

Managing Your Woodland: A Non-forester's Guide to Small-Scale Forestry in British Columbia. 2002 edition. Co-published by Small Woodlands Program of BC and the Canadian Forest Service, Victoria, BC. (2002). 301 p. (available in PDF format only - see our online bookstore to download)

New Web Site
(continued from page 8)

Douglas-fir, amabilis fir, grand fir, subalpine fir, mountain hemlock, western hemlock, common juniper, Rocky Mountain juniper, subalpine larch, tamarack, western larch, jack pine, limber pine, lodgepole pine, ponderosa pine, western white pine, whitebark pine, black spruce, Engelmann spruce, Sitka spruce, white spruce and western yew.

The web site will be updated annually until all species are included. The hardcopy version of the guide, describing all conifer defoliators in BC is expected to be completed and available in early 2005.

Matchmaker
(continued from page 10)

"The characteristics of each species can be listed to further narrow a search and make an identification. For example, decurrent gills rank high in the list of best characters, so if the mushroom that you are trying to identify has decurrent gills, clicking on this choice will eliminate any species without decurrent gills. Searches may also be narrowed to family or genus."

"Eli and I are very pleased with the Web version of the program," says Dr. Ian Gibson **(ig@islandnet.com)**, who, with his son Eli of Victoria, wrote the original non-profit CD-ROM version of the program. In that program, there are more than 1400 illustrations of over 700 of the gilled species, as well as almost 900 illustrations of about 450 nongilled species.

A subset of the illustrations of gilled species is presented on the MMPNW web site. "We have heard from people not only in the Pacific Northwest but from elsewhere in North America and even in Europe who find the site useful. More images and the most recent version will be included in the next few months."

Besides the interactive web site on mushroom identification, the Pacific Forestry Centre also houses the largest curated mycological herbarium in western Canada, representing more than 3000 different species of fungi. Information about the herbarium and fungi in general, including a BC Host/Fungus Index database, is available at:
www.pfc.cfs.nrcan.gc.ca/biodiversity/herbarium.

Upcoming Events

The Canadian Institute of Forestry 2002 Annual General Meeting and Conference: Forests Sustaining Communities/Communities Sustaining Forests

September 29 – October 3, 2002
North Bay, Ontario, Canada

The conference will focus on practices being used in forestry today. Participants will be made aware of the results of different solutions that have been implemented to address the challenges of sustainable forestry.

For further information, check the web site at http://www.cif-ifc.org/ or contact

Richard Macnaughton, a Canadian Forest Service scientist and co-chair of the conference, available at rmacnaug@nrcan.gc.ca or phone (705) 541-5591.

International Union of Forest Research Organizations (IUFRO) Tree Seed Symposium, "Seeds 2002"

September 11-15, 2002
Chania, Crete

The symposium will cover various aspects of tree seed science and technology.

For further information, check the web site at http://iufro.boku.ac.at/ or contact
Dr. Thanos, University of Athens, Greece,
available at cthanos@biol.uoa.gr or phone +3-010-7274655, fax +3-010-7274702.

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