Columbia Mountains Institute of Applied Ecology

CMI Annual Researchers Meeting 2002

April 22-23, 2002
Hillcrest Hotel, Revelstoke BC

Every year the Columbia Mountains Institute's members get together to hear about ecological research in the southeastern BC. The members provide updates on their projects and initiatives and catch up on the news. It's an informal atmosphere and the non-members are welcome to join in.

This year's CMI Annual Researchers' Meeting was held in Revelstoke at the Hillcrest Hotel. The meeting began with dessert and coffee on the evening of Monday April 22nd and continued on the morning of Tuesday April 23rd. After lunch the CMI held a short Annual General Meeting. A few more presenters spoke, then the group headed out onto the Revelstoke Flats (Upper Arrow Reservoir) for a field trip.

The field trip was to Drimmie Creek, about 15 km south of Revelstoke in the Upper Arrow Lakes drawdown zone. About 20 meeting participants went on-site with the BC Hydro contractors who had assessed the ecological benefits of BC Hydro's seeding program.

Here the group is walking along the edge of a seeded area, looking at erosion in a side channel.

In addition to the regular assortment of CMI member presentations, heard BC Hydro contractors present on "Benefits of Shoreline Revegetation in the Upper Arrow Reservoir", a project undertaken as part of BC Hydro' s Strategic Environmental Initiatives Program. The presenters outlined the results of a three-year project to assess the benefits of the revegetation work done by BC Hydro over the last decade.

The CMI is grateful to BC Hydro for their financial and in-kind support for this meeting.

THE POWER IS YOURS

BC hydro

CMI Annual Researchers Meeting
April 22-23, 2002
Agenda

Monday April 22, 2002 (evening)

1. **Overview of BC Hydro's Activities in the Upper Arrow Reservoir–** Brian Gadbois, BC Hydro
2. **Overview of Upper Arrow Revegetation Benefits Project** – Ed Hill, BC Hydro
3. **Vegetation Development in the Draw Down Zone of Upper Arrow Lake - a Historical Perspective** – Anne Moody, AIM Ecological Consultants Ltd.
4. **Recreational Users and Use of the Upper Arrow Reservoir Revegetated Areas** - Mike McPhee, Quadra Planning Consultants Ltd.
5. **Bird Use of the Revelstoke Reach, Arrow Reservoir-** John Woods, Parks Canada, et al.

Tuesday April 23, 2002

6. **Soil and Vegetation Studies (carbon, biomass and nutrient analysis) on the New Revelstoke Wetlands -** Will Carr, CSQ Environmental Technologies Ltd and Anne Moody, AIM Ecological Consultants Ltd.
7. **Biofilm, Invertebrate, and Fish Communities Associated with Vegetation Strata in the Drawdown Zone of the Arrow Lake Reservoir -** Chris Perrin Limnotek Research and Development Inc.
8. **Predicting the Response of Riparian Vegetation and Aquatic Littoral Communities to Alternate Reservoir Operating Strategies,** - Josh Korman, Ecometric Research Inc.
9. **Evaluating Ecosystem Management in the Columbia Mountains of British Columbia** - Jenny Feick, Ministry of Water Lands and Air Protection (Ph.D. Thesis)
10. **Post-Harvesting Windthrow Rates –** Harry Quesnel, Ecotessara Consultants
11. **Stand-Level Seral Indices for the IDFdk3** - Harry Quesnel, Ecotessara Consultants
12. **Fire Regime Analysis of Mount Revelstoke National Park** - Marie-Pierre Rogeau, Wildland Disturbance Consultant
13. **A Framework for Maintaining and Monitoring Biodiversity in the Arrow Forest District** - Robert Serrouya, Kokanee Forest Consulting
14. **Alpine Larch or Subalpine Larch? A disturbing dilemma** - Brendan Wilson, Cordilleran Ecological Research
15. **Townsend's Big-eared Bat in the East Kootenays** – Mitchell Firman, Golder Associates

Field Trip – to drawdown zone of the Upper Arrow Reservoir near Drimmie Creek, about 15 km south of Revelstoke BC.

The final report for *the Upper Arrow Revegetation Ancillary Benefits Project* will be available from BC Hydro in the near future. Please contact Ed Hill, Senior Environmental Coordinator, Power Supply Environment, BC Hydro, Burnaby, BC (phone 604-528-3253 email ed.hill@bchydro.bc.ca) to find out how to obtain this report .

1. Overview of BC Hydro's Activities in the Upper Arrow Reservoir
Brian Gadbois

Brian Gadbois, Biologist
BC Hydro, Revelstoke BC
Phone: 250-837-5261
Email: brian.gadbois@bchydro.bc.ca

By way of setting the context for the evening's presentations, Brian spoke on the early history of Upper Arrow Lake, the dust problem after the reservoir was created, and BC Hydro's activities in the Upper Arrow Reservoir. Brian brought along a set of air photos of the Revelstoke area taken at different times, pre-and post- flooding of the reservoir.

2. Overview of Upper Arrow Revegetation Benefits Project
Ed Hill

Edward Hill, Senior Environmental Coordinator
Power Supply Environment, BC Hydro, Burnaby, BC
Phone: 604-528-3253
Email: ed.hill@bchydro.bc.ca
Web: www.bchydro.bc.ca/environment

Severe dust storms in Revelstoke originating from the reservoir bottom exposed during twenty metre drawdowns in the Upper Arrow Reservoir resulted in the implementation of a dust control program by BC Hydro. The long-term revegetation program in the drawdown zone of the Revelstoke Reach of Upper Arrow Reservoir has controlled the dust, and also has resulted in unplanned benefits to wildlife, fish and recreational users of the area. Many of these benefits are immediately obvious to even casual observers (e.g., bird activity, increased angling effort). A study was initiated in 1999 to evaluate the effects of drawdown zone revegetation on aquatic productivity in Upper Arrow Reservoir. A multidisciplinary team was assembled to define the study, undertake a literature review, develop a conceptual model, and undertake the required field studies. While the original focus of the study was on aquatic productivity, the study was expanded in 2000 and 2001 to include benefits to the riparian and terrestrial ecosystems adjacent to the reservoir (i.e., benefits to wildlife and recreational users). Results of these studies are now being used on other reservoirs and in Water Use Planning.

3. Vegetation Development in the Draw Down Zone of Upper Arrow Lake
Anne Moody

Anne Moody
AIM Ecological Consultants Ltd.
100 Mile House, BC
Phone: 250-397-2649
Email: aim@bcinternet.net

Anne presented the results of the Arrow vegetation mapping study conducted for BC Hydro. Maps were generated from colour aerial photography flown in 2000 as well as historical photography from 1968, 1977 and 1991. Trends in vegetation development were discussed.

4. Recreational Users and Use of the Upper Arrow Reservoir Revegetated Areas
Mike McPhee

Mike McPhee
Quadra Planning Consultants Ltd.
Phone: 604-944-9570
Email: mmquadra@telus.net

Over the past year Mike has been assisting BC Hydro with the coordination of the Upper Arrow Revegetation Ancillary Benefits Project. As part of this project, Mike undertook a study of the recreation use in the reservoir by groups and clubs in Revelstoke. He presented the findings from his interviews with club representatives and the results of an extensive telephone survey of Revelstoke residents' perceptions towards the revegetation of the reservoir and the impact of the revegetation on their recreation use.

5. Bird Use of the Revelstoke Reach, Arrow Reservoir
John Woods

John Woods, Wildlife Biologist
Mount Revelstoke and Glacier National Parks
Revelstoke BC
Phone: 250-837-7527
Email: john.woods@pc.gc.ca

Along with a dedicated crew of Revelstoke citizens, John runs the Columbia River Revelstoke Bird Monitoring Station near the Revelstoke Airport. The station began in 1998 as a trial project to evaluate the potential for establishment of a long-term land bird monitoring station at Revelstoke. For reports on the monitoring station visit the Columbia Mountains web site at www.cmiae.org and look in the “Research Highlights” section. View earlier reports for this station at www.livingbasin.com .

6. Soil and Vegetation Studies (carbon, biomass and nutrient analysis) on the New Revelstoke Wetlands
Will Carr and Anne Moody

William Carr
CSQ Environmental Technologies Ltd.
Surrey, BC
Phone: 604-574-3100
Email: wcarr@direct.ca

Anne Moody
AIM Ecological Consultants Ltd.
100 Mile House, BC
Phone: 250-397-2649
Email: aim@bcinternet.net

Will's presentation focused on the results of soil and vegetation sampling in the drawdown zone. The objective of his project was to quantify the current status of the vegetation and soil in the wetlands, with a focus on the potential benefits to the area ecosystem.

7. Biofilm, Invertebrate, and Fish Communities Associated with Vegetation Strata
Chris Perrin

Chris Perrin
Limnotek Research and Development Inc
Vancouver, BC
Phone: 604-222-3546
Email: cperrin@limnotek.com
Web: www.limnotek.com

An experiment was implemented in 1999 to examine the effect of submersed vegetation on the abundance and composition of periphyton, benthic invertebrates, and fish in the drawdown zone of Revelstoke Reach in the Arrow Lakes Reservoir. Periphyton on all plants was comprised mainly of diatoms and filamentous green algae. Of 66 benthic invertebrate taxa found in association with submerged plants and barren soil, oligochaete worms, nematodes and ostracods were most abundant. Densities reached 43,727 animals$\cdot m^{-2}$ in above ground samples and almost 64,000 animals/$\cdot m^{-2}$ in below ground samples. These densities were very high compared to those in other oligotrophic systems. Vegetation establishment increased the biomass of benthic invertebrates by two to four times over that found in barren soils. While the simple presence of plants increased benthic invertebrate biomass, invertebrates favoured dead and decaying plant matter (fall rye) over submersed living plants (lenticulate sedge and reed canary grass). The plant-benthos link was mediated by the epiphytic biofilm in which benthic diatoms were a major component. Suckers that are mainly detritivors

responded to increased benthos in association with dead and decaying fall rye but there was no link between the plant-benthos association and sport fish species. One reason for this outcome was that benthos were generally not available to visual feeding habits of those species. In this respect, the establishment of vegetation in the drawdown zone of Revelstoke Reach greatly increased the capacity of the reach to host a diverse and abundant benthic community but it did not directly lead to an equal change in abundance of sportfish.

8. Predicting the Response of Riparian Vegetation and Aquatic Littoral Communities to Alternate Reservoir Operating Strategies
Josh Korman

Josh Korman
Ecometric Research
Vancouver, BC
Phone: 604-737-8314
Email: jkorman@ecometric.com
Web: www.ecometric.com

Josh presented a model which predicts the responses of riparian vegetation and aquatic littoral production to alternate reservoir management strategies. The model has been applied to Downton and Carpenter reservoirs in the Bridge-Seton Hydro system, and in the Revelstoke Reach in Arrow Reservoir.

9. Evaluating Ecosystem Management in the Columbia Mountains of BC
Jenny Feick

Jenny Feick, Manager, Terrestrial Ecosystem Science, Biodiversity Branch
Ministry of Water, Land and Air Protection
Victoria BC
Phone: 250-387-1837
Email: jenny.feick@gems8.gov.bc.ca

A key assumption underlying ecosystem management is that providing scientific information to decision-makers leads to better land use decisions. This research, published in Jenny Feick's Ph.D. dissertation (Feick 2000) investigated the role of science and other factors in land use decision-making in the Columbia Mountains of British Columbia. The study grew out of an evaluation of the ecosystem management efforts of Mount Revelstoke and Glacier national parks. This research augments existing knowledge about the human dimensions of ecosystem management.

The methodology involved a mixed methods evaluation research approach, with an emphasis on stakeholder analysis. Both quantitative and qualitative data were gathered and analyzed, the latter using qualitative data analysis software. Results included an

assessment of pertinent attitudes, beliefs and values of 146 stakeholders who affected land use and research decisions in the Columbia Mountains.

The findings revealed that Mount Revelstoke and Glacier national parks had a positive but limited effect on the ecological integrity of the Columbia Mountains of British Columbia. This was due partly to the environmental, political and economic context of the Columbia Mountains and partly due to weaknesses related to Parks Canada' s inconsistent management practices, organizational culture, and internal/external communications. Strengths included the protected land base, protective mandate and staff expertise. The quality of the scientific and technical information conveyed by park staff was viewed highly, and opportunities existed to collaborate with provincial government agencies in research, land use planning, and education. Scientific information appeared to affect significantly certain land use decisions in British Columbia, although successful application depended on specific conditions and effective communications strategies.

10. Post-Harvesting Windthrow Rates
Harry Quesnel

Harry Quesnel
Ecotessara Consultants
Nelson BC
Phone: 250-825-4202
Email: hquesnel@netidea.com

Integrating mountain caribou (*Rangifer tarandus caribou*) and timber management is important in the Revelstoke area. A significant proportion of the annual allowable cut will be harvested from old-growth habitat critical for caribou. As part of a study on alternative harvesting systems in mountain caribou habitat, windthrow was evaluated at three sites north of Revelstoke. These sites are within the Interior Cedar-Hemlock zone and were harvested using a group selection (patch cut) silviculture system. Post-harvest results are presented for windthrow transects monitored for five years at the Keystone site, and for three years at Gregson Road and Lookout Mountain sites. At each site, the four treatments being compared are: 1. the edges of group selections (<1-2 ha) surrounded by mature timber, 2. the unharvested buffers between these small openings, 3. the edges of similar sized openings along old clearcut boundaries, and 4. large, unharvested areas in nearby forests.

After five years at the Keystone site, there was no difference in the windthrow rates: 1. along the edge of group selections, 2. in the unharvested buffers, and 3. on the edge of small patches harvested along the boundaries of old clearcuts. Yearly rates for total windthrow density in the large unharvested area were comparable in magnitude to the unharvested buffer areas between the group selections. The lack of a treatment effect indicates that the edges of the 1-2 ha patches at this site are not suffering significantly more windthrow than unharvested areas. Analysis using data from the other two sites

plus the large unharvested areas indicated that for three years, no significant differences existed between the four treatments. For total density and total basal area of windthrow, the Keystone site had greater values than the other two sites. The lowest rates occurred at the Lookout Mountain site. For the three sites, overall windthrow rates of 0.44-1.76 sph (0.08-0.96%)/yr, relative to the pre-harvested stand densities, were comparable to windthrow rates published for other mature or older forests. Windthrow rates for snags were unaffected by treatment. However, snags were more susceptible to windthrow than live trees. Pre-treatment stands were 7-11% dead while 40-62% of the windthrown trees were dead. Across all treatments and sites, most windthrown trees were western hemlock (*Tsuga heterophylla*) followed by western red cedar (*Thuja plicata*).

11. Stand-Level Seral Indices for the IDFdk3
Harry Quesnel

Harry Quesnel
Ecotessara Consultants
Nelson BC
Phone: 250-825-4202
Email: hquesnel@netidea.com

A strategy for maintaining biodiversity is to manage forests for ecologically valuable structures. An example of ecologically valuable structures include larger live or dead trees. Some of these structures are difficult to maintain or re-create through rotation forestry based on clear-cut harvesting. As accurate stand age is often difficult or expensive to measure and does not always reflect stand-level ecological values, there is a desire to develop a structural basis for comparing the stands in the Lignum IFPA. Thus, a measure of ecological values is needed for assessing the structural attributes of forests in Lignum's IFPA. Because of the continuous variability in stand structures, Franklin and Spies (1991) recommend that simple indices for comparing old growth and other seral stages be developed.

Stand age and structure variables were used to develop seral indices using data in the "natural stand permanent sample plots". The structure variables used in these seral indices included maximum dbh, mean dbh of trees >12.5 cm dbh, basal area of trees 4-25 cm dbh, density of trees >4 cm dbh, density of Douglas-fir >40 cm dbh, and density of trees with forked tops or crooked stems. A second data set, the Vegetation Resource Inventory (VRI) structure plots, was obtained to assess the value of seral indices on an independent data set. Stepwise regression was then used to select four of 19 structure variables calculated for the VRI structure plots and to develop additional seral indices comparable in nature to the seral indices previously developed with the permanent sample plots. The four variables selected after analysis of the VRI structure data included maximum dbh, density of live trees >40 cm dbh, density of live Douglas-fir >40 cm dbh, and density of trees with broken or dead tops. A seral index, based on regression coefficients for an equation using these four variables, could explain

approximately 73% of the variation in maximum tree age of plots in the VRI structure data. These seral indices are suitable for comparing and ranking both Douglas-fir and lodgepole pine stands, for comparing stands within each stand type, and for incorporating the values of residual stand structures. The application of these seral indices to the VRI structure plots provides a mechanism for assessing the status of ecologically valuable structures within the IDFdk3 portion of the IFPA. As these data were collected using a random sampling procedure, the data for these plots in the IDFdk3 provides a legitimate estimate of the current ecological status of this BEC unit. Eighteen percent of the VRI structure plots have seral index values greater than an age class 9 plot from the permanent sample plots. Future reassessment of the VRI structure plots and recalculation of the seral indices would provide a mechanism for monitoring stand-level ecological values.

12. Fire Regime Analysis of Mount Revelstoke National Park
Marie-Pierre Rogeau

Marie-Pierre Rogeau, Wildland Disturbance Consultant
Banff AB
Phone: 403-762-8892
Email: mprogeau@telusplanet.net

Through the use of air photos, data collection for fire dating, fire occurrence reports, lightning strike density distribution, and stand origin modelling, fire managers of Mount Revelstoke National Park gained a better understanding of the fire regime of the region. This information is being used to implement a fire management plan that considers the ecological benefits of restoring the historical fire occurrence and distribution of fire in the Park.

Results of this study showed that the fire regime of the Park is largely dominated by lightning-caused fires (80%), and that in opposition to the East Slopes of the Canadian Rockies, older forests are found at lower elevations while younger aged forests are found higher up. This is largely due to the fact that the source of ignition is greater at higher elevations and that every summer the region experiences a phenomenon referred to locally as the thermo-belt effect, a night-time temperature inversion where heat is trapped between two cold air layers. The effect of topography was also assessed and it was found that valley orientation, aspect and elevation do play a role on fire distribution in the area.

13. A Framework for Maintaining and Monitoring Biodiversity in the Arrow Forest District

Robert Serrouya

Robert Serrouya
Kokanee Forests Consultants
Nelson BC
Phone: 250-352-9141
Email: serrouya@kokaneeforests.com

The Arrow Lakes Forest District Timber supply Area (TSA) has been operating under an Innovative Forestry Practices Agreement (IFPA) with the goal of enhancing ecological, social, and economic values. This talk will focus the ecological component, by presenting the IFPA's strategy for maintaining biological diversity. Although vertebrate-biased, the strategy is intended to account for all organisms, not just vertebrates. The mechanism is a 3-tiered approach that seeks to: 1) represent a portion of each distinct ecosystem in an unmanaged state (also know as "ecological representation"; this is our "coarse filter"); 2) ensure the abundance and distribution of key habitat elements (e.g., snags, coarse woody debris, large live trees, shrubs; "medium filter"); and 3) maintain well-distributed, productive populations of species in the TSA ("fine filter"). The fine filter is intended to be a feedback of how well the 2 coarser levels are acting as surrogates for maintaining species. This hierarchical approach stems from the Canadian Council of Forest Ministers "criteria and indicators" framework, but has been modified to reflect local values and interpretations. For example, means of assessing "ecological representation" can be ambiguous and difficult to quantify, and here we present a specific definition and application within the TSA. Rob focussed mainly on presenting results from the coarse filter analysis, with only peripheral mention of medium and fine filter work.

14. Alpine Larch or Subalpine Larch? A Disturbing Dilemma

Brendan Wilson

Brendan Wilson
Cordilleran Ecological Research
Winlaw BC
Phone: 250-226-7582
Email: wilsonb@netidea.com

Alpine Larch (*Larix lyallii* Parl.) is a high elevation conifer that occurs over a limited area of the northern United States and southern Canada. This species is generally found near timberline, often forming the tree limit in these harsh environments. However, at the northern edge of the larch's distribution, the species forms extensive subalpine associations with Engelmann spruce (*Picea engelmannii* Parry.) and subalpine fir (*Abies lasiocarpa* (Hook) Nutt.). Because there was little known about the occurrence of the larch in these subalpine locations, my objective was to determine the importance of

disturbance and the resultant forest structure in maintaining these peripheral populations over a range of forest ages present in the southern Canadian Rockies. I found alpine larch initially established following fire disturbance (< 40 years old) over a broad elevation range. Most larch regeneration occurred on northern aspects, although some seedlings were also found on shaded southern slopes. Seedlings were generally dispersed within 300 m of surviving parent trees and appeared to require moderate shrub cover for successful recruitment. In maturing forests (c.150 years), larch seedlings were not found in the lower subalpine zone, even though canopy larch were present. This was linked to the combination of increased fir basal area and increased shrub and canopy cover. In older forests (>300 years) larch recruitment remained inhibited at lower elevations where canopy height, canopy cover, and shrub cover was high, even though tree fall gap disturbance had started. However, at higher elevations, where there was a reduction in these competitive influences, larch regeneration reinitiated. This was linked to the changed gap structure. In these forests larch seedlings were found only in gaps. Larch gap fillers were more frequent at the northern edge of the larger (>70m^2), lighter gaps, and where the surrounding average canopy height was less than 17 m. I suggest that the ability of larch to disperse into recent burns and the maintenance of a viable population within some part of the subalpine forest over time may be important for (1) maintaining genetic diversity between otherwise isolated timberline populations and (2) enabling migration as the climate changes.

15. Townsend's Big-eared Bat in the East Kootenays
Mitchell Firman

Mitchell Firman
Golder Associates
Calgary AB
Phone: 403-216-8931
Email: mfirman@golder.com
Web: www.golder.com

In Canada, Townsend's Big-eared bat occurs only in British Columbia, where it is Blue-listed. Although found from Vancouver Island to the Rocky Mountains, this bat has a scattered distribution, usually associated with the dryer biogeoclimatic zones of the southern coast, southern interior and central interior. In Canada, little is known of this bat's biology. Townsend's Big-eared bats are rarely captured or detected by typical bat survey methods and were previously known from very few maternity colonies in the province. In 1996, a survey funded by the Columbia Basin Fish and Wildlife Compensation Program (CBFWCP) located a maternity colony of one hundred Townsend's Big-eared bats at the St. Eugene Mission (near Cranbrook). Previously unknown in the East Kootenays, this colony was, at the time, the largest ever found in the province and the only maternity colony ever found in the interior. Unfortunately the status of the abandoned St. Eugene Mission was uncertain, as it was to be developed as part of a golf resort. The CBFWCP funded further studies to determine the feasibility

of incorporating the roost into the finished resort and to locate hibernacula and other roosts of this species in the East Kootenays. Resort developers approved the roost concept / design and it was built in the spring of 1997. The roost is remotely monitored and has been successfully occupied since 1997. Resort construction has been sporadic but is now underway and expected to finish in the summer of 2002. A separate roost structure may be built this spring in case the bats are displaced by this year's construction activity. Five additional maternity colonies (50 or less individuals) were also located in buildings as well as 4 abandoned maternity sites (including one natural roost). Five hibernacula have been located in mineshafts, with more than 40 individuals occupying one site. Steps are being taken to preserve these additional maternity and hibernacula sites for the bats.
*Also known as *Corynorhinus townsendii*