SOME ENCOUNTERS ARE EVEN BETTER VIRTUAL

SOCIAL EVENTS
RESEARCH TALKS
AWARDS

PANEL DISCUSSIONS
ONLINE AUCTION
COMMITTEE MEETINGS

ALBERTA CHAPTER OF
THE WILDLIFE SOCIETY

ENGAGE
INSPIRE
EMPOWER
CONNECT

Virtual Conference
Species on the Move

March 22-26, 2021

PROGRAM

TABLE OF CONTENTS

CONFERENCE SPONSORS

The ACTWS extends a sincere thank you to all of our conference sponsors!
You all make this conference possible!

PRESIDENT'S MESSAGE

Welcome to the 2021 Alberta Chapter of The Wildlife Society Virtual Conference! The conference theme, "Species on the Move" reminds us that humans are currently stagnant, and I expect there is some disappointment that we are not able to meet in person this year. Rest assured, the conference planning committee has brought you a virtual experience that is fully immersive and as engaging as past conferences. I encourage everyone to take advantage of the networking features the virtual platform offers to connect with other wildlifers. Not only will you be able to attend the live events, but you will have access to the presentations, posters, and panel discussions for three months after the end of the conference. Thanks very much to the conference planning committee and all the volunteers that have worked to create this virtual conference experience. Enjoy the conference and the varying surrounding landscapes of your remote locations. We look forward to seeing you virtually at the conference and in person in the coming years.

Alex Beatty,

ACTWS President

SCHEDULE AT A GLANCE

Monday, March 15	All pre-recorded video talks available for viewing
Monday, March 22	Conference Opening Videos Available Annual General Meeting
Tuesday, March 23	Equity, Diversity, and Inclusion Committee Meeting Creating a Safe Space workshop
Wednesday, March 24	Student Mentor Hour Public Talk – Alberta Bison: Cultural and Ecological Perspectives Conservation Affairs Committee Meeting
Thursday, March 25	Expert Panel Discussion: Species on the Move Concurrent Sessions: 1. Human Wildlife Interaction • Human dimensions • Impacts from human management • Human impacts 2. Wildlife Behaviour and Selection • Behavioural decisions • Migratory Behaviour • Habitat Selection Poster Session: Big League
Friday, March 26	Expert Panel Discussion: Role of Hunting, Trapping, and Fishing in Conservation Concurrent Sessions: 1. Emerging Issues • Novel Approaches • Urban Wildlife • Disease 2. Lasting Impacts • Climate change • Assisting caribou recovery • Long-term monitoring Poster session: Small Fry Closing comments video available

PUBLIC TALK – ALBERTA BISON: CULTURAL AND ECOLOGICAL PERSPECTIVES

Wednesday March 24, 2021 | 12:00 PM MST

Join us for lunchtime talk of three interesting presentations by Bill Snow, Wes Olson, and Dillon Watt. Bill Snow will be presenting a talk and a short film on the cultural perspective on the bison reintroduction in Banff National Park. Dillon Watt will be presenting on bringing bison back to Banff National Park, and Wes Olson will be presenting on the ecological buffalo: following the trail of a keystone species.

Bill Snow, Consultation Manager, Stoney Nakoda First Nation
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 and 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 will also include the scenery of the Bison herd at Stoney Indian Park, on the Stoney Indian Reserve.

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 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.

Dillon Watt, Resource Conservation Officer, Parks Canada
Title: *Bringing Bison Back to Banff National Park*

Abstract: In February 2017, Parks Canada began a 5-year pilot project to reintroduce North America's largest land mammal (bison) to Canada's first national park (Banff). Dillon will summarize the project and provide some behind-the-scenes stories of the effort to restore this iconic animal to a place where it's been missing for 140+ years.

Dillon Watt is a Resource Management Officer in Banff National Park, and a member of the plains bison reintroduction team. Of Dillon's 16-year career with Parks Canada in Banff, the past five and a half years have been dedicated to the bison reintroduction effort.

Wes Olson, Author, Elk Island National Park (Retired)
Title: *The Ecological Buffalo: Following the Trail of a Keystone Species*

Abstract: For more than 130,000years 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.

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 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, Prince Albert and Grasslands National Park in southern 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 and rather than stop working with bison, established his own bison consulting company and continues to work in the field of bison conservation. 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.

Sacred and Sacrifice - Wes Olson

KEYNOTE AND EXPERT PANEL DISCUSSION – SPECIES ON THE MOVE

Thursday March 25, 2021 | 9:00 AM MST

Species on the Move prompts us to think critically about current and future challenges facing wildlife and how they navigate landscapes in a shifting climate.

KEYNOTE

Dr. Kathy Martin, Professor of Wildlife Ecology, University of British Columbia
Title: *Temperate Mountain Bird Responses to Climate Change Influences*

Abstract: About 24% of the North American landbase is classified as mountainous, including >75% of the British Columbia and Yukon landbase. 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 breeding in mountains, many birds use mountain 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.

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 Research Scientist Emeritus 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 and 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 225 scientific papers and book chapters on ecology, behaviour and conservation of birds. Kathy Martin is immediate Past 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 Ornithologists' 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).

PANELISTS

Dr. Geoff Holroyd, Chair, Beaverhill Bird Observatory
Co-author: Myrna Pearman
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, Eurasian Collared Doves are expanding their range northwards and severe weather events are negatively impacting a variety of avian species, including burrowing owls and peregrine falcons.

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.

Dr. Andrew E. Derocher, Professor, University of Alberta
Title: *An Accidental Icon: Climate change and polar bears*

Abstract: Habitat loss is the main threat facing ursids across their range and in the Arctic, rapid warming has 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 points. Energy stores are the 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 but management has failed to evolve to the address changing ecological conditions. As the Arctic sea ice ecosystem disappears, a new one is emerging. There will be winners and losers in a warming Arctic, but polar bears are unlikely to retain their top predator status in much of their current range.

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 the Norwegian Polar Institute before returning to Canada. He is a member and past-chair of the IUCN/SSC Polar Bear Specialist Group. His has studied polar bears across the Arctic over the past 38 years and published >180 peer reviewed papers on their ecology, ecotoxicology, and the effects of climate change. He has also studied grizzly bears, wolves, cougars, Dall sheep, caribou, ringed seals, Arctic ground squirrels, ermine, marbled murrelets, and peregrine falcons.

Diane Stralberg, Research Scientist, 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. 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 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.

Diana Stralberg is a research scientist with the Canadian Forest Service (recently at the University of Alberta) and the Boreal Avian Modelling Project. Her work has 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.

Dr. Kathreen Ruckstuhl, Professor, University of Calgary
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.

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.

Moderator

César Augusto Estevo

PhD Student, University of Alberta

César is a PhD student in ecology at the University of Alberta investigating climate change resilience of bird communities and the boreal ecosystem. César is chair of the International Committee within the Wildlife Society's Student Development Working Group and co-chair of the Equity, Diversity, and Inclusion committee of the Society of Canadian Ornithologists. César's passion for wildlife started during his biology undergrad in Brazil, which led him to look for birds in the Brazilian Atlantic Forest, to travel to the Amazon forest to guide wildlife enthusiasts, and now to study birds in the boreal forests of Canada. Twitter: https://twitter.com/cesar_estevo; Website: www.cesarestevo.com.

EXPERT PANEL DISCUSSION – ROLE OF HUNTING, TRAPPING AND FISHING IN CONSERVATION

Friday March 26, 2021 | 11:15 AM MST

The role that hunting, trapping and fishing can play in helping us understanding wildlife movements and conservation.

Panelists

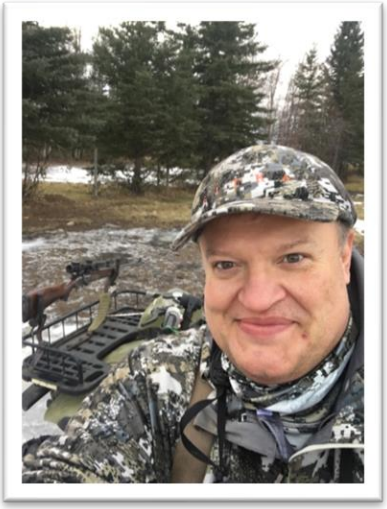
Lee Foote, Professor Emeritus, University of Alberta

Title: Hunting: A gift to all Albertans

Abstract: For us to live, something else must die is a truism as fundamental as thermodynamics, yet, in the world of human-constructed reality and perception, mortality remains deeply concealed. Even a pacifist vegan in organic cotton clothing inadvertently finances the unintended death of wildlife. Aldo Leopold could have been speaking to ACTWS when he wrote *One of the penalties of an ecological education is that one lives alone in a world of wounds. Much of the damage inflicted on land is quite invisible to laymen.* How does the intentional use of wildlife help balance the equation of habitat loss? In practice, we save what we love, value, and use. Much of Alberta's stewardship, conservation, and habitat securement rests on the attitudes hunters maintain with hunted species; from this relationship, all Albertans benefit.

Lee Foote is a father, spouse, day-dreamer, conversationalist, traveler, musician, mentor, writer and celebrator of outlandish ideas. As a retired academic supported three decades by taxpayers, it is time to pay the fiddler and Lee works to give back in some proportion to what he has been given. Therefore, 30% of his retirement is directed to volunteer activities, advising, engagement, and conservation. Currently he is serving as a magazine contributor, an essayist, a grant adjudicator for two granting bodies, a frequent reviewer of scientific articles, a contributor to workshops and webinars and a wetland advisor for Yukon Territorial Government and the Trond'ek Hwech'in First Nations.

Matt Besko, Director of Wildlife Health, Licensing and Hunting/Angling Ethics, Alberta Environment and Parks
Title: Hunting's Contribution to Conservation



Abstract: Hunting in Alberta is an ecologically, culturally, socially and economically important resource-based activity. There are many reasons why hunting has contributed to conservation, the understanding of wildlife movements and to the recognition of historically significant events in Alberta's wildlife heritage. But how does hunting contribute to one's personal growth as both a human being and as a species whose effects on their natural surroundings are so profound? Is hunting a vestigial activity to our evolutionary and social development, or is it a fundamental reminder of who we are as a species with inextricable ties to our natural environment? Is it a means to participating directly in an act of predation, and taking responsibility for that action, or are we content to quietly acquiesce to placing our effects (and subsequent collective responsibility) on wildlife and natural systems at the feet of society as a whole? For the answer to these and many other related and unrelated questions and issues, tune in to the presentation. Funny images and humorous anecdotes of Dr.'s Foote and Stelfox included!

Matt Besko is currently the Director of Wildlife Health, Licensing and Hunting/Angling Ethics for Alberta Environment and Parks. As a consummate generalist, he has had a diverse career managing most aspects of natural resource stewardship in 3 provinces over 30 years. He's had positions in Species at Risk, Regional FW Management, Habitat biology, wildlife and fisheries allocation and now fish and wildlife health, licensing and the management of invasive species. For most of his career he has been interested in the management of hunting and how humans interact with nature and natural resources. He is passionate about wildlife ecology, history, writing, hunting, dogs, humour and food. Actually, mostly food.

Brian Joubert, Park Planner, Alberta Environment and Parks
Title: Can Hunting Connect Us to Nature?

Abstract: 'Connecting' people to nature is an often stated goal for many conservation organizations. The assumption is that a connection to nature can inculcate an ecological consciousness, which in turn translates into efforts to act ecologically and live more sustainably. Hunting and killing wildlife as catalysts for deep connection with nature seems counterintuitive to some. From the perspectives of area-based conservation (i.e. reserves, parks, protected areas etc.) is hunting a legitimate activity in meeting those aims of creating conservation

stewards, and as a means for stimulating an ecological conscience amongst its practitioners?

Brian Joubert is a self-described conservation generalist (don't we all need to be?), with a strong interest in the human dimensions of conservation management. He currently works as a park and protected area planner. His from his start in South Africa, his career has spanned a number conservation and land management topics, with an interlude in eco-tourism.

Moderator

Bill Abercrombie, President, Alberta Trappers Association

Bill is a lifelong outdoorsman and environmentalist. Bill's ancestors first came to the province of Alberta in western Canada in the 1880's. For generations, Bill's family has enjoyed a relationship of mutual respect with the original inhabitants. As a young man, Bill embarked on many wilderness adventures, canoeing and exploring northern Canada's vast rivers and lakes, and winters in the boreal forest. He realized a deep connection with the aboriginal peoples of this rugged and beautiful landscape. At the University of Alberta, Bill studied anthropology, primarily interested in Canada's Arctic. After university, Bill journeyed on many canoeing adventures in the far north including a 4 month, 2000 mile journey from the Mackenzie Mountains to the Arctic Ocean along the Yukon River. In 1986, Bill moved with his young wife Laura and their team of malamutes to the wilderness of central Alaska. He and Laura settled along the Wood River 100 miles south of Fairbanks and built a small log cabin with their own hands. They traveled by traditional dog sled, hunting and trapping for the meat and fur that would sustain them through the long winters. Bill has worked as a wildlife control officer and wildlife consultant for 21 years and a guide and outfitter for 12 years. Bill is President of the Alberta Trappers Association and Chair of the Alberta Conservation Association board of directors.

CONCURRENT SESSION A – HUMAN WILDLIFE INTERACTION

Thursday March 25, 2021 | 9:50 AM MST

Thank you to our session sponsor, Fuse Consulting

Human Dimensions

Emily Thoroski, University of Manitoba
Co-authors: Ricky Baydack, Erin McCance, and Jill Oakes
Title: *Using Music as a Tool for Promoting Environmental Conservation*

Philip Rose, Alberta Conservation Association
Co-authors: Robert Anderson, Doug Manzer
Title: *Understanding property access barriers that influence hunter retention and recruitment in Alberta: a landowner's perspective*

Karine Pigeon, Research Scientists, Yellowstone to Yukon Conservation Initiative and University of Northern British Columbia
Co-authors: Aerin Jacob, Pamela Wright
Title: *Leveraging technology to improve recreation and reduce human-wildlife conflict in the Yellowstone to Yukon region*

Read speaker abstracts in Appendix A1.

Impacts from Human Management

Dillon Watt, Parks Canada
Co-authors: David N. Laskin, Jesse Whittington, Karsten Heuer
Title: *Designing a fence that enables free passage of wildlife while containing reintroduced bison: a multispecies evaluation*

Baily McCulloch, University of Alberta
Co-authors: Melanie Dickie, Rob Serrouya, Stan Boutin
Title: *The new top dogs? Mesopredator densities increase with human habitat alteration, not with apex predator removal.*

Isobel Phoeebus, fRI Research
Co-authors: Gordon Stenhouse, Terry Larsen, Cameron J.R. McClelland, Karen Graham, Abbey E. Wilson, Dan Wismer, Paul Frame
Title: *How Do Moved Bears Move? Translocating Grizzly Bears into Unfamiliar Environments*

Claire Edwards, University of Alberta
Co-authors: Sarah Heemskerk, Colleen Cassady St. Clair
Title: *Measuring success of aversive conditioning and hazing programs for bears: a review*

Read speaker abstracts in Appendix A2.

Human Impacts

Victoria Van Mierlo, University of Alberta
Co-authors: Cristina Buendia-Fores, Stephanie Green, Mark Poesch
Title: *Occupancy and Impacts of Invasive Northern Crayfish (Faxonius virilis) on Native Fish Species in the North Saskatchewan River Basin*

Bethany Parsons, fRI Research
Co-authors: Nicholas C. Coops, Sean P. Kearney, Cole Burton, Trisalyn A. Nelson, Gordon B. Stenhouse
Title: *Risk taking and decision making: Grizzly bear responses to road visibility depend on movement mode.*

Carrie Ann Adams, University of Alberta
Co-authors: Erin Bayne, Esteban Fernández-Juricic, Colleen Cassady St. Clair
Title: *The effect of artificial light on bird movement and distribution: A Systematic Map*

Read speaker abstracts in Appendix A3.

Photo: Dragomir Vujnovic

CONCURRENT SESSION B – WILDLIFE BEHAVIOUR AND SELECTION

Thursday March 25, 2021 | 11:30 AM MST

Behavioural Decisions

Juliana Balluffi-Fry, University of Alberta
Co-authors: Shawn Leroux, Yolanda F. Wiersma, Isabella Richmond, Travis R. Heckford, Matteo Rizzuto, Joanie L. Kennah, Eric Vander Wall
Title: *The effects of intraspecific variation in forage quality on herbivore feeding and body condition*

Emily Studd, University of Alberta
Co-authors: M.J.L. Peers, A.K. Menzies, R.E. Derbyshire, Y.N. Majchrzak, J.L. Seguin, D.L. Murray, B. Dantzer, J.E. Lane, A.G. McAdam, M.M. Humphries, S. Boutin
Title: *The blustery boreal: Examining how species respond to wind*

April Martinig, University of Alberta
Co-authors: Andrew G. McAdam, Ben Dantzer, Jeffery E. Lane, David W. Coltman, Stan Boutin
Title: *The new kid on the block: Immigrant males win big whereas females pay fitness cost after dispersal*

Read speaker abstracts in Appendix B1.

Migratory Behaviour

Sara Williams, University of Montana
Co-authors: Mark Hebblewhite, Hans Martin, Josh Killeen
Title: *Predation Risk Drives Long-Term Shifts in Migratory Behavior and Demography in a Large Herbivore Population*

Hans Martin, University of Montana
Co-authors: Mark Hebblewhite, Evelyn Merrill
Title: *Bull elk survival, vulnerability, and antler size in a transboundary elk population*

Madeline Trottier, University of Alberta
Co-authors: Mark Hebblewhite, Evelyn Merrill
Title: *Social interactions in a partially migratory ungulate: does familiarity influence behavioural disparity?*

Read speaker abstracts in Appendix B2.

Habitat Selection

Robin Glover, University of British Columbia
Co-authors: Leticia Aviles
Title: *Habitat Selection as a Function of Web Type and Forest Succession Level in Spiders*

Abbey Wilson, University of Saskatchewan
Co-authors: Dan Wismer, Gordon Stenhouse, Nicholas C. Coops, David M. Janz
Title: *Using biomarkers in skin to inform how landscape condition influences energetics, reproduction, and stress in grizzly bears*

Read speaker abstracts in Appendix B3.

Photo: Mark Bradley

CONCURRENT SESSION C – EMERGING ISSUES

Friday March 26, 2021 | 9:00 AM MST

Novel Approaches

Glynnis Hood, University of Alberta
Co-authors: Mateya Bluett
Title: *Critters in the cattails: Enhanced detection of riparian mammals*

Elston Dzus
Co-authors: J. Gerrard
Title: *Population Trends and Comparison Traditional vs. Drone-Assisted Nest Checks of Bald Eagles at Besnard Lake, Saskatchewan, Canada 1968-2021.*

Laurens Put, University of Alberta
Co-authors: Peter Smoko, Margo Pybus, Anne Hubbs, Mark Ball, Evelyn Merrill
Title: *A Shiny App for Predicting Spread of CWD in Alberta, Canada.*

Camille Warbington, University of Alberta
Co-authors: Mark Boyce
Title: *Population genetics of free-ranging sitatunga in the Mayanja River of central Uganda*

Read speaker abstracts in Appendix C1.

Urban Wildlife

Cassondra Stevenson, University of Alberta
Co-authors: Maureen Murray, Catherine Shier, Colleen Cassidy St. Clair
Title: *Comparison of habitat selection by coyotes (Canis latrans) and circuit-based connectivity models in Edmonton, Alberta*

Jonathan Farr, University of Alberta
Co-authors: Robin Glover, Matthew Pruden, MH Murray, Howie Harshaw, Colleen Cassady St. Clair
Title: *Spatial and temporal correlates of conflict with urban coyotes from a 10-year community reporting database*

Scott Sugden, University of Alberta
Co-authors: Dana Sanderson, Kyra Ford, Lisa Stein, Colleen Cassady St. Clair
Title: *An altered microbiome in urban coyotes mediates relationships between anthropogenic diet and poor health*

Deanna Steckler, University of Alberta
Co-authors: Scott Sugden, Dana Sanderson, Kyra Ford
Title: *Dietary correlates of Echinococcus multilocularis infection in urban coyotes (Canis latrans)*

Read speaker abstracts in Appendix C2.

Disease

Maria Dobbin, University of Alberta
Co-authors: Evelyn Merrill
Title: *Relating Risk of Direct Contact and Risk of CWD Infection in Mule Deer (Odocoileus hemionus)*

Kelsey Gritter, University of Alberta
Co-authors: Evelyn Merrill, Maria Dobbin, Mark Lewis
Title: *Individual-based Modelling of Chronic Wasting Disease*

Jinging Xu, University of Alberta
Co-authors: Evelyn Merrill
Title: *Dietary correlates of Echinococcus multilocularis infection in urban coyotes (Canis latrans)*

Read speaker abstracts in Appendix C3.

Photo: Mark Bradley

CONCURRENT SESSION D – LASTING IMPACTS

Friday March 26, 2021 | 10:40 AM MST

Thank you to our session sponsor: West Fraser

West Fraser
Partners in Healthy Habitats

Climate Change

César Estevo, University of Alberta
Co-authors: Diana Stralberg, Scott Nielsen, Erin Bayne
Title: *Ecosystem-driven processes may promote cool wildlife habitat in a changing world*

Larissa Thelin, University of Alberta
Co-authors: Andrew Derocher, Alasraire Franke, Kylee Dunham, Evan Richardson
Title: *Projecting habitat use and dynamics for Davis Strait polar bears (Ursus maritimus)*

Lionel Leston, University of Alberta
Co-authors: David Andison, Erin Bayne, Yan Boulanger, Matt Carlson
Title: *Habitat On The Move: Using species distribution models and landscape simulation to project and manage for future Canada Warbler populations*

Read speaker abstracts in Appendix D1.

Assisting Caribou Recovery

Laura Finnegan, fRI Research
Co-authors: Karine Pigeon
Title: *Let it grow? Moose response to seismic lines in caribou ranges*

Erin Tattersall, fRI Research
Co-authors: Karine Pigeon, Doug MacNearney, Laura Finnegan
Title: *Walking the line: investigating ecological characteristics relating to wildlife linear feature use*

Stephanie Leonard, Aseniwuche Winewak Nation
Co-authors: Chantelle Bambrick
Title: *Caribou Patrol: An Indigenous Response to Fatal Interactions Between Migrating Caribou and Vehicles*

Read speaker abstracts in Appendix D2.

Long-Term Monitoring

Miriam Boucher, AJM Environmental
Co-authors: Aaron Cyr, Adam Martinson
Title: *Snakes of the Plain: Monitoring Snake Populations in Southern Alberta.*

Geoff Holroyd, Bearverhill Bird Observatory
Title: *Population Dynamics and Conservation of Burrowing Owls in Prairie Canada*

Sara Pearce Meijerink, Beaverhill Bird Observatory
Co-authors: Geoff Holroyd
Title: *37 Years of Monitoring at Beaverhill Bird Observatory.*

Read speaker abstracts in Appendix D3.

Photo: Mark Bradley

POSTER SESSION – BIG LEAGUE

Thursday March 25, 2021 | 10:25 AM MST

Dayce Rhodes, Lethbridge College
Title: *Monitoring Elk Visitation Between Agriculture Crops and Grassland in the Porcupine Hills of Southern Alberta*

Mélanie R. Routh, University of Alberta
Co-authors: Scott Neilsen
Title: *Dynamic patterns in winter ungulate browse succession in the Boreal Plains of Alberta*

Jennifer Foca, University of Alberta
Co-authors: Mark Boyce
Title: *Camera traps for density estimation: Evaluating the REST method*

Wyatt Villetard, University of Alberta
Co-authors: Phil Walker, Art Rodgers, Jen Shuter, John Cook, Rachel Cook, John Fryxell, Evelyn Merrill
Title: *Response of Woodland Caribou (Rangifer tarandus) to harassing insects across northeastern Ontario*

Erin Miller, University of Alberta
Co-authors: Andrew Derocher, Nicholas J. Lunn, David McGeachy
Title: *Autumn migration phenology of polar bears (Ursus maritimus) in Hudson Bay, Canada*

Anna Jovtoulia, University of Alberta
Co-authors: Andrew Derocher
Title: *Spring prey selectivity and habitat use in wolves (Canis lupus) in the southern Northwest Territories*

Justin Kestler
Title: *Wildlife Identification: The Hair Scale Guide to Terrestrial Mammalian Carnivores of Canada*

Read presenter abstracts in Appendix E.

POSTER SESSION – SMALL FRY

Friday March 26, 2021 | 9:35 AM MST

Lisa Wilkinson, Government of Alberta
Co-authors: Joanna Burgar, Brenda Shepherd
Title: *Bat Monitoring in Alberta: A five-year summary*

Conor Griffith, University of Alberta
Co-authors: Macs Macleod, Mark Poesch
Title: *Morphological Influence of Flow Augmentation on Milk River Plains Sucker*

Cory Olson, Alberta Community Bat Program
Title: *Bat Roost Monitoring and Citizen Science in Alberta*

Emma Micalizzi, University of Calgary
Title: *The roosting ecology of Little Brown Bats in Banff National Park*

Summer Hunter, University of Calgary
Co-authors: Sylvia Checkley, Scott Weese, Carl Ribble, Jamie L. Rothenburger
Title: *Health survey and pathology of free-ranging urban Leporidae in Calgary, Alberta*

Read presenter abstracts in Appendix F.

Photo: Mark Bradley

CONFERENCE COMMITTEES 2021
THANK YOU!

The ACTWS is an organization blessed with many dedicated volunteers who continually donate their time, expertise, and passion to organizational operations. This year's conference committees rose to the challenge of planning our first virtual conference with optimism, creativity, and thoughtfulness. We are so grateful for their hard work! This conference would not be what it is without them!!

Conference Chair: Nikki Heim

General Planning Committee: Glynnis Hood, Dee Patriquin, John Wilmshurst, Jessica Melsted, Sarah Elmeligi, Chuck Priestley, Andrea Morehouse, Alyssa Bohart, Alex Beatty, Nikki Heim

Open Paper Program: Robin Gutsell, Robb Stavne, Thea Carpenter

Expert panel discussions: Andrea Morehouse, John Wilmshurst, Chuck Priestley

Public Talk: Alex Beatty

Student Event: Jenny Foca

Professional Awards: Glynnis Hood, Margo Pybus, Lee Foote

Student Presentation Awards: Alyssa Bohart, Larry Roy, Fauve Blanchard, Emily Herdman, John Paczkowski, Corey Scobie, Jessica Melsted, John Wilmhurst, Sarah Elmeligi

Scholarships and Grants: Jessica Melsted, Gillian Fraser, Jacalyn Normandeau

Auction: Dragomir Vujnovic, Erin Henderson , Alyssa Bohart, Sarah Elmeligi

Sponsorship: Fauve Blanchard, Grace Enns

Registration: Alyssa Bohart

Website: Layla Neufeld, Lucas Habib

Communications and Marketing: Sarah Elmeligi

Session Moderators: John Wilmshurst, Sarah Elmeligi, Alyssa Bohart, Fauve Blanchard, Jessica Melsted, Nikki Heim

Programs: Nikki Heim, Sarah Elmeligi

APPENDIX A: HUMAN WILDLIFE INTERACTION ABSTRACTS

A1: Human Dimensions

Emily Thoroski, University of Manitoba
Co-authors: Ricky Baydack, Erin McCance, and Jill Oakes
Title: *Using Music as a Tool for Promoting Environmental Conservation*

Abstract: The planet is currently in one of the great extinction crisis of world history. The next steps that the human race takes to protect and conserve our planet will determine our long-term existence on Earth, as well as the existence of many species. Communication and collaboration between humans is critical to move forward to sustain healthy ecosystems and populations throughout the planet. Music can be used as a tool to get people excited and educated on environmental conservation. Emily uses her passion for science and music to help get more people involved in our conservation mission. Her methods include interviewing wildlife professionals, indigenous peoples, and students to gain an extensive amount of knowledge and perspectives. Songs and videos are created based on the results from the interviews completed. The content is then promoted to act as a tool to educate and inspire people to get involved. There has been evidence throughout this study showing that music can be used as a tool to promote environmental conservation. Our species needs to work together to conserve biodiversity on our planet. We need to communicate and collaborate and take an interdisciplinary approach at our mission to conserve and protect the species and habitat that are left on our planet. Join me in spreading our message to a greater audience!

Keywords: Communication, music, environment, conservation

Biosketch: Emily is a M.Env.S at the University of Manitoba who's research focuses on environmental communication. She is a biologist and musician known as The Environmental Musician and was awarded with The Wildlife Society's Conservation Education Award in 2020.

Philip Rose, Alberta Conservation Association
Co-authors: Robert Anderson, Doug Manzer
Title: *Understanding property access barriers that influence hunter retention and recruitment in Alberta: a landowner's perspective*

Abstract: Landowners and hunters have always played vital roles in conservation. Recently, the number of active hunters has been declining across North America. Research has shown that insufficient land access for hunting can be a barrier to retaining and recruiting hunters. To understand if the hunter-landowner dynamic is changing in Alberta and why this may be the case, Alberta Conservation Association developed a voluntary landowner survey in collaboration with the Universities of Alberta and Waterloo and received input from a variety of agriculture producer groups. Survey questions evaluated the degree to which hunters are allowed on private land. Landowners were asked about their property, how many requests they receive, how many hunters

are permitted access, how they decide who is granted access, and the factors they consider when allowing or denying access. The accessibility of properties covers a broad spectrum of scenarios ranging from no hunting access under any circumstances to unrestricted access for all who ask. Previous surveys have suggested that most landowners are willing to allow hunting access in some form. However, we also know that many hunters, especially those new to the activity, have difficulty getting access or gaining the trust of landowners. We want to better understand: 1) what causes this discrepancy, and 2) what might be practical steps to improving the situation for both hunters and landowners. Here we present the initial results of the survey and what has been learned so far.

Keywords: Hunter access, landowner survey

Biosketch: I am a Wildlife Biologist with Alberta Conservation Association. Over the past 3 years I have worked on a variety of projects that include understanding the dynamics of hunter retention and recruitment, promoting habitat for game birds, and species at risk management.

Karine Pigeon, Research Scientists, Yellowstone to Yukon Conservation Initiative and University of Northern British Columbia
Co-authors: Aerin Jacob, Pamela Wright

Title: *Leveraging technology to improve recreation and reduce human-wildlife conflict in the Yellowstone to Yukon region*

Abstract: The Rocky Mountains and foothills are world-renowned for protected areas and abundant wildlife. Parks see millions of visitors; nearby towns are hubs for tourism and recreation. But more people are recreating in more places, more often, going farther and faster than ever before. Without careful planning, this can harm sensitive wildlife and their habitats. Yet it can be hard to manage recreation in ways that are ecologically meaningful and socially acceptable (e.g. across park boundaries; when/where to close/create trails). Although the impacts of motorized and non-motorized recreation on wildlife are well documented, most efforts to track where and how much recreation is happening rely on static metrics (e.g., road/trail density), and exclude the number of users, timing, or type of recreation. Scientists, governments, and conservation and recreation groups have called for comprehensive analyses of recreation to identify impacts of multiple users across multiple species ranges and seasons, and to account for cumulative impacts. We have been mapping, measuring, and modelling recreation in two wildlife and recreation hotspots using a wide range of available technologies, including remote cameras, infrared trail counters, smartphone user apps, social media geotagging, expert input, and survey data. We compare opportunities and limitations of different data sources to predict when, where, and how recreation occurs. Our results provide decision-makers with much-needed baseline information to (1) accurately assess recreation intensity, (2) identify hotspots where wildlife and recreationists do and do not overlap, and (3) inform land-relationship initiatives, recreation and tourism planning, and manage recreation.

Keywords: Recreation, wildlife impacts, technology, opportunities and limitations

Biosketch: I'm a landscape ecologist invested in human-wildlife coexistence worldwide and an active member of the IUCN Species Survival Commission Specialist group. My main research

project is aimed at figuring out how we can best encourage people to connect with nature and wild places while strengthening and preserving biodiversity.

Back to Table of Contents

A2: Impacts from Human Management

Dillon Watt, Parks Canada
Co-authors: David N. Laskin, Jesse Whittington, Karsten Heuer

Title: *Designing a fence that enables free passage of wildlife while containing reintroduced bison: a multispecies evaluation*

Abstract: Reintroductions of extirpated species are an important global conservation tool yet can be challenging for wide-ranging species. Fences that help anchor reintroduced species to a target area may have deleterious effects on other wildlife. Here we assessed the wildlife-permeability of six bison drift fence designs at three spatial scales during the reintroduction of a wild herd of plains bison Bison bison to a 1200 km2 wilderness area in Banff National Park, Canada. First, we used an array of remote cameras along fences to capture wildlife interactions for 12 species, and modelled crossing success, preferred crossing methods and age–sex class tendencies. Second, we investigated fence barrier effects on wildlife movement at the local scale using cameras that were in place before and after fence construction. Finally, we tested for changes in movement rates of migratory elk and resident wolves at the landscape scale using GPS collar telemetry. Our results point to a single fence design that maximizes permeability for several species with diverse crossing strategies and can be adjusted to contain bison. Wildlife detections increased independently of fence construction in our broader study area. Fence construction did not affect wolf or elk movements and migration at a landscape scale even when fences were deployed to obstruct bison. Our study highlights the important role of wildlife permeable fences in the reintroduction of large mammals such as bison.

Keywords: Barrier, bison, fence, wildlife movement, reintroduction

Biosketch: I am a Resource Management Officer in Banff National Park, and a member of the plains bison reintroduction team. Co-authors of this paper are David N. Laskin, Jesse Whittington, and Karsten Heuer, all of Banff National Park.

Baily McCulloch, University of Alberta
Co-authors: Melanie Dickie, Rob Serrouya, Stan Boutin

Title: *The new top dogs? Mesopredator densities increase with human habitat alteration, not with apex predator removal.*

Abstract: Top predators are disappearing worldwide as human activity continues to transform the natural world. These apex predators play a vital role in structuring ecosystems, and their absence can have complex consequences, including mesopredator release. However, because apex predators tend to be lost as a consequence of increasing human activity, human habitat alteration may confound studies of mesopredator release. The wolf reduction program in Alberta provided an

opportunity to study the effects of removing an apex predator, and the boreal ecosystem across Alberta and Saskatchewan offered a gradient of habitat alteration from Alberta, where industrial activity has reshaped the landscape, to less human-modified Saskatchewan. We compared mesopredator densities between areas with and without wolf reduction and across a gradient of habitat alteration to determine which factor had a stronger effect on mesopredator populations and contrasted these mesopredator densities before and after the implementation of wolf reduction. Using data from 1,785 camera traps established by the Alberta Biodiversity Monitoring Institute, we calculated mesopredator densities using the Random Encounter and Staying Time model. Habitat alteration was associated with larger changes in mesopredator density than apex predator removal. Coyotes were more abundant in areas with higher habitat alteration both before and after wolf reduction began, and red fox densities increased in areas with higher habitat alteration after wolf reduction was implemented. A more nuanced understanding of the circumstances under which mesopredator release may occur is essential to further our understanding of the future for all predators in a more and more human-dominated world.

Keywords: Wolf control, wolf reduction, mesopredator release, camera traps, human disturbance, habitat alteration

Biosketch: As a Master of Science student in Ecology at the University of Alberta, I am working with Dr. Stan Boutin and the Alberta Biodiversity Monitoring Institute to study changing boreal predator populations. If you're interested in my work, I'd love to hear from you! I'm on Twitter @BailyMcCulloch.

Isobel Phoebus, fRI Research
Co-authors: Gordon Stenhouse, Terry Larsen, Cameron J.R. McClelland, Karen Graham, Abbey E. Wilson, Dan Wismer, Paul Frame

Title: *How Do Moved Bears Move? Translocating Grizzly Bears into Unfamiliar Environments*

Abstract: In order to reduce or mitigate human-wildlife conflicts, some jurisdictions translocate offending large carnivores involved with conflicts into unfamiliar environments where they have little or no experience. These management actions can alter wildlife population numbers, particularly if small or threatened; however, the response of translocated individuals is not usually monitored and remains largely unknown. The aim of this study was to examine how grizzly bears (Ursus arctos) that were involved in human-wildlife conflicts in Alberta between 2016 and 2019 respond to unfamiliar environments after translocation. We used biological and GPS collar data to compare grizzly bears translocated to an unfamiliar environment (n=12) with resident bears from the area (n=12). We found that from translocation event to the time of analysis, 1a) 75% of translocated bears did not engage in further conflict behavior after translocation (i.e. reoffending) and 1b) 67% of translocated bears survived. Translocated bears compared with resident bears 2) had larger home ranges, greater space use, and greater daily displacement; 3a) spent more time in poor quality habitat; 3b) selected for earlier vegetative growth and higher vegetation greenness; and 4a) spent more time in habitats with higher mortality risk. We suggest managers and the public

recognize that translocated grizzly bears need adequate time to explore and learn within an unfamiliar environment, and consider that this process may sometimes, but not always, involve reoffending. Nonetheless, our findings indicate that based on behavioral responses most translocated bears do not pose a greater threat to humans than resident bears.

Keywords: Human-wildlife conflict, grizzly bears (Ursus arctos), translocation, unfamiliar environments

Biosketch: As a wildlife biologist at fRI Research working with the Grizzly Bear Program since 2016, Isobel's research ranges from exploring grizzly bear use of riparian zones to comparing non-invasive inventory methods and understanding impacts of translocating bears. Outside of work in winter, Isobel skis backcountry slopes and climbs frozen waterfalls.

Claire Edwards, University of Alberta
Co-authors: Sarah Heemskerk, Colleen Cassady St. Clair
Title: *Measuring success of aversive conditioning and hazing programs for bears: a review*

Abstract: 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 increasing, supporting the use of non-lethal techniques for managing human-bear conflict. 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 to mitigate human-bear conflict, there is limited synthesis of the past literature or established metrics with which to design or evaluate the success of these programs. We comprehensively reviewed the literature for research papers that used AC and/or hazing on black, grizzly and polar bears and found 12 peer reviewed papers and 27 grey literature sources. We synthesized data on biological, behavioural, and management factors to identify correlates of program success, which ranged from management goals (e.g., reduction in reported conflict) to behavioural metrics (e.g., increase in wariness). Preliminary results suggest that programs measuring short-term success (within-season) were highly successful across the spectrum of success metrics (81% of papers). However, few papers (17%) showed reductions in conflict behaviour to persist in the years subsequent to the use of these tools. 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 advance non-lethal management practices throughout ranges where bears and people share space.

Keywords: Human-bear conflict management, aversive conditioning, hazing

Biosketch: I am a Master of Science student in the Department of Biological Sciences, at the University of Alberta, Canada. I study behavioural ecology, human-bear conflict management and conservation. My current work involves exploring adaptive management and success of behavioural management tools (aversive conditioning and hazing) for mitigation of human-bear conflict.

Back to Table of Contents

A3: Human Impacts

Victoria Van Mierlo, University of Alberta
Co-authors: Cristina Buendia-Fores, Stephanie Green, Mark Poesch

Title: *Occupancy and Impacts of Invasive Northern Crayfish (Faxonius virilis) on Native Fish Species in the North Saskatchewan River Basin*

Abstract: 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. In the North Saskatchewan River (NSR) basin, the Northern Crayfish Faxonius virilis, was introduced and has persisted since the early 1990s. Despite the NSR being an ecologically, economically, and culturally valuable watershed and home to multiple sensitive and at-risk fish species, the crayfish's impacts on fish communities have yet to be assessed. This study's aims are to (1) create an occupancy model of Faxonius virilis in the NSR, (2) identify tributaries at highest risk for subsequent invasion, and (3) use isotope analysis and condition to determine if there is evidence of crayfish and native fish niche overlap indicating potential competition for resources.

Keywords: Faxonius virilis, Invasive, NSR, occupancy, isotopic niche

Biosketch: My name is Victoria Van Mierlo and I use she/her pronouns. I am in my 2nd year of my MSc degree at the University of Alberta. I completed my Honours BSc in Molecular Biology and played 4 years of Varsity Softball as a pitcher at McMaster University in Hamilton, ON.

Bethany Parsons, fRI Research
Co-authors: Nicholas C. Coops, Sean P. Kearney, Cole Burton, Trisalyn A. Nelson, Gordon B. Stenhouse

Title: *Risk taking and decision making: Grizzly bear responses to road visibility depend on movement mode.*

Abstract: Animal movement and habitat selection decisions hinge on trade-offs between resources and risks. For grizzly bears in the foothills of Alberta, roads represent a particularly difficult trade-off. Roadside verges and associated harvest blocks provide high quality forage, yet are also considered the most important factor in predicting human-caused grizzly bear mortalities. In addition, occupying areas visible to people travelling on roads may further increase the risk of negative human-bear interactions. In this study, our goal was to investigate how grizzly bears respond to visibility around roads in the Yellowhead region of Alberta. We used detailed topographic and vegetation data from airborne Light Detection and Ranging (lidar) to estimate visibility around roads. We modelled habitat selection as a function of road visibility and environmental variables using GPS telemetry data from 39 grizzly bears and integrated step selection analysis (iSSA). Finally, we assessed mortality risk in visible areas by comparing habitat selection between grizzly bears that died and those that survived. Grizzly bears were less likely to select visible areas when

moving slowly or resting, but more likely to select visible areas when traveling. We also found that grizzly bears that survived selected for areas farther from roads than grizzly bears that died. However, while an exploratory analysis showed that grizzly bear mortalities commonly occurred in visible areas, no difference in selection for visible areas was observed. Our findings highlight the importance of sensory perception and movement behaviour in understanding animal response to risk.

Keywords: Perception, road ecology, integrated step selection analysis, grizzly bears, behaviour

Biosketch: Bethany Parsons recently completed her MSc at UBC and was thrilled to join fRI Research's grizzly bear team in Hinton. Lately, she has been delving further into how grizzly bear behaviour influences mortality and, in her free time, exploring the breathtaking Canadian Rockies.

Carrie Ann Adams, University of Alberta
Co-authors: Erin Bayne, Esteban Fernández-Juricic, Colleen Cassady St. Clair
Title: *The effect of artificial light on bird movement and distribution: A Systematic Map*

Abstract: Artificial light is increasing rapidly worldwide, with diverse biological and ecological impacts. We conducted an extensive literature search for evidence on how artificial light affects how birds move or are distributed in landscapes. We summarized 476 studies and extracted information to a systematic map and associated database. We addressed four secondary questions about how light affects phenomena relevant to bird conservation and management, including: a) aggregation and mortality around lights sources; b) mechanisms of disorientation and attraction; b) the efficacy of light-based deterrents; and d) the effects of artificial light on habitat selection. We identified studies relevant to each secondary question based on bird activity during light exposure, the type of light source, and several response variables. The map can immediately inform management decisions and research priorities and provides an evidence base for reviews and meta-analyses. Our review suggests that there is sufficient information to determine weather patterns, lunar phases, and light characteristics associated with bird aggregation/mortality. There is also sufficient evidence to evaluate the deterrent efficacy of red and green lasers and how species traits influence response to deterrents. Further primary research should study whether using flashing lights on tall structures and guy wires could reduce bird collisions compared to dark structures and wires. Laboratory experiments could better inform lighting practices by testing lights with characteristics similar to those used in the built environment. Consistent and accurate measurement of other anthropogenic disturbances and field experiments could improve our ability to evaluate how artificial light affects habitat selection.

Keywords: Avian, light pollution, artificial light at night, review, urban

Biosketch: Carrie Ann studies the impacts of artificial light on birds through evidence synthesis, citizen science, and bioacoustic analysis. She is a Ph.D. candidate at the University of Alberta, co-supervised by Erin Bayne and Colleen Cassady St. Clair.

Back to Table of Contents

APPENDIX B: WILDLIFE BEHAVIOUR AND SELECTION ABSTRACTS

B1: Behavioural Decisions

Juliana Balluffi-Fry, University of Alberta
Co-authors: Shawn Leroux, Yolanda F. Wiersma, Isabella Richmond, Travis R. Heckford, Matteo Rizzuto, Joanie L. Kennah, Eric Vander Wall

Title: *The effects of intraspecific variation in forage quality on herbivore feeding and body condition*

Abstract: Forage quality impacts herbivore fitness and body condition; herbivores select plants of higher quality when feeding. Plants of the same species can differ in quality due to habitat type, soil fertility, or forest age. Despite this, less is known about the impacts that natural intraspecific variation in forage quality may have on herbivores compared to the impacts of quality variation between plant species or un-natural treatments. We measured black spruce (Picea mariana) quality variation (nitrogen, phosphorus, and terpene compositions) across a snowshoe hare (Lepus americanus) trapping grid in eastern Newfoundland and found plant growing conditions to explain spruce quality variation (R2 < 0.36). Then, sourcing hares from the same trapping grid, we tested if spruce quality influenced hare feeding choices and body conditions in two-choice cafeteria-style experiments in two replicated autumn sample seasons (n = 75). Hares were variable in their selection for spruce but preference for higher-quality spruce significantly reduced weight loss during experiments (p = 0.018). By leveraging natural variation in forage elemental compositions and consumer energetic and nutritional states, our experiments resembled natural conditions more so than traditional feeding trials. Collectively, we found a link between plant growing conditions and snowshoe hare body conditions.

Keywords: Stoichiometry, snowshoe hares, foraging, cafeteria experiments

Biosketch: I have recently started my PhD at the University of Alberta to study snowshoe hare nutritional ecology in the Yukon. For my MSc, I studied moose and snowshoe hare foraging ecology in Newfoundland. Here, I will be presenting some of my MSc findings on snowshoe hares.

Emily Studd, University of Alberta
Co-authors: M.J.L. Peers, A.K. Menzies, R.E. Derbyshire, Y.N. Majchrzak, J.L. Seguin, D.L. Murray, B. Dantzer, J.E. Lane, A.G. McAdam, M.M. Humphries, S. Boutin

Title: *The blustery boreal: Examining how species respond to wind*

Abstract: Wind is an understudied component of weather that has multifaceted effects on organisms from altering thermoregulation to masking sensory cues. In order to mitigate associated costs of wind, organisms can adjust activity. However, thermal and sensory constraints imposed by wind create trade-offs between energy balance and predation risk with opposing behavioural

responses required to mitigate each constraint. Thus, the strength and direction of behavioural adjustments to wind should vary between species according to organismal traits that determine whether mitigation of sensory or thermal constraints are most critical. Here, I discuss how three free-ranging boreal mammals living in the same location respond behaviourally to variable wind. I examine whether responses were consistent with thermal or perceptual constraints using behaviour classified from accelerometer data collected on free-ranging red squirrels, snowshoe hares, and Canada lynx. To explore the effectiveness of behavioural responses at mitigating increased risk from perceptual constraints, I also monitored daily survival of 305 snowshoe hares over the same time period. I show that wind speed is highly correlated with behavioural changes in boreal species, but that each species responds differentially to the same climatic conditions according to relative importance of different mechanistic pathways.

Keywords: Behaviour, bio-logging, boreal, environmental variation

Biosketch: I'm a postdoctoral research fellow and wildlife ecologist interested in how individuals respond behaviourally to environmental change and how these responses shape species interactions and population dynamics. My research sits at the interface of behavioural, metabolic, population and community ecology, and combines observation- and biologging-based field studies with modelling.

April Martinig, University of Alberta
Co-authors: Andrew G. McAdam, Ben Dantzer, Jeffery E. Lane, David W. Coltman, Stan Boutin

Title: *The new kid on the block: Immigrant males win big whereas females pay fitness cost after dispersal*

Abstract: Dispersal is nearly universal; yet which sex tends to disperse more, and their success thereafter depends on the fitness consequences of dispersal. We asked if lifetime fitness differed between residents and immigrants (successful dispersers) and their offspring using 29 years of monitoring from North American red squirrels (Tamiasciurus hudsonicus) in Canada. Compared to residents, immigrant females had 23 % lower lifetime breeding success (LBS), while immigrant males had 29 % higher LBS. Male immigration and female residency were favoured. Offspring born to immigrants had 15 – 43 % lower LBS than offspring born to residents. We conclude that immigration benefitted males, but not females, which appeared to be making the best of a bad lot. Our results are in line with male-biased dispersal being driven by local mate competition and local resource enhancement, while the intergenerational cost to immigration is a new complication in explaining the drivers of sex-biased dispersal.

Keywords: Dispersal, fitness, mammals

Biosketch: I study how consistent variation in individual behaviour contributes to performance differences across lifetimes, particularly during dispersal. If you would like to see more about my research, please see my professional page at martinig.weebly.com

Back to Table of Contents

B2: Migratory Behaviour

Sara Williams, University of Montana
Co-authors: Mark Hebblewhite, Hans Martin, Josh Killeen

Title: *Predation Risk Drives Long-Term Shifts in Migratory Behavior and Demography in a Large Herbivore Population*

Abstract: Migration is an adaptive life-history strategy that helps individuals across diverse taxa maximize fitness by avoiding predation risk and obtaining. The mechanisms driving migratory changes are often poorly understood, and links between migratory behavior, space use, and demographic consequences are rare. Here, we use a nearly 20-year record of individual-based monitoring to test hypotheses for changing patterns of migration in a large herbivore, elk (Cervus canadensis), in a transboundary setting in Banff National Park (BNP), Canada. We test whether bottom-up (forage quality) or top-down (predation risk) factors explained trends in the proportion of individuals using 5 different migratory tactics, differences in survival rates of migratory tactics and on summer ranges, cause-specific mortality by wolves, cougars and grizzly bears, and population abundance. We found dramatic shifts in migratory behavior consistent with established behavioral plasticity in annual choice of migratory routes. Shifts were inconsistent with the demonstrated bottom-up benefits of migration to montane summer ranges. Instead, transboundary gradients in predation risk caused by predator protection inside, and exploitation of wolves and grizzly bears outside, the park led to low survival rates inside BNP, and the highest survival rate for the resident tactic. Wolf predation risk was higher on migratory routes than summer ranges of mountain-migrant tactics, but wolf predation risk traded-off with heightened risk from grizzly bears on summer ranges. A new eastern migrant tactic emerged during the study following a large burn and lower predation risk from grizzly bears and exploited wolves.

Keywords: Migration, predation, forage, survival

Biosketch: Sara Williams is a quantitative conservation ecologist and a post-doctoral researcher in the Hebblewhite Ungulate Ecology Lab at the University of Montana. Sara works on collaborative projects investigating changes to migratory behavior of caribou and elk and the resulting individual and population-level consequences.

Hans Martin, University of Montana
Co-authors: Mark Hebblewhite, Evelyn Merrill

Title: *Bull elk survival, vulnerability, and antler size in a transboundary elk population*

Abstract: Migration is a behavioral strategy used to access resources or avoid predation in spatially and temporally heterogenous landscapes. On the eastern slopes of the Rocky Mountains, elk migrate to higher elevation summer ranges to access higher forage quality and avoid predation risk. Thus, the decision to migrate has both individual and population level consequences. Antler growth and development is driven primarily by age and forage quality. Thus, if migratory animals can gain access to higher quality forage and avoid predation, migratory males will have higher fitness than residents. However, migration often results in transboundary populations being exposed to different

levels of harvest as they move across the landscape. Our goal was to investigate these potential drivers of male elk survival and antler size in a transboundary, partially migratory population in a multi-carnivore system. We collared 75 bull elk in 2018-2020 for a total of 105 elk-years ($\bar{x}$=35 collars/year). Male elk survival and antler size was largely a function of age. Human harvested was the primary cause of mortality(n=33) with wolf predation having little effect on survival (n=2). Antler-point-restrictions resulted in low yearly survival rates for male elk over 4 years of age (S=0.42). While migration itself did not enhance antler size or survival, we found a negative effect of increasing forage biomass (and hence decreasing forage quality) on antler size. These advancements will help managers to understand how vulnerability to natural and human predation risk affects male elk age structure and antler size.

Keywords: Bull elk, antlers, survival, antler-point restrictions

Biosketch: Hans Martin is a PhD Candidate at the University of Montana and has spent the last 5 years working on the Ya Ha Tinda Elk Project near Sundre, Alberta.

Madeline Trottier, University of Alberta
Co-authors: Mark Hebblewhite, Evelyn Merrill

Title: *Social interactions in a partially migratory ungulate: does familiarity influence behavioural disparity?*

Abstract: Sociality incurs costs and benefits for group-living animals, resulting in behavioural trade-offs, such as dominance, that may drive patterns of association among group members. We examined interaction patterns among elk in the partially migratory Ya Ha Tinda (YHT) elk herd (Cervus canadensis) in Alberta following three migratory tactics (residents, R; eastern migrants, E; western migrants, W). Because familiarity may influence dominance and thus group interactions, we predicted that familiarity would be higher within versus among migrant tactics, and thus 1) spatial overlap will be lower among versus within tactics, and 2) rates of interaction and aggression will differ among tactics. At the home range scale, we used GPS telemetry data to document home range overlap of collared female elk on the sympatric range during the winters of 2015-2018. We determined the volume of intersection (VI) of 95% utilization distributions (UD) during the winter between all tactics (RR, RE, RW). Mean overlap was high (0.78 ± 0.013 SE) among all pair types, though RE overlap was higher (p < 0.005) than RW overlap (p < 0.005) compared to average RR VI. At the individual level, we evaluated dominance from direct observations of conspecific interactions during winters 2019-2020 relative to migrant tactic, age, density, and time of year. Preliminary results suggest differences in aggression rates among migrant tactics, but similar rates of interaction overall (range 0.0031± 0.0005 - 0.0035 ± 0.0004 interactions/min.). We discuss the implications of differences in dominance among migratory tactics and the relationship to forage acquisition and predation risk.

Keywords: Sociality, home range overlap, aggression

Biosketch: I'm a Master's student at the University of Alberta studying elk in the foothills of the Rockies. Originally from Ontario, I completed my BSc at Trent University prior to moving west. I'm

currently focused on behavioural ecology and how fine-scale behaviours influence ecological patterns at a larger scale.

Back to Table of Contents

B3: Habitat Selection

Robin Glover, University of British Columbia
Co-authors: Leticia Aviles

Title: *Habitat Selection as a Function of Web Type and Forest Succession Level in Spiders*

Abstract: Behaviours associated with habitat selection greatly influence organismal fitness because they determine the environmental pressures an organism is exposed to. Due to the costs of web relocation, choosing an initial habitat is especially important for web-building spiders, which may remain stationary for extended periods of time. Spider webs can be separated into three categories based on their geometry: orb, tangle, and sheet-and-tangle. Since each web architecture is associated with a unique set of trade-offs, spiders with certain web types may favour environments with particular vegetation structure. While different habitat selection strategies have been observed in spiders with various web types, factors that influence a spider's choice in web-site location are still largely unknown. In this study, I aimed to determine how forest succession stage influences communities of web-building spiders in terms of the proportion of different web types. In order to address this, I investigated whether the proportion of different web geometries changes along a gradient of succession levels in Pacific Spirit Regional Park (PSRP). I collected web and vegetation data across ten sites in PSRP throughout the summer of 2020. Preliminary results have determined the two vegetation variables that correlated with succession level: size of gaps in otherwise continuous vegetation and understory density. Further analysis will determine the effect of these two vegetation variables on the probability of each web type occurring in a site.

Keywords: Spider web architecture, habitat selection, forest succession

Biosketch: Robin is an honours biology student in the Aviles lab at the University of British Columbia and is the current president of the UBCV Chapter of TWS. She is interested in conservation, animal behaviour, and genetics and hopes to pursue a research career in these fields.

Abbey Wilson, University of Saskatchewan
Co-authors: Dan Wismer, Gordon Stenhouse, Nicholas C. Coops, David M. Janz

Title: *Using biomarkers in skin to inform how landscape condition influences energetics, reproduction, and stress in grizzly bears*

Abstract: Environmental change has been shown to influence mammalian distribution, habitat use, and behavior; however, few studies have investigated the impact on physiological function. This study aimed to determine the influence of landscape condition on the expression of 19 target proteins related to energetics, reproduction, and stress in grizzly bears. We hypothesized that the expression of target proteins would be associated with landscape condition represented by anthropogenic disturbance, food resources, and terrain attributes. Skin biopsies were collected

from free-ranging grizzly bears in Alberta, Canada from 2013-2019 (n=103 samples from 95 individuals). Generalized linear mixed models were used to develop candidate models representing biologically plausible relationships between protein expression and landscape variables. We compared models using Akaike Information Criteria (AIC) weights and selected the most supported models (ΔAICc=0) for each protein. Results confirmed that daily movement rate and elevation influenced the majority of proteins. The expression of proteins related to reproduction and stress was strongly associated with anthropogenic disturbance (forestry and roads) and food resources and showed both direct and inverse relationships with corresponding variables. Given the need to detect emerging threats to wildlife, we suggest the assessment of physiological function will lead to improved monitoring of species in rapidly changing landscapes.

Keywords: Physiology, conservation, ursid

Biosketch: Abbey Wilson is a postdoctoral fellow at the University of Saskatchewan with research covering topics related to animal physiology, wildlife health and reproduction, and population management.

Back to Table of Contents

APPENDIX C: EMERGING ISSUES ABSTRACTS

C1: Novel Approaches

Glynnis Hood, University of Alberta
Co-authors: Mateya Bluett

Title: *Critters in the cattails: Enhanced detection of riparian mammals*

Abstract: Semi-aquatic mammals, despite some variability in habitat selection, share a surprising degree of habitat overlap and interspecific interactions. In particular, the presence of beaver is an important predictor of habitat use by river otter, and muskrat and mink exhibit a similar relationship. Less is known about water shrews and northern bog lemmings because of their cryptic nature. We placed specialized camera boxes, camera rafts, and cameras on beaver dams to assess the detectability of riparian mammals. From the ~22,300 images analyzed to date we have detected over 1,900 individual animals, including 21 species of birds, 16 species of small mammals, 5 species of medium to large mammals, 2 species of herptiles, and several invertebrates. Muskrats, beavers, and water shrews were the most abundant small mammals detected by the cameras, with shoreline camera boxes being more effective at capturing the highest diversity of species. Camera data helped inform locations for subsequent eDNA sampling in ponds within the Beaver Hills Biosphere in east-central Alberta. In collaboration with InnoTech Alberta, we were also able to aid in the development of four DNA assays for the more cryptic species of semi-aquatic mammals (river otters, mink, water shrew, and bog lemming). We also conducted winter field surveys within several protected areas across the study area to map the distribution of beaver lodges, muskrat push-ups

and huts, and mink and muskrat tracks. This research increases our understanding of the efficacy of varied non-lethal sampling methods for the detection of cryptic, but important riparian species.

Keywords: Detectability, semi-aquatic mammals, wildlife cameras

Biosketch: Glynnis Hood is an ecologist and Professor of Environmental Science at the University of Alberta's Augustana Campus in Camrose. Mateya Bluett is a Research Assistant and holds a BSc in Biology from the Augustana Campus.

Elston Dzus
Co-authors: J. Gerrard
Title: *Population Trends and Comparison Traditional vs. Drone-Assisted Nest Checks of Bald Eagles at Besnard Lake, Saskatchewan, Canada 1968-2021.*

Abstract: Long term monitoring is crucial for understanding population dynamics and conservation. We report on trends in population size and reproduction of Bald Eagles (Haliaeetus leucocephalus) at Besnard Lake, Saskatchewan, Canada, during 1968-2021. Techniques for monitoring eagle populations have involved a variety of techniques varying from aerial (fixed-wing aircraft), boat-based visual observations, climbing of nest trees or adjacent trees, and in the past 5 years we've begun to use drones to assess nest status and productivity (number of young per nest). In 2021 we investigated the relative accuracy and time required to assess reproductive status of Bald Eagle nests using traditional methods (binoculars / tree climbing) compared to the use of drones to check nests. Preliminary analysis reveals no differences in the accuracy of nest status and minimal differences in nest productivity. However, effort required to assess nest status using conventional techniques is greater than drone-based assessments.

Keywords: Bald Eagle, population, nest status, drone

Biosketch: Elston Dzus, Ph.D. (FYI pronounced Deuce) While he's better known in Alberta as a caribou biologist, Elston's roots are in avian ecology. He spent the summer of 1984 boating and canoeing around 7 lakes surveying Bald Eagles and other waterbirds as an undergraduate research project with then turned a master's project from the University of Manitoba. Except for a few years where he pursued a Ph.D. on Mallards, he has migrated back to Besnard Lake annually to continue what has become a 'passion' studying Bald Eagles in north central Saskatchewan.

Laurens Put, University of Alberta
Co-authors: Peter Smoko, Margo Pybus, Anne Hubbs, Mark Ball, Evelyn Merrill
Title: *A Shiny App for Predicting Spread of CWD in Alberta, Canada.*

Abstract: Chronic wasting disease (CWD) is a fatal transmissible spongiform encephalopathy of cervids that was first detected in wild deer in eastern Alberta in 2005 and has since spread westward in the prairie-parklands of the province. Alberta Environment and Parks has maintained a consistent, hunter-based surveillance program for CWD since its first detection. We demonstrate the use of a Shiny App that was built to estimate spread of CWD in Alberta. Estimates of spread are based on a generalised additive model. This approach uses a phenomenological regression-based

framework that permits the user to make species (Odocoileus hemionus, O. virginianus) and sex-specific inferences about CWD spread based on past trends in growth and diffusion of CWD, and to forecast spread of CWD into the future. We used data from the Alberta surveillance program from 2005 to 2017 and model selection to derive the spread model. We found extent of woody cover, stream density, ruggedness, distance to large rivers and distance to the nearest urban areas influenced CWD spread. We incorporated the model into a Shiny App that provides tools for visualizing rate of spread across the province or growth within specific Wildlife Management Units. The Shiny App allows managers to identify areas with the greatest relative predicted increase in CWD and when prevalence in a particular area is > 0.25, where declines in deer are expected. The Shiny App will provide managers with a tool to help devise strategies for CWD management and prioritize areas for implementation.

Keywords: R, Shiny App, Chronic wasting disease

Biosketch: Laurens Put is a Research Assistant in Dr. Evelyn Merrill lab at the University of Alberta. He received his MSc Forest and Nature Conservation from Wageningen University in 2009. His expertise is in data management, R coding and GIS, but he also likes to be outside doing fieldwork.

Camille Warbington, University of Alberta
Co-authors: Mark Boyce

Title: *Population genetics of free-ranging sitatunga in the Mayanja River of central Uganda*

Abstract: Sitatunga (Tragelaphus spekii) is an African antelope that specializes in dense wetland habitats. Wetlands are under threat from climate change and anthropogenic causes. Loss of habitats can isolate populations, leading to declines. In this study, we use single-sample genetic data to assess population connectivity of sitatunga in a wetland subject to anthropogenic disturbance. We evaluated microsatellite markers developed for other species against 39 sitatunga DNA samples to establish the first baseline population genetics parameters for sitatunga. We found high genetic diversity and admixture in this population (inbreeding coefficient (Fis) = -0.5 when including all loci), confirming our predictions that this population is not reproductively isolated. In addition to identifying 17 markers that amplify in sitatunga, we found a marker that may be sex-linked in sitatunga (this locus shows an excess of heterozygotes than what would be expected with random mating (Fis = -0.79, p < 2.9 x 10-3) but not in other ungulates. Our results indicate that this sitatunga population is well mixed and current habitat connectivity is sufficient to maintain genetic diversity.

Keywords: Conservation genetics, habitat fragmentation, microsatellites, Tragelaphus spekii, wetlands

Biosketch: Camille completed her PhD in 2020, under the supervision of Dr. Mark S. Boyce at the University of Alberta. Camille's work focuses on large mammal ecology, including populations and communities in changing and human altered landscapes. Camille currently works as a Postdoctoral Fellow for the Alberta Biodiversity Monitoring Institute.

Back to Table of Contents

C2: Urban Wildlife

Cassondra Stevenson, University of Alberta
Co-authors: Maureen Murray, Catherine Shier, Colleen Cassidy St. Clair

Title: *Comparison of habitat selection by coyotes (Canis latrans) and circuit-based connectivity models in Edmonton, Alberta*

Abstract: With increasing urban development, the value of maintaining ecological connections increases substantially because fragmentation and habitat loss convert large, contiguous habitat patches to smaller, more isolated ones. In Edmonton, AB, urban ecological planners use remotely sensed data to estimate habitat quality and support biodiversity in land-use planning. One of these tools is a circuit-based model of coyote (Canis latrans) movement intended to estimate the habitat connectivity of other terrestrial mammal species. We compared the predictions of two circuit models based on the season (summer and winter) to habitat selection by 14 GPS-collared coyotes modelled with RSF's. To model habitat selection in RSFs, we used general mixed-effect logistic regressions. We then derived habitat suitability values based on coefficients from RSFs to compare with circuit-based values in linear regressions. In winter, we found that coyotes selected vegetated areas, especially when vegetation was natural, and areas closer to buildings and the river valley and ravine system. Coyotes avoided developed areas, roads, and areas designated for off-leash dogs. In summer, predictive models were similar, except coyotes selected both riverine and upland natural areas, perhaps because the frozen river is a conduit to movement in winter, but a barrier in summer. Habitat suitability values were significantly correlated with their corresponding seasonal circuit-based connectivity values (winter $p = 0.049$ and summer $p = 0.001$). Our results suggest that circuit-based connectivity models used in urban planning accurately predicted habitat selection by urban coyotes in Edmonton, AB and may be a cost-effective tool for modelling urban connectivity.

Keywords: Connectivity, wildlife, habitat selection, urban-planning, urban ecology

Biosketch: Cassie is an MSc student in the lab of Dr. Colleen Cassady St. Clair whose interests include mitigating human-wildlife conflict and promoting coexistence strategies for humans and wildlife, particularly in urban areas.

Jonathan Farr, University of Alberta
Co-authors: Robin Glover, Matthew Pruden, MH Murray, Howie Harshaw, Colleen Cassady St. Clair

Title: *Spatial and temporal correlates of conflict with urban coyotes from a 10-year community reporting database*

Abstract: In cities throughout North America, sightings of coyotes (Canis latrans) have become common and reports of human-coyote conflict are on the rise. The public demand for proactive management to prevent conflict requires more information about the spatial, temporal and

contextual correlates of conflict and how they are changing over time. We used a web-based reporting system operating between September 2010 and December 2020 to collect N=7,872 voluntarily submitted coyote reports in the city of Edmonton, Alberta, each of which contained the time and date of the report, the location, and comments. We used a standardized classification method to extract further information from the comments including the coyote response to people, the human activity, the human perception of the coyote and the presence or absence of vulnerable individuals. We used this information to identify the spatiotemporal distribution of reports, correlates of reports that were suggestive of conflict, and the human factors that affect the distribution of reports. Preliminary results suggest that the frequency of human-coyote conflict in Edmonton has increased over the past 10 years. Reports of conflict were more prevalent between April and August, occurred closer to natural areas, and were more common when dogs were present. Reports that mentioned pets and children had higher perceptions of coyote danger or aggression. Our results support proactive management actions to prevent conflict that include public education about methods for protecting pets, preventing food-conditioning of urban coyotes, and use of aversive techniques to increase wariness of coyotes in residential areas.

Keywords: Canis latrans, human-wildlife conflict, urban ecology

Biosketch: Jonathan is finishing his fourth year of an honours Ecology, Evolution and Environmental Science degree, and his academic interests include human-wildlife conflict, behavioural ecology and landscape ecology. Outside of school, you can find Jonathan exploring the mountain parks, searching for different species of chickadees or sipping overpriced coffee.

Scott Sugden, University of Alberta
Co-authors: Dana Sanderson, Kyra Ford, Lisa Stein, Colleen Cassady St. Clair
Title: *An altered microbiome in urban coyotes mediates relationships between anthropogenic diet and poor health*

Abstract: Generalist species able to exploit anthropogenic food sources are becoming increasingly common in urban environments. Coyotes (Canis latrans) are one such urban generalist that now resides in cities across North America, where diseased or unhealthy coyotes are frequently reported in cases of human-wildlife conflict. Coyote health and fitness may be related to habitat use and diet via the gut microbiome, which has far-reaching effects on animal nutrition and physiology. In this study, we used stomach contents, stable isotope analysis, 16S rRNA gene amplicon sequencing, and measures of body condition to identify relationships among habitat use, diet, fecal microbiome composition, and health in urban and rural coyotes. Three distinct relationships emerged: (1) Urban coyotes consumed more anthropogenic food, which was associated with increased microbiome diversity, higher abundances of human-like gut bacteria, and poorer average body condition. (2) Conversely, rural coyotes harbored microbiomes rich in Fusobacteria, Sutterella, and Anaerobiospirillum, which were associated with protein-rich diets and improved body condition. (3) Diets rich in anthropogenic food were associated with increased abundances of Erysipelotrichiaceae, Lachnospiraceae, and Coriobacteriaceae, which correlated with larger spleens in urban coyotes. Urban coyotes also had an increased prevalence of the zoonotic parasite Echinococcus multilocularis, but there were no detectable connections between parasite infection

and microbiome composition. Our results demonstrate how the consumption of carbohydrate-rich anthropogenic food by urban coyotes alters the microbiome to negatively affect body condition, with potential relationships to parasite susceptibility and conflict-prone behavior.

Keywords: Coyotes; urbanization; anthropogenic food; gut microbiome; Echinococcus multilocularis

Biosketch: Scott is a recent MSc graduate from the University of Alberta, where he continues to study the interface between wildlife ecology and microbiology.

Deanna Steckler, University of Alberta
Co-authors: Scott Sugden, Dana Sanderson, Kyra Ford
Title: *Dietary correlates of Echinococcus multilocularis infection in urban coyotes (Canis latrans)*

Abstract: Urban environments can influence parasite transmission and prevalence by altering the diets, distribution, abundance, and behaviour of wildlife. Echinococcus multilocularis is a zoonotic cestode of increasing concern in Alberta where a new European strain of the tapeworm is associated with several human infections. This strain is now widespread among coyotes (Canis latrans) in Alberta and the species appears to be especially prevalent among urban coyotes in Edmonton. We tested the hypotheses that diet contributes to infection either by (a) greater exposure via consumption of infected rodents (which are intermediate hosts), or (b) increased susceptibility via consumption of anthropogenic food that may reduce body condition. We did so by comparing stomach contents and several metrics of body condition to infection status, measured genetically, and infection intensity, measured by counts of worms in the intestine for carcasses donated from urban and rural sources in and near Edmonton. We found few differences in stomach contents or longer-term diet (measured by isotopic signatures) between infected and uninfected coyotes, but urban location and young age significantly increased both likelihood and intensity of infection. We conclude that a direct link between diet and infection status was not supported, but indirect links may exist via relationships among coyote habitat, age, and condition. A younger age distribution may explain why urban coyotes have a higher prevalence of the parasite.

Keywords: Wildlife disease, zoonotic parasite, human-wildlife conflict, urban ecology

Biosketch: Following a B.Sc. 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.

Back to Table of Contents

C3: Disease

Maria Dobbin, University of Alberta
Co-authors: Evelyn Merrill

Title: *Relating Risk of Direct Contact and Risk of CWD Infection in Mule Deer (Odocoileus hemionus)*

Abstract: Chronic wasting disease (CWD) is a fatal, prion disease of cervids that was first detected in Alberta in 2005. Transmission of CWD occurs by direct contact with infected individuals and via contaminated environments. We investigate the seasonal effects of grouping patterns and landscape heterogeneity on direct, pair-wise contacts within and between sex-specific (same or mixed sex) groups of mule deer (Odocoileus hemionus) in eastern Alberta. First, we establish criteria based on spatial-temporal movements of collared deer to define sex-specific group membership. Second, we classify whether sex-specific dyads of collared deer are in different groups and model the relative risk of a sex-specific contact occurring in a locale based on landscape characteristics. Third, we relate seasonal predictions of the spatial relative risk of contacts to the risk of deer being CWD-infected in an area based on hunter-harvest, CWD surveillance data. We predict that probability of a harvested deer being CWD+ is more related to probability of contact than directly to landscape variables and that a harvested male deer being CWD+ is more strongly related to risk of contact risk with other males than females, whereas the risk of a harvested female deer is most related contact between females.

Keywords: Direct contact, landscape, chronic wasting disease

Biosketch: Maria Dobbin is a M.Sc student with Dr. Evelyn Merrill at the University of Alberta. Her research focuses on interactions between mule deer and how it related to the spread of chronic wasting disease.

Kelsey Gritter, University of Alberta
Co-authors: Evelyn Merrill, Maria Dobbin, Mark Lewis
Title: *Individual-based Modelling of Chronic Wasting Disease*

Abstract: Chronic wasting disease (CWD) is an emerging prion disease in Canada that infects mule deer, white-tail deer, elk, and moose by direct and indirect contact and is invariably fatal. CWD spread can be promoted at “hotspots” that attract deer, such as those are created intentionally via supplemental feeding or accidentally via grain spills. Hotspots may increase contacts between and within groups depending on how many animals use the site and how long individuals spend at the site. An individual-based model was created to investigate the effects of different densities and arrangements of hotspots on contact rates between- and within-groups. The model tracks contacts (when two individuals come within a defined distance of one another), which are defined as between- or within-group depending on the group membership of the two individuals. Simulations are run in Netlogo on a heterogeneous landscape and include behaviours such as grouping and home ranges. Grouping behaviours and home range are simulated via biased turning angle and step length distributions. Deer are moved across the landscape model at a two-hour time step based on step-selection movement rules relative to resources and group behaviours. The step-selection function utilizes GIS layers for environmental weights and GPS collar movement data for calculating step-selection coefficients, as well as turning angle and step length distributions. We

present preliminary results of how environment influences contact rates and the potential for disease transmission.

Keywords: Chronic wasting disease, deer.

Biosketch: I am a master's student in biology studying chronic wasting disease in mule deer. I did my undergraduate degree at The King's University as a biology major with math and chemistry minors.

Jinging Xu, University of Alberta
Co-authors: Evelyn Merrill
Title: *Dietary correlates of Echinococcus multilocularis infection in urban coyotes (Canis latrans)*

Abstract: Chronic wasting disease (CWD) is a fatal disease of cervid species that continues to spread across North America and now in Europe. It poses a threat to cervid populations and the local ecological and economic communities that depend on them. 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. 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 one-dimensional 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. We examined the relative influence of host density, sex ratio, home range size, and male dispersal distance on the spreading speed by showing the sensitivity analysis for those factors.

Keywords: Chronic Wasting Disease, Home Range, Direct and Indirect transmission, Spreading Speed

Biosketch: I'm a PostDoc working on mathematical biology. I use mathematical tools to study the spread of the chronic wasting disease in wild cervids populations and predict cyanobacteria blooms in Albertan lakes.

Back to Table of Contents

APPENDIX D: LASTING IMPACTS ABSTRACTS

D1: Climate Change

César Estevo, University of Alberta
Co-authors: Diana Stralberg, Scott Nielsen, Erin Bayne

Title: *Ecosystem-driven processes may promote cool wildlife habitat in a changing world*

Abstract: Anthropogenic climate change is degrading habitat quality and distribution for wildlife across ecosystems, imposing considerable challenges for conservation as targets are constantly on the move. Nevertheless, ecosystem-driven processes may buffer warming and offer an opportunity to retain some local integrity and ecosystem functioning. We explored the potential for such ecosystem buffering by examining how topographic features and canopy cover promote local climate cooling across river valley and hill systems in Alberta, Canada. We found that a combination of high elevation, low incoming solar radiation, and increasing levels of soil moisture and canopy cover decreased local maximum temperatures substantially. For example, shaded slopes were 2 degrees celcius cooler than areas with average solar radiation. Mapping results of current climate patterns reveal a complex and heterogeneous thermal landscape and offer some insight about the potential of ecosystem-driven processes to shield the effects of climate change. We believe that our results might also help inform climate-smart decisions for wildlife habitat management.

Keywords: Local climate, thermal heterogeneity, ecosystem, topography, climate change

Biosketch: I am a PhD student interested in the effects of climate change on ecosystems and wildlife, with a particular interest in birds.

Larissa Thelin, University of Alberta
Co-authors: Andrew Derocher, Alasraire Franke, Kylee Dunham, Evan Richardson

Title: *Projecting habitat use and dynamics for Davis Strait polar bears (Ursus maritimus)*

Abstract: This presentation will outline both the results-to-date and next steps of Larissa Thelin's MSc thesis (Department of Biological Sciences, University of Alberta). The goal of this study is to understand the potential impacts of climate change on the habitat of the Davis Strait subpopulation of polar bears (DS). First, we will determine DS habitat selection as it relates to sea ice, using radio telemetry data and resource selection functions (RSFs). Second, using the same methodology, we will determine the habitat selection of harp seals, a major source of prey for DS. Next, we will determine how the habitats of both species overlap to understand the spatial relationship between predator and prey. Incorporating the habitat selection of primary prey in habitat selection models is not often done in ecology, yet it allows us to better understand the spatial ecology of target predator species. Finally, using a projected sea ice model, we will predict changes in their overlapping habitat using various climatic warming scenarios. In a region such as the Arctic, where climate change is causing significant changes such as decreasing sea ice conditions, understanding the potential impacts of a warming climate on the habitat selection of ice-dependent

species can be crucial for their conservation. This study will allow us to understand not only where the suitable habitat of DS may shift to in the future, but also whether or not the habitat of their primary prey will exist in the same space.

Keywords: Polar bears, habitat selection, resource selection function, harp seals, climate change

Biosketch: Larissa Thelin is an MSc student in the Department of Biological Sciences at the University of Alberta and is supervised by 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.

Lionel Leston, University of Alberta
Co-authors: David Andison, Erin Bayne, Yan Boulanger, Matt Carlson
Title: *Habitat On The Move: Using species distribution models and landscape simulation to project and manage for future Canada Warbler populations*

Abstract: Alberta's boreal forests and their bird communities are projected to contract significantly over the next century due to cumulative effects of forest maturation, harvest, fire, drought-associated mortality, energy-sector development in Alberta. We used species distribution models in tandem with simulations to predict how a declining species (Canada Warbler [Cardellina canadensis]) would respond to cumulative disturbances. We used the Alberta-Pacific Forest Industries Inc. Forest Management Area as the study area for all scenarios. We simulated different spatial harvest plans for different 50-year scenarios (Patchworks) and 200-year scenarios (LANDIS-II). For the Patchworks harvest scenarios, we simulated additional effects of fire and energy sector development in other scenarios using ALCES Online. For the LANDIS-II scenarios, we simulated additional effects of fire, wind-related, and drought-related tree mortality in that software and allowed those disturbances to vary with climate change. Canada Warbler were predicted to increase by 30 – 36 % over 50 years under the two harvest scenarios in Patchworks. Canada Warbler responded negatively to increasing fire and energy sector disturbances in ALCES Online scenarios but was still projected to increase over 50 years. In the LANDIS-II scenarios, Canada Warbler responded negatively to increasing harvest and warmer future climates. After scenarios were run, we used ZONATION software to run conservation planning scenarios to prioritize locations for additional habitat protection or management for Canada Warbler under both present and future conditions. With increasing harvest and climate change more northern sites and fewer southern sites were favoured for conservation.

Keywords: Bird, species distribution model, simulation

Biosketch: Lionel Leston is a postdoctoral researcher at the University of Alberta with the Boreal Avian Modelling Project.

Back to Table of Contents

D2: Assisting Caribou Recovery

Laura Finnegan, fRI Research
Co-authors: Karine Pigeon

Title: *Let it grow? Moose response to seismic lines in caribou ranges*

Abstract: Woodland caribou (Rangifer tarandus) have declined across Canada as habitat disturbance has altered and fragmented caribou ranges. Seismic lines are a focus of ongoing caribou habitat restoration efforts as they are used by caribou predators to travel, and they are associated with elevated caribou mortality risk. There is a growing understanding that densities of seismic lines and fine-scale characteristics of seismic lines, like vegetation height, impact wolf response. However, few studies have assessed how wolf primary prey, moose, respond to seismic lines. Understanding primary prey response to seismic lines is vital to direct restoration efforts, and to evaluate when restoration is successful. We used GPS location data from 17 moose, collected in west-central Alberta between 2008 and 2010, to assess moose response to seismic lines densities at broad-scales, and seismic line characteristics at fine-scales. At broad-scales, moose selected seismic lines during winter, and had a functional response to seismic lines; selecting seismic lines when they were in areas with lower densities of seismic lines. At fine-scales, moose selected seismic lines during winter irrespective of regeneration height and wetness. During summer, moose neither selected nor avoided seismic lines. Combined with previous work, our results highlight the importance of considering the density of anthropogenic features in habitat restoration efforts – as restoration may shift the distribution of primary prey and predators within caribou ranges. At fine-scales, we provide additional evidence that focusing on functional and structural restoration will likely be the most effective in reducing primary prey and predator use of seismic lines.

Keywords: Seismic lines, caribou, moose, functional response, regeneration

Biosketch: Dr Laura Finnegan leads the Caribou Program at fRI Research in Hinton, Alberta. The Caribou Program team has been working with partners across different sectors on applied caribou research questions since 2013.

Erin Tattersall, fRI Research
Co-authors: Karine Pigeon, Doug MacNearney, Laura Finnegan

Title: *Walking the line: investigating ecological characteristics relating to wildlife linear feature use*

Abstract: The Albertan boreal forest is characterized by vast networks of linear features (seismic lines, pipelines, roads), which pose a problem for at-risk woodland caribou (Rangifer tarandus). To mitigate the negative effects linear features have on caribou, we must first understand the biophysical 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. hemonius), elk (Cervus elaphus), and moose (Alces alces). Results

supported the hypotheses that wildlife used linear features for ease of movement, forage, and prey availability. Moose, bears, and deer were more likely to use linear features with game trails, while canines were more likely to use linear features with human trails. Use of linear features by moose also corresponded to greater cover of willow and birch, while deer use corresponded to greater forbs cover. In at least one study area each, canine and bear use was higher on linear features used by any prey species. These findings support practices in linear feature restoration that remove trails and replace early seral vegetation, which aim to deter predators and prey species alike. With caribou recovery on the line, linear feature restoration is ramping up in Alberta and beyond. Investigating questions such as these translates the broader objective of species conservation to specific actions that can be implemented at the local scale.

Keywords: Caribou conservation, seismic lines, habitat restoration, apparent competition

Biosketch: I am an early career researcher interested in wildlife, people, our impacts on one another and on the land. My research has primarily been in Alberta, but I currently work for the government of British Columbia as a Wildlife Information Specialist within the Caribou Recovery Program.

Stephanie Leonard, Aseniwuche Winewak Nation
Co-authors: Chantelle Bambrick

Title: *Caribou Patrol: An Indigenous Response to Fatal Interactions Between Migrating Caribou and Vehicles*

Abstract: Highway 40 is Alberta's deadliest highway for caribou as animals from the A la Peche herd cross it twice per year during their seasonal migrations. This puts these iconic animals at risk to fatal interactions with vehicles. Caribou Patrol is an Indigenous-led stewardship program that directly engages the people of the Aseniwuche Winewak Nation of Canada (AWN) in the preservation and recovery of Woodland Caribou within AWN's traditional territory. Caribou Patrol began in 2012 and successfully established committed funding partnerships with the Foothills Landscape Management Forum, Government of Alberta, and Environment and Climate Change Canada. For decades, AWN has witnessed the decline of woodland caribou and have struggled to follow the advice of their Elders who said, “We must speak for those that have no voice”. Caribou Patrollers are community members who work in two worlds; the traditional Indigenous world, using knowledge passed down through generations to observe animal behavior, and the modern world, using current technology to create electronic records and populate GIS databases.
Patrolling and Outreach complement each other. Caribou Patrol crews humanely divert any caribou they encounter away from the road and vehicles using stockmanship principles. and the patrollers’ presence reminds us of the uncertain future of caribou. Social media is the catalyst to make the plight of caribou personal. Presentations to schools have inspired a new generation of environmentally conscious individuals and presentations to industry and the general public encourage people to have a compassionate understanding of the importance of species protection and preservation.

Keywords: Caribou, migration, vehicle, Indigenous

Biosketch: Stephanie Leonard is the Environmental Coordinator for Aseniwuche Winewak Nation and one of the project managers for the Caribou Patrol. Stephanie has worked on the program for two years, updating it and ensuring it has the funding and resources to continue into the future.

Back to Table of Contents

D3: Long-Term Monitoring

Miriam Boucher, AJM Environmental
Co-authors: Aaron Cyr, Adam Martinson

Title: *Snakes of the Plain: Monitoring Snake Populations in Southern Alberta.*

Abstract: The success of conservation and management programs depends on contemporary and reliable scientific data. One way that scientists can provide such data is through long-term mark-recapture monitoring programs. In Alberta, snake species face mounting pressure from habitat loss and impacts from infrastructure development (i.e., roads, petroleum extraction), and are vulnerable to population decline. To monitor and determine the effects of critical infrastructure on snake populations, we implemented a long-term mark-recapture study of three known hibernacula. We employed a combination of intensive field sampling with passive antenna arrays to determine seasonal use of the hibernacula, rates of return, times of peak activity, and population demography and health. To date, sampling efforts have been largely successful in marking and re-encountering snakes at the monitored hibernacula sites. In total, 1171 non-neonate snakes have been PIT-tagged, 915 having been recaptured at least once. Preliminary population models indicate larger than anticipated populations at two of the hibernacula, and monitoring infers minimal population differences between 2019 and 2020. Seasonal use of the hibernacula and times of peak activity provides useful information for timing of field sampling and considerations for current provincial mitigation setbacks. Data collected through this project is shared with provincial regulators with the goal of supporting the management of snake species and critical overwintering habitat in the face of climate change, declining populations, and increasing human activity.

Keywords: Snake, population ecology, mark-recapture

Biosketch: Miriam Boucher is a Calgary native whose passion for wildlife took her to the USA and further to Belize in pursuit of wildlife conservation. After 10 years of study and work abroad, she returned to Alberta to learn about resource development and wildlife in her home province.

Geoff Holroyd, Beaverhill Bird Observatory

Title: *Population Dynamics and Conservation of Burrowing Owls in Prairie Canada*

Abstract: 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 'Canadian' owls winter in southern Texas and central Mexico and 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.

Keywords: Endangered species, dispersal, dynamics, conservation

Biosketch: During Dr. Geoff Holroyd's 36-year career with the Canadian Wildlife Service he supervised Ecological Wildlife Inventories of five National Parks; studied Burrowing Owl and Peregrine Falcon conservation, and was an adjunct professor in Renewable Resources, University of Alberta. He is now chair of the Beaverhill Bird Observatory.

Sara Pearce Meijerink, Beaverhill Bird Observatory
Co-authors: Geoff Holroyd
Title: *Beaverhill Bird Observatory – Monitoring Climate Change in Central Alberta.*

Abstract: The Beaverhill Bird Observatory (BBO) was established in 1984, making it the second oldest bird observatory in Canada. As an active member in the Canadian Migration Monitoring Network and the Monitoring Avian Productivity and Survivorship (MAPS) Program, BBO has been monitoring migratory and local breeding birds through bird banding and census surveys for decades. This long-term monitoring is vital to understanding trends in bird populations and increases our understanding of how birds use the continental landscape. In recent years, with the help of live imprinted birds of prey, the BBO has given over 200 presentations per winter to groups across central Alberta about the importance of birds, conservation, and climate change. This talk will highlight some of the many accomplishments of BBO and plans for future research including the MOTUS system..

Keywords: Education, biodiversity monitoring, migration monitoring, climate change

Biosketch: Sara Pearce Meijerink Is head biologist at BBO where she has been for almost a decade. Previously she was a reptile educator in Ontario. She has detoured to study snow geese in the Canadian arctic, endangered Kiwis in New Zealand and lemurs in Madagascar.

Back to Table of Contents

APPENDIX E: BIG LEAGUE POSTER SESSION ABSTRACTS

Dayce Rhodes, Lethbridge College

Title: *Monitoring Elk Visitation Between Agriculture Crops and Grassland in the Porcupine Hills of Southern Alberta*

Abstract: Rocky Mountain elk (Cervus canadensis nelsoni) are a source of social, ecological, and economic benefits, but may also contribute to agricultural crop depredation. Wildlife - agricultural conflict (e.g., crop depredation) is a growing issue in southern Alberta. Crop depredation creates challenges for wildlife agencies and landowners working to minimize losses while maintaining abundant cervid populations. The objective of this study is to determine whether elk spend more time foraging in open grassland meadows or greenfeed oat crops during the summer. Monitoring between June and September 2020, targeted the growing and harvest seasons of crops, on two ranches within the Porcupine Hills of southern Alberta. Sites were monitored using six remote infrared cameras; two grassland sites and four crop sites. Data were also collected opportunistically when elk sightings occurred at study sites. The study aims to test the hypothesis that elk spend more time foraging green feed crops rather than grassland during the summer because of crop availability and nutritional benefit. Data analysis is ongoing but the results of this study will describe the differing amounts of time elk spend foraging between grass and crop feed types, and associated effects on supplemental feed crops. Results may also provide information to agricultural producers and local wildlife managers towards developing future management techniques aimed at enhancing coexistence of agriculture in elk habitat.

Keywords: Agriculture conflicts, habitat use, Rocky mountain elk, ungulate foraging, wildlife management

Biosketch: I was raised on a cattle ranch west of Claresholm, Alberta. The western lifestyle, family tradition, and value for nature has shaped my life in many facets. No matter it be my education, hobbies, recreational activities, or professional endeavours, all share the common them of the outdoors.

Mélanie R. Routh, University of Alberta
Co-authors: Scott Neilsen

Title: *Dynamic patterns in winter ungulate browse succession in the Boreal Plains of Alberta*

Abstract: Wildfires are a key driver of boreal forest structure and composition that alter food resources for wildlife. In the first 50 years post-wildfire, woody browse availability in upland forests increase in quantity and quality for generalist ungulates, such as moose (Alces alces) and white-tailed deer (Odocoileus virginianus). However, the duration of post-wildfire browse availability is not well understood in the Boreal Plains as previous studies are primarily from the Taiga and Boreal Shield where vegetation communities are structurally different. This study examines the changes in winter browse richness, evenness, and abundance, as well as their use (browse levels) by moose

and white-tailed deer, over a 150-year post-wildfire period. We collected vegetation and ungulate browsing data from 164 upland forest and lowland sites in northeastern Alberta. We used analysis of covariance and ordinal logistic regression to examine changes in browse measures. Species richness and evenness showed a double peak at 10 – 25 years and 90 years post-wildfire in mixedwood forests, while browse abundance was constant. Black spruce forests and lowlands had similar species richness, evenness and abundance over the 150-year chronosequence, although browse abundance in lowlands was higher than mixedwood forests, but this consisted of low palatable browse. Browsing was significant in jack pine forests, mixedwood forests and poor fens; coniferous saplings were generally avoided, whereas 35 to 65% of available deciduous saplings were browsed. Understanding post-wildfire succession and ungulate browsing in post-wildfire forests provides useful information for managing alternative prey populations necessary for long-term woodland caribou (Rangifer tarandus caribou).

Keywords: Moose, white-tailed deer, winter browse, Boreal Plain, wildfire

Biosketch: Mélanie Routh is a M.Sc. student in the Applied Conservation Ecology (ACE) Lab at the University of Alberta. She is studying the impacts of wildfires and climate change on moose and white-tailed deer winter browse succession and winter habitat quality in northeastern Alberta with implications for boreal woodland caribou conservation.

Jennifer Foca, University of Alberta
Co-authors: Mark Boyce

Title: *Camera traps for density estimation: Evaluating the REST method*

Abstract: Accurate population density estimates are invaluable to wildlife managers, but difficult to attain. Several methods have been developed to estimate density using camera traps, many of which require further testing. The Random Encounter and Staying Time (REST) approach allows for density estimation of "unmarked" species using cameras traps. We applied a version of the REST model to "known" populations of bison (Bison bison, B. bison athabascae), elk (Cervus elaphus), and moose (Alces alces) in Elk Island National Park (EINP) using camera trap data collected from 2017-2020. EINP conducts a minimum count aerial survey annually that produces reliable estimates for bison, elk, and moose. We used aerial survey data from winter 2017, 2018, and 2019 to evaluate our REST estimates for accuracy. We also compared alternative model parameters and assessed applicability for herding species (i.e. bison and elk). Preliminary results show the REST method overestimated elk density and underestimated bison density. REST density estimates for moose were accurate each year when using winter camera data only. Possible causes of inaccuracy for bison and elk densities include group size, insufficient number of cameras, and lack of stratification by habitat type, since cameras were placed on a systematic grid with deciduous forest being overrepresented relative to availability. We are now considering options to improve our density estimates for bison and elk, such as weighting relative densities by proportion of available habitat. This study provides valuable insight for estimating densities of unmarked species in a heterogenous landscape.

Keywords: Camera trap, density estimation, population monitoring, REST model, ungulates

Biosketch: Jennifer Foca is an MSc student in the Boyce lab at the University of Alberta. Her research interests include camera trap methods, population monitoring, and spatial ecology.

Wyatt Villetard, University of Alberta
Co-authors: Phil Walker, Art Rodgers, Jen Shuter, John Cook, Rachel Cook, John Fryxell, Evelyn Merrill
Title: *Response of Woodland Caribou (Rangifer tarandus) to harassing insects across northeastern Ontario*

Abstract: Insect abundance is predicted to increase as climate change continues and may influence species movement, distribution, and survival. Caribou (Rangifer tarandus) are particularly subject to intensive insect harassment during peak insect abundance in late summer. The extent that insects may impact the movements of caribou populations is mixed with previous research showing both increased and decreased movement. Both responses have the potential to alter foraging efficiency and animal condition. We monitored trends in the abundances of three insect families in the Clay-belt region of northeastern Ontario in 2018 and the change in caribou movements associated with these trends. Black fly and mosquito abundances overlapped most whereas peak tabanid season occurred earlier and for a shorter time period. We found peak black fly abundances increased as canopy cover and stand age decreased, while tabanid and mosquito abundances increased with a decrease in stand age and an increase in canopy cover. We assessed the movement response of GPS-collared caribou in northeastern Ontario relative to canopy cover, stand age and landcover type before, during, and after peak insect abundance to assess the potential impact of insect harassment on caribou movement rates. Results of this analysis is our first step toward understanding how insects may influence caribou use of forest communities during the critical summer period when they accumulate fat reserves, and how forest management may influence insect-caribou interactions.

Keywords: Summer insect harassment, caribou, movement

Biosketch: My name is Wyatt Villetard, I am an undergraduate student at the University of Alberta in the department of biological sciences. Currently I am working on a 499 project under Evelyn Merrill in the Merrill lab. I love to be outdoors in the Alberta backcountry.

Erin Miller, University of Alberta
Co-authors: Andrew Derocher, Nicholas J. Lunn, David McGeachy
Title: *Autumn migration phenology of polar bears (Ursus maritimus) in Hudson Bay, Canada*

Abstract: Migratory species respond in predictable ways to seasonal changes in their environment but have demonstrated novel shifts in phenology due to climate change. To predict how migratory species will respond to changing conditions, we must identify the fitness consequences of variation in migratory behaviour and relate it to their environment. In this twenty-year study, we examined the autumn migration of polar bears (Ursus maritimus) in Hudson Bay, Canada. We demonstrated how time-to-event models can predict the biological and environmental factors that explain the variation

in the timing of migration within a population. To quantify the fitness costs of behavioural plasticity, we examined trends in the body condition and energetic thresholds of fasting bears. We found no evidence of inter-annual trends in migratory behaviour. We did, however, find strong inter-individual variation in the timing of migration influenced, seeing delayed departure for older bears and during years with later freeze-up dates. Finally, we found evidence of temporal trends in both body condition and fasting thresholds. For both metrics we found female bears with cubs-of-year to be in better condition at the beginning of the study than females with yearlings, but that they declined over the study period while females with yearlings remained stable. Our results suggest an influence of sea ice dynamics on the migratory behaviour of polar bears that has not yet exerted a significant shift in migration phenology on the population. Despite this, females with cubs-of-year have demonstrated a decline over time that may indicate future threat to the population.

Keywords: Polar bears, Hudson Bay, migration

Biosketch: I am a master's student at the University of Alberta in my second year. I had a wonderful first year getting to know my lab and have missed our coffee trips terribly since working from home. After overcoming my natural aversion to phone calls, I now enjoy virtual coffee visits.

Anna Jovtoulia, University of Alberta
Co-authors: Andrew Derocher

Title: *Spring prey selectivity and habitat use in wolves (Canis lupus) in the southern Northwest Territories*

Abstract: Understanding the dietary habits of a predator species can be critical for the study of predator-prey relationships within complex ecosystems. In the southern Northwest Territories, we studied gray wolves (Canis lupis) across 3 regions with distinct assemblages of ungulate prey species (boreal caribou (Rangifer tarandus caribou), moose (Alces alces), and bison (Bison bison)). Gray wolves are known to mainly prey on large ungulate species, however they also often hunt small mammals as well as scavenge opportunistically. The main objective of this study was to determine the diet of gray wolves during the ungulate calving period. Understanding the diet of wolves in the southern Northwest Territories during the spring and summer seasons, may provide insight into seasonal predation pressure on ungulate species. A scat analysis was used to examine macroscopic hair and bone fragments found within scat to determine the diet of wolves. Scat samples were collected around wolf den sites in late summer from 2018 to 2020. Wolf dens were located using telemetry data from wolves which were tracked throughout each year. A secondary goal of this project was to analyze the movement and habitat selection of wolves during the ungulate calving period to understand whether wolves focus on habitat types where selected prey species are more prevalent. Data collection for this project began in 2018 and will continue into 2021. This project permits greater insight into predator-prey dynamics between gray wolves and ungulate species in the southern Northwest Territories and may provide key information for improving management strategies.

Keywords: Canis lupus, gray wolf, habitat selection, diet study, RSF

Biosketch: Anna is a M.Sc student at the University of Alberta studying ecology. Anna obtained a B.Sc degree from the University of Alberta in 2019. She completed an independent research project during her undergraduate studies focusing on parental provisioning of Arctic Peregrine Falcons during nesting in Rankin Inlet, Nunavut.

Justin Kestler

Title: *Wildlife Identification: The Hair Scale Guide to Terrestrial Mammalian Carnivores of Canada*

Abstract: 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, The Royal Ontario Museum and the Calgary Zoo. 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.

Keywords: Mammalian carnivore hair scale guide

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

Back to Table of Contents

APPENDIX F: SMALL FRY POSTER SESSION ABSTRACTS

Lisa Wilkinson, Government of Alberta
Co-authors: Joanna Burgar, Brenda Shepherd
Title: *Bat Monitoring in Alberta: A five-year summary*

Abstract: In response to bat population declines from White-Nose Syndrome, the North American Bat Monitoring Program (NABat) was created in 2014 to track bat population trends using acoustic monitoring. Alberta has been participating in this program, and to date there have been passive ARU deployments at 120 unique locations within 61 NABat grid cells. We will present monitoring data from 2015-2020, within a provincial and landscape context. Our analysis will include examination of spatial and temporal bat activity patterns at the species or species group level for focal species with sufficient detections. Importantly, this analysis will allow a comparison of activity patterns and temporal niche partitioning across Alberta and show if there have been changes over time. This monitoring program is an example of what can be achieved through collaboration with various partners at both a provincial and continental scale.

Keywords: Bats; monitoring; trends; ARUs

Biosketch: Lisa Wilkinson is a Senior Species at Risk Biologist and Provincial Bat Coordinator.

Conor Griffith, University of Alberta
Co-authors: Macs Macleod, Mark Poesch
Title: *Morphological Influence of Flow Augmentation on Milk River Plains Sucker*

Abstract: Anthropogenic river exploitation and augmentation has elicited widespread concern for riverine species adapted to historic flow regimes. In Alberta, water discharged into the Milk River from the St. Mary Diversion Dam increases base flows of 1-5m3/s to 5-20m3/s. Augmented flows can act as a selective pressure, and significantly influence the character and morphology of downstream organisms. The Plains Sucker (Pantosteus jordani), recently taxonomically revised from the Mountain Sucker, is listed as “threatened” by the Committee on the Status of Endangered Wildlife in Canada in Designatable Unit 2: Milk River populations. In response to augmented flows, the Milk River Plains Sucker has demonstrated a capacity to significantly modify its swimming ability. This same response is not seen in unmodified tributaries. Given the broad variation in flow regime across its range and the disjunction of populations associated with river impoundments, it is hypothesized that the Plains Sucker possess different morphologies adapted to their local flow regime. This study analyzes potential intraspecies morphological variation across 7 sites using landmarking software, and the implications it may have on future survival and management of the species.

Keywords: Morphometry, flow augmentation, selective pressure, Catostomidae

Biosketch: Conor Griffith is a 4th year undergraduate studying environmental and conservation science at the University of Alberta. Conor's research in the Fisheries and Aquatic Conservation Lab will help support the development of a Milk River Plains Sucker recovery strategy.

Cory Olson, Alberta Community Bat Program

Title: *Bat Roost Monitoring and Citizen Science in Alberta*

Abstract: 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 five years, greater than 250 roosts have been reported to the program and, for most of these, species identity has been confirmed using single-species 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 Bats, 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 sometimes thousands of individuals. The citizen science database is now a key resource to address new questions and fill important knowledge gaps limiting conservation and recovery efforts.

Keywords: Bats, citizen science

Biosketch: Cory Olson is Program Coordinator for the Alberta Community Bat Program. He completed his graduate 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.

Emma Micalizzi, University of Calgary

Title: *The roosting ecology of Little Brown Bats in Banff National Park*

Abstract: The Little Brown Bat is federally listed as endangered in Canada after severe population declines due to white-nose syndrome, a novel fungal disease that is spreading across North America. It is a high priority in the Recovery Strategy for the Little Brown Bat to protect important habitat, including roosting habitat, that is essential for the species' survival. However, despite its importance to Little Brown Bat populations, roosting habitat for Little Brown Bats is poorly characterized in the Canadian Rocky Mountains. My research involves radiotracking female Little Brown Bats in Banff National Park to identify Little Brown Bat roosts and characterize the factors that drive roost selection in this area. Our results from radio-tracking nine female Little Brown Bats in 2019 suggest that female bats in Banff National Park have unique roosting strategies, including small colony size, low roost fidelity, and the use of solitary coniferous bark roosts by pregnant females, although further inferences about the causes of these behaviours are limited by our small sample size. Nevertheless, our research adds to very limited data on the ecology of this endangered, ecologically important species in the Canadian Rocky Mountains.

Keywords: Bats, Banff National Park

Biosketch: I am in the second year of an MSc in Biological Sciences at the University of Calgary. I worked in microbiology for a few years but decided to return to school to get more involved in conservation work.

Summer Hunter, University of Calgary
Co-authors: Sylvia Checkley, Scott Weese, Carl Ribble, Jamie L. Rothenburger
Title: *Health survey and pathology of free-ranging urban Leporidae in Calgary, Alberta*

Abstract: Wild rabbits (Oryctolagus and Sylvilagus) and hares (Lepus) were an important historical food source for many Canadians. While consumption has decreased, the expansion of Leporidae in urban environments has introduced the potential for frequent interactions between these animals and people through human food gardens, lawns, and other shared spaces. Yet the health and diseases present in Leporidae in an urban context has yet to be explored. The objective of this study is to perform a general health study of the rabbits and hares in the city of Calgary and determine the prevalence and risk factors associated with disease. These objectives will be met by performing pathology analyses (necropsy examination and histopathology) to identify tissue changes consistent with disease. We received roadkill carcasses from the City of Calgary and rehabilitation centers. Of the 154 animals, 143 (93%) were White-tailed jackrabbits (L. townsendii), and 11 (7%) were feral European rabbits (O. cuniculus). We identified macroscopic lesions in 44% (68/154) of the carcasses. Lesions include suspected parasitic cysts, kidney and liver tumours, and splenomegaly of unknown cause. Further analyses to characterize these lesions are underway. Exploring urban wildlife health is valuable not only for wildlife management but also to human health, as previous research suggests a potential linkage between poor overall health in the host and increased zoonotic pathogen carriage. The results from this study will provide a scientific understanding of background diseases and health status of rabbits and hares, informing future researchers of the disease risk of Leporidae in Canadian cities.

Keywords: Urban, wildlife, Leporidae, pathology, health

Biosketch: Summer Hunter is a second-year MSc. student from the University of Calgary and is studying urban rabbit and hare disease in the city of Calgary.

Back to Table of Contents