Forum Summary

CMI Annual Researchers' Forum

September 28, 2018

Old Fire Hall, Naksup BC

Every year CMI members get together to provide updates on their projects, catch up on each others' news, learn about what's happening in the different parts of our region, and have a few field trips. It's an informal atmosphere and non-CMI members are always welcome.

This year fifty-three people gathered at Nakusp's Old Fire Hall, including a class from the Integrated Environmental Planning program of Selkirk College. We heard eleven talks, viewed two posters, and participated in two field trip options.

Thank you to **Columbia Basin Trust** for sponsorship of this event and to **Nakusp and Area Community Forest** for contributing to the coffee break at this gathering!

PHOTO: Brendan Wilson

Columbia Mountains Institute of Applied Ecology

Box 2568 Revelstoke BC

Phone/ Fax 250-837-9311

office@cmiae.org ~ www.cmiae.org

Contents

Oral presentations (in order they were presented) 3

1. Wading into Kootenay Watershed systems; MacDonald Creek and beyond 3

2. Diet of Piscivorous Bull Trout and Rainbow Trout under Differing Kokanee Abundance and Size Structure 4

3. American bullfrog monitoring and control program in the Central Kootenay Region 7

4. How Wetlands can Mitigate Effects from Climate Change: Flooding, Drought and Water Quality 9

5. Short-eared Owls nesting in the Arrow Lakes Reservoir 10

6. Preparing B.C. bats for the arrival of white nose syndrome – a comprehensive conservation approach 11

7. Implementing the North American Bat Monitoring Program and BatCaver in Columbia Basin – preparing for the arrival of White-Nose Syndrome 13

8. Improving recovery of bighorn sheep after a pneumonia outbreak 15

9. Snow and Ice Changes in the Arrow Lakes Region and Ecosystem Health 16

10. Wildlife Habitat created in drawdown zone in Burton 18

11. Mechanisms influencing the winter distribution of wolverine (*Gulo gulo luscus*) in the southern Columbia Mountains, Canada 19

Posters 21

12. Forest Management in Western Toad Habitat in the Summit Lake Area 21

13. Post-fledging survival of juvenile Savannah Sparrows (*Passerculus sandwichensis*) within a fluctuating reservoir 22

Field trips 23

14. The influence of watershed physical characteristics on channel morphology: MacDonald Creek case study 23

15. Re-greening the Arrow Lakes Reservoir drawdown zone: 24

success and failures, nine years later 24

Oral presentations *(in order they were presented)*

1. Wading into Kootenay Watershed systems; MacDonald Creek and beyond

Kim Green P.Geo., PhD.
Apex Geoscience Consultants Ltd.
apexgeo.kg@shaw.ca

Watersheds provide many essential services of nature but beneath the biological cover lay the physical processes that move sediment and water from headwater regions to downstream rivers, lakes and oceans. The transfer of material through a watershed is governed by hydrogeomorphic processes change over time in response to changes in landcover, climate and other factors. Information gained from a hydrogeomorphic study of MacDonald Creek funded by NACFOR south of Nakusp contributes to a broader understanding of the role of geomorphology in determining how a watershed is likely to respond to disturbance.

Biographical notes

Kim Green, P.Geo. PhD, is co-founder and senior geoscientist with Apex Geoscience Consultants Ltd. Kim holds a BSc in Geology from UBC, an MSc in Geoscience from University of Calgary and a PhD from UBC Faculty of Forestry. As a Professional Geoscientist, Kim has worked for over 25 years throughout western North America specializing in the field of watershed and stream channel analysis. In 2014 Kim completed her Doctorate entitled Forests, floods and channel processes: illuminating links between forest harvesting, the flood regime and channel response in snowmelt headwater streams. She has published numerous peer reviewed scientific papers on the topics of watershed systems and connections between watersheds, flow regimes and forest and land cover impacts. In addition to her consulting work, Kim is and research scientist at Selkirk College. Kim currently lives in Nelson BC with her husband Will Halleran, daughters Claire and Laurel, three dogs and a cat. More about Kim and the work she does, her publications and past presentations can be found on her website; www.apexgeoconsultants.com.

2. Diet of Piscivorous Bull Trout and Rainbow Trout under Differing Kokanee Abundance and Size Structure

Steve Arndt
Fish and Wildlife Compensation Program - Section
Ministry of Forests, Lands, Natural Resource Operations and Rural Development
401-333 Victoria St, Nelson, BC V1L 4K3
Ph. (250) 354-6218; Fx. (250) 354-6332
Steven.Arndt@gov.bc.ca

Bull Trout and piscivorous Rainbow Trout are the apex predators in large oligotrophic lakes of the West Kootenay, with Kokanee typically being their primary prey. Kokanee population structure (relative abundance at size and age) can vary substantially over time, with size and survival to spawning being inversely related to density. Spawning channels built to compensate for flooded habitat can have a strong influence on Kokanee density and the subsequent growth rates and survival to adult. This study quantified diets of Bull and Rainbow trout in Arrow Lakes Reservoir (ALR) from 2003-2006 and 2015-2016 and Kootenay Lake from 2015 - 2017 to: 1) determine the degree of diet overlap between the two predators, 2) examine the evidence for prey selection by age or size, 3) evaluate relationships between predator condition factor and the abundance of different age classes of Kokanee, and 4) estimate the annual biomass of Kokanee consumed by predators.

Bull Trout and Rainbow Trout diets were very similar with Kokanee providing greater than 95% by weight for both species under a wide range of Kokanee densities in ALR. However, under extremely low Kokanee densities in KL, Bull Trout were more successful at maintaining Kokanee in the diet than Rainbow Trout. Larger predators of both species select for larger Kokanee when they are available, as evidenced by a much higher proportion of ages 1 to 3 Kokanee in the diet than in the reservoir (Fig. 1), and the fact that predator condition factor was best predicted by abundance of age-3 and age-2 Kokanee. Bull and Rainbow Trout in Arrow Lakes Reservoir consumed more than 3 times their weight in Kokanee (g Kokanee/g predator) annually. Under extremely low Kokanee densities In Kootenay Lake, Bull Trout consumption was only slightly reduced, whereas Rainbow Trout consumption was reduced to about 1 g Kokanee/g predator. Feeding conditions for Bull and Rainbow Trout are optimized when Kokanee densities allow a maximum number of Kokanee to survive to spawning age; Kokanee populations strongly skewed towards maximized densities of younger fish support fewer predators that grow more slowly to a smaller maximum size.

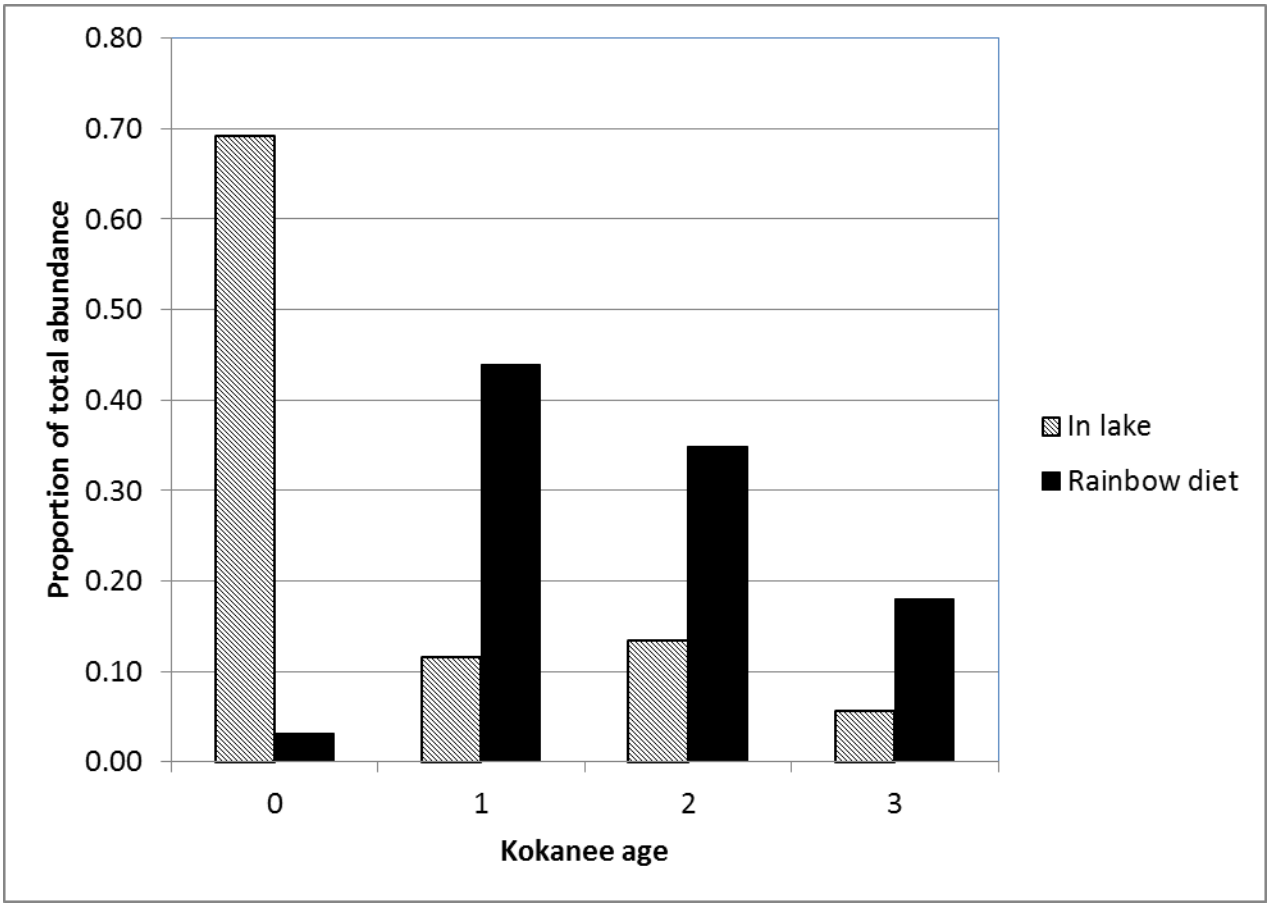

Fig. 1. An example of the relative age abundance of Kokanee in Arrow Lakes Reservoir compared to the relative abundance in the diet of Rainbow Trout for a 12-month period around October 2005.

Acknowledgements

Thanks to Tyler Weir and David Johner (MFLNRORD) for providing Kokanee abundance estimates and size data for Arrow Lakes Reservoir. Funding was provided by:

• Fish and Wildlife Compensation Program (FWCP). The FWCP is a partnership between BC Hydro, the Province of B.C., Fisheries and Oceans Canada, First Nations and Public Stakeholders to conserve and enhance fish and wildlife in watersheds impacted by BC Hydro dams.

• Arrow Lakes Power Corporation. Arrow Lakes Power Corporation is jointly owned, on a 50/50 basis, by Columbia Power and Columbia Basin Trust (CBT) Arrow Lakes Power Development Corporation (an indirect subsidiary of CBT).

Biographical notes

Steve is a fisheries biologist with the Ministry of FLNRORD in Nelson. He has been monitoring fish populations and angling in relation to nutrient restoration and spawning channel programs on Arrow Lakes Reservoir and Kootenay Lake for about 20 years. Earlier in his career he worked in Ontario and New Brunswick. He has a B.Sc. from University of Guelph and M.Sc. from University of New Brunswick. He lives in Nelson with his wife Janice; they have two grown children.

3. American bullfrog monitoring and control program in the Central Kootenay Region

Laurie Carr
c/o Central Kootenay Invasive Species Society
Suite 19-622 Front Street, Nelson, BC V1L 4B7
Email: lcarr@ckiss.ca
www.ckiss.ca
Phone: 1 (844) 352-1160, ext 210

American bullfrogs are native to Eastern North America where they exist in equilibrium with other pond species. They have however, been spread across the world primarily to satiate a real or perceived consumer appetite for frog legs. They are now listed as one the 100 worst invasive species globally according to the World Conservation Union, in 2000. In British Columbia, bullfrog populations are established in the Lower Mainland, Lasqueti Island, and Vancouver Island as far north as Campbell River. Bullfrogs were first confirmed in the interior of B.C. near Nelway, in the Central Kootenays in 2015. Sightings have also been reported in the South Okanagan and there is a confirmed population in Creston. The introduction of bullfrogs into the Central Kootenay area is most likely from natural dispersal from the United States. Bullfrogs can displace and prey upon native frogs as they invade. They are also indiscriminate predators, preying on almost anything that will fit in their mouths, including birds, turtles, salamanders, toads, and fish. As Creston is home to the last extant population of the northern leopard frog, bullfrog control and eradication is a priority for the region. In response to the threat of the American bullfrog, the American Bullfrog Action Team (ABAT) was created in 2015 to ensure a collaborated and strategic approach to monitoring and management. The ABAT is formed of eight organizations, including non-profits, Canadian and US government departments and first nations. As a member of ABAT the Central Kootenay Invasive Species Society (CKISS) is responsible for the monitoring and control of the American Bullfrog in the Central Kootenay region.

Acknowledgements

Thank you to the supporters of this project:
Columbia Basin Trust
Fish and Wildlife Compensation Program
Government of Canada
Creston Valley Wildlife Management Area
Nature Conservancy of Canada

Male (left) and female (right) American Bullfrog
Photo: Stephen Price

Biographical notes

Laurie has been involved with the Central Kootenay Invasive Species Society (CKISS) for the past five years as President of the board. She recently joined CKISS as the Executive Assistant. She brings her background in conservation biology and environmental research to the position. Her studies in landscape ecology are based on determining the effects of road mortality on amphibian populations.

4. How Wetlands can Mitigate Effects from Climate Change: Flooding, Drought and Water Quality

Carrie L. Nadeau, R.P.Bio, Senior Ecologist
Associated Environmental Consultants Inc.
nadeauc@ae.ca

Wetlands are natural buffers and can function as part of a drought mitigation or flood control system, especially when planning for the effects of climate change. Climate change is expected to bring more powerful storms, longer drought cycles, greater evaporation, and longer, hotter growing seasons, as we have experienced in recent years in this region. Wetlands absorb, store and slowly release water, reducing the effects of flooding and mitigating impacts from drought. However, a high percentage of wetlands have been lost to development. Implementation of constructed wetlands in urban or rural green space and parks can improve water quality and flow management in times of flood and extreme weather events. Recent case studies provide examples of wetland restoration, construction and conservation, and development of a constructed wetlands guidebook demonstrate how communities are planning to increase resiliency in response to climate change.

Biographical notes

Carrie Nadeau, R.P.Bio., is a senior ecologist with Associated Environmental Consultants Inc. and has been involved in a broad range of multi-disciplinary projects throughout western Canada, including restoration of riparian areas and wetlands, creation of rare and endangered species habitats, environmental impact assessments, vegetation ecology surveys, reclamation planning, and ecological land classification. Carrie grew up in Vernon, and has worked in the Columbia Region for the last 13 years on various projects with BC Hydro and small independent power producers. Carrie has served one term on the CMI BOD, and is currently in her second term as the President of the Board of Directors with the Columbia Mountains Institute of Applied Ecology.

5. Short-eared Owls nesting in the Arrow Lakes Reservoir

Ryan Gill
Cooper Beauchesne and Associates Ltd.
rgill@cooperbeauchesne.com

Short-eared Owl (*Asio flammeus*) sometimes nests below the high-water mark of the Arrow Lakes Reservoir in southeastern British Columbia, Canada, and both their microtine prey (*Microtus pennsylvanicus*), and their nest success may be modulated by weather and reservoir water management cycles. We examined factors that may have affected vole populations to see if they influenced owl nesting decisions among years. With only 11 years of known nesting history, these models were not significant, but indicated that maximum reservoir level negatively influenced the probability of owls nesting in the following spring.

Biographical notes

Ryan Gill has worked in the Columbia mountains for the past 17 years, and for the past ten years has been closely involved in the Water Use Planning (WUP) projects in the Arrow Lakes, Kinbasket and Williston reservoirs, studying how birds are affected by hydroelectric reservoir operations.

6. Preparing B.C. bats for the arrival of white nose syndrome – a comprehensive conservation approach

Cori L. Lausen,
Wildlife Conservation Society Canada
clausen@wcs.org

White-nose syndrome (WNS) is an invasive and deadly fungal disease that has killed millions of bats since its discovery in 2006 in New York State. Since then, it has spread across eastern North America, and made an unexpected leap to Washington State in March 2016. Wildlife Conservation Society Canada (WCSC) is dedicated to bat conservation in western Canada, and our comprehensive program addresses 3 levels of preparation: obtaining baseline data, assessing risk, and developing and evaluating mitigation tools.

Baseline data are needed to determine current diversity, range and abundance information prior to the arrival of the disease. Such data include locating where bats hibernate in winter, the season during which bats succumb to WNS (WCSC's BatCaver.org program), and monitoring various habitats across the province to determine what species are found where and in what relative abundance so that impacts of the disease can be measured (North American Bat Monitoring program). Baseline data will also inform future recovery strategies, which is critical for this group of mammals for which very basic ecological information is still lacking.
WNS has not affected all species equally. While the extreme negative impact of WNS on many eastern bats has been documented, in B.C. we are uncertain which species are most vulnerable to the disease and would thus be most in need of limited resources. B.C. has approximately 16 species of bats, more than double the number found in eastern Canada. How most of these species will fare in the face of WNS, is not yet known. As such, through international collaborations, we are developing survivorship models that predict which bat species are likely to experience the highest mortality rates from WNS, taking into consideration latitude, winter length, hibernation conditions, and bat physiology.

Concurrent to the above activities, WCSC has teamed up with Thompson Rivers University, McMaster University, UBC Okanagan, the BC provincial government, and BC Wildlife Park to develop, test and eventually implement a new potential prophylaxis application for reducing the severity and spread of WNS. This is through development of a naturally occurring probiotic that can positively alter the wing microbiome of bats to more effectively fight off WNS infection. A prototype probiotic cocktail has been developed that contains bacteria found on some B.C. bats that inhibit the growth of the

WNS fungus. This approach is potentially self-propagating, can be delivered in summer, and is more realistic than any other proposed WNS treatments for western bats to date. And there are other mitigation strategies including the promotion of habitat enhancement using such artificial structures such as bat boxes. One of our up and coming projects includes an assessment of bat boxes across North America to determine if bat reproduction is enhanced or hindered by these structures.
I will provide an overview of our bat conservation activities in the Columbia Basin in the context of our larger western Canada program.

Biographical notes

Dr. Cori Lausen lives in Kaslo, and is a conservation research biologist. After completing her PhD in bat ecology, she worked as an independent bat biologist. During this time she initiated several research projects, setting the foundation for a western Canada bat conservation program which she continues to develop and expand as a full time associate research scientist with Wildlife Conservation Society Canada. She sits on a number of bat conservation committees including the North American Bat Conservation Alliance and played a key role in developing and implementing the North American Bat Monitoring Program. Today she will provide us with an overview of this larger bat conservation program and describe WCS Canada's activities in the Columbia Basin.

7. Implementing the North American Bat Monitoring Program and BatCaver in Columbia Basin – preparing for the arrival of White-Nose Syndrome

Jason Rae, Wildlife Conservation Society Canada
Nelson, BC Office
Jrae@wcs.org
www.WCSCanada.org, www.BatCaver.org

White-nose syndrome (WNS) is an invasive and deadly fungal disease that has killed more than 7 million bats since its discovery in 2006 in New York State. Since then, it has spread across eastern North America, and made an unexpected leap to Washington State in March 2016. WNS can kill up to 99 per cent of bats in hibernation sites. BC is host to the highest diversity of bats in Canada, with at least 16 species, at least half of which are thought to be vulnerable to WNS. The disease has spread to the southern border of BC, and its impact on BC bat populations is looming. Mass die-offs will be catastrophic to biodiversity and ecosystem health because bat populations take a long time to recover due to low reproductive capacity. Bats are worth billions of dollars to the economy through their consumption of forest and agricultural pests, maintenance of ecosystem health, and facilitation of organic farming. Despite the importance of bats, little baseline knowledge of the species distribution, critical habitat, and even susceptibility to the disease exists. Two ongoing Wildlife Conservation Society Canada (WCSC) programs aim to address this knowledge gap, the North American Bat Monitoring Program (NABat) and BatCaver. The data collected from NABat and BatCaver will prepare British Columbia for the arrival of WNS.

NABat is a multi-agency initiative designed to increase baseline bat monitoring at the national and continental scale. Since 2016, WCSC has implemented the program in BC, with the assistance and collaboration of bat biologists and naturalists across the province. The goal of the NABat program is to monitor trends in bat populations and relative abundances. WCS Canada has engaged biologists, naturalists, and citizen scientists from across the province to 'adopt' 10 x 10 km grid cells, and collect acoustic recordings of bats in their grid cell areas. Province-wide, we have surveyed 41 grid cells, of which 11 are in the Columbia Basin.

The BatCaver Program is a collaborative effort to study bat hibernation sites (hibernacula) in the mines and caves of Western Canada. Since 2014, the program has partnered with expert cavers to collect data and help identify critical habitat used by local bat species. The BatCaver program aims to identify important hibernation sites for bats in Western Canada and gain insight into the use of our caves and mines by bats to

guide effective WNS mitigation and recovery actions. BatCaver addresses its goals by deploying acoustic bat detectors (roostloggers) and temperature and humidity loggers in caves and mines over fall, winter, and spring. BatCaver also teaches cavers to watch for signs of bats, educates them on the ecological value of bats, then trains and promotes adherence to decontamination procedures to ensure they do not accidentally introduce or spread the WNS fungus throughout BC. To date, BatCaver has investigated over 110 caves and mines within BC through its acoustic monitoring program. We have identified several important hibernacula for conservation and study, all of which are located in the Columbia Basin.

Biographical notes

As a member of the Wildlife Conservation Society Canada Bat Program team since early 2017, Jason is responsible for providing management and research support for the program from his base in Nelson, British Columbia. He completed his BSc in Ecology at the University of Calgary, and a subsequent MSc in Environmental and Life Sciences (Ecology and Conservation Biology) at Trent University. His past projects provide a broad scope, including investigating the traditional ecological knowledge surrounding polar bears in south-eastern Husdon Bay, pollinator attractants and foraging activity of seep monkeyflower, and behavioural and morphological interactions between pathogen exposure and predation risk in green frog tadpoles. Jason currently manages the BatCaver and NABat programs in British Columbia.

8. Improving recovery of bighorn sheep after a pneumonia outbreak

Jeremy Ayotte
Phyla Biological Consulting
jeremy.ayotte@gmail.com

In 2013 the Chasm bighorn sheep herd near Clinton experienced a decline from 100 down to 25. Health sampling determined that the remaining Chasm bighorns had been exposed to *Mycoplasma ovipneumoniae* (Movi), a pathogenic bacteria often carried by domestic sheep that can cause outbreaks of pneumonia and all age die-offs of wild sheep. Since the 2013 decline, lamb recruitment within the Chasm population has been very poor. Many areas in the US (e.g., Washington, Idaho, South Dakota, Nevada) where pneumonia outbreaks in wild sheep have occurred, are attempting to stop chronic pathogen transmission to lambs and prevent spread to adjacent herds by removing chronic carriers of Movi from the population. We are planning a similar test-and-remove project on the Chasm herd to help improve recovery and avoid pathogen transmission to adjacent herds especially as the 2017 Elephant Hills fire is expected to improve connectivity among these herds in the Thompson-Nicola area. Lessons learned from this project will support bighorn sheep management across their range in BC including the Columbia Valley herds in the East Kootenays.

Biographical notes

Jeremy Ayotte is a biologist with his company Phyla Biological Consulting. Jeremy lives in Salmon Arm where he works with a variety of species and ecological systems. He completed a Masters of Science through The University of Northern BC working on the ecological role of mineral licks for moose, elk, Stone's sheep, and mountain goats in northern Rockies. Recent work includes 5 years as the provincial coordinator for the BC Sheep Separation Program, working to mitigate the risk of respiratory disease transmission from domestic sheep to wild sheep across BC, including bighorn herds in the Columbia Basin.

9. Snow and Ice Changes in the Arrow Lakes Region and Ecosystem Health

Melinda M Brugman
brugmanm@telus.net

From the ice age climates to the current period of warming, the snow and ice in the Arrow lakes Region of the Upper Columbia River basin in Canada has shaped what ecosystems locally survive and thrive. Salmon, caribou and unique interior wet belt ecosystems have thrived near these mountains despite harsh wintertime conditions and during the waning phases of glaciations. Humans have also thrived in these same snow and ice marginal regions, with healthy rivers, lakes and associated ecosystems. The presence of snow and glaciers in the mountains protect vegetation from droughts, helps prevent wildfires by minimizing summertime deep convection, and provides a cool moist environment essential for life, including threatened wild fish and caribou. The glaciers and deep snow fields provide critical high stream discharges and protective turbidity levels during hot dry summers, yet are clear flowing during spawning periods. The deep snow packs of the surrounding mountains moderate the greatest flooding impacts of most heavy rain events. The high springtime runoff pulses help flush salmon fry downstream safely. The exceptional rain on snow event for some years refreshes flood lands with nutrients and stimulates growth in vegetation and helps wildlife living on flood plains, but challenges humans who have developed too close to the water downstream for safety. With changing climates and weather variations, snow and ice volumes in the Arrow Lakes Region have grown and shrunk greatly while animals and plants have adapted and thrived nearby, until modern times. Currently the glaciers in the Arrow lakes region are on the march towards demise and likely will be gone within decades to a century. Once abundant wildlife nearby and living downstream are increasingly at risk. Glaciers, snow fields, and wintertime lake ice extents in Arrow Lakes region were significantly greater a century ago than now. Extremely long lasting cold winters of early historic times (late 1800s to early 1900s) still occur, but are anomalies now. Historic evidence suggests that British Columbia is increasingly receiving more precipitation and higher intensity events with warming over the past century, but reliable long term records are sparse, however proxy records are reliable when well researched. Greater shifts in climate of the region have occurred in the past, when animals could more easily migrate and adapt. With an accelerated hydrologic cycle, the vulnerable species are further threatened because both human and climate change forces are together working against their survivability. In this paper is examined how past snow and ice changes in the Arrow Lakes region can help us understand impacts now and in a future world where we can use this information to help improve ecosystem health.

Biographical notes

Mindy has worked across western North America and in Switzerland on glaciers, hydrology, geology and meteorology since the 1970s and currently works as a senior research and development meteorologist at Environment Canada. This presentation represents her own work and not her current employer. She obtained her BS at University of Washington in Seattle, PhD at CalTech in Pasadena and post doctorate at ETH in Switzerland. Her work experience includes considerable field, lab, consulting, research, analysis and forecasting and guiding, university teaching and research work in most of the western States and Alaska, and western Provinces. She has worked for USGS Glaciology Project office, as a research scientist for Env. Canada National Hydrology Research Institute in Saskatoon, and as a visiting professor of geohydrology at Western Washington University and glaciology and volcanology at UNAM in Mexico City, and as an adjunct professor at University of Saskatchewan in geography. She has lived in Revelstoke for the last 22 years carrying out research, consulting and forecasting in the region and has worked in Environment Canada offices in Edmonton, Kelowna and Vancouver. She worked as a research hydrologist leading glacier hydrology programs in western Canada 1989 to 1996 and as a research associate with CMIAE in 1996-1999. Then she was trained and then certified as a meteorologist forecasting for western Canada between 1999-2010 and a research and development meteorologist in 2010 – current. She is a volunteer science innovator in the public schools with Science World in Vancouver, and recently co-organized a workshop series on the Columbia Basin Reconciliation for a Better Future with recommendations in 2017-18 aimed towards making our basin and river the best possible. She was featured recently by PBS in “Rescued from Mount St Helens” with Anne Curry in the We’ll Meet Again Mini Series that aired in Jan 2018, about her research and narrow escape in 1980. This summer she was an invited research scientist, and volunteer at the arctic biological research institute of University of Alaska at Toolik.

10. Wildlife Habitat created in drawdown zone in Burton

Harry van Oort | Senior Environmental Coordinator (Wildlife), Environment
BC Hydro
6911 Southpoint Drive, 11th floor
Burnaby, BC, V3N 4X8
P 604 528 2213, M 604 290 7056
Harry.vanOort@bchydro.com

BC Hydro Water Licence Requirements is planning a wildlife enhancement project in the drawdown zone of the Arrow Lakes Reservoir at Burton Flats. This project is expected to improve conditions for nesting and migratory birds and wildlife in general, and will be accomplished by creating, protecting or enhancing habitat for nesting and migratory birds, amphibians and other wildlife. The design options focus on excavating pools with emergent and riparian vegetation. Excavated material will be used to develop mounds planted to re-establishing native vegetation. Work was anticipated to commence in fall 2018, however, due to delays in the permitting process the project was postponed to fall 2019. Construction is proposed in two phases, with Phase 1 constructed in 2019 and Phase 2 constructed one to two years later; the phasing will allow for the project to adapt and learn moving forwards. Baseline information at the project site has been ongoing, and will continue after the construction is complete.

Biographical notes

Harry lived in Revelstoke working as a wildlife biologist throughout the Columbia Mountains from 2004 through 2017. Harry became a CMI board member many moons ago, and he has helped organize several of the conferences. He now works for BC Hydro, and is based in Squamish. When not working, Harry likes to spend time with his family and friends in the mountains…especially in the Columbias.

11. Mechanisms influencing the winter distribution of wolverine (*Gulo gulo luscus*) in the southern Columbia Mountains, Canada

(**paper has been submitted to Wildlife Biology- not accepted at the time of this submission**)

Presenter's Information:
Doris Hausleitner
Seepanee Ecological Consulting and Selkirk College
dorishaus@shaw.ca
http://selkirk.ca/faculty/doris-hausleitner

Co-authors:
Andrea Kortello (lead author): Grylloblatta Ecological Consulting kortello@yahoo.com
Garth Mowat: Ministry of Forests, Lands and Natural Resource Operations and Department of Earth, Environmental and Geographic Sciences, The University of British Columbia Okanagan Campus, Kelowna, B. C. garth.mowat@gov.bc.ca

To better understand the mechanisms driving the distribution of a threatened carnivore, wolverine (*Gulo gulo*), in the southern Columbia Mountains, we contrasted four hypotheses; climate, food, human disturbance and trapping harvest. We examined wolverine occupancy with respect to these factors, collectively and by sex, at a 5 km radius scale around sampling sites and at a larger 10 km radius to evaluate consistency over changes in scale. For all analyses our top models included food and human disturbance. Of the 4 food items examined; caribou (*Rangifer tarandus*), mountain goat (*Oreamnos americanus*), moose (*Alces alces*), and hoary marmot (*Marmota caligata*), wolverine occurrence was mostly closely related to hoary marmot habitat. With regards to human disturbance, we documented a negative association with forestry road density and a positive association with protected areas. The importance of climate was low compared to the food and disturbance hypotheses. Furthermore, we did not detect wolverine distribution gaps associated with recent harvest. Our top 10 km scale models were similar to the 5 km scale, but with a stronger link to caribou distribution. We show that marmot habitat is important to wolverine in winter and suggest that management actions for conservation prioritize female habitat preferences, as these were more selective than male. We demonstrate that human disturbance is a major driver of wolverine distribution. Protected areas appear to be providing secure habitat, and reducing road density or mechanized use of roads in winter should be considered for species conservation. A positive relationship between recent harvest and subsequent wolverine occurrence suggests that harvest data may not be useful in detecting population declines.

Acknowledgements

Funding was provided by the Columbia Basin Trust and the Fish and Wildlife Compensation Program, as well as BC Ministry of Forests, Lands and Natural Resource Operations (MFLNRO) and The Wolverine Foundation. MFLNRO, BC Provincial Parks, Idaho Fish and Game and Idaho Panhandle National Forest also provided logistical support and assistance.

Biographical notes

Doris teaches Ecology in the School of Environment and Geomatics. She also is owner/operator of a consulting company, Seepanee Ecological Consulting which has specialized in research on rare and endangered wildlife species in British Columbia. She also sits on the board of CMI! She has a small hobby farm in Nelson BC where she is kept entertained by her husband, two incredible children, sheep, turkeys bees and chickens. She is going to talk about wolverines today which she has been studying since 2012.

Posters

12. Forest Management in Western Toad Habitat in the Summit Lake Area

Frances Swan, Nakusp and Area Community Forest (NACFOR)
f.swan@truenorthforestry.com

The Summit Lake area supports a regionally important population of western toads (*Anaxyrus boreas*) and, as such, has been the focus of recent management initiatives. Land use practices such as highway infrastructure, forestry operations, recreation and private land development influence local toad populations and habitat (MFLNRO, 2017). Over the past several years, the Nakusp and Area Community Forest (NACFOR) has been working with the Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD) and the Fish and Wildlife Compensation Program (FWCP) to develop beneficial management practices that address some of the land use issues in the Summit Lake area.

Western toads breed in Summit Lake but are predominantly terrestrial and inhabit a variety of upland forest types for foraging, security and overwintering. The forests around Summit Lake have a long history of disturbance from both wildfire and logging that has created a mosaic of timber types, ages and densities. These diverse forests adjacent to breeding areas provide suitable habitat for the Summit Lake western toad population.

The Summit Lake area is a productive and economically important part of NACFOR's working forest; hence, in 2014 NACFOR initiated planning to harvest approximately 50 hectares in seven cut blocks in the Summit tenure area. Through working with FLNRO and FWCP project biologists, NACFOR developed management strategies and practices intended to protect toads and toad habitat during operational activities. In 2018 harvesting was completed in the last of the seven planned cut blocks. The poster describes the forest management process from planning through post-harvesting.

13. Post-fledging survival of juvenile Savannah Sparrows (*Passerculus sandwichensis*) within a fluctuating reservoir

Authors: Catherine Craig, Cooper Beauchesne and Associates Ltd.
ccraig@cooperbeauchesne.com
John M. Cooper
jcooper@cooperbeauchesne.com

The fluctuating water levels within reservoirs have the potential to impact the survival of juvenile birds fledged within the impounded area. We examined the post-fledgling survival of Savannah Sparrows (*Passerculus sandwichensis*) at Kinbasket Reservoir, British Columbia, Canada. Recently fledged Savannah Sparrows cannot fly and primarily run along the ground, potentially limiting their ability to escape rising water. From 2013-2017, we fitted 94 nestling sparrows with radio-transmitters at two study sites and monitored them daily. 75 of the tagged sparrows fledged and 39 of these fledglings survived the monitoring period. The main cause of post-fledging mortality was depredation; however, three sparrows were determined to have died due to rising water.

Field trips

14. The influence of watershed physical characteristics on channel morphology: MacDonald Creek case study

Hosted by: Kim Green, P.Geo., PhD., Apex Geoscience Consultants Ltd, and Frances Swan, NACFOR

Kim Green and group at one stop along the MacDonald Creek watershed tour
Photo credit: Frances Swan

This field trip took participants to a number of stops along MacDonald Creek and its tributaries to investigate the influence of watershed physical characteristics on channel morphology and hydrogeomorphic processes. One of the stops was along the lower reach of MacDonald Creek upstream from Hwy 6 which provides Kokanee spawning habitat. The fieldtrip encouraged participants to consider the entire watershed system in order to gain a more holistic understanding of stream channel morphology and disturbance.

15. Re-greening the Arrow Lakes Reservoir drawdown zone: success and failures, nine years later

Hosted by: Carrie Nadeau, R.P.Bio., Senior Ecologist, Associated Environmental Consultants Inc.


Carrie Nadeau leading a group in the drawdown zone of the Arrow Lakes Reservoir in Nakusp. Photo credit: Brendan Wilson

This field trip took participants to the drawdown zone of the Arrow Lakes Reservoir in Nakusp to look at BC Hydro's revegetation program. To reduce dust storms and increase vegetation cover for fish and wildlife, BC Hydro revegetation efforts have been completed in the Columbia Basin since the 80's. This field trip looked at a revegetation area from the most recent program, which started nine years ago. At the field trip site, participants looked at plants present in the drawdown zone, talked about reservoir ecology and the challenges of colonizing the drawdown zone, the adaptations plants have exhibited to this drastically changing environment, and discussed some of the successes and failures of these revegetation efforts.