



Parks Canada: Lake Louise, Yoho and Kootenay Field Unit

Research Update - 2010/2011

*For additional information contact Derek Petersen at Derek.petersen@pc.gc.ca

Quantifying Heat Flux beneath Burning Hand Piles

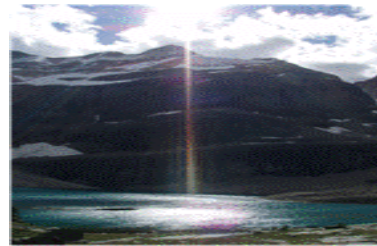


Principal Investigator:
Robert W. Gray,
University of Victoria

Objectives: The recent increase in ecosystem restoration and wildland-urban interface funding has resulted in a large increase in the amount of hand piling treatments being prescribed. This practice involves hand slashing, piling, and burning of ladder fuel material. A concern of this tactic is high heat beneath the burning and smouldering piles causing unacceptable below-ground effects. This study is intended to qualify the level of heat flux beneath burning hand piles to determine whether or not damage to soils and cultural artifacts is being caused, and to suggest guidelines to mitigate potential damage.

of on-site waste management technologies critical to the safe, effective, and sustainable management of these wilderness areas.

Ecology of Zooplankton Metacommunities in Alpine Lakes



Principal Investigator:
J. Fisher,
Franklin & Marshall College

Objectives: “The unique ecological communities in alpine lakes are currently threatened by human-accelerated environmental change, particularly the interactive effects of climate warming and changes in ultraviolet radiation (UVR). One expected consequence of a warming climate is an upward shift in the treeline. With more trees in the watershed, alpine lakes will receive greater inputs of dissolved organic carbon that will in turn decrease light penetration and reduce UVR levels.” The goals of this project are to investigate the effects of UVR, temperature, and food resources on zooplankton on vertical distributions in alpine lakes and study factors driving zooplankton community composition in alpine lakes.

Human waste management in remote Alpine and Arctic Environments



Principal Investigator:
Geoff Hill,
University of BC

Objectives: Managing human waste in remote Alpine and Arctic environments is challenging. Extreme weather events, low average temperatures, expensive mechanized vehicle access, limited electricity, costly heat generation, poorly developed soils, and steep terrain combine to make onsite treatment difficult. This project will provide data for the development, implementation, and monitoring





Individual host tree selection decisions and population-level responses of mountain pine beetle: the role of energy limitation on host tree acceptance



*Principal Investigator:
Alexander Chubaty,
Simon Fraser University*

Objectives: Mountain pine beetle infestations in pine forests in BC and Alberta have accelerated to epidemic rates during the last decade. This experimental study will test the role of energy (lipid) reserves on the host tree acceptance of mountain pine beetle (MPB) adults. The study will evaluate the willingness of MPB with high and low lipid levels to accept lodgepole pine tree hosts.

Didymosphenia geminata and organic phosphorous, a nuisance bloom forming combination



*Principal Investigator:
Lisa Duke,
University of Calgary*

Objectives: “In the last decade a microscopic algae, *Didymosphenia geminate* “Didymo” has begun to produce blooms that have reached nuisance levels. The widespread occurrence and fact that Didymo does not form blooms at all sites where it has been confirmed to be present suggests that Didymo may be endemic, yet why blooms occur remains unknown and rates of nuisance blooms continue to increase. To date, there are no generally accepted practices to control Didymo bloom development. Conventional control of noxious algae typically involves nutrient management. However, Didymo

thrives in nutrient poor water, in areas with very limited ecological disturbance, or even in areas that are still considered relatively pristine. The main goal of this research is to determine the degree to which organic phosphorus availability drives Didymo blooms.”

Cumulative Effects of Nutrients on Water Quality State in Bow River



*Principal Investigator:
Leland Jackson,
University of Calgary*

Objectives: Nutrient management in rivers is often designed to preserve the ecosystem services provided by the river. Generally, a low nutrient state is desirable, while a high nutrient state that leads to excessive plant and algal growth is undesirable. Along a river’s course, the response of algal growth to nutrient inputs changes. In the case of the Bow River, the highest quality water (lowest nutrients) exists at the river’s source in Banff National Park, and declines as the river moves out of the mountains and across the Alberta prairies. Wastewater inputs provide significant point sources of nutrients that contribute to an increase in nutrients as the water moves downstream. The main objective of this study is to understand the cumulative impacts of land use and urban point sources on nutrient inputs and ecosystem responses in the Bow River.



Kickinghorse & Howse Pass HNS Archaeological Site



*Principal Investigator:
Gwyn Langemann,
Parks Canada*

Objectives: This project involves assessments and surveys in the Kickinghorse Pass and Howse Pass National Historic Sites. This will include: detailed mapping and artefact recovery at the site of an 1899 rail wreck, various site assessments and developments of long term management measures, assessment of possible impacts on archaeological resources in relation to the ongoing Trans Canada Highway twinning project, and excavation based research to follow up on historic research suggesting the possible location for David Thompson’s camp.

The relation between Glacier Activity and Sediment Export at Inter-annual to Decadal Time Scales



*Principal Investigator: Dr. Brian Menounos,
University of Northern British Columbia*

Objectives: “Though few dispute the importance that glaciers play in increasing sediment yield in mountain watersheds, the relation between sediment yield and glacier cover at a time scale of years to decades within a single watershed is weak. It is hypothesized that sediment yield at inter-annual to decadal time scales is most closely associated with ice dynamics and rates of dimensional changes of a glacier (length, area or volume) rather than glacier extent. The research from this project will provide estimates of the quantity of sediment exported from a glacierized catchment. In addition the analysis may also detect the presence of sediment layers produced during past floods and may provide some insight into changing flood frequency through time.”

Burgess Shale fossil deposition – Steven Shale Formation – BC reconnaissance Phase 2



*Principal Investigator:
Dr. Jean-Bernard Caron, Department of Natural History, Royal Ontario Museum*

Objectives: “The 505 million year old Burgess Shale fossils occur along the basal edge of a paleoescarpment in the “thick” Stephen Formation. This escarpment was thought to have played a critical role in controlling the occurrence and preservation of the Burgess Shale community. Preliminary fieldwork activities in the summer of 2008 discovered Burgess Shale fossils from a different paleoenvironment setting known as the “thin” Steven Formation near Stanley Glacier, Kootenay NP.” The second phase of this study will expand research to poorly known areas where the “thick” and “thin” formations have been briefly observed in previous work.

Micromoth Inventory of BC



*Principal Investigator:
Greg Pohl,
Canadian Forest Service*

Objectives: Micromoths are poorly documented in BC. While visiting Yoho National Park the researcher will collect micromoths to better document this fauna. The project aims to document the moths and butterflies of BC, specifically micromoths.





NSERC’s HydroNet – A national research network to promote sustainable hydropower and healthy aquatic ecosystems



Principal Investigator: Pascale Gibeau, University of Montreal

Objectives: “The 470+ hydroelectric facilities distributed across the country generate 60% of the electricity used by Canadians. The rising demand for energy and the interest in renewable energy will require additional facilities and increased production from the existing installations. Hydropower, however affects water distribution and movement within and among watersheds, as well as the physical, chemical, and biological processes in aquatic ecosystems.” The goals of NSERC’s HydroNet project is to attain a better understanding of the effects of hydroelectric facilities on the productivity and the biodiversity of communities in order to reconcile industrial and environmental water requirements. The project will focus primarily on fish and their habitats.

University field course – Impacts of Mountain Pine Beetle on Forests



Principal Investigator: Mary Reid, University of Calgary

Objectives: “The current mountain pine beetle outbreak is typically described as ‘devastating’ to forests.” This project poses the question of how such devastation should be assessed. Researchers will collect data that will test predicted effects of forest communities in an unbiased manner. “This study will teach students basic forest mensuration

methods in context of addressing the impacts of mountain pine beetle activity on forest ecosystems.”

Biotic and Abiotic Determinants of Species’ Range Limits; Pilot Field Season



Principal Investigator: Anna Hargreave, University of Alberta

Objectives: “Understanding the limits to species ranges is important in predicting vegetation changes in response to climate change, especially in alpine areas where range limits are common and the effects of climate change are likely to be especially strong. One of the major predictions regarding global warming is that species will shift their ranges to track appropriate climatic conditions. This study proposes to survey characteristics of the herbaceous plant communities spanning the elevation gradient from the foothills of Alberta to the BC border, and the latitudinal gradient from Waterton Lakes NP to the Wilmore wilderness area (near Hinton and Grande Cache Alberta). The aim is to quantify whether fitness and/or population size decrease towards the elevation range margins, or whether biotic and abiotic stressors vary in their intensity with elevation and latitude.”



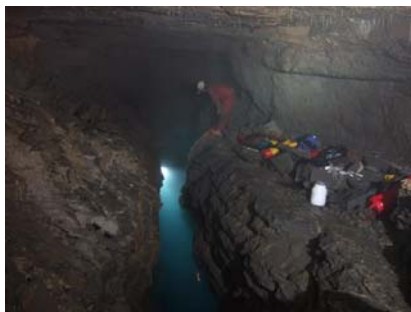
Trans-Canada Highway Phase 3B – Wildlife Monitoring and Research



Principal Investigator:
Dr. Anthony P. Clevenger,
Montana State University

Objectives: Parks Canada Agency is a world leader in efforts to mitigate the Trans-Canada Highway (TCH) in Banff National Park. The scale and magnitude of the proposed TCH Phase 3B Twinning Project expansion are unprecedented for Parks Canada. A total of 21 new wildlife crossing structures along 30 km of new highway construction are designed to mitigate the impacts by enhancing ecological connectivity throughout the project area. The purpose of the Trans-Canada Highway Phase 3B – Wildlife Monitoring and Research project is to create and implement a wildlife monitoring and research plan to guide the monitoring of the TCH Phase 3B Project’s goals- reducing wildlife-vehicle collisions and improving habitat connectivity for key species.

Water Temperature Monitoring of Boon’s Sump, Castleguard Cave



Principal Investigator:
Greg Horne,
Parks Canada

Objectives: “During a cave expedition in 2009 the diver, Martin Groves, extended the limit of underwater exploration to 0.5km in the submerged passage of Castleguard Cave. The assumed source of the water where the dive was conducted has long been believed to be melt water from under the

Columbia Icefield. Expected temperature ranges for this water was between 0.5 to 1.5 degrees Celsius, similar to those found deeper in the cave. The diver’s instrument console indicated water temperatures in the range of 4 to 5 degrees Celsius. The reason for the much higher temperature is unknown.” The purpose of this research will be to install a series of data loggers when the diver returns to continue explorations within the cave. The collected temperature data will be circulated to cave hydrologists for opinions that may lead to a more detailed study of the hydrology of Castleguard Cave.

Ecosystem Resilience of Mountain Lakes stocked with Exotic Sportfish



Principal Investigator:
Dr. Rolf Vinebrooke,
University of Alberta

Objectives: Current fish stocks, macro-invertebrate and zooplankton community compositions of approximately 30 previously fish stocked lakes located within Banff, Jasper, Kootenay, and Yoho National Parks were collected for the purpose of constructing a community biodiversity inventory. The inventory enables the assessment of the ecological resilience of these and other mountain lakes in relation to the impacts of introduced predators such as rainbow trout (*Oncorhynchus mykiss*) on lower trophic levels within the system. The purpose of this research is to gain an understanding of the effects of introducing fish into these areas, as well as to further the understanding of the effects of multiple stressors on the integrity of ecological communities in mountain lake systems.





Mass Balance of the Columbia Icefield and its significance to the Water Resources and Ecosystem Integrity of the Upper Headwaters of the Nelson, Columbia and Mackenzie River Basins



Principal Investigator:
Michael N. Demuth,
Natural Resources Canada

Objectives: The project involves developing the observational data base to initiate and employ the mass flux approach to monitor and assess the mass balance of the Columbia Icefield. "The measurement program will reveal for the first time the thickness, sub-glacial topography and volume of the Icefield, which hereunto has only been estimated from the surface topography and empirical models." A historical and contemporary digital elevation model will be constructed of the Columbia Icefield using both homogenous and heterogeneous earth observation data sets to determine the change in volume/time series. A time series of the historical accumulation area ratio data will also be constructed "to thereby allow an approximation of the minimum waterflux contribution of the Columbia Icefield if it were to come into equilibrium with today's climate." This data combined contributes to "enhance modeling projection efforts by University partners of the configuration of the Columbia Icefield out to 2100."

A Taxonomy Revision of the Genus Ophion (Hymenoptera: Ichneumonidae) in Canada



Principal Investigator:
Marla Schwarzfeld,
University of Alberta

Objectives: "Parasitoids play an important role in the regulation of potential pest species and in maintaining ecosystem equilibrium. Because of their highly specialized life histories, they may also be particularly vulnerable to ecological disturbances. However, due to a lack of taxonomic experts, they are often ignored in ecological and biodiversity studies. Inventory and taxonomic work is essential to augment our knowledge of species natural history, and to provide a foundation for long-term monitoring of population and distribution changes."

Forest Health Assessment



Principal Investigator:
Gary Roke, Forest Health Network Canadian Forest Service, Natural Resources Canada

Objectives: The forest health assessment is aimed to detect, appraise and monitor forest insect outbreaks, measure population levels and assess insect, disease or air pollution caused by forest damage. "This includes identification of damaging agents, collecting material for study and identification and making specific observations pertinent to an understanding of forest health, including the effects of insects and diseases. The insect and disease program has been in place for many decades, and has proven a valuable tool for forest managers and in a wide range of research projects by Canadian Forest Service, provincial forestry, and universities."





What Determines the Shape, Size, and Internal Structure of the Geographical Range of Calypso Bulbosa (Orchidaceae): The Importance of Local Population Dynamics



Principal Investigator: Dr. Thomas C. Gibson, The Centre for Biogeographical Research and Conservation

Objectives: This project contributes to the species life history characteristics and patterns of local abundances of Calypso Bulbosa in Arizona, Utah, Wisconsin, and Michigan over a period of 35 years of research. A multi-level approach is being taken to investigate all levels, but paying greatest attention of the level of population dynamics within a site. "There are many interacting factors which govern the population dynamics of calypso: seed production, and seed dispersal, to suitable microhabitat sites." Forty more data points will be added to the relationship of maximum percentage pollinated as a function of colony size.

Adopt-A-Plant Alberta: A Volunteer-Based Program Designed to Identify and Record Observations of Rare Native Plants Across Alberta



Principal Investigator: Lisa A. Matthias, Adopt-A-Plant Alberta, Alberta Native Plant

Council; Alberta Sustainable Resource Development-Fish and Wildlife Division

Objectives: "The Adopt-A-Plant initiative in National Parks is to gather information on the occurrence and health of rare plant and lichen species in Alberta for use in assessment of rarity at both species and population levels. The data will be entered into Alberta Conservation Information Management

System (ACIMS) and will be used for general status assessment, COSEWIC reports and species ranking."

Testing Lake Sediment Proxies for Recent Environmental Change in the Canadian Rocky Mountains



Principal Investigator: Dr. Randy W. Dirszowsky, Laurentian University

Objectives: "Since glacial activity influences both the amount and character of sediment and meltwater produced, it can be hypothesized that the differences in the accumulation at different sampling/coring sites potentially represents a glacial or climatic signal." The research conducted for this project intends "to test this possibility by documenting variations in sediment thickness (annual and longer term accumulations) across the floor of two lakes subject to glacial influence in the Canadian Rocky Mountains." The objective of this research is to: "assess the overall patterns of sedimentation in two-glacial fed lakes in the Canadian Rocky Mountains during the Little Ice Age period, to assess recent spatial variations in annual sedimentation and varve formation within these sediments, evaluate varying sedimentation rates as a proxy indicator of glacial fluctuations and sediment delivery to the lakes, and to infer environmental change based on the above records."



Spatial and Temporal Patterns of Drought in Western North America during the Holocene



Principal Investigator:
Mark Abbott,
University of Pittsburgh

Objectives: “Recent droughts affecting the American West are among the most severe on record. This aridity, combined with rapid population growth, limited water resources, receding glaciers and decreasing mountain snowpack provides the impetus to improve our understanding of how and why the hydrologic cycle has varied in the past. Paleoclimate datasets will be produced recording the timing, duration, frequency and magnitude of aridity cycles using consistent methods on a network of similar lakes set along the western cordillera of North America from the Pacific NW to the Canadian Arctic. This data will aid in our understanding of the frequency duration and magnitude of wet/dry cycles to help place the recent drought impacting the region in perspective and aide policy makers to enable them to implement informed plans regarding water resources.”

Mapping the Stand-Level Distribution of Whitebark and Limber Pine



Principal Investigator:
Greg McDermid,
University of Calgary

Objectives: “Whitebark pine and limber pine are keystone species that inhabit high-elevation environments across western North America. The seeds are large and nutritious, and represent a critical food source for a variety of wildlife species including Clark’s nutcracker and possibly grizzly bears. However Whitebark pine and limber pine are declining across much of their range, being adversely affected by epidemics of mountain pine beetle,

white pine blister rust, and competition from shade-tolerant species bolstered by more than a century of fire suppression. The overall goal of this project is to map the stand-level distribution across their entire provincial range.”

Whitebark Pine Seed Collection and Planting Study



Principal Investigator:
Brenda Shepherd,
Parks Canada

Objectives: Whitebark pine seeds will be collected in Jasper and Banff National Park. Two year old seedlings will be planted at sites in the park where whitebark pine currently grow. Target sites include: Marmot Basin, and burned areas including Mt Greenock. The projects objectives are: to test out whitebark pine restoration techniques at a small scale to be able to apply them at larger scales in future restoration projects, raise the profile of whitebark pine in the community and parks as a species at risk, and to work with Marmot basin to raise awareness and profile of whitebark pine on their lease for protection of existing stands.

Prepare COSEWIC Status Report and conduct Surveys for the Magnum Mantleslug, Magnipelta mycophaga



Principal Investigator:
Lennart Sopuck,
Biolinx Environmental Research Ltd.

Objectives: Surveys for the Magnum Mantleslug will be conducted in south-eastern BC and a COSEWIC status for the species will be produced. The occurrence of the species will be verified at historic observation sites.





The Effects of Prescribed Fire on Mountain Pine Beetle Population Dynamics



Principal Investigator: Crisia Tabacaru, University of Alberta

Objectives: “The mountain pine beetle (MPB) is a significant insect pest of Alberta’s lodgepole pine forests; larval tunnelling disrupts nutrient flow and mass attacks are sufficient to kill even the largest healthy trees. Prescribed fires are used as a management tool to remove potential host trees, thus slowing the spread of MPB. The success of this tactic, however, depends on the beetles’ response to fire-damaged trees.” The purpose of the study is “to conduct temporal and spatial analyses of MPB population and reproductive success in burned and unburned stands to determine whether beetles preferentially locate and breed in fire injured trees.” As well as “to determine whether prescribed fires impact MPB population growth-positively or negatively-at the landscape level, and to provide ecologically meaningful explanations for these responses and relationships, specifically in relation to natural enemies and competitors.”

Dendrochronological Sampling



Principal investigator: Colin Laroque, Mount Allison University

Objectives: “Live, detrital and/or archeological samples are taken within the park system as directed by the cultural resource staff of the park system,” the proposed study area for sampling is the Saskatchewan Glacier outwash plain. “The purpose of the project is to dendrochronologically date objects of interest to Jasper National Park (ie. The lobster and potentially detrital wood from ice proximal glaciers, etc.).”

Sequence Stratigraphy and Detrital Zircon Analysis of Late Ordovician Mt. Wilson Quartzite, BC, and Alberta Canada



Principal Investigator: Andrew Hutto, Texas A&M University

Objectives: “The goal of this project is to develop a high-resolution stratigraphic framework for the Late Ordovician Mt. Wilson Quartzite, south-eastern British Columbia and south-western Alberta. This will be done by measuring 4-5 sections bed by bed in the unit and correlating them using the principals of sequence stratigraphy. This will aide in understanding the regional roles eutasy, climate and tectonism on formation, and to correlate this unit to coeval units surrounding the Transcontinental Arch. The overall importance of this project is that it will add to a larger project that will aide in the understanding of the regional scale sedimentary, tectonic, and eustatic processes that occurred during the Mid-Late Ordovician.”

Monitoring Ground and Air Temperatures in Permafrost Areas



Principal Investor: Stuart Harris, University of Calgary

Objectives: “This study is monitored through weather stations and ground temperature cables that are set up in the study area. These have been in place since the 1970’s with the help of the national Research Council of Canada. This contributes to long term monitoring of permafrost in relation to climate change.”





**Speciation and Ecology Adaptation in Fireweed
(Chamerion angustifolium)**



*Principal Investigator:
Brian Husband,
University of Guelph*

Objectives: Seed and leaf tissue from 30 populations of Fireweed in the Rocky Mountains are collected for this research. These samples contribute “to census the genetic and genomic variability of Fireweed in the Canadian Rocky Mountains.” The objective of the project is “to explore the population processes driving speciation via genome duplication. Some of the information, such as distributions and ecological differences between diploid and tetraploid forms of fireweed may be of use to park managers and policy makers.”

**Non-Invasive Latex Peels of Cambrian Trace Fossils
Upon the Scree Slope at Moraine Lake**



*Principal Investigator:
Stacey Gibb,
University of Alberta*

Objectives: “The assessment of the sedimentological processes, the trace fossils, and any possible body fossils found within the Gog Group or other groups and/or formations will be conducted, as well as the Ichnology of the Lower Cambrian Gog Group and other possible Groups and/or Formations. The purpose of this research is to establish the ichnospecies of the trace fossils found within the Gog Group and any correlating species that may have had the capacity to produce these traces. The sedimentological/ecological environment during deposition will also be evaluated.”

**Environmental Assessments, TCH Twinning Project
KM 82-88**



Principal Investigator: Jeff Matheson, EBA Engineering Consultants Ltd.

Objectives: “Parks Canada is considering expanding the ongoing TCH twinning Phase IIIB project an additional 6 km into Yoho National Park (KM 82-88). In preparation for adjusting the original environmental assessment to now cover this expansion, Parks Canada is conducting some additional data gathering, including field assessments to determine existing site conditions. This additional field data will then allow for more complete assessments and deliberations during the pending adjusted environmental assessment. EBA’s work includes a geotechnical/pavement investigation, environmental studies, and an avalanche risk assessment for the purpose of incorporating into the overall environmental assessment and preliminary design of the Km 82-88 Project.” The purpose of the project is to identify fish presence and assess fish habitat, identify the presence of rare plants, and characterize the soil and delineate the spatial extent of the soil at these two locations.

