The Alberta Chapter of The Wildlife Society

2017 Conference and AGM

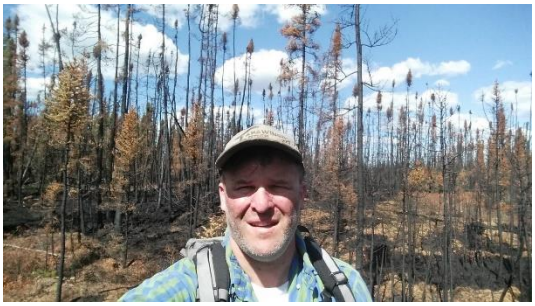
Thank you for hosting us Portage!

Plenary Session: The effects of fire on our landscape and wildlife

Richard Schneider: Research Associate, University of Alberta.

Wildlife management under a changing climate.

For wildlife managers, global warming fundamentally changes the rules of the game. We will have to transition to a new management paradigm, where the natural range of variation in the preindustrial landscape no longer constitutes a relevant reference state. This presentation provides an overview of the key aspects of this transition. I begin with a review of the projected climatic changes and how they are expected to affect ecological systems in Alberta. Key questions are: how much change will occur? How quickly will it happen? And, how sure are we that our predictions are at all reliable? I then turn to management implications, exploring what a dynamic management system might look like and how the transition might take place. A key issue is determining the appropriate scope for management intervention in a world of constant change.



Erin Bayne: Professor, Department of Biological Sciences, University of Alberta.

Fire dynamics of boreal Alberta post, present, and future: Implications for forest birds.

The boreal forest is a dynamic ecosystem. Fire has played a key role in the development of forest structure and composition in this region and presumably has influenced the ecology and evolution of the animals that live there. There is a notion that boreal birds may be adapted to "roll with the punches" when fire occurs. However, the role of fire size, fire intensity, and human actions after fire all influence the magnitude of how bird communities react. A review of bird response to fire in terms of how bird communities recover as vegetation regrows relative to harvested areas, the role of salvage logging as a factor influencing avian recovery, and the importance of fire intensity in relation to size of skips will be addressed. Future simulations that look at how these fire attributes might shift with climate change and the implications for birds will be addressed.

Philip D. McLoughlin: Associate Professor, Department of Biology, University of Saskatchewan.

Ecology of woodland caribou in an area characterized by high-fire but low-anthropogenic disturbance: new research from the Saskatchewan Boreal Shield.

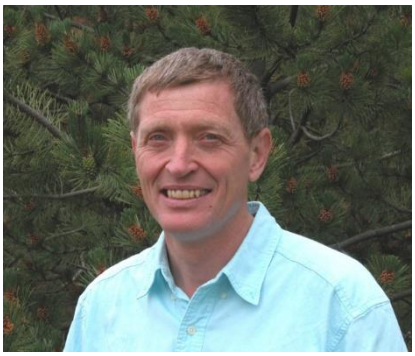
Woodland caribou of the Saskatchewan Boreal Shield occupy some of the most pristine habitat available to non-migratory, forest-dwelling caribou in Canada. The region is described by very low levels of anthropogenic disturbance (0.01 km/km^2 of linear disturbance); however, the area is subject to large fires reflecting the natural fire cycle for the area (≈100 years). Here I describe how caribou are faring in this region, based on results of a large-scale research program that we initiated in 2013. We found that despite the fires, the region retains large tracts of high-quality habitat available for woodland caribou, with half (50.1%) of the land area being characterized by >40 year-old pine and black spruce forests, and black spruce bogs and open muskegs that positively predict caribou probability of occurrence. Selected habitat supports some of the highest densities currently observed for non-migratory, boreal caribou in mainland Canada, which we estimate to be 36.9 caribou/1000 km^2 (95% CI: 26.7–47.2 caribou/1000 km^2). At the same time, wolf and moose densities in the region are very low, as is hunting pressure. The population is presently characterized by high adult female survival rates (>0.90) but moderate-low recruitment (≈0.20 calves per 100 females in March), but yet high pregnancy rates (≈0.90). These traits are suggestive of a large herbivore population that may be experiencing density-related constraints on further population growth. The standing age- and sex-structure, combined with known survival rates and reproductive data, indicates a stable to slightly increasing population over the recent past and as a future projection. We believe that one of the great values of our research may be in describing the dynamics of a woodland caribou population in a region that has changed little from historic conditions; that is, the conditions in which the species evolved.

James M. Peek: Emeritus Professor, Wildlife Resources Fish and Wildlife Sciences, University of Idaho.

A few observations of ungulate and vegetation responses to a wildfire in the Middle Fork Salmon River, Idaho.

Vegetation and ungulates in the Big Creek drainage of the Middle Fork Salmon River have been monitored by University of Idaho and Idaho Fish & Game for several decades. An assessment of bighorn, elk, mule deer, mallow ninebark, and bluebunch wheatgrass responses to a major wildfire in August 2000 can thus be attempted. Elk populations in this remote area had been unproductive for at least a decade prior to the advent of the wolf population. Bluebunch wheatgrass, a major forage species, responded in increased nitrogen content for two years following the fire, but decreased biomass production for a year. The elk population did not show any responses to changes in this forage species. This wheatgrass is also a major forage for bighorn, which showed increased lamb survival for two years following the fire. This did not translate into population increases. Both elk and bighorn were observed using regrowth on burned areas, indicating some minor redistribution of habitat use did occur. Mule deer populations, as evidenced by buck harvest and observations of fawn production and survival, may have increased following the fire for a few years. Mallow ninebark, an ecological equivalent of beaked hazel, showed dramatic responses in biomass and nitrogen content of resprouted plants following the fire. Wolf predation likely accelerated the decline in elk. The major conclusion from these observations is that ungulate populations that are at or near a forage-based carrying capacity and are old-aged with low survival of young, may not respond to major fire in their habitat. Major influences on wildlife in this system include fire, climate, and predation (pathogens for bighorn). Quantity and quality of plants can be reasonably predicted with monthly mean temperature and precipitation. We have enough information to develop "first-cut" predictions of ungulate and vegetation responses to wildfire in this system.

Jim Schieck: Research Scientist, InnoTech Alberta, Adjunct Professor, University of Alberta and Science Director, Alberta Biodiversity Monitoring Institute and Peter Solymos: Alberta Biodiversity Monitoring Institute.



How important are burned forests to wildlife: Who uses what?

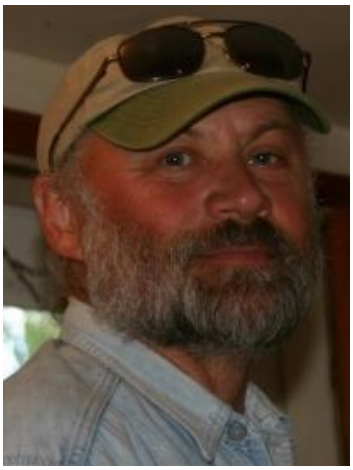
Wildfire is common in Alberta's forest, with recently burned stands having structures that are very different from those found in harvested stands. After fire there are many standing dead trees (snags), whereas these trees are taken to the mill during harvest. During the subsequent decades, snags fall and create abundant downed logs in fire-derived stands. We used information from the Alberta Biodiversity Monitoring Institute to: i) describe how forest biota (birds, plants, mosses, lichens, mites) differ between stands immediately post-fire versus post-harvest, ii) determine the degree to which these two stand types converge during the next few decades, and iii) identify biota that are post-fire specialists and that are expected to be heavily affected if harvest/salvage replaces most natural fires in Alberta's forested landscapes. Biotic

communities differed greatly between post-fire and post-harvest stands – many upland biota that live in forested areas were more common post-fire than post-harvest. However, there were relatively few specialists that depended solely on early post-fire stands; most species present immediately post-fire had similar abundances in mid-seral and/or old-forest stands. To complicate matters, biotic communities in post-fire and post-harvest stands converged greatly by 30-40 years post-disturbance. Thus, for most species harvest/salvage is not expected to have devastating consequences. Special management will be required for the few species that both specialize on early post-fire stands, and that are uncommon in all other habitat types. If old forest also becomes less common in future landscapes, more species will be of concern because many species had relatively high abundance in early post-fire and old-forest stands. Our results must be interpreted cautiously because few harvest stands >50 years have been surveyed, and convergence may be overestimated.

Predator Control Symposium – March 19, 2017

Keynote Speaker

Tom Nudds: Emeritus Professor, Department of Integrative Biology, University of Guelph.



Predator control and foodweb dynamics.

Species-rich communities and complex foodweb interactions present challenges to predicting the outcome of predator management programs. Large-scale control of mammalian nest predators in northeastern North Dakota had increased duck nest success but, apparently, neither duckling survival nor population recruitment. Three mechanisms – compensatory predation and/or food resource limitation on ducks and ducklings and/or emigration – could have foiled management efforts to materially affect recruitment to either the harvestable or local breeding populations. A large-scale, multi-year program to control nest predators, implemented as adaptive management, confirmed weak compensatory predation by raptors, and limiting food resources for breeding ducks and ducklings, combined to reduce effects of predator control. Consistent with foodweb theory, weak interactions, omnivory and compensatory predation in the greater prairie foodweb appear to confer stability and resilience to whole foodweb that thwart efforts to affect desired change to its constituent parts. Researchers and managers considering predator control to affect change to constituent populations in other types of foodwebs might benefit from an appreciation for the effects complex foodweb interactions, first, on the prospects for success at all; and, second, in the design of predator control programs as adaptive management experiments even where the prospects might be predicted to be good. Since Nature is capricious, it seems reasonable to test the obvious.

Paul Frame: Provincial Carnivore Specialist, Alberta Environment and Parks.

A quick review of large carnivore control efforts in Western North America.

The removal of large carnivores is tool used by wildlife managers to address issues such as endangered species recovery, protection of personal property (e.g., livestock and stored grain), and to facilitate ungulate population growth for harvest (subsistence and recreation). Results of control initiatives are varied depending on the issue they are addressing, the methods used to remove carnivores, and the environmental conditions during removal. Here I provide a review of what we have learned from predator control efforts in Western North America, highlight some remaining knowledge gaps, and consider the Alberta Environment and Parks perspective.

Bill Abercrombie: President and CEO, Bushman Inc.

Predator Control in Alberta for the 21st Century and the role of trappers in modern predator management.

The presentation will include a brief summary of current predator management issues and the challenges represented by rapid resource development, increased rural human activity and increasingly large numbers of predators living in close proximity to people in both rural and urban settings. The focus will then shift to looming future issues and problems associated with predator habitation that will require managers both professional and government to rethink and strategize how we approach predator management in the future.

Trappers in the province of Alberta have been the primary predatory management tool in Alberta for decades. How has the role of trappers evolved over the past 20 years? What is the status of trapper involvement in predator management and control currently? How will this change in the future? With most of the crown lands in Alberta under an RFMA disposition as well as a substantial part of the private rural landscape the 3500 licensed trappers in Alberta are certainly making an impact. However, with fluctuating fur prices, increased scrutiny by society and increased responsibilities to rural communities, landowners and government; how is the trapping community responding?

This presentation will present an overview of current strategy and factors influencing trapper harvest of predators. I will discuss how the trapping community has adapted, changed and remade themselves as an effective and necessary tool for predator control. Then I will focus on the challenges that face trappers and society in the future regarding the management of predator control in Alberta.

Emily Blythe, Jessica Melsted and Mark Boyce: University of Alberta, Joel Brice, Mike Buxton and Frank Rohwer: Delta Waterfowl Foundation, Bismark, ND.

Trappings of success: Upland duck nest survival in Alberta parklands.

Maintenance of stable dabbling duck (Anas spp.) populations requires ~15% - 20% annual nest success with success defined to be the hatching of at least one egg. Habitat alteration and other

anthropogenic drivers of artificially high mesopredator populations have led to high nest predation, the strongest limiting factor for nest success in ducks in many areas. Predator reduction is a proposed means of increasing nest success. In 2016, at both of our study locations (Bashaw and Viking, Alberta), 20 quarter sections were nest-searched and half were trapped for predators by Delta Waterfowl Foundation. To date, we have monitored 651 nests including those from a pilot study in 2015. Maximum likelihood estimates of 35-day nest success rates in 2016 on trapped and control plots respectively are 13.0% (95% CI = 8.5% - 19.7%) and 12.1% (95% CI = 7.2% - 20.0%) for Viking sites, and 15.8% (95% CI = 10.4% - 23.9%) and 19% (95% CI = 10.7% - 33.2%) for Bashaw sites. High numbers of hatched nests on trapped plots at both sites were negated by high predation on those plots, resulting in no significant difference in nest success between treatments. For the 2017 nesting season, we will transpose trapped and control plots to account for habitat effects on nest success.

Presentations by Surname

Joanna Burgar: University of Victoria and Jason Fisher: InnoTech Alberta, Cole Burton: University of British Columbia, Vancouver.

Using camera trap surveys to estimate mammal densities in the northern boreal: trials and tribulations of a Bayesian modeller.

Camera trap surveys are increasingly used to monitor wildlife populations and provide managers with much needed information. Population densities are typically estimated from cameras using capture-recapture models that require uniquely recognizable individuals. Statistical advances have expanded traditional capture-recapture models to unmarked populations using spatially referenced counts and Bayesian methods. While simulations and small-scale field studies suggest these models have promise, they have not yet been tested on realistic field datasets with relatively sparse detections. We are using data from a three year camera trap survey conducted in the boreal forest of northeastern Alberta to estimate densities for six large-mammal species occurring with low frequency. To meet assumptions of a closed population model while maximizing the number of detections for less frequent species, we focused on a subset of the data that included 59 camera sites sampled from 1 April to 6 October 2012. The number of independent detections ranged from 14 for caribou (*Rangifer tarandus*) to 157 for black bear (*Ursus americanus*). The Bayesian models were computationally intense and frequently did not converge, even after high numbers of MCMC iterations (300,000 iterations, ~ 200 hours of computation time), making it difficult to produce reliable density estimates for these species. Unmarked and partially marked models have proved successful at estimating density for the frequently occurring white-tailed deer (*Odocoileus virginianus*). This highlights the challenge of applying complex models to realistically sparse large-mammal datasets, and stresses the need for continued research and evaluation of the most effective analytical approaches and survey designs.

Connor Charchuk, Erin Bayne and Stan Boutin: University of Alberta, Elston Dzus: Alberta-Pacific Forest Industries Inc.

Boreal songbird community of understory protection harvested areas.

Traditional harvesting practices have followed the natural disturbance regime, which in Canada is the practice of clearcutting to mimic forest fires. Young aspen outcompete conifers in young clearcuts, resulting in mature stands of pure deciduous. For both economical and ecological objectives, mixedwoods are often desirable. Alberta-Pacific Ltd. (Al-Pac) has implemented a novel type of harvesting, termed understory protection, to facilitate the regeneration of mixedwoods following harvest. Understory protection is implemented in areas with high understory spruce densities, and involves harvesting of mature aspen by reaching in with a feller buncher to avoid damaging the understory. The economic benefits of UP harvesting are well understood, but the organisms that utilize these areas is poorly understood. The purpose of my research is to survey bird communities in understory protection harvested areas to compare them against communities in traditionally harvested cutblocks and nearby mature forest. Using autonomous recording units (ARUs) to acoustically survey bird communities, comparisons of richness, diversity, and overall community composition can be made. In 2015 we surveyed 47 sites (consisting of one of each treatment type), and 45 sites in 2016. I will be presenting analyses that I have conducted to compare the bird communities across these three treatment types. My focus will be how the bird communities respond differentially between the two harvest types over time. I hypothesized that the bird community found in understory protection would be different from the clearcut community, and would recover more rapidly towards a preharvest state.

Chimone Dalton, Susan Kutz, Faizal Careem and Frank van der Meer: Faculty of Medicine, Kathreen Ruckstuhl: Faculty of Science, University of Calgary.

Characterizing orf infection in muskoxen from Victoria Island.

Muskoxen have recently been found dead on Victoria Island in the Canadian arctic. Some of these animals show clear evidence of infection; lesions on limbs, skin, and muzzle suggestive of disease. As part of an ongoing project designed to characterize the diversity of wildlife viruses, our research explores the role of parapoxvirus (Orf) in muskox health. Orf can cause painful lesions in infected animals which can cause morbidity, starvation, and opportunistic infection by other harmful pathogens. We screened opportunistically derived tissue biopsies from muskox lesions for genetic evidence of Orf infection. Using molecular approaches, we sequence signature viral genes for data analyses. Surprisingly, our preliminary results suggest that our muskoxen are infected with a previously uncharacterized Orf strain, as well as an expected known muskox herpesvirus. Examining the relatedness of Orf virus strains within our muskox population will improve our understanding of virus transmission within Victoria Island. Further, understanding how these virus strains are related to muskoxen from other regions in the Canadian arctic can directly influence potential biosecurity measures to manage the spread of Orf infection. As the project progresses, samples from cohabiting animals will be included to help us identify potential wildlife viral reservoirs. Finally, we discuss briefly

the importance of screening wildlife animals for endemic and transmitted viruses, and challenges of virus detection in wildlife samples.

Siobhan Darlington, John Volpe: University of Victoria, Jason Fisher, and Cole Burton: Innotech Alberta.

Predator avoidance and seasonal resource selection by white-tailed deer (*Odocoileus virginianus*) in Northern Alberta, Canada.

In recent decades Canada's northern boreal forests have been subject to expansive energy development and rising temperatures that have allowed certain species to expand their natural ranges. Normally limited by low quality forage in conifer stands and severe winter conditions, white-tailed deer are now one of the most pervasive ungulates in this ecosystem. This change in prey abundance on the landscape has inadvertently affected declining woodland caribou populations by sustaining predators such as grey wolves. The role of the vast network of industrial features such as cutblocks, seismic lines, and roads in maintaining deer populations through the winter is not well understood. Predator avoidance behaviour and the availability of early successional forage in clear-cut areas may act as a drivers in habitat selection for white-tailed deer. To examine these spatial relationships I use telemetry data from 39 female deer across three years and a suite of anthropogenic features from the Alberta Biodiversity Monitoring Institute and the University of Alberta to develop seasonal Resource Selection Functions (RSFs). In addition, I include occurrence models for grey wolves, Canada lynx, black bears, and coyotes to examine the strength of response of white-tailed deer to predation risk in each RSF model. Preliminary results in the winter models show strong selection of cutblocks, well sites, roads, and seismic lines and avoidance of 3D seismic lines by deer. Understanding how deer survive harsh winters, where they go, and how they interact with predators will inform current management practices used in mediating industrial footprint.

Sandra Frey: University of Victoria and Jason Fisher: InnoTech Alberta.

Carnivore activity patterns in relation to landscape development and competitor co-occurrence across the Rocky Mountains of Alberta.

Diel activity patterns are an important component of species ecology. Environmental cues such as predation risk, anthropogenic disturbance, and the potential for agonistic encounters with dominant competitors may influence behavioural decisions that alter animal activity patterns. Using camera-trap data collected over multiple years across two study systems in the Rocky Mountains of Alberta in the Willmore Wilderness and the Kananaskis/East Slopes region, and we compared the diel activity of multiple carnivore species in relation to landscape development and competitor co-occurrence. We applied kernel density functions on the temporal data of the time-stamped camera-trap images to assess changes to animal activity patterns between high versus low disturbance areas both within and across the study systems using GIS landscape data. We also characterized how carnivores alter their

activities temporally in the presence of competitors or intraguild predators. Comparing activity patterns in response to external stimuli provides insight into the degree of plasticity in species activity schedules, and into the extent that environmental variables may alter an animal's standard activity pattern. Understanding how biotic processes and abiotic factors such as species interactions and human-driven landscape changes may influence species activity is of special relevance to management and conservation decisions.

Aditya Gangadharan, S. Pollock, P. Gilhooly, A. Friesen and Colleen St. Clair: University of Alberta, B. Dorsey: Mount Revelstoke & Glacier National Parks.

Grain spilled from moving trains create a substantial wildlife attractant in protected areas.

Transportation corridors can attract threatened wildlife via energy-dense food products that are spilled or discarded from moving vehicles, thereby increasing mortality risk. We quantified train-spilled attractants in Banff and Yoho National Parks, where agricultural products (hereafter, grain) are transported along 134 km of railway. We measured grain deposition from 2012 to 2015 at 19 sites and assessed the performance of three structures developed to measure spilled grain. We then modeled grain deposition with respect to four types of spatial and temporal variables: those related to grain shipment, physical habitat characteristic, train-related characteristics and variables specific to the study site. Grain was spilled at a mean rate of 1.64 g m^2/day (SD = 3.60) from April to October (n = 3 years) and 1.52 (SD = 2.37) from November to March (n = 1 year). Extrapolating annual deposition yielded enough grain (110 tons) to provide 4.77 x 108 kcal of gross energy: equivalent to the average annual caloric needs of 42-54 grizzly bears, *Ursus arctos horribilis*; the regional population is estimated at 50-73 animals. Much of this energy is inaccessible or unavailable to bears, but their attraction to it could contribute to mortality risk. Models explained 9-31% of the variance in deposition, primarily via coarse temporal variables of shipping rates and month. The absence of more specific predictive variables suggests that mitigation should target broader policies, such as prompt reporting and repair of leaky hopper cars, and limits to train stoppage in protected areas.

Patrick Gilhooly, Scott E. Nielsen and Colleen Cassady St. Clair: University of Alberta, Jesse Whittington: Parks Canada, Banff National Park.

Relationships between highway mitigation and railway mortality.

We investigated the effect of road mitigation (1983-2013) on the TransCanada Highway through Banff National Park, by comparing wildlife collisions on both the highway and adjacent railway before and after mitigation. To test for effects of road mitigation we compared annual highway and rail-caused collisions rates (per km) per species for each highway section. First, we examined the effects of transportation mode, guild, and mitigation status with road segment (mitigation section) as a random effect. Second, we constructed mode-specific models for three species groups with high relevance to managers; elk, other ungulates, and bears using either log-linear or logistic models. When considering all species, collision frequency was generally lower on the railway, lower for carnivores, and lower

with population size, but decreased over time for elk, and increased both over time and after mitigation for other ungulates, whereas the collision rate for bears increased slightly over time, but decreased after mitigation. Although the overall effect of highway mitigation was to reduce mortality on both transportation features, this effect was most pronounced for ungulates on the highway due partly to the concomitant reduction in the population size of elk. High variability in collision rates among species, transportation modes, and over time underscores the need to plan and evaluate transportation mitigation holistically and monitor adjacent transportation features and wildlife populations.

Jocelyn Gregoire and Erin Bayne: University of Alberta.

Boreal Songbird Response to Seismic Lines and the Impact of Observational Scale.

The cumulative effects of energy sector growth in Northern Alberta has raised concerns about its' impact boreal forest ecosystems. Linear features make up a large component of energy impacts and pose a challenge to environmental management. My thesis will explore two fundamental issues in mitigating their effects on forest birds: 1) whether the metric of successful mitigation is behavioural or numerical; and 2) what observational scale is appropriate to assess population level effects. The first objective of my thesis is to assess how seismic lines affect the use of disturbed and edge habitat by the Canada Warbler and species of a similar habitat association. To conduct this study, I will use a grid of autonomous recording units to locate the position of songbirds around seismic lines representing a gradient of vegetation recovery states. These grids cover the seismic line and forested edge on either side to identify avoidance behavior. The second objective is to determine how observational scale affects our interpretation of song bird response. I will use data collected from the ongoing 'Big Grid' project conducted by the Bayne Lab. Each site consists of a 10x10 grid of ARUs spaced 600m apart. These grids are established on a minimum of 10 sites that represent three levels of SAGD disturbance (undisturbed, developing and active). This research has implications for future reclamation practices and industry standards. It will help to define what is recovered from an ecological perspective and provide industry with an accurate means of evaluating ecological impacts.

Tracey Hammer, Kathreen Ruckstuhl and Peter Neuhaus: Department of Biological Sciences, University of Calgary, Susan Kutz: Faculty of Veterinary Medicine, University of Calgary.

Intra- and Inter- Litter Variation in Parasite Intensity and Diversity in Columbian Ground Squirrels (*Urocitellus columbianus*).

The extent of parasite infection is affected by both host susceptibility and parasite traits. Parasite traits include colonizing ability, transmission mode and target tissue. Host susceptibility can vary with

animals; however, offspring susceptibility to parasites has been little explored. Offspring can provide valuable information since they are naive to parasites, showing responses unmasked from the effects of previous infections. My study investigates multiple sources of host susceptibility in offspring, which I separate into two models: intra- and inter-litter variation in parasite load and diversity. Inter-litter sources of variation include litter size, mother's age and experience, mother's condition, nest burrow location, and nest hygiene. Intra-litter variation is expected to stem from offspring body size, sex, and genetic differences resulting from multiple paternity. Highly infested offspring are expected to have lower survival during their first hibernation. These mechanisms were tested on a wild population of Columbian ground squirrels located in Sheep River Provincial Park, Alberta. Multiple parasites were tested: two external parasites (fleas and mites) and three gastrointestinal parasites (eimeria, ascarid, and strongylid spp). This study benefits from a unique design (spatially and socially isolated nest burrows) which allows for the exploration of an unusually large number of explanatory variables and parasite types, making for one of the most comprehensive studies on the topic of host susceptibility to date.

Glynnis Hood and Curtis B. Stratmoen: University of Alberta, Augustana.

Changing data? A comparison of blue-winged teal habitat suitability using historic analog and current GIS approaches.

We compared habitat predictions derived from the United States Fish and Wildlife Service's paper-based 1985 habitat suitability model for breeding blue-winged teal (*Anas discors*) and a geographic information system-based model (GIS) in Miquelon Lake Provincial Park (MLPP), Alberta. We investigated whether possible detections of habitat change over time were due to the application of improved technology rather than true habitat differences resulting from various waterfowl conservation efforts. Our GIS model assessed the four original variables presented by the 1985 model: wetland density, wetland area, horizontal cover, and proximity to wetlands for three components of breeding habitat: mating, nesting, and brood rearing. We also incorporated an additional variable, vertical visual obstruction, into our analyses to determine its applicability in the model's assessment for nesting blue-winged teal. Finally, we compared our habitat suitability index (HSI) scores from the GIS analysis with scores obtained using methods described in the original model to determine the practicality and comparability of the two methods. The paper-based model produced higher habitat suitability scores for MLPP by 55% compared to those derived by our GIS model when the original four variables were used. When vertical cover was included in the GIS model, the HSI score was greatly reduced as well. We validated the model through the use of waterfowl and vegetation surveys. Our results suggest that longitudinal comparisons of an area's habitat suitability might be biased to historic conditions due to differences in spatial scale, improved data sets (e.g., remote imagery), and more advanced modelling capabilities.

Aerin Jacob and Hilary Young: Yellowstone to Yukon Conservation Initiative.

Yellowstone to Yukon: Vision, progress, and challenges for large landscape conservation.

Conceived more than 20 years ago, the vision of connecting and protecting habitat from Yellowstone to the Yukon was one of the first very large, collaborative missions for landscape-scale conservation in the world. One of the conceptual challenges in large landscape conservation is that action often occurs locally but science and vision are often at larger scales. This begs the question as to whether having a much larger vision can impact and guide cumulative localized efforts in a meaningful way. Focusing on examples in Alberta, I will cover the significant progress made on connecting and protecting wildlife and habitat, including increasing the number and size of protected areas, designating management and improving conservation value on other lands, and implementing arguably the most progressive wildlife crossing structures in the world. However, many conservation challenges remain and further applied work is needed. I will discuss priority research plans for Y2Y and our partners in Alberta, including opportunities for academics, civil society, and communities to engage in practical, effective conservation science and application.

Michelle Knaggs, Erin Bayne and Scott Nielsen: University of Alberta, Samuel Hache, Environment and Climate Change Canada

Effect of wildfire on passerines in the northern boreal forest.

The boreal forest provides breeding habitat for the majority of migrant passerine species in North America. Wildfire, the most important natural disturbance in the boreal forest, is expected to become more prevalent with climate change. There is limited knowledge to how passerines will respond to the predicted increase in burn severity and frequency on the landscape, particularly in the northern boreal forest. Additionally, although peatlands and wetlands make up between 20 - 60% of the boreal forest of Western Canada, upland habitats have been the focus of similar previous studies. This study is investigating how passerine communities respond to burn severity across all habitats in the northern boreal forest using two large (110,000 and 750,000 Ha) naturally caused fires that occurred in 2014 in the Northwest Territories. Passerine abundance was collected one and two years after fire using autonomous recordings units (ARUs). Preliminary results showed that species richness decreased in peatlands, but not uplands, with increasing burn severity. Results of community analysis and single species habitat models will be discussed. This research will contribute to knowledge of passerines responses to wildfire for conservation planning.

Elly Knight: University of Alberta, Kevin Hannah: Environment and Climate Change Canada.

Assessment and optimization of automated acoustic species recognition for practitioners.

Bioacoustic technology is increasingly used for surveying acoustic wildlife species, but the number of acoustic recordings amassed by monitoring programs is rapidly outpacing the ability of ecologists to process those recordings into analyzable data. Automated acoustic species recognition, or a “recognizer”, is an option for efficient identification of a target species from acoustic recordings, but

there are existing challenges that discourage practitioners from using this approach. First, little information is available on the costs and benefits of recognizers, and how the available recognizer platforms compare. Second, there is no general framework with which to assess how well a recognizer works for the target species and desired response variable. Third, and perhaps most challenging, it can still be time consuming to validate recognizer output, as each hit reported by the recognizer needs to be verified as a true or false positive. Using the Common Nighthawk (*Chordeiles minor*) as a bioacoustic model species, I will address these challenges to encourage and facilitate recognizer use by wildlife ecologists. The Common Nighthawk is ideal for testing automated acoustic species recognition because their simple, frequent, and consistent vocalizations are easy for recognizers to detect and identify. First, I will present a framework for recognizer cost-benefit assessment. Next, I will use a sample training and testing dataset on five readily-available recognizer platforms to show the costs and benefits of existing platforms. Finally, I will present several strategies for optimizing and reducing the work load of recognizer validation, including statistical validation and multiple recognizer use.

Shantel Koenig, Shari Clare and Faye Wyatt: Fiera Biological Consulting Ltd.

Big Buck Seeking Pretty Doe: Finding Ecological Connections in an Urban Landscape.

Landscape composition and configuration is a key consideration for the management of wildlife in urban environments, and maintaining functional habitat connectivity has become a central focus for restoration and landscape ecologists. For most wildlife species, reduced landscape connectivity is driven by habitat loss or conversion, which decreases the amount of available habitat and leads to the fragmentation of remaining habitat. As the human population grows and urban areas continue to expand, so does the need to understand how wildlife navigates through the urban landscape. Thus, assessing and maintaining habitat connectivity regionally (e.g., throughout the city) and locally (e.g., from park to park) is essential for maintaining biodiversity. In this study, we assessed landscape connectivity in the City of Calgary for a range of wildlife species, with a focus on terrestrial habitat connectivity. Circuit theory was used to model multispecies functional connectivity independent of source and destination points to assess how different components of the urban landscape (e.g., parks) contribute to habitat connectivity. In our approach, resistance represented the relative avoidance of human-modified landscape features by wildlife, and we created six candidate resistance surfaces that varied in: 1) the predicted magnitude to which modified landscape features were avoided by wildlife, and 2) whether or not traffic flow was included as a variable affecting connectivity. The resulting connectivity maps were validated and compared using independent datasets, which included wildlife road mortality and songbird point count data, to determine which model best predicted multi-species habitat connectivity in the city.

Anne Loosen, Andrea Morehouse and Mark Boyce: University of Alberta

Black bear density estimation in southwestern Alberta: Using ancillary data from a grizzly bear study.

Despite heavy harvests in many jurisdictions, black bear (*Ursus americanus*) management is often based on human-wildlife conflicts, expert opinion, and harvest records as indicators of abundance. We used non-invasive genetics to estimate black bear density in an understudied and harvested portion of their range, and we used indices of habitat productivity and human disturbance for covariates of spatial variation in density. In conjunction with a grizzly bear monitoring project, we collected black bear hair during 7 collection periods from 899 rub objects in southwestern Alberta in 2013 and 2014. Genetic analysis of DNA extracted from hair follicles identified species, individual, and sex. We used spatially explicit capture-recapture to estimate density for each year and sex, allowing for heterogeneous density surfaces. Male black bear densities were 39.9 bears per 1,000 km2 (SE = 3.5) in 2013 and 37.5 bears per 1,000 km2 SE = 3.3) in 2014. Female densities were 118.3 bears per 1,000 km2 (SE = 24.3) in 2013 and 91.02 bears per 1,000 km2 (SE = 20.4) in 2014. While estimates of male black bear density were precise, female error rates were high likely because rubbing behavior is more reliable among males. However, these data represent the only recent data-driven black bear density estimates in Alberta, and we encourage further cooperation with province-wide grizzly bear monitoring projects to improve our estimates of black bear populations in Alberta.

Kara MacAulay, Eric Spilker, and Evelyn Merrill: University of Alberta.

Do spatial differences in carnivore diet reflect predation risk for Ya Ha Tinda elk?

There is evidence that prey perceive the risk of predation, as they navigate a landscape of fear and alter their behaviour in response. Previous approaches to mapping spatial risk use predator and prey distributions to estimate potential encounters, yet this approach does not account for attack success resulting in mortality. Locations of prey kill sites represent actual mortality in space, but obtaining kill site data can be cost intensive and require time to accumulate adequate sample sizes. I address an alternative to these approaches for mapping predation risk based on mortality by relating features within a buffer to contents of predator scats in Ya Ha Tinda (YHT), a multi-predator community along the eastern slopes of the Rocky Mountains. Scats collected from four carnivores across a 1200-km2 study area will be analyzed for presence of elk. The objectives of this study are to: (1) compare the diets of large carnivores through macroscopic and DNA methods, (2) determine whether % elk in scat be predicted by predator distribution, elk distribution and/or landscape features, and (3) validate risk predictions with known elk kill sites. Preliminary results suggest that cervids (elk and deer) comprise a large part of wolf diet with juveniles occurring more frequently than adults (46% and 31% respectively). My project is part of a 15-year study investigating the changes in migratory behaviour of the YHT elk.

Sandra MacDougall, Stephen Legaree, and Darren Carter: Alberta Transportation.

The Alberta Wildlife Watch Program.

The Alberta Wildlife Watch (AWW) Program was developed to reduce animal-vehicle collisions (AVCs) on provincial highways, improve driver safety, and reduce the impacts of highways on wildlife populations. The AWW Program includes a smartphone and website application, and together, these applications allow Alberta Transportation to cost-effectively collect and analyze high-quality data for effective decision making across the provincial highway network. The AWW Program is a joint project between the Safety, Policy and Engineering Division (SPED) and Delivery Services (DS) staff, and was developed with input from Alberta Environment and Parks (AEP) and Red Deer College. The core pillars of the AWW Program are to: (1) provide high-quality data for effective decision-making; (2) Identify AVC-prone locations and trends; (3) develop departmental policy and standards relating to AVC mitigation; and (4) establish monitoring programs to evaluate innovative solutions and long-term mitigation effectiveness. The AWW Program was developed using lessons gathered from a 2008 provincial workshop and in effort to meet regulatory commitments for twinning Highway 63. The AWW Program launched provincially in 2016 and continues to be piloted along Highways 63 and 881.

Sandra MacDougall: Red Deer College, Karla Langlois: Tetra Tech EBA Inc, Yellowknife, Barry Wigmore: Tetra Tech, Waikanae, New Zealand, Stephen Legaree and Darren Carter: Alberta Transportation.

Use of a smartphone application to collect animal carcass data along Highway 63 in Alberta, Canada.

The Alberta Wildlife Watch (AWW) smartphone application was developed to gather accurate and timely animal carcass data, and live wildlife sighting information to improve analysis and reporting capabilities within the province of Alberta. Key considerations in the app design included: availability for iOS, Android and Blackberry platforms, a single reporting format, increased spatial accuracy, an increased reporting rate, photo uploading capability, species-specific reporting, and up to date data management, storage and retrieval. In phase one testing (2014), highway maintenance contractors along Highway 63 were provided with Android phones, and on-site training and follow-up. Of the 218 valid report submissions, 85% (n=185) were carcasses and 15% were live animal reports. Photos were submitted with 58.4% (n=108) of carcass reports, and 18 different species were identified. Fifty percent of reports were submitted from four IP addresses. Feedback from the contractors was overwhelmingly positive and preferred over the traditional paper method, but as deployment into subsequent phases continued, we identified issues in four key areas: training, user engagement, user sources of error, and technical issues with the app. These factors all influence long term program success and the types of analysis tools which should be used to determine significant collision-prone locations based on animal carcass data.

Evelyn Merrill, Joshua Killeen, Holger Bohm and Jodi Berg: University of Alberta, Scott Eggeman and Mark Hebblewhite: University of Montana

Changing migration in the Ya Ha Tinda elk population: when, where and why to migrate.

In most temperate systems, spring migration to high elevations by ungulates is key for increasing energy intake in a variable environment. A trophic mismatch can occur if the timing of migration is not consistent with plant growth either along the migration route or on their summer ranges. Major migrations routes may change over time due to shifts in land use, predation, human disturbance, or their interactions. We used movement data from 305 elk collared on winter ranges of the Ya Ha Tinda near Banff National Park, Alberta during 2002-2015 to investigate the routes used, timing and duration of migration, and factors associated with the distributional shifts in migrating herd segments over time in a partially migratory elk herd. Individual elk showed strong fidelity to migration routes between seasons and across years, but the proportion of elk that migrated westward to high elevation ranges declined while the proportion of migrants moving eastward to low-elevation summer ranges increased. Timing of migration across years was most closely associated with plant phenology on summer ranges, rather than information on the winter range. Elk moving to low-elevation ranges migrated earlier and were exposed to higher green vegetation early in the calving season compared to residents or elk migrating to high elevations. Average exposure to bear and wolf predation risk was similar along migration routes but not on summer ranges. Trade-offs between forage and predation in summer rather than along migration routes may account for distributional shifts in migrating elk over the past decade.

Sarah Milligan, Leonie Brown and Gordon Stenhouse: FRI Research, Dave Hobson and Paul Frame: Alberta Environment and Parks.

Managing the Move: Factors Affecting the Success of Grizzly Bear (*Ursus arctos*) Translocations in Alberta, Canada.

Evaluating wildlife translocation can be expanded from traditional assessments of survival and reproductive success to include measures of behaviour and physiology in reference to baseline data. We determined an outcome for 110 grizzly bear translocation events in Alberta, Canada between 1991 and 2013 and used logistic regression to investigate the effect of individual bear factors, management factors, and habitat factors on translocation success. We also compared the home range size, habitat selection, and denning behaviour of translocated bears to the resident population over time in an effort to assess the long-term effects of translocation. The odds of translocation success are increased by translocation distance and dissimilarity in habitat type between the capture and release site, but are decreased by past translocation events, the season of translocation, and increasing levels of mortality risk at the release site. We found no significant effect of sex-age class or conflict type on translocation success. The home range sizes of translocated grizzly bears were significantly larger than resident bears both during and after the first year of translocation but den entry dates, den exit dates, and the denning period of translocated grizzly bears did not differ significantly from resident grizzly bears. Translocated grizzly bears were initially selecting high quality

habitat similar to resident bears but this behaviour changed over time. Greater efforts to monitor translocated grizzly bears post-release are pertinent to improving translocation success and to increasing our understanding of the extent to which translocated grizzly bears acclimate to their new environment.

Eric Neilson and Stan Boutin: University of Alberta.

Human disturbance alters predation risk to moose in the Athabsaca oil sands.

Human disturbance can alter predation risk to prey in various ways. Predators can use human disturbance to facilitate hunting, thereby increasing risk. Conversely, when predators avoid human disturbance and prey do not, prey refugia is generated. Because the direction and magnitude of such effects are not always predictable it is important to examine if and how predation risk varies with human disturbance. Spatial predation risk can be estimated as a relative predation rate comparing the frequency of prey kill locations to an index of prey density. Alberta's Athabasca oils sands region (AOSR) is characterized by extensive human disturbance and is home to moose and wolf populations. Wolves exhibit a range of responses to human disturbance that alter risk to their prey but the AOSR is a novel environment in which this remains an open question. We examined whether risk to moose due to wolf predation varies with human disturbance in the AOSR. We compared the distribution of wolf kills of moose to a spatial index of moose density near and far from mines and facilities, and at high and low densities of linear features. Moose were killed closer to mines, further from facilities, and at lower densities of linear features than expected by random. However, the relative predation rate of moose increased with decreasing distance to mines and facilities and was not related to linear feature density. Human disturbance in AOSR has increased predation risk to moose but further work is required to identify population consequences.

John Paczkowski: Alberta Environment and Parks, Aurore, Prieur De La Comble: Agrocampus Ouest, France.

Monitoring wildlife in alpine habitats, using motion triggered and time-lapse wildlife cameras near Mount Allan, Alberta.

We deployed remote wildlife cameras at 19 locations to assess wildlife abundance in alpine habitats. The cameras were deployed between October 2013 and June 2016 in the Mount Allan area of Kananaskis Country Alberta. Some of the cameras were positioned to capture large open slopes known to be used by bighorn sheep and elk. Cameras were motion triggered by as well as set to record time lapse images at 15-30 minute intervals within a viewshed. Camera data were classified using Timelapse software. We reviewed 548,627 images, which were classified into 4,545 unique events. Human use, mostly in the summer, accounted for 77% of all camera events. We recorded 24 different wildlife species on camera. Bighorn sheep and elk accounted for 67% and 22% of all wildlife events respectively. We discuss some of the operational and methodological benefits and limitations of this research. We will also discuss the temporal and geographic distribution of humans and wildlife

in the study area. The camera data strongly support previous designations of the area as critical winter range for bighorn sheep.

D.L. (Dee) Patriquin and Ian Basford, Solstice Canada Corp., Robyn Perkins: University of Alberta.

How did the chick(adee) cross the road? Mapping arboreal connectivity in urban landscapes.

Land managers in a variety of contexts are concerned with identifying connective habitat for conservation planning. CircuitScape has recently emerged as a versatile option for mapping connective habitat at a landscape scale, to identify locations requiring conservation management (e.g., alternative pathways, pinch points). As part of an urban conservation project, we applied CircuitScape in an city landscape, using coyote and chickadee as indicators of terrestrial and arboreal movement, respectively. The chickadee model, one of the first applications for urban arboreal movement, highlighted issues not previously reported for terrestrial species, including an island effect at the neighbourhood level due to road networks. Through further application in a smaller urban landscape, supported by winter surveys, we have identified habitat features that appear to enhance arboreal connectivity in the urban context, and the resulting distribution of chickadees. Songbirds and other arboreal species are often overlooked in planning urban conservation efforts, yet provide a valued, and easily accessible wildlife viewing opportunity for urban residents. Results of this study can assist urban planners and ecologists in planning future development, and in maintaining and restoring habitat in already developed urban areas. Our work also suggests areas of future study for urban ecologists relative to fragmentation effects and urban connectivity.

Chuck Priestley, Lisa Takats Priestley: STRIX Ecological Consulting, Wendy Crosina: Weyerhaeuser Company Ltd.

Canada Warbler (*Cardellina canadensis*) distribution, breeding habitat, and singing phenology in Alberta's Foothills.

Canada Warbler is listed as Threatened under Schedule 1 of the Federal Species at Risk Act. In Alberta the general status of Canada Warbler is At Risk. Declines have been attributed to habitat conversion of breeding and nonbreeding habitat; over-browsing; changes in insect prey availability; and window collisions. Canada Warbler detection rates during the Breeding Bird Survey (BBS) declined 71% during the period 1970 – 2012. However, it is unclear whether this corresponds to range-wide declines as BBS does not randomly sample the entire species' range particularly in northern regions. Within Weyerhaeuser's Forest Management Agreements, we investigated where Canada Warblers were found during Songbird Monitoring Programs, surveyed additional sites in Canada Warbler habitat, measured habitat characteristics within breeding territories, and investigated singing phenology of territorial males. Forty-six Canada Warblers were found during Songbird Monitoring Programs conducted every three years at 1235 sites between 1996 – 2016. During 2013 – 2015, 289 additional sites were surveyed and 27 Canada Warblers were detected. Breeding habitat tended to have high canopy closure, dense understory vegetation, standing water and variable topography. Four automated recording units were used to survey previously occupied Canada Warbler breeding sites

during the period 28 May – 20 July 2016. Males sang throughout the season (median 8 June) and at all times of day (median 09:58). Our findings provide information about where to target Canada Warbler-focused management efforts, which habitat characteristics should be maintained and created, when breeding surveys should occur, and habitat data will be used to develop a model for the Foothills.

Matthew Pyper and Sonya Odsen: Fuse Consulting Ltd., Geoff Sherman, Javed Iqbal, Terri Perron and Bruce Nielsen: Woodlands North.

Seismic line restoration in woodland caribou habitat, how a provincial framework can get us to where we need to go.

For years, the wildlife community has wrestled with the reality of caribou conservation in Alberta. Climate change, range expansion of white tailed deer, and tension between economic prosperity and environmental fragmentation are all very real and can make it hard to find reasons to be positive. However, in the last year alone there have been public commitments to restore over 6,000 kilometres of legacy seismic lines in woodland caribou habitat. But many questions remain. How do we ensure that habitat restoration is completed in an efficient and effective way? And how do we get it right? In the fall of 2016 Woodlands North and Fuse Consulting were contracted to develop a provincial framework for habitat restoration and monitoring in woodland caribou habitat. In this presentation we will highlight three components we believe are critical to a successful restoration program: prioritization for value to caribou, addressing site limiting factors to promote forest recovery, and robust monitoring to understand recovery trajectories and resulting responses of caribou populations.

Amit Saxena: Devon Energy Corporation.

Mitigating wildlife impacts from in situ oil sands development: creating wildlife value and business value.

Devon Energy has 3 operating oil sands projects and another approved project. Impacts to wildlife, biodiversity and land are major topics of interest to our stakeholders in the oil sands region, and Devon is actively addressing them through an industry-leading In Situ Oil Sands Wildlife Mitigation and Monitoring Program. This Program is a multi-pronged commitment to monitor wildlife populations, conduct environmental research and mitigate negative impacts to biodiversity in and around our project areas. Devon's program is comprised of 5 key elements: (i) long-term wildlife monitoring, (ii) extensive wildlife mitigation commitments, (iii) BearSmart practices, (iv) innovative technology and tools, and (v) a regional caribou collaboration and research program. The results of this program are being used by Devon in real time to influence engineering and project design considerations from the outset of new project planning. Empirical results from this program have been applied to all of our intensive project EIAs to-date, resulting in shorter review times, streamlined approvals, improved environmental performance, and stronger stakeholder relationships.

Amit Saxena: Devon Energy Corporation, Margaret Donnelly: Alberta Pacific Forest Industries Inc., Michael Cody: Cenovus, Caroline Hann: MEG Energy, Jon Gareau: Canadian Natural Resources Limited, Lisa Bridges: Statoil, Lori Neufeld: Imperial Oil Limited and Kendal Benesh: Alberta Biodiversity Monitoring Institute.

Regional Collaboration for Caribou Recovery in the Oil Sands Region of Alberta.

Woodland caribou conservation and recovery in Alberta is a shared government, public and private sector responsibility. The Lower Athabasca Regional Plan has established that on landscapes with multiple uses and resources, economic benefits of industrial development are desirable from a public interest perspective, and must be balanced with resource conservation on a working landscape. Resource-based industries active in these working landscapes on caribou ranges recognize that habitat-based actions are within our sphere of influence, and therefore coordinated restoration of existing industrial footprints are the actions we can take to best benefit caribou. The long-term benefits of these actions will be greatest if they are coordinated over whole caribou ranges. This necessitates collaboration among multiple operators and industry sectors on a shared landscape at a scale larger than individual dispositions and operating areas. A group of companies from the oil sands, forestry and pipeline sectors are collaborating to implement such a program in the Cold Lake and East Side Athabasca River (ESAR) boreal caribou ranges of northeast Alberta. The Regional Industry Caribou Collaboration (RICC) has initiated habitat restoration on over 1,200 linear kilometers of seismic lines within and adjacent to these caribou ranges. A variety of silviculture techniques and treatments have been used in various project areas, with the immediate goal of deterring predator and/or human movement along these linear features, while promoting ecological succession and recovery as a longer-term goal. Collaborative relationships and coordinated action have been essential to the successful implementation of these projects.

Matthew Scrafford, Tal Avgar and Mark Boyce: University of Alberta.

Wolverine habitat selection in response to anthropogenic disturbance in the western Canadian boreal forest.

Our aim was to evaluate competing hypotheses that anthropogenic disturbance can attract versus displace wolverine populations. Our research took place in the lowland boreal forest of northwestern Alberta where we used radiotelemetry to track wolverine habitat use over three years. We used mixed-effects logistic regression models and resource selection functions (used/available design) for analyzing wolverine habitat selection patterns during summer and winter seasons. We focused our analyses on the effect of active logging, intermediate-aged cutblocks (11-25 years old), seismic lines, and borrow pits on wolverine habitat selection patterns. The analysis of active logging used a before, during, interim, and after design. Wolverines were not displaced by harvest activities but instead were attracted to areas of active logging. Wolverines avoided the interior of intermediate-aged cutblocks but often selected for cutblock edges. Seismic lines and borrow pits were selected by wolverines likely because of enhanced foraging opportunities. Our research highlights the need for managers to appreciate the potential for anthropogenic disturbance to either attract or repel

wolverines. We also stress the importance of how the age of a disturbance influences its suitability to wolverines.

Julia Shonfield and Erin Bayne: University of Alberta.

Who gives two hoots? Surveying owls using autonomous recorders and automated species identification.

Playbacks of owl calls are frequently used during surveys to assess presence or abundance of owls. Playbacks can increase detection rates by eliciting territorial individuals to respond. However, they are known to draw owls in from a distance, and may cause some species to remain silent. Passive acoustic surveys may be a less biased method to assess habitat use for multiple owl species. Autonomous recording units (ARUs) are increasingly being used for avian point counts. For owl surveys, ARUs can reduce time constraints and eliminate safety concerns of nocturnal field work during spring breakup, however the volume of audio data collected can be time consuming to process. We tested the efficiency of automated species identification by building "recognizers" for the territorial calls of the barred owl, the boreal owl, and the great horned owl. We surveyed 238 locations in northeastern Alberta for owls using ARUs. We compared owl detections from the recognizers that scanned all recordings, to owl detections from listening to a subset of the recordings. We were able to process more recordings and obtain a larger dataset of owl detections than would have been possible with either listening only or conducting owl surveys without ARUs. Detection probability was not strongly affected by the presence of industrial noise on the recordings suggesting recognizers can function in non-ideal recording environments. Given the relatively low detection rates of owls by listening to recordings, using an automated identification approach is likely to be highly useful for monitoring these elusive animals.

Hans Skatter and M.L. Charlebois: Omnia Ecological Services, S. Eftest: Omnia Ecological Services , University of Oslo, Norway, Norwegian University of Life Sciences, Naturrestaurering AS, D. Tsegaye: University of Oslo and Norwegian University of life Sciences, J.E. Colman: University of Oslo, Norway, Norwegian University of Life Sciences and Naturrestaurering AS, J.L. Kansas: Kansas & Associates, Calgary, K. Flydal: University of Oslo and Naturrestaurering AS, Balicki: Cameco Corporation, Saskatoon.

Living in a burned landscape: Woodland caribou (*Rangifer tarandus caribou*) use of post-fire residual patches for calving in a high fire/low anthropogenic Boreal Shield Ecozone.

Environment and Climate Change Canada (ECCC) calculated that 55% of Saskatchewan's Boreal Shield has been disturbed by wildfire in the last 40 years. The 2012 Canadian Federal Recovery Strategy for woodland caribou states that these large-scale natural disturbances can cause caribou to cease use of portions of their range. This assumption neglects the potential habitat value of post-fire residuals and regenerating forests. We tested this assumption using two years of GPS data obtained from 56 female caribou to identify calving site selection. Seventy-nine calving events were identified from 91

individual calving seasons, and average calving day was May 17. For both calving and post-calving periods, woodland caribou preferred non-burned (> 40 years) over burned habitats (â‰¤40 years). Within burned areas, residual patches dominated by bogs/fens were preferred, indicating that burns with residuals are important woodland caribou calving habitat. The residuals may act as island refuges providing food/security, while surrounding burns provide reduced visual obstruction from which caribou can detect approaching predators. This study provides novel insight into the ecological interactions of forest fires with woodland caribou in northern Saskatchewan, and offers important considerations regarding critical habitat identification and range level planning to ensure all suitable caribou habitats are identified.

Eric Spilker, K. MacAulay and E. Merrill: University of Alberta, R. Steenweg and M. Hebblewhite: University of Montana, J. Whittington: Parks Canada, Lake Louise

Assessing relative abundance and resource selection function for predicting predation risk in a multi-species predator community.

Understanding how large carnivores interact to distribute themselves in a heterogeneous landscape is an important first step toward quantifying how they collectively pose risk to their shared prey. Resource selection models and abundance estimates are two common approaches used as measure of predation risk, yet most studies employ only one. In this study, we assess whether camera-derived estimates of relative abundance improve a multi-species resource selection function (RSF) of predation risk on the eastern slopes of the Rocky Mountains in southwest Alberta by comparing the 2 approaches or their integration to predict location of elk kill sites. We modeled RSFs for four predator groups based on scats collected using detection dogs during summers 2014-2016 along 1057 km of transects distributed throughout 57 5x5-km grid cells. We estimated relative abundance of each predator group using Theissen polygons based on data from nearby remote cameras (n=41). Using a model selection approach, we found using both carnivore RSFs and relative abundance best predicted areas where elk are likely to be killed for most but not all carnivores. Multi-species predation risk quantified from this study can be used to assess forage-predation risk trade-offs of different migratory segments of the elk population in this region.

Robin Steenweg: Alberta Environment and Parks, M. Hebblewhite: University of Montana, J. Whittington: Parks Canada, Banff, M. Musiani: University of Calgary, C. Burton, University of British Columbia, Vancouver, J. Fisher: Alberta Innovates–Technology Futures, A. Ladle: University of Alberta, J. Paczkowski: Alberta Environment and Parks.

Testing and expanding umbrella species — how large carnivore occupancy correlates with species diversity and food-web structure.

Use of remote cameras is expanding across the globe to monitor biodiversity. As a result, the number of camera networks provides an opportunity to examine ecological patterns and processes across large spatial scales and many different species. Ideally, multiple-species data from cameras can provide information on how species interact in food-webs and to test the ecological and conservation function of top carnivores. We combined data from 13 study areas to develop camera-based

occupancy models for 16 mammal species in the Canadian Rockies (*n* = 698 cameras). We evaluate top carnivores as candidate umbrella species and assess their ecological role in structuring food-webs. Grizzly bear occupancy was highly correlated with higher biodiversity and other species' occupancy, but wolves were more correlated with how food webs changed across the landscape. This research expands the analytical toolbox of researchers using camera data. Our results corroborate the importance of wolves as a keystone species in the Canadian Rockies and advance the umbrella-species concept beyond conserving biodiversity.

Frances Stewart and John Volpe: University of Victoria, Jason Fisher: InnoTech Alberta, Margo Pybus and Drajs Vujnovic: Alberta Environment and Parks, Glynnis Hood: University of Alberta and Cole Burton: University of British Columbia.

Biological interpretation, accuracy, and precision of species occurrence data.

Animals move across space and across time. Biologists sample this dynamic array by collecting snapshots of animal occurrence. Species occurrence data (SOD) including presence- absence or count data to provide the foundation for ecological research and conservation management. Despite the large applicability and ease of collection, applications of SOD rely upon, and derive from, assumption of space-use and movement that are rarely tested or explicitly acknowledged in research studies. For example, an increasingly popular contemporary method for collecting wildlife occurrence data is camera trapping. These data are collected from stationary points in space and time, but result from individual's distribution and movement on the landscape. To quantify the accuracy and precision of the space-use and movement assumptions inherent in SOD we employ a paired data set of 14 GPS collared fisher (*Pekankia pennanti*) to quantify space-use and movement around 64 stationary camera traps. We utilize generalized linear regressions and occupancy models to demonstrate that SOD better represent animal movements than their locations in space, and discuss the profound implications these results have on our ability to infer and manage ecological process.

Michael Stock, Jackson Chambers: MacEwan University and Colleen St. Clair: University of Alberta.

Parasites of Urban Coyotes in Edmonton: A Community Ecology Approach.

Coyotes (*Canis latrans*) are resilient, adaptable, cosmopolitan omnivores, frequently seen in urban environments. Because of common interactions with humans and pets, they are thought to be important hosts that can potentially transmit zoonotic diseases. Several studies of the internal animal parasites of sylvatic coyotes have been conducted in North America, ranging from southern Texas to northern Alberta as well as a parasite survey of urban coyotes from Calgary Alberta. Here, we report the internal parasite fauna of 14 urban coyotes from Edmonton Alberta and compare the community structure (faunal similarities, dominant species, species richness, biodiversity and evenness) to sylvatic coyote parasite communities across North America, and to an urban coyote study from Calgary. Additionally, parasite faunas from Edmonton coyotes were correlated with health indicators to assess urban coyote health and to compare urban with sylvatic coyotes.

Presentations by Surname

Emily Upham-Mills and Erin Bayne: University of Alberta, Samuel Haché: Canadian Wildlife Service.

Can song rate be used to predict breeding status in the Olive-sided Flycatcher?

Male songbirds sing primarily to attract a mate and defend a breeding territory. Biologists make use of bird song to identify species and monitor population sizes and distributions across the landscape. But what if bird song can tell us more that just if a bird is present? Large amounts of time and effort are normally required to assess breeding status for songbirds, making a simpler index attractive. A count of the number of songs produced over a given time, or "song rate", is a possible measurement. I tested this idea by measuring song rate in the Olive-sided Flycatcher, a Species at Risk songbird, on 27 breeding territories in northern Alberta and the Northwest Territories. Male birds were monitored throughout the breeding season to assess their breeding status and acoustic recording units (ARUs) were deployed to see if song rate could also be detected remotely. The presentation will cover initial results of the study as well as possible implications for songbird monitoring on a larger scale.

Poster Presentations by Surname

Joanna Burgar: University of Victoria and Lisa Wilkinson, Alberta Environment and Parks.

North American Bat Monitoring Program in Alberta.

Bats across North America are facing unprecedented decline from existing and emerging threats, including habitat loss, climate change, wind energy developments and the fungal disease white-nose syndrome (WNS). In 2014 the province initiated a pilot project to expand the North American Bat Monitoring Program (NABat) into Alberta as a means of monitoring bat populations to better understand bat species distributions and abundances. As of 2016, 11 sites in Alberta are being monitored following the NABat methodology. An automated bat call identification model was developed to objectively and efficiently classify the thousands of bat call sequences recorded to species. Seven bat species have been recorded, including possible *Myotis californicus* calls. The majority of bat call sequences were classified as *Lasionycteris noctivagans*, *Myotis lucifigus* and 40K *Myotis* spp. In 2015 nearly half of the bat call sequences recorded in Jasper National Park were *M. lucifugus* and in southern Alberta migratory bat species vulnerable to wind energy development were detected. These findings have serious implications for the conservation and maintenance of Alberta's bat populations with the increasing and emerging threats of wind energy development and WNS. Acoustic surveys for NABat requisite five years at all sites are recommended, as is the addition of new sites throughout the province. If survey resources are limited, sites should be preferentially selected in the Canadian Rockies and surrounding areas, as well as areas being considered for wind energy development. Locating winter hibernaculum and maternity colonies of species susceptible to WNS should also be a priority.

Nicole Boucher: University of Alberta.

Assessing ecosystem dynamics in the Beaufort Sea using stable isotopes in polar bears (*Ursus maritimus*) and ringed seals (*Pusa hispida*).

The amount of sea ice is declining in the Arctic, which likely will result in changes of abundance and distribution of both polar bears (*Ursus maritimus*) and their main prey ringed seals (Pusa hispida). Changes in availability and accessibility of prey will result in changes in the diets of both species. I am studying how the diets of both polar bears and ringed seals in the Beaufort Sea may have changed due to climate change using samples collected in April and May from 1985-1987, 1992-1994, 2000, and 2003-2011. I am using nitrogen and carbon stable isotopes in serially sectioned polar bear claws and hair, and ringed seal claws, to quantify diet. The objectives of this study are to 1) determine if seasonal and annual variation in polar bear and ringed seals diets has changed over time from 2003 to 2011, 2) determine whether stable isotope values in sectioned hair and claw samples are associated with polar bear space-use strategies from satellite telemetry data, 3) examine relationships between isotopic values in both species relative to sea ice breakup dates, rate of sea ice breakup and climate indices, and 4) determine if changes to ringed seal diets are associated with changes in polar bear stable isotopes.

Alyssa Bohart, Andrew Derocher: University of Alberta and Nick Lunn: Environment and Climate Change Canada.

Ice-period migration dynamics of polar bears (*Ursus maritimus*) in the western Hudson Bay.

Migration cycles of animals are often predictable with seasonal changes as they depend on ephemeral resources such as food. Polar bears (*Ursus maritimus*) migrate onto sea ice as it forms because they depend on ice to hunt their prey. This seasonal feeding ensures their survival during their fasting period when ice and prey are absent. Climate change is altering the seasonal ice within the western Hudson Bay, resulting in the break-up season occurring sooner and the freezing season becoming later, decreasing the overall ice period. The objective of my research is to determine if bears demonstrate different migration strategies and if these patterns have changed with altered ice-periods, as no previous studies have examined these aspects of movement in a migration context in polar bears. I will use satellite-linked collar movement data of female polar bears in the western Hudson Bay collected between 2004-2017 to determine migration patterns. By comparing the different distance travelled, rates of migration and tortuosity of movements, I anticipate to find groups of bears that exhibit similar strategies. I will use ice cover data collected via remote sensing to investigate the effect of ice dynamics on migration strategies. Determining how ice dynamics have influenced polar bear migration will give insight into future conservation and management strategies to help this species survival.

Jillian Cameron, Erin Bayne and Cindy Paszkowski: University of Alberta.

Using bioacoustics to develop monitoring practices for Alberta anurans.

Declines in amphibian populations have been documented worldwide due to their susceptibility to a variety of stressors, predominantly caused by human activity. Many Albertan anuran species have declining populations or are data deficient. In response to the Government of Alberta's development of biodiversity management frameworks, the creation and implementation of an optimal monitoring program for amphibians is required. This research aims to understand best practices for monitoring anurans across Alberta using autonomous recording units (ARUs) to detect male breeding calls. Acoustic detections will capture daily and seasonal dynamics of calling behaviours to optimize the timing of monitoring for each species. Temporal variation in calling will be assessed by accounting for differences in day length, lunar phase and anthropogenic light for a number of anuran species. These variables will be analyzed over several years of acoustic data to determine the role of inter-annual variation in calling dynamics. Currently, the abundance of calling individuals in an anuran chorus is classified by three coarse categories. However, to accurately detect changes in the number of calling individuals in a population, a new, more sensitive method will be developed. An index will be created by correlating the amplitude of a chorus to the number of individuals calling, while correcting for distance. The collection of baseline distribution and population data for these anuran species is important to effectively track population changes over time. Long-term monitoring allows for early detection of population declines, which is essential for effective management and conservation of these sensitive species.

Thomas Corsiatto, Nolan Dyck, Sandra MacDougall: Red Deer College and Ken Lehman: City of Red Deer.

Photomonitoring of a Wildlife Underpass and Fencing in the Red Deer River Valley Prior to final construction of the North Highway Connector around the City of Red Deer.

The purpose of this study was to monitor use of wildlife mitigation measures constructed as part of an multi-phased 8 km long bypass expressway project around the east and north side of the City of Red Deer known as the North Highway Connector. A section of the North Highway Connector, tentatively slated to open in eight to ten years, crosses over the Red Deer River, and bisects a wildlife movement corridor along the Red Deer River Valley. In 2013, 2300 metres of wildlife fencing, associated jump-outs, and an underpass were constructed on the east side of the Red Deer River Valley. Fall and winter photomonitoring sessions of the underpass have been conducted by the City since 2014. In October 2016, in partnership with Red Deer College, photomonitoring was expanded to include the east end of the wildlife fencing to evaluate end of fence use. White-tailed deer (*Odocoileus virginianus*), coyote (*Canis latrans*) and red fox (*Vulpes vulpes*) began utilizing the underpass structure regularly within one year post-construction. Since October 2016, end of fence crossings by white-tailed deer have been detected daily and a well-established trail crosses the road around each end of the fence. Preliminary analyses will be presented to compare wildlife traffic through the underpass to use of the eastern end of the wildlife fence. The City will use this data to evaluate the success of the

mitigation measures and develop a plan to action to minimize animal-vehicle collisions at the end of the wildlife fence.

Gillian Fraser and John Volpe: University of Victoria, Jason Fisher: InnoTech Alberta.

How human footprint influences energetic trade-offs across multiple trophic levels.

Landscape change in the Rocky Mountains (Alberta) through rapid development has introduced a unique suite of novel ecological scenarios. The landscape has been altered by the oil and gas industry, forest harvesting, mining, and transportation causing spatial avoidance of anthropogenic features by several animal populations. However, the effects of landscape development are not limited to the elimination of habitat, but also the addition of potential resources. For example, the abundant use of cutblocks for early seral subsidies by many ungulate species; or, the addition of linear features that facilitate the movement of grey wolves (*Canis lupus*) to access prey more quickly. The human footprint creates unsuitable habitat for some, but also introduces suitable or neutral habitat onto the landscape for others. The type and density of human footprint alters availability and suitability and I hypothesize these affect resource acquisition strategies for prey, mesopredator and top predator species. I will frame this decision-making process using traditional energetic trade-off theory, which states that there is a need for individuals to maximize resource acquisition, while minimizing risks to their survival. Longterm minimization of risk is reflected as broadscale shifts in habitat selection, aiming to lower probability of encountering perceived risk. Large scale differences in habitat selection dependent on human footprint may then reflect evaluation of this energetic trade-off. I will examine this relationship using trap camera and telemetry data on multi-species distributions across a gradient of development in the Rockies.

Manuel A. González, Beatriz Blanco-Fontao, Peter Neuhaus, Kathreen E. Ruckstuhl and Petra McDougall: University of Calgary.

Surveying Grey Partridge (*Perdix perdix*) in winter: easy and cheap.

Grey Partridge *Perdix perdix* is a widely distributed bird native to Eurasia and invasive to North America. It is mostly considered as a game species (North America and Eastern Europe) or endangered and protected in Western Europe. Its habitats greatly vary from steppes, prairies and cultivated areas to subalpine mountain scrublands or even to suburban areas (i.e. such as in Calgary). This species may be of hunting or conservationist interests according to its regional status. We locally studied abundance of the endangered subspecies, the Pyrenean Grey Partridge *P. p. hispaniensis*, in winter by direct observation in the Cantabrian Mountains (NW Spain) driving in a paved road. We related partridge abundances with different context variables to find the one helping to optimize the detectability of this species the most. Pyrenean Grey Partridge were more easily detected at the end of the winter (i.e. February-March) but other variables had no effect on its detectability. Wherever open paved roads exist we strongly recommend using direct observations at the end of winter for Pyrenean Grey Partridge monitoring whenever the ground is mostly snow covered in winter. This easy and cheap method is

affordable both to managers (i.e. where it is a game species such as Alberta) and to conservationists (i.e. where the Grey Partridge is endangered such as Spain).

TJ Gooliaff and Karen E. Hodges: University of British Columbia, Okanagan.

Spatial and temporal patterns of bobcat and lynx distributions in British Columbia.

Climate change is causing many species to shift their ranges northward. Bobcats (*Lynx rufus*) and Canada lynx (*Lynx canadensis*) might be among these species since their distributions are tied to snow. Lynx have long legs and snowshoe-like paws making them well adapted for deep snow. In contrast, bobcats are heavier, have small feet, and sink into the snow. While lynx are found throughout the interior of British Columbia (BC), bobcats have been restricted to southern BC. However, climate change has led to earlier springs and lower snow levels. As a result, we speculated that bobcats might be expanding their range northward while lynx might be contracting their range. Our objectives were to map the current provincial distribution of each species, and to determine whether each species has shifted its range over the past 80 years. To determine their current distributions, we collected photographs of both species submitted by the public from throughout the province. In total 4,397 photographs were collected comprising 1,621 separate detections. The most northern bobcats were detected in Prince George and Houston. To determine whether each species has shifted its range, we examined historic harvest records. We also distributed trapper surveys to determine whether trappers have noticed any range shifts. Our analysis suggests ranges have not changed much in the last 80 years. Despite a changing climate that is thought to favour bobcats over lynx, we found no evidence that the range of either species has shifted in BC.

Erin Henderson, Andrew Derocher: University of Alberta, Nick Lunn and Evan Richardson: Environment and Climate Change Canada.

Assessing polar bears (*Ursus maritimus*) use of the Western Hudson Bay and Beaufort Sea flaw lead polynyas.

Adult female polar bears select for different sea ice features throughout the winter, but optimize prime foraging features and sea ice conditions for energy conservation and safety. Reproductive status affects habitat selection due to differences in the energy expenditures and movement capabilities of the groups. Polynyas are areas of open water within sea ice and are important for a large number of species, including polar bears prey. The importance of polynyas to polar bears has not been examined. Sea ice in the Arctic is significantly declining due to climate change.

This study assesses polar bears use of the polynya in Western Hudson Bay and the Cape Bathurst polynya in the Beaufort Sea by measuring the time polar bears spend near the polynyas, and how polynya size affects polar bears movements. These trends will then be compared between study sites,

throughout the winter, between years, and between reproductive groups. Global positioning system collars deployed on adult female polar bears from 2004-present measure polar bears locations. The polar bears locations, when compared to the locations of the polynyas, measure the amount of time polar bears spend near the polynyas, their movements relative to the polynyas, and how these vary between study sites, throughout the winter, between years, and between reproductive groups. This research is important for preserving biodiversity in the Canadian Arctic by testing whether changes in polynya size or abundance due to melting sea ice will affect polar bear habitat selection or inhibit polar bears movements through the Arctic.

Michael Kelly: Alberta Community Bat Program.

The influence of design on internal temperatures of bat houses.

Bat houses are often used to create roosting habitat or mitigate for the loss of roosting habitat for bats. Mortality events at bat houses have been reported following periods of hot weather, and high temperatures within bat houses have been implicated as a possible cause. Bats will move within a roost to access areas with preferable temperatures as a method of behavioral thermoregulation. Understanding if current bat house designs provide enough temperature variation for bats to thermoregulate by moving throughout the bat house is important if bat houses are to be considered as a management strategy. This study examined the thermal characteristics of three different bat house designs: a 4-chamber nursery house; two 4-chamber nursery houses installed back-to-back with connective chambers on each side of the post; and a 4-chamber rocket box. Bat houses were painted black and temperature data loggers were installed in each chamber of the bat houses. The bat houses were installed on poles facing south in an open field in Southern Alberta. The 4-chamber rocket box exhibited the greatest temperature variation and held temperatures better than the other designs. The 4-chamber nursery house had the lowest temperature variation between chambers. Further, temperatures within in the 4-chamber nursery house were consistently higher than external temperatures during peak daylight hours, indicating that bats would could not find refuge from extreme temperatures during hot weather within this design. It is recommended that larger bat houses should be used when possible.

Erin Low, Cory Olson: Alberta Community Bat Program Coordinator and Lisa Wilkinson: Alberta Environment and Parks.

New Advances in the Use of Citizen Science for the Monitoring and Study of Alberta's Building Roosting Bats.

The Alberta Community Bat Program (ACBP) was initiated in 2015 by WCS Canada, in collaboration with Alberta Environment and Parks and participants of the Alberta Bat Action Team. The program promotes bat conservation and stewardship in communities throughout Alberta by engaging the public using a combination of outreach, education, and citizen science projects. During the summer of 2016, the ACBP invited the public to submit reports on the locations of known bat roosts on their

property, with the goal of developing a long-term database that can be used for population monitoring and examining habitat use. Participants were asked to submit a report detailing the location, physical characteristics, and history of the roost. In addition to this report, participants were asked to submit a sample of guano collected from below the roost. Recent advances in genetic analysis techniques allow relatively inexpensive species determination using a guano sample, providing important information that was previously difficult to obtain from public submissions. This is a new tool for monitoring and researching bat populations, and a very promising means of getting citizen scientists involved in the collection of high quality data needed for monitoring and conservation. Over forty roost observations were submitted, mainly from the central regions of the province. We will present preliminary results for the first year of the project and discuss future priorities.

Petra McDougall, Kathreen E. Ruckstuhl: University of Calgary, Manuel A. González: University of Leon, Spain & University of Calgary.

Vigilance is about more than just watching for predators: Social mimicry of vigilance behaviour contributes to group cohesion.

Predator avoidance is widely accepted as a primary function of vigilance. Interestingly, recent studies suggest that vigilance is susceptible to allelomimicry effects: the behaviour spreads between social partners like the socially contagious spread of stretching, feeding, or yawning. If allelomimicry supports the predator avoidance function of vigilance (by transferring information between group members), then we expect that vigilance bouts containing cues of a possible threat should be more contagious than vigilance bouts that do not contain these cues. Alternatively, if allelomimicry of vigilance functions primarily to maintain group cohesion (by coordinating the activities of group members), we expect that vigilance contagion will depend on the social relevance of the initiator. We examined both of these hypotheses in a population of bighorn sheep in Southwestern Alberta. To test the predator avoidance hypothesis, we video-recorded 300 vigilance bouts and coded them for gaze duration, head-raise duration, and cessation of chewing. While all three of these cues correlated with the presence of a potential threat, neither head-raise duration nor gaze duration influenced contagion. Cessation of chewing significantly increased contagion, but the behavioural occurrence was rare. To test the social cohesion hypothesis, we examined several social variables and determined that contagion increased with familiarity, proximity, and postural alignment, and with initiators that were young or had a lower relative rank. Overall, our results support the social cohesion hypothesis as a primary function of vigilance contagion, and provide less evidence of a predator avoidance function.

Sean O'Donovan, Andrew E. Derocher: University of Alberta, Allicia P. Kelly: Environment and Natural Resources, Government of Northwest Territories, Keith A. Hobson: University of Western Ontario and Suzanne M. Budge: Dalhousie University.

Stable isotopes and fatty acids reveal freshwater aquatic prey in the diet of wolves.

Stable isotopes (SI) and fatty acids (FA) are often used to examine wildlife diets. SI have been used extensively across a variety of ecosystems, whereas FA have primarily been used to assess the diets of marine animals. Here we combine SI (13C and 15N) and FA analyses to gain insights into the diet of a terrestrial predator: grey wolves (*Canis lupus*) in southern Northwest Territories. We sampled hair, muscle and adipose tissue from 102 wolves harvested during winter between 2012 and 2015. We also collected muscle tissue from potential prey species in the study area. We are particularly interested in examining intrapopulation variability in wolf diet between three sub-regions within the study area characterized by unique assemblages of large ungulate prey species. Preliminary results suggest that during summer and winter there may be consistent differences in wolf diet between sub-regions. Unexpectedly, analysis of wolf muscle tissue SI data in Bayesian mixing models suggested that 9-30% of winter diet was comprised of an aquatic source. Preliminary analysis of FA data also suggests that in some wolves, aquatically sourced FA are present in adipose tissue. Wolves from areas near communities, toward which our dataset is biased, may have exploited fish scraps left on ice from commercial fishing operations and bait stations set to lure furbearers into trapped areas. SI data from hair suggest that an aquatic food source is absent in a subset of the same wolves during spring and summer months. Sample collection and analyses are ongoing.

Nick Parayko, Erin Bayne: University of Alberta and Troy Wellicome: Environment Canada.

Space use of Ferruginous Hawks in response to the presence of transmission lines.

Human disturbance and land conversion are driving factors behind the decline of native prairie grasslands across North America, which now occupy under one third of their historic range. In Alberta, mixed grasslands have undergone extensive modification, primarily from agricultural and industrial developments. Transmission lines are continuously developed and upgraded as urban populations increase and can run through critical habitat for several Species at Risk. Ferruginous Hawk (*Buteo regalis*; FEHA) populations in Canada have been declining since the 1980s and in 2006 they were listed as provincially Endangered in Alberta under the Alberta Wildlife Act. Recent declines in FEHA are attributed to anthropogenic disturbance including habitat loss (industrial development, conversion for agriculture, fragmentation, and farming) and the loss of nesting structures as remnant trees are removed from the landscape. Since 2012, we have captured and transmitted 24 male FEHA in southern Alberta. With precise and frequent GPS fixes, we are able to determine FEHA home ranges using multiple home estimators. I plan to use this data to assess how home range size and nesting success change in the presence of transmission lines. I am also interested in how non-breeding territorial males utilize transmission line towers and if their home range use differs from breeding males. My results have the potential to assist in key management decisions at both the federal and provincial level regarding transmission line placement, construction, and mitigation measures and will help to improve our understanding of how FEHA alter movement patterns in the presence of energy infrastructure.

Maria Alejandra Santa, Claudia Klein, Sonya Pastran, Sangwook Ahn, Kathreen Ruckstuhl and Alessandro Massolo: University of Calgary.

New invader or old unknown? The European strain of *Echinococcus multilocularis* in coyotes and foxes in Alberta.

Echinoccocus multilocularis is a zoonotic cestode considered a global emerging pathogen. Recent findings indicate that the parasite is expanding its range and European strain-like worms have been found in Western Canada in both intermediate (meadow voles) and definitive hosts such as foxes and coyotes. We aimed to explore the spatial distribution of this European-like strain and of the North American one in Alberta, describing the genetic diversity of the parasite, to provide insights on the origin of the European strain in Alberta, and to compare the relative abundance of both strains in coyote and fox populations. So far, we tested carcasses of 23 foxes and of 84 coyotes for *E. multilocularis* presence using a modified scraping, sieving and counting technique and cropo-qPCR. To assess the genetic diversity of the parasite, we used mitochondrial and nuclear DNA markers. As preliminary results we found a higher prevalence of *E. multilocularis* in foxes than coyotes and based on mitochondrial DNA analysis, all the individual worms extracted from each host so far turned out to be the European-like strain. We are now focusing on the deep sequencing of pooled DNA samples from the whole worm population per animal, to characterize more in deep the intra-specific diversity of the parasite within hosts. Exploring the distribution, the genetic diversity and the dynamics of the European and North American strains in definitive main hosts is key for understanding the origin and evolution of *E. multilocularis* in North America and the potential change in public health risk.

Justin Shave, Andrew Derocher: University of Alberta and Seth Cherry: Parks Canada Prince Albert.

Diet composition and prey selectivity of gray wolves (*Canis lupus*) in Prince Albert National Park, Saskatchewan.

Few studies have investigated the direct role of gray wolves (*Canis lupus*) in predator-prey dynamics with the plains bison (*Bison bison bison*). This project aims to study wolf predation on plains bison and other ungulates in the southwest corner of Prince Albert National Park (PANP), Saskatchewan. The Sturgeon River plains bison (SRPB) population is the only wild population of plains bison in their historical range in Canada, and have experienced a decline of around 50% in the last eight years. We investigated to what extent wolves are contributing to the decline of the SRPB population using direct observation of wolf kill sites. Kill sites were determined via spatially- and temporally-clustered data points obtained from GPS-collared wolves over three consecutive winters (2014, 2015, and 2016). Overall, white-tailed deer (*Odocoileus virginianus*) were consumed most frequently, followed by moose (*Alces alces*) and plains bison. Our next step in this study will be to perform stable isotope analysis on wolf hair and blood tissue, to assess whether the proportion of prey species consumed by wolves changes in comparison to kill site investigations. In addition, we will assess the influence of prey body condition and stress physiology on prey selection by wolves, through marrow fat and cortisol analysis of prey tissues. The results of this study will quantify the impact that wolves are having on SRPB population mortality, and contribute to the long-term viability of plains bison in this region.

Anja Sorensen, Sarah Milligan, Terry Larsen, Karen Graham, Gordon Stenhouse: FRI Research, Hans Geir Eiken, Snorre Hagen, Siv Grete Aarne and Ida Marie Bardalen Fiaystad: Norwegian Institute of Bioeconomy Research.

Using scat DNA and citizen science to determine grizzly bear distribution and abundance in West-Central, Alberta.

In North America, non-invasive hair-based DNA methods that have been used to estimate grizzly bear abundance and distribution remains costly for long-term monitoring. A citizen science based approach similar to that used to monitor European brown bear populations may offer a cost-effective solution for Alberta. In 2014, we developed and tested a non-invasive scat-based DNA approach for estimating grizzly bear abundance and distribution in the Yellowhead population unit that aimed to engage hunters and trappers in the collection of scientific information. Scat samples were also collected by fRI research staff on transect surveys, as well as opportunistic collection during the concurrent barb wire hair snag survey. Overall, 6 samples were collected by volunteers, 130 samples were collected from 154 transect surveys, and 132 samples were collected opportunistically. Using scat, we identified 17 individual bears (9 male, 8 female), including 6 individuals (3 male, 3 female) undetected by hair-based genetic sampling and previously unknown to researchers. We were unable to directly compare grizzly bear abundance and distribution estimates from scat-based genetic sampling to estimates from hair-based genetic sampling due to the low volunteer participation, which resulted in reduced spatial coverage of sampling effort and fewer than expected scat samples. However, when we compare effort and detectability post-hoc, the average number of bears detected per sample unit was nearly the same. This suggested that similar results could be achieved by scat-based DNA inventories as hair-based DNA inventories, at a reduced cost, if the number of sample units (i.e. volunteers) were increased.

Lisa Takats Priestley: STRIX Ecological Consulting.

Fifteen Years of Volunteer Nocturnal Owl Surveys in Alberta.

The Alberta Nocturnal Owl Survey program completed its fifteenth year of monitoring in 2016. The goals of this program are to: obtain information on distribution, relative abundance, and habitat associations of nocturnal owls in Alberta, collect information that will lead to estimating population trends of nocturnal owls at regional and provincial scales, as well as contribute to a North America-wide program. Surveys are conducted along roadside routes, and call playback is used, following the Guidelines for Nocturnal Owl Surveys in North America. The pilot year was in 1998, with 30 volunteers surveying 15 routes, and presently there are over 190 volunteers surveying 99 routes. Throughout the program, eight species of owls have been detected, however, six species have high enough sample sizes to investigate trends: Barred, Boreal, Great Gray, Great Horned, Long-eared, and Northern Saw-whet Owl. Great Horned and Saw-whet Owl numbers varied greatly year to year but are stable, Barred Owls are declining, and Boreal, Great Gray, and Long-eared Owls are stable. Citizen-science based programs are an excellent way to monitor long-term populations of various wildlife across a large geographic range, and while this owl survey program contributes valuable data for owl management, it also engages with the public and encourages beneficial habitat management practices.

Erin Tattersall, Cole Burton: University of British Columbia, Jason Fisher: InnoTech Alberta and Joanna Burgar: University of Victoria.

Large mammal responses to seismic line restoration.

Seismic lines make up a large portion of anthropogenic disturbances in Alberta, cutting vast numbers of linear corridors through the boreal forest. This has severe consequences for the woodland caribou, causing habitat fragmentation and providing movement corridors for predators (wolves, black bears) into previously inaccessible habitat. As a result, and in response to federal and provincial caribou recovery strategies, energy companies are increasingly pursuing restoration projects to facilitate vegetative regeneration along seismic lines within caribou habitat. One such project is being implemented in the Algar region southwest of Fort McMurray. The aim of our current research is to use camera traps to examine the efficacy of seismic line restoration within the range of the Algar caribou population. Specifically, we are comparing detection rates between treated and control lines to determine whether restoration does indeed reduce predator movements and increase caribou presence. Here, I report on preliminary results from our pilot study of 24 camera traps active from November 2015-November 2016. I also outline future research questions as we expand the scope of the project to include naturally regenerating lines and those reserved for human use. Results of this research will offer insight into how effectively restoration projects reclaim caribou habitat, as well as explore their effects on predator-prey relationships in the boreal forest mammal community. This will have implications for conservation efforts in regions of major industrial activity and may inform future policies on reclaiming these areas.