CMI Annual Researchers' Meeting

May 12, 2010
Castlegar, British Columbia
Canada

Columbia Mountains Institute of Applied Ecology

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About the Columbia Mountains Institute of Applied Ecology

www.cmiae.org

The Columbia Mountains Institute of Applied Ecology (CMI) is a non-profit society based in Revelstoke, British Columbia. The CMI is known for hosting balanced, science-driven events that bring together managers, researchers, educators, and natural resource practitioners from across southeastern British Columbia. CMI members include resource managers, consultants, government staff, public interest groups, and academics, who share an interest in improving the management of ecosystems in southeastern British Columbia. Our website offers many resources, including conference summaries for all of our past events.

Meeting description

Every year CMI members get together to provide updates on their projects (research, field trials, new initiatives in southeastern British Columbia) and catch up on each other's news. It's an informal atmosphere and non-CMI members and post-secondary students are welcome.

This year's meeting was held in the Staff Lounge at the Castlegar campus of Selkirk College. About 30 people attended. Nine presentations, posters, and a field trip were offered. CMI's Annual General Meeting was held right after lunch.

Thanks for your support…

The CMI is grateful to Selkirk College, for allowing us the use of their Staff Lounge for this meeting.

We also acknowledge the support of the Kootenay Association for Science and Technology, which sponsored our lunch.

Dr. Brendan Wilson, President of CMI, was our Master of Ceremonies, and also chaired our Annual General Meeting.
Thanks also to our speakers and the people who brought posters. We are grateful for your willingness to share your expertise with us.

Presentation abstracts

1. Elk migratory behaviour and management in the southern East Kootenay Trench

Tara Szkorupa, Ministry of Environment, Cranbrook
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There is substantial evidence that elk populations, and in particular non-migratory elk, have increased recently in the East Kootenay. Concerns are mounting with overgrazing on crown land and depredation on private land, and much of the blame is targeted at non-migratory elk (i.e., animals that do not leave low elevation habitat during summer). In response, the Ministry of Environment initiated Crown Land cow/calf hunts in 2005. These hunts are restricted to low elevations and close early in the fall to focus harvest on non-migratory elk.

Through this project, we intend to monitor the response of elk populations and individual elk to these liberalised hunts, to determine whether they are effectively reducing year-round elk pressure in low elevation areas. The East Kootenay Elk Management Plan (2005-09) recommended monitoring to assess the effectiveness of the cow/calf hunt in meeting private and Crown land objectives.

Current information on elk migratory behaviour in the East Kootenay is lacking. Research in the early 1990s provided vital information on elk movements and population dynamics. However, much has changed in the East Kootenay Trench over the past 15 years and we require updated information on elk movements, habitat use and population dynamics to make informed management decisions. Our project is designed to duplicate past work, so that changes in migratory behaviour over time can be assessed. The public perception in the East Kootenay is that migratory behaviour has changed recently, and that a much higher percentage of the elk population is now non-migratory, exacerbating social and economic conflicts. Also, substantial changes have occurred since the early 1990s: the elk population has increased substantially, and the Trench has seen significant development and wide-spread exclusion fencing.

The objectives of this project are:

1. To assess the response of elk to liberalised low elevation cow/calf hunts, to determine whether these hunts are effectively reducing overgrazing and crop depredation. We will assess both population responses (e.g., declines in population size) and individual responses (e.g., individual elk movement, habitat use, etc.)

2. To update information on the migratory behaviour of East Kootenay elk, and compare this to the early 90s, when movement patterns were last monitored. Specifically, we are interested in the proportion of the elk population that is non-migratory, and average spring/fall migration times

2. *Conservation strategies for wildlife habitat: An evaluation of policy approaches to adapt to climate changes*

Rod Davis, PhD candidate, University of Victoria
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The objective of this paper is to present a proposed PhD dissertation research concept which purports to evaluate land policy alternatives and adaptive social governance mechanisms to address wildlife resiliency, changing land use, and climate change. Maintaining resilient populations of wildlife species will require land management approaches that are adaptive to land use and climate change dynamics.

There is compelling evidence that biodiversity is being significantly altered by human activities and climate change. British Columbia has become an ecological refugium, retaining some of the last intact multi-predator ecosystems in North America. Advances in biodiversity conservation in BC include new protected areas, land use and conservation objectives established across much of the land base through strategic land use plans, new resource management practices and species at risk protection legislation, and investments in conservation land acquisition by both government and non-government organizations. Implementation of these initiatives has involved broad discourse and a degree of consensus among governments, First Nations, local communities, and conservation and industry stakeholders. However, implementation of conservation initiatives in BC has not generally considered implications of climate change impacts on ecological integrity. The Canadian Rocky Mountain Ecosystem appears to be at the southern boundary of multi-species large mammal species richness that once spanned much of North America. Re-evaluating conservation and restoration policies in this area may be critical to maintaining megafaunal biodiversity in the north-western hemisphere.

The thesis of this research is that conservation and restoration design approaches need to integrate landscape analyses of predicted environmental and ecological change with social and political perspectives in order to effect the policy changes needed to maintain biodiversity. Such integrated design approaches which incorporate change dynamics are needed to inform land use planning decision-makers and stakeholders, and the public more broadly. The research intends to evaluate public and stakeholder valuation of land use options in light of predicted climate change impacts on habitat response and wildlife species distribution through public opinion analysis and focused collaborative stakeholder decision analysis. Public and stakeholder valuation will be informed through development of land use and climate change impact scenarios to build understanding of spatial land use and climate change potential impacts on habitat connectivity, patch size, quality and disturbance dynamics, and wildlife population dynamics and direct disturbance. It is hoped this research will inform land management through evaluation of conservation and restoration policy alternatives that potentially will promote wildlife resilience.

3. *Overview of climate change research initiatives in the Columbia Basin*

Deb MacKillop, Ministry of Forests and Range, Research Branch, Nelson
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The Future Forest Ecosystems Initiative is adapting British Columbia's forest and range management framework so that it continues to maintain and enhance the resilience and productivity of B.C.'s ecosystems as our climate changes.

Future Forest Ecosystem Science Council
This is part of FFEI program, initiated by Jim Snetsinger, Chief Forester in 2005. It is a cooperative initiative between the Ministry of Forests and Range, UBC, and UNBC. In 2008 the Council was given 5.5 million dollars. A call for proposals in 2009 led to the selection of 16 projects. Projects in southeastern BC include:

- Stand level risk assessment and decision support tool (Delong *et al*)
- South Selkirk Resilience project (Innes *et al*)
- Resilience and Climate Change: Adaptation Potential for Management and Ecological Systems in the West Kootenays (Holt *et al*)
- Landscape level vulnerability assessment (Campbell *et al*)
- Future tree regeneration niches – Rocky Mountain Forest District (Nitschke *et al*)
- BEC bioclimate envelope modelling (Random Forests method - Wang *et al*)

Other projects related to climate change in this region

- Larch assisted migration (Jaquish and Rehfeldt)
- Communities adapting to Climate Change (Columbia Basin Trust) (Castlegar, Rossland, Kaslo/RDCK)
- And others.

Resources

ClimateWNA
http://www.genetics.forestry.ubc.ca/cfcg/ClimateWNA/ClimateWNA.html

A program to generate climate normal data for genecology and climate change studies in western North America. Allows users to estimate current, past, and future climate parameters based on geographic position (lat/long) and elevation

Pacific Climate Impacts Consortium
http://www.pacificclimate.org/

The Vision of the Pacific Climate Impacts Consortium is to stimulate collaboration among government, academe and industry to reduce vulnerability to extreme weather

events, climate variability and the threat of global change. The consortium for climate impacts will bridge the gap between climate research and climate applications and will make practical information available to government, industry, and the public. This site provides GCM scenarios for a custom defined area, including maps, plots, and data.

Actual climate data from:

Environment Canada
http://www.climate.weatheroffice.gc.ca/Welcome_e.html
Forecasts, past weather, climate normals, and more.

BC Fire Weather
http://bcwildfire.ca/Weather/

BC River Forecast Centre
http://bcrfc.env.gov.bc.ca/data/

Weather conditions on BC highways
http://www.th.gov.bc.ca/weather/interior_region.asp

4. *Biodiversity Atlas Version 2.0: Expanding the scope to included volunteered geographic information*

Ian Parfitt, Selkirk College, and MSc candidate at University of British Columbia
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Volunteered Geographic Information (VGI) is the term given to internet-based geo-tagged or other spatial information contributed by people outside of the professional or expert geospatial community. One of the best known examples is OpenStreetMap (www.openstreetmap.org), the crowd-source response to expensive and licensed spatial road data controlled by the UK Ordnance. In the context of conservation science, VGI draws on the history of citizen involvement in initiatives such as the Breeding Bird Survey or FrogWatch, as well as new technologies available online such as Google or Bing Maps.

In a partnership with FWCP's Wildlife Reporter project, the Columbia Basin Biodiversity Atlas team is enabling VGI for biodiversity (B-VGI) this season in the region. We will be inviting the public to contribute sightings of several (~10) species of conservation interest through the FWCP's Wildlife Sightings form, via phone, or using a map interface. Sightings reports will be distributed to wildlife biologists for confirmation and field checks where appropriate. Confirmed sightings will be posted regularly through the season on a web map such as Google along with photos and brief observations or stories.

These sightings records will be summarized for each species at the end of the season and final VGI species layers will be added to the Biodiversity Atlas within a new chapter entitled "Citizen Science".

I will be undertaking an analysis of these data to determine the relative accuracy of locations and attributes, degree of clustering, and location relative to human population density and road density and other metrics. An analysis of the sighting submitter's internet access availability (broadband vs dial-up) will also be preformed to evaluate the systemic bias for VGI capacity in the Kootenays. Broadband is considered the basic level of connectivity needed to engage productively with VGI.

5. *Mixed-severity fire regimes: Historic drivers of forest structure and stand dynamics in the Cranbrook watershed*

Helene Marcoux, University of British Columbia
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Forest fires were historically common in interior forests, however, the confounding impacts of fire suppression, human land-use, and climatic change underscore a need to quantify the historic range of variability of fire regimes. While predictive models have been used to classify fire regimes at a landscape level, this study provides direct dendrochronological evidence of historic forest fires and their effects on stand structure and dynamics at a finer scale. Using tree ages and fire scarred trees, we quantify stand level processes (e.g. tree establishment, mortality, regeneration, and survival) in relation to past disturbance by fire in mid-elevations forests of the Joseph and Gold Creek watersheds - the drinking water supply to Cranbrook. Field plots used to reconstruct stand dynamics were located within 10 randomly selected stands characterized as having a mixed-severity fire regime according to the Historical Natural Fire Regime Model (Blackwell et al. 2003). Live and dead canopy trees (n=30) and subcanopy trees (n=10) from each site were dated to determine year of establishment (and death). Fire disturbance event dates at each site were identified using direct evidence from cambial fire scars, and substantiated using ages of post-fire cohorts. Fire severity was inferred using relative survivorship from each event.

Fire scar evidence suggests that between the years 1700 and 1900, at least 19 fires burned at mid-elevations, while older records outlined 8 fire events between 1600 and 1700. However, over the last 100 years, aside from one large widespread fire in 1910, only 4 small fire events were recorded, suggesting fire exclusion has been effective. Historically, half of the fires were widespread (occurring at more than one site), and preliminary forest structure assessments show that spatially fire severity varied within a single fire event. Canopy tree ages suggest that forests are multi-aged and that trees likely established after a fire. Ages of subcanopy trees (<25 cm and >5 cm dbh) are between 90 and 130 years old, and established within 15 years of the last widespread fire events. Our findings will help guide restoration objectives and fuel-management efforts for communities living in the urban-wildland interface.

6. An Overview of BEC in the Kootenay sub-region: Current status and expected changes

Deb MacKillop, Ministry of Forests and Range, Research Branch, Nelson
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No abstract was provided. Deb's talk was followed by an opportunity to informally review and discuss the BEC maps she brought along to the meeting.

7. Tree declines: Examining three species in BC's Southern Interior

Michael Murray, Ministry of Forests and Range, Nelson
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During the past several years, a number of tree species have suffered pronounced death or injury with multiple agents evident. Paper birch has been denuded in the Kootenays with bronze birch borer and *Armillaria* root disease the most obvious. Whitebark pine is dying from mountain pine beetles, blister rust, and fire. Western red cedar is the most recent victim and agents have not been identified yet. Although known mortality agents are native, except blister rust, trees may be more prone to death owing to underlying environmental stress. Forest declines are typified by three elements: a complex-causal relationship; environmental stress; and two or more mortality agents. A milieu of factors can be challenging to analyze and eventually boil-down to any single cause of tree death. Why are one or more pests successfully killing multiple tree species in such large numbers within a short period of time? This die-off may be linked to climate perturbations inducing stress. Tree stress is evident in growth rings. A dendrochronology lab is being set up at the Kootenay Lake Forestry Centre. A ring analysis system includes a velmex stage, high-resolution video, and precise ring measurement. During 2009, a collection of increment cores and cross-sections began. To date we have almost 200 samples from 16 sites between Revelstoke and Yahk. Two-thirds of samples are from birch. Preliminary examination of rings indicates many trees have suffered stress during the past 5—20 years. Weather records extending back 100 years are also being examined. Field sampling will continue in 2010.

8. *Mushrooms of the West Kootenay: Biology, identification, edibility, and economics of some prominent species*

Tyson Ehlers, Tysig Ecological Research, Winlaw
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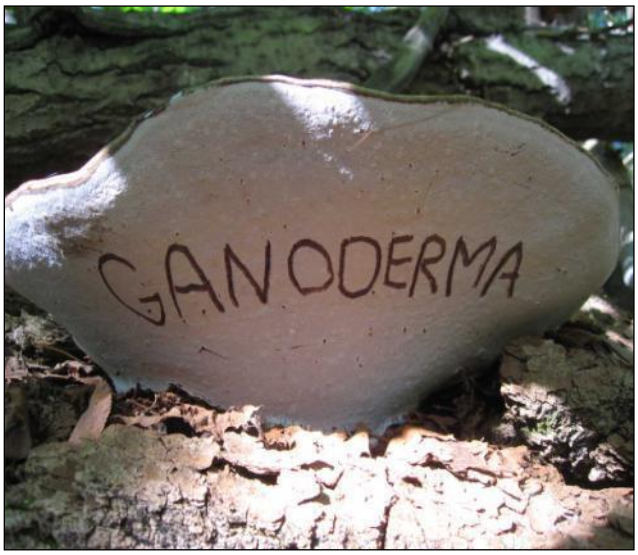
Fungi are an integral part of healthy functioning ecosystems. There are an estimated 1.5 million fungal species worldwide, about 5% of which have been formally classified. About 20,000 species form mushrooms as part of their reproductive cycle. Mushrooms contribute to ecosystem health through their various roles as decomposers, parasites, and plant symbionts. Most forest trees depend on mycorrhizal relationships with fungi for their growth and survival. Many of these fungi produce mushrooms that have nutritional, medicinal, and commercial value. Over the past several decades, interest and commerce in wild mushrooms has steadily grown, as witnessed in the boom of the commercial mushroom industry in British Columbia, particularly for pine mushrooms, morels, chanterelles, and boletes. With over 2000 wild edible and medicinal fungi collected and traded worldwide, British Columbia has potentially many more species than the 40 or so that are currently commercially valued.



Mushrooms are also a source of natural wonder and beauty in nature. The intent of this presentation was to inspire some of this wonder through a photographic tour introducing some of the common edible, medicinal, hallucinogenic, and poisonous mushrooms of the West Kootenay.

It's handy when fungi identify themselves.
-- Tyson Ehlers photo

9. *Natural reproduction of Rainbow Trout in the Columbia River between Keenleyside Dam and the Canada-U.S. border*

Presenter: Steve Arndt, Fish & Wildlife Compensation Program, Nelson
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Co-authors: John Hagen, J. Hagen & Associates, Prince George
Jeremy Baxter, Mountain Water Research, Silverton

The Columbia River below Hugh Keenleyside Dam supports a robust population of fluvial rainbow trout that supports a popular recreational and food fishery. Dams on the Columbia, Kootenay, and Pend d' Oreille rivers have isolated this population from historical connections to the Arrow Lakes and smaller rivers such as the Slocan and Salmo. Some of the trout in this reach spawn in the mainstem Columbia and lower Kootenay rivers and others spawn in smaller tributaries that remain accessible. This talk was a brief summary of studies since the late 1990s on the location and number of spawning fish, and the number of fry emigrating from tributaries into the river.

Counts of spawning fish and their redds, conducted by BC Hydro approximately once a week, were used with an estimated spawning area residence time to compute area under the curve (AUC) estimates of the spawning population in the Columbia River. Tributary spawner abundance estimates were made by AUC estimates (Murphy Creek side channel), snorkel count (Norns Creek) and by expanded counts of fish passing through culverts (Blueberry, Murphy, China). Estimates of emigrating fry were made from Murphy, Blueberry and China creeks using drift nets and stream discharge profiles.

Spawner estimates for the mainstem river increased ten-fold from 1999 to 2008 and may be around 10,000 assuming a spawner residence time of approximately 10 days. Tributary spawning populations are probably largest in Blueberry (1,000 – 2,000) and Norns (> 500) creeks although there are estimated spawning runs in the 100s for several other tributaries including Murphy, China and several others. Total fry production to the population is likely over a million annually. Much remains to be learned about the importance of the tributaries to the fluvial population.

10. Ecological research, restoration, and teaching on the Selkirk College campus

Dr. Brendan Wilson, Selkirk College
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Selkirk College sits at the confluence of the Columbia and Kootenay rivers and was opened in 1967. The Castlegar campus is situated on approximately 65 hectares of private land, and includes a mix of riparian forests, flood plains, upland dry ICH forests, old fruit orchards, and developed urban space. This setting lends itself to various student-centred research projects.

- Fish stranding
- Oxbow fish inventory
- Redd surveys from shore
- Forest restoration
- Riparian vegetation ecology
- Whitebark pine seed germination
- Bioengineering
- Silviculture
- Invasive weed management
- Applied geomatics
- Recreational trail maintenance and construction

Brendan outlined some of these projects, and we heard more about them on the field trip.

Porcupine grass *(Hesperostipa spartea)* is one of the red listed species inhabiting BC's grasslands and the college campus. Students are identifying and mapping the areas this threatened species is found, estimating densities, and creating baseline data for this poorly known species in BC.
Marc-André Beaucher photo

Posters

To stump or not to stump? Armillaria management in Southern Interior Forests

Adrian Leslie, MSc candidate, Royal Roads University
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Armillaria ostoyae is a fungus that causes *Armillaria* root rot in forests throughout the southern interior of British Columbia. In the Interior Cedar Hemlock zone, it can affect up to 80% of trees, reducing their growth rates and causing mortality. Logging can increase infection rates in regenerating forests, which threatens the long-term sustainability of forest ecosystems and the forest industry. Current management practices recommend removing stumps from the ground (stumping) following logging as a means of reducing *Armillaria* in regenerating stands. However, it is uncertain if this results in improved tree growth, or if it is an effective method at reducing *Armillaria*. Stumping is expensive, and is associated with increased soil disturbance and decreased soil nutrients, which could lead to reduced soil productivity.

In 1994, near Revelstoke, BC, a research trial was set up in the ICHmw3 to investigate the impacts of stumping on the regenerating forest. Half of two small cutblocks were stumped, while the other halves were left unstumped. In the fall of 2009, *Armillaria* infection rates and tree growth rates were measured and results were compared. Several interesting differences became apparent. Stumping resulted in slightly greater natural regeneration of western hemlock and Douglas-fir, probably due to greater levels of exposed mineral soil. Stumping also resulted in different growth responses for some species, such as significantly smaller cedar in the stumped areas. When all species were combined, both the height and diameter at breast height were significantly larger in the unstumped control, indicating a reduction of soil productivity resulting from stumping. While overall *Armillaria* infection rates were unexpectedly low, there were slightly fewer incidences of *Armillaria* in the stumped area, but the difference was not significant. While it is possible that stumping does lower incidences of *Armillaria* in the regenerating stand, it appears that the sandy loam soils at this site were negatively impacted by the increased soil disturbance, indicating that stumping may be inappropriate at similar sites.

Banners prepared for Pass Creek Regional Park: Forest diversity; fish; and riparian habitat and wildlife

Lawrence Redfern
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Lawrence Redfern displayed three posters, which will become signs for Pass Creek regional park. The goal of the signs is to raise public awareness of environmental values. They were prepared by Lawrence for the Castlegar and District Wildlife Association, with funding assistance from BC Hydro.

BEC Maps

Deb MacKillop deb.mackillop@gov.bc.ca displayed a number of BEC maps for the region, and asked for comments on changes.

Field Trip

After the meeting, Dr. Brendan Wilson (Selkirk College) and David DeRosa (BC Hydro) led a field trip on campus grounds. Brendan spoke about the ecological richness and riparian restoration on the Selkirk College grounds, and David spoke about the Lower Columbia River Fish Management Program.

David DeRosa at confluence of Kootenay and Columbia Rivers.

Brendan Wilson next to Columbia River on Selkirk College grounds.