Forum Summary

CMI Annual Researchers' Forum

October 17-18, 2022

Radium Hot Springs Community Centre,

Radium Hot Springs, BC

PHOTO: Glen Wainmann

Many thanks to Teck Resources for your financial support.

Every year CMI members get together to provide updates on their projects, catch up on each other's news, learn about what's happening in the different parts of our region, and have a few field trips. It's an informal atmosphere and non-CMI members are always welcome. We took the necessary two year break due to the pandemic, and it was really nice to get this event up and running again.

This year just under 60 people gathered at Radium Hot Springs Community Centre. We heard eleven talks, viewed five posters, and participated in two field trips.

A big **thank you** to everyone who took the time to share their work with us and for the important work you do. Thank you to Marc-André Beaucher and Catherine Craig who volunteered to emcee the forum. Thanks also to Natalie Maslowski and Isobel Phoebus for their volunteer support.

PHOTO: Brendan Wilson

Contents

Oral presentations (in order they were presented)

1. Fire deficits illustrate a need for landscape-level restoration of fire-adapted ecosystems in the Rocky Mountain Trench

Presented by:
Jen N. Baron, University of British Columbia, Department of Forest and Conservation Sciences
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Co-Authors:
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Lori D. Daniels, University of British Columbia, Department of Forest and Conservation Sciences

In western North America, modern wildfire seasons are characterized by frequent large and intense wildfire events, which stand in stark contrast to fire regimes of the past. The last 100 years marks a critical transition between pre-colonial and modern-era fire regimes, providing crucial context for understanding future wildfire behavior. Using the greatest time depth of digitized fire events available in Canada, we identify distinct phases of wildfire regimes from 1919 to 2019 by evaluating changes in mapped fire perimeters (>20-ha) across the East Kootenay Regional District, British Columbia. Fire was active from 1919 to 1939 with frequent and large fire events, but the regime was already altered by a century of colonization. Fire activity decreased after 1939, coinciding with effective fire suppression and a mild climatic period. In 2003, the combined effects of fire exclusion and escalating climate change fueled increases in area burned and mean fire size driven by lightning fires in many forest types. As a result of these changes, low- and mixed-severity fire regimes (46.4-percent of the flammable landscape) are in a fire deficit, missing between 1 and 10 fires since 1919. Through science-based management interventions, we can facilitate re-entry of fire to the ecosystem and maintain its stabilizing feedbacks to the broader landscape. Managing fuels, protecting people and infrastructure, and restoring ecosystems will require broadly applied thinning and fuel reduction, prescribed and cultural burning, and managed wildfire treatments. Integrated landscape planning will be needed to address both the effects of the status quo (i.e., continued fire suppression) and of actions taken to return fire as a stabilizing ecosystem process. The extent of fire regime disruption warrants significant management and policy attention to alter the current trajectory and facilitate better co-existence with wildfire throughout this century.

Biographical notes

Jen Baron is a PhD candidate in the Department of Forest and Conservation Sciences, University of British Columbia. She applies principles from historical ecology, landscape ecology, data science and modelling to explore how disturbance, management, and climate influence forest ecosystems across spatiotemporal scales. Her doctoral research is at the nexus of theory and application, addressing fire regimes through past trends and contemporary management decisions. She aims to understand how the legacies of fire suppression and fuel accumulation influence current fire behaviour and interact with climate and management scenarios to shape future fire regimes.

2. Keeping people and wildlife safe on BC's Rocky Mountain highways

Presented by:
Clayton Lamb, Postdoctoral Researcher | Liber Ero Fellow, University of British Columbia & Montana
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Co-Authors:
Duane Wells, Ministry of Transportation and Infrastructure; Emily Chow, Ministry of Forests Lands and Natural Resource Operations and Rural Development; Candace Batycki, Yellowstone to Yukon Initiative; Randal MacNair, Wildsight; Tracy Lee, Miistakis Institute

Southeast British Columbia supports one of the most diverse assemblages of large mammals in North America and is also home to thousands of people and several major highways to support the movement of goods and people. Collisions between motorists and large mammals pose a significant threat to both parties. Hotspots of conservation concern are now arising where wildlife abundance is declining or collisions are frequent. Here we present an overview of causes, intensity, and hotspots of vehicle-wildlife collisions over the last few decades and their impact on wildlife populations in Southeast BC. We assess the solutions to reduce collisions that have been implemented to date locally (diversionary salt/feeding, awareness campaigns, and detection systems) and elsewhere (wildlife crossing systems, speed reduction, etc.). Three collision hotspots (Radium Hill on Hwy 93, Elko Rock Cuts on Hwy 3, and Sparwood on Hwy 3) with unique challenges and emerging solutions will be overviewed and updates on progress to date presented.

Biographical notes

Clayton Lamb, local to Jaffery, is a wildlife scientist and postdoctoral Researcher with the University of British Columbia and Montana. He is working at the interface of population ecology, human-wildlife coexistence, and endangered species recovery.

3. A wholistic approach to assessing the impacts of wildfire and forest management on future fire risk, food availability and use of forests by wildlife

Presenter:
Cora Skaien, Arrow Lakes Environment Stewardship Society, Ministry of Forests Forest Analysis and Inventory Branch (FAIB)
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Co-Authors:
Tyler Muhly, Ecological Modeling Specialist, FAIB, Ministry of Forests; Elizabeth Kleynhans, Ecological Modeling Specialist, FAIB, Ministry of Forests; Garth Mowat, Large Carnivore Specialist, Province of British Columbia; Richard Johnson, PEng, Arrow Lakes Environmental Stewardship Society

Additional Collaborators and Contributors:
Yvonne Patterson and Alysia Dobie, Okanagan Nation Alliance; Adrian Leslie, Nature Conservancy of Canada; Lori Daniels, University of British Columbia; Clayton Lamb, wildlife scientist

Landscapes throughout British Columbia are modified by wildfire, timber harvest, and climate-related shifts in conditions, among various other drivers of change. Various techniques have been employed to assess impacts of these drivers, including the use of aerial and satellite imagery, field surveys and ecological modelling that combines multiple datasets. Often, using a combination of approaches can lead to a better understanding of ecological dynamics and ecosystem recovery. The focus of this presentation will be to present on the use of multiple techniques and projects to gain a more wholistic picture of (1) predicted fire risk across British Columbia over the next 100 years, (2) the impacts of wildfire and wildfire risk reduction on fuel loads, plant species and wildlife use, (3) the impacts of silviculture and ecological restoration practices on huckleberry production, and (4) incorporating predictions for changes in climatic conditions and species assemblages, with particular focus in the West Kootenays. To assess current and future wildfire risk across BC, we utilize wildfire data from the Province of BC to determine what climate, fuel and topographic variables best predict risk of wildfire now, and project risk into the future given predictions for changes in climatic conditions and the location of BEC (Biogeoclimatic Ecosystem Classification) zones. The impacts of wildfire and the rate of recovery following wildfire in the West Kootenays is being explored through the use of satellite imagery from the European Space Agency's EO Browser to acquire NDVI (Normalized Difference Vegetation Index) and NDMI (Normalized Difference Moisture Index) values for areas burned in 2018 (Fennel Creek) and 2021 (Darkwoods Nature

Conservancy) and comparing to field surveys that explore vegetation composition and cover. We also quantify thickness of the duff layer and wildlife use (via trail cameras) within areas burned at different severities, as determined through satellite imagery and visual assessment. From this, we intend to prioritize areas most severely degraded by wildfire to test restoration methods to enhance the rate of vegetation recovery and increase in browse for ungulates or huckleberry production for use by bears, considering climate adapted approaches. In other areas, wildfire risk reduction (WRR) initiatives are being undertaken by the Okanagan Nation Alliance, and we are monitoring the fuels, vegetation and wildlife use prior to fuel reduction so that we can assess effectiveness and impacts of WRR on wildlife use and food sources. Information gleaned from assessing impacts of silviculture techniques, canopy cover, and more on huckleberry production will help guide targets during fuel management, with this data obtained by combining multiple datasets from Garth Mowat and Clayton Lamb on huckleberry production throughout the Kootenays. We will assess the effectiveness of WRR techniques in reducing fuel loads, with subsequent seeding tested as needed to speed up ecosystem recovery without compromising fuel reduction. Combined, these projects provide a framework to determine which areas are most at risk of future wildfire to prioritize for WRR, and to determine methods to reduce impact of wildfire and WRR on vegetation and use by wildlife species.

Additional Resources:
https://github.com/bcgov/clus
The Caribou and Land Use Simulator (CLUS) is a spatial, large-scale analytical model for simulating forest harvest and its potential influence on other forest values (e.g., wildlife habitat). It was first designed to support the government of British Columbia's caribou recovery program, by providing a tool to spatially estimate future forestry and caribou habitat conditions under hypothetical, alternative forest management regimes. It has since been and will continue to be expanded and developed to examine other forest values.

The code in this github is open-source and provides a transparent record of the CLUS model. Anyone is free to download, reproduce and apply the model. However, this is not a self-contained piece of software. In particular, using CLUS as-is requires accessing our data management framework, or modifying the code here to work with your preferred data structure. The repository here also consists of code to create backend apps to develop CLUS model scenarios and review outputs.

Biographical notes
Cora Skaien is a biologist living in the Slocan Valley. Cora's background is in eco-evolutionary dynamics in plant populations, and how these dynamics apply in a conservation framework (PhD 2013-2019). Since completing her graduate studies, she

has focused on creating restoration plans in the Gulf Islands to enhance biodiversity (Islands Trust Conservancy and local landowners), working with the BC Government (FAIB, Ministry of Forests) as an Ecological Modelling Specialist to forecast wildfire risk and assess impacts of silviculture on huckleberries, and working with a local non-profit (Arrow Lakes Environmental Stewardship Society) to assess impacts of wildfire and wildfire risk reduction on fuel loads, vegetation and wildlife use. Cora is particularly interested in taking a scientifically informed approach to restoration and is passionate about trying to reduce the likelihood and impacts of wildfires locally.

4. Peckham's seeding refurbishment project

Presenter:
Hanna McIntyre, P.Ag., Range Agrologist, Rocky Mountain District, Ministry of Forests (MOF)
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Co-Authors and Presenters:
Shawna Larade, P.Ag., Range Officer and Todd Larsen, P.Ag., Range Habitat Specialist.

The Peckham's Seeding Refurbishment project is currently being completed near Horseshoe Lake just south of Fort Steele. Peckham's is an area with a variety of overlapping and diverse land use values including livestock grazing, wildlife use and recreation. From the 1960's to the 1980's, large domestic seedings were established across the landscape in an effort to improve forage resources. With little to no inputs over time, invasive plants were introduced and spread quickly across the project area (yellow hawkweed, sulphur cinquefoil, saint john's wort). The Peckham's Seeding Refurbishment project aims to improve ecosystem health by reducing invasive plants and restoring/ refurbishing domestic seedings to benefit all resource users, including wildlife and livestock who depend upon the forage resource.

In this presentation, Hanna provided a brief history of the area, an overview of the current project treatments, discussed available treatment results, and outlined successes, challenges, and future site goals.

Biographical notes
Hanna McIntyre, P.Ag., is a Range Agrologist in the Rocky Mountain District with the Ministry of Forests (MOF). Growing up in the South Country of the East Kootenays, she has always had a passion for grasslands, ecosystems, and agriculture. Hanna has a B.Sc. in Environmental Science from the University of Lethbridge and has been working with the Range Program in Cranbrook since 2017. She is a member of the BC Institute of Agrologists (BCIA) and currently serves as the vice president for the Kootenay Boundary Region Executive.

5. Using plant-pollinator interaction networks to guide restoration in West Kootenay Camas Meadows

Presenter:
Rowan Rampton, University of Calgary
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Co-Authors:
Valerie Huff, Kootenay Native Plant Society; Lincoln Best, Oregon State University

Flowering plants are often unable to reproduce without pollinators and depend on a diverse array of native species to achieve maximum seed production. Ensuring reproductive output of native plant species is crucial, especially in restorations when competition with invasive plants is intense. Plant-pollinator interactions occur when a pollinator visits a flower, transferring pollen. Sampling these visits produces a snapshot of the ecological interactions occurring at a location, which can be aggregated into a network and used for various purposes, including informing restoration. In the Central Kootenay, *Camassia quamash* (common camas) has lost much of its floodplain habitat and is now a priority for restoration. Before beginning, a pollinator survey was undertaken to document the baseline community. Plant-pollinator interactions were recorded at eight camas meadow sites around the Castlegar area and were used to create a camas meadow plant-pollinator network. This network contains information on the preferences of pollinators, as well as information on which pollinators are supported by flowering plants present in the meadows. Since upwards of ninety pollinator species were observed visiting fifty-seven species of flowering plants, untangling the interactions between them is not a simple task. It would be easy to simply choose the plants that support the most pollinators, but this is unlikely to restore the full complement of ecological interactions possible and would likely result in less diverse, highly homogenous communities. Instead, networks can be used to identify plants that support the most pollinator diversity, with a focus on supporting specialist pollinators, which are not present in communities that lack their preferred floral partner. Currently available methods for identifying such plants and their potential for use in guiding restorations will be discussed.

Biographical notes
Rowan is a current MSc student at the University of Calgary. As an undergraduate at Simon Fraser University, he assisted with a variety of ecological research projects, but kept coming back to pollinator research after being introduced via a blueberry pollination project in the Fraser Valley and later a field season studying the pollinators of variously aged burnt sites in Tweedsmuir Provincial Park. His research currently focuses on

pollination ecology across an elevation gradient of camas meadows found in the Castlegar area, in partnership with the Kootenay Native Plant Society.

6. Whitebark Pine recovery in the Kootenay-Columbia

Presenter:
Randy Moody, Moody Tree, Whitebark Pine Ecosystem Foundation of Canada
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Whitebark pine is an endangered high elevation pine common to the Kootenay-Columbia Region. It plays important ecological roles and widespread declines may lead to cascading negative impacts to high elevation ecosystems. This project consisted of surveying stands to determine white pine blister rust trends in the region, conducting restorative plantings, and implementing other recovery actions in the region. This portion of the range presents novel challenges and opportunities due to the presence of numerous ski tenures in the region. We are in the process of developing collaborations with heli and cat ski operations as they have large tenures and a high degree of local knowledge; working directly with these industry sectors is likely to identify practices that will consider tenure holder needs and will also expose whitebark pine recovery to a broader audience. Surveys of previous plantings found that seedling survival was negatively impacted by drought impacts and grizzly bear digging; when developing planting programs practitioners should avoid spring beauty and glacier lily fields and consider that heat dome events are likely to be more common in the future.

Biographical notes
Randy Moody is a Kimberley based whitebark and limber pine recovery specialist. He has worked on related conservation and restoration projects throughout British Columbia and has experience with industrial and small-scale native plant restoration and reclamation.

7. Conservation and restoration of whitebark pine in the mountain national parks

Presenter:
Natalie Stafl, Parks Canada, Fire and Vegetation Ecologist
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Whitebark pine (*Pinus albicaulis* – SARA listed Endangered) and limber pine (*Pinus flexilis*— COSEWIC recommended Endangered) are key components of forested and subalpine ecosystems in the Rocky and Columbia Mountains of Canada. Both pines are experiencing population declines and are at risk due to the combined effects of exotic white pine blister rust (*Cronartium ribicola*), fire and fire exclusion, mountain pine beetle and climate change. The seven Canadian Mountain National Parks are in the midst of a 10 year project dedicated to the conservation and restoration of whitebark and limber pine. The outcomes of conservation and restoration actions to promote blister rust resistance, conserve genetic diversity and improve habitat conditions from 2014-2019 are presented along with proposed restoration actions for the remaining 4 years of the project.

Biographical notes
Natalie Stafl is the Fire and Vegetation Ecologist Team Leader in Mount Revelstoke and Glacier National Parks. She works on forest health, ecosystem monitoring and restoration and supports the Parks Canada fire management program. Natalie received a master's degree in Zoology at UBC studying the impacts of hikers and a warming climate on the American pika as well as a bachelor's degree in Natural Resources Conservation from the UBC Faculty of Forestry. Along with her colleagues in the mountain national parks, Natalie coordinates whitebark pine recovery efforts and monitors long term health transects.

8. Examining blister rust incidence in whitebark pine: why is Banff so different?

Presenter:
Brendan Wilson, Selkirk College, School of Environment & Geomatics
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Co-Authors: Hilary Cameron, Parks Canada, Fire and Vegetation, Banff Field Unit; Conor Griffith, Parks Canada, Fire and Vegetation, Banff Field Unit

White pine blister rust remains the greatest threat to whitebark pine in high elevation stands over the species' Canadian Rocky Mountain range. The initial obvious trend was that greater infection and mortality of trees due to blister rust was highest at the international border in Waterton and lower at the northern end of the species' distribution beyond Jasper National Park. With more data, it became clear that there was some variation in the levels of infection, with the least amount occurring in the mid latitudes to the east of the Continental Divide over much of the geographic range of Banff National Park. This presentation introduces the two-year study designed to explore several hypotheses that might explain this pattern of reduced infection and reports out the first year of field work.

Biographical notes

Originally from the Bow Valley in Alberta, Brendan Wilson continues to explore a life-long interest in subalpine and timberline forest communities in the Columbia Basin. Brendan teaches and conducts research with the School of Environment and Geomatics at Selkirk College, in Castlegar.

9. Water monitoring for watershed security in the Canadian Columbia Basin

Presenter: Kat Hartwig, Living Lakes Canada
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Climate change is the most critical issue impacting water management in the Columbia Basin. Water sources are dependent on glaciers and snowpacks, which are declining. Existing water monitoring networks are insufficient to track and understand these impacts.

Living Lakes Canada has begun the pilot implementation of a coordinated water monitoring network in three hydrologic regions in the Columbia Basin, using an innovative methodology that can be replicated in other regions, to better understand the state of watersheds and the actions required to maintain their integrity in consideration of climate impacts.

Living Lakes Canada has facilitated the preliminary research and community engagement required to implement this project. Launched in 2021, an open-source water database (the 'Columbia Basin Water Hub') is used by 40+ stewardship groups; municipal, regional, and Indigenous governments; environmental professionals and industry to share and access current and historical water data. A Priority Monitoring Matrix for selecting monitoring sites within each of the hydrologic regions was developed based on scientific rationale combined with community feedback. Local Reference Groups were created in each of the pilot areas so participants could identify key community concerns and priorities. Hydrologic modelling and data gap analysis was also completed in the target hydrologic regions. Prioritized monitoring based on science and informed by community water priorities ensures that monitoring addresses both community and scientific needs in a nested, cost-efficient manner. Equipment installation in all three pilots will be completed in Fall 2022, and next steps are to scale up the project and expand across the Basin region. This is planned as a 10-year project that has received significant funding from the Province of BC.

A number of other Living Lakes Canada monitoring programs feed into this larger monitoring Framework with data also housed on the Columbia Basin Water Hub. Groundwater data is currently being collected through the Columbia Basin Groundwater Monitoring Program, high elevation data is being collected through Kootenay Watershed Science and a pilot High Elevation Monitoring in Kokanee Glacier Provincial Park program; data from lake foreshore surveys to assess the rate of change through the Foreshore Inventory Management Planning program; and biomonitoring data through

our STREAM project. All these programs contribute to a greater understanding of our water and watersheds.

The resulting data will be used to facilitate the creation of water budgets for eventual evidence-based water allocation required during water shortages. This project supports the paradigm shift necessary to collectively address water challenges imposed by climate impacts.

Biographical notes

Kat Hartwig is the Founder and Executive Director of Living Lakes Canada. She has been involved in international, national, and regional environmental advocacy issues relating to sustainable tourism, endangered species, corporate social responsibility, and water-based ecosystem health since 1983. She advocates for land and water policy and protection mechanisms necessary to support biodiversity, source water protection and climate resilient communities. She is an advisor for the Global Water Futures Canada's First Research Excellence Fund panel, the Lake Windermere Ambassadors, and the BC Water Leaders Consortium; and a former advisor for the Small Change Fund, the Vancouver Foundation, the Columbia Basin Trust Climate Resilience Advisory and the Columbia Basin Watershed Network. She continues to serve as a board member of the Germany-based Global Nature Fund.

10. Sqlewʔulə́cw wetland restoration and beaver reintroduction

Ariana McKay, MSc, RPBio, Habitat Biologist with Ministry of Land, Water and Resource Stewardship
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Wetland restoration was conducted in partnership with Shuswap Band on Provincial Conservation Land and Nature Trust of BC Conservation Property. This 7ha wetland was degraded due to historic water diversions and cattle use. The wetland was restored in fall 2021 using heavy machinery. The watercourse was re-established, and deep pools were constructed. Planting, fencing, and grass seeding were conducted to support restoration. Beaver reintroduction to wetland is planned for fall 2022 or spring 2023. Shuswap Band will conduct welcoming ceremony for beaver, as well as a re-naming ceremony. The site is now known as Sqlewʔulə́cw; formerly Sun Creek.

Biographical notes
Ariana is a Habitat Biologist with MLWRS with 12 years of experience in environmental conservation. She is passionate about habitat enhancement and has led numerous projects including wetland creation, prescribed burning, forest thinning, invasive plant control and revegetation. Her favourite part of these projects is seeing how a project team can work through obstacles to bring a project to life.

11. Conserving vulnerable Columbia Wetlands affected by climate change

Presenter: Suzanne Bayley, President of Columbia Wetlands Stewardship Partners (CWSP) in Columbia Valley, BC, Emeritus Professor of Ecology, University of Alberta
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Co-Authors: Ryan MacDonald, hydrologist with MacHydro Consulting; Catriona Leven, MSc student, University of Waterloo, CWSP; Annie Pankovitch, CWSP

The Columbia Wetlands (CW) are an internationally recognised wetland in eastern BC which have had reduced water flows and reduced area of open water habitat in the last few decades. CWSP with funding from ECCC/Kootenay Connect, CBT and the local conservation fund has been monitoring the water levels in 38 wetlands and the Columbia River. The connection to the Columbia River determines the type of wetlands in the valley and the availability of water that remains in the wetlands over winter. Beaver dams allow water into the wetlands during the flood pulse and block water outflow from the wetlands during the rest of the year. Those wetlands provide winter and spring habitat for migrating birds and SAR. There are very few of those habitats available in CW and we have repaired a defunct dam in a 53ha wetland to provide this winter/spring habitat. This is an example of a soft, more process-based restoration approach to climate adaptation in the face of declining water levels.

Biographical notes
Dr. Suzanne Bayley is President of the Columbia Wetlands Stewardship Partners, a 31 member NGO that works with local organizations to ensure that the Columbia Wetlands and Columbia Valley maintain a healthy natural environment.

She is an Emeritus Professor of Ecology at the University of Alberta. Her research focused on the ecology and management of wetlands, shallow lakes, and streams. Her primary interest is in applied ecology to enhance the understanding of the value, health, and ecological processes in aquatic systems.

She is now helping lead a Columbia Valley series of projects on the heath of the wetlands, the conservation of Species at Risk and developing the background information and approach to needed to conserve and maintain wildlife corridors across the Columbia Valley.

Posters

12. Effects of pesticide use on bat health and ecology

Nicole Besler, Vespertine Ecological & DWB Consulting
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Development and reclamation activities associated with industrial, agricultural, forest harvest, and urban areas introduce environmental toxicants (e.g., pesticides) onto the landscape that may negatively affect wildlife health and, thus, persistence of populations. Bats in British Columbia are physiologically and ecologically unique insectivores that provide important ecosystem services (e.g., pest control); however, the impact of pesticide use on bat populations is largely under-represented in ecotoxicology studies. The goal of this research project is to evaluate the effects of pesticide use on bat health and ecology with the following objectives:

1. Determine the degree of pesticide exposure among bat species in the Kootenays;
2. Identify and quantify the effects of pesticides on endocrine and immune function; and,
3. Identify the risks and benefits of pesticide use within the context of ecosystem health.

To address objective 1, the validity of using biomarkers (genotoxicity) will be tested and methods for detecting pesticides in bat tissue will be developed. Additionally, bat foraging habitat and environmental sampling of pesticides will be done to further quantify the degree of pesticide exposure. To address objective 2, hair and feces will be tested for reproductive hormones and cortisol (stress) levels alongside pesticide analyses. To date, eight species of bats have been captured at six sites of varying pesticide exposure in the Kootenays. Analyses have not been completed yet, but sampling in 2023 will include more sites to increase sample size. The results of analyses will be used to inform crop management, invasive species treatment, and other pest control measures.

Biographical notes
Nicole Besler has been doing wildlife work for nine years and is currently operating a research-based business in Kimberley and working for DWB Consulting in Cranbrook. Her specialty is with bats, but she has also worked with amphibians, mesocarnivores, and birds across North America. Nicole is passionate about bridging science with land management and fostering one health approaches. She will be starting her PhD in ecotoxicology in January at the University of Calgary.

13. Re-imagined trail cameras for wildlife science: initial field testing of a newly designed smart camera for salmon restoration, raptor migrations, herpetofauna and insect pollinators

Doug Bonham, Field Data Technology
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Trail cameras, aka camera traps, have made dramatic contributions to wildlife field science due to their continuous unobtrusive monitoring of wildlife sites. Commercially available trail cameras were designed for big game sport hunters instead of for scientific research. As such, these commercial devices lack features that would be valuable for ecological field research. To address this lack of features our team secured grants from the US Department of Agriculture (USDA), National Oceanographic and Atmospheric Agency (NOAA) and the State of Montana to do a ground-up electronic design of a re-imagined AI-assisted camera with features that target the needs of ecological field research. Commercial trail cameras acquire only a single data type – visual images. Commercial trail cameras acquire terabytes of raw images from the field and then require researchers to spend immense amounts of time analyzing these images to extract data that has ecological meaning. Ecologically meaningful data typically takes the form of a time series of ecological events. For this reason, our devices automatically generate a multivariate time series of sensor data onboard the field camera instead of asking the researcher to manually compile this data after the fact. Rapid advancements in the semiconductor industry are fueling our design work. The semiconductor industry is currently experiencing a dramatic expansion of artificial intelligence capability, not where it already exists on the cloud and super computers but rather on tiny portable micro-powered processors, smart sensors, and other specialized integrated circuits. Our team is leveraging these new technologies to create a new generation of science-ready field cameras to meet humanity's urgent need to understand and navigate rapidly changing planetary ecological conditions. In addition to motion-triggered images these new devices compile spreadsheets of temperature, humidity, barometric pressure, ambient light, GPS location and motion as detected by two different types of motion sensors. Commercially available trail cameras use a single type of motion sensor called a passive infrared sensor (PIR). PIRs require a temperature differential between the moving target and the background. As such, PIRs work well when a large warm-blooded mammal moves across a cold background. But PIRs work poorly or not at all on ectothermic amphibians, reptiles, fish, and insects. Therefore, we added a newly available infrared multi-zone rangefinder motion sensor which is essentially a tiny LiDAR on a chip. These LiDAR-on-a-chip sensors can detect the motion of flying insect pollinators, herpetofauna and salmon as they splash across shallow riffles in spawning

streams. We also added sorely needed features including interchangeable camera lenses, custom focusing, free wireless notifications and the ability to run your own custom machine vision scripts on the acquired images so that only high-value images are stored on the memory card. To carry out our mission we formed a 501(c)3 non-profit research organization headquartered next to Waterton-Glacier International Peace Park. Our team is currently seeking innovative field projects and partners to continue to develop, field test and seek next stage grant funding.

Biographical notes

Doug Bonham began as a wildlife biologist working in the Pacific Northwest in the 1970s. He then added an electronics engineering degree and spent thirty years designing medical, scientific, telecom and consumer devices in the Seattle technology corridor. That experience included ten years designing custom GPS tracking devices for marine and wildlife research. Most recently he worked for Microsoft Research and on the design team for Microsoft's Surface Pro Devices. He left Microsoft last year to pursue design of AI-assisted non-invasive alternatives to tracking collars including science-ready smart cameras for wildlife research. His Montana based non-profit research organization, Field Data Technologies, is a three-way partnership between himself and Dr. Constance Woodman (biomedical sciences) at Texas A&M University and Dr. Christopher Evelyn (herpetologist) at University of California Santa Barbara.

14. The Northern Rocky Mountain biodiversity challenge: uniting people across an ecoregion

George Gehrig, Kinnikinnick Native Plant Society
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The Northern Rocky Mountain Biodiversity Challenge (NRMBC) is a spin-off of the international springtime City Nature Challenge (CNC) bioblitz. The CNC started in 2016 as a competition between San Francisco Bay Area and Los Angeles County. It is an annual international effort for people to find and document plants and wildlife in cities across the globe. It's a bioblitz-style competition where sites (mostly cities) are in a contest against each other to see who can make the most observations of nature, who can find the most species, and who can engage the most people. Observations are made using the iNaturalist or Seek apps and saved to the iNaturalist site. The NRMBC is structured the same way.

To encourage phenological and landscape level engagement, Summer and Fall NRMBCs were created in 2022. A total of 106 jurisdictions in Canada and the United States were identified as being (in whole or partially) a part of the Yellowstone to Yukon corridor (Y2Y). iNaturalist projects were created for all of them. The results have been tabulated, and the jurisdictions ranked by per capita number of Observations, Species and Observers.

Now that base line numbers have been collected, future CNC and NRMBC bioblitzes and further research will try to discover why some jurisdictions have more participation than others. Different interventions will be tried to boost participation using the partnership of governments, institutions, and non-profits. The specific measure of interest will be the number of Observers per capita. This measure will be called the Environment Engagement Index and will serve as a proxy for ecosystem/ecoregion awareness.

Biographical notes
George retired after a career in academic medicine. He has lived in Northern Idaho for 2.5 years, and has been supportive of conservation efforts, and non-profits. He organized City Nature Challenges in Bonner County, Idaho in 2021 and 2022, and mini competitions regionally to win a newly commissioned Northern Rocky Mountain Trophy (the winners are the top 3 iNaturalist projects with the most people per capita to make at least one Observation). The NRMBC was created to connect people to their ecoregion, and to connect people at the landscape level to raise awareness of biodiversity.

15. Understand current and historic cervid population in Shuswap Band Territory

Presenter: Rhiannon Kirton, Shuswap Band
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Co-Author: Anthony Caravaggi, University of South Wales,

Over the last century, industrial development and resource extraction have led to habitat loss and declines in ungulate populations, most notably in Mountain Caribou, but Elk, White-Tailed Deer, Mule Deer and Moose have also declined in the Kootenay region. Ungulates are also critically important as game species that are utilized for subsistence by First Nations who hold inherent rights to hunt and fish on their lands.

The project aims to assess the current population abundance and density of ungulate species in the Columbia Valley area using camera traps to get population density estimates. Following population estimates we will compare these numbers to historical abundances within this area from both Traditional knowledge and FLNRORD sources to understand how population trends have changed over time throughout the valley. With this information on population trends from historical records to present day estimates, we aim to create a more inclusive and holistic management plan for these ungulate species in the Columbia Valley, prioritizing the needs of Shuswap First Nation. Through a reassessment of ungulate populations, outside of the restrictive framework of the North American Model of Wildlife Conservation, we will provide recommendations that increase ungulate abundance and benefit the First Nations whose traditional lands fall within the study area. This will achieve two goals: the conservation of ungulates in the Columbia Valley and the ability to provide security of game animals for Shuswap Nation to gain a greater understanding of these culturally important species.

Biographical notes

Rhiannon Kirton is a Biologist and Research Scientist with the Shuswap Band in Invermere. She has a BSc in Zoology from The University of Manchester, England and an MSc in Geography from The University of Western Ontario where she studied spatial ecology in White-Tailed Deer (Odocoileus virginianus). Before her role at Shuswap, Rhiannon interned for the Ministry of Forests, Lands and Natural Resource Operations in Nelson, BC as well as work in Montana and Australia. She is also a Trebek Initiative awardee and National Geographic Explorer for her project using camera traps to estimate the densities of culturally important ungulates in the Columbia Valley.

16. Impacts of repeat wildfire on forest resiliency in Glacier National Park British Columbia (BC)

Natalie Maslowski, Mount Revelstoke and Glacier National Park
natmaslowski@gmail.com

Changing climatic conditions are impacting fire regimes and driving more frequent and severe wildfires in western Canada. Associated impacts include increases in lightning ignitions, nighttime burning, and the occurrence and persistence of drought conditions. Low to moderate severity wildfires can maintain forest structure, however, short-return interval wildfires or repeat wildfires, can affect seedling survival and forest regeneration. This can lead to landscape change over time, such as the shift of forests to lower ecosystem states or a decrease in ecological diversity that have been observed in forests following high severity or high-frequency wildfires in Jasper National Park, Alberta. The study aims to characterize high elevation forest regeneration following repeat wildfires in Glacier National Park in British Columbia (BC). Our study fire is in the Beaver Valley, focusing on areas which burned in 1992 and 2017. To assess forest regeneration three subsites were identified: two control subsites affected by single but different fires (e.g., a 1992 and 2017 wildfire), and a third subsite affected by both fires. At each subsite, 10 plots from each burn severity category were identified (e.g., low, moderate, and high) for a total of 30 plots. We hypothesize that tree species counts, and diversity, will be significantly lower in plots affected by two close succession fire events compared to plots affected by a single fire event or control subsites. More specifically, paired plots of either high or moderate burn severity will show significantly lower amounts of species counts than sites paired with low or no burn severity (e.g., plots affected by two fire events and affected by high burn severity). In the face of climate change and increasing wildfire frequency, the results from this study will provide baseline ecological information that will help inform wildfire management plans in BC.

Biographical notes
Natalie Maslowski is a masters student at Thompson Rivers University completing her thesis on the effects of repeat wildfire on forest resiliency at high elevations in Glacier National Park, BC.

Field trips

17. Shuswap Creek Restoration

Hosted by: Jon Bisset, Biologist, principal – Jon Bisset and associates. Columbia Headwaters Aquatic Restoration Secwépemec Strategy (CHARS), team providing technical support to the Shuswap Band and partners
jon@bissetco.com

This site visit, led by the knowledgeable and passionate Jon Bisset, was to the Shuswap Creek restoration project where a multiple indicator approach is being used to study fish populations, water quality, identify the total number of km's of the stream that's vegetative, channel morphology and to learn more about the stream habitat that's available for fish movement as well as removing potential barriers for fish movement. This project includes numerous sites and the following features:

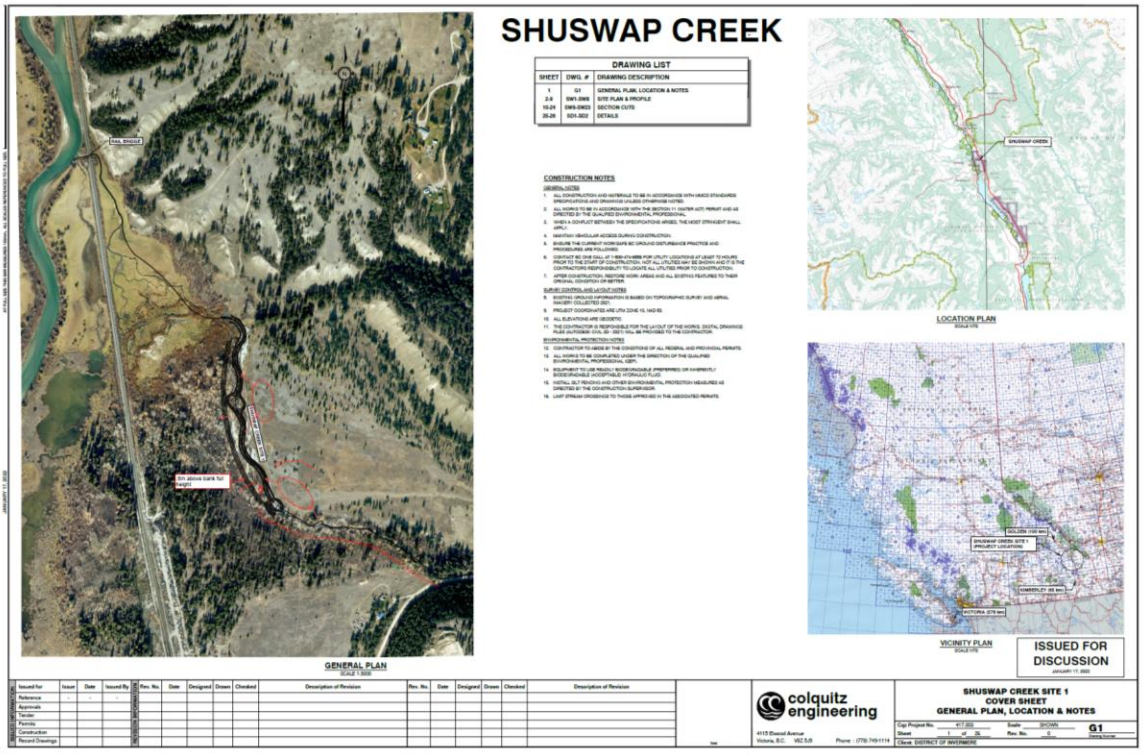
- pilot watershed for restoration/connectivity;
- watershed-based approach, one of several watersheds identified in the first phase of CHARS (Galena (Fraling), Luxor, Marion, Abel, Stoddart, Windermere creeks also identified);
- small stream that supports fluvial and resident populations of Westslope Cutthroat Trout, Bull Trout; Kokanee, rainbow trout have also been documented in lower reaches;
- headwaters isolated from the Columbia River (similar to many tributaries to the Columbia);
- combination of First Nations Reserve (Shuswap Band), crown and private lands; lower reaches transected by provincial highway and railway crossings.

Field trip lead and project partners:
Jon Bisset is a consultant supporting the Shuswap Band and Partners for numerous restoration projects under the Columbia Headwaters Aquatic Restoration Secwépemec Strategy (CHARS) umbrella. Principal, Jon Bisset and Associates, lead (with Camille Des Rosiers Ste. Marie, Mindi Sheer, and other Associates) for the CHARS project; may be supported on the field trip by Camille

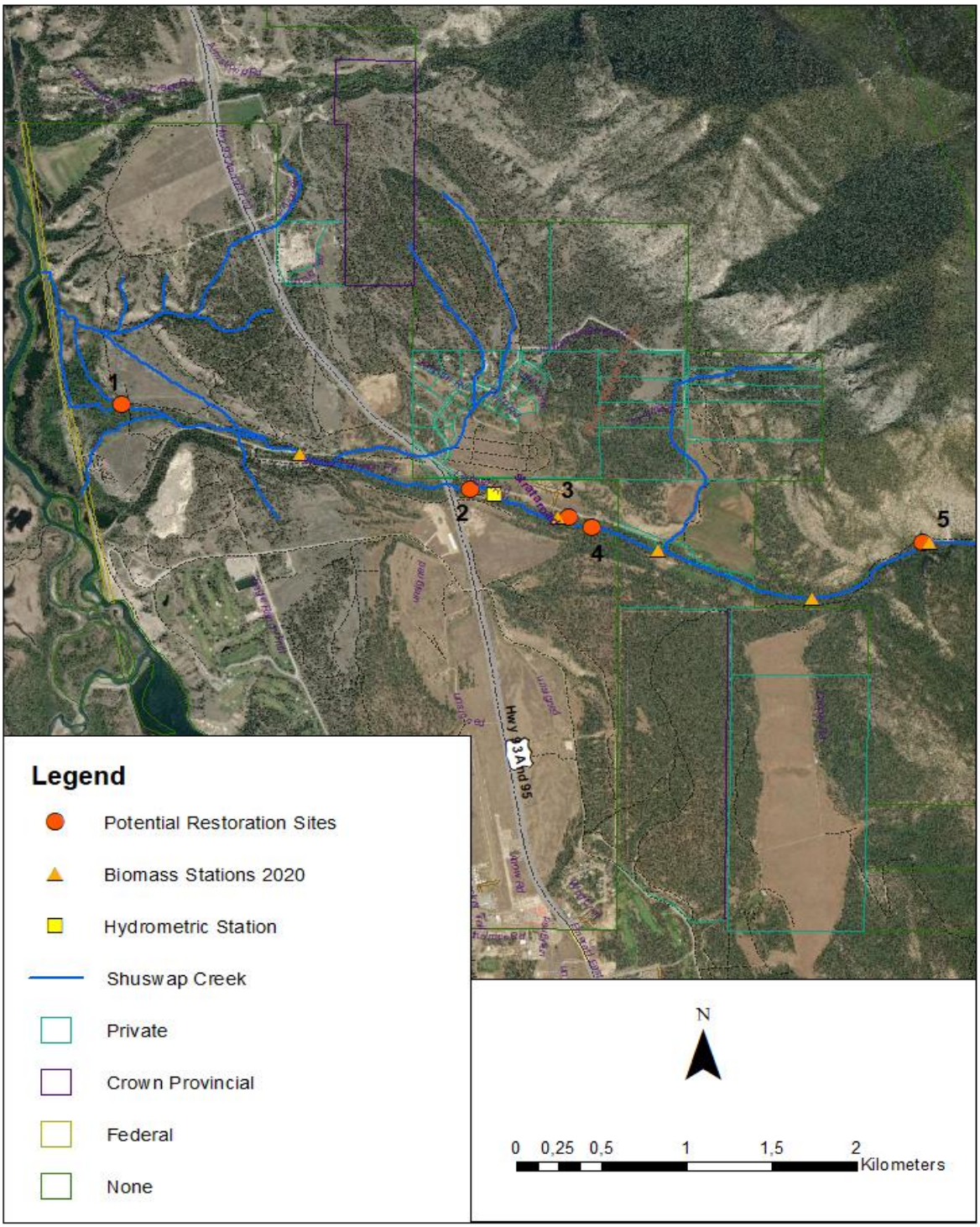
Photo credit: Randy Harris

Project partners include Columbia Wetlands Stewardship Partners, Lake Windermere District Rod and Gun Club, Living Lakes Canada, Golden Rod and Gun Club, Trout Unlimited Canada, province of BC, Selkirk College, numerous other partners and local landowners.

Mouth of Shuswap Creek – Columbia River Confluence; Jon Bisset photo



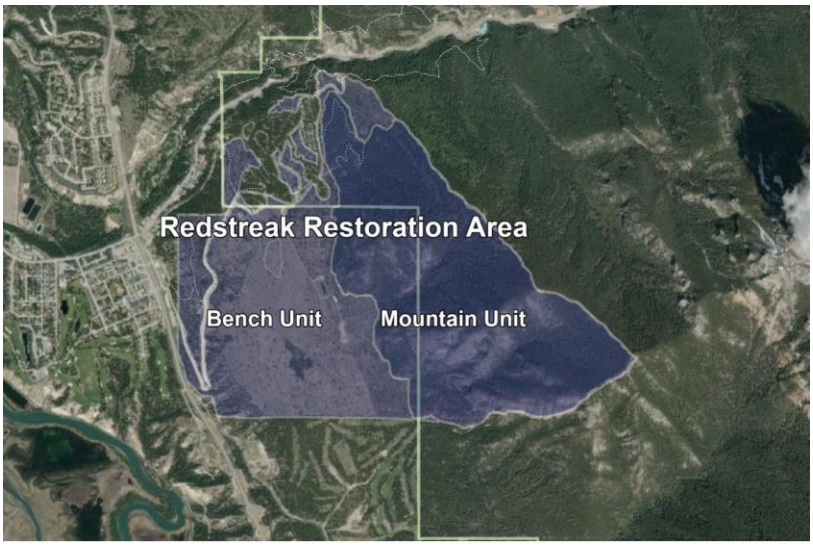
Location Map – Shuswap Creek Watershed



Restoration, monitoring locations – Shuswap Creek Watershed

18. Redstreak Ecological Area, Kootenay National Park

Hosted by: Elana Olsen, Parks Canada
elena.olsen@pc.gc.ca



Graphic credit: Parks Canada

Photo credit: Randy Harris

Elana Olsen with Parks Canada took us through the Redstreak Ecological Restoration Area to discuss restoring open-grassland habitat for Rocky Mountain bighorn sheep and a historic frequent low-moderate intensity fire regime.

Continue the conversation on any or all our channels

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