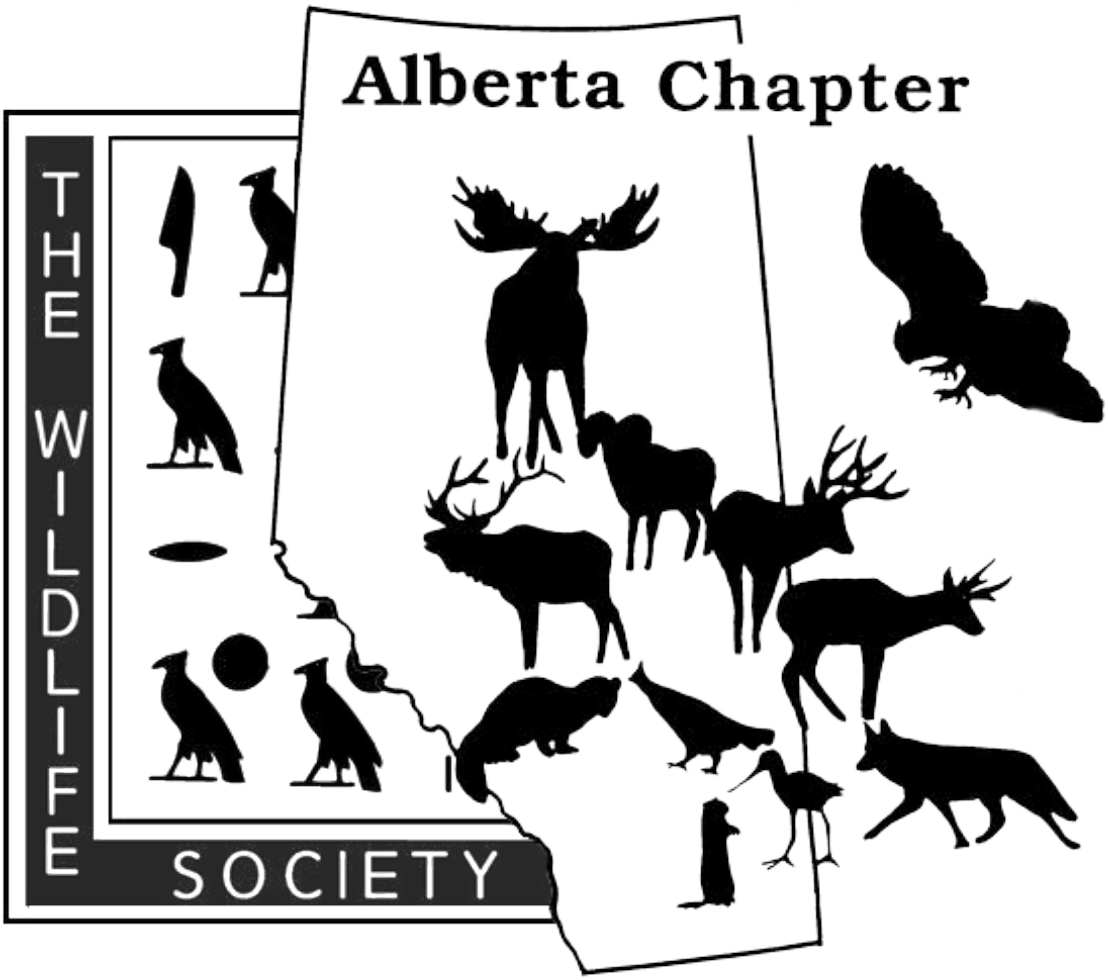
ACTWS 2020 CONFERENCE ABSTRACTS



SPECIES ON THE MOVE

PUBLIC TALK

Bill Snow, Consultation Manager, Stoney Nakoda First Nation

Bill Snow (Stoney Nakoda / Yuma Quechan) is a Consultation Manager with Stoney Tribal Administration, as well as a Director at Large for the Canadian Wildlife Federation. Bill has coordinated ceremonies for the Bison Reintroduction in Banff National Park since 2014, and will be conducting a cultural study on the Bison Reintroduction area in 2020, as part of the Canadian Mountain Network initiative. Bill Snow is a member of the Wesley First Nation, of the Stoney Nakoda Nation, as well as a Dual Citizen of Canada / United States of America.

Title: *Cultural Perspective on the Bison Reintroduction*

Abstract: The Bison Reintroduction in Banff National Park, represents over 140 years exclusion of bison in mountain landscapes. While there are many environmental benefits to having bison on landscapes, there are also cultural impacts to the Bison Reintroduction project. Bill Snow, a Consultation Manager, will cover the cultural ceremonies that have been conducted in relation to the Bison Reintroduction since 2015, and will discuss the historical and current importance that bison have in Stoney Nakoda culture. A short film of place names in the Canmore and Banff area also includes the scenery of the bison herd at Stoney Indian Park, on the Stoney Indian Reserve.

Wes Olson, Author, Elk Island National Park (Retired)

Wes Olson was raised in the rugged foothills of Alberta's Rocky Mountains. There, on family camping, hunting and fishing trips he began a life-long association with wild places and the wildlife that live in them. Following graduation from college Wes worked for several years as a Wildlife Technician for the Yukon Government, and in 1981, began a career with Parks Canada as a National Park Warden in Banff, and later in Waterton Lakes, Elk Island National Parks in Alberta, as well as Prince Albert and Grasslands National Parks in Saskatchewan. For over two decades Wes managed the plains and wood bison populations in Elk Island National Park and participated in the translocation and establishment of almost every free-roaming plains and wood bison population in Canada. Wes retired in 2012 but continued working in the field of bison conservation by establishing his own bison consulting company.

Wes's passion for bison spills over into his creative side and he and his wife Johane have written the books, "Portraits of the Bison; An Illustrated Guide to Bison Society", and "A Field Guide to Plains Bison." These captivating books take the reader through bison society with rich illustrations, photographs and descriptive text.

Title: *The Ecological Buffalo: Following the trail of a keystone species*

Abstract: For more than 130,000 years bison have roamed the ecosystems of North America, and while doing so, have influenced the lives of every other species they shared space and time with. This presentation looks at some of the intricate, and often unexpected relationships bison have with these species across their former range, with an emphasis on the northern mixed-grass prairie. Reintroducing bison populations to areas of their former historic range re-establishes that relationships and improves ecological diversity.

SESSION 1 PLENARY

SPECIES ON THE MOVE

Kathy Martin, Professor, University of British Columbia

Dr. Kathy Martin is a Professor of Wildlife Ecology in the Department of Forest and Conservation Sciences at the University of British Columbia, Vancouver, and a Senior Research Scientist with Environment and Climate Change Canada. Kathy has always held a fascination for how species persist and cope in extreme and challenging environments. She conducts research on population ecology and life history variation of alpine, arctic songbirds, and grouse across elevation gradients, and in relation to climate variation in these increasingly unreliable habitats. She and her students have written over 200 scientific papers and book chapters on ecology, behaviour and conservation of birds. Kathy Martin is currently President of the American Ornithological Society, the largest member-based ornithological society globally. She is also a Past President of the Society of Canadian Ornithologists, and a member of The Wildlife Society and the International Ornithological Union. Dr. Kathy Martin received the Doris Huestis Speirs Award for Lifetime Research Contributions to Ornithology from the Society of Canadian Ornithologists (2008), the Ian McTaggart-Cowan Lifetime Achievement Award for outstanding contributions to the understanding, conservation, and/or management of wildlife in Canada by The Wildlife Society, Canadian Section (2016), and the Godman Salvin Prize for Lifetime Contributions to Ornithology from the British Ornithologists' Union (2018).

Kathy Martin, Professor, University of British Columbia

Title: *Temperate Mountain Bird Responses to Climate Change influences*

Abstract: About 24% of the North American land base is classified as mountainous, including over 75% of the British Columbia and Yukon land base. One-third of bird species breeding in continental North America use mountain habitats for at least one critical period of their annual life cycle (breeding, migration or winter). In addition to the specialist and generalist birds breeding in mountains, many birds use high elevation habitats for stopovers during fall migration. One quarter of these species are on lists of conservation concern. Temperate mountain birds are considered to be particularly vulnerable to climate change impacts in the short term given the increasingly variable temperature and precipitation regimes, and also from habitat loss or change in the longer term. I examine the potential impacts of environmental variability for the reproduction and survival of grouse and songbirds in mountain habitats. Factors enabling birds to cope with climate change include

flexibility in their reproductive phenology and behaviour, as well as a shift towards a slower life history. However, species differ in their abilities to cope with more variable seasonality, and thus even congeneric and sympatric species experience different reproductive outcomes after storms and extreme delays in breeding. Climate change models predict habitat losses will exceed gains, and alpine patches will decrease in number and size likely resulting in higher costs to conduct seasonal and dispersal movements. As climate change is only one of multiple stressors, the potential of birds to adapt to changing climates will depend on the extent to which their adaptation abilities are constrained by other disturbance processes. Understanding the life history and year-round ecology of species will be critical to predicting responses of mountain birds to climate change.

Contact Information: Dept. of Forest and Conservation Sciences, the University of British Columbia, Vancouver British Columbia, V6T 1Z4. Kathy.Martin@ubc.ca

Home Page: http://profiles.forestry.ubc.ca/person/kathy-martin/

Centre for Alpine Studies: http://alpine.forestry.ubc.ca/

Andrew E. Derocher, Professor, University of Alberta

Andrew E. Derocher is a Professor of Biological Sciences at the University of Alberta, Edmonton, Canada. He holds a B.Sc. in Forest Biology (Hon.) from the University of British Columbia and a M.Sc. and Ph.D. in Zoology from the University of Alberta. After graduating, he worked with Environment Canada, B.C. Ministry of Forests, and then the Norwegian Polar Institute before returning to Canada. Andrew is a member and past chair of the IUCN/SSC Polar Bear Specialist Group. His research has studied polar bears across the Arctic over the past 35 years. Andrew has published >100 peer reviewed papers on polar bear ecology, ecotoxicology, and the effects of climate change.

Title: *An accidental icon: climate change and polar bears*

Abstract: Habitat loss is the major threat facing ursids across their range and in the Arctic, rapid warming has fundamentally altered and degraded polar bear (*Ursus maritimus*) habitat. Polar bears are an accidental icon and became the poster-species for climate change because long-term monitoring revealed the links between sea ice loss and population impacts. The changes in polar bear life history are influenced at several life history points. Energy stores are the primary affected link and the key to understanding the effects of habitat loss on polar bears lies on the balance between energy intake and energy use. Energy use is influenced by habitat conditions and ice-free period duration. Past monitoring of polar bears focussed on abundance estimates, yet the inventory intervals have failed to evolve to the changing ecological conditions. As the Arctic sea ice ecosystem disappears, a new one is emerging, but polar bears are unlikely to retain their top predator status in much of their current range.

Diana Stralberg, Research Scientist, University of Alberta

Diana Stralberg is a research scientist at the University of Alberta, working with the AdaptWest Project for climate-change adaptation and the Boreal Avian Modelling Project. Her work has primarily focused on predictive modelling and multi-species conservation planning questions at multiple scales, from landscape to continental, with an emphasis on climatic drivers and responses to climate change. Her recent research has involved the development of avian abundance models for the boreal region, which she has used to develop future projections of climatic suitability, and to identify potential refugia from the effects of climate change. She has also worked on modeling vegetation responses to changes in climate and wildfire activity in the western boreal region. Her current focus is on understanding the landscape features and ecosystem characteristics that confer resilience to climate change in the rapidly changing boreal region. Prior to moving to Alberta in 2010, she worked as a researcher at Point Blue (founded as the Point Reyes Bird Observatory) in California. She holds a BS from UCLA, an MS from the University of Michigan, and a PhD from the University of Alberta.

Title: *Conservation and management of western boreal birds in a changing climate: What do we expect, what have we observed, and what do we do about it?*

Abstract: Climate change is expected to bring rapid and dramatic changes to the boreal forest region of North America, challenging boreal birds and other organisms to keep pace by adapting in place or tracking changing environmental conditions. The magnitude of expected change means that bird conservation and management activities must consider increasingly larger geographies, often spanning multiple jurisdictions. This creates new challenges for conservation research, as scientists struggle to address broad-scale ecosystem transitions across large geographies while also addressing local and regional management needs. Conservation planners and managers are also confronted with high-stakes decisions and trade-offs, given large remaining uncertainties. This begs the related questions: “What are anticipated direct and indirect consequences of climate change on boreal bird populations and communities? What changes have been observed to-date? and How does this information influence conservation planning and management decisions?” With an emphasis on Alberta and the western North American boreal region, I will review results from various types of predictive modeling efforts, including correlative niche models as well as landscape change simulations. I will compare these results with new population trend estimates and present a recently developed vulnerability-adaptation framework to guide bird conservation based on species’ individual vulnerability and exposure to climate change. Finally, I will address ways in which climate-change information and predictions can be synthesized to inform conservation and management of boreal species.

Kathreen Ruckstuhl, Professor, University of Calgary

From left to right: Brigitte Reuter (assistant), ram lamb 369, and Kathreen Ruckstuhl

Kathreen Ruckstuhl: I have studied the behaviour and ecology of ungulates for the past 30 years, from work on alpine chamois (MSc), and bighorn sheep (PhD) to a variety of species including ibex, chamois, gazelles, goral, wild and feral sheep, deer, oryx, equids, etc. Since June 2004, I have been a professor for wildlife ecology, department of biological sciences, at the University of Calgary. While my main research focus is on the behaviour and ecology of wild ungulates, my students, collaborators and I, have also worked on rodents of all sorts, fish, canids, and not to forget, their parasites. What I particularly love about my profession is the possibility to gain a deep understanding of an individual's behaviour and life history, and more directly to be with and observe these magnificent animals in the wild. My long-term (26 years) research on individually marked bighorn sheep in Sheep River Provincial Park allows me to follow each individual's ontogeny of behaviour in greatest detail, from their first summer as lambs to the time they disappear or die. Over the decades, I have worked both on applied and fundamental studies, investigating human impacts, climate change, behaviour and sociality in a variety of species, and on different continents. We have explored the impact of social networks on individual survival and LRS, group dynamics and sexual segregation, cooperation, feeding ecology, decision-making, mate choice and mating tactics.

Title: *Of hosts, parasites, migration and climate change: what can long term studies tell us?*

Abstract: My talk will be a synthesis of various research projects, focusing on the behavior and ecology of wild sheep but also some recent research on parasites and climate change. Long-distance seasonal and breeding migrations are very common in many species of insects, birds, fish, and mammals. While most of these migrations are undertaken to track the phenology of food and water, and to avoid predation on neonates, or parasites, many species also have partial breeding migrations in search of potential mates. During the breeding season, some of the Rocky Mountain bighorn sheep (*Ovis canadensis canadensis)* who winter in Sheep River Provincial Park remain with their natal subpopulation, while others migrate to breed elsewhere. Rams often go on breeding migrations, but we have observed that a subset of ewes also leaves their range to breed elsewhere. The purpose of this study was to determine the proximate and ultimate causes of breeding partial migration. The second part of my talk will concentrate on parasites and how they can affect the behavior and ecology of their hosts, from affecting body condition, sociality to behaviour. Lastly, I will briefly talk about climate change and what potential problems that will entail in regard to parasites and their hosts, and conclude with a remark on the importance of long-term research on marked individuals.

Geoff Holroyd, Chair, Beaverhill Bird Observatory

Dr. Geoff Holroyd's interest in birds developed as a teenager when he was an active volunteer and subsequently, chairman of the Long Point Bird Observatory. He earned his MSc and PhD from the University of Toronto for his studies of the foraging strategies and diet of swallows. During his 36 year career with the Canadian Wildlife Service he supervised Ecological Wildlife Inventories of Banff, Jasper, Kootenay, Glacier and Mt Revelstoke National Parks, and was Head of the Threatened Wildlife Section; then as a research scientist he studied Burrowing Owl and Peregrine Falcon and chaired their Recovery Teams. He was an adjunct professor in the Department of Renewable Resources at the University of Alberta. He is now chair of the Beaverhill Bird Observatory which he co-founded in 1984. During his variety career he has published articles as diverse as Green Sea Turtle biology to dung beetles in the diet of Burrowing Owls.

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Title: *Avian Passerines on the Move*

Abstract: As our climate changes and becomes more volatile, the effect on small birds varies considerably. While average annual temperatures are warming in Alberta, the seasonal and even monthly changes are more important than the annual average. Averages mask variability particularly for temperature which is getting warmer faster in the winter than it is in the summer. This presentation will present species trends from 50+year databases that show Mountain Bluebirds are arriving earlier, Tree Swallows are nesting later and less successfully, Purple Martins appear to be dispersing westward and severe weather event are negatively impacting a variety of avian species, including burrowing owls and peregrine falcons.

Co-authors: Myrna Pearman and Glen Hvenegaard

Contact Information: Dr. Geoff Holroyd, Beaverhill Bird Observatory (retired EC Research Scientist), 54, 51520 Range Road 200A, Beaver County, Alberta, T0B 4J1. Email: geoffholroyd@gmail.com

SPECIAL PRESENTATION

Sarah Milligan, Wildlife Biologist, Integral Ecology Group

Sarah Milligan is a wildlife biologist with a budding interest in landscape ecology. She received a B.Sc. and M.Sc. in Conservation Biology from the University of Alberta. After graduation she worked on research projects investigating the effects of industry on grizzly bear and caribou habitat in west-central Alberta. She has also worked as a wildlife biologist with the Government of Alberta in various capacities on several wildlife projects. Sarah recently began working with IEG to assist clients interested in applying landscape simulations to understand cumulative effects and inform land use and conservation planning. When not working she loves to explore non-simulated landscapes near and far with her husband and their two dogs.

Title: *Cumulative Effects of Land Uses and Conservation Priorities in Alberta's Southern East Slopes*

Abstract: Alberta's Southern East Slopes of Alberta are rich in both natural resources and biodiversity, including habitat for several threatened species. In recognition of the region's ecological value, watershed management and headwater protection has been identified as the region's highest priority. Using scenario analysis, the goal of this study was to explore the cumulative effects of land use and climate change in the Southern East Slopes in order to provide guidance on implications to valued ecosystem components and to explore conservation priorities, with a focus on threatened trout species. Our analysis prioritized watersheds based on the cost-effectiveness of protection, where cost was interpreted as natural resource sector GDP and effectiveness was interpreted as reduction in risk to trout. A business-as-usual scenario demonstrated substantial risk to bull trout and westslope cutthroat trout and negative impacts to indicators of hydrology, water quality, and intact land cover. Protection scenarios suggested that the environmental benefits are greatest and the economic costs of protection are lowest in the western portion of the study area. Expanding the protected areas network in the western portion of the study from 30% (current level of protection) to 40% resulted in a sharp improvement in trout sustainability indices. As a first step towards understanding conservation challenges and opportunities in Alberta's Southern East Slopes, our findings suggest conservation efforts should be focused on western catchments to maximize benefits and minimize costs.

SESSION 2A

COMPARING METHODS

Saturday, March 14 14:00 – 15:00

Estimating Feeding Relationships of Sharp-Tailed Grouse Using Stable Isotopes

Sejer Meyhoff, Dan Johnson, Ben Ellert, and Katelyn Lutes

Stable isotopes of a consumer organism can be used to estimate the proportional utilization of food items that have different isotopic signals and can also be used to estimate changes to diet over time. Using stable isotopes as biotracers in ecological research has become a useful tool for investigating trophic dynamics in animals and ecosystems. There have been many recent advances in stable isotope theory and modeling that have extended the utility of natural abundance stable isotope data. However, as a growing field there are many approaches to using stable isotopes that remain untested. In this study stable isotopes of nitrogen (δ 15N) and carbon (δ 13C) were used to validate their utility in examining the feeding relationships of plains sharp-tailed grouse (Tympanuchus *phasianellus jamesi*) in southern Alberta. Sharp-tailed grouse are known to consume mostly plant food and opportunistically utilize insects and spiders as a high protein food source during the warm season. Primary feathers obtained from hunter harvested grouse were analyzed and used to estimate diet proportions of plant foods and arthropods from May to October. Results indicated that sharp-tailed grouse may primarily be utilizing nutrients obtained from grasshopper prey for feather synthesis during molt. However, model uncertainty existed due to a wide range of δ 13C values in plant foods. This research points towards the utility of compound-specific isotope analysis, rather than the two-tracer model used here, for future investigations into the feeding relationships of omnivorous birds.

Biosketch: Sejer Meyhoff is a graduate student at the University of Lethbridge and is in the final stages of completing an MSc supervised by Dr. Dan Johnson. Sejer is interested in ecological research related to wildlife, disturbance, trophic dynamics, and ecosystem function.

Estimating Density of Wildlife with Camera Traps – Spatially Explicit Capture-Recapture and Time in Front of the Camera

Camille Warbington, Megan Brownlee, and Mark Boyce

In recent years, camera traps have become ubiquitous for estimating density of wildlife populations. Researchers frequently use spatially explicit capture-recapture (SECR) models of density, whether in a maximum likelihood (ML) or Bayesian framework. However, not all wildlife populations "fit" SECR assumptions and model requirements. Time in front of the camera (TIFC) is another method for density estimation that does not have the same limitations and assumptions as SECR. While SECR density estimates are widely published, we are unaware of any that compare SECR results to TIFC estimates. Sitatunga, a wetland specialist African antelope, has ecological requirements and behaviour that do not align with SECR assumptions. We present results on density estimates from ML and Bayesian SECR models, as well as TIFC methods. Our results show that sitatunga density estimates from TIFC are comparable to SECR estimates, without the same model limitations. We suggest TIFC as an alternative to SECR when the species in question violates assumptions or is otherwise unsuited to density estimation with SECR.

Biosketch: Camille has a BS in Forest Resources from the University of Georgia and an MS in Wildlife Ecology from the University of Wisconsin - Madison. Her PhD research focuses on the

ecology of sitatunga, an understudied and economically valuable wetland-specialist African antelope species.

Do You Only Get What You Pay For? Comparing Low-cost Recording Units to the Field Standard
Tyne Baker
Digital bioacoustical surveys have been on a slow rise as the devices get technologically better, user-friendly, more portable, and more affordable. Bioacoustical research papers with a focus on audible-range species (birds, frogs) have been rife with the "Song Meter" brand from Wildlife Acoustics (WA) for a decade now. In recent years, more affordable units have burst on to the market. I put the new AudioMoth, a low-cost open-source contender from Open Acoustic Devices, head-to-head against the industry standard Song Meter from Wildlife Acoustics in a playback study under real-world field conditions. Pulling from these data, experience with these models, and other literature, I will discuss the differences, strengths, and relative performance of these units. My goal with this talk is to provide specifics and realities of these devices for those looking to wisely allocate their funds, while still acquiring the appropriate tool for their own unique survey plan.
Biosketch: Tyne has been digitally eavesdropping on animals for over a decade. She holds a MSc from the University of Windsor focused on Animal Communication and Ecology. As the owner of A/Vian Eco her goal is to help organizations implement remote audio/visual detection technology in a scientifically rigorous and practical way.

Five Years of Monitoring Mammals in Alberta by Remote Camera: Current Applications and Future Directions
Marcus Becker, Shannon White, Stan Boutin, Jim Schieck, David Huggard, and Robert Serrouya
The Alberta Biodiversity Monitoring Institute (ABMI) tracks changes in Alberta's wildlife populations and their habitats in order to provide ongoing, relevant, and scientifically credible data and information. Beginning in 2015, the ABMI began monitoring mammals throughout the province using remotely deployed cameras. Since then, over 3,000 individual ABMI camera deployments have captured nearly 20 million images, which includes data on 42 native mammal species.
In this talk, an overview of the ABMI's remote camera data collection efforts to date will be provided, including a description of a new environmental sensor platform, Wildtrax, which is now used to process, tag, and organize the images that are collected. We will then walk through how these images are used to calculate animal density as an index of relative abundance, which provides the basis for the development of models of habitat association for each species and spatial predictions of relative abundance throughout the province. These scientific products help to quantify the impact of human land use on mammal populations. Using the example of moose, we demonstrate how density estimates derived from cameras compare to traditional aerial survey estimates.
This comprehensive dataset represents a valuable resource for ecological research and management of wildlife in the province. We will conclude the talk with a demonstration of new open-source tools currently under development to allow for increased interaction and use of the data by external groups, including the estimation of mammal density for user-derived areas of interest.
Biosketch: Marcus Becker is an applied data scientist with the ABMI and handles a wide array of mapping and statistical analyses related to biodiversity in the province. He graduated from the University of Alberta in 2016 and has been plying his trade at the ABMI ever since.

SESSION 2B

SHARING THE LANDSCAPE (I): ECOLOGY OF HUMAN INFRASTRUCTURE

Saturday, March 14 14:00 – 15:00

From Butterflies to Bears: Developing standards for road ecology across Canada

D.L. (Dee) Patriquin and Alex Zeller

Road ecology has developed as a new field of study over the past several decades, as interest has grown about the effects of transportation networks on adjacent natural ecosystems. Alberta has been a front-runner in this field, developing large animal crossings in Banff National Park, but other innovations have emerged globally to manage roadside habitats, and the species that use them, as unique ecosystems. As part of a scan of Canadian Best Management Practices, currently underway for the Transportation Association of Canada, we have reviewed measures used to address terrestrial ecological issues affecting Canada's road systems, from coast to coast to coast in both rural and urban contexts, and including the Canadian North. This preliminary review highlighted a range of management issues, including wildlife collision, restoration of connective habitats, management of pollinator habitat, natural vegetation, and climate change impacts such as permafrost warming and habitat change. Our presentation on the early results of this review will discuss the suite of issues transportation agencies are currently facing across Canada and highlight some of the innovation solutions emerging to manage these concerns.

Biosketch: Dee is an interdisciplinary scientist with 30 years of experience in environmental assessment and management in governmental, industrial and urban development sectors. Her background in wildlife biology, environmental science and policy has supported her work in regulatory approvals, environmental assessment, and policy development.

Assessing the Impacts of Threats to the Survival of the Plains Sucker (Pantosteus jordani) in the Milk River

Taylor MacLeod, Mark Poesch, Eva Enders, Doug Watkinson, and Keith Tierney

The Plains Sucker is a newly identified species of catostomid that is considered "threatened" by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in part of its Canadian range in southern Alberta and Saskatchewan. It resides in a connected series of streams and rivers known as the Missouri drainage, which eventually empties into the Gulf of Mexico.

Waterway infrastructure is considered by COSEWIC to be one of the largest threats to the Plains Sucker's survival. During spring and summer melt, 20m^3/s of water is transferred from the St. Mary River into the Milk River of the Missouri Drainage. A swim tunnel was used to examine the Plains Sucker's ability to maintain position at increasing water velocities. Measurements of fecundity and length/weight-at-age were used to assess evidence of an energetic trade-off among life history characteristics. These tests and results are compared between the augmented Milk River and waterbodies that do not experience augmentation.

The experimental measurements of this project, and life history measurements taken from the fish collected, will contribute to filling large knowledge gaps on this species in Canada and provide focus for recovery planning measures to preserve the Plains Sucker in its natural habitat.

Biosketch: My name is Taylor, I'm a second year PhD student at the University of Alberta. I did my undergrad at the University of Calgary before moving to Edmonton to pursue graduate studies.

Railway Mortality for Several Mammal Species Increases in Areas with Poor Sight Lines and Escape Terrain

Colleen Cassady St. Clair, Anne Forshner, Aditya Gangadharan, David Laskin, and Jesse Whittington

Railways are an important source of direct mortality for many populations of large mammals, but unlike roads in this context, have been little studied or mitigated. We evaluated temporal and spatial factors affecting mortality risk using 646 railway morality incidents collected over 24 years through Banff and Yoho National Parks where train strikes have become a leading cause of mortality for grizzly bears. The spatial analysis compared topographic and land cover attributes of mortality locations to paired random locations at three spatial scales for three guilds: bears, other carnivores, and ungulates. We ranked variables by summed model weights across guilds and scales. Mortality risk generally increased in areas with high track curvature, lower forest cover, near water, and near roads. Mortality risk was moderately correlated with maximum posted train speed and topographic complexity. Factors affecting mortality risk varied across guilds but not spatial scales within guilds. Mortality rates were highest in winter, spring, and early summer for ungulates, other carnivores, and bears respectively. Mitigations to reduce mortality risk could focus on areas near where wildlife have poor escape terrain, especially near water, and areas with poor sight lines.

Biosketch: Colleen Cassady St. Clair is a professor of Biological Sciences at the University of Alberta. She and her students use emphasize studies of animal behaviour to address problems in conservation biology and wildlife management. This presentation stems from a long-term collaborative project supported by Parks Canada and Canadian Pacific.

Spatial Distribution and Factors Affecting Anthropogenic Cougar Mortality in Alberta

Alexa C. MacPherson, Paul Frame, Delaney Frame, Mark Edwards, Owen M. Slater, and Andrew E. Derocher

We reviewed three years (2016-2019) of Alberta cougar mortality data to evaluate spatial relationships of cougar mortality with anthropogenic, landscape, and terrain features. Location data of deceased cougars (n=230) was collected and examined using landcover variables. Mortality distribution models were created using resource selection functions at the home range scale. A global mortality distribution model was created using all mortality events of varying age and sex. Distance to roads, industrial areas, water, and forest cover were associated with increased mortality risk, while distance to linear features and agriculture negatively predicted mortality. Mortality distribution models were created for each type of mortality (hunting, road, landowner and trapping) and by sex. Hunting mortality (n=86) was positively predicted by terrain ruggedness and distance to water features and negatively predicted by distance to industrial areas. Males had an increased mortality risk closer to roads than females. Road mortality (n=23) was positively predicted by adjacency to road and water in forested areas and did not vary by sex. Landowner (n=77) mortalities were positively predicted by distance to industrial areas and roads. Males had an increased mortality risk closer to linear features. Lastly, trapping mortality (n=47) was positively predicted by distance to water in forested areas for both sexes. Our models demonstrate that cougar mortality can be predicted by spatial features and highlights areas of increased mortality risk by sex. Our results provide implications of how landscape features influence mortality events across the landscape and have application to reduce human-wildlife conflicts and mitigate unnecessary cougar mortality.

Biosketch: Alexa is a second year master's student at the University of Alberta studying cougar mortality and habitat fragmentation in Alberta, Canada. She graduated from Trent University with a

bachelor's degree in Ecological restoration and a Restoration technician diploma from Sir Sandford Fleming College.

SESSION 3A

A SHIFTING CLIMATE: CHANGES IN ENVIRONMENTAL AND SOCIAL CONDITIONS

Saturday, March 14 15:15 – 16:00

A Hill Has Many Faces: The influence of topography on microclimates, vegetation and boreal songbirds

Cesar Estevo, Diana Stralberg, Scott E. Nielsen, and Erin M. Bayne

Climate change in the boreal forest is expected to shift species' climatic envelopes northward and upslope, placing many forest-dwelling species at risk of local extirpation. However, topography may buffer microclimates from warming and allow temperatures to deviate from the surrounding matrix, for example through topographic shading that moderates incoming solar radiation. These locally cooler areas may serve as refugia and/or steppingstones for plants and associated wildlife. Though our understanding of topographic refugia has advanced in the last decade, implications for wildlife management remain relatively unexplored. We explored the influence of topography on boreal songbirds and vegetation to disentangle and evaluate the strength of topographic variation to accommodate species' microclimate requirements. We assessed species-specific responses to fine-scale topographic variation by using a combination of species distribution modeling, generalized linear mixed models and regression trees to explore the influence of terrain characteristics on boreal songbirds and trees occupying four hill systems along a latitudinal gradient in Alberta, Canada. We found that temperature differences among locations were mostly driven by elevational gradients and topographic indices such as heatload (solar radiation). We also found that bird and tree models improved substantially by the inclusion of topographic indices, which are in turn associated with local differences in temperature. For example, models that included topographic variables were the most supported (Δ AICc < 2) for 9 out of the 14 bird species analyzed. Our results provide insights into the strength of topographic refugia from climate change and the extent to which they contribute to climate-smart conservation

Biosketch: I am a PhD student passionate about wildlife and their world. My research focus on identifying and quantifying potential climate change refugia for birds in the boreal forest of western Canada.

Elucidating the Distribution of a Non-native Species of Katydid in Alberta Using Bioacoustics

Alexandre Caouette and Dr. Kevin Judge

Accumulating evidence has shown that climate change is causing shifts in the distribution of many species. For species that produce audible vocalizations, bioacoustics may provide a useful tool to better understand how animals are responding to the pressures of climate change. Recently, *Roeseliana roeselii*, a species of Orthoptera native to Europe, was discovered near Edmonton, Alberta, outside of its naturalized range in Eastern North America. This discovery presents a unique opportunity to elucidate the provincial distribution of *R. roeselii* by using automated audio recognition software. This project uses Songscope to sort through province-wide field recordings from the Alberta Biodiversity Monitoring Institute (ABMI) looking for the auditory calls of *R. roeselii* in Alberta. Over the summer, I recorded R. roeselii individuals to create a recognizer. Using this recognizer, I am

sorting through the ABMI recordings to look for additional records of *R. roeselii* and map the species' distribution. This project will lay the groundwork for research looking into both the range expansion of *R. roeselii* and geographic distributions of other acoustic insects in North America.
Biosketch: Alex was born and raised in Edmonton. He is currently completing his undergraduate honour's degree at MacEwan University in biology. In his free time, he likes catching, reading, and learning about insects.

The Human Dimensions of Waterfowl Hunting Participation: Understanding Albertan waterfowl hunting retention, recruitment, and reactivation.
Howie Harshaw
Waterfowl hunting plays important roles in the conservation of waterfowl species and wetlands. A challenge facing waterfowl hunting associations, and waterfowl and wetlands managers across North America, is the decline of participation in waterfowl hunting. This presentation highlights preliminary analyses of a survey administered to current-, lapsed-, and non-hunters in Alberta to understand factors that contribute to hunting participation, lapse, and non-participation. This study is part of a larger program of research examining the recruitment and retention of waterfowl hunters in the Prairies to document patterns of hunting participation in Alberta. Preliminary results suggest that social aspects of waterfowl hunting are particularly valued. Current hunters have a history of waterfowl hunting in their family and expressed willingness to mentor family members or friends in the activity. Mentorship programs seem to provide short-term benefits as people that have been mentored are likely to participate in the next year's hunt. The majority of lapsed hunters consider waterfowl hunting to be a worthwhile activity and would support family or close friends taking up waterfowl hunting; their reasons for not continuing hunting include life changes and regulatory complexity. Few non-hunters indicated a desire to take up waterfowl hunting and did not cite incentives that would get them to do so; few non-hunters would be supportive of close friends or family member taking up the activity. Moral opposition, the cost of equipment, access to fire arms and lack of knowledge were among the reasons for non-participation in waterfowl hunting.
Biosketch: Dr. Howie Harshaw is an associate professor in the Faculty of Kinesiology, Sport, and Recreation at the University of Alberta. He examines the human dimensions of natural resources, to understand the relationships that people have with nature, and to investigate the interactions of resource development and quality of life.

SESSION 3B

SHARING THE LANDSCAPE (II): WILDLIFE IN HUMAN ENVIRONMENTS

Saturday, March 14 15:15 – 16:00

A 20-Year Retrospective 0f Aversive Conditioning 0f Grizzly Bears in Kananaskis Country, Alberta, Canada.
John Paczkowski, Claire Edwards, Jay Honeyman, and Derek Ryder
Aversive conditioning (AC) is a management tool employed in the Parks and Protected areas of Kananaskis Country, Alberta, for over 20 years. The program applies different conditioning stimuli to grizzly bears to change behaviour and maintain public safety. We discuss the context, evolution and operational requirements of the program. We reviewed over 8,000 grizzly bear AC records collected between the 2000 and 2019. Most of the over 30 grizzly bears involved in the program were

habituated female grizzly bears that demonstrated a strong fidelity to the facility zone, an area of high human visitation and recreational infrastructure. Juvenile and young bears typically required more AC actions, while conditioning frequency diminished with age. None of the bears involved in the aversive conditioning program were involved in a serious human wildlife conflicts causing human injury or death. The AC program has also reduced the need for local facility closures and management removals of bears, which may contribute to greater reproductive success. Bears that left the operational area of the aversive conditioning program, specifically protected areas, were often subject to a higher frequency of management actions and removals. We will discuss the efficacy of different noise, projectile and contact projectile stimuli as well as the use of Karelian Bear dogs. The Kananaskis AC program is a model of how management actions can achieve both public safety and conservation objectives in a high recreational use landscape specifically parks and protected areas.

Biosketch: John is a park ecologist with Alberta Environment and Parks working out of Canmore Alberta. For over 25 years John has been involved in carnivore research and management in Canada and internationally, with a keen interest on understanding and reducing human wildlife conflicts.

Poor-Quality Diet Correlates with Increased Echinococcus multilocularis Infection in Urban Coyotes (Canis latrans)

Deanna Steckler, Scott Sugden, Dana Sanderson, Arya Horon, Kyra Ford, and Colleen Cassady St. Clair

Urban environments can influence parasite transmission and prevalence by altering the diet, distribution, abundance, and behaviour of wildlife. As generalists, coyotes (*Canis latrans*) may be susceptible to changes in parasite prevalence due to their tendency to aggregate where food is abundant and to eat anthropogenic food resources. Past work has shown that urban coyotes foraging at compost sites have increased rates of single-host parasite infection, which could stem from greater exposure to infected conspecifics and/or greater susceptibility to infection resulting from decreased immune function and poor-quality diet. However, it is unknown if multi-host, trophically-transmitted parasites are also more likely to infect coyotes that consume low-quality anthropogenic food. *Echinococcus multilocularis* is a multi-host zoonotic tapeworm of growing concern in Alberta and the cause of potentially fatal alveolar echinococcosis in humans. Our objective was to determine if coyotes that consumed anthropogenic food were more likely to be infected with *E. multilocularis*. Using donated coyote carcasses, we compared stomach contents with and without infection by *E. multilocularis* (determined molecularly by PCR) by categorizing stomach contents by prey, vegetation, and anthropogenic food that was either digestible (e.g., fruit) or indigestible (e.g., wrappers). There was little difference in prey and vegetation between infected and uninfected coyotes. However, digestible anthropogenic food constituted a higher proportion of uninfected coyote diets and indigestible food was significantly more abundant in infected coyote stomachs. We speculate that this association could be caused by aggregation at sites with abundant garbage, immune system degradation from poor-quality diets, and/or physical damage to intestines.

Biosketch: Following a BSc from MacEwan University, Deanna is completing her graduate thesis as part of the Edmonton Urban Coyote Project. Her research is exploring how the ecology and behaviour of urban coyotes may influence the transmission and prevalence of zoonotic tapeworm parasites, *Echinococcus multilocularis*, within the City of Edmonton.

Do Fireworks Impact Bat Activity?

Brendan Roy

Previous studies of bat responses to anthropogenic disturbance have focused on relatively chronic impacts, including traffic and natural gas compressor noise. This study seeks to determine if firework displays disturb bat activity. Generally, such displays produce relatively high-intensity bursts of noise - exceeding the disturbance volume (dB) threshold reported in previous studies - over a relatively short duration of time. Insectivorous bats rely exclusively on echolocation to forage. Consequently, increasing encroachment of anthropogenic noise can mask prey echoes and cause bats to avoid otherwise suitable habitats. To test this hypothesis, acoustic data were collected before (3-5 nights), during (5-25 minutes), and after (3-5 nights) firework displays (n = 3) June-August 2019 at various city parks, or similar city-adjacent areas, in southern Alberta using AudioMoth recording devices. Acoustic data (total mins/total pulses) were analyzed using Kaleidoscope Pro software to determine species presence and levels of bat activity (detections/minute) for each sampling period. Data analysis will determine if firework displays reduce bat activity. The expected findings may increase awareness of potential anthropogenic impacts that may compound ongoing threats to bat conservation, such as wind turbine associated mortality and the spread of white-nose syndrome. Processing of results is ongoing and will be presented at the conference.

Biosketch: My name is Brendan Roy; I am currently earning my bachelor's degree in ecosystem management. I have lived in Lethbridge, Alberta for nearly six years. I am very fond of entomology and the conservation of species at risk. In addition to my academic path, I am an active musician.

SYMPOSIUM

THE ROLE THAT HUNTING, TRAPPING, AND FISHING CAN PLAY IN HELPING US UNDERSTAND WILDLIFE MOVEMENTS AND CONSERVATION

Lee Foote, Professor, University of Alberta

Lee Foote is an applied ecologist who uses scientific approaches for solving real-world problems. He holds degrees in Forestry, Wildlife Management and has a PhD in Wetland Ecology from Utah State University

He has been a professor of Conservation Biology at the U of A for 21 years and his publications and his student's topics range from wetland reclamation to Botswana biodiversity, to Nunavut peregrine falcon habitat to philosophy of wildlife use.

Lee is an avid photographer, hunter, and folk musician. He is married to Dr. Naomi Krogman, Dean and environmental sociologist at Simon Fraser University. Lee retires on 30 June and moves over to join her. They have two daughters, a Labrador retriever, and a house for sale.

Brad Stelfox, Landscape Ecologist, ALCES Group

Dr. Brad Stelfox started the ALCES modeling platform and Group in 1995, which focuses on the interface between human land uses and regional landscapes. The major development stream has been **ALCES Online**© (A Landscape Cumulative Effects Simulator) a simulator rapidly gaining acceptance by government, industry, the scientific community, and NGOs to explore issues between landscapes, land uses, and ecological and economic integrity. Today, the ALCES Group is a collection of ecologists, landscape planners, and resource analysts whose mission is to be a world leader in the delivery of land use cumulative effects simulation modelling tools, strategic land use planning advice, and the provision of practical strategies to assist government, business, and society in making balanced, informed decisions.

Dr. Stelfox received the William Rowan Award (The Wildlife Society) in 2011, the Outstanding Leadership Award of the Canadian Boreal Initiative (2009), the Alberta Emerald Foundation Award (2004), and the Alberta Science and Technology Award (2003) for his contributions with the ALCES model in advancing understanding of land use sustainability issues, and in seeking solutions that balance economic, social, and ecological indicators.

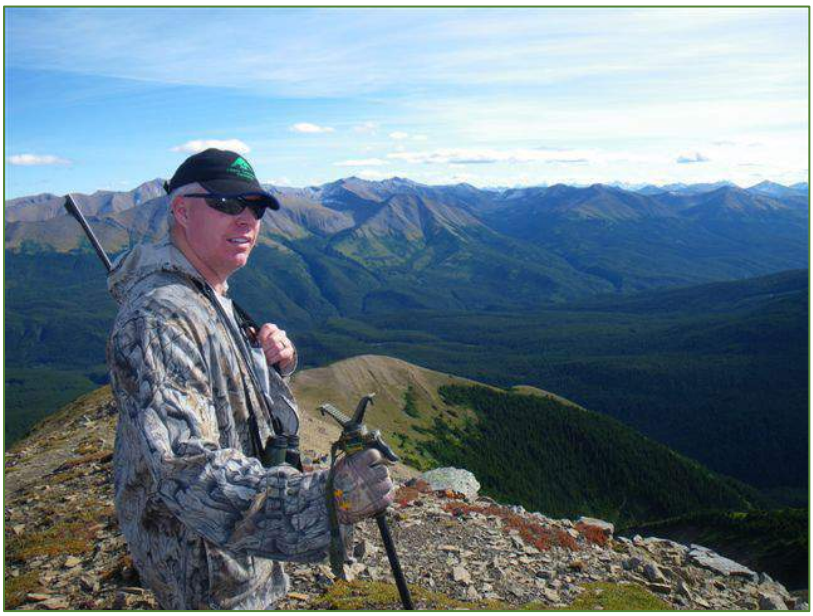
Dr. Brad Stelfox is an adjunct professor at the Department of Biological Sciences, University of Alberta and. He and his wife Sarah live in Calgary.

Matt Besko, Director of Wildlife Policy, Alberta Environment and Parks

Matt Besko is currently the Director of Wildlife Policy for Alberta Environment and Parks, Resource Stewardship Division. During the course of his career, he has worked as a Landscape Ecologist, Wildlife Habitat Biologist, Game Biologist, Species at Risk Specialist, and Director of Fisheries Policy over a period of 27 years in 3 Provinces. He is especially interested in wildlife ecology, conservation of forested landscapes, and the management of game species. He dabbles in the philosophy of human-dimensions in wildlife management and the concept of wildness, as well as the practical application of novel approaches to wildlife allocation and use.

Matt lives in Edmonton with his family and Scouty the Longhaired Weimaraner, and when not working he is reading, writing, hunting, bbq'ing meats of many origins, and eating. Especially eating.

Todd N. Zimmerling, President and CEO, Alberta Conservation Association



Todd Zimmerling has an undergraduate degree in zoology from the University of Alberta and an M.Sc. and PhD. in population ecology from the University of British Columbia. He is a Professional Biologist with 29 years of experience working on a wide range of wildlife and fisheries related projects across western and northern Canada. In 2007, after 14 years as an environmental consultant, Todd took over the role of President & CEO of the Alberta Conservation Association (ACA), where he oversees a staff of 85 dedicated conservation professionals. In his spare time Todd enjoys hunting and fishing with family and friends.

SESSION 5A

MANAGING FOR CARIBOU RECOVERY

Sunday, March 15 10:30 – 12:00

Moving Genes Around: Considerations for caribou breeding and translocation programs

Maria Cavedon, Bridgett vonHoldt, Elizabeth Heppenheimer, Jan Adamczewski, Troy Hegel, Lalenia Neufeld, Hellen Schwantje, Jessica Theoret, and Marco Musiani

Various caribou populations are declining in and outside protected areas. For example, caribou herds located in Jasper National Park (JNP) are at the quasi-extinction threshold mainly as result of wolf predation. Ecological conditions are now improving, and a breeding program could be considered, along the limited recovery options, to provide a reliable source of caribou for herd augmentation. Some source populations have been identified, so far based on ecological and genetic data, but limited to neutral molecular markers. Genomic studies, based for example on Single Nucleotide Polymorphisms (SNPs – including non-neutral marker too), can provide critical information, also accounting for actual genes in both source and captive bred stocks. We examined 30,000 SNPs across caribou herds, also including JNP, distributed throughout western Canada. Caribou were grouped in two main clusters, following a geographic separation further south than the currently accepted boundary between the barren-ground and woodland subspecies. Secondly, herds belonging to the southern group were clearly separated in boreal vs. mountain. Moreover, we detected genes under selection within each caribou group. Some of these genes were found to be linked to morphological characteristics, migratory behavior, and to habitat-selection and climatic factors. These findings suggest that specific mutations, resulting in different behaviours and ecologies, are maintained within caribou groups. Overall, we detected genetic mutations that any conservation plan needs to consider. Moving alien animals in areas with locally differentiated genes could have detrimental consequences. We therefore interpret our results in view of caribou breeding programs and evaluate applications to other threatened species.

Biosketch: Maria did her undergrad on Forestry at Padua University (Italy), a master's on Wildlife Management and Conservation also at Padua University. Then, she worked for the Adamello Brenta Nature Park on various species and now is a PhD candidate at the University of Calgary focusing on caribou conservation genomics.

Recovery Actions for Woodland Caribou: Predicting and testing the efficacy of habitat restoration

Melanie Dickie, Scott McNay, Glenn Sutherland, Geoff Sherman, and Michael Cody

Anthropogenic habitat alteration via land conversion reduces habitat availability and disrupts ecological processes. Western Canada's boreal forest has undergone rapid landscape change as a result of human expansion and resource development. Resulting habitat loss and alteration is hypothesized to be the ultimate cause of boreal woodland caribou declines, one of the most high-profile species at risk in Canada's boreal forest. While a variety of recovery actions are being employed to recover caribou populations, habitat restoration has been identified as a necessary and important management tool. Restoration is required to restore ecological processes to address the ultimate cause of caribou declines, habitat loss and alteration, as well as the proximate cause, unsustainable predation rates as a result of human-mediated changes to predator-prey dynamics. While the importance of conducting habitat restoration is clear, the effectiveness of restoration treatments is not well understood. Given the spatial extent of these disturbances and the cost of

habitat restoration treatments, it behooves researchers and managers to predict and monitor the effectiveness of restoration treatments. Here we explore the predicted success of restoration for recovering caribou populations using predator-prey simulations, and empirically test the effectiveness of restoration treatments. We present a multiple-lines-of-evidence approach for understanding caribou, moose, wolf and bear response to habitat restoration treatments aimed to restore the functional and ecological processes in northeastern Alberta. Understanding behavioral and population-level responses to restoration treatments is necessary to ensure successful recovery and adaptive management.

Biosketch: Melanie Dickie is the research coordinator at ABMI's Caribou Monitoring Unit. Melanie focuses on informing woodland caribou recovery in western Canada using applied research and actively collaborating with academics, industry, First Nations and government. Melanie is also starting a PhD at the University of British Columbia Okanagan.

Facilitating Understanding Between Western-Based Science and Indigenous Traditional Knowledge for the Conservation of Species-at-Risk in Northwestern Alberta, Within the Context of a Proposed Indigenous Protected and Conserved Area (IPCA)

Matthew Munson, Fred Didzena, Kecia Kerr, Gillian Chow-Fraser, and Ryan Cheng

The northwest corner of Alberta is a remote boreal forest landscape encompassing some Traditional Territory of the Dene Tha' First Nation. The area holds Alberta's third largest lake and would benefit from ecologically sustainable and culturally appropriate management, as it provides important habitat for many species-at-risk and holds strong cultural importance to the Nation. Indigenous Protected and Conserved Areas (IPCAs) present an opportunity to create protected areas that are co-managed by Indigenous governments, supporting conservation values and Indigenous traditional uses of the land. We will summarize an in-progress community-led project within the proposed IPCA area. The project aims to highlight the role of Traditional Knowledge (TK) in guiding community-based research for the benefit of many species at risk upon which communities depend. The project goals are to: successfully implement community-based research, wherein project questions and methodological designs are consistently informed /validated by TK; understand boreal mammal dynamics, with express interest in how Bistcho Lake is seasonally used by woodland boreal caribou, wolverine, and grizzly bear, and; collect data and analyze trends to inform land use and adaptive management plans and actions within the proposed IPCA. The project will inform land management actions for the IPCA, presenting one option for a framework for IPCAs in the province. Benefits of Indigenous-led conservation must recognize not only the ways in which Indigenous communities can collaborate on management actions to improve desired outcomes, but additionally recognize the societal benefits of empowering communities that regain agency in stewarding their traditional lands and resources.

Biosketch: Matthew Munson, BSc. Matthew is a Dene Tha' band member and Technical Consultant, with over 12 years of experience in geographic and information management systems as these relate to government and Industry Crown consultation and environmental assessment processes, Matt's work was key in developing DTFN's Traditional Use Study (TUS) Geodatabase.

Partial Cutting: Changing the timber harvest paradigm in Alberta to conserve mountain caribou.
Kirby Smith
The Government of Canada issued an Imminent Threat Assessment for 2 herds of mountain caribou in west central Alberta in May 2018: the Redrock-Prairie Creek and Narraway herds. The Assessment states that "the effects of the threats facing the species will make achieving the recovery objectives of the species highly unlikely or impossible without immediate intervention including population and habitat management measures". In contrast, the Government of Alberta provided direction to increase the volume of timber to be clear-cut within the winter ranges of these 2 herds from 200 000 cubic meters to 500 000 cubic meters annually over the next decade. This form of timber harvest eliminates lichen producing habitat essential for caribou, increases vehicle access and increases the amount of habitat suitable for alternate prey thereby contributing to "apparent competition". An alternative to clear-cut logging is partial cutting, which was experimentally applied in west central Alberta more than 20 years ago (Vitt et al, 2019). This approach has the potential to avoid the three aforementioned issues for caribou, while still providing timber supply and regeneration of coniferous stands.
Biosketch: Kirby Smith is a recovering wildlife biologist who spent 35 years working for the Government of Alberta in west central Alberta. He spent much of his time working on woodland caribou including completing a MSc thesis which examined woodland caribou demography and persistence relative to landscape change.

Caribou on the Move: Identifying migratory behaviours to preserve intraspecies diversity
Jessica Theoret, Maria Cavedon, Liam Horne, Bridgett vonHoldt, Troy Hegel, Robin Steenweg, Helen Schwantje, Jan Adamczewski, and Marco Musiani
Preserving intraspecies biodiversity is a fundamental conservation goal because it strengthens species adaptability. Conservation biology literature highlights the importance of examining the concordance of ecological traits with genetic traits potentially of adaptive value since extirpation of locally adapted populations can concurrently result in the permanent loss of those adaptations. Across most of their range, caribou are declining, with some recent population extirpations. As populations decline and are lost, gene-to-environment associations are also at risk of disappearing. Migratory or sedentary movement behaviours are considered adaptive relative to local ecological conditions of barren-ground and woodland caribou populations (respectively). In addition, these behaviours may be genetically influenced. My research contributes to addressing an important question: is the presence of migratory movement behaviour associated to (a)genomic differences, (b)environmental factors, or (c)genomic differences when controlling for environmental factors? Through collaborations with government agencies of Alberta, British Columbia, Northwest Territories and Yukon, genetic and GPS telemetry data were obtained for 362 barren-ground and woodland caribou from 31 herds across Western Canada. Utilizing a Net Squared Displacement (NSD) approach, individuals were categorized as migratory or non-migratory based on patterns of movement behaviour. Despite the common description of woodland caribou as non-migratory, migratory behaviour was found to occur widely in woodland caribou populations. Populations may therefore be more behaviourally diverse and adaptable than previously thought. From these results, correlations of migratory behaviour with genomic traits and with environmental conditions are being evaluated. Specifying migration behaviours within populations may help refine conservation and management strategies to aid caribou recovery.

Biosketch: Jessica Theoret obtained a Bachelor of Science in Environmental Science with first class honours at the University of Calgary and is currently pursuing a Master of Environmental Design, also from University of Calgary. Theoret is a passionate Albertan dedicated to informative science, conservation and environmental protection in the province she calls home.

Woodland Caribou Calving Fidelity in Northern Ontario

Phil Walker, Jen Shuter, Ian Thompson, John Cook, Rachel Cook, John Fryxell, and Evelyn Merrill

Determining if woodland caribou express space-use fidelity during the calving period can have significant implications for land management coinciding in caribou ranges. If caribou express calving range fidelity, the protection of these regions may be critical to caribou persistence. Using GPS telemetry data, we evaluated calving fidelity at 1) the calving-range scale and 2) the birth-site scale. We used a movement-based, statistical approach to predict parturition events of GPS collared caribou within three distinct regions in northern Ontario. We determined that 56 individuals had multiple predicted parturition events across 2010-2014. First, we evaluated individual calving range fidelity using a Jaccard overlap index of 95% utilization distributions (UD) calculated for the calving period (1 May to 30 June). Mean individual Jaccard overlap index values were 0.24 ± 0.19 (± SD) indicating moderate range fidelity, with values ranging from 0 to 0.85. Secondly, we evaluated inter-annual birth-site fidelity by comparing the Euclidean distance between an individual's two birth-sites to 10,000 random distances generated between the individual's two calving 95% UDs. Forty-seven percent of individuals had significantly closer birth-sites compared to random distances with a mean distance between birth sites of 1.7 ± 1.4 (± SD) kms compared to 18.7 ± 17.4 (± SD) kms for individuals with birth-site distances not significantly shorter than random distances. We identified substantial individual variation in calving-area and birth-site fidelity, which supports the inconsistency associated with site fidelity previously observed in woodland caribou. Therefore, as a conservative approach we recommend the protection of woodland caribou calving areas.

Biosketch: PhD Candidate at the University of Alberta studying woodland caribou and in my spare time I enjoy photography.

SESSION 5B

UNDERSTANDING DISTRIBUTION AND SELECTION

Sunday, March 15 10:30 – 12:00

Effects of Forest Fire on the Bat Community in Waterton Lakes National Park

Erin Low

The Kenow Wildfire occurred in Waterton Lakes National Park (WLNP) in southwestern Alberta in September 2017. The wildfire started by lightning and burned 38% of WLNP, resulting in a predominantly 'very high' burn severity throughout the park. As the wildfire occurred at the end of summer after bats had dispersed to their wintering grounds, there was likely no direct mortality. Therefore, any changes to bat diversity and relative abundance can be attributed to the wildfire's impact on the environment. Past studies have suggested that bats respond positively to fires, by increasing the roosting and foraging opportunities for most species. From 2015 – 2017 bat acoustic surveys were conducted by Parks Canada staff from late June to early August. Acoustic monitoring was continued after the Kenow Wildfire (2018 – 2019), providing the opportunity to compare bat diversity from before the fire to levels after the natural disturbance. During the summer of 2019 (June

– August), bats were captured using mist nets, and body and reproductive conditions were assessed. Capture data from 2019 was compared to data from trapping surveys in 2011 and 2012. Little brown Myotis reproductive females were radio-tagged and tracked to their maternity roosts in 2019. Preliminary results of capture data show a strong preference for anthropogenic roosting structures with reproductive females traveling much further distances than expected between roosting and foraging sites. Little brown Myotis body and reproductive condition appear to be similar between pre- and post-fire years, and the analysis of acoustic results is still in progress.
Biosketch: Erin Low is the Edmonton Regional Coordinator for the Alberta Community Bat Program. She has been involved in bat research and outreach throughout Alberta as well as in other provinces and internationally. She is pursuing her Master of Science degree with Dr. Robert Barclay at the University of Calgary.

Year-Round Northern Saw-Whet Owl Movements Through a Banding Station in Central Alberta, Canada
Lisa Takats-Priestley and Chuck Priestley
Year-round movements of Northern Saw-whet Owls (*Aegolius acadicus*) were investigated at a banding station in central Alberta, Canada. Mist nets with audio-lures have been set in the fall (September to early December) since 2014 near Ministik, Alberta (53o22.78'N, 112o55.47'W). We have captured between 85 and 273 Saw-whet Owls each fall. Nets have not been run at other times of the year however, spring migration has been found in the Great Lakes region in May and June, and juvenile dispersal has been observed in eastern parts of their range. In fall 2015, we began netting in September and continued to run through one full year to determine if a spring migration of returning owls or a summer movement of young was occurring. Through the winter only a couple of owls were captured however, in spring, 2016 we captured 38 Saw-whets between 25 February and 4 May. We found summer movements of 32 hatch-year owls still in juvenal plumage from 4 July to 11 August 2016. In 2017, we captured 10 Saw-whet Owls between 13 February and 27 March; in 2019, we captured 14 between 15 February and 02 April. We will also present results collected in summer and fall 2019. The evidence found to date suggests that Saw-whet Owls in Alberta are partial migrants, showing some true migration, some nomadism, and some year-round residency.
Biosketch: Lisa has been involved in wildlife research and monitoring for over 20 years. Lisa and her husband own STRIX Ecological Consulting and work (with staff) on various monitoring, inventory and assessment studies on birds, mammals, bats, and amphibians. She also coordinates the Alberta Nocturnal Owl Survey.

If You Were a Ewe, Where Would You Give Birth?
Grace Enns and Mark S. Boyce
Parturient mountain sheep are known to use steep, rugged terrain at high elevations during parturition events to avoid predation on newborn lambs. Lambing habitat selection in North America has seen little research, especially for Stone's sheep (*Ovis dalli stonei*), a subspecies of thinhorn sheep residing predominately in British Columbia. Our study focuses on a Stone's sheep population in the Cassiar Mountains, a relatively remote area with varying levels of landscape disturbance. Recent increases in human activity, including mining, snowmobiling, and highway traffic could threaten recruitment, creating a need for identifying critical lambing habitat. We equipped ewes in 2018 (n=8) and 2019 (n=10) with GPS radio-collars collecting relocations every 2hrs (2018) and 1hr

(2019). Ewes confirmed pregnant (n=17) were outfitted with a vaginal implant transmitter (VIT). We estimated parturition events using step lengths from GPS relocations and information obtained from the VITs. Median parturition dates in 2018 and 2019 were June 3rd (lambing events occurred within 42 days) and May 14 (lambing events occurred within 24 days) respectively, indicating annual variations in timing and synchronicity. We used step-selection functions to identify significant variables that link movement to habitat selection during three time periods of the lambing season: pre-parturition, parturition and post-parturition. Habitat selection differed between pre-, post- and during parturition, and was influenced by elevation, ruggedness, slope, and aspect. Understanding spatial and temporal use of parturition habitats will help wildlife managers implement human-use mitigation strategies to conserve lambing habitats and improve Stone's sheep recruitment in the Cassiar Mountains.

Biosketch: I am a master's student in Mark Boyce's lab at the University of Alberta examining seasonal habitat use of Stone's sheep. I am originally from Kingsville, Ontario and received my BSc in Environmental Sciences from the University of Windsor in Windsor, ON.

Tracking Burrowing Owls to Determine Population Dynamics and Conservation Needs in Prairie Canada

Geoff Holroyd

In Canada, the Burrowing Owl *(Athene cunicularia)* is endangered in prairie Canada. The number of breeding pairs declined 22% per year during the 1990's even though over 700 landowners voluntarily protected over 37,000 hectares of the owls' grassland habitat. Low productivity is implicated in the Burrowing Owl's decline; typically only 3-4 young fledge from the average clutch size of 9 eggs. Food supplementation experiments indicated that the wild food supply was inadequate for this species to reach its reproductive potential. Migration and dispersal are important ecological processes and understanding them is a requirement for species conservation efforts. Studies of movements of Burrowing Owls using banding, VHF telemetry, stable isotopes, geolocators, and satellite transmitters demonstrate that annual dispersal is a second factor driving the owl's decline. SARA's focus on critical habitat, recovery strategies and action plans have not slowed the species' decline in prairie Canada. This talk summarizes over 20 years of research into the breeding biology, migration and dispersal of this species in Canada, Texas and Mexico and recommends a conservation solution - supplemental feeding of nests each June. Greater international cooperation and direct conservation action are needed if this species is to remain on the Great Plains.

Biosketch: Chair of the Beaverhill Bird Observatory and retired EC Research Scientist. *More information can be found in the plenary abstract section.*

Biotic Communities Change Throughout Alberta Along Major Climatic Gradients and in Relation to Subtle Habitat and Taxonomic Differences.

Jim Schieck and Peter Solymos

We used information collected by the Alberta Biodiversity Monitoring Institute (ABMI) to describe changes in bird, plant, lichen, moss, and mite communities throughout Alberta. Between 2007 and 2018, ABMI surveyed approximately 5,500 sites and developed habitat associations and distribution maps for 974 species. Information was integrated among species to identify three major biotic communities: prairie, mountain, and boreal. We then visualized how these three communities intermingle throughout the province at a 1km2 pixels scale. The prairie biotic community extended

into the parkland and southern boreal (Dry Mixedwood) regions. Reciprocally many boreal species were present in the parkland, especially in the Peace River region. Foothills communities were composed of a mix between boreal and mountain species. Interestingly, many species commonly found in the mountains were also abundant in hill complexes throughout the boreal. Geographic changes in species communities were generally similar between birds, plants, lichens, mosses and mites. However, moss communities had more abrupt ecological changes at natural region boundaries than other taxa. Other, more subtle differences between taxa included lichen and bird communities in the boreal hill complexes being more like mountain communities than found for plant, mite and moss communities. Plant and mite communities, on the other hand, had larger differences between the prairie and parkland communities than found for other taxa. Geographic variation in biotic communities (e.g. the concentrations of certain species, or the overlap of multiple species), should be considered when choosing locations for protected areas, especially in the face of climate change.
Biosketch: Jim received his BSc and MSc from University of Western Ontario, PhD from University of Alberta, and post Doc from Simon Fraser University. He was the Science Director for the Alberta Biodiversity Monitoring Institute and an adjunct professor at the University of Alberta, but now is enjoying retirement.

Characteristics of Wolverine Dens in the Lowland Boreal Forest of North-Central Alberta
Robert Anderson, Mike Jokinen, Doug Manzer, and Shevenell Webb
Denning habitat requirements have been identified as a potential limiting factor for wolverine (*Gulo gulo*) populations under climate change predictions. Industrial companies in Alberta are required to protect wolverine dens but very little is known about where these occur or whether they share the same characteristics that have been reported in other jurisdictions. We investigated the denning ecology of wolverines in the boreal forest of northern Alberta. During winters 2015/16 and 2016/17, we used live traps to capture four female wolverines and fitted them with GPS collars. We determined reproductive status at capture and GPS location data were used to identify den sites. We found wolverine den sites (n = 8) to be very different than what has been reported elsewhere. Dens were located in lowland habitat, with little to no snow, under hollow moss-covered mounds. Other studies have found wolverine dens to be associated with high elevation areas, deep snow, persistent spring snow cover, or large boulders. Wolverines in Alberta's Boreal natural region may be using the landscape differently to meet their basic needs. Further investigation is required to determine if this will influence their resiliency to climate change.
Biosketch: Robert lives with his family in Crowsnest Pass, where they enjoy a variety of outdoor pursuits in the mountains. During his time with Alberta Conservation Association, he has enjoyed working on a variety of ungulate and furbearer-related projects. He attended his first ACTWS conference 25 years ago.

SESSION 6A

CASCADING IMPACTS: COMMUNITY DYNAMICS AND LANDSCAPE GENETICS

Sunday, March 15 13:00 – 14:00

The New Top Dogs? Mesopredator Response to Wolf Removal in a Changing Landscape

Baily McCulloch, Melanie Dickie, Robert Serrouya, and Stan Boutin

As apex predators disappear worldwide, their role in structuring systems facing rapid anthropogenic change is a critical avenue of study. The absence of apex predators can have complex ecological consequences, such as mesopredator release – an increase in the number of smaller predators. Although global increases in mesopredator range and abundance are a current conservation concern, it is uncertain whether this effect is driven primarily by apex predator loss, or by a changing landscape becoming more friendly to mesopredators; these factors have previously been challenging to test simultaneously. The wolf control program in Alberta provides a natural experiment to study mesopredator release, while neighbouring Saskatchewan offers a less human-modified baseline compared to Alberta, where industrial activity has left a heavy human footprint. Using a network of camera traps across Alberta and Saskatchewan, established by the Alberta Biodiversity Monitoring Institute, paired with an emerging method for estimating the density of unmarked species, we compare mesopredator densities across different levels of wolf control and human disturbance. At a larger scale, we investigate the relative effect of apex predator presence and anthropogenic disturbance – as well as abiotic factors associated with climate change – on mesopredator occupancy and range, to advance our understanding of the effects of the loss of apex predators and the increasing human footprint on the world's predator systems. We demonstrate that anthropogenic landscape change is associated with a larger change in mesopredator density than the top-down effect of apex predator loss.

Biosketch: As a master's student with Dr. Stan Boutin at the University of Alberta, Baily is studying the effects of human disturbance on the carnivores of the boreal forest. She holds a Bachelor of Science in Ecology from the University of Toronto.

Ecological Compromise: Can alternative beaver management maintain biodiversity?

Glynnis A. Hood, Anne C.S. McIntosh, and Glen T. Hvenegaard

Habitat modifications by various species can positively influence numerous other taxa; however, the effects of these modifications can be confounded by management actions within these environments. Beavers are recognized for their positive influence on aquatic biodiversity, yet beaver ponds near human infrastructure are often drained to mitigate associated flooding. We present findings from a 3-year study in Miquelon Lake Provincial Park (MLPP), Alberta that identified factors influencing the composition and distribution of aquatic macroinvertebrates in 16 shallow-water wetlands that had either current (active) or past (inactive) occupancy by beavers. We then compared these results to those from 14 additional active beaver ponds that were of management concern relative to flooding of infrastructure in nearby Beaver County. Over a 4-year period in the County, we sampled aquatic macroinvertebrate communities prior to and one year following the installation of pond-levelling devices intended to mitigate human-beaver interactions. Within MLPP, active beaver ponds had the highest biodiversity, with some taxa found exclusively within these ponds. Unique niches, such as beaver channels, served as "hunting hotspots" for some predaceous invertebrates. In Beaver County, sampling from ponds where pond levelers were installed resulted in 195,000

individuals from 90 taxa. As with MLPP, there were within-pond differences in distributions of aquatic invertebrate taxa. There was also a shift in community composition one year following pond leveler installation (mean Jaccard Similarly Index = 43.1%, SD 14.5%). Assessing natural and anthropogenic influences on ecological communities provides important insights into how management actions might affect community-wide interactions.
Biosketch: Glynnis A. Hood is a Professor of Environmental Science at the University of Alberta's Augustana Campus in Camrose, Alberta. She is the author of The Beaver Manifesto and a new book, Semi-aquatic Mammals: Ecology and Biology. She specializes in aquatic and wildlife ecology.

Mammalian Responses to Caribou Recovery Activities in West-Central Alberta
Caroline Seip, Robin Steenweg, Cole Burton, Dave Hervieux, and Jason Fisher
Woodland caribou are a threatened species in Alberta and across Canada. The Little Smoky caribou population in west-central Alberta is at risk due to anthropogenic disturbances, such as forest harvest and linear features, which facilitate increased predation on caribou. To aid caribou recovery the Government of Alberta is working to conserve areas of existing caribou habitat, recover habitat on linear features, and annually reduce wolf abundance. These management actions are beneficial for caribou, but potential effects on other wildlife have rarely been tested. To better understand any effects, we conducted multispecies surveys using remote cameras within and around the Little Smoky caribou range. We hypothesized that changes in wolf detection rate would be the predominant factor influencing other wildlife, because they are the top predator on the landscape. We predicted decreased wolf detection rate in areas of high wolf removal efforts would result in higher detections of coyotes and lynx, through decreased competition, and higher detections of moose, elk, and deer, through decreased predation. As expected, wolf detections were negatively affected by wolf removals. Unexpectedly, mesopredator detections were positively associated, and ungulate detections unaffected, by wolf activity. These species were instead more strongly associated with habitat disturbances (clearcuts, linear features), and mesopredators were also associated with prey availability. Our results suggest that despite the direct effect of wolf removals on wolves, wolf population management did not have a cascading effect on other wildlife in this system. Rather, bottom-up factors were the most important drivers affecting wildlife in west-central Alberta.
Biosketch: Caroline works as a caribou biologist with the Government of Alberta in Grande Prairie, while simultaneously pursuing an MSc at the University of British Columbia under the supervision of Dr. Cole Burton. In 2016 she received a BSc in Wildlife and Fisheries (Honours) at the University of Northern British Columbia.

Species Reintroductions and Population Bottlenecks: Conservation genetics of Roosevelt elk in southwest British Columbia
Ian Gazeley, Brendan A. Graham, Darryl M. Reynolds, and Theresa M. Burg
Species reintroductions have long been undertaken to establish populations in areas of historic distribution and viable habitat. Only recently has genetic diversity, and its role in population viability, been considered in the long-term survival of these often isolated and bottlenecked reintroduced populations. Provincially 'blue-listed' Roosevelt Elk (*Cervus elaphus roosevelti*) were initially reintroduced to the British Columbia mainland over a 10-year period from 1987 to 1996, with the translocation of 29 animals from Vancouver Island. Beginning in 2001, a 15-year translocation project was initiated to re-establish viable Roosevelt Elk populations throughout much of their historic range,

resulting in more than 32 new populations with unknown connectivity. The existing Vancouver Island elk population has low genetic diversity relative to other elk subspecies, raising concerns about the genetic health of South Coast Region elk populations as notably, all are descendants of 29 founding individuals. To identify changes in genetic diversity, we genotyped 305 Roosevelt elk, using various DNA sources including blood, tissue, hair and faecal samples at 10 microsatellite loci. Genetic diversity was quantified for the source population on Vancouver Island and the reintroduced populations. Results suggest that Vancouver Island Roosevelt elk form two distinct subpopulations with limited connectivity and some reintroduced populations show reduced genetic diversity, indicative of secondary bottlenecks and isolation.

Biosketch: As an RRM student at Lethbridge College, Ian received the Robert (Bob) K. Goddard Memorial Scholarship (2005). After earning his diploma, he completed a BSc Environmental Science and is completing an MSc Biology at the University of Lethbridge. Ian is presently looking for an interesting PhD opportunity.

SESSION 6B

PARASITE AND DISEASE TRANSMISSION

Sunday, March 15 13:00 – 14:00

Contact Rates for Disease Transmission: Do metrics matter?

Maria Dobbin, and Dr. Evelyn Merrill

To model chronic wasting disease (CWD) transmission and spread, reliable estimates of seasonal contacts are essential. We evaluate consistency in seasonal contact rates of sex-specific dyads (male-male, female-female, mixed sex) of 55 collared mule deer (*Odocoileus hemionus*) in habitats characteristic of eastern Alberta where CWD is most prevalent. We estimate seasonal contact rates derived from data obtained from 3 different metrics used to define contacts: (1) concurrent global positioning system (GPS-only) locations assuming various scales of contact (≤ 10-200m), (2) proximity loggers (PL-only) that record contacts when deer are ≤ 3m and (3) contacts recorded from collars with paired GPS-proximity functionality (GPS-PL). First, we compared relative change in contact rates among the GPS-only and PL-only types in different seasons. Second, we used data from GPS-PL collars to explore scaling contact rates between collar types. Initial results indicate that relative rates of contacts of concurrent GPS locations and proximity loggers are consistent through the seasons and landscape patterns, and that scaling of contact rates between metrics depended on landscape configuration. In addition, we determined if dyads were within or between social groups. We expect that group classification will also influence scaling of contact rates between metrics. These data will be useful in validating fine scale contact patterns that can then be used to determine potential routes of CWD transmission.

Biosketch: Maria Dobbin is a master's student in Dr. Evelyn Merrill's lab at the University of Alberta.

Chronic Wasting Disease and Where to Find it: Modelling spread of infection in Alberta

Peter Smolko, Evelyn Merrill, Margo Pybus, Anne Hubbs, Mark Ball, Judd Aiken, and Debbie McKenzie

Predicting the spread of Chronic Wasting Disease (CWD) is critical for identifying cervid populations at risk, targeting surveillance and designing management programs. Following the detection in Alberta in 2005, a herd reduction program was implemented during 2005 – 2008 and the ongoing

hunter-based Surveillance Program became mandatory in high risk Wildlife Management Units (WMU). The disease has, however, continued to spread, from 5 WMUs in 2005 to 42 WMUs in 2018. We employed a generalized additive model to harvest data collected within the programs to model spatio-temporal process of the growth and spread of CWD in Alberta and to identify landscape features (cover, riparian habitat, soil humus, deer genotypes and presence of cervid farms) that might have driven the distribution of CWD in mule deer and white-tailed deer during 2005 – 2018. CWD prevalence was highest for mule deer and males of both species. Our top model showed that the probability of CWD infection was slowed during 2005 – 2008, consistent with implementation of the herd reduction program, and started to grow immediately after its cancellation in 2009. Spread and growth of the infection was highest in open areas with patchy forest cover and on soils with low organic carbon content, but also increased in areas of high cover with high density of riparian habitats. We used our model to predict a probability map, providing important information for CWD management by identifying likely routes of spread and providing a tool for prioritizing disease monitoring and containment efforts.

Biosketch: I recently worked as a postdoc at the UofA. I worked on modelling risk of infection and spread of the Chronic Wasting Disease in wild deer in Alberta. I am also involved in monitoring of the Eurasian lynx in Slovakia and its trapping and reintroduction to western Europe.

Wildlife and Domestic Animal Overlap and Parasitic Infections: The Echinococcus multilocularis case

Emilie Toews, Alejandra Santa, Marco Musiani, Sylvia Checkley, Darcy Visscher, Alessandro Massolo

In Alberta and globally, human population expansion causes wildlife and domesticated animals to increasingly share altered habitats. As well, parasites relying on both wild and domestic hosts are increasingly shared. Finally, like some wildlife species, invasive species of parasites take advantage of the new habitat provided – i.e. by the overlap between wild and domestic hosts. Echinococcus multilocularis (Em) is a parasitic helminth cycling through definitive hosts (coyotes, wolves, foxes, dogs) and intermediate hosts (rodents) in a predator-prey system. Humans can be infected, often lethally. The Asian and European strains of Em, which are likely more pathogenic, have recently been expanding upon their traditional ranges. In Alberta, a European-like strain was first detected in 2013 in wild canids, and a subsequent increase of human infections has also been documented. Domestic dogs provide a possible conduit for infection between wildlife and humans, and we have found that 2.12% of dogs living near Calgary parks are infected with Em. Dogs, which co-occur (often at high densities) with wildlife in urban and suburban areas, therefore are becoming important hosts and likely an additional source of Em infection. Our findings suggest that areas of wildlife and domestic animal overlap could enhance spread of diseases and encourage invasions of new strains of parasites. Overall, the emerging patterns of this disease suggests the influence of human expansion and urbanization in introduction and invasion of parasites affecting humans, domestic animals and wildlife.

Biosketch: Emilie Toews is a 3rd year MSc candidate at the University of Calgary working on determining the prevalence of *Echinococcus multilocularis* in domestic dogs in Alberta. She is interested in how parasites and diseases are spread at the animal-human interface, especially in urban areas.

SESSION 7

SPEED TALKS

Sunday, March 15 14:15 – 15:00

Remote Cameras Reveal Species-Specific Performance of Ecological Indices Used for Urban Planning

Cassondra Stevenson, Colleen Cassady St. Clair, and Catherine Shier

Urban development alters, reduces, and fragments wildlife habitat and can negatively affect biodiversity. Nonetheless, urban areas retain a variety of wildlife species with diverse habitat needs, behavioural characteristics, and contributions to ecological processes. Some urban-avoiding species typically decline as urban development progresses. In contrast, urban-exploiting species may increase, creating a need for more information about the correlates of these patterns to inform management and land-use planning. The City of Edmonton has developed two indices to assist with this planning, one that estimates ecological connectivity (mainly via the presence of upland and wetland habitat) and one that estimates biodiversity potential (via the size, shape, and diversity of habitat types). We tested the predictive value of these indices by using remote cameras to measure visitation rates for urban-avoiding deer and moose (*Odocoileus spp.* and *Alces alces*) and urban-exploiting coyotes (*Canis latrans*). Data from 61 cameras deployed throughout Edmonton in July 2018 recorded 180 visits by coyotes (mean = 2.95 visits / site) and 277 visits by ungulates (mean = 4.54 visits / site). Although the average coyote visitation rate was 65% less than that of the combined ungulate guild, coyotes were detected at 14% more camera sites than ungulates. The index of biodiversity potential was not predictive of coyote visitation, but it was positively related to ungulate visitation. Conversely, ecological connectivity was positively related to coyote and negatively related to ungulate visitation. Our results suggest that urban planners should consider adapting ecological indices to consider varying sensitivity of urban-adapted versus urban-avoiding species.

Biosketch: I am an MSc student working with Dr. Colleen St. Clair at the University of Alberta studying human wildlife-conflict with urban coyotes and to a lesser extent, other urban species. I'm interested in mitigating the effects of human disturbance on wildlife and maintaining and developing coexistence strategies.

Why Hunt Sharp-Tailed Grouse? Hunter motivation and satisfaction in Alberta, Canada.

Eric Smith, Howie Harshaw, and Doug Manzer

Sharp-tailed grouse hunting is a popular activity in Alberta, yet little is known about sharp-tailed grouse hunter satisfaction, motivations and where they hunt. Upland game bird license holders were surveyed in the fall of 2019 using an online questionnaire. Overall, sharp-tailed grouse hunters (n=132) were somewhat satisfied with sharp-tailed grouse hunting in Alberta. Respondents were motivated to hunt sharp-tailed grouse to get exercise, get outdoors and enjoy nature, get away from everyday life, and to spend time around wildlife. Although seeing birds and harvesting a grouse was important to respondents, 80% assessed the success of their hunts by whether or not they got exercise. The majority of respondents hunted sharp-tailed grouse on vacant Crown land and rarely hunted on public grazing leases. Although 39% of respondents reported that they primarily focus hunting trips on the pursuit of sharp-tailed grouse, 97% hunted sharp-tailed grouse while scouting for or hunting big game. When comparing sharp-tailed grouse hunting effort to effort applied on other upland game birds, the majority of respondents mostly hunted ruffed grouse, 40% sometimes hunted

sharp-tailed grouse and 81% never hunted at one or more of the 42 Pheasant Release Sites. The results of this study highlight the importance of non-harvest-oriented hunter motivations and paired hunting/scouting of sharp-tailed grouse and big game in Alberta, Canada. In order to retain and recruit sharp-tailed grouse hunters, wildlife managers should consider setting sharp-tailed grouse hunting season dates to overlap with big game hunting seasons.
Biosketch: Eric blends biology and conflict resolution to solve wicked conservation problems. His research evaluates ways to reduce human-wildlife conflict and explores what makes great hunting experiences. He is pursuing an MSc at the University of Alberta.

The Effects of Artificial Light on Relative Abundance of Common Nighthawks (Chordeiles minor)
Carrie Ann Adams, Elly Knight, Erin Bayne, and Colleen Cassady St. Clair
Global increases in artificial light at night (ALAN) disrupt the natural light-dark cycles under which most organisms evolved. ALAN may be particularly disruptive to phototactic insects and their predators, but there is disagreement as to whether ALAN is beneficial or detrimental for aerial insectivores, especially crepuscular and nocturnal species. Light may concentrate their insect prey and increase nocturnal foraging opportunities, but species who hunt primarily in low-light conditions may not be able to forage under bright artificial lights. ALAN may also reduce insect populations over time and increase nest predation, though it may also provide protection from predators that avoid light. To determine how artificial light affects distribution patterns for a crepuscular aerial insectivore, I studied Common Nighthawks (*Chordeiles minor*) in British Columbia using data from the WildResearch Nightjar Survey. Within survey routes, relative abundance of territorial Common Nighthawks was lower at light-polluted survey stations, indicating that fewer nighthawks establish territories near artificial lights. Further comparison of nighthawk abundance across survey routes with varying levels of ALAN will demonstrate how light pollution affects nighthawk populations at a regional scale. Results of this research will inform policy on managing light pollution to support vulnerable populations.
Biosketch: Carrie Ann Adams is a PhD student at the University of Alberta, co-supervised by Erin Bayne and Colleen Cassady St. Clair. She studies birds in human impacted landscapes. Her current research uses literature synthesis, citizen science, and acoustic recordings to study the effects of artificial light on birds.

Bison Movement Ecology as a Model for Livestock Grazing Management
Tawnee Dupuis, Mark S Boyce, and Viktoria Wagne
The coevolution between bison (*Bison bison*) and grasses on the Canadian plains led to an ecosystem that has been efficient at sequestering and storing carbon in the soil. Based on a literature review and analyzing bison movement from Grasslands National Park in Saskatchewan, , we are examining the hypothesis that bison foraging patterns can inform livestock grazing systems. We are using relocations of radio-collared bison to determine a resource selection function as well as a step selection function to account for movement constraints. We are looking to see whether livestock grazing systems can mimic nature as a climate mitigation solution.
Biosketch: Tawnee Dupuis is in the final semester of her undergraduate degree at the University of Alberta studying biology.

Wildlife Identification: The hair scale guide to terrestrial mammalian carnivores of Canada

Justin Keszei

Mammalian predators are keystone species in any ecosystem. Many cover large areas of land within their territories and are elusive by nature, making them difficult to monitor. When tracks and sign prove difficult to interpret or are non-existent, hair samples may be utilized. The objective of The Hair Scale Guide to Terrestrial Mammalian Carnivores of Canada is to offer an expansion on existing hair scale reference guides by providing a complete set of hair scale impressions based all the terrestrial carnivorous mammalian species native to Canada. The guard hair samples featured in the guide are procured from identity-verified pelts and taxidermied specimens provided by Sault College and The Royal Ontario Museum. With the 25 recognized Canadian species accounted for, each sample underwent a hair scale impression procedure at medial portion using clear nail polish on a glass slide. These impressions were then observed under a light microscope and images were taken at two magnification settings with a Bodelin ProScope HR. Similarities and unique traits of coronal or imbricate hair scale patterns can be observed from this guide. This resource also outlines the hair impression techniques and procedures made to achieve these results. Benefits of The Hair Scale Guide to Terrestrial Mammalian Carnivores of Canada include post-field lab identification, especially those involving hair snares, scat analysis and kill site investigation, further assisting with predatory wildlife monitoring studies

Biosketch: Justin is a wildlife technician and outdoor educator. He graduates from Sault College in 2020 and earned a Communication Technology degree from the University of Toronto. He's been involved in wildlife monitoring projects with The Kensington Conservancy, Sault College and worked federally as a forestry technician for Natural Resources Canada.

What Makes Elk Tick: Hair loss and winter ticks in collared and uncollared elk

Jacalyn Normandeau, Susan Kutz, Colleen Cassady St. Clair, Mark Hebblewhite, and Evelyn Merrill

Ectoparasite infestation in ungulates can reduce body condition or cause hair loss compromising thermoregulation. Elk groom to remove ectoparasites but grooming may interfere with foraging, vigilance, and rumination. We studied the effects of grooming for winter ticks (*Dermacentor albipictus*) by elk (*Cervus canadensis*) in the partially migratory population that winters at the Ya Ha Tinda adjacent to Banff National Park (BNP). Most elk remain on the Ya Ha Tinda year-round with equal numbers of elk migrating westward into BNP and eastward to low-elevation industrial forests. We assessed whether grooming for ticks in winter differed among the migratory tactics, and whether increased grooming reduced time spent foraging, ruminating or being vigilant. We conducted 592 focal observations on 48 collared and 18 uncollared individuals in 2019, used photographic images to quantify hair loss, and related ticks to hair loss in captured elk. Because collars also cause neck hair loss, we also assessed whether presence of a collar on elk altered grooming patterns. An increase in grooming was associated with a decrease in foraging time and an increase in time spent resting. Grooming during foraging did not differ among migratory tactics, but eastern migrants increased grooming during resting more than residents and western migrants. Collars increased neck hair loss above that of grooming but did not influence time spent grooming. To date, this is the only study that has examined the cost of grooming for winter ticks on foraging and anti-predatory behaviors in migratory ungulates or how collars may alter this cost.

Biosketch: I'm a recent graduate with my master's from University of Alberta on elk parasites and migration. I currently work as a technician on the Ya Ha Tinda elk project west of Sundre, Alberta.

POSTER SESSION

Saturday, March 14 16:30 – 17:30

Evaluating the Effects of a Woodland Caribou Recovery Strategy on Grey Wolf Resource Selection in Northeastern Alberta

Katherine Baillie-David, Dr. John P. Volpe, and Dr. Jason T. Fisher

Predator control is a common wildlife management strategy to recover declining prey populations. While previous research has focused on the effects of predator control on the abundance and distribution of prey populations, there is a paucity of research measuring the ecological impact of predator control on the focal predator species. The objective of this research is to determine whether a predator control program to conserve woodland caribou (*Rangifer tarandus caribou*) alters the resource selection of the remaining individuals within a target grey wolf (*Canis lupus*) population. Using camera trap data, I will test whether grey wolf occurrence frequency as it relates to prey availability and land cover differs following lethal removal. The camera trap array is located in a 4000 km2 area of boreal forest, 150 km southeast of Fort McMurray, Alberta. Prescribed grey wolf removal has taken place in this area since 2016 to recover the Cold Lake and Eastside Athabasca caribou populations. To evaluate changes in grey wolf resource selection as a result of a population reduction, I will utilize two camera trap datasets: a "pre-removal" dataset, collected from 2011 to 2014, and a "post-removal" dataset, collected from 2017 to 2019. Across western Canada, predator control is widely used to conserve threatened woodland caribou populations, despite conflicting evidence of its long-term effectiveness. Understanding how prescribed population reductions affect the target predator species will allow for more informed caribou conservation. Future research will examine the resource selection response among competing predators and prey following grey wolf removal.

Biosketch: Katherine Baillie-David is an MSc student in the School of Environmental Studies at the University of Victoria. She researches the effects of wildlife management practices and landscape change on mammal communities in northeastern Alberta. She enjoys exploring her home of Vancouver Island and keeping up with the latest memes.

Estimating Sitatunga (Tragelaphus spekii) Density Using Time in Front of the Camera

Megan Brownlee, Mark Boyce, and Camille Warbington

Population densities are a very important consideration for wildlife management. For hunted species, estimations of population size are essential for establishing quotas. Sitatunga (*Tragelaphus spekii*) is a semi-aquatic African antelope, and trophy hunting is authorized for this species in Uganda. Despite their demand from hunters, sitatunga are underrepresented in scientific literature, and no formal density estimations of sitatunga (from camera trap data have been conducted in Uganda. We estimated sitatunga density in the Mayanja River area of Uganda using a time in front of the camera (TIFC) method with camera trap data from 2015-2018. The TIFC model averaged 10.30 sitatunga/km2, which is consistent with results from a spatially explicit capture-recapture study of sitatunga density. These results suggest that TIFC methods accurately and reliably estimate population densities. It is important to understand sitatunga populations in order to develop sensible hunting quotas and ensure sustainable sitatunga harvest.

Biosketch: I am a 4th year undergraduate student at the University of Alberta and will be receiving my BSc Sciences Biologiques (Biological Sciences) from the Faculté Saint-Jean this year. My research interests include ecology and conservation of large mammals.

Post-Disturbance Patterns in Cladonia arbuscula ssp. mitis Growth Rates in the Boreal Forest of Alberta, Canada

Larissa Clayton, Dr. Scott Nielsen, and Ashley Hillman

In the boreal region of Alberta, Canada, fire succession is a natural process. However, increases in fire frequency and intensity may negatively impact species, such as woodland caribou (*Rangifer tarandus caribou*), which is listed in Canada as Threatened. Caribou use lichens as a critical winter forage source; however, lichen growth is slow, and re-establishment post-fire can take decades. An understanding of lichen recovery rates is key to managing caribou habitat. This study examines the growth and recovery rate of a focal lichen species, *Cladonia arbuscula ssp. mitis*. Samples were harvested from 82 field sites located within known caribou ranges in northeastern Alberta. This included upland jack pine (*Pinus banksiana*) stands and treed peatlands. Upland sites were stratified by time since fire in decadal classes from 0 to 7 > 40 years post fire. Using 404 C. mitis samples, average annual growth rates per strata were calculated and used to model the effects of habitat characteristics on lichen recovery. Peatlands and uplands differed in their best predictors of growth, with canopy cover and bryophyte cover being important indicators, respectively. Surprisingly, time since fire was not as significant as predicted. Burned uplands, however, did have a much slower growth rate than in established mature uplands. The more fire-repellant peatlands had a slightly higher annual growth rate than mature uplands. Lichen growth is subject to many environmental factors across and within stands, therefore further analysis is needed to fill knowledge gaps and assist in critical caribou habitat management relating to winter forage supply.

Biosketch: I am in my final term completing a degree from the University of Alberta with a Bachelor of Science in Environmental and Conservation Sciences. Currently, I am in my second internship with Canadian Wildlife Service. As an aspiring wildlife biologist, I hope this research contributes to the ecology field.

Defining and Measuring Success of Aversive Conditioning and Hazing Programs for Bears: A review

Claire Edwards, Colleen Cassady St. Clair, Sarah Heemskerk, and John Paczkowski

Human population growth and increasing urbanization are leading to rising human-bear conflict across landscapes where human developments and bear ranges overlap. In many areas, societal tolerance for bears is also increasing, supporting the use of non-lethal techniques for managing human-bear conflict, particularly in threatened populations. Aversive conditioning (hereafter AC) and hazing are behavioural management tools that apply negative stimuli to wild bears with the goal of increasing wariness, decreasing undesired behaviour, and reducing human-caused bear mortality. Although AC and hazing are widely used in North America, there is limited synthesis of the past literature or established metrics with which to design or evaluate the success of these programs. We comprehensively compiled data from 39 research papers on the use of AC and hazing on bears from peer reviewed (n=12) and grey literature sources (n=27). We found that 81% of papers reported success of behavioural management programs with 83% showing short-term (within the same season as management) reduction of conflict behaviour over multi-year reduction or cessation of conflict behaviour (17%). We present data on factors that correlate with success of AC and hazing

programs. We synthesize established measures for evaluating that success, and outline methods to increase efficacy of assessment of future programs. Investigating historical trends in behavioural management of human-bear conflict and identifying rigorous and repeatable measures of success for AC and hazing programs can help set reasonable measurements of success for both existing and new programs, advancing non-lethal management practices throughout ranges where bears and people share space.

Biosketch: I'm investigating correlates of success of behavioural management programs on bears, in partnership with Alberta Environment and Parks and the University of Alberta. I worked in human-bear conflict management for 10 years before deciding to study for an MSc and am passionate about helping improve future human-bear conflict management programs.

Effect of Passive Integrated Transponders (PITs) on Black-Capped Chickadees (Poecile atricapillus)

Jonathan Farr, Elène Haave-Audet, and Kimberley Mathot

Individual tagging is used to identify wildlife in order to address a range of questions related to the biology and ecology of the focal organisms. Prior to implementing individual tagging methods, it is important to study the impact of tagging on individual health and survival. Passive integrated transponders (PIT) and radio frequency identification are a relatively new tagging method used on a variety of species, including songbirds. However, the effects of PIT tags on Black-capped chickadees (*Poecile atricapillus*) have not yet been evaluated. Between 2017 and 2018, we individually marked chickadees in the University of Alberta Botanic Gardens with PIT tags that were either attached to leg bands or subcutaneously implanted. Both of these PIT tagging methods have been conducted in other study systems, and although subcutaneous implantation is more labour intensive in the field than installing leg-bands, leg-bands have been known to cause leg deformities in some songbirds. We compared the recapture rates one and two years following individual tagging of birds with leg-band and subcutaneous PIT tags to un-tagged, control birds to determine the effect of the two tagging methods on overwinter survival. If PIT tagging method has no effect on individual health and survival, we expect to observe no difference in recapture rate of individuals with PIT tags of either type compared to un-tagged control birds. Assessing the impact of PIT tagging on chickadee survival will inform our future research efforts, as observing behaviour at an individual level is central to our studies.

Biosketch: Jonathan is a third-year student at the University of Alberta, and his current academic interests include ecology, wildlife biology and science communication. Outside of school Jonathan enjoys volleyball, cross-country skiing and piano, and is currently trying to learn how to play the guitar.

The Isotope Ecology of Freshwater Fish and Their Parasites

Kaegan Finn, Karling Roberts, and Dr. Mark Poesch

Using stable isotopes to study food webs has become a common practice in aquatic ecology. Until recently parasites were largely omitted from these analyses, despite the known importance of parasites in food webs. Additionally, when parasites were included in food web studies, long-standing assumptions about the enrichment of 15N in consumers relative to their resources often placed parasites in a trophic level above their hosts. However, recent literature has shown that unlike consumers to prey, parasites do not reliably exhibit enrichment in 15N with respect to their hosts. This is particularly true of parasites in the class cestoda, which tend to be depleted in 15N relative to

their hosts. To date, much of the research showing this relationship has been conducted in Europe. To determine if this trend holds true in Alberta, I will analyze stable isotope ratios of nitrogen and carbon in cestode parasites and their fish hosts across four lakes in northern Alberta. In addition, nitrogen and carbon isotope values of host and uninfected fish will be compared to determine if infection impacts the trophic ecology of host fish. Results from this study will expand the geographic range of cestode parasite isotope studies considerably and improve our understanding of how stable isotopes can be used to effectively include parasites in food webs.
Biosketch: Kaegan is a fourth-year undergraduate student at the University of Alberta in the Environmental and Conservation Sciences program, majoring in Conservation Biology. Kaegan currently works as a teaching assistant and hydrology research technician and will be pursuing graduate studies in the fall of 2021.

Evaluating Density and Spatiotemporal Changes of Five Sympatric Ungulates
Jennifer Foca and Mark S. Boyce
Factors influencing ungulate distributions include population densities, interspecific interactions, seasonality, and changes in human use. Management strategies that alter population densities (i.e. culling, translocations) influence space use and interactions, but most studies fail to account for the variation of ungulate densities across the landscape. We are evaluating spatial covariance in ungulate densities in Elk Island National Park (EINP) and Cooking Lake -Blackfoot Provincial Recreation Area (BPRA) using trail cameras and aerial census data. EINP is home to plains bison (*Bison bison*), wood bison (*B. bison athabascae*), elk (*Cervus elaphus*), mule deer (*Odocoileus hemionus*), white-tailed deer (*O. virginianus*), and moose (*Alces alces*). Due to the fenced perimeter, wildlife movement is restricted, and predation is limited. Active population management is necessary to prevent populations of elk and bison from becoming hyperabundant. BPRA has different management strategies compared to EINP and bison are not present. These adjacent areas provide a unique opportunity to evaluate density estimation methods for trail cameras and compare ungulate spatial dynamics under alternative management strategies. Aerial counts have been used in EINP for many years, but data on deer are limited and demographic data for all species are insubstantial. Trail cameras offer a cost effective, safer alternative to aerial surveys. We are using trail camera data to estimate densities of each ungulate species and calculate demographic ratios. This study will provide park staff with information regarding population densities, herd composition, and dynamics of spatial interactions for the 5 ungulate species of Elk Island National Park and Blackfoot PRA.
Biosketch: Jennifer Foca is a MSc student studying Biological Sciences - Ecology in the Boyce Lab at the University of Alberta.

Individual-Based Modelling of Chronic Wasting Disease
Kelsey Gritter, Evelyn Merrill, Mark Lewis, and Maria Dobbin
Chronic wasting disease (CWD) is an emerging disease in Canada that infects mule deer, white-tail deer, elk and moose and is invariably fatal. It is a transmissible spongiform encephalopathy for which vertical transmission is limited, but horizontal transmission can occur directly through contact between individuals and indirectly through the environment. An individual-based model was developed to simulated both indirect and direct transmission on heterogeneous landscape. This model uses step-selection movement rules to simulate movement relative to resources and conspecifics and was implemented in NetLogo 6.1.1. The step-selection function utilizes GIS layers

for environmental weights and GPS collar movement data for calculating turning angle and step length distributions. The model tracks visits by gender and deaths to infer the potential for indirect transmission and tracks when the deer come in proximity to infer the potential for direct transmission. Running over years the model can track transmission rate of the environment and proportion infected. Preliminary results have shown the importance of environmental factors in modelling the spread of CWD. This model will be used for investigating the effects of feeding hotspots by allowing managers to test the effects of hotspot distribution and density, as well as environmental perturbations.

Biosketch: I am a master's student at the University of Alberta, studying the spread of chronic wasting disease in deer, supervised by Evelyn Merrill and Mark Lewis. I graduated with a Bachelor of Science from The King's University in 2018.

Anthropogenic Diet Correlates with Parasite Prevalence in Urban and Peri-Urban Coyotes (Canis latrans)

Arya Horon, Deanna Steckler, and Colleen Cassady St. Clair

Urbanization is increasing at an unprecedented rate throughout North America, applying directional selection on species that can adapt to or exploit urban areas, including coyotes (*Canis latrans*). Urban coyotes are the definitive hosts to several complex and simple life cycle zoonotic parasites. The goal of this paper was to determine how urbanization, diet and parasite prevalence are related within a coyote population in Edmonton, Canada. I used 30 coyotes collected by trappers outside of the city and 30 coyotes from animal control officers or as roadkill within the city. I counted the number of parasites found in the intestines and sorted them morphologically (*Echinococcus multilocularis, Alaria sp., Taenia sp., Uncinaria sp., and Ascarids (Toxascaris sp.* and *Ascaris sp.*). I compared parasite prevalence to measures of stomach contents and body condition from the same animals to determine whether infections correlated with diet or health, with emphasis on anthropogenic food and prey items. Relative to peri-urban animals, urban coyotes had a higher diversity of parasites, including *E. multilocularis*, ate a higher proportion of anthropogenic food, and a lower proper of prey. This study suggests that anthropogenic food could contribute to the prevalence of parasites, including the zoonotic source of human alveolar echinococcosis.

Biosketch: Arya is a third-year undergraduate student studying biology at the University of Alberta. Her passion lies in wildlife conservation and animal behavior, especially in carnivores.

Modelling the Spread of Chronic Wasting Disease in Mule Deer Based on Their Home Range Behavior

Jingjing Xu, Evelyn Merrill, and Mark Lewis

Chronic Wasting Disease (CWD) is a 100% fatal, untreatable, infectious prion disease in cervids, e.g., mule deer, white-tailed deer, elk, and it might cause problems to cervid population size, the hunting tradition, and the ecological system. CWD is transmitted via direct deer-to-deer interactions as well as by environmental contamination. In turn, the direct interactions depend upon the social structure and movement of the cervid hosts. Annual surveillance and testing for CWD from hunter-harvested deer show an increasing trend in CWD prevalence. Our model considers both the direct contact (deer to deer) and the indirect contact (contaminated soil or vegetation to deer), and the difference in dispersal distance and group size between males and females. We build a differential equation model tracking the change of susceptible and infected deer of both sexes and the environmental hazard,

based on the deer movement around their home ranges. This model allows us to estimate the within-group contact rate between-group contact rate, and the spreading speed of travelling-wave solution. Our numerical simulation suggested the importance of relative location and group size of male groups and female groups in the spreading of CWD.
Biosketch: Jingjing Xu is a Postdoc of the University of Alberta, studying the 'zombie deer' disease, i.e., the Chronic Wasting Disease. With a PhD degree in Applied Mathematics, Jingjing uses mathematical tools, like differential equations, to model the disease, identify key factors and explore strategies for disease control.

Summer Diet of Wolves (Canis lupus) Using DNA and Hair-Based Approaches in the South Slave Lake Region, Northwest Territories
Anna Jovtoulia, Andrew E. Derocher, and Allicia Kelly
Understanding the dietary habits of a predator species can be critical for the study of predator-prey relationships within complex ecosystems. A well-established method for determining the diet of mammals is conducting a scat analysis by examining macroscopic hair and bone fragments found within scat. Found throughout North America, the gray wolf (*Canis lupus*) is an obligate carnivore preying mainly on large ungulates but is also known to hunt small mammals as well as scavenge opportunistically. Determining the diet of gray wolves in the South Slave Lake region of the Northwest Territories becomes critical during the spring and summer seasons when boreal caribou calves (*Rangifer tarandus caribou*) are at a higher risk of predation as wolf pups are also born and raised during this time. Scat samples will be collected around wolf den sites in late August identified through telemetry data in the South Slave Lake area. A macroscopic analysis using hair and bone fragments found within scat will be conducted to gather information on the most recent meal consumed by wolves at den sites and establish whether there is selectivity for boreal caribou. A secondary goal will be to analyze the home range and movements of wolves during the caribou calving period to understand whether wolves focus their ranges in areas where caribou are more prevalent. The continuation of sampling in 2020 will permit greater insight into the gray wolf and boreal caribou predator-prey dynamic and potentially aid in management strategies for the boreal caribou range plan.
Biosketch: Master of Science student currently studying at the University of Alberta specializing in ecology. Bachelor of Science obtained from the University of Alberta in 2019. Completed an independent research project during undergraduate studies focused on feeding behaviours of Arctic Peregrine Falcons during nesting in Rankin Inlet, Nunavut.

The Effect of Temporal Trends in Sea Ice Freeze-up on Polar Bear Migration in the Western Hudson Bay
Erin Miller, Andrew E. Derocher, and Nicholas J. Lunn
Polar bears are specialized predators distributed within the circumpolar Arctic. They rely on sea ice for most aspects of their life history, including accessing prey. The Western Hudson (WH) polar bear subpopulation migrates between winters on the Hudson Bay sea ice hunting seals and summers inland spent fasting. Migration closely follows sea ice freeze-up and break-up dates. An increased ice-free period will lead to lower body condition, survival, and increased human-animal conflict. The Western Hudson subpopulation is one of the most well-researched of a poorly documented species and presents a unique opportunity for identifying long-term trends in migration ecology. Conflict rates

are believed to have increased over time, but the climatic and demographic factors influencing these rates are not fully understood. Currently, WH bears are subject to legal harvest in Nunavut as well as 'in-defense' killings in Manitoba as a total harvest quota. By comparing long-term telemetry with harvest records, a more accurate database of WH bear human-caused mortality can be created. As polar bears experience increased climatic stress, it will be necessary to reassess the sustainability of current harvest quotas. I first plan to model the bottom-up effects of sea-ice on the ecology of WH polar bear autumn migration. I will then focus on the "problem" bears involved in human-animal conflicts to examine the spatial and temporal variation in conflict rate. At the end of my analyses, I will have summarized the individual and interacting effects of climate change, demography, and human-animal conflict on WH polar bear fall migration

Biosketch: I am a Master's of Science student at the University of Alberta. I graduated with a BSc (Honours) in Ecology from the University of Calgary where I studied urban bat roosts. I spent a summer in Dominica where I caught Caribbean bats as part of a conservation research organization.

What we Caribou: A tool for landscape assessment to support caribou conservation

Mariana Nagy-Reis, César Estevo, Lalenia Neufeld, Tracy McKay, and Laura Finnegan

Declines in woodland caribou (*Rangifer tarandus caribou*) populations are a result of apparent competition mediated by broad-human alterations to landscapes and ecological communities in which they occur. These alterations disrupt ecosystem dynamics across three trophic levels: vegetation, ungulates, and carnivores. Caribou conservation in the future will rely on creating/maintaining ecological conditions to support caribou survival. Because management of critical habitat is therefore key in ensuring that future landscape conditions support caribou, understanding what landscape characteristics predict caribou and other ungulate populations, and consequently predators, is essential. The ultimate goals of this project are to determine how landscape characteristics (e.g., resources and disturbances) in various spatial scales affect caribou via alternative prey and wolves, and to use this information to compare the effectiveness of restoration options for caribou critical habitat. We first conducted a literature review on the relationships between landscape characteristics and North American ungulate and carnivore populations. We assessed whether it is possible to use remote-sensing based information (e.g., NDVI) and forest characteristics (e.g., disturbance and age) to infer ungulate populations. We then compiled information on predator-prey relationships to assess the feasibility of using landscape assessments to obtain wolf population density and infer predator-prey dynamics. We will outline the results of this literature review and discuss the feasibility of using existing data (i.e., vegetation data, remote sensing data, forest stand data, ungulate population data, and predator data) to predict ungulate and carnivore abundances in Jasper National Park to support caribou recovery.

Biosketch: Mariana is the Caribou Recovery Ecologist at the Alberta Biodiversity Monitoring Institute /University of Alberta. Her ultimate goal is to answer real-world questions and deliver research tailored to guide conservation plans and science-based management.

Bat Roost Monitoring and Citizen Science in Alberta

Cory Olson and Erin Low

The Alberta Community Bat Program (Wildlife Conservation Society Canada) has been operating a citizen science program to encourage bat roost reporting in Alberta since 2016. Over the past four years, greater than 200 roosts have been reported to the program and, for most of these, species

identity has been confirmed using DNA barcoding of guano samples. Several trends are now apparent in the use of anthropogenic structures by bats in Alberta. Just two species—Little Brown Myotis and Big Brown Bat—account for nearly all reports of bats roosting in buildings or bat houses in the province. Roosts of the federally endangered Little Brown Myotis are much more frequently reported than those of Big Brown Bats, and many of these consist of maternity colonies numbering in the hundreds and potentially thousands of individuals. The use of bat condos (very large bat houses capable of supporting thousands of bats) has been suggested as a conservation tool for helping to mitigate for the loss of building roosts, especially for Little Brown Myotis. A key objective is to avoid overheating and to provide conditions that more closely resemble building roosts. During 2019, we installed temperature and humidity dataloggers in three bat condos in central Alberta, in addition to several bat houses and building roosts, to evaluate the viability of using bat condos to mitigate for the loss of building roosts. Preliminary results are now available, and this project is expected to continue during 2020.

Biosketch: Cory Olson is an environmental consultant and Program Coordinator for the Alberta Community Bat Program. He completed his master's degree at the University of Calgary focusing on bat ecology, and has led several research and conservation projects relating to bats and other wildlife over the past ten years.

Winter Ecology of the Ronald Lake Wood Bison Herd

Aidan Sheppard, Lee Hecker, Mark Edwards, and Scott Nielsen

Understanding determinants of animal movement is necessary for effective management and conservation of wildlife. The ability to model and predict animal movement and habitat selection across various spatiotemporal scales can reveal key information about a population. Northern landscapes offer unique challenges for wildlife, as harsh winter conditions can dramatically alter animal behaviour. Snow is a major limiting factor for many wildlife, including North America's largest land animal: the wood bison (*Bison bison athabascae*). Snow is known to influence bison foraging behaviour and habitat selection, as well as increase predation risk. The effect of low temperatures on bison behaviour at the landscape scale is less understood, but it is known to adversely affect other ungulate species. In this study, we use data from GPS collared wood bison to examine the main drivers of winter bison behaviour through a modelling approach that considers the influence of temperature and snow depth on movement and habitat selection. The results from this study will improve understanding of wood bison ecology and inform management of the Ronald Lake herd.

Biosketch: Aidan is a fourth-year undergraduate student in the Environmental and Conservation Sciences program at the University of Alberta. Aidan worked as a summer field technician in the Applied Conservation Ecology Lab in the summer of 2019 and plans to pursue graduate studies in the fall of 2021.

Canada Warbler (Cardellina canadensis) Breeding Ecology at the Edge of the Range in Western Alberta

Lisa Takats-Priestley, Chuck Priestley, and Wendy Crosina

Canada Warbler has been listed as *Threatened* federally (COSEWIC 2010) and provincially *At Risk* (AEP 2015). Declines have been attributed to habitat conversion of breeding and nonbreeding habitat, changes in insect prey availability, and window collisions. The annual trend in Canada for the Breeding Bird Survey (BBS) was -1.77 (1970-2017), however most routes are in southern parts of the

species range. Within Weyerhaeuser's Forest Management Agreement (FMA) areas, we investigated where Canada Warblers were found, conducted a Rapid Assessment using banding and point counts, measured habitat characteristics within breeding territories, and investigated singing timing of territorial males. We banded six second year male Canada Warblers in 2017, however there was no evidence of any returning in 2018. We also netted in six areas in 2018 and captured and color banded four males (all aged second year). In 2019, we revisited the banding sites from 2017 and 2018. We captured three new second year males, and successfully recaptured one color banded one from 2018. This is the first evidence of a Canada Warbler returning in this part of their range. Density of Canada Warblers across the FMA ranged from 0.0019 to 0.0095 birds/ha per year. We developed a breeding habitat model for Canada Warbler for the western part of their range. Habitat tends to be deciduous dominated, have high canopy closure, structurally complex understory, some component of standing water, and variable topography. We will also present an updated range map and recommended timing windows for conducting surveys.
Biosketch: Lisa has been involved in wildlife research and monitoring for over 20 years. Lisa and her husband incorporated STRIX Ecological Consulting in 2005 and both work on various monitoring, inventory and assessment studies on birds, mammals, bats, and amphibians. She has banded 118 species of birds (over 5000 individuals).

The Benefits and Costs of Coursing
Ryan Tate
Male bighorn sheep (*Ovis canadensis*) have two mating tactics: tending (guarding the female) and coursing (stealing the female). These two tactics are highly correlated with size and age with young/small males coursing and old/large males tending. I am using evolutionary game theory to look at how males invest in coursing. I am looking on a macro scale of balancing the early payout that coursing allows for vs the risk of injury and thus not surviving to be a tender. I am also looking at the micro scale of how two coursing males reach an equilibrium strategy for who initiates and who joins a coursing event and how long to remain in a given coursing event.
Biosketch: Student at the University of Calgary studying evolutionary game theory

Walking the Line: Investigating ecological characteristics relating to wildlife linear feature use
Erin Tattersall, Karine Pigeon, Doug MacNearney, and Laura Finnegan
Industrialized landscapes in the western boreal forest are characterized by vast networks of linear features (seismic lines, pipelines, roads), which pose a problem for at-risk woodland caribou (*Rangifer tarandus*). Linear features create movement corridors for predators, facilitate growth of vegetative forage for alternate prey species, and fragment caribou habitat. To mitigate the negative effects of linear features on caribou, we must first understand the ecological characteristics that influence wildlife use of linear features. In this study, we use field data collected in west-central and north-western Alberta to investigate habitat and vegetation characteristics influencing linear feature use by bears (*Ursus arctos* and *U. americanus*), deer (*Odocoileus virginianus* and *O. hemonious*), elk (*Cervus elaphus*), and moose (*Alces alces*). We test the hypotheses that linear feature use is affected by 1) ease of movement, 2) risk avoidance 3) prey availability and 4) forage availability by modelling the relationships between ecological characteristics and wildlife track and sign data. Results of this study will increase understanding of what characteristics of linear features attract predators and alternate prey to these disturbances, which will highlight characteristics to be focused

on during habitat restoration. This information will assist land managers and decision makers in planning landscape rehabilitation and future development in a manner consistent with caribou conservation goals.
Biosketch: I am a research intern with the Caribou Program at fRI Research, where I conduct analyses on wildlife linear feature use and field work for the Deer Cutblock project. My previous research experience was at the University of British Columbia, where I investigated wildlife responses to linear feature restoration.

Hydro Acoustic Surveys in Shallow Northern Boreal Lakes: Improving non-lethal sampling techniques, exploring the potential of hydro acoustic surveys, and acknowledging its limitations and potential biases
Sebastian Theis, Mark Poesch, and Cameron Stevens
The need for fishery independent data in regard to stock assessment and implementation of management strategies has increased at a rapid rate over the past few decades (Fernandes et al. 2000). In the light of utilizing alternative sampling techniques and approaches, hydro acoustic surveys have taken the center stage. While nowadays, especially more often used in assessing fish populations in smaller freshwater systems, mobile hydro acoustic surveys conducted from research vessels potentially still introduce a variety of biases (Wheeland and Rose 2014). Fish may change their swimming behavior to avoid the moving vessel (Wheeland and Rose 2014). Adding to that the nearfield of the hydro acoustic setup does not allow for including the first 1 to 2 m below the surface (Baran 2017). Differences in movement patterns between day and night surveys also occur following the different feeding and activity behavior of various fish species and their preferred prey (Lian et al. 2013). To investigate these potential biases our research aims to conduct vessel avoidance studies and compare fish distribution and abundance in day and night surveys, as well as using a combination of side and downward facing scans to capture the whole of the depth profile.
Biosketch: MSc in Fishery Science and Aquaculture (Humboldt University of Berlin), BSc in Geology and Paleontology (Ernst-Moritz-Arndt University Greifswald), PhD Student University of Alberta - Conservation Biology. Research Interests include: Behavioral Ecology, Freshwater Conservation, Science Communication.

Habitat Suitability Models and Climate Change: Projecting habitat changes for the polar bears of Davis Strait
Larissa Thelin and Andrew E. Derocher
This poster will outline the MSc thesis proposal of Larissa Thelin (Department of Biological Sciences, University of Alberta). The proposed study will attempt to understand how climate change may impact the habitat range of the Davis Strait (DS) subpopulation of polar bears (*Ursus maritimus*) using four objectives: 1) determine the habitat selection of DS polar bears as it relates to sea ice, and across both space and time, using radio-telemetry data and resource selection functions (RSFs); 2) determine the habitat selection of harp seals, a major food source for DS bears, using radio-telemetry data and RSFs; 3) develop a model of current potential habitat for the DS subpopulation using up-to-date sea-ice models and data determined through objectives 1 and 2; and 4) project the model established in objective 3 using various climatic warming scenarios established by the IPCC. While there are studies that have modelled potential shifts in polar bear habitat, none have

investigated the DS subpopulation. This proposed study will fill this gap in polar bear research and improve upon habitat suitability models in general by incorporating the spatial ecology of prey.
Biosketch: Larissa Thelin is an MSc student in Biological Sciences at the University of Alberta, working under the supervision of Dr. Andrew Derocher. She completed her BA in Natural Resource Management at Vancouver Island University in 2017 and her undergraduate thesis was published in the Canadian Geographer in 2018.

Migration and Movement Dynamics of Polar Bears (Ursus maritimus) in Western Hudson Bay
Alyssa M. Bohart, Nicholas J. Lunn, Andrew E. Derocher, and David McGeachy
Migration is a behavioral response to temporal variation in resources. While migration phenology is often predictable, phenology is expected to shift as climate change alters seasonal resource availability. We used data from satellite-linked telemetry collars on adult female polar bears (*Ursus maritimus*) in western Hudson Bay from 2004-2016 to: (1) quantify migration using multiple metrics, (2) assess environmental and biological factors that may influence migration, and (3) evaluate temporal patterns in migration. We included migration metrics (maximum distance to coast, Brownian bridge home range size, median speed (km/h), straightness index, land departure date, and land arrival date) as response variables in multivariate response variable regression models to assess the effect of environmental (ice concentration, wind speed, and wind direction) and biological (bear body condition, bear age, age of offspring, and number of offspring) factors on migration. We included year as a covariate to assess temporal effects on migration. We found that ice concentration was the only factor that consistently predicted migration patterns. Wind direction and wind speed were predictors of freeze-up migration, whereas wind direction was a key predictor of break-up migration. Migration patterns did not change temporally during our study period, suggesting lack of a climate-induced migration shift. Examining multiple migration metrics avoids oversimplification of a complex behavior and allows an in-depth investigation into what factors influence migration.
Biosketch: Alyssa recently completed her MSc at the University of Alberta, where she studied polar bear movement ecology. She completed her bachelor's degree in Honors Animal Biology at the University of Alberta. As an aspiring wildlife biologist, she hopes to continue researching conservation issues as well as share her passion for wildlife conservation and public engagement.

Identifying Memory-Based Movement Patterns in Arctic grizzly bears
Peter Thompson, Mark A. Lewis, and Andrew E. Derocher
Understanding how animals move is important to their conservation, protection, and management. With the recent advent of GPS technology as an animal tracking method, ecologists can identify such patterns at a much higher resolution than was previously available. Step selection functions (SSFs) have emerged as an effective method to statistically explain the factors governing an animal's movement. While qualities of an animal's landscape, such as environmental conditions or the presence of other species, are generally accepted as primary drivers of animal movement, spatial memory (the way an animal encodes landmarks based on their locations) may also play an important role. In environments where food is sparse and seasonal, such as the Arctic tundra, the ability to remember the location and timing of seasonal, localized food pulses is integral to optimizing foraging efficiency. Grizzly bears *(Ursus arctos horribilis*) in the Mackenzie River Delta region of the Northwest Territories are opportunistic feeders, taking advantage of a wide variety of seasonal food sources, from berries to fish. Because these pulses are only present at one time of the year, bears would

benefit from navigating to specific parts of their home ranges at the same time each year. We can verify this rigorously by conducting a step selection analysis on GPS data from these bears. Identifying evidence of memory-informed movement in this study system would not only be a novel application of step selection analysis but could inform improved understanding of this peripheral population of grizzly bears.

Biosketch: I am a first-year graduate student at the University of Alberta studying movement ecology. I graduated from the University of Maryland with a BS in Mathematics in 2019. I am trying to advance this field from a multidisciplinary approach using my quantitative background.

Comparing Expert-Ranked and Model-Estimated Risk of Incidental Take of Forest Birds and Their Nests by Logging Operations

Laura Marie Trout, Lionel Leston, Erin Bayne, Peter Solymos, Lisa Takats-Priestley, Wendy Crosina, Margaret Donnelly, and Kari Stuart-Smith

There is increasing interest by forestry companies in predictive tools that can be used during operational planning to reduce the risk of incidental take of birds and nests during harvest operations. There are existing GIS-based tools that rank the relative bird abundance – and risk of incidental take – within individual forest stands, but the ranks assigned by these tools are based on the expert opinions of biologists alone. There are thousands of point counts that have been used to develop generalized linear models (GLMs) of individual bird species, which can be used to predict densities of individual species within forest stands. We summed the predicted densities of individual species, then assigned forest stands a model-based rank of risk of incidental take. We compared our model-based ranks for forest stands to the expert-based ranks those stands received from an existing GIS-based tool. There were strong positive correlations (Spearman rank correlation > 0.50) between the model-based and expert-based ranks of forest stands in different boreal forest regions of Alberta, suggesting that stands that received a high model-based rank also received a high expert-based rank. Correlations were stronger in regions that were sampled by more point counts. As two different systems independently predicted similar high relative bird densities across species within forest stands, forestry companies can have greater confidence in minimizing incidental take by avoiding harvest of high-ranked stands in the main breeding season of Alberta birds.

Biosketch: Laura Trout is the Senior Biologist with West Fraser. Earning a BSc and MSc in ecology from Guelph is the early 2000s, she then moved into applied conservation biology through adaptive forest management planning. She will be presenting this body of work on behalf of a large group of collaborators.

Understanding the Impacts of Invasive Northern Crayfish (Orconectes virilis) on Native Piscivorous Fish Species in the North Saskatchewan River Watershed

Victoria Van Mierlo, Cristina Buendia-Fores, Stephanie Green, and Mark Poesch

Invasive species are the second largest threat to biodiversity, globally. Crayfish are especially robust invaders due to their omnivorous nature and ability to compete directly (resource procurement) and indirectly (habitat occupation and modification) with native species. *Orconectes virilis* is a species of crayfish that has recently seen range expansions via anthropogenic and natural avenues into previously unoccupied Alberta watersheds as an invasive species. A newly *Orconectes virilis* afflicted watershed is the North Saskatchewan River (NSR). The NSR is an ecologically, economically, and culturally valuable watershed and is home to multiple sensitive and at-risk fish species. It is also

highly impacted by surrounding land uses including agricultural, urban, oil and gas, and forestry. Despite the presence of *Orconectes virilis* in the NSR since the early 2000s, the crayfish's densities and impacts on fish communities have yet to be assessed. This study aims to address this by (1) establishing *Orconectes virilis* densities in the North Saskatchewan River basin, (2) to compare NSR *Orconectes virilis* densities to those of native range watershed, and (3) use isotope analysis to determine if there is evidence of crayfish and fish niche overlap indicating competition for resources.
Biosketch: Hello, my name is Victoria Van Mierlo and I am a first year master's student in the lab of Dr. Mark Poesch. I am originally from Ontario and completed my BSc Honours at McMaster University.

Increased Tracking Ability When Using Backpack-Mounted VHF Transmitters on Post-Fledge Raptors
Ronena Wolach, Cameron Nordell, Erin Bayne, Troy Wellicome, and Melynda Johnson
The development of satellite tracking technology has increased our ability to accurately monitor wildlife over time and distance. There are demonstrated negative effects of transmitters on raptors, but there is limited evidence of the effects on post-fledging juveniles (hereafter, fledglings). Our objective was to determine if survival and tracking time of fledgling hawks differed between two transmitter types that are commonly used in raptor research. Backpack- and tarsal-mounted VHF transmitters were deployed on juvenile ferruginous hawks (n=106) in southern Alberta and Saskatchewan in 2011-2012. Ferruginous hawk young were tracked using VHF receivers every 3-4 days until they dispersed beyond the range of the receiver or died. Using a Cox proportional hazards survival model, we found no significant difference in survival time between fledglings with backpack- and tarsal-mounted transmitters. Using a generalized linear model, we found that fledglings with backpack-mounted transmitters (34.6 days ± 14.9 SD) were tracked significantly longer than those with tarsal-mounted transmitters (30.2 days ± 4.9 SD). These results indicate that the survival impact of carrying a transmitter for fledgling raptors did not differ between tarsal- and backpack-mounted units. The longer tracking time for backpack-mounted transmitters could be explained by longer signal transmission distances compared to tarsal-mounts. However, future studies should test whether backpack-mounted transmitters increase tracking time due to weight and movement restrictions that inhibit fledgling movements. We suggest that the greater tracking time afforded by backpack-mounted VHF transmitters can benefit projects monitoring fledgling behaviour and space use before dispersal from the home range.
Biosketch: I am currently a MSc student at the University of Alberta and being supervised by Dr. Erin Bayne. I am leading the Raptor Ecology and Conservation Team (REACT), and am investigating nest height preference and productivity of ferruginous hawks in southern Alberta.

Disparity in Elk (Cervus canadensis) Behaviour Following Different Migratory Tactics on a Sympatric Winter Range
Madeline Trottier, Jacalyn Normandeau, Mark Hebblewhite, and Evelyn H. Merrill
The partially migratory Ya Ha Tinda (YHT) elk herd in Alberta exhibits a western migration to montane summer ranges in Banff National Park, while resident elk remain on the sympatric winter range year-round. In recent years, a new migratory tactic emerged moving to industrial forest lands east of YHT. Previous studies have shown that despite high spatial overlap, western migrants showed different vigilance patterns in areas of human and predation risk than resident elk, which was attributed to differential exposure to predators and humans during the summer. We documented

the foraging, vigilance, and grouping behaviors of GPS-collared elk following these three migratory tactics on the winter range in 2019 and 2020. We predicted that the new eastern migrants would exhibit higher vigilance than other tactics due to less predictable levels of human disturbance on the summer range east of YHT. We examined home-range overlap between migratory tactics using GPS data during the winters of 2018 and 2019, in addition to recording direct observations of foraging and vigilance of focal elk of each tactic relative to forage biomass, predation risk, and position in the herd. Preliminary results indicate high home-range overlap among all three migratory tactics, but significantly higher vigilance during foraging between eastern migrants (19.2 ± 2.5% total observation time) and residents (16.5 ± 1.6% total observation) across both years. Group sizes, snow and position within the herd best explained variance in vigilance. We discuss the implications of differences on anti-predator behaviors on winter foraging constraints among migratory tactics.
Biosketch: I'm a master's student in the Merrill Lab at the University of Alberta studying elk behaviour at Ya Ha Tinda ranch. I graduated from Trent University in Peterborough, Ontario in 2018 with a BSc in Biology.