COLUMBIA MOUNTAINS INSTITUTE
of Applied Ecology

Forum Summary
CMI Annual Researchers' Forum

September 24 - 26, 2025
Revelstoke, BC

Photo Credits: Marc-André Beaucher (Creston Valley Wildlife Management Area), Hailey Ross (CMI), Brittany Eliadis (EKISC)

The Columbia Mountains Institute of Applied Ecology (CMI) hosts an annual Researchers' Forum where we gather members of the scientific community, Indigenous community members and representatives, stewardship groups, students, land managers, and interested individuals to provide updates on ecological projects taking place in southeastern British Columbia – everything from field trials, new restoration projects and their associated community initiatives, to ecosystem monitoring and research, etc. These updates cover a wide range of topics and species in an informal atmosphere - everyone is invited to attend, mix, and mingle!

This event annually travels around the Columbia Mountains and Kootenay region. This year we gathered in Revelstoke, BC where a number of topics discussed had direct connections to the local and surrounding landscape, from community-driven stewardship for the blue listed western painted turtle in Revelstoke, post-fire vegetation recovery in the Beaver Valley, to extensive research studies into population dynamics and habitat requirements for bighorn sheep in the Kicking Horse Canyon. Projects from further afield highlighted insights from camera trap monitoring, genetic-based bear inventories, fire ecology modeling, and innovative data-driven approaches to species monitoring. We also received key updates from large-scale landscape connectivity initiatives like Kootenay Connect, highlighting how good work can continue beyond formal timelines, ensuring on-the-ground solutions remain connected to policy and decision-making.

In addition to an afternoon of well-articulated and engaging talks on day one, there were a number of fantastic posters featuring yet more ecological work pertaining to communal roosting behaviour, microbial processes in cave systems, northern mountain caribou survival, and more. The first day culminated in a public talk by two of CMI's inspiring founders, Dr. John Woods and Dr. Bruce McLellan, who shared wild stories of grizzly bear monitoring and the collaborative efforts that laid the foundation for CMI. The following day, we immersed ourselves in field tours that provided interactive learning experiences, exploring the productivity and connectivity of the Revelstoke Reservoir, sustainable forest management practices by the Revelstoke Community Forest Corporation, and the maternal roosting habitat of the endangered Northern Myotis bat.

A big **thank you** to everyone who took the time to share their work with us, bring their colleagues and students to the event, and for the important work you do. Thank you to Isobel Phoebus, Marc-André Beaucher, Marcy Mahr, Catherine, Jeremy and Pete who volunteered at the event – without you the event would not have run so smoothly. Thank you also to CMI's staff Hailey Ross and Jasmin Dorinda for the organization and delivery of yet another well-organized Researchers' Forum!

Event Sponsors

Many thanks to Tourism Revelstoke, Downie Timber Ltd, Shearing Consultancy Limited. And Revelstoke Community Forest Corporation for your financial support.

Contents

Oral presentations (in order they were presented)

1. CMI and the evolution of genetic-based bear inventories for bears (Mowat)

Presenter: Garth Mowat, University of British Columbia, garth.mowat@gov.bc.ca

Genetic-based inventories for bears were developed in BC largely by early members of CMI. The method came about when conservation geneticists developed methods to fingerprint tiny volumes of DNA like the amount you find in the root of a hair. This method allowed biologists to sample much larger areas than previous radiotelemetry-based inventories that typically sampled <20 bear home ranges (<500 km^2). Much of the uncertainty in applying the data to real-world scenarios like hunting quotas was in extrapolating the data to larger areas. Genetic-based inventories typically sampled larger areas (>2000 km2), and new statistical tools have since come along that allow analysts to extrapolate abundance to even larger areas while better accounting for the uncertainty in that venture. These methods have also supported new insights into parentage, individual-based diet, stress levels, and even newer tools will allow the estimation of age using epigenetic clocks and population size based on kin-relationships.

Biographical notes

Garth Mowat was born and raised in British Columbia and has lived in Nelson since 1996. He attended his first CMI meeting in 1997 and was a board member after that. Garth is the Provincial Large Carnivore Specialist with the BC Wildlife Branch and an Adjunct Professor at the University of British Columbia. He has studied mammalian population ecology for the last 4 decades with a focus on grizzly bear ecology over the last two.

2. Back From the Brink: DNA-Based Monitoring of the Cabinet Mountains Grizzly Bear Population (Paetkau)

Presenter: David Paetkau, Wildlife Genetics International, Nelson, British Columbia. dpaetkau@wildlifegenetics.ca

Co-authors: Wayne Kasworm and Justin Teisberg, United States Fish and Wildlife Service, Missoula, Montana.

When John Woods *et al.* (1997) pioneered the use of remotely-collected hair samples (RCHS) for individual identification, they changed the way the world counted bears. While estimates of abundance were usually the main focus of these studies, the genotypes they produced have proven useful for studying relationships between family members and between populations (e.g., Proctor *et al.* 2012). Nowhere have these tools been more powerful than in monitoring small populations at risk of extirpation.

The grizzly bears in the Cabinet Mountains, at the southern tip of the Purcell Mountain chain, are one such population. Since 2002, the US Fish and Wildlife Service has been conducting annual RCHS surveys as part of their program to support the recovery of this population (Kasworm *et al.* 2024). In the early 1990's 4 young females from the Flathead Valley (western flank of the Rocky Mountains) had been moved into the Cabinets, and an initial goal of the RCHS surveys was to look for evidence that these bears had stayed in the area and reproduced.

In 2004 RCHS confirmed that an augmentation bear released in 1993 was still present in the Cabinets. She was identified as bear 286, or Irene (Goldfarb 2014). Over the next couple of years, RCHS detected 7 other bears in the Cabinet Mountains, all of which turned out to be Irene's mates (n = 2), cubs (n = 3) or grand-cubs (n = 2; Kasworm et al. 2007). This confirmation that augmentation had not only worked, but was responsible for all of the documented reproductive events from the early 2000s, led to a renewed augmentation program, with another 18 Flathead bears being introduced to the Cabinets between 2005 and 2023 (for details see Table 7 of Kasworm *et al.* 2024).

RCHS surveys conducted since those early years have confirmed Irene's extraordinary contribution to the Cabinet Mountains grizzly bear population: we have now identified 10 of her cubs, 28 F2 grand-cubs, and 7 F3 great-grand-cubs, with most newly identified bears still tracing part of their ancestry to Irene (Table 1). In addition to Irene's outsized contribution, 4 other augmentation bears — 2 females and 2 males — have been documented as having stayed and reproduced. The descendants of these 5 reproductively successful augmentation bears, along with Irene's original mates, account

for 100% of the ancestry of the bears that we have documented being born in the Cabinet population between 1997 and 2022 (Fig. 1).

One challenge when a population contains so many close relatives is that it's not always clear from the genotypes alone which close relatives are the actual parents of a given individual; sometimes we have to weigh competing parentage hypotheses. A tool that has aided the interpretation of the genetic results has been the deployment of wildlife cameras at hair collection sites, which record when groups of bears are travelling together, and provide insight into the ages of cubs. Often when we identify a new bear in the Cabinets, photographs show that it was sampled in the presence of a female that was known from previous years, and that has a genotype consistent with a mother–offspring relationship. Another complementary information source that has helped to resolve relationships has been age data obtained from teeth collected during live-captures and from mortalities.

While augmentation has been key to the persistence of Cabinet Mountains grizzly bears, the long-term goal is still to re-establish natural demographic and genetic connections to nearby populations. Starting in 2012, RCHS have provided tantalizing detections of bears coming into the Cabinets from adjacent regions in the Selkirk, Purcell and Rocky Mountains (Table 1). Unfortunately, these bears — all of them male — have usually been detected in a single year, and have not left cubs behind. Searches of datasets from adjacent regions often confirmed these bears to have been wandering subadults that eventually went back to their natal range, or died during their perambulations.

The first evidence of a natural disperser having made a genetic contribution to the Cabinet population came from the 2023 survey, where we detected an offspring of a mating between one of Irene's granddaughters and a male immigrant. RCHS collected across the Kootenay River from the Cabinets, in the Yaak region of the southern Purcells, showed that the immigrant male in question had spent most of his adult life between the Kootenay River and British Columbia Highway 3. Remarkably, this bear's parents had been identified through RCHS collected in the 1990s (M. Proctor pers. comm.), north of the Highway 3 corridor, which defines another genetic and demographic fracture, dividing the Yaak from the rest of the Purcells (Proctor et al. 2012). Thus, this remarkable and hopeful story of natural gene flow actually spanned 3 generations and 3 populations.

As illustrated by this story, internationally coordinated hair sampling of the fragmented grizzly bear populations in the southern Columbia Mountains has provided insights into birth, survival, reproductive success, and lifetime dispersal that would have been difficult to replicate with live capture and telemetry alone. In addition, the genetic approach is far less invasive and expensive than live capture. After 25 years of annual sampling, the RCHS program in the Cabinets has shown that augmentation can rescue a population on

the brink of extirpation, and has documented ever more encouraging evidence that movements — initially temporary, and limited to males — may eventually be sufficient to support a naturally-sustaining grizzly bear population in the Cabinet Mountains.

Table 1. RCHS results from the most recent 15 years for which analysis is complete. As many as 22 grizzly bears have been detected in a single year (n), with a total of 51 individuals identified for the first time across 15 years (some bears known from earlier RCHS surveys were also detected during this time period). The 51 'new' bears included 8 of the 22 bears moved from the Flathead, 35 of Irene's descendants, and 8 noteworthy bears that don't fall into either of these categories.

Year	n	Known from past RCHS	First RCHS detection	Augmentation	Irene's F1	Irene's F2	Irene's F3	Neither augmentation nor Irene's descendant
2009	5	3	2		2			
2010	7	4	3		1	2		
2011	9	6	3	1	2			
2012	20	10	10	3		6		1 male (see note 1)
2013	6	6	0					
2014	11	9	2	1		1		
2015	11	9	2			1	1	
2016	13	10	3	1		1		1 male (see note 2)
2017	22	16	6			5		1 male (see note 3)
2018	22	17	5	1		2	1	1 male (see note 4)
2019	18	13	5			3	1	1 male (see note 5)
2020	13	11	2					2 cubs (see note 6)
2021	13	10	3			1	1	1 male (see note 7)
2022	20	18	2	1		1		
2023	15	12	3				3	
Total			51	8	5	23	7	8

Note 1. This male was identified through a single 2012 hair sample and had an unusual genotype that clustered with the South Selkirk population. A search of the South Selkirk dataset identified his parents and brother, and in the following years both he and 7 of his children were identified there (M. Proctor pers. comm.). None of his offspring have been detected in the Cabinets.

Note 2. Nearly all of this male's detections, before and after 2016, were in the Yaak, and none of his offspring have been found in the Cabinets. He is known to have died of human causes.

Note 3. Prior to being detected in the Cabinets, this male was captured as a management bear in the Rockies. He has not been detected again, nor have any of his offspring been detected.

Note 4. This male had detections in the South Selkirks prior to its detection in the Cabinets, and its only subsequent detection came from further south, beyond the current limit of occupied grizzly bear range. None of his offspring have been found in the Cabinets.

Note 5. This male had an extensive history of detections through RCHS in the Yaak. His parents were detected in the 1990s north of Highway 3, and 1 of his offspring was detected in the Cabinets in 2023; the first documented case of natural gene flow into the Cabinets (1 of the 3 new cubs identified in 2023).

Note 6. These 2 bears were born in the Cabinets, but were not descendants of Irene because both of their parents were other augmentation bears.

Note 7. This male's parents and brother were sampled in the Rocky Mountains, and he was only detected in the Cabinets in 2021. None of his offspring have been detected.

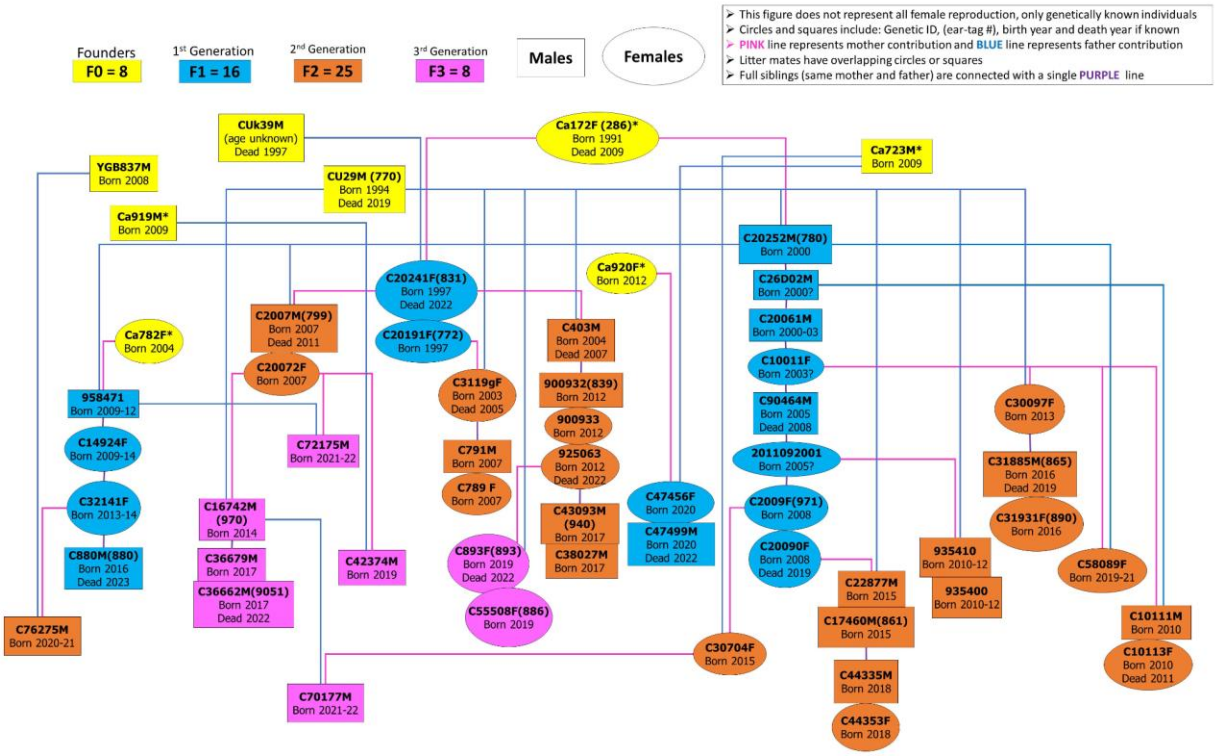

Figure 1. The most likely family tree for the Cabinet Mountains grizzly bear population as of 2023 (Fig. 7 of Kasworm *et al.* 2024, reprinted with permission). Rectangles and ovals represent males and females, respectively.

Biographical notes

David Paetkau got involved in Columbia Mountains ecological research in 1996, when John Woods wanted to know whether geneticists could be relied on to identify bears. The outcome of that research was a new way to count bears, and it sort of took over David's life. For the past 25 years David has been the President of Wildlife Genetics International, in Nelson, where they do the lab portion of Woods-et-al-inspired projects from all over the world, including many population ecology projects from the Columbia Mountains.

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3. Let there be light! Forest dynamics and policy related to woodland caribou recovery (Serrouya)

Presenter: Robert Serrouya, Biodiversity Pathways, Wildlife Science Centre, serrouya@ualberta.ca

No summary provided

4. Understanding White-Tailed Deer range expansion in the Columbia Mountains (Petersohn *et al.,*)

Presenter: Megan Petersohn, University of British Columbia
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Co-Authors: Rob Serrouya, Biodiversity Pathways, serrouya@ualberta.ca; Colin Bergeron, Parks Canada, colin.bergeron@pc.gc.ca; Adam Christian, Splatsin, adam_christian@splatsin.ca; Stan Boutin, University of Alberta, sboutin@ualberta.ca; and Tal Avgar, University of British Columbia, tal.avgar@ubc.ca

British Columbia is at a crossroads. Climate change, industrial expansion, and landscape change are reshaping ecosystems. One of the most concerning developments is the rapid, yet poorly understood, expansion of sek̓wtúps (white-tailed deer; hereafter WTD) into the Columbia Mountains, a region historically lacking WTD due to harsh winters and dense old-growth forests. These adaptable animals are moving into high-value conservation areas, threatening ecological community structure and endangering species like selcwéycen (Southern Mountain Caribou), which rely on intact, low-predator ecosystems. If uninhibited, WTD expansion could disrupt predator-prey dynamics, accelerate the spread of Chronic Wasting Disease, increase vehicle collisions, and suppress forest regeneration, posing risks to native species and humans.

We presented preliminary results from a long-term collaborative project aimed at identifying ecological drivers of WTD distribution and abundance. Using over 200 trail cameras across ~7,000 km², spanning broad gradients of elevation, timber harvest, and predator reduction, we evaluated WTD occurrence across space and time. We observed increased detection rates from 2019 to 2024, even at high elevation sites, consistent with early indicators of expansion.

Our work highlights emerging ecological shifts in BC's mountainous interior and offers decision-makers new tools to anticipate and mitigate the impacts of WTD proliferation in a changing climate. Our findings serve as early indicators of future expansion hotspots, with important implications for caribou recovery, disease surveillance, and habitat management in BC's rapidly changing interior.

Biographical notes

Megan has spent over nine years researching the conservation and management of carnivores and cervids across North America, with a particular focus on predator-prey dynamics. She has deployed more than 500 remote cameras, many used to estimate

white-tailed deer abundance, and has live captured over 100 cervids using drop nets, clover traps, and helicopters.

Her work includes novel wolf research in Yellowstone and Isle Royale National Parks, as well as in Minnesota, Michigan's Upper Peninsula, and the American Southwest, where she contributed to Mexican gray wolf projects. Across all of these efforts, Megan has collaborated extensively with Indigenous communities, state and federal agencies, researchers, and local stakeholders.

She holds dual Bachelor of Arts degrees in Biology and Neuroscience. Megan began her Master's in Biology at UBC Okanagan in May 2024, where she now works in collaboration with Biodiversity Pathways, Parks Canada, and Splatsin Nation.

5. Kicking Horse Canyon Bighorn Sheep Herd - population dynamics and habitat enhancement (Higgins)

Presenter: Stephanie Higgins, Cirque Ecological, steph@cirque-ecological.ca

The small herd of bighorn sheep (Ovis canadensis) that inhabits the area along the TransCanada Highway east of Golden, BC has been struggling with high road mortality as this transportation corridor has increased in traffic volume. When the Kicking Horse Canyon Highway project began in 2020, the herd was down to 11 individuals. The Golden District Rod and Gun Club, along with Ktunaxa Nation Council began a monitoring project with GPS collars, winter intercept feeding, and routine visual monitoring. Further work began to enhance and improve habitat for sheep to encourage them away from the highway, as well as collaborating with the Ministry of Transportation and Transit to erect exclusion fencing throughout the entire sheep range corridor and improve egress structures for sheep. Individual identification using high resolution photography combined with visual monitoring has allowed us to gather detailed data on behaviour, reproduction, lamb survival, and mortality.

Road mortality is driving declines, responsible for killing between 5% and 31% (average of 15%) of the herd each year. This is an additional 5% mortality on average to all other cause mortality (train collisions, predation). Birth rates and lamb survival are high, resulting in lamb to ewe ratios averaging 7:10. This is higher than the management goal of 30:100 for East Kootenay herds. The number of mature ewes remains low, limiting growth of the herd. Lambs have an average first year mortality of only 18%, where rates for this species can be close to 50%. The human shield effect of the highway may provide an advantage in this regard.

Barrier and egress structure monitoring has been ongoing with the Ministry of Transportation and Transit, resulting in modifications to jump-out height (from 1.6m to 2.4m) as well as trialling novel one-way gate designs for sheep. Habitat enhancement using manual thinning to open sightlines and promote forage growth began in 2024 and will continue in 2025. Future plans involve more habitat enhancement, including prescribed fire, to encourage sheep away from the highway corridor, and continued monitoring to ensure population growth continues. Interventions over the past 5 years have resulted in the doubling of herd numbers.

Acknowledgements

This monitoring work has been funded by Ktunaxa Nation Council, the Golden District Rod and Gun Club, the BC Ministry of Transportation and Transit, the BC Ministry of Water, Land and Resource Stewardship. The habitat enhancement work has been funded by the Samuel Hanen Society for Resource Conservation, Columbia Basin Trust, the Ministry of Transportation and Transit, the Fish and Wildlife Compensation Program, BC Conservation Foundation, and the East Kootenay Wildlife Association.

Biographical notes

Steph has been working on the Kicking Horse Canyon Bighorn Sheep Project for 3 years and has been involved with the early stages of two new bighorn sheep projects in Columbia Lake and the Elk Valley.

6. TRU cave microbiology research group: Unlocking cave microbial biology, their roles, and potential applications (Cheeptham)

Presenter: Naowarat Cheeptham (Ann), Thompson Rivers University, ncheeptham@tru.ca

The Cheeptham Cave Microbiology Laboratory at Thompson Rivers University (TRU) is dedicated to studying microbial life in subterranean environments. Our research focuses on the microbial communities, their relationships, and interactions within the caves. Caves are regarded as extreme environments, characterized by their darkness, stability, isolation, levels of humidity, high concentration of minerals, and limited nutrients (oligotrophic). Naturally, caves offer a natural laboratory for investigating extremophiles, novel microbial taxa, and microbial interactions with mineral substrates in the habitats. Through interdisciplinary approaches combining classical and modern microbiology, molecular biology, geo- and analytical chemistry, and microscopy, we aim to uncover the roles of microbes in cave formation (speleogenesis) and degradation, mineral precipitation, and dissolution. Our lab investigates the implications of cave microbiota for biotechnology and environmental conservation.

This presentation shared findings, struggles, ongoing and future discoveries, and collaborations with caving communities, including BC Speleological Federation, Chilliwack River Valley Caving Club, Vancouver Island Cave Exploration Group, Alberta Speleological Society, and Canadian Cave Conservancy. Of many caves explored, the most prominent and extensive studies included the Helmcken Falls Cave, Iron Curtain Cave, White Rabbit Cave, Horne Lake Cave, and Raspberry Rising Cave.

Our findings to date: 1) We found microorganisms everywhere in caves where we studied; 2) from our collective cave studies, there seemed to be two groups of microbial communities in each cave - generic community where they can be found in all caves everywhere, and a specialized microbial community whose unique to each and certain cave; 3) These cave actinomycetes can produce bioactive compounds that can inhibit growth of some multidrug resistant bacteria however further studies are needed; 5) Some of the actinomycetes and other bacteria isolated from speleothem samples from all the caves we studied can precipitate calcium carbonate crystals in the laboratory - we are continuing our further work to investigate the potential genes and metabolic pathways associated with such process; 6) caves are home to many beneficial microorganisms, they are still lots that we do not know.

Acknowledgements: BC Speleological Federation, Chilliwack River Valley Caving Club, Vancouver Island Cave Exploration Group, Alberta Speleological Society, and Canadian Cave Conservancy. Former, current and future research students. TRU internal research grants, NSERC USRA, UREAP, and Mitacs.

Biographical notes

Ann's research interests and focus have included cave microbiomes/new drug discovery, white-nose syndrome in bats, alternative treatment tools against multidrug-resistant infections, and geomicrobiology. Her work has been featured in the New York Times, WIRED, Bloomberg TV network's Spark series, Al Jazeera TV, the CBC's Nature of Things (The Antibiotic Hunters episode), Global TV (Global 16x9 and Global Health), Knowledge Network, CBC radio (Daybreak) and in several International and Canadian magazines. In 2013, she chief-edited and co-authored a book entitled Cave Microbiomes: A Novel Resource for Drug Discovery, published by Springer. Besides her research interests in cave microbiology and related areas, she is also drawn to pedagogical issues in microbiology education and public engagement. In 2009, she was selected as one of the biology research residency scholars in the ASM/NSF Biology Research Residency Scholars Program and participated in an NSF-sponsored residency in Washington, DC. She has continuously been involved with ASM's Journal of Microbiology and Biology Education (JMBE) as a reviewer and was a section editor until 2018. During her career at TRU, she has been honored as a recipient of many internal and external awards. Recently, she is the recipient of the 2025 Kamloops-Thompson Board of Education's OWL (Outstanding Work in Learning) Award for Excellence in Public Education, the 2022 3M National Teaching Fellowship from the Society for Teaching and Learning in Higher Education (STLHE) and 3M, the 2020 TRU Faculty Excellence Award and the 2020 D2L Innovation Award in Teaching and Learning STLHE and D2L (Desire2Learn). She is a Full Professor at the Department of Biological Sciences, Thompson Rivers University, Kamloops, British Columbia, Canada. You can find more information about Ann via her website.

7. A simple approach to mapping animal distribution based on fitted integrated step-selection functions (Jack *et al.,*)

Presenter: Alexander Jack, University of British Columbia,
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Co-authors: Jonathan Potts and Tal Avgar, University of British Columbia

Current approaches to mapping spatial patterns of individual animal occurrence (AKA, the Utilization Distribution; hereafter UD) are either divorced from the underlying environmental conditions (and may thus lack transferability across space and time) or are based on mechanistic models that are mathematically and computationally difficult to predict from. Given the rapid shifts in climate and novel disturbance regimes created by humans, there is a need to develop a fast, scalable method that can adequately predict animal UDs under changing environmental conditions and across novel landscapes. We address this gap by developing a method to approximate the UD based on the parameters of an integrated-step selection function (iSSF; a popular method for analyzing animal movement data) without relying on computationally intensive simulations. Specifically, we show how the iSSF selection coefficients could map the UD to any landscape using a scaling factor derived from the animal's movement capacity and the landscape's spatial autocorrelation (i.e., environmental similarity as a function of geographical distance). Our approach is based on mathematical principles established more than 15 years ago, which have largely gone unnoticed by wildlife professionals to date. This approach bridges a critical divide in movement ecology by providing a biologically informed and computationally feasible method for predicting patterns of animal occurrence across heterogeneous landscapes.

Biographical Notes

Alex received his BSc in Mathematics from the University of Minnesota in 2017 with a minor in computer science. He has since worked on various conservation-related endeavors including: flowering plant surveys, invasive plant surveys, camera trap projects, and community education. In 2024 Alex also received his Master's from the University of Minnesota in Conservation Sciences with projects focused on various aspects of Chronic Wasting Disease in White-tailed deer. He emigrated from the US to Canada in January to begin his PhD under Dr. Tal Avgar where he is studying movement behavior at UBCO.

8. Non-consumptive effects of black-bear hunting: Evidence From wide-scale camera monitoring (Suen *et al.,*)

Presenter: Anson Suen, University of British Columbia ansonsuen030101@gmail.com

Co-authors: Megan Petersohn, University of British Columbia megan.petersohn@ubc.ca; Robert Serrouya, Biodiversity Pathways serrouya@ualberta.ca; Tal Avgar, University of British Columbia tal.avgar@ubc.ca

When facing predation risk, prey often mount a trait response (e.g., moving less, or thickening their shell) to lower mortality risk. Yet, such Risk-Induced Trait Responses (RITRs) carry a cost to other aspects of the prey's fitness, such as reduced food acquisition rate. These costs, known as Non-Consumptive Effects (NCEs), are often argued to be as influential as the Consumptive Effects (CEs) in shaping predator-prey dynamics. Managers are tasked with maintaining a sustainable harvest of game species by ensuring a stable predator-prey dynamic between hunters and their target species, yet, they typically focus on CEs of hunting while overlooking NCEs; should harvest managers concern themselves with NCEs? To answer this question, we must first quantify the magnitude of RITRs, which we have done here for American black bears (Ursus americanus) responding to human hunters. By contrasting black bear use of camera-trap sites with varying hunter exposure across space and time, we evaluated how much black bears shift their space-use patterns in response to hunting risk (RITRs), and hence the potential for biologically significant hunting-induced NCEs. Our results indicate that, in hunted areas and during hunting seasons, black bears (1) reduced daytime activity, (2) increased nocturnality, and (3) substantially avoided high-risk habitats. These RITRs likely impact foraging efficiency, increase exposure to nocturnal predators, and result in functional habitat loss due to road avoidance. Hence, whereas we did not directly observe hunting-induced NCEs, our finding of strong RITRs demonstrates the existence of the necessary conditions for such NCEs in our system.

Biographical notes

Anson Suen recently completed an Honours degree in Zoology at the University of British Columbia Okanagan. Her Honours thesis focused on the behavioral responses of American black bears to human hunting pressure and the potential for these responses to result in non-consumptive effects. Using motion-sensitive trail cameras, she examined changes in bear activity patterns across gradients of hunting risk. Anson is broadly interested in predator-prey dynamics and applied conservation.

9. The effects of recreation on wildlife - how deep-snow caribou respond to heli-skiing (Gill)

Presenter: Ryan Gill, Biodiversity Pathways, rygill@gmail.com

Southern mountain caribou (*Rangifer tarandus caribou*, hereafter SMC) are a federally listed species at risk (threatened) that inhabit deep snow and mountainous environments in parts of British Columbia and Alberta. Winter recreationists seek out these same habitats, with heli-skiing being the predominant recreation that overlaps both spatially and temporally with SMC on their late-winter ranges. In 2020, COVID-19-induced travel restrictions severely limited heli-skiing over the winter of 2020/2021, creating a year where SMC was not exposed to this type of recreation. We used data from GPS-collared SMC to compare the movement ecology of SMC during this 'anthropause' year against three winters of normal heli-ski operations to elucidate the effect of heli-skiing on SMC space use. During the anthropause year, SMC expanded their home ranges by 80 – 120% as compared to years of normal heli-ski operations, but movement rates and resource selection did not change. This change in home range size without an associated change in the available resource quality and abundance may indicate that SMC are restricted in their ability to obtain life history requisites under normal heli-ski operations, potentially impacting individual fitness and survival.

We then used these home ranges to estimate 3rd order resource selection, accounting for differences among individuals and sub-populations. Resource selection by SMC was predominantly explained by elevation, and slope, but forest crown closure and forest age also help to explain their selection. We then created a resource selection function for heli-skiing, using openly available, anonymized human-movement data from Strava to understand the underlying features selected for by heli-skiers. Heli-skiers primarily select for moderate slopes, mid- to high elevations and aspects other than south. We projected and compared these two resource selection functions to identify where heli-skiing and SMC late-winter range likely overlap. The main finding from this analysis is that southern mountain caribou and heli-skiing select for similar terrain attributes, but heli-skiing can exploit a wider range of terrain features, thus a large proportion of the study area is suitable for heli-skiing, but is not also highly suitable SMC late-winter habitat. While there appears to be a high degree of overlap on the landscape, careful management of heli-skiing may reduce those interactions with SMC that are causing reductions in home range size. Better information on the location of skiing and helicopter flight paths can improve the understanding of fine-scale effects on this vulnerable species.

Biographical notes

Ryan Gill is a wildlife biologist living in the Columbia Mountains. He has spent the last 20+ years studying terrestrial and avian wildlife, and has recently done a deep dive into the movement ecology of southern mountain caribou, and how they respond to winter recreationists.

References

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10. Reconstructing historical fire regimes in the Columbia Mountains: Twenty-five years of research (Baron)

Presenter: Dr. Jen Baron, Centre for Wildlife Coexistence, University of British Columbia, jen.baron@mail.ubc.ca

Prior to Euro-Canadian colonization, Columbia Mountain ecosystems were adapted to and maintained by active fire regimes that enabled ecological resilience to disturbance. Historical fire regimes in these ecosystems were diverse, with low-severity fire regimes in dry submontane grasslands and open forests, moderate-severity fire regimes in montane mixed-conifer forests, and high-severity fire regimes in cool subalpine forests. The disruption of Indigenous fire stewardship and subsequent legacies of 20th century forest, fire, and range management have altered the structure and composition of landscapes, creating widespread fire deficits. The Columbia Mountains are a provincial hotspot for fire history research, with an extensive network of dendropyrochronological studies available to inform present-day management. In this presentation, we provide an overview of the last twenty-five years of regional fire history research, highlighting findings from studies across elevational and climatic gradients and forest types. Synthesizing these findings, we contextualize current wildfire activity, discuss ecosystem departures, and explore ecosystem-specific restoration activities to restore the role of fire as a process. The key takeaway is that the abundance of tree-ring fire history data collected over the past 25+ years across ecosystem types (PP, IDF, ICH, MS, ESSF) in the Columbia Mountains collectively indicate that the disruption of historical low- and mixed-severity fire regimes has degraded native ecosystems and increased wildfire risk.

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Biographical notes

Dr. Jen Baron is a Postdoctoral Researcher and an incoming Assistant Professor in Fire Ecology at the Centre for Wildfire Coexistence, University of British Columbia Okanagan. Her applied research program focuses on the landscape ecology of fire, wildfire and ecosystem management, and ecocultural restoration. Through her research she works to understand how the ongoing legacies of colonial land management and climate change have altered wildfire regimes and ecological dynamics, and how the strategic applications of treatments and management can restore resilience in fire-adapted communities, ecosystems, and landscapes.

11. Assessing post-fire vegetation recovery in the Beaver Valley, Glacier National Park (Harvey *et al.,*)

Presenter: Jillian Harvey, Thompson Rivers University, Canada Research Chair for Fire Ecology, jharvey@tru.ca

Co-Authors: Natalie Maslowski, Sarah McIntyre, Emma Lloyd, Max Rokosh, Geoff Fink, Thompson Rivers University

Recent wildfires in 2017, 2018 and 2023 have affected Beaver Valley, Glacier National Park. Since 2022 we have conducted research in Beaver Valley in partnership with Parks Canada to advance our understanding of post-fire effects on forest recovery. Here we provide an overview of three research projects: (1) the effects of reburns on fire regeneration in the Prairie Hills; (2) post-fire impacts on near surface temperature and humidity; and, (3) establishing a long-term monitoring network to assess post-fire plant recovery (integrating lidar and multispectral datasets). We hope the findings from these studies will provide insights on post-fire landscape recovery, with special considerations for wildfire effects on high-elevation forests.

Keywords: wildfire, fire management, reburns, forest recovery, vegetation dynamics

Introduction

Wildfires are key ecological disturbances that shape landscape diversity, influence vegetation composition and structure, and in some forest types, enhance resilience to future fire events (Stevens-Rumann and Morgan 2016; Turner *et al.* 2019; Buma *et al*. 2022; Hoecker and Turner 2022). Yet, decades of fire suppression combined with increasing aridity linked to climate change (Littell *et al.* 2009; Marlon *et al.* 2012; Stephens *et al*. 2014; Coogan *et al.* 2021; Ellis *et al*. 2021) have intensified wildfire activity and increased fire frequency (Wotton *et al.* 2017; Parisien *et al.* 2023). These shifts raise the likelihood of short-interval reburns—successive wildfires occurring within ~30 years—where fuel-based controls are overridden by extreme burning conditions (Parks *et al.* 2017; Whitman *et al*. 2019; Buma *et al.* 2022). For forests historically adapted to infrequent, high-severity fires, such as high-elevation coniferous systems, these accelerating trends in fire frequency and severity are pushing ecosystems beyond their historical disturbance regimes (Harvey *et al.* 2016; Turner *et al.* 2016; Hanes *et al.* 2019; Buma *et al.* 2022). While projections consistently forecast increases in fire size and frequency (Wotton *et al.* 2017; Whitman *et al*. 2019; Parisien *et al.* 2023), the consequences for post-fire forest regeneration remain uncertain (Coop *et al*. 2020; Weber *et al.* 2022).

The research projects described here examine the impacts of wildfire burn severity on post-fire regeneration, microclimatic conditions, and long-term ecosystem recovery in the Beaver Valley, Glacier National Park, BC. Together, the three projects provide a multi-scale understanding of how wildfire influences vegetation dynamics, soil conditions, and forest structure, while also integrating advanced monitoring technologies and supporting student-led research.

Project 1: The effects of reburns on fire regeneration in the Prairie Hills

Understanding the relationship between wildfire burn severity and post-fire regeneration is critical for predicting ecosystem recovery and for informing wildfire management practices. Burn severity not only influences the immediate impact of a fire but also determines the pace and trajectory of long-term forest recovery. At the Prairie Hills site in Beaver Valley, research has been directed toward examining how burn severity and repeated wildfires affect vegetation recovery. The study area was subject to fires in both 1992 and 2017, creating an opportunity to assess the effects of multiple burns within a 25-year period. Results indicate that higher burn severity is associated with delayed regeneration, particularly when fires reoccur in the same area within a short interval. In these cases, loss of seed sources, and soil organic matter appear to constrain the ability of both trees and understory vegetation to re-establish. These findings have direct implications for management, particularly in regions where rapid recovery of vegetation is necessary for maintaining ecosystem services, protecting watersheds, or sustaining wildlife habitat.

Project 2: Post-fire impacts on near surface temperature and humidity

Burn severity alters the microclimatic conditions critical for seedling establishment and survival. Project 2 investigates how soil-surface temperature and humidity are affected by fire severity, as well as how these conditions vary across slope, elevation, and ecological zones. Monitoring occurs throughout the growing season, capturing data relevant to seed germination and early growth processes. 56 sensors were deployed over summer 2025 at the Uto and 30 Mile wildfires in Beaver Valley. Preliminary findings suggest that high-severity burns increase soil exposure, resulting in elevated temperatures and reduced moisture availability. Such shifts may constrain regeneration in the years immediately following fire events. The project's broader objective is to identify thresholds of microclimatic stress beyond which natural regeneration is unlikely, thereby providing managers with information to target post-fire planting or assisted regeneration efforts.

Project 3: Establishing a long-term monitoring network to assess post-fire plant recovery (integrating lidar and multispectral datasets)

A complementary study is underway at the 30 Mile wildfire in Beaver Valley. Here, burn severity was quantified in the field (Composite Burn Index) at 86 plots in summer following the fire. In summer 2025, we visited 49 of these plots to establish a network of permanent plots to provide a long-term dataset on post-fire recovery. The objective is to monitor changes in vegetation composition, structure, and regeneration trajectories across gradients of burn severity. We completed the first set of vegetation recovery measurements in 2025 and plan to revisit the plots every three years to monitor longer-term recovery. Long-term data of this nature are uncommon but essential, as they provide robust insights into the persistence of burn severity effects and the capacity of forests to return to pre-fire conditions under changing climate regimes.

Monitoring post-fire recovery at landscape scales requires tools that extend beyond field sampling. To address this, lidar and multispectral imagery were collected over the 30 Mile wildfire site in summer 2025. Lidar provides high-resolution data on forest structure and canopy recovery, while multispectral imagery allows for the detection of vegetation health and species differences. This project seeks to integrate remote sensing products with ground-based plot data to test their effectiveness in monitoring recovery across spatial scales. The integration of these datasets has the potential to greatly enhance efficiency in tracking forest dynamics, enabling more frequent and spatially comprehensive assessments of post-fire regeneration for both research and management applications.

Student Research and Capacity Building

These projects are led primarily by graduate and undergraduate students from Thompson Rivers University (TRU), providing both training opportunities and capacity building in applied wildfire research. Two master's students are pursuing thesis research focused on Projects 1, and 2. At the undergraduate level, one honors thesis is centered on Project 3, focusing on the application of remote sensing to forest recovery monitoring. In addition, an undergraduate student funded through the Undergraduate Research Experience Award Program (UREAP) has contributed to Project 3. The integration of student-led research within these projects ensures not only the generation of new scientific knowledge but also the development of expertise among emerging wildfire scientists. The combination of field-based, laboratory, and remote sensing methods provides a comprehensive training environment, preparing students to address the increasingly complex challenges associated with wildfire management under climate change.

Summary

Collectively, these projects provide a multi-scale examination of how wildfires can shape forest ecosystems. From immediate impacts on soil temperature and moisture to long-term effects on vegetation recovery and landscape dynamics, the research contributes directly to understanding resilience and vulnerability in fire-affected ecosystems. Furthermore, the integration of advanced technologies such as lidar with traditional field approaches offers innovative pathways for monitoring recovery at scales relevant to both researchers and managers. By linking empirical findings with management applications, this research program strengthens the capacity of agencies and communities to anticipate post-fire outcomes, design effective interventions, and sustain ecological and cultural values in landscapes increasingly influenced by wildfire.

Acknowledgements

We would like to acknowledge the contributions of Kiera Macauley, Spencer Verdiel, Natalie Stafl, and Colin Bergeron to this research, and the support of Parks Canada to conduct research in Glacier National Park. We also acknowledge the support and services of Stinson Aerial in collecting lidar and multispectral data for this research.

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Biographical notes

Jillian Harvey is an Assistant Professor and Canada Research Chair in Fire Ecology at Thompson Rivers University, Kamloops, BC. Together with graduate and undergraduate students, Jillian conducts research on historical fire regimes, post-fire vegetation regeneration, and fuel treatment/fire behaviour dynamics.

12. 30 years of whitebark pine conservation in the Canadian Rockies and Columbia mountains (Wilson, Leslie and Stafl *et al.,*)

Presenters: Brendan Wilson, Selkirk College School of Environment and Geomatics bwilson@Selkirk.ca; Adrian Leslie, Nature Conservancy of Canada, adrian.leslie@natureconservancy.ca; and Natalie Stafl, Parks Canada, natalie.Stafl@pc.gc.ca

Co-Authors: Randy Moody, Whitebark Pine Foundation of Canada; Michael Murray, BC Ministry of Forests

This talk reflected on 3 decades of whitebark pine research and restoration that has taken place in southwestern Canada. We explored the beginnings of the work in the Rocky Mountain National Parks and the southern interior mountains of BC and highlighted the current and future conservation efforts being made by different organizations.

Whitebark pine (*Pinus albicaulis*) is a keystone subalpine species facing significant threats across its range in western Canada. Over the past three decades, a collaborative network of researchers, conservationists, and government agencies has advanced the understanding and recovery of this endangered tree. This presentation reviewed the evolution of whitebark pine conservation efforts in the Canadian Rockies and Columbia Mountains, highlighting milestones, innovations, and future directions.

Early work in the 1990s laid the foundation for long-term monitoring and restoration, including prescribed burn protocols and forest health plots. The species was officially listed as endangered in 2012, with a proposed recovery strategy emerging in 2017. Since 2000, extensive monitoring plots have tracked forest health and blister rust infection rates.

A major focus has been on **blister rust resistance screening**, with nearly 300 parent trees tested and approximately 10% showing high resistance. This work underpins seed selection and propagation strategies. Restoration efforts have scaled up significantly, with over 100,000 seedlings planted in 2025 alone, supported by cone collection from healthy trees and drone-assisted identification.

The **Conservation Standards Working Group**, active since 2018, has helped unify best practices across jurisdictions. Technological advances have enabled novel applications such as species distribution modeling, climate niche mapping, and UAV-based multispectral imaging for cone and tree identification.

Recent efforts emphasize **restoration mapping and planning**, integrating spatial data to prioritize planting in post-fire landscapes. New work modelling drone multispectral and LIDAR data can now individually identify trees and their maturing cones in subalpine forest stands. The talk concluded with a call for continued collaboration, innovation, and

long-term commitment to ensure the resilience of whitebark pine ecosystems in a changing climate.

Biographical notes

Brendan Wilson is an instructor and research scientist in Selkirk College's School of Environment & Geomatics and Selkirk Innovates, where he has taught since 2001. Over the past 20 years Brendan and his students have worked on whitebark pine conservation, species at risk assessment, white pine blister rust monitoring, species distribution modelling, prescribed fire and forest fuel treatment work, and remotely sensed imagery to aid with these projects. Brendan sits on the CMI Board of Directors, and served as President for many years.

Natalie Stafl is an Ecologist with Parks Canada based here in Revelstoke and has been working with whitebark pine and forest health for over a decade.

Adrian Leslie is the South Selkirk Program Manager for the Nature Conservancy of Canada and has been working in the Columbia Basin on ecosystem conservation, restoration and research for over 10 years. He is a Registered Professional Biologist with experience working in both terrestrial and aquatic ecosystems from low elevation floodplains to high elevation forests throughout the Columbia Basin.

13. Pining for change: the effects of fire and fire surrogates on whitebark pine in Glacier National Park, BC (Greenberg et al.,)

Presenter: Jeremy Greenberg, University of British Columbia, Parks Canada, Jeremy.greenberg@pc.gc.ca

Co-Authors: Lori Daniels, University of British Columbia; Natalie Stafl, Parks Canada

Whitebark pine (*Pinus albicaulis*) is a high-elevation keystone species in western North America, currently endangered due to white pine blister rust (*Cronartium ribicola*), mountain pine beetle (*Dendroctonus ponderosae*), and altered fire regimes. While the species is fire-intolerant, low- to moderate-severity fire can reduce competition and promote regeneration, making fire and fire surrogates important tools in restoration efforts.

This study evaluates the effectiveness of four treatment strategies - thinning, prescribed fire, a combination of thinning and prescribed fire, and wildfire - compared to untreated controls in the Bald Hills of Glacier National Park, BC. Field data were collected three years post-prescribed fire and five years post-thinning and wildfire. The research focuses on treatment impacts on mature tree dynamics, regeneration density, and factors influencing regeneration success.

Mortality of mature whitebark pine was high across all treatment types. Burned treatments showed the highest mortality. Fire effects were most severe the wildfire treatment, followed by prescribed fire and thinning x prescribed fire, respectively. Density of whitebark pine regeneration was higher in unburned treatments than in burned treatments. Regeneration density was positively influenced by shrub and regeneration cover and negatively influenced by herb and fern cover.

These outcomes suggest that to achieve the best outcomes, mixed-severity prescribed burns should be limited to areas with dense overstory and few mature whitebark pines. Thinning to reduce surface fuels can help lower fire severity, and treating fire-injured trees with anti–pine beetle pheromones can decrease the risk of infestation. Reassessing monitoring plots every five years is recommended to evaluate long-term effects on survival, growth, and regeneration.

Biographical notes

Jeremy Greenberg recently completed his Master of Science in Forestry at the University of British Columbia. He has worked with Parks Canada for the past eight years, focusing on whitebark pine conservation in Mount Revelstoke and Glacier National Parks. Since 2023, he has also served on the board of the Whitebark Pine Ecosystem Foundation of Canada.

14. The severity of ill effects model and other tools used to assess the impacts of dredged sediment release on fish and fish habitat (Shearing)

Presenter: Giles Shearing, Shearing Consultants Ltd., BC Hydro, giles@shearing.ca

The accumulation of sediment in waterways presents a unique challenge for many infrastructure owners and natural resource professionals, on how best to manage the relocation of removed sediment. During the Spring 2025 freshet, BC Hydro undertook a trial sediment release at Wilsey Dam on the Middle Shuswap River to remove forebay sediment to inform how the river would respond to a large-scale sediment input (30,000 cubic meters). The project goal was to inform whether to decommission the dam or refurbish the aging facility, either option leading to anadromous fish passage. To monitor impacts on fish during dredging, a primary tool was a digital portal created to monitor cumulative real time changes to the Severity of Ill Effects model (Newcombe and Jensen 1996) based on background and introduced turbidity compared with a linear regression comparing turbidity and total suspended solids. This presentation included a summary of the regulatory process, the use of the SEV model, and an overview of other environmental assessment tools deployed.

Background information

Background video on sediment management challenges at Wilsey Dam: **Wilsey Dam**

Wilsey Dam at Shuswap Falls near Lumby became operational in 1929. Almost 100 years later, the existing hydroelectric project is nearing its end of life. BC Hydro is deciding whether to refurbish the dam with a fish ladder or decommission the dam and restore the river to its natural state. Either option would see the repatriation of anadromous salmon above the dam project site.

Should dam decommissioning proceed, approximately 400,000 cubic meters (m^3) of a total of 1 million m^3 of sediment aggraded upstream of the dam in the headpond and backwater channel will need to be managed.

In Spring 2025, a Trial Sediment Release (TSR) was undertaken to better understand how a large sediment release to the downstream receiving environment would impact river morphology and terrestrial and aquatic ecological

niches used by fish, avian and terrestrial species. Planning for the TSR started in late 2023 and involved a Regulatory Working Group (RWG) made up of Splatsin, Okanagan Nation Alliance, Okanagan Indian Band, federal Fisheries and Oceans Canada, the provincial Comptroller of Water Right's office, the provincial Ministry of Water, Land and Resource Stewardship, BC Hydro and several other guest contributors. Collectively, the RWG provided advice on BC Hydro's work plans and ultimately approval of the approach.

To explore options for sediment management, a trial sediment release of 30,000 m^3 of predominantly fine sand occurred from May to June 2025 over 25 dredge days. This was the largest downstream release of sediment at the generation station since the early 1970s. The dredge method used was a large suction pump capable of dredging up to 300 m^3 / hour suspended from a crane on a sectional barge in the dam headpond.

Figure 1. The accumulation of sediment in the Wilsey Dam headpond, highlighting the scale of the sediment to manage.

The trial sediment release leveraged high river flows to flush sand downstream during Spring freshet. Modeling for an initial target of 60,000 m³ predicted up to 10 cm bed rise in the first 3 km, with negligible effects over the next 18 km. A key requirement was adhering to guidelines to avoid fish mortality.

The approach for releasing just over 30,000 cubic meters of sediment below the dam was to measure impacts to fish using the Severity of Ill Effects (SEV) model, prepared by Ecofish Research, based on the findings of Newcombe and Jensen (1996). BC Water Quality Guidelines for turbidity and total suspended solids (TSS) were too stringent and did not accurately measure the unique attributes of the Middle Shuswap River when assessing impacts on fish. Instead, the SEV approach was used.

The SEV formula is: $z = a + b(\log_e x) + c(\log_e y)$, where z is SEV score, x is exposure to sediment duration (hours), y is sediment concentration (mg/L), and a, b, c are coefficients. x and y = the dose rate.

To develop the dose rate, the relationship between turbidity and total suspended solids needed to be known for a wide range of river turbidity levels. Inputs into the model included historical NTU data (2015-2018), the TSS-NTU relationship from 2017-2025 samples, and flow discharge. The dose used in the model combines both natural upstream and project sediment loads. The project targeted SEV ≤9 over a 30-day average to avoid severe effects like high mortality. SEV scores range from 0 (no effects) to 14 (catastrophic, 80-100% mortality). The actual project achieved SEV <7.6 at the compliance point approximately 800 m downstream of the dam and spillway (i.e., the sediment discharge location).

Figure 2. Active dredging in Spring 2025 at Wilsey Dam

The project employed advanced monitoring: seven telemetry stations with turbidity and temperature updating every 5 minutes (i.e., to an online portal that would convert turbidity to total suspended solids and track SEV score in real time), bathymetric multibeam mapping at the river confluence with the lake, aerial and bathymetric surveys of holding pools and redd density, thermal refugia mapping to identify zones of upwelling and downwelling, and fluvial geomorphological studies: Acoustic Doppler Current Profiler for river shape changes, bedload sampling for grain size distribution, and a seismometer trial for detecting sediment movement via seismic waves correlated with discharge.

The technical team for this project included those shown in Figure 3.

Figure 3. technical team for Wilsey Trial Sediment Release.

Future options for Wilsey Dam will be either dam decommissioning or refurbishment with a fish ladder. To inform dam decommissioning, the preferred alternative, benchmarking draws from U.S. projects like Elwha and Klamath, where large sediment volumes were managed. The ultimate goal is restoring salmon spawning habitat above the dam.

Figure 4. An aerial view of salmon redds in Deer Pool below the dam, representing the desired outcome for habitat restoration above Wilsey Dam.

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Biographical notes

Mr. Shearing is a biologist and project management consultant based in Revelstoke BC. For the past 22 years he has studied the interface of civil construction and the environment, with a focus on sediment transport dynamics around dams, and the implications of sediment management on the aquatic environment. Mr. Shearing holds a BSc. From Royal Roads in Environmental Management and a MSc. from UBC in environmental science.

15. Enhancements and monitoring of Western Painted Turtle nesting sites in Revelstoke (Harding)

Presenter: John Harding, Turtle Conservation Revelstoke, johncsharding@gmail.com

Background information

Western Painted Turtles (Chrysemys picta bellii) in the Revelstoke area are blue-listed provincially and federally recognized as a species of Special Concern. Among the challenges facing this sub-population, located near the northern edge of its range are habitat loss, nest predation, and road-related mortality. Turtle Conservation Revelstoke (TCR) is a community partnership formed in 2023 to develop and implement comprehensive strategies to protect and conserve Revelstoke's Western Painted Turtle (WPT) population. Revelstoke's WPT population forages and overwinters in well-established areas of the Upper Arrow Lakes wetlands with the Airport Marsh being the most populated habitat. Nesting appears to be concentrated in four sites, with Red Devil Hill (RDH) being the most prolific.

Red Devil Hill monitoring

While the RDH nest site had been maintained intermittently in the last 2 decades, it had been largely neglected in recent years. The site's location on the shoulder of a major roadway increases the risk of road mortality for gravid females seeking alternative upland nesting locations. Our goal was to establish a monitoring program to characterize nesting activity at the RDH site, estimate nest emergence, better understand predation, and take efforts to reduce road mortality. Beginning 2023, the location and activity of adult turtles around RDH have been recorded each evening (8-9 pm) from mid-May to early July by community volunteers. Beginning 2024, the traditional nesting zones were enhanced by removing the encroaching vegetation (grasses, clover, horsetail, fern, etc) after hatchling emergence and prior to new nesting.

Temporary silt fences were installed above and below the concrete shoulder barriers to deter turtles from crossing the road. Wildlife cameras were situated at key locations on the nest site to capture time lapse images (5 min intervals, 24h) to assess nest predation. In 2023 and 2024, nesting began in mid-May and unfolded in two distinct waves separated by a roughly 7-10 day period of relative inactivity with total duration 41 and 44 days, respectively. In these two years, 143

and 204 turtles were observed during evening counts, with 81% and 94% observed on the nesting site compared to seeking alternative sites. Of turtles on the RDH nesting site, 58% were observed to be excavating or nesting, and the remaining stationary or transiting. Nesting activity was concentrated in two discrete zones with greatest sun exposure. Based on the evaluation of >8,000 wildlife camera images from a 28-day period of nesting in 2024, occasional turtles were observed on-site starting 11:00 but the most active period of nesting activity was between 16:00 and 23:00. Of the nests completed during daylight when cameras were operational (n=56), the time to completion was 150 minutes (range 70-315). Ravens were the only predator observed. They arrived early morning singly, in a pair, or more rarely in trio and were frequently observed digging up nests with their bills between 04:15 and 08:25, and sporadically later in the day. Of 73 nests, 56 were predated (76.7%), 85% of these within 12 hours of being laid. Twenty-one emergent nest holes were counted in April 2025 but no hatchlings were observed. Similar monitoring was undertaken in 2025 (results pending) and additional wildlife cameras installed to help obtain more accurate estimates of predation that may lead to the development of mitigation strategies.

Nest site development

In keeping with our mission to help sustain WPT populations, TCR aims to expand and develop new sites in suitable locations. A historic site was identified based on testimonials from local residents and biologists. Upon first inspection in fall 2023, it was found to be largely overgrown by scrubby poplar trees and thimble berries but several small depressions in rocky aggregate, consistent with abandoned nests, were evidence of nesting attempts. In 2024, a new 12’ x 120’ (4 m x 40 m) nesting site was built immediately adjacent to this historic site. Our goal was to re-establish nesting at the site, monitor nesting behaviour and subsequent hatchling emergence.

The site was cleared of scrub trees/bushes in the fall 2023 and a site plan developed. Construction began in early May 2024 with the removal of the remaining trees, roots and 30 cm (12”) of soil while preserving the historic nesting site. The perimeter of the new site was lined with sheet metal to a depth of 30 cm. This, and the base of the site, were lined with landscape fabric to prevent weed encroachment, then ~60 yards of winter road sand were delivered followed by backfilling and final grading. Construction was substantially completed by May 18th and the first turtle tracks were observed on the new site May 20th.

Five wildlife cameras were installed in early June to record nesting behaviour and locate potential nests. A TCR volunteer visited the site daily from mid-May to early July to record the types and locations of turtle nesting digs and later corroborated those with turtle behaviour observed on camera images. Turtles were active in the nesting area from ~16:00 and some remained active after dark (~22:00) when observation was no longer possible using the wildlife cameras. Fresh turtle digs were observed on or adjacent to the site on 31 of 37 days from May 29 to July 5, 2024. Roughly 27% of all turtle digs were identified within the confines of the newly constructed nesting site, 68% occurred in the rocky-muddy region adjacent to the new nesting site, and 5% at more distant locations. Turtle digs were categorized as crescents, excavations, abandoned nests or completed nests based on their appearance and the turtle behaviour captured on camera images. Completed nests were dug in 80-157 minutes whereas crescents and excavations required substantially less time. For every completed nest, 6.7 crescents, excavations and abandoned nests were observed indicative of numerous failed nesting attempts. In total, 177 turtle digs were recorded during this first nesting season including 8 completed nests that were protected with screened nest boxes. Fourteen nests were predated by ravens just after sunrise the following day before they could be protected. Eleven emergent nest holes were counted in April 2025.

During the 2025 nesting season, 29 nests were protected and none were predated. On September 21, 2025, two nests appeared to have emerged and one hatchling was found walking on the nesting aggregate in the direction of the marsh. This is the first evidence of fall hatchling emergence on the site. In summary, the new nest site constructed with community donations and volunteers in 9 days has exceeded expectations. Future efforts will focus on understanding nesting behaviour, patterns of usage and predation, and hatchling emergence.

Biographical notes

John is a resident of Revelstoke living adjacent to the Airport Marsh. His professional background is in veterinary medicine and he is currently a semi-retired swine medicine professor at the Western College of Veterinary Medicine, University of Saskatchewan who works remotely from Revelstoke. He is a founding member of Turtle Conservation Revelstoke (TCR) and volunteers his time coordinating TCR's Western Painted Turtle field work in Revelstoke including the monitoring of nesting sites. This work is supported by his interest and expertise in veterinary medicine, reproductive biology, animal welfare and data analyses.

16. Logyard ambrosia, bark beetle and wood boring beetle management (Jeans-Williams)

Presenter: Nicole Jeans-Williams MPM, RPBio, Sole Proprietor ForHealth Consulting and Scientific Advisor Synergy Semiochemicals Corp, jeanswilliamsn@gmail.com

This talk shared insights into the logyard pest management program currently in place at Downie Timber's operation in Revelstoke. This program has drawn some public interest and questions, particularly due to the visibility of several traps located near the Illecillewaet Greenbelt pathway, which runs adjacent to Downie's log storage facility.

Background information

Logyard Pest Management Program Overview

Woodboring insects cause substantial losses to post harvest inventory every year for B.C.'s forest industry. Attacks may occur on landings in forested areas or in log storage facilities where logs may sit from weeks to months prior to milling. Adults and larvae may mine in the sapwood and heartwood of dying, dead, and felled timber, producing 'pin' or 'grub' holes and cause degradation in wood and wood products. Successful woodborer management programs typically involve the use of semiochemical-baited traps and visual inspections of stored inventory in the logyards. Information provided allows for site-specific management recommendations to minimize impact. Some of these pest management programs have been in place since the 1990s. Bark beetles such as the Douglas-fir beetle may also be trapped to reduce the spread and potential impact of beetles flying from stored infested material following sanitation harvesting operations.

Semiochemicals and Woodborer Management

Semiochemicals are natural chemical signals that insects and other organisms use to communicate. They include pheromones, which are exchanged within a species for purposes such as mating, aggregation, and dispersal. Allelochemicals are exchanged between species, such as host plant odors that attract insects or defensive compounds that repel them. These chemicals can be manufactured into lures that hang from insect trapping devices. In woodborer management, the most important semiochemicals include aggregation pheromones and host volatiles

such as ethanol and alpha-pinene, which mimic the natural cues these insects use to find suitable host trees.

Primary Uses of Semiochemicals in Woodborer Management

Multiple funnel traps baited with semiochemicals may be used for monitoring insect populations and flight timing, mass trapping to reduce beetle pressure, early detection of invasive or outbreak species, and research on insect ecology and behavior.

Key Woodboring Species

There are a few important insect groups that play a key role as woodboring species in BC. These include ambrosia beetles, cerambycids and buprestids and siricid wasps. They differ in their appearance and life history as well as their attractive semiochemicals.

Ambrosia Beetles

Trypodendron lineatum, the striped ambrosia beetle, is the most damaging ambrosia beetle in BC logyards. It overwinters in the duff along yard edges and prefers winter-felled logs, especially spruce and fir. It bores into the sapwood, introduces staining fungi, and creates 'pin holes' that downgrade lumber. Gnathotrichus spp., including spring and summer gnathos, bore deeper than Trypodendron, causing further degradation. Both of these species overwinter in wood; old inventory, pulp and debris may increase beetle risk.

Cerambycids (Roundheaded Wood Borers)

Monochamus spp., or sawyer beetles, are the most economically important large woodborers in BC. Their larvae may tunnel into the heartwood, producing piles of fibrous frass. Logs develop deep grub holes, reducing lumber grade. They are also an export concern as they are a potential vector of the pinewood nematode. These beetles are active from June to September and attack pine, Douglas-fir, spruce, and true firs. Development usually takes 1–2 years. Xylotrechus spp., or zebra beetles, bore into sapwood and heartwood and tightly pack galleries with frass, making damage hard to detect until milling. Their hosts include spruce, pine, and Douglas-fir. Other species of importance include Asemum and Rhagium.

Buprestids (Flatheaded Wood Borers)

Species such as Buprestis aurulenta (golden buprestid), Dicerca, and Chalcophora bore winding tunnels in the sapwood and heartwood. These tunnels are difficult to detect prior to milling. These beetles typically have longer life cycles and some species persist in dry lumber, damaging finished products.

Observations of Woodborer-Driven Tree Mortality in Western North America

Woodboring beetles typically infest downed, dead, or dying trees and are not usually considered primary agents of tree mortality in western North American forests. However, recent reports have documented unusual patterns of woodborer-induced tree death across regions including southern British Columbia, Idaho, Montana, Washington, Utah, Wyoming, and California. These events have primarily affected mature Douglas-fir, as well as lodgepole pine, ponderosa pine, and western larch, with mortality clusters often appearing at lower elevations near roads, riverbanks, and forest openings. Affected trees exhibit rapid crown discoloration—turning from green to red and then grey within weeks during early spring. Detection is often aided by observing woodpecker activity, as they strip bark to feed on large woodborer larvae. Contributing factors are believed to include the 2021 heat dome, prolonged drought conditions, elevated woodborer populations following wildfires, and bark beetle outbreaks. Surveys are underway to map the extent of the damage and identify the specific insect species responsible.

Conclusion

Semiochemicals can play an important role in the management of woodboring insects by enabling effective monitoring, early detection, and population control. Their integration into logyard management programs helps mitigate economic losses and supports sustainable forestry practices. For more information on these programs please feel free to contact me.

Recent Operational Research Activities at Synergy Semiochemicals Corp.

Recent research activities at Synergy Semiochemicals Corp. relevant to the Columbia Mountain area include evaluating potential improvements to trap design to enhance catches of specific target insects; optimization of a pheromone blend lure for detecting invasive woodborers at ports of entry, and studies on the field

longevity of Synergy Shield MCH (methylcyclohexenone) bubblecap that may be used as a deterrent for Douglas-fir beetle.

To learn more, go to www.semiochemical.com.

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Special thanks to Downie Timber Ltd., whose ongoing logyard pest management program served as the foundation for this presentation. Most of the images were taken on-site.

Biographical

Nicole has operated as a forest health consultant in south central British Columbia for the past 25 years. She brings years of field experience using semiochemicals to manage and monitor bark and wood boring beetle populations in the field. Her clients have included government agencies, forest companies, small landowners and community associations. Nicole earned her Master of Pest Management degree under the supervision of Dr. John Borden at Simon Fraser University, with a focus on developing semiochemical tactics to contain and concentrate the western balsam bark beetle

17. Looking at the big picture: Impacts of landscape development disturbances inside and outside of protected areas on large mammals (Smith *et al.,*)

Presenter: Rebecca Smith, University of Victoria, Parks Canada, rebeccasmith@uvic.ca

Co-Authors: Jason T. Fisher, University of Victoria fisherj@uvic.ca; Nancy Shackelford, University of Victoria nshack@uvic.ca; Andrew Barnas, University of Victoria abarnas@uvic.ca

Protected areas (PAs) are one of the key approaches to conserve wildlife amid prolific landscape alteration and serve particular importance to wide-ranging species. However, many species still face declines within PA boundaries, so the effectiveness of PAs in safeguarding wildlife populations often remains unclear. Since PAs are intrinsically linked to the wider surrounding landscapes, anthropogenic pressures outside of PAs can be sources of direct and indirect mortality, or avoidance, for mammals using habitat that spans boundaries. We examined the influences of landscape development disturbances inside and outside of PAs on the occurrence of large mammal species inside of PAs. Species occurrences were sampled using camera traps across Canada's Mountain National Parks and used generalized linear mixed models to relate these occurrences to distinct anthropogenic development disturbances inside and outside of the PA boundaries. Nine of the ten species occurrences analyzed were found to be best predicted by both inside- and outside-PA development, demonstrating that PAs may not offer the full protection they are mandated to conserve – especially for large mobile mammals. These nine species also occurred more frequently in interior regions of the parks, as distance to outside-PA boundaries and associated pressures increased. Thus, to ensure wildlife conservation benefits are maximized moving forward, we suggest that PAs be considered within the context of the wider ecosystem and surrounding unprotected landscapes.

Reference

Smith, R. M. 2024. *Chapter 2: Looking at the big picture: The relative impacts of landscape development disturbances inside and outside of protected areas on large mammals*, In: Evaluating the impacts of anthropogenic development on large mammals across protected and industrialized landscapes in Western Canada. MSc thesis, University of Victoria. Access thesis here.

Biographical notes

Rebecca Smith Rebecca (Becca) Smith has worked in wildlife conservation in British Columbia, Alberta, and Ontario since 2017, with a focus on large mammal monitoring, Species at Risk recovery, and landscape ecology in boreal and mountain ecosystems. In 2024, she completed her master's degree at the University of Victoria where she used camera traps to study the functionality of protected areas in supporting mammalian biodiversity, as well as the impacts of oil extraction in western Canadian landscapes. Becca now works for Parks Canada in Revelstoke as a Species at Risk Coordinator.

18. Bottoms up! How Kootenay Connect's network of ecological corridors links on-the-ground solutions to policy and decision-making (Mahr and Proctor)

Presenter: Marcy Mahr, Kootenay Connect and Kootenay Conservation Program
kootenayconnectivitygroup@gmail.com

Co-Author: Michael Proctor, Kootenay Connect, Transborder Grizzly Bear Project mproctor@netidea.com

Website: https://kootenayconservation.ca/kootenay-connect-priority-places/

Kootenay Connect is part of the global biodiversity conservation movement helping to sustain nature's resiliency through conserving wildlife corridors and ecological connectivity in the Kootenay region of southeastern British Columbia. In identifying a regional network of 12 Ecological Corridors, Kootenay Connect has provided a science-based framework to guide both on-the-ground habitat conservation and restoration projects and inspire discussions for how to formally recognize ecological corridors through provincial land use planning and policy. A key component of this initiative is Kootenay Connect Priority Places led by Kootenay Conservation Program that coordinates diverse partners to implement over 60 projects in seven of the ecological corridors to benefit the region's biodiversity and increase landscape resiliency to climate change.

Kootenay Connect is linking these on-the-ground projects to land use planning, management and policy via the Kootenay Connectivity Working Group comprised of BC Ministry of Water, Land and Resource Stewardship, BC Parks, Parks Canada, Ktunaxa Nation Council, ʔakisq̓nuk First Nation and Nature Conservancy of Canada. This group's efforts provide a useful case study for integrating collaboratively developed management guidelines into planning and policy for ecological connectivity across multiple jurisdictions for multiple wildlife species in the Columbia Lake area connecting the Rocky and Purcell mountains. The Columbia Lake Corridor is within one of Canada's nationally recognized priority ecological corridors, and the goal of the Kootenay Connectivity Working Group is to have this corridor be one of the first formally recognized "Priority Ecological Corridors" by BC's provincial government.

Resources

Kootenay Connect Corridors information, maps & videos:
https://kootenayconservation.ca/kootenay-connect-priority-places/

Movements of "Drone Bear": https://www.youtube.com/watch?v=DpguT-R760w

2023 Summary Report: *Kootenay Connect: Riparian Wildlife Corridors for Climate Change*

KCP & CMI 2024 webinar series season #8: “Wildlife Corridors and Ecological Connectivity”: https://kootenayconservation.ca/winter-webinar-series-recordings/

Kootenay conservation project aims to connect habitat for species at risk: https://thenarwhal.ca/species-at-risk-b-c-kootenays-wildlife-corridors-canada-nature-fund/

National Program for Ecological Corridors: https://parks.canada.ca/nature/science/conservation/corridors-ecologiques-ecological-corridors

IUCN Guidelines for conserving connectivity through ecological networks and corridors: https://portals.iucn.org/library/sites/library/files/documents/PAG-030-En.pdf

Biographical notes

Marcy Mahr is co-founder of Kootenay Connect, an initiative with an inspiring vision of a regional network of wildlife corridors in the Kootenay region. Marcy has a M.Sc. in Plant Ecology and early in her career her love of plants and curiosity about their diversity led her to blend field work with mapping habitat distribution and predicting wildlife corridors. For over 30 years, Marcy has championed corridor conservation in many of North America’s iconic landscapes including Yellowstone to Yukon by identifying priority areas, applying cutting-edge science, building collaborative partnerships, coordinating knowledge exchange, and influencing private and public land management to conserve biological diversity and the ecological processes that species depend upon.

Marcy wears many hats, one of which is as a director with CMI.

19. 30 years after a West Slopes Bear Study beginning, a recovered South Selkirk grizzly population & more (Proctor)

Presenter: Michael Proctor, Transborder Grizzly Bear Project, Kootenay Connect, mproctor@netidea.com

This talk was a brief, high-level summary of 30 years of research and conservation management of grizzly bears in the Canada-US Trans-border region focussing on the Purcell and South Selkirk ranges within the Southern Columbia Mountains. I summarized:

- A Wildlife Monograph about population level fragmentation showing the isolated status of the South Selkirk population (Proctor et al. 2012)
- A paper using GPS telemetry data to identify high quality grizzly bear habitat and corridors across human-settled valleys with major highways (Proctor et al. 2015)
- Two papers detailing the conservation management we applied to recover the previously small isolated threatened South Selkirk population (Proctor et al. 2018, 2025)
- A Wildlife Monograph (Proctor et al. 2023) where we used GPS telemetry locations to identify huckleberry patches important to grizzly bears. We tested that bottom-up food model against the top-down influence of mortality risk (in the form of open roads) for female habitat selection, both-sex density and female fitness (spatialized reproductive success). A key result was that otherwise productive huckleberry patches within 500m of an open forestry road made little to no contribution towards bear density.

In cooperation with several partners we implemented conservation management including:

- strategic land purchases (Nature Conservancy Canada, NCC)
- non-lethal conflict response to appropriate bears (BC Conservation Officer Service)
- a cost-share electric fencing program (Grizzly Coexistence Solutions)
- access management on NCC's Darkwoods lands.

Using the results of a population-wide DNA-based population survey in 2020-2021, we assessed recovery targets developed after a similar baseline survey in 2005 (MacHutchon and Proctor 2017). The management actions revealed all the biological recovery targets being met, the most important of which was to reconnect the south Selkirk bears with those in the South Purcell's across the

Creston Valley. In the period of time after we started management, we identified 9 immigrants who bred 27 offspring.

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Biographical notes

Michael Proctor is a conservation-focused research scientist who uses science to understand and inform conservation problems and solutions related to bears and large carnivores, and ecological connectivity. He has focused on small isolated threatened populations requiring higher conservation attention, including population recovery, population fragmentation and connectivity. Michael spent his 25+ year career integrating and implementing conservation solutions to real world conservation problems including managing people as well as bears.

20. Evening Plenary: Giving interior BC a voice - Stories from the early days of the CMIAE (Woods)

Presenter: Dr. John Woods, National Parks Scientist (retired), woodsj@telus.net

Dr. John Woods is one of CMI's co-founders. John's talk traced the CMIAE's beginnings, from its informal start in 1993 to becoming a non-profit society in 1996 based in Revelstoke, BC. Open to anyone interested in ecological research in the BC Interior, the Institute has long provided a platform for researchers to share projects, develop skills, and build connections. The presentation included early photographs of fieldwork with Dr. Bruce McLellan and others, illustrating the hands-on, collaborative spirit that shaped the CMIAE in its formative years.

John also highlighted how the Institute helped launch cooperative projects such as the pioneering use of DNA to monitor bear populations. A major mid-winter workshop on this work drew researchers from across Canada and internationally, demonstrating that high-quality scientific events could be successfully hosted in a small-town setting using local hotels and community venues.

John's dream for CMI was to foster a vibrant interdisciplinary community of ecology professionals for interior BC – when looking at the registration for the Researchers' Forum this year, he shared triumphantly that the goal has been achieved.

Biographical notes

John was born in Winnipeg and raised in Toronto, where early bird-watching and canoe trips on the Canadian Shield sparked his love of nature. In high school he worked in biology-related summer jobs, including four seasons as a park naturalist with Ontario Parks and a summer studying bats for the Royal Ontario Museum. After earning his Honours B.Sc. in Biology from the University of Guelph in 1972, he became the first full-time biologist for Thousand Islands National Park, and in 1975 he and his wife Marcia moved to Revelstoke, where he served as Chief Park Naturalist for Mount Revelstoke and Glacier national parks.

In 1985, John pursued his Ph.D. at UBC studying elk movement in the Rockies, later returning to Revelstoke. By the early 1990s he was park wildlife biologist and collaborated with Dr. Bruce McLellan on groundbreaking research on black and grizzly bear populations, and together they helped found the Columbia Mountains Institute of Applied Ecology. Into the 2000s he continued with Parks Canada,

leading national resource analyses, including evaluating the South Okanagan for a potential new national park.

After 32 years with Parks Canada, John and Marcia worked in Thailand on a resource analysis for Koh Chang National Marine Park. In retirement, he taught Field Ornithology at UBC Okanagan, co-led an annual CMI ornithology course, and remains active in the Shuswap Naturalist Club. Now living in Salmon Arm, he enjoys time with his grandchildren and writes the “Nature Watch” column for the Salmon Arm Observer.

21. Evening Plenary: The Flathead grizzly bear study: Stories from the first forty years (McLellan)

Presenter: Dr. Bruce McLellan, IUCN Bear Specialist Group, brucenmclellan@gmail.com

Dr. Bruce McLellan's talk offered an engaging look into the early days of his grizzly bear research, blending adventurous fieldwork stories with lessons learned from decades in the wilderness. Drawing on his long career studying bears through radio telemetry and DNA research across the Flathead Valley and much of southwestern BC, he described the realities of conducting science in remote terrain—from long days tracking collared bears to the unpredictable encounters that shaped his understanding of large carnivores.

Amid the stories, Bruce emphasized the vital role of high-quality data in fostering coexistence between people and bears. He highlighted how rigorous research underpins effective land-use decisions, access and recreation management, and public education initiatives, including early efforts that helped lead to today's WildSafe BC program. His experiences demonstrated how science-based understanding is essential for reducing conflict and guiding responsible stewardship.

Bruce also reflected on the personal side of his career, sharing glimpses from his book Grizzly Bear Science and the Art of a Wilderness Life, which recounts raising his children, Michelle and Charlie, in a remote research camp—both of whom later became grizzly bear ecologists themselves. His talk captured a lifetime of discovery, community collaboration, and commitment to ensuring that humans and large carnivores can thrive together.

Biographical notes

Dr. Bruce McLellan is a co-founder of CMI and a retired Wildlife Research Ecologist who, since 1978, has done radio telemetry and DNA based field research on grizzly bears in several areas of BC including the Flathead Valley of Southeastern BC, and since 2007 he also worked in the coastal mountains across most of Southwestern BC. He has authored dozens of science journal papers on grizzly bears and caribou. Over the decades he has been involved with many land-use, access management, and recreation management processes and, with others, initiated the Bear Awareness Society in the 1990s that now evolved into Wildsafe BC.

Bruce has been President of the International Association for Bear Research and Management, then co-chaired the IUCN Bear Specialist Group for 15 years. In his retirement he wrote the book “Grizzly Bear Science and the Art of a Wilderness Life” that summarizes his 45 year study of grizzly bears in the Flathead Valley. The book covers what was learned about bears as well as a few stories of what life was like for Bruce and Celine as they had babies (well, Celine did) and raised them in a remote camp. Eventually, both babies (Michelle and Charlie) grew into adults and eventually each earned graduate degrees studying grizzly bear ecology.

22. Aquatic Invasive Species on the move: mussels, milfoil and more (Booth and Novotny *et al.,*)

Presenter: Brittany Eliadis, East Kootenay Invasive Species Council.
brittany@ekisc.com

Co-Authors: Megan Macphee, East Kootenay Invasive Species Council, Jess Booth and Nolan Novotny, Columbia Shuswap Invasive Species Society;

View poster here.

This poster was developed collaboratively by the Columbia Shuswap Invasive Species Society (CSISS), the East Kootenay Invasive Species Council (EKISC), and the Central Kootenay Invasive Species Society (CKISS) for the Columbia Mountains Institute 30th Anniversary Forum. The exhibit aimed to raise awareness of the threats posed by aquatic invasive species (AIS) and to highlight regional collaboration in preventing their spread.

The poster introduced aquatic invasive species as “animals, plants, or pathogens living in a waterbody outside of their natural range. Without natural predators to keep them in check, they can quickly take over and disrupt ecosystems.”
It emphasized the widespread impacts of AIS, including:

- Altering food webs and nutrient availability
- Reducing habitat quality and biodiversity
- Harming commercial, recreational, and First Nations fisheries
- Damaging infrastructure such as water intakes, hydro stations, and docks
- Limiting safe recreation in lakes and rivers

The poster noted, “Invasive species are the second greatest threat to biodiversity after habitat loss. They are a global problem, a Canadian problem, and a British Columbia problem. Understanding their negative impacts on our environment, economy, and health is the first step in taking action to stop their spread.”

Three high-priority species were profiled:

Whirling Disease: A microscopic parasite that can cause up to 90% mortality in juvenile trout, threatening wild fish populations, shifting freshwater food webs, and impacting recreational fisheries and local economies. The poster stressed that “there is no treatment for whirling disease; once introduced, the elimination of the parasite in wild finfish populations is not usually possible.”

Eurasian Watermilfoil: An aquatic plant introduced to North America through the aquarium trade and ship ballast water, thriving in still or slow-moving water and spreading via seeds, roots, buds, and even tiny stem fragments.

Zebra and Quagga Mussels: Highly invasive mussels that can clog pipes, damage infrastructure, and disrupt aquatic habitats and recreation.

The **"What Can You Do?"** section underscored that water-based recreation—boating, fishing, paddling—can easily spread invasive species as plants, animals, and microscopic organisms cling to boats, trailers, gear, and clothing. It urged recreationists to:

- Inspect and remove debris from all watercraft and gear
- Learn about local invasive species and report sightings to authorities
- Always **CLEAN, DRAIN,** and **DRY** all equipment after every waterbody visit

The poster included a special note on whirling disease prevention, emphasizing that "Clean, Drain, Dry alone is not enough to stop the spread. The Columbia River Watershed is at high risk, and spores can travel on boats, gear, footwear, and even mud. Always follow BC's decontamination protocol—use approved disinfectants, soak or spray items for 15 minutes, rinse with clean water, and let gear dry for at least 24 hours."

Biographical notes

Jess Booth joined the Columbia Shuswap Invasive Species Society (CSISS) team in 2021 as the Outreach Program Assistant. She holds a Bachelor of Outdoor and Environmental Education from La Trobe University in Australia and has a background in invasive species and nature education. Since moving to Revelstoke in 2019, she's been actively involved in community outreach through CSISS, the Revelstoke After School Society, and Wildsight as an Environmental- Nature Educator.

Nolan Novotny is backfilling as Acting Field Operations Coordinator in 2025-2026, as well as the Senior Field Technician for CSISS. He joined the CSISS team in 2022 and conducts terrestrial and aquatic fieldwork across the region to monitor and prevent the spread of invasive species. Nolan has a Bachelor of Science Hons. and a Masters of Science in Biology and Entomology from the University of Manitoba and has previously worked in mosquito control programs.

Brittany Eliadis is the Education and Outreach Manager for the East Kootenay Invasive Species Council. With a Master of Teaching from the University of Toronto and five years of experience in public education, Brittany specializes in outdoor and environmental learning. Her approach blends experiential education with a deep respect for place-based knowledge, aiming to inspire stewardship through engaging outreach programs.

23. Sharing is caring: the evolution of communal roosting behaviour and its relevance for scavengers (Cuadros)

Presenter: Sandra Cuadros, University of British Columbia, sandra.cuadros@ubc.ca

Co-Author: Michael Noonan, University of British Columbia michael.noonan@ubc.ca

Communal roosting (CR) is a form of social behaviour exhibited by several species of birds where unrelated individuals spend the resting time together. Different hypotheses have been proposed to explain the origins of this behaviour, including predator avoidance, thermal regulation, and increased foraging efficiency. To test for potential evolutionary drivers of this behaviour, we first compiled ecological data from all landbirds from online databases and published literature, and classified communal roosting behaviour as present (1) or absent (0). We then used body mass (kg), trophic guild, Hand-wing Index and brain to body size ratio as potential predictor variables and evolutionary relatedness using phylogenetic trees from VertLife. We fit GLMs using the brms package using the predictor variables and communal roosting behaviour as a binary response variable with phylogeny as a random effect. We then performed model comparison between the null model with phylogeny only and the full model to test whether CR can be explained with the aforementioned variables. Our results show that this behaviour is positively correlated to body mass, HWI, and is more persistent in scavengers than any other trophic level. Our findings support that communal roosting cannot be explained through phylogeny only. We use these results to highlight the importance of communal roosting sites for scavengers with a focus on vultures and discuss the implications for vultures foraging efficiency from the lens of the Information Center Hypothesis.

Biographical notes

Sandra Cuadros is a recent graduate Master's student from Biology at UBCO. She has a background in ornithology and working with endangered species, mostly in Latin America. She's particularly interested in movement ecology and behaviour of wildlife and landscape management for human-wildlife coexistence. She is passionate about mountain ecosystems and mountain living, which she tries to include in her research and conservation work through outreach and education.

24. Exploring microbial life and biomineralization in Raspberry Rising Cave (Rousseau *et al.,*)

Presenter: Leah Rousseau, Thompson Rivers University leahrousseau11@gmail.com

Co-Authors: Kathleen Graham, Alberta Speleological Society; Kingsley Donkor, Nancy Van Wagoner, and Naowarat Cheeptham, Thompson Rivers University

View poster here.

Caves are oligotrophic (low nutrient), dark, and isolated environments. Despite this, caves are blooming with biodiversity on the microscopic scale. Microorganisms have evolved unique ways to thrive in these extreme cave habitats, where other forms of life cannot thrive. Some species are capable of utilizing limited nutrients in these difficult habitats through a metabolic process called microbiologically induced carbonate precipitation (MICP). This process is a form of biomineralization that yields calcium carbonate crystals and is important in speleothem formation, and possibly degradation in caves. MICP has industrial applications in self-healing concrete or bio concrete. This material has potential to decrease the need for producing and repairing concrete which in turn would decrease global greenhouse gas emissions.

With the help of expert caver Kathleen Graham, and her skilled team, we were able to obtain hard-to-get samples from Raspberry Rising Cave located in Glacier National Park. This cave system is an extensive marble cave system that is not accessible to the general public. The intentions of this collaborative, multi-disciplinary study were to isolate bacterial species with biomineralization potential, analyze the chemical make-up of the cave environment, and learn more about microbial ecosystems in caves. To attain this, we used classical microbiological techniques specific for oligotrophs to isolate cave bacteria and screen them for calcium carbonate crystal precipitation. Additionally, we have used scanning electron microscopy (SEM) to observe crystal formation and microbial community structure within the cave samples. To analyze the chemistry of the cave samples, we used a chemical technique called inductively coupled mass spectroscopy (ICP-MS), allowing us to compare microbial community activity to the chemical environment they live in.

Biographical notes

Leah Rousseau is a 4th year undergraduate student majoring in Cell, Molecular, and Microbial Biology at Thompson Rivers University. She currently conducts research in the Cheeptham Cave Microbiology Lab working under the mentorship of Dr. Naowarat (Ann) Cheeptham. She delights in learning about microbial communities and how we can harness the power of microbes to positively impact the world. In the future, Leah plans to attend graduate school to study microbial ecology at UBC.

25. Northern Mountain Caribou survival: An ongoing analysis aimed at quantifying spatiotemporal patterns, identifying drivers, and predicting future patterns (Wang *et al.,*)

Presenter: Liufeng Wang, University of British Columbia Liufeng.wang@outlook.com

Co-Authors: Tal Avgar, University of British Columbia tal.avgar@ubc.ca; Kelsey Russell, Department of Environment, Yukon Government, Kelsey.Russell@yukon.ca; Megan Hornseth, Yukon Government Department of Environment megan.hornseth@yukon.ca; Julie Turner, University of Alberta, Biodiversity Pathways jwturner@ualberta.ca

Caribou (Rangifer tarandus) are ecologically and culturally important across Canada; however, their widespread declines raise significant conservation concerns. Unlike most ecotypes of woodland caribou (Rangifer tarandus caribou) that are subject to conservation efforts due to well-documented declines, much less is known, and hence much less is done, for Northern Mountain Caribou (hereafter NMC). Critical knowledge gaps persist regarding NMC population size, demographic trends, and vital rates across most of the ecotypes' ranges, which encompass vast regions in Northern British Columbia and Yukon.

We aim to develop and apply a comprehensive survival analysis tailored to existing data collected across NMC subpopulations over the past decade. An exploratory analysis based on 198 GPS-tracked individuals provided preliminary insights but highlighted limitations related to seasonality and handling right-censored mortality data. While suggesting strong annual and regional influences, our preliminary analysis did not detect significant effects of anthropogenic disturbance or seasonality.

Recognizing these limitations, our research is now focused on identifying and fitting a suitable continuous time (time to event) model that will allow us to best utilize the available information to infer drivers of NMC mortality across space and time and predict mortality patterns under future landscape scenarios.

Biographical notes

Liufeng Wang is a Ph.D. candidate from the University of British Columbia Okanagan (UBCO), specializing in Northern Mountain Caribou (NMC) survival analysis.

26. Does forest thinning prevent forest fires in wet-belt forests? A look at the literature (Petryshen *et al.*,)

Presenters: Ashley Schweitzer, Biodiversity Pathways, ashley.schw3@gmail.com; Rob Serrouya, Biodiversity Pathways, serrouya@ualberta.ca

Co-Author: Eddie Petryshen, Wildsight, eddie@wildsight.ca

View poster here.

Recently there has been increased pressure on thinning regenerating forests and mature forests in caribou ranges in the wet Interior Cedar Hemlock (ICH) and Engelmann Spruce Subalpine Fir (ESSF) biogeoclimatic zones. Thinning is widely studied in drier forest types where it can reduce fire severity by decreasing ladder fuels, basal area, and crown bulk density. Thinning means to selectively fell trees to reduce stand density. But there has been limited research on what is ecologically appropriate in wet forest ecosystems including the inland temperate rainforest and wet ESSF variants. In contrast to dry and more fire prone systems, wet ICH and ESSF forests generally have less frequent fire and large scale disturbance regimes and fire history, microclimate is also a key driver to how a forest responds to extreme weather and disturbance events.

Our literature review demonstrates that in wetter forests (ICH/ESSF) the evidence for whether thinning effectively reduces wildfire risk and severity is lacking and results are mixed. In addition, there is a need for Trials And Field Based Data Specific To wet ICH and ESSF forests and there is a need for great understanding and knowledge of natural disturbance regimes in the wet ICH and ESSF forests. Lastly, we must consider other values including Caribou and landscape condition and rare lichens and plant communities.

Field trips

27. Reservoir productivity, operations, and charismatic microfauna

Hosted by:
Karen Bray, BC Hydro, Biologist, Environmental Field Operations,
Karen.Bray@bchydro.com

Location:
Revelstoke dam

Description:
An open-air overview of how the reservoirs operate and what that means for pelagic productivity based on results of long-term monitoring. Karen has been working with reservoir operations and studying productivity and connectivity of the Revelstoke reservoir for almost 30 years.

28. RCFC's Keystone commercial thinning: A demonstration site for sustaining forestry on the landscape while restoring ecosystem processes and values

Hosted by:
Julie Norton, Revelstoke Community Forest Corporation, Jnorton@rcfc.bc.ca;
Mike Copperwaite, Revelstoke Community Forest Corporation (retired),
mike.copperthwaite@telus.net

Description:
Forest management has seen major changes in the last decade in the form of recreation, regulation and ecological understanding. With added constraints of the landbase, the forest industry must get more from less. One aspect of increasing growth and value is through intensive forest management. This continues to provide fibre for mills, jobs for workers and habitat for the wildlife. We visited a site that has been harvested in the mid 1970's, juvenile spaced in 1997 and commercial thinned in 2021. We saw the line between a juvenile spaced area and non-spaced in addition to how this type of harvesting blends into old growth areas. Use of a harvester for cutting

to length in the block reduces soil disturbance by using branch debris on trails and also reduces damage to residual trees. A forwarder moves the logs to the landings, where there are no debris piles. This type of harvesting does not work everywhere, but where it does work, the method is shown to enhance the diversity of tree species in the area and speed up natural processes of forest development. Commercial thinning has been proven effective for multiple objectives including wildfire reduction, wildlife habitat restoration, increasing biodiversity and accelerating forest stand development.

29. Northern Myotis maternal roost trees in the ICH

Hosted by:
Mandy Kellner, Kingbird Consultants, mandy.kellner@gmail.com

Location: Downie Creek bridge

Description:
This stop focused on the natural history of the endangered Northern Myotis bat, discussed results from the ongoing work into maternal roost requirements and how they fit into species conservation efforts, and looked at example potential roost features.

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