COLUMBIA MOUNTAINS INSTITUTE OF APPLIED ECOLOGY

CMI Annual Researchers' Meeting

Abstracts

The Use of Prescribed Fire to Restore Whitebark Pine Communities in the Canadian Rocky Mountain National Parks

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The goal of this research is to determine whether prescribed fire can be an effective tool for increasing whitebark pine stand regeneration. Increased regeneration should help maintain genetic diversity, which is the basis for the future survival of whitebark pine. Whitebark pine trees grow in the highest elevation forests and occur throughout the Canadian Rocky Mountain National Parks. Whitebark seeds are an important seasonal food source for an associated community of animals including Clark's nutcrackers, red squirrels and grizzly bears. Whitebark pine communities are threatened by a variety of stressors. The most pressing concern is an introduced pathogen, pine blister rust. Over its range, blister rust is responsible for killing 40-100% of the whitebark pine and infects 50-100% of the remaining, live trees. The proportion of whitebark pine stands infected with blister rust in the Canadian Rockies decreases with latitude. However, the potential for high infection does not appear to be limited by climatic or stand conditions. Selective mortality from blister rust has removed the more homozygous individuals from heavily infected populations. To date, the project has consisted of establishing research plots in one high elevation mixed conifer site and a subsequent, high intensity prescribed burn. Future efforts will concentrate on post-burn data collection, additional sites and developing a comprehensive management plan for the restoration of whitebark pine communities.

Ecological Comparisons between Wildfire and Logging: The East Kootenay Songbird Project

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Emulating natural disturbances like wildfire is a key component of recent approaches being taken towards forest management for biodiversity. One aspect involves leaving live (residual) trees in

harvested areas to emulate those remaining following natural disturbances, and to provide habitat for wildlife. However, there are few data on how wildlife communities respond to logging *vs* wildfire, or on the densities and patterns of live trees required to emulate wildfire and maintain wildlife habitat. Furthermore, there is evidence that residual trees in harvested areas may increase nest predation on songbirds by providing perches for nest predators. The main objectives of this 3-yr. study are to

1) Compare the songbird communities in logged and burned (by wildfire) stands in relation to the density and type of residual trees,
2) Determine if the songbird communities in logged and burned stands converge through time (5-50 yr.), and
3) Determine the relationship between the density of residual trees and the reproductive success of ground and shrub nesting birds in burned and logged stands.

In 1997, 210 point count stations were randomly selected and established in logged and burned stands in the Rockies in southeastern British Columbia. Songbirds were surveyed at each during the breeding season in 1997 and 1998, and extensive vegetation plots completed. Nest predation and the reproductive success of ground and shrub -nesting species is being examined through experimental and observational approaches. In 1998, 900 artificial nests were placed out in 30 logged and burned stands with high or low densities of residual trees, and predation rates on them monitored. In similar stands, actual nests of Warbling Vireos, Dusky Flycatchers, Dark-eyed Juncoes, White-crowned Sparrows, Wilson's Warblers and Chipping Sparrows were located at the egg-laying stage and monitored through fledging. Point counts and nest experiments will be repeated for a final season in 1999. Results will be used to develop recommendations for stand level harvest practices and be implemented by agency and industry project partners. Local project partners include the Invermere Enhanced Forest Management Pilot Project (BCFS), Crestbrook Forest Industries, Slocan Forest Products, Wings Over the Rockies Bird Festival, and Kootenay National Park.

For detailed reports on this and related wildfire projects, see http://www.for.gov.bc.ca/nelson/district/invermer and look under the pilot project listings.

Bio:
Kari Stuart-Smith is a forest wildlife ecologist (RPBio.) currently working on a PhD in Forest Ecology through Oregon State University. She has a MSc Wildlife Ecology from the University of Alberta (1993) and a BSc Biology from Carleton University (1989). While working as a wildlife biologist for Alberta-Pacific Forest Industries she conduced research into the effects of industrial development on woodland caribou and the effects of forest practices on songbirds, and used the results to develop and implement improved harvest practices. Her other research projects have included studies of forest fragmentation and small mammals, population dynamics of red squirrels, and a population census of forest elephants. Her current research focuses on the scientific basis for the natural disturbance approach to forest management, and on developing and implementing ecologically based forest practices in the central Rockies.

Harvesting Strategies to Reduce Costs AND Protect the Soil

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With the advent of the Forest Practices Code in 1995, both industry and ministry staff have been hesitant to propose or employ harvesting practices that may temporarily exceed soil disturbance levels, or ensure that harvesting can occur under wetter soil conditions. As a result, logging costs went up, in terms of direct costs, because of less efficient layouts, and in terms of indirect costs due to increased voluntary shutdowns. With the recent slump in the forest industry, these costs became an issue. Fortunately, in co-operation with industry and district staff over the last few years, we have been working on a number of harvesting strategies that industry feels have been saving them up to three or four dollars per cubic meter, while still protecting the soil and related resources.

Four key strategies that have been working include: closer spaced temporary trails on gentler or steeper ground, closer spaced temporary roads on gentler ground, hoe-chucking to wider spaced trails, and random skidding with feller buncher harvesting. Through harvest planning, the end result should be harvesting strategies that are less dependant on weather/climate. A number of these strategies can also save silviculture costs by providing a reasonable amount of "site prep" type disturbance during the dispersed skidding component of the harvesting operation, a bonus for natural regeneration or planting, and dealing with growth limiting factors during stand establishment. (For similar reasons, a number of people have been hesitant to employ mechanical site prep as well, which can drive up prices for planting, reduce survival and early growth, increase replants and brushing costs - similar strategies apply to well-planned site preparation.) Interpretive tools are being developed to match sites (soil sensitivity) to appropriate strategies, and to provide simple tests for adequate frost or excessive soil wetness. High quality SP data collection will help prevent problems due to poor soil characterization - a simplified soil texture key is being developed to assist here as well.

Bio:
Undergraduate degree in physical geography and botany, Master's in soil chemistry, and Doctorate studying long-term effects of slash burning. Previous work experience in soil survey, environmental impact assessment, and mine and pipeline reclamation planning, in B.C. and Alberta. Current areas of responsibility include: Soil conservation aspects of the Forest Practices Code; specifically, managing disturbance effects on soil properties and tree growth. Currently also functioning as Research Staff Officer. Also represents the Nelson Forest Region on technical research issues (e.g, Operations Division Research Review, Research Branch Strategic Plan, Interim Board of Directors, Southern Interior Forest Extension and Research Partnership (SIFERP). He is also cooperating with Bill Chapman from the Cariboo Region on a possible "biological control agent" for *Armillaria* root rot that may have application on our more sensitive sites. Funding from FRBC (SCBC), and Invermere Enhanced Forest Management Pilot Project, in collaboration with CFS, MoF Research Branch and University researchers on the above topics, and fire effects on soils.

Of interest to CMI: Mike Curran is developing a "Columbia Mountains Guidebook" similar to Ben Gadd's Handbook of the Rocky Mountains, in cooperation with Leslie Anderton and others at Selkirk College; Greg Utzig, Kutenai Nature Investigations, and fellow scientists in the MoF. He is also an avid climber.

Partial Cutting Prescriptions for Mountain Caribou in the ESSF of Southeastern BC- 20 years later

Deb DeLong, Bruce McLellan, Jane Miller and **Eliot Terry**

The Engelmann Spruce Subalpine fir (ESSF) biogeoclimatic zone (Braumandl and Curran 1992) represents a large portion of the remaining undeveloped, operable, forested landbase in the Nelson Forest Region in southeastern British Columbia. Timber harvesting on much of this landbase is constrained by other resource values, particularly caribou habitat requirements as specified in the Kootenay Boundary Land Use Plan (KBLUP). Using partial cutting to harvest timber may be one means to meet multiple objectives in the ESSF.

Several blocks were partially cut in the 1970's and early 1980's in the ESSF in the Kootenay Pass area of the Southern Selkirk Mountains. These blocks offered a unique opportunity to assess regeneration, stand response, and caribou habitat potential of partial cuts. This study assessed regeneration density and various stand and site factors in a sample of the partially cut blocks. In addition, some of the blocks were used to compare attributes of the partial cuts with attributes of caribou habitat areas.

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Evaluating Ecosystem Management in the Columbia Mountains of British Columbia

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A key assumption underlying ecosystem management is that providing scientific information to decision makers, leads to better land use decisions. This research investigates the role of science in land use decision-making in the Columbia Mountains of British Columbia, as well as other factors. The study grew out of an evaluation of the ecosystem management efforts of Mount Revelstoke and Glacier national parks. Evaluating an evolving program with a ten year history, posed significant challenges. The methodology involves an evaluation research approach, specifically fourth generation evaluation (Guba & Lincoln, 1989), with its tenets of stakeholder rights and constructivism. Methods include participant observation, consultations with program staff, content analysis of documents, self-administered questionnaires, and in-depth interviews with 146 stakeholders conducted in 1997. Both quantitative and qualitative data were gathered and analyzed. Challenges in the transcription of the taped interviews significantly delayed the qualitative analysis. This research augments existing knowledge about the human dimensions of

ecosystem management. Preliminary results include an assessment of pertinent attitudes, beliefs and values of stakeholders who affect land use and research decisions in the Columbia Mountains. These stakeholders perceive the B.C. Forest Service and the Forest Industry as possessing the most power in land use decision-making, with influence also exerted by the B.C. Ministry of Environment, Lands and Parks, B.C. Hydro, and Parks Canada. Scientific information appears to significantly affect certain land use decisions, although its successful application depends on specific conditions and effective communications strategies. Sixty-five per cent of respondents judged Parks Canada as effective in its ecosystem management efforts, however forty-two per cent noted problems in Parks Canada's internal and/or external communications which reduce its effectiveness. The focus of this paper is on a selection of the qualitative information from interviews with stakeholders which are currently being analyzed using NUD*IST 4.0. software (Non-Numeric Unstructured Data Indexing, Searching, and Theorizing).

Bio:
Jenny has an Honours B. Sc. in Environmental Biology with a minor in Physical Geography, and a Masters of Environmental Design, specializing in Environmental Science. Her thesis, Mountain Town with a Vision, A Case Study in Sustainable Community Development, used qualitative methods to investigate the utility of community vision-setting in sustainable community development. She is currently completing a Ph.D. in Geography at the University of Calgary. Her research focuses on understanding British Columbia's land use decision-making processes and how they can be influenced through ecosystem management programs involving interagency collaboration and ecological research. From 1976 to 1992, Jenny worked for national and provincial parks in Canada. Her career took her from the boreal forests and Atlantic Ocean of Terra Nova National Park in Newfoundland to most of the mountain parks of Alberta and British Columbia, including Mount Revelstoke and Glacier National Parks in the Columbia Mountains. Her work included positions in interpretation, communications, resource studies, planning, and management. Jenny currently serves on the Board of Directors of the Columbia Mountains Institute of Applied Ecology.

Integrating Mountain Caribou Requirements And Forest Management In The Interior Wet-Belt Near Revelstoke, British Columbia -- Lichen Retrospective and Dispersal Studies

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Alternative harvesting systems in old-growth habitat are being evaluated in the Revelstoke area. Integrating mountain caribou (*Rangifer tarandus caribou*) and timber management is important in the Revelstoke area because a significant proportion of the annual allowable cut will be harvested from old-growth stands critical for the early winter and spring range of caribou. Many of these stands are in the interior cedar-hemlock zone (ICH). Alternative silviculture systems that maintain caribou habitat while allowing access to merchantable timber will be preferred in caribou habitat.

As part of the evaluation of alternative harvesting systems, dispersal and establishment of lichens, a critical forage for mountain caribou, is being evaluated. Establishment of two lichen genera, *Alectoria* spp. and *Bryoria* spp., was assessed as a function of distance from mature timber on 15 - 17-year-old plantations of interior Douglas-fir (*Pseudotsuga menziesii*). The plantations are located at Sheill Road and Goldstream River. Mature to over-mature forests near the tree plantations are dominated by *Alectoria* spp. with minor amounts of *Bryoria* spp. Significant inverse relationships exist between biomass of lichen established on young Douglas-fir and distance from mature timber. Most lichen establishment occurred within 75 m of mature timber and the proportion of *Bryoria* spp. established significantly increases with distance from the mature timber. Lichen establishment was significantly less on western redcedar (*Thuja plicata*) than on other tree species.

Dispersal of *Alectoria* spp. and *Bryoria* spp. lichens was assessed using litterfall traps in the Keystone area during 1997 and 1998. Dispersal rates of *Alectoria* spp. and total lichens within the patch cuts (1.0-1.78 ha) were significantly less in 1998 than in 1997. Dispersal of both lichen genera was significantly greater in traps located within mature timber, compared with traps located 0-20 m, 20-40 m, and 40^{+} m from the mature timber. Lichen dispersal within these patches occurs at a relatively uniform rate. Lichen establishment and dispersal rates were observed to be higher at or near residual trees or wildlife tree reserves.

Factors Affecting the Establishment of Alpine Larch Following Fire in the East Kootenays

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Alpine Llarch (*Larix Lyallii*) is a deciduous conifer with a limited distribution in south-western Canada and the north-western United States. Traditionally, Alpine Larch has been associated with timberline environments where its ability to tolerate harsh winter conditions, short growing seasons, and poorly developed soils were considered the main factors in the species' ability to maintain viable populations within these areas. In the northern part of its distribution, Alpine Larch often forms an extensive mixed-wood forest with Subalpine Fir and Engelmann Spruce. This atypical subalpine distribution appears, in part, to be mediated by the occurrence of high intensity fires. In this presentation I report on research conducted to examine what types of environmental gradients are important for the recruitment of Alpine Larch, compared the other conifers within two recently burned areas in the East Kootenays.

Bio:
Brendan is originally from the Bow Valley in Alberta. He moved to Australia in his teens where he completed both high school and some time later, his undergraduate degree in applied environmental biology at the University of Technology, Sydney. Brendan stayed on at UTS to complete an honours thesis investigating the effect of selective harvesting on understory plant communities in an Australian subalpine forest. In 1993, he moved back to the Rockies to start a PhD investigating the regeneration dynamics of alpine larch at the University of Alberta with Dr. Mark Dale. Brendan now lives in the Slocan Valley with his partner Rena, were he works a consulting biologist and is finishing his graduate thesis.

The Southern Interior Forest Extension and Research Partnership (SIFERP)

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British Columbia has always supported investment in researching forest ecology and management, but little in the synthesis and dissemination of results. SIFERP is a newly-created, non-profit cooperative of people focussed on developing, using and sharing this knowledge, about how forested ecosystems function and their sustainable and holistic management. Over thirty organizations are now partners, and staff are now in place in several locations in the Southern Interior. Mandate, services and directions of the new Partnership will be described.

Bio:
Don Gayton is an ecologist and writer living in Nelson, British Columbia. He has a Bachelor's degree in Agronomy from Washington State University and a Master's Degree in Plant Ecology from the University of Saskatchewan.
In addition to being a rangeland ecologist, he has worked on cattle ranches and as a community developer in Latin America, an agricultural extension agent on Saskatchewan Indian Reserves, a soil assessor, a forage specialist, and a steelyard worker. For the last ten years he has worked for the BC Forest Service, and is currently seconded to the Southern Interior Forest Extension and Research Partnership as an extension specialist. Don has published two books of non-fiction, plus a number of articles in both popular and technical magazines, including Equinox, Canadian Geographic, and Harrowsmith. His first book, the Wheatgrass Mechanism, was published in 1990 and won the Saskatchewan Writer's Guild's major award for that year. Landscapes of the Interior, his second book, was published in 1997. It was a runner-up for the Roderick Haig-Brown Prize at the BC Book Awards, and won the US National Outdoor Book Award for 1997.

Landscape Patterns in Managed Forests: Can We Define Fragmentation?

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Landscape ecology is based upon an implicit assumption that there is a direct influence of landscape pattern on underlying ecological processes. Most of what we know and understand about the effect of pattern on process is derived from theory and simulation modeling. One of the major challenges to empirically testing theoretical predictions in landscape ecology is a lack of meaningful quantitative tools for describing observed patterns. This lack of quantitative methodology has left central concepts such as forest fragmentation undefined and elusive. Issues surrounding this situation and management implications are presented.

Bio:
Rob has a B.Sc. in forestry: 1987, Lakehead University, Thunder Bay, Ontario, and an M.Sc: 1992, Univ. New Brunswick, Fredericton, NB. During 1992-95 he was employed as habitat

biologist with Ontario Ministry of Natural Resources in Timmins, Ont. He worked on hybridization and behavioural mechanisms in ducks. In 1995 he arrived in the Kootenays, took up backcountry skiing and drinking Oso Negro coffee, and oh yeah, got a job with Kokanee Forest Consulting, been here since. In 1998 he went back to school and is currently working on a PhD in landscape ecology at UBC Centre for Applied Conservation Biology. Still backcountry skiing and drinking Oso Negro coffee.

An Index of Old-Growthness for Two BEC Variants in the Nelson Forest Region by Rachel Holt, Tom Braumandl, and Deb MacKillop

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Policy on landscape unit planning in British Columbia recommends areal targets for the retention of Old-growth Management Areas (OGMAs) by biogeoclimatic ecosystem classification variant, within landscape units. The Ministry of Forests defines old-growth using forest cover age class. However, there is increasing awareness that age class alone may miss functional attributes of old-growth forests, and may also be too coarse, and inaccurate a scale for evaluating the biological value of older seral forests. In order to optimize the biodiversity value retained in OGMAs, it is important to identify and rank candidate OGMAs based on their functional value. Here we present a methodology for indexing the 'old-growthness' of older seral forest in two variants of the Interior Cedar-Hemlock subzone of the Nelson Forest Region. We sample stand structural attributes in a range of stand ages from the two variants, and use a statistical methodology to group stands based on these data. We define threshold values based on these groupings, and present look-up tables and a scorecard for ranking recruitment and old seral stands based on their structural attributes.

Bio:
Tom is a Forest Service Regional Ecologist,. He has worked in Nelson with FS since 1979 and helped to develop the ecological classification for the region. Other areas of responsibility: fire ecology, biodiversity, landscape unit planning.

Biographies; no abstracts:

Christoph Steeger
Chris's Bio. MSc. in Biology (SFU). Last 10 years, senior biologist with Pandion; research focus: wildlife and biodiversity in relation to forest management (esp. stand level management).

Dr. Mindy Brugman
Mindy is presently a Glacier Researcher with the Columbia Mountains Institute of Applied Ecology, in Revelstoke and a private consultant in Geology and Hydrology. Her address is Box 2568, 204 Campbell Avenue, Phone: (250)-, FAX: -5837-9315, FAX-4223 , E-mail brugman@junction.net .

She specialized in glaciers and hydrology, with focus on physical process modeling and measurement, hazard assessment, remote sensing and climate change detection. Her research with Atmospheric Environment involves applying satellite remote sensing to understand how we may use the Cryospheric systems for evaluation of Climate change in Canada (CRYSYS). Mindy is involved in surveying glacier-related hazards and has carried out isotopic and chemical analyses of snow and ice in Canada, U.S. and Mexico. She obtained her 1978 B.S., Atmospheric Sciences, University of Washington, Seattle, with an emphasis on quaternary science and geology. She obtained her M.S. in Geology in 1982, and Ph.D. in Geology in 1987 both at the Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena. Her Thesis research was on water flow through glaciers and volcanic hazards. She carried out a postdoctoral appointment at the ETH VAW-Glaciology section in Zurich Switzerland in 1986-87, and was a visiting Professor of Geology and Hydrology at Western Washington University and consultant for the U.S. EPA in 1988 and 1989. From 1989 –1996 she was Research Scientist and Glaciologist at Hydrological and Aquatic Sciences Division, National Hydrology Research Institute, Environment Canada, Saskatoon. There she re-established and maintained glacier mass balance program at NHRI for western Canada, and provided environmental advice on topics related to glaciers, hazards, ecosystem-health, mining impacts and climate change in Canada. In addition she acted as principal investigator to develop a physically-based model of the glacier runoff in the Columbia River basin for use in large-scale distributed hydrologic models. She is an adjunct Professor at University of Saskatchewan and Research Associate in 1987-89 at Western Washington University in Bellingham.

Committee appointments held included in 1991 to 1995 Secretary of International Tracer Committee- for the International Association of Hydrological Science, Expert for Mexican Government on glacier hazards at active Popo volcano 1994-96, Co-Investigator and glacier coordinator for Earth Observing System-CRYSYS 90- .present, GLIMS- ASTER investigator 1998- present, Correspondent for glacier mass balance foIHP-4 for WGMS-IAHS, 1991-95, member of Canadian GEWEX team (1991, 1994-6, advisor to scientific educational programs at Columbia Icefields Center (1994-96).