



2023 NORTH AMERICAN CARIBOU WORKSHOP & ARCTIC UNGULATE CONFERENCE

ANCHORAGE, ALASKA



CROSSING BOUNDARIES
MAY 8 - 12, 2023

LAND ACKNOWLEDGEMENT

We are gathered on Dena'ina Elnena, the traditional homeland of the Eklutna (Idlughet) and Knik (K'enakatnu) tribes of the Dena'ina Athabascan people. We thank them for their stewardship of this land and its inhabitants over thousands of years and their continuing connections to, and knowledge of, these places today. We are also grateful to all the Indigenous peoples across the Arctic for their deep knowledge and ongoing stewardship of Arctic ungulates and habitats. We are committed to being more conscientious and inclusive by seeking to work closely with Indigenous communities.





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CARIBOU WORKSHOP &
ARCTIC UNGULATE CONFERENCE
ANCHORAGE, ALASKA

CROSSING BOUNDARIES

May 8-12, 2023
Hotel Captain Cook
Anchorage, Alaska, USA

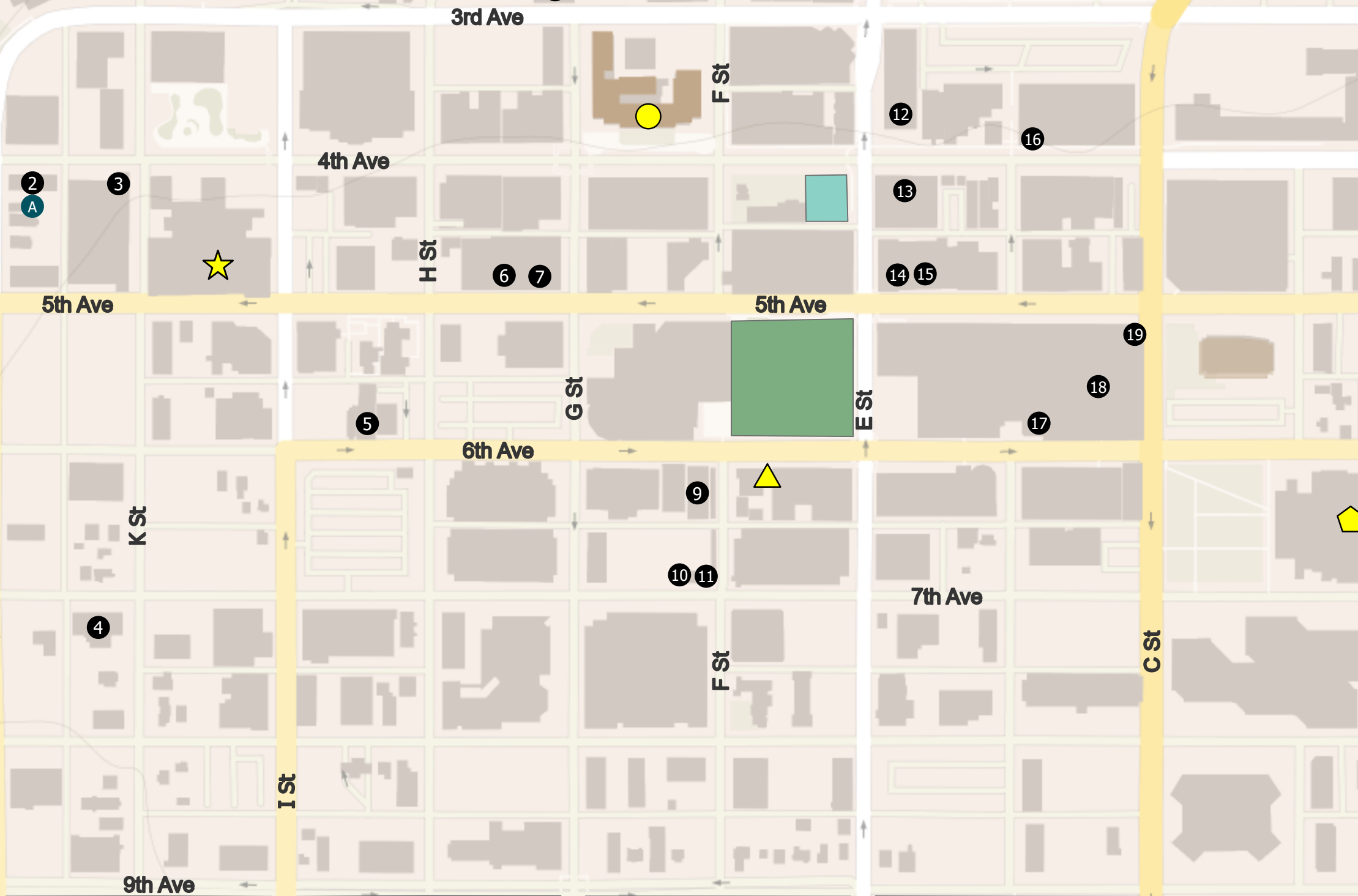
Hosted by



DOWNTOWN ANCHORAGE

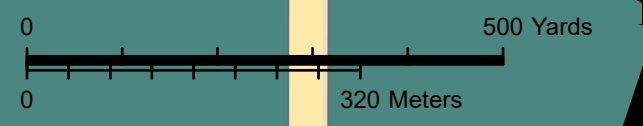
Westchester Lagoon
1 Mile Southwest

Ship Creek
3 Blocks North



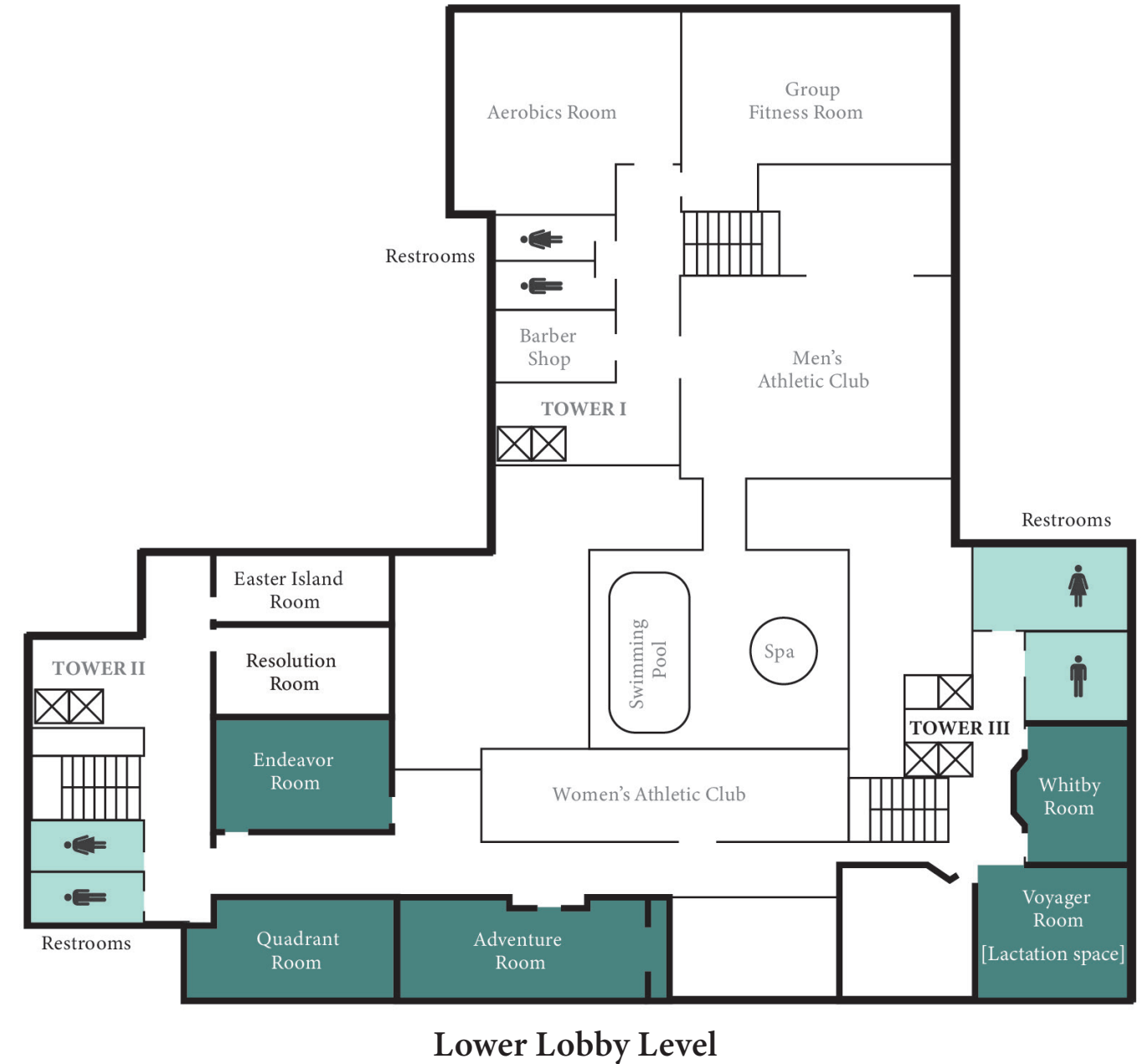
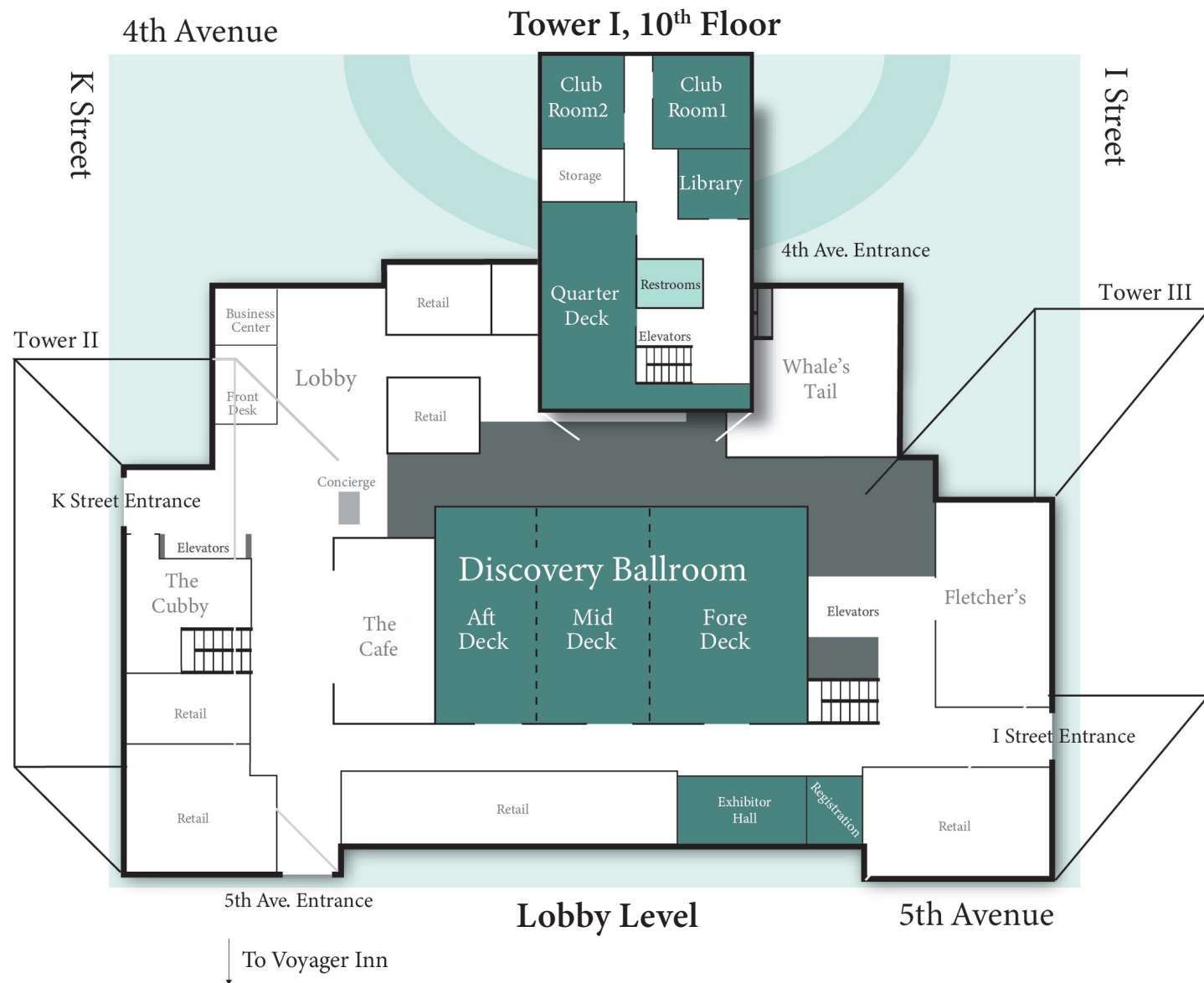
- Event Locations**
- ★ Hotel Captain Cook
 - Alaska Public Lands Information Center
 - ▲ Williwaw Social
 - ⬠ Anchorage Museum at Rasmuson Center
- Restaurants**
- ① Simon and Seafort's Saloon and Grill
 - ② Snow City Cafe
 - ③ Sandwich Deck
 - ④ Fire Island Rustic Bakeshop
 - ⑤ Cafe 817
 - ⑥ Glacier Brewhouse
 - ⑦ Orso
 - ⑧ 49th State Brewing
 - ⑨ Flattop Pizza
 - ⑩ Alaska Gourmet Subs
 - ⑪ Dark Horse Coffee Co
 - ⑫ Tequila 61
 - ⑬ Whiskey and Ramen
 - ⑭ Wild Scoops
 - ⑮ Ginger
 - ⑯ myThai Downtown
 - ⑰ Tent City Taphouse
 - ⑱ 5th Avenue Mall Food Court
 - ⑲ Sullivan's Steakhouse
- Outdoor Space**
- Elderberry Park
 - Peratrovich Park
 - Town Square Park
 - Delaney Park Strip
 - Tony Knowles Coastal Trail
 - Ⓐ Pablo's Bicycle Rental

New Sagaya City Market
3 Blocks South



National Park Service
Data Sources: MOA GIS & AK Open Data Geoportail

HOTEL CAPTAIN COOK



Welcome to the Hotel Captain Cook!

Conference events will be held on three floors: the lobby level, downstairs on the lower lobby level, and the 10th floor of Tower I. To access the 10th floor of Tower I, use the elevator or stairs across from the Whale's Tail. Restrooms and a lactation/quiet space are located on the lower lobby level. At this time the Hotel Captain Cook does not have an all-gender restroom; we apologize for this inconvenience. An all-gender restroom is available across the street in the lobby of the Voyager Inn. Please use the key card at the conference registration desk to access the Voyager Inn lobby as the Voyager is open only to conference attendees.

**WIFI: HOTEL CAPTAIN COOK
(NO PASSWORD)**

CODE OF CONDUCT

The 2023 North American Caribou Workshop & Arctic Ungulate Conference is a place for everyone interested in the knowledge, conservation, and management of caribou and Arctic ungulates. We affirm that our fellow participants deserve to be welcomed, respected, and valued regardless of their race, ethnicity, gender identity and expression, sexual orientation, marital status, parental status, ability, age, employment or military status, religious beliefs, socioeconomic status, political affiliation, or nationality. In keeping with our conference theme of Crossing Boundaries, we believe ungulate knowledge, conservation, and management are strengthened when multiple backgrounds, perspectives, and ways of knowing come together. We value diverse perspectives and opinions and want all participants to be treated with kindness and respect. Thus, **discrimination or harassment of any kind will not be tolerated**. If you experience or witness discrimination or harassment please alert one of our conference ambassadors.

Examples of unacceptable behavior (not a complete list):

- Harassment, intimidation or discrimination, including unwelcome or personally offensive speech or behavior
- Physical or verbal abuse
- Bullying behavior
- Inappropriate physical contact
- Deliberate intimidation, stalking, or following
- Unwanted sexual attention
- Sustained disruption of talks or events
- Retaliation for reporting unacceptable behavior



If you witness or experience behavior that constitutes a serious threat to public safety, please contact law enforcement by calling 911 and notify facility security. If you are not in immediate danger but are subject to or have witnessed unacceptable behavior please notify a conference ambassador.

Those asked to stop unacceptable behavior are expected to comply immediately. The 2023 NACW-AUC Organizing Committee will take any action deemed necessary and appropriate to resolve issues, including removal from the conference without warning or refund.

This Code of Conduct is adapted from and used by the permission of the Ecological Society of America's Code of Conduct for ESA Events.

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CONFERENCE ORGANIZING COMMITTEE

Executive Committee

Kyle Joly | *National Park Service*
Tim Fullman | *The Wilderness Society*
Heather Johnson | *U.S. Geological Survey*
Matthew Cameron | *National Park Service*
Kristin Denryter | *Alaska Dept. of Fish and Game*
Anna Brose | *Fate of the Caribou Project, SUNY-ESF*

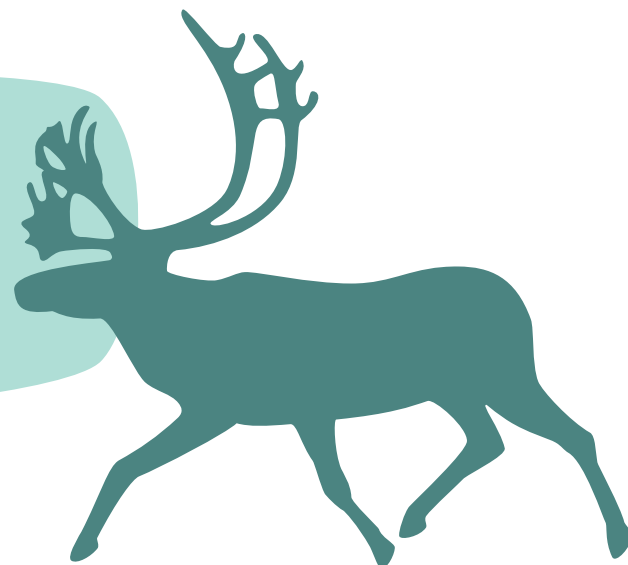
Organizing Committee

Liz Williams | *Office of Subsistence Management*
Joe Welch | *ABR, Inc.*
Hannah Voorhees | *Office of Subsistence Management*
Laurie Thorpe | *Wasilla, Alaska*
Karin Sonnen | *USDA Natural Resources Conservation Service*
John Severson | *U.S. Geological Survey*
Michael Stickman | *Nulato, Alaska*
Danielle Stickman | *The Wilderness Society*
Rena Sattler | *Alaska Dept. of Fish and Game, WEST Inc.*
Alex Prichard | *ABR, Inc.*
Jody Potts-Joseph | *Eagle Village, Alaska*
Maija Lukin | *National Park Service*
Letty Hughes | *National Park Service*

Kendra Holman | *Office of Subsistence Management*
Joelle Hepler | *Alaska Dept. of Fish and Game*
Alex Hansen | *Alaska Dept. of Fish and Game*
Lisa Grediagin | *Office of Subsistence Management*
Neil Dewitt | *Eagle River, Alaska*
Gabrielle Coulombe | *U.S. Geological Survey*
Shawn Crimmins | *U.S. Geological Survey Alaska Cooperative Fish and Wildlife Research Unit*
Sophia Bracio | *Alaska Dept. of Fish and Game*
Bridget Borg | *National Park Service*
Hannah Atkinson | *University of Alberta*
Andy Aderman | *U.S. Fish and Wildlife Service*
Layne Adams | *U.S. Geological Survey*

THANK YOU, VOLUNTEERS!

This conference would not be possible without the many volunteers who are helping with set up, IT, session moderation, staffing the registration table, and more. Thank you for your time!



WELCOME TO THE 2023 NORTH AMERICAN CARIBOU WORKSHOP & ARCTIC UNGULATE CONFERENCE!

Thank you for joining us in beautiful Anchorage, Alaska - the traditional homelands of the Dena'ina people - to share your knowledge, experience, and passion for caribou, reindeer, muskox, moose, and Dall's sheep (Arctic ungulates). Only through working together can we help keep these vital, iconic, and majestic animals on northern landscapes for generations to come.

This year's meeting is the 19th North American Caribou Workshop and 16th Arctic Ungulate Conference. This is the first time the two meetings have come together, and we hope it represents an unprecedented opportunity for learning, networking, and collaborating. This conference would not have been possible without the generous financial support from our sponsors (p. 76): we thank them all for making this conference a reality.

The conference's theme is Crossing Boundaries. This theme reflects several ideas that are critical to sound management of caribou and other Arctic ungulates. First, these animals routinely cross political boundaries and we must work across these boundaries to both understand and conserve them. Second, we must find ways to bridge the boundaries among scientific, Indigenous, and local knowledge. Each of these knowledge sources provide important information that can help us conserve these magnificent species and the habitats they occupy. Lastly, instead of focusing on what makes us different, we hope that by coming together, the conference provides an opportunity for everyone to recognize what we all have in common: a desire to see caribou and all Arctic ungulates thrive. In order to fulfill this lofty pursuit, we'll have to cross international, cultural, ethnic, gender, generational, and other boundaries. The number of participants, their geographical diversity including 10 different countries and many rural areas far from roads, wide range of organizations, and breadth of talks represented here all but ensures this conference will provide many opportunities for listening and learning. Debate and discussions are part of the learning process but please keep disagreements focused squarely on ideas and not individuals, and keep them respectful. Please treat your fellow participants with respect, seek out people that you may not ordinarily interact with, and be welcoming of people that reach out to you. For more information, see our Code of Conduct (p. VI).

In addition to the talks and networking opportunities, we have a number of events that should not be missed: the Welcome Reception Monday evening in the beautiful Quarter Deck at the Hotel Captain Cook, the Poster Session Tuesday evening at the Anchorage Museum at Rasmuson Center, the Storytelling Event at Williwaw Social on Wednesday evening, and the Closing Ceremony and Banquet at the Hotel Captain Cook on Thursday evening. There is also a public film festival featuring caribou and ungulate-related films streaming at the Alaska Public Lands Information Center all week long. We hope to see you at all of them!

Thank you for joining us and we hope you enjoy the conference!

The 2023 North American Caribou Workshop & Arctic Ungulate Conference Organizing Committee



**2023 NORTH AMERICAN
CARIBOU WORKSHOP &
ARCTIC UNGULATE CONFERENCE**
ANCHORAGE, ALASKA



FREE!

Film Festival

May 8-12, 2023 from 10am-5pm the Alaska Public Lands Information Center* is hosting a series of short films for the NACW-AUC.



*605 W 4th Ave, Anchorage AK 99501 (security screening at entrance)



COVID-19 POLICY

The health and safety of all conference attendees is a top priority for the 2023 NACW-AUC Organizing Committee. Therefore, we **encourage conference attendees to wear masks and practice social distancing, when possible**, to help minimize the spread of disease. We expect to have attendees from all over the North and are cognizant that conferences can be a source of rapid transmission of COVID-19. Masks will be available at the registration desk at no charge but we request that attendees bring their own mask(s) if possible.

To minimize transmission, we **encourage all attendees to take a COVID-19 test 24-48 hours prior to arriving at the conference**. Please do not attend if you feel ill or were recently exposed to COVID-19. Colored stickers will be available at the registration desk for individuals to indicate their comfort with proximity to other participants. Please respect the wishes of other participants.

Outdoor dining options are generally limited in Anchorage. See the map of downtown Anchorage (p. II-III) for nearby restaurants (some of which have outdoor seating) and parks where you can take your lunch. An array of food delivery services are available, and several local food trucks will be stationed outside the Hotel Captain Cook. The banquet will be inside the main ballroom of the hotel.

Please note that masks are not currently required by the Municipality of Anchorage, so other hotel/venue guests and staff may not be masked. Please help us keep the conference as safe and enjoyable as possible for all attendees!

ACCESS THE OFFICIAL 2023 NACW-AUC ONLINE PLATFORM!



Apple App



Android App



Web Browser

- PLAN YOUR SCHEDULE
- VIEW ABSTRACTS
- RECEIVE ANNOUNCEMENTS
- CHAT WITH OTHER ATTENDEES
- UPLOAD YOUR TALK OR POSTER FOR OTHERS TO SEE

To access conference content from your phone, scan the QR code with your phone's camera to download the Apple or Android app and search for '2023 North American Caribou Workshop – Arctic Ungulate Conference'. Alternatively, from a computer, you can access content at: cvent.me/yWRZ4D



SCHEDULE AT A GLANCE

	Monday 8 May Workshops				Tuesday 9 May				
Room	Fore Deck	Mid Deck	Aft Deck	Endeavor	Fore Deck	Mid Deck	Aft Deck	Endeavor	Adventure
8:00-8:30am	Doors open				Doors open				
8:30-8:40am	Snow Field Measurements for Ungulate Research	Structured Decision Making as a Model to Integrate Different Knowledge Systems and Achieve Collaborative Conservation	Caribou Movements & Geospatial Covariates with TuktuTools R Package & Google Earth Engine	Implementing Boreal Caribou Habitat Restoration in Practice: A Practical Approach for Indigenous Communities	Welcome & Opening Remarks Fore Deck				
8:40-9:00am									
9:00-9:20am									
9:20-10:00am									
10:00-10:20am					Snack Break				
10:20-11:00am	Plenary: Status and Trends of Migratory Tundra Caribou (Fore Deck)								
11:00-11:40am	Plenary: Climate Change & Arctic Ungulates (Fore Deck)								
11:40-1:00pm	Lunch Break								
1:00-3:00pm	Storytelling & Science				Population Estimation & Monitoring	Nutrition & Foraging Ecology	Quantifying Habitat & Habitat Management I	Symposium: Southern Lakes Relationship Planning	Symposium: Ex Situ Management & One Plan Approach for Woodland Caribou
3:00-3:20pm					Snack Break				
3:20-5:00pm					Population Estimation & Monitoring	Nutrition & Foraging Ecology	Interspecific Interactions	Habitat Restoration	Symposium: Arctic Winter Rains
5:00-6:00pm	Dinner Break				Dinner Break				
6:00-7:00pm	Welcome Reception Quarter Deck				Poster Session at the Anchorage Museum at Rasmuson Center				
7:00-8:00pm									
8:00-9:00pm									
9:00-10:00pm									

Abstracts are available online (p. 5)

SCHEDULE AT A GLANCE

	Wednesday 10 May					Thursday 11 May					
Room	Fore Deck	Mid Deck	Aft Deck	Endeavor	Adventure	Fore Deck	Mid Deck	Aft Deck	Endeavor	Adventure	Quarter Deck
8:00-8:30am	Doors open					Doors open					
8:30-8:40am	Announcements (Fore Deck)					Announcements (Fore Deck)					
8:40-9:00am	Plenary Bridging Indigenous & Western Ways of Knowing Fore Deck					Plenary Caribou Crossing: Collaborative Caribou Stewardship in a Changing Arctic Fore Deck					
9:00-9:20am											
9:20-10:00am											
10:00-10:20am	Snack Break					Snack Break					
10:20-11:00am	Habitat Use & Movement	Integrating Indigenous & Western Knowledge	Symposium: Caribou, Lichen, & Habitat Modeling	Harvest Management	Symposium: Historical Data in Caribou Conservation & Management	Co-management & Local Knowledge	Management & Conservation	Symposium: Health Ecology of Ungulates	Recovery Planning & Implementation II	Reindeer Pastoralism & Husbandry	Room closed
11:00-11:40am											
11:40-1:00pm	Lunch Break					Lunch Break					
1:00-3:00pm	Habitat Use & Movement	Integrating Indigenous & Western Knowledge	Symposium: Caribou Lichen & Habitat Modeling	Diseases & Parasites	Symposium: Historical Data in Caribou Conservation & Management	Co-management & Local Knowledge	New Methods & Technology	Symposium: Health Ecology of Ungulates	Behavioral Responses to Development	Symposium: Genetic Composition & Diversity in Rangifer	Room closed
3:00-3:20pm	Snack Break					Snack Break					
3:20-5:00pm	Habitat Use & Movement	Recovery Planning & Implementation I	Population Ecology I	Quantifying Habitat & Habitat Management II	Symposium: Imago Initiative	Banquet set up			Population Ecology II	Resource Development	Symposium: Ungulate Management in Alaska
5:00-6:00pm	Dinner Break					Break					
6:00-7:00pm	Storytelling Event at Williwaw Social					Closing Ceremony & Banquet Discovery Ballroom					
7:00-8:00pm											
8:00-9:00pm											
9:00-10:00pm											

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MONDAY | 8 MAY

WORKSHOPS

Snow Field Measurements for Ungulate Research

Stine Højlund Pedersen^{1,2}, Adele Reinking¹, Kelly Elder³, and Glen Liston¹
¹Colorado State University; ²University of Alaska Anchorage; ³U.S. Forest Service, Rocky Mountain Research Station
8:30am - 5:00pm | Fore Deck + Field Trip

Storytelling & Science

Arran Forbes¹
¹Arctic Entries
1:00 - 5:00pm | Fore Deck

Prior registration is required for all workshops.

Structured Decision Making as a Model to Integrate Different Knowledge Systems and Achieve Collaborative Conservation

Tuula Hollmen^{1,2} and Erik Osnas³
¹University of Alaska - Fairbanks; ²Alaska Sealife Center; ³U.S. Fish and Wildlife Service
8:30am - 5:00pm | Mid Deck

Analysis of Caribou Movements and Geospatial Covariates with the TuktuTools R Package and Google Earth Engine

Elie Gurarie¹, Ophélie Couriot¹, Megan Perra¹, and Chloe Beaupré¹
¹Fate of the Caribou Project, State University of New York College of Environmental Science and Forestry
8:30am - 5:00pm | Aft Deck

Implementing Boreal Caribou Habitat Restoration in Practice: A Practical Approach for Indigenous Communities

Susan Leech¹, Jesse Tigner², Katherine Wolfenden³, and Anne Hervieux¹
¹Firelight Group; ²SwampDonkey; ³Fort Nelson First Nation
8:30am - 5:00pm | Endeavor

WELCOME RECEPTION

6:00 - 9:30pm | Quarter Deck
Stop by the beautiful Quarter Deck at the Hotel Captain Cook for an opening Welcome Reception (10th Floor of Tower I). Savor drinks and snacks while mingling with the other conference participants and taking in stunning views of the majestic Chugach Mountains and Cook Inlet. This is an informal event with conference participants welcome to come and go and no formal speakers. Appetizers and one beverage ticket will be provided. There is no additional charge for this event, but please wear your conference name tag.

MONDAY | 8 MAY

Preserving Biodiversity Matters

With the recent acquisitions of the Environment & Infrastructure business (E&I) of John Wood plc. and Golder Associates Ltd., WSP has built the largest environmental practice in the world.

WSP brings clarity to complex challenges and supports your contributions to biodiversity conservation by delivering strategies that offer measurable results.

Discover our biodiversity conservation services including our corporate caribou experience:



TUESDAY | 9 MAY

WELCOME & OPENING REMARKS

8:30 - 10:00am | *Fore Deck*

PLENARIES

What Have We Missed?: A Commentary on the Status and Trends of Migratory Tundra Caribou

Don Russell¹ and Anne Gunn¹

¹*CircumArctic Rangifer Monitoring and Assessment Network*

10:20 - 11:00am | *Fore Deck*

Ecology, Migration, and Population Dynamics of Arctic Ungulates in the Context of Climate Change

Steeve Côté^{1,2}

¹*Caribou Ungava*; ²*Centre for Northern Studies, Laval University, Québec, Canada*

11:00 - 11:40am | *Fore Deck*

CONCURRENT TALKS & SYMPOSIA

1:00 - 5:00pm

POSTER SESSION

7:00 - 10:00pm | *Anchorage Museum at the Rasmuson Center*

Join us at the Anchorage Museum at Rasmuson Center for > 80 posters on caribou and Arctic ungulates! The event will provide access to museum galleries, particularly those on Indigenous culture in Alaska, and feature artwork and handicrafts by conference participants and local artists. Appetizers and one beverage ticket will be provided. Additional beverages may be purchased with a credit card only (no cash). There is no additional charge for this event, but please wear your conference name tag.

PLENARIES

What Have We Missed?: A Commentary on the Status and Trends of Migratory Tundra Caribou

Don Russell¹ and Anne Gunn¹

¹CircumArctic Rangifer Monitoring and Assessment Network

10:20 - 11:00am | Fore Deck

Internationally, *Rangifer* are in trouble with widespread and persistent declines. The problem with the declines is not so much that we don't know what is driving them, but that we struggle to apply our knowledge effectively to alter trends in abundance. Continental migratory tundra herds show an overall 70% decline since the 1990s and current status is 1.5 million individuals. Migratory mountain caribou are mostly declining or stable at reduced numbers. Describing declines has to take into account the role of natural cycles (regular fluctuations) and ask the questions about how factors integrate as additional threats and drive the declines beyond the range of natural (previous) levels. Generalizations are tricky as the underlying geography and ecology of the herds varies and management regimes differ in survey frequency and management response times. Despite all the monitoring and management planning, declines have persisted even to the point of herd collapses (>90% decline) so what are we missing? Some things we missed are obvious - anticipatory planning for cycles and a failure to act in time and to convince others (politicians) to act. We missed investigating what happens at the peak as declines start and how nutrition and parasites/diseases have a role. Instead, we emphasized harvest and predation despite *Rangifer* being a social herbivore: nutritional ecology, individual traits, social behavior and parasites were given short shrift. Then, as declines continued, threats changed which led to surprises such as emigration and all that against the background of a hotter climate.

Don Russell: After graduate degree work at UBC involving field experience at Prudhoe Bay, Alaska, he worked in caribou/forestry issues in central B.C. (1975-1976). Moving north, Don worked for the Yukon Government (1976-1983) as a habitat and caribou biologist and researcher for Canadian Wildlife Service in Yukon (1983-2006). Since his graduate work in the early 1970s, he has developed computer modeling tools that help to better understand the nutritional ecology of the species, and better evaluate the combined effects of climate and human disturbance on caribou. He has sat on numerous territorial, national and international co-management boards and in 2004 helped form the CircumArctic Rangifer Monitoring and Assessment (CARMA) Network.



Anne Gunn: After university in the UK and Ireland, Anne came to Canada to work in the Arctic – a dream realized in the 1970s. She eventually settled down with the Government of the Northwest Territories (1979-2006) as the regional biologist in the central Arctic and then the caribou biologist based in Yellowknife. Her knowledge and experience are from working and traveling on the land with people; watching and counting caribou and muskoxen from the ground and the air. Since 2006, Anne continued with caribou but with CARMA and aboriginal co-management boards and councils including the Wek'èzhii Renewable Resource Board and Kivalliq Inuit Association.



Ecology, Migration, and Population Dynamics of Arctic Ungulates in the Context of Climate Change

Steeve Côté^{1,2}

¹Caribou Ungava; ²Centre for Northern Studies, Laval University, Québec, Canada

11:00 - 11:40am | Fore Deck

Arctic ungulates are central to the ecology of Arctic ecosystems and the culture of northern human communities. As human development and climate change intensify in the Arctic, concerns are raised about the future of Arctic ungulates. Human disturbances and climate change have been suggested as potential causes for the decline of several caribou and reindeer populations across the Arctic circle. Our research program Caribou Ungava aims to identify and quantify the factors determining population dynamics and space use of migratory caribou in the context of climate change and anthropogenic disturbance. We study the demography, genetics, space use and life-history strategies of migratory caribou and muskoxen, as well as interactions with their predators, mainly wolves and an expanding population of black bears. We have monitored >1000 individuals of two migratory caribou herds for nearly four decades in northern Québec and Labrador, the Rivière-aux-Feuilles herd (RFH) and the Rivière-George herd (RGH). We found that caribou avoided human disturbances, either by using seasonal areas that excluded disturbances, or by reducing their use up to 23 km from disturbances. Avoidance of disturbances translated into cumulative habitat loss reaching as much as 30% of seasonal ranges. The main determinant of wintering area selection was population size, suggesting intra- and inter-herd competition for wintering areas. Migrations tended to occur earlier with a warming climate. Spring arrival on calving grounds was delayed when caribou encountered mild temperatures and abundant precipitation during their migration, as early snowmelt may increase cost of movements. We are continuing our research on the demography, connectivity among populations, habitat modifications with climate change and life-history strategies of Arctic ungulates.

Steeve Côté holds a PhD from Sherbrooke University (Canada) and has conducted post-doctoral research in France, Antarctica, Scotland and Norway. Since 2001, he has been a professor at the Department of Biology of Laval University in Québec City, senior scientist at the Centre for Northern Studies, director of Caribou Ungava and holder of an NSERC industrial Chair. His research focuses on the ecology and behavior of large mammals, mainly migratory caribou in northern Québec, long-term studies on life-history strategies of mountain goats in Alberta, white-tailed deer forest relationships on Anticosti Island, and more recently eastern moose-winter tick interactions. An important goal of his work is to produce knowledge useful for the management and conservation of populations of large mammals inhabiting boreal and Arctic ecosystems.



SYMPOSIA

Southern Lakes Caribou Relationship Planning: Recovery, Relationships, and Leadership

Organizers: Southern Lakes Caribou Steering Committee

1:00 - 3:00pm | *Endeavor*

This session will be a panel presentation from representatives from several First Nation and non-First Nation governments. The representatives have been engaged in creating a relationship plan for the Southern Lakes Caribou Herds. A relationship plan tries to build off the best of First Nation worldviews and non-First Nation worldviews to create a healthy, generational relationship with caribou. Relationship plans are similar to management plans yet try to 'cross boundaries' between knowledge systems. The successes in creating this plan and general process that was followed will be discussed, as will the outcomes. Challenges may be touched on and advice on how to follow a relationship planning process. The relationship plan involves representatives from: Carcross/Tagish First Nation, Kwanlin Dun First Nation, Ta'an Kwach'an Council, Champagne and Aishihik First Nation, Teslin Tlingit Council, Taku River Tlingit, Government of Yukon Territory, Government of British Columbia, and Government of Canada – Parks Canada.

Note: First Nation is a term used to describe many Indigenous Nations within Canada, it is not inclusive of Metis or Inuit Nations.

Opportunities for Ex Situ Management and the One Plan Approach for Woodland Caribou Conservation in Canada

Organizers: Amy Chabot^{1,2} and Jessica Steiner²

¹Caribou Conservation Alliance; ²Canadian Species Initiative

1:00 - 3:00pm | *Adventure*

Coined by the IUCN Species Survival Commission (SSC) Conservation Planning Specialist Group (CPSG), the One Plan Approach (OPA) is the integrated development of management strategies and conservation actions for all populations of a species, whether in situ in the wild, or ex situ in human care. The symposium will begin with a panel of speakers who will present on existing and potential opportunities for OPA conservation of Rangifer species, followed by a moderated panel discussion and open Q & A. The second half of the Symposium will consist of a facilitated World Café style session to foster constructive dialogue around opportunity, capacity, and challenges to OPA planning and implementation for woodland caribou in Canada. Participants will be encouraged to contribute their ideas and perspectives around predetermined questions (e.g., opportunities for enhanced integration of ex situ and in situ activities in caribou conservation, opportunities for improved collaboration between ex situ/in situ communities, level of interest in OPA planning for woodland caribou). At the end of the session, the whole group will convene to share and synthesize the main insights that have emerged. A Symposium report will be produced and made publicly available after the conference.

Arctic Winter Rains: Observing and Responding to Extreme Precipitation, Rain on Snow Events, and a Wetter Arctic

Organizers: Mike Brook¹, Matthew Drunkenmiller², Bruce Forbes³, Shari Fox², Roza Latander³, Sirpa Rasmus³

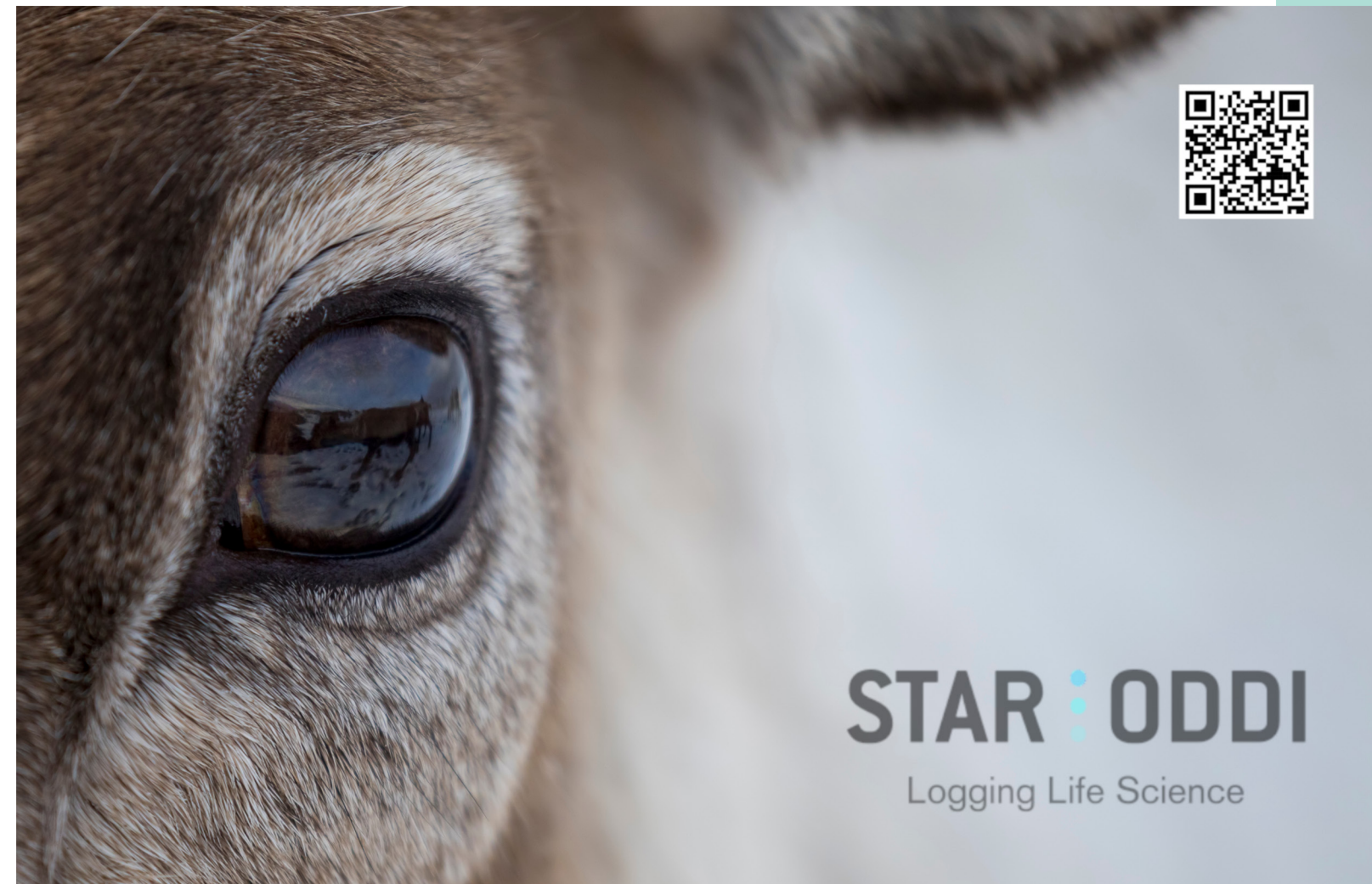
¹Alaska Native Tribal Health Consortium; ²University of Colorado Boulder; ³University of Lapland

3:20 - 5:00pm | *Adventure*

This session will bring together Arctic residents, Indigenous knowledge holders (including Elders, hunters, and reindeer herders), scientists, and communication specialists to address and discuss a more holistic understanding of extreme precipitation, rain on snow events, and a wetter Arctic. This session will share perspectives and knowledge about the impacts on reindeer herding, hunting, communities, and northern livelihoods.

Scientists from the Arctic Rain on Snow Study (AROSS) will introduce their project and the focus on this session. Next, the Local Environmental Observer (LEO) Network will be demonstrated as an online tool for observing and documenting Arctic rain-on-snow events and their impacts. Indigenous and community participants from multiple Arctic regions (including Alaska, Nunavut, Sápmi, and the Yamal Region of West Siberia) will be invited to share perspectives and knowledge from their respective regions, especially in regard to reindeer, caribou, and marine mammal hunting.

TUESDAY | 9 MAY



STAR : ODDI
Logging Life Science

CONCURRENT TALKS & SYMPOSIA: SCHEDULE

	<i>Fore Deck</i>	<i>Mid Deck</i>	<i>Aft Deck</i>	<i>Endeavor</i>	<i>Adventure</i>
Session	Population Estimation & Monitoring	Nutrition	Habitat I	<i>Symposium: Southern Lakes Caribou</i>	<i>Symposium: Ex Situ Management</i>
1:00pm	Use of aerial photography to enumerate Alaska caribou herds; An examination of how the photo-direct count technique has evolved from the 1960s to present (Nathan Pamperin)	Nutritional paradoxes in northern ungulates (Kristin Denryter)	Remote sensing phenology of the Bathurst Caribou Range, NWT and Nunavut (Ryan Danby)	Southern Lakes Caribou Relationship Planning: Recovery, Relationships, and Leadership	The One Plan approach to species conservation (Amy Chabot)
1:20pm	Done any Distance Sampling surveys recently? Try this with your data (Christine Cuyler)	Successional development of caribou forage resources in montane and boreal habitats of Canada (John Cook)	There is still time to reconcile forest management with climate-driven declines in habitat suitability for boreal caribou (Mathieu Leblond)		The role for assisted reproductive technology and biobanking in caribou conservation (Gabriela Mastromonaco)
1:40pm	Evaluating the efficacy of close-kin mark-recapture for estimating caribou abundance (Brandon Merriell)	The influence of region and body condition on Mulchatna caribou herd diets as inferred from stable isotopes (Robert Jespersen)	Integrating traditional ecological knowledge and western science to map seasonal core and matrix habitat for the Chase subpopulation of Southern Mountain woodland caribou (Erica Bonderud, Michael Klaczek, and Luke Gleeson)		Experience gained from rearing captive caribou in Québec (Vicki Carriere)
2:00pm	Large migratory caribou herd management can be informed by population models (Michael Suitor)	Seasonal diets of moose (<i>Alces alces</i>) in northeastern Alaska: Arctic and Boreal intra- and interpopulation differences ascertained using isotope forensics (Jessica Richert)	Tracking caribou habitat change over time - what numbers really matter? (Robert Serrouya)		Adoption of a conservation breeding strategy to support caribou recovery in Jasper National Park (Lalenia Neufeld and Jean-François Bisailon)
2:20pm	A tale of three herds: Demography of the Bathurst, Bluenose-East and Beverly herds in northern Canada (John Boulanger)	Svalbard reindeer diets in summer and autumn using stable isotope (d13C & d15N) forensics (Tamara Ann Hiltunen)	Migratory caribou influence rates of vegetation change across Alaska and northwest Canada (Kathleen Orndahl)		Creating a hub for knowledge exchange and advocacy on the potential for ex situ management roles to assist conservation of caribou in Canada (Chris Ritchie)
2:40pm	Population and habitat assessment for conservation: Lessons from caribou in Canada and wild reindeer in Norway (Lucie Lelotte)	Estimating dietary composition through a camera lens: Evaluating the video collar technique for ungulates (Rachel Cook)	Caribou, fire, and forestry: Understanding the differential effects of natural and anthropogenic disturbance for long-term habitat supply (Ian Best)		Ex Situ Management Q&A
3:00-3:20pm	<i>Snack Break</i>				
Session	Population Estimation & Monitoring	Nutrition	Interspecific Interactions	Habitat Restoration	<i>Symposium: Arctic Winter Rains</i>
3:20pm	More than one way to count caribou in Canada: Showcasing the NBCKC's Boreal Caribou Monitoring Methods Toolkit (Melanie Mullin)	Supplementary winter fed domestic reindeer improve their vital rates and the herd's production potential (Øystein Holand)	Optimal spatial games between predators and prey in complex food webs can explain species-specific variations in habitat selection (Daniel Fortin)	End of the road: Short-term responses of a large mammal community to forest road decommissioning (Rebecca Lacerte)	The Local Environmental Observer (LEO) Network as a way to understand emerging environmental phenomena (Mike Brook)
3:40pm	Monitoring and status of forest-dwelling caribou populations in Québec and of the mountain caribou population of Gaspésie (Sabrina Plante)	Strategies in lactation of muskoxen: Control and implications of milk production during extended lactation (Robert White)	Harvesting moose to recover endangered caribou in a changing landscape (Mateen Hessami)	Advancing caribou habitat restoration through equipment innovations (Matthew Pyper)	Winter Rain on the Nabesna River (Wilson Justin)
4:00pm	Status and trends of Southern Mountain caribou herds in British Columbia, Canada (Kathi Zimmerman)	Resilience of caribou to changing food supply: Resistance, tolerance and thresholds for digestible energy and nitrogen (Perry Barboza)	The mistake of applying a southern-based conservation strategy to northern boreal caribou range (Philip Mcloughlin)	Not all roads lead to Rome: Contrast in vegetation regrowth in two types of logging roads and their implication in the conservation of woodland caribou (Robichaud Lisandre)	The meteorology of Arctic rain on snow events (Mark Serreze and Taylor O'Brien)
4:20pm	Community-based monitoring of Dall's sheep in the Gwich'in Settlement Area using remote wildlife cameras (Sydney Goward)	The influence of summer habitat conditions on the behavior and demography of caribou in the Arctic (Heather Johnson)	Dynamic winter distribution patterns of migratory barren-ground caribou influence effectiveness of wolf management (Abbey Wilson)	Legislating a legacy of disturbance: Disposition rights along linear features prevents caribou habitat restoration (Jesse Tigner)	Stories and maps of the 'serad po': visualizing the severe icing event of 2013/4 on the Yamal Peninsula (Roza Laptander)
4:40pm	An adaptive co-management framework for Bathurst and Bluenose-East barren-ground caribou (Aimee Guile)	Comparative analysis of the summer grazing ecology of a migratory tundra caribou herd during warm, average, and cool summers (Don Russell)	Muskox habitat association and interaction with caribou (Laurence Carter)	A collaborative approach to habitat restoration for Central Mountain caribou (Scott Schilds and Blake Spencer)	Measuring the (im)permeability of landscape features for highly mobile caribou (Eliezer Gurarie)

CONCURRENT TALKS & SYMPOSIA: DETAILS

Population Estimation & Monitoring

1:00 - 5:00pm | Fore Deck

- 1:00 **Use of aerial photography to enumerate Alaska caribou herds; An examination of how the photo-direct count technique has evolved from the 1960s to present**
Nathan Pamperin^{1*}
¹Alaska Dept. of Fish and Game
- 1:20 **Done any Distance Sampling surveys recently? Try this with your data**
Christine Cuyler^{1*}, Tiago Marques², Íuri Correia³
¹Pinnngortitaleriffik - Greenland Institute of Natural Resources; ²CREEM University of St. Andrews, School of Mathematics and Statistics, Scotland; ³University of Lisbon, Faculty of Sciences, Portugal
- 1:40 **Evaluating the efficacy of close-kin mark-recapture for estimating caribou abundance**
Brandon Merriell^{1*}, Paul Wilson², Micheline Manseau³
¹Environmental & Life Sciences Dept., Trent University; ²Biology Dept., Trent University; ³Landscape Science and Technology, Environment and Climate Change Canada
- 2:00 **Large migratory caribou herd management can be informed by population models**
Michael Suitor^{1*}, Leonardo Frid², Schuyler Pearman-Gillman², Torsten Bentzen³
¹Environment Yukon; ²Apex Resource Management Solution Ltd; ³Alaska Dept. of Fish and Game
- 2:20 **A tale of three herds: Demography of the Bathurst, Bluenose-East and Beverly herds in northern Canada**
John Boulanger^{1*}, Joe Thorley², Jan Adamczewski³, Mitch Campbell⁴
¹Integrated Ecological Research; ²Poisson Consulting; ³Environment and Natural Resources, Government of Northwest Territories; ⁴Dept. of Environment, Nunavut Wildlife Research Division
- 2:40 **Population and habitat assessment for conservation: Lessons from caribou in Canada and wild reindeer in Norway**
Lucie Lelotte^{1*}, Bram Van Mooter²
¹University of Liege; ²Norwegian Institute for Nature Research
- 3:20 **More than one way to count caribou in Canada: Showcasing the NBCKC's Boreal Caribou Monitoring Methods Toolkit**
Melanie Mullin^{1*}, Anna Calvert¹, Lindsay Crawford¹, Matthew Boeckner¹, Monitoring Working Group of the NBCKC²
¹Landscape Science and Technology Division, Science and Technology Branch, Environmental and Climate Change Canada; ²The National Boreal Caribou Knowledge Consortium
- 3:40 **Monitoring and status of forest-dwelling caribou populations in Québec and of the mountain caribou population of Gaspésie**
Sabrina Plante^{1*}, Virginie Vanlandeghem¹, Léa Harvey¹, Michael Bonin¹, Joëlle Taillon¹, Kim Lemieux¹, Simon Pelletier¹, Jérôme Plourde¹, Guillaume Szor¹, Alexis Brodeur¹, Caroline Hins¹, Stéphanie Pellerin¹, Mathieu Morin¹, Frédéric Lesmerises¹
¹Ministère de l'Environnement, de la Lutte aux Changements climatiques, de la Faune et des Parcs, Gouvernement du Québec

*Denotes presenter

- 4:00 **Status and trends of Southern Mountain caribou herds in British Columbia, Canada**
Kathi Zimmerman^{1*}
¹British Columbia
- 4:20 **Community-based monitoring of Dall's sheep in the Gwich'in Settlement Area using remote wildlife cameras**
Sydney Goward^{1*}, Jason Fisher¹, Trevor Lantz¹, Steve Andersen²
¹University of Victoria, School of Environmental Studies; ²Gwich'in Renewable Resources Board
- 4:40 **An adaptive co-management framework for Bathurst and Bluenose-East Barren-ground Caribou**
Aimee Guile^{1*}, Laura Meinert¹, Jody Pellissey¹, Anne Gunn¹
¹Wek'èezhì Renewable Resources Board

Nutrition & Foraging Ecology

1:00 - 5:00pm | Mid Deck

- 1:00 **Nutritional paradoxes in northern ungulates**
Kristin Denryter^{1*}, Robert White², Katherine Parker³
¹Alaska Dept. of Fish and Game; ²Institute of Arctic Biology - University of Alaska Fairbanks; ³University of Northern British Columbia
- 1:20 **Successional development of caribou forage resources in montane and boreal habitats of Canada**
John Cook^{1*}, Rachel Cook¹, Kristin Denryter², Philip Walker³, Katherine Parker⁴, Evelyn Merrill³, Allicia Kelly⁵
¹National Council for Air and Stream Improvement; ²Alaska Dept. of Fish and Game; ³Dept. of Biological Sciences, University of Alberta; ⁴Ecosystem Science and Management, University of Northern British Columbia; ⁵Dept. of Environment and Natural Resources, Government of the Northwest Territories
- 1:40 **The influence of region and body condition on Mulchatna caribou herd diets as inferred from stable isotopes**
Robert Jespersen^{1*}, Andy Baltensperger¹, Dominic Demma², Renae Sattler², Jeffrey Welker¹, Jessica Richert¹, Timm Nawrocki³
¹University of Alaska Anchorage; ²Alaska Dept. of Fish and Game; ³Alaska Center for Conservation Science
- 2:00 **Seasonal diets of moose (*Alces alces*) in northeastern Alaska: Arctic and Boreal intra- and interpopulation differences ascertained using isotope forensics**
Jessica Richert^{1*}, Greg Breed¹, William Leacock², Matthew Cameron³, Jim Herriges⁴, Kyle Joly³, Mathew Sorum³, Jeffrey Welker⁵
¹University of Alaska Fairbanks; ²U.S. Fish and Wildlife Service; ³National Park Service; ⁴Bureau of Land Management; ⁵University of Alaska Anchorage
- 2:20 **Svalbard reindeer diets in summer and autumn using stable isotope (d13C & d15N) forensics**
Tamara Ann Hiltunen^{1*}, Stefaniya Kamenova², Leif-Egil Loe², Vebjorn Veiberg³, Jeffrey Welker^{1,4,5}
¹Ecology and Genetics Research Unit, University of Oulu, Finland; ²Norwegian University of Life Sciences; ³Norwegian Institute for Nature Research; ⁴UArctic, Rovaniemi, Finland; ⁵Dept. of Biological Sciences, University of Alaska Anchorage

2:40 **Estimating dietary composition through a camera lens: Evaluating the video collar technique for ungulates**

Rachel Cook^{1*}, Stephanie Berry², John Crouse³, Lisa Shipley², John Cook¹, Kristin Denryter⁴

¹ National Council for Air and Stream Improvement; ² Washington State University; ³ Kenai Moose Research Center;

⁴ Alaska Dept. of Fish and Game

3:20 **Supplementary winter fed domestic reindeer improve their vital rates and the herd's production potential**

Øystein Holand^{1*}, Amélie Paoli², Robert Weladji², Mauri Nieminen³

¹ Norwegian University of Life Sciences; ² Concordia University; ³ Emeritus

3:40 **Strategies in lactation of muskoxen: Control and implications of milk production during extended lactation**

Robert White^{1*}, Pamela Groves², Rich Kedrowski³, Karen Hill⁴, William Hauer²

¹ IAB, University of Alaska Fairbanks; ² University of Alaska Fairbanks; ³ University of Alaska (retired); ⁴ Bird Treatment Center

4:00 **Resilience of caribou to changing food supply: Resistance, tolerance and thresholds for digestible energy and nitrogen**

Perry Barboza^{1*}, Rachel Shively², Daniel Thompson³

¹ Texas A&M University; ² Kansas State University; ³ Alaska Dept. of Fish and Game

4:20 **The influence of summer habitat conditions on the behavior and demography of caribou in the Arctic**

Heather Johnson^{1*}, Elizabeth Lenart², David Gustine³, Layne Adams¹, Perry Barboza⁴

¹ U.S. Geological Survey, Alaska Science Center; ² Alaska Dept. of Fish and Game (retired); ³ U.S. Fish and Wildlife Service; ⁴ Texas A & M University

4:40 **Comparative analysis of the summer grazing ecology of a migratory tundra caribou herd during warm, average, and cool summers**

Don Russell^{1*}, Robert White², Don Spalinger³, David Gustine⁴, Josh Leffler⁵, Jeff Welker³

¹ CARMA; ² Institute Arctic Biology UAF; ³ University of Alaska Anchorage; ⁴ USFWS; ⁵ South Dakota State

Quantifying Habitat & Habitat Management I

1:00 - 3:00pm | Aft Deck

1:00 **Remote sensing phenology of the Bathurst Caribou Range, NWT and Nunavut**

Ryan Danby^{1*}, Katherine Dearborn², Michael Stefanuk³

¹ Queen's University; ² University of Winnipeg; ³ University of British Columbia

1:20 **There is still time to reconcile forest management with climate-driven declines in habitat suitability for boreal caribou**

Mathieu Leblond^{1*}, Yan Boulanger², Jesus Pascual Puigdevall², Martin-Hugues St-Laurent³

¹ Environment and Climate Change Canada; ² Natural Resources Canada; ³ Université du Québec à Rimouski

1:40 **Integrating traditional ecological knowledge and western science to map seasonal core and matrix habitat for the Chase subpopulation of Southern Mountain woodland caribou**

Erica Bonderud^{1*}, Keri Dresen², Luke Gleeson^{3*}, Marianna Nagy-Reis², Sean Rapai¹, Kevin Hoekstra²

¹ Chu Cho Environmental; ² British Columbia Ministry of Land, Water and Resource Stewardship; ³ Glezhe Nache Consultation

Co-presenter: Michael Klaczek* British Columbia Ministry of Forests

2:00 **Tracking caribou habitat change over time - what numbers really matter?**

Robert Serrouya^{1*}, Craig DeMars¹, Melanie Dickie¹, Robin Steenweg², Anna Calvert³

¹ Biodiversity Pathways; ² Canadian Wildlife Service; ³ Environment and Climate Change Canada

2:20 **Migratory caribou influence rates of vegetation change across Alaska and northwest Canada**

Kathleen Orndahl^{1*}, Torsten Bentzen², Logan Berner¹, Libby Ehlers³, Scott Goetz¹, Mark Hebblewhite³, Jim Herriges⁴, Kyle Joly⁵, Matt Macander⁶, Eric Palm³, Michael Suitor⁷

¹ School of Informatics, Computing and Cyber Systems, Northern Arizona University; ² Alaska Dept. of Fish & Game; ³ W.A. Franke College of Forestry and Conservation, University of Montana; ⁴ Bureau of Land Management; ⁵ National Park Service, Yukon-Charley Rivers National Preserve; ⁶ ABR Inc. Environmental Research & Services; ⁷ Yukon Dept. of Environment, Fish and Wildlife

2:40 **Caribou, fire, and forestry: Understanding the differential effects of natural and anthropogenic disturbance for long-term habitat supply**

Ian Best^{1*}, Leonie Brown², Che Elkin¹, Laura Finnegan², Chris Johnson¹, Cameron McClelland²

¹ Dept. of Ecosystem Science and Management, UNBC; ² fRI Research

Symposium: Opportunities for Ex Situ Management and the One Plan Approach for Woodland Caribou Conservation in Canada

1:00 - 3:00pm | Aft Deck

1:00 **The One Plan approach to species conservation**

Amy Chabot^{1*}, Jessica Steiner²

¹ African Lion Safari & Canadian Species Initiative; ² Wildlife Preservation Canada & Canadian Species Initiative

1:20 **The role for assisted reproductive technology and biobanking in caribou conservation**

Gabriela Mastro Monaco^{1*}

¹ Toronto Zoo

1:40 **Experience gained from rearing captive caribou in Québec**

Vicki Carriere^{1*}

¹ Parc Omega

2:00 **Adoption of a conservation breeding strategy to support caribou recovery in Jasper National Park**

Lalenia Neufeld^{1*}, Jean-François Bisailon^{1*}

¹ Parks Canada, Jasper National Park

2:20 **Creating a hub for knowledge exchange and advocacy on the potential for ex situ management roles to assist conservation of caribou in Canada**

Chris Ritchie^{1*}

¹ Caribou Conservation Alliance

*Denotes presenter

Interspecific Interactions

3:20 - 5:00pm | *Aft Deck*

3:20 **Optimal spatial games between predators and prey in complex food webs can explain species-specific variations in habitat selection**

Daniel Fortin^{1*}, André Fortin²

¹ *Dépt. de Biologie, Université Laval*; ² *Dépt. de Mathématiques et de Statistique, Université Laval*

3:40 **Harvesting moose to recover endangered caribou in a changing landscape**

Mateen Hessami^{1*}, Robert Serrouya¹, Adam Ford¹

¹ *Biodiversity Pathways*

4:00 **The mistake of applying a southern-based conservation strategy to northern boreal caribou range**

Philip McLoughlin^{1*}

¹ *University of Saskatchewan*

4:20 **Dynamic winter distribution patterns of migratory barren-ground caribou influence effectiveness of wolf management**

Abbey Wilson^{1*}, Dean Cluff¹, Robin Abernethy¹, Stephanie Behrens², Michael Birlea², John Nishi³, Amanda Dumond⁴, Karin Clark¹

¹ *Wildlife Division, Dept. of Environment and Natural Resources, Government of the Northwest Territories*; ² *Tłı̨chǫ Government*; ³ *EcoBorealis Consulting Inc.*; ⁴ *Kugluktuk Angoniatit Association, Hunters and Trappers Organization*

4:40 **Muskox habitat association and interaction with caribou**

Laurence Carter^{1*}, Édouard Bélanger², Eliezer Gurarie³, Tracy Davison⁴, Michael Sutor⁵, David Tavares¹, Murray Humphries⁶

¹ *Parks Canada*; ² *Gwich'in Renewable Resources Board*; ³ *State University of New York College of Environmental Science and Forestry*; ⁴ *Government of Northwest Territories*; ⁵ *Yukon Government*; ⁶ *McGill University*

Habitat Restoration

3:20 - 5:00pm | *Endeavor*

3:20 **End of the road: Short-term responses of a large mammal community to forest road decommissioning**

Rebecca Lacerte^{1*}, Mathieu Leblond², Martin-Hugues St-Laurent¹

¹ *Université du Québec à Rimouski*; ² *Environment and Climate Change Canada*

3:40 **Advancing caribou habitat restoration through equipment innovations**

Matthew Pyper^{1*}, Jesse Tigner²

¹ *Fuse Consulting Ltd.*; ² *SwampDonkey Solutions*

4:00 **Not all roads lead to Rome: Contrast in vegetation regrowth in two types of logging roads and their implication in the conservation of woodland caribou**

Lisandre Robichaud^{1*}, Pierre Drapeau², Fabien St-Pierre¹, Rebecca Lacerte¹, Martin-Hugues St-Laurent¹

¹ *Université du Québec à Rimouski*; ² *Université du Québec à Montréal*

4:20 **Legislating a legacy of disturbance: Disposition rights along linear features prevents caribou habitat restoration**

Jesse Tigner^{1*}, Katherine Wolfenden², Anne Hervieux³, Susan Leech³

¹ *SwampDonkey*; ² *Fort Nelson First Nation*; ³ *The Firelight Group*

4:40 **A collaborative approach to habitat restoration for Central Mountain caribou**

Scott Schilds^{1*}, Blake Spencer^{2*}

¹ *British Columbia*; ² *Nikanêse Wah tzee Stewardship Society*

Symposium: Arctic Winter Rains: Observing and Responding to Extreme Precipitation, Rain on Snow Events, and a Wetter Arctic

3:20 - 5:00pm | *Adventure*

3:20 **The Local Environmental Observer (LEO) Network as a way to understand emerging environmental phenomena**

Mike Brook^{1*}

¹ *Alaska Native Tribal Health Consortium/Alaska Pacific University*

3:40 **Winter rain on the Nabesna River**

Wilson Justin^{1*}

¹ *Native Village of Chistochina*

4:00 **The meteorology of Arctic rain on snow events**

Mark Serreze^{1*}, Jessica Voveris¹

¹ *University of Colorado Boulder*

Co-presenter: Taylor O'Brien* *CU Boulder, NSIDC*

4:20 **Stories and maps of the 'serad po': visualizing the severe icing event of 2013/4 on the Yamal Peninsula**

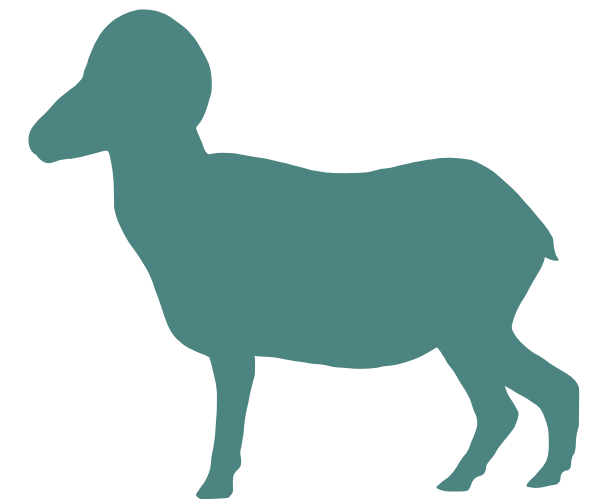
Philip Burgess¹, Roza Laptander^{1,2*}

¹ *Arctic Centre, University of Lapland, Finland*; ² *University of Hamburg, Germany*

4:40 **Measuring the (im)permeability of landscape features for highly-mobile caribou**

Eliezer Gurarie^{1*}, Nicole Barbour¹, Allicia Kelly², Anne Gunn³

¹ *State University of New York*; ² *Government of Northwest Territories*; ³ *CARMA*



*Denotes presenter

POSTER SESSION

7:00 - 10:00pm | Anchorage Museum at the Rasmuson Center

- 1 **Protecting Bathurst Barren-ground Caribou – a methodological review of techniques used to define the Mobile Core Bathurst Caribou Management Zone in the Northwest Territories, Canada**
Robin Abernethy^{1*}, Robin Kite²
¹ Wildlife and Fish Division, Dept. of Environment and Natural Resources, Government of the Northwest Territories; ² Caslys Consulting
- 2 **Leaping out of the predator pit? The Togiak Refuge moose story**
Andrew Aderman^{1*}, Patrick Walsh¹, Phillip Perry²
¹ USFWS - Togiak National Wildlife Refuge; ² Alaska Dept. of Fish & Game
- 3 **Why have all the reindeer gone?**
Kristin Agustsdottir^{1*}, Skarphedinn Thorisson¹
¹ East Iceland Nature Research Centre
- 4 **Multi-jurisdictional connectivity corridors for Southern Mountain Caribou herds of the northern Columbia Mountains**
Clayton Apps¹, Elizabeth Vincer², Colin Bergeron^{3*}
¹ Aspen Wildlife Research Inc.; ² Parks Canada Agency, Species Conservation Branch; ³ Parks Canada Agency, Mount Revelstoke and Glacier National Parks
- 5 **Value consultation for an Indigenous protected area in the boreal caribou range**
Annie Claude Bélisle^{1*}, Yan Boulanger², Benoit Croteau¹, Mathieu Leblond³, Jérôme Cimon-Morin⁴, Solange Nadeau²
¹ Conseil de la Première Nation Abitibiwininni; ² Natural Resources Canada; ³ Environment and Climate Change Canada; ⁴ Université Laval
- 6 **Forum Atik: A caribou workshop with First Nations in Québec and Ontario, Canada**
Annie Claude Bélisle^{1*}, Iris Lochon¹, Benoit Croteau¹
¹ Conseil de la Première Nation Abitibiwininni
- 7 **Habitat restoration: Why Indigenous partnerships matter**
Paula Bentham^{1*}, Ryan Abel², Tom Habib³
¹ WSP Golder; ² Fort McKay First Nation; ³ Alberta-Pacific Forest Industries Inc
- 8 **Regional planning for caribou herd recovery in Mount Revelstoke and Glacier National Parks**
Colin Bergeron^{1*}, Elizabeth Vincer², Clayton Apps³
¹ Parks Canada Agency, Mount Revelstoke and Glacier National Parks; ² Parks Canada Agency, Species Conservation Branch; ³ Aspen Wildlife Research Inc
- 9 **Where can moose find a healthy meal? Moose forage response to disturbances in central British Columbia**
Jocelyn Biro^{1*}, Alana Clason², Jennifer Baltzer¹, Anne-Marie Roberts³
¹ Wilfrid Laurier University; ² Bulkley Valley Research Centre; ³ B.C. Ministry of Water, Land and Resource Stewardship

*Denotes presenter

- 10 **A practical approach to evidence-based decision-making for woodland caribou conservation breeding**
Jean-François Bisailon^{1*}, Lalenia Neufeld^{2*}, Nick Salafsky³, Jaclyn Lucas³
¹ Parks Canada, Jasper National Park; ² Parks Canada; ³ Foundations of Success
- 11 **State of population management actions for boreal caribou populations in Québec and for the mountain caribou population of Gaspésie**
Michaël Bonin¹, Caroline Hins¹, Stéphanie Pellerin¹, Marion Barbé¹, Mathieu Morin¹, Sabrina Plante^{1*}
¹ Ministère de l'Environnement, de la Lutte contre les Changements Climatiques, de la Faune et des Parcs, Gouvernement du Québec
- 12 **The management of migratory caribou populations in Québec: History and avenues for reflection to reconcile wildlife conservation and traditional Aboriginal cultures**
Auréli Bourbeau-Lemieux¹, Vincent Brodeur¹, Joëlle Taillon^{1*}
¹ Ministère de l'Environnement, de la Lutte contre les Changements Climatiques, de la Faune et des Parcs, Gouvernement du Québec
- 13 **Suspected persistent thiamin deficiency in a hand-reared caribou calf**
Sophia Bracio^{1*}, Kristin Denryter¹, Kimberlee Beckmen¹
¹ Alaska Dept. of Fish and Game

TUESDAY | 9 MAY




Do you want a STEM career in service to land and culture? Looking for a FULLY FUNDED graduate program?

The Center for Native Peoples and the Environment at the State University of New York's College of Environmental Science & Forestry is recruiting students for graduate study in diverse environmental science fields, including ecology, sustainability, conservation biology, restoration, environmental engineering, and more. Thanks to support from the Sloan Indigenous Graduate Partnership, the program includes tuition, stipends, and professional development for Indigenous students pursuing MS, MPS, and PhD degrees.



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ESF Apply today for this unique program integrating Indigenous and Scientific Knowledges for Environmental Sustainability. We are accepting applications on a rolling basis!



In partnership with the Fate of the Caribou Project: fateofthecaribou.esf.edu

TUESDAY | 9 MAY

- 14 **Caribou must eat but what does it take to stay alive? Disentangling the forage-risk hypothesis in a multi-ungulate community**
Jacob Bradshaw^{1,2*}, Chris Johnson¹, Carolyn Shores²
¹ Ecosystem Science and Management, University of Northern British Columbia; ² Caribou Recovery Program, B.C. Ministry of Water, Land and Resource Stewardship
- 15 **Variation in stable carbon ($\delta^{13}\text{C}$) and nitrogen ($\delta^{15}\text{N}$) isotopes along antlers of male Qamanirjuaq caribou (*Rangifer tarandus groenlandicus*)**
Matthew Brenning¹, Fred Longstaffe², Danielle Fraser^{3*}
¹ Carleton University; ² University of Western Ontario; ³ Canadian Museum of Nature
- 16 **Past, present and future of migratory caribou herds in northern Québec and Labrador**
Vincent Brodeur¹, Sara McCarthy², Aurélie Bourbeau-Lemieux¹, Joëlle Taillon^{1*}
¹ Ministère de l'Environnement, de la Lutte contre les Changements Climatiques, de la Faune et des Parcs, Gouvernement du Québec; ² Wildlife Division, Fisheries, Forestry and Agriculture Dept., Government of Newfoundland and Labrador
- 17 **Lichen It: Refining post-fire winter caribou habitat restoration**
Elise Brown-Dussault^{1*}, Jennifer Baltzer¹, Catherine Dieleman²
¹ Wilfrid Laurier University; ² University of Guelph
- 18 **Strategies for effective knowledge exchange: Learnings from the Alberta Regional Caribou Knowledge Partnership**
Kristy Burke^{1*}
¹ Alberta Regional Caribou Knowledge Partnership (Coordinator)
- 19 **Relationships between caribou lichen biomass and non-destructively measurable variables in Northern Canada**
Wenjun Chen^{1*}, Julie Lovitt¹, Sylvain Leblanc¹, Robert Fraser¹, Liming He¹, Christian Prévost¹, H. Peter White¹, Leila Naeni², Isabelle Schmelzer³, André Arsenault⁴, Darren Pouliot⁵
¹ Canada Centre for Remote Sensing, Natural Resources Canada; ² Dépt. de géomatique appliquée, Université de Sherbrooke; ³ Fisheries, Forestry and Agriculture - Government of Newfoundland and Labrador; ⁴ Atlantic Forestry Centre, Natural Resources Canada; ⁵ Landscape Science and Technology, Environment and Climate Change Canada
- 20 **Indigenous language diversity for Southern Mountain Caribou recovery in British Columbia and Alberta**
Kate Curtis^{1*}, Jean Polfus², Laura Machial², Carmen Chelick³
¹ University of Victoria; ² Canadian Wildlife Service - Pacific Region, Environment and Climate Change Canada; ³ Biodigenous Consulting Ltd
- 21 **The Tâdzié-Sagow Atihk Stewardship Plan: an Indigenous knowledge-based approach to recovering caribou in ACFN and MCFN Homelands**
Lori Cyprien¹, Brian Fung², Lindsay Wong³, Anne Hervieux⁴, Chris Wagner⁴, Susan Leech^{4*}
¹ Manager, Lands and Rights, Athabasca Chipewyan First Nation Dept. of Lands and Resource Management; ² Manager, Government Relations, Athabasca Chipewyan First Nation Dept. of Lands and Resource Management; ³ Environmental Coordinator, Mikisew Cree First Nation Government Industry Relations; ⁴ The Firelight Group
- 22 **The Arctic Circle: Climate Change, International Law and Indigenous Heritage**
Keshia Talking Waters De Freece Lawrence^{1*}
¹ Ramapough Lenape Munsee, United Nations University for Peace

- 23 **Demographic history and conservation genomics of caribou (*Rangifer tarandus*) in Québec**
Morgan Dedato^{1*}, Claude Robert², Joëlle Taillon³, Aaron Shafer⁴, Steeve Côté⁵
¹ Trent University; ² Dépt. des Sciences Animales, Université Laval; ³ Direction de l'expertise sur la Faune Terrestre, l'herpétofaune et l'avifaune, Ministère des Forêts, de la faune et des parcs, Gouvernement du Québec; ⁴ Forensics Dept., Trent University; ⁵ Dépt. de Biologie, Caribou Ungava and Centre d'Études Nordiques, Université Laval
- 24 **Living in fear: How experience shapes caribou responses to predation risk**
Laurie Derguy¹, Mathieu Leblond², Martin-Hugues St-Laurent^{1*}
¹ Université du Québec à Rimouski; ² Environment and Climate Change Canada
- 25 **High school student-led monitoring of summer range use by the eastern migratory Cape Churchill caribou population using minimally invasive trail cameras**
Soren Dhruv^{1*}, Emily Brinckerhoff¹, Samantha Zooker¹, Paul Hudes¹, Julie Rogers², Russell Turner³, Ryan Brook^{4,5}
¹ The Park School of Baltimore; ² Zwei Corp; ³ Wapusk National Park, Parks Canada; ⁴ Indigenous Land Management Institute; ⁵ Dept. of Animal and Poultry Science, University of Saskatchewan
- 26 **Serum amyloid a reference interval for monitoring free-ranging caribou**
Lindsey Dreese^{1*}, Kimberlee Beckmen¹
¹ Alaska Dept. of Fish and Game, Division of Wildlife Conservation
- 27 **A method-comparison study for monitoring land health in reindeer ranges on the Seward Peninsula, Alaska**
Aliza DuComb^{1*}
¹ Bureau of Land Management
- 28 **Communicating zoonotic risks to subsistence communities**
Stacey Elmore^{1*}, Kimberlee Beckmen²
¹ Colorado School of Public Health/University of Maine Fort Kent; ² Alaska Dept. of Fish and Game
- 29 **Interactive mapping of caribou health**
Stacey Elmore^{1*}, Kimberlee Beckmen²
¹ Colorado School of Public Health/University of Maine Fort Kent; ² Alaska Dept. of Fish and Game
- 30 **Estimating diet overlap between domestic sheep and wild reindeer using metabarcoding**
Kirsten Engeseth^{1*}, James Speed¹, Glenn Dunshea¹
¹ Dept. of Natural History, NTNU University Museum, Norwegian University of Science and Technology
- 31 **A pathway for enabling resilience within modern reindeer governance regimes in northern Fennoscandia**
Bruce Forbes^{1*}, Hannu Heikkinen², Horstkotte Tim³, Kristina Labba⁴, Mia Landauer¹, Annette Löf⁶, Jon Moen³, Kaisa Raitio⁶, Sirpa Rasmus¹, Camilla Risvoll⁷, Simo Sarkki²
¹ Arctic Centre, University of Lapland, Finland; ² Cultural Anthropology, University of Oulu, Finland; ³ Dept. of Ecology and Environmental Science, Umeå University, Sweden; ⁴ Faculty of Law, The Arctic University of Norway; ⁵ Resources, Rights and Development Division, Stockholm Environment Institute; ⁶ Dept. for Urban and Rural Development, Swedish University of Agricultural Sciences; ⁷ Nordland Research Institute, Norway
- 32 **Using drones to map caribou lichen cover for training satellite-based lichen classifiers**
Robert Fraser^{1*}, Sylvain Leblanc¹, Liming He¹, Julie Lovitt¹, Owen Lucas¹, Darren Pouliot², Jurjen van der Sluijs³, Wenjun Chen¹
¹ Canada Centre for Mapping and Earth Observation, Natural Resources Canada; ² Landscape Science and Technology Division, Environment and Climate Change Canada; ³ NWT Centre for Geomatics, Government of Northwest Territories

*Denotes presenter

33 **It pays to be a fat cow: juvenile weight predicts age of primiparity in northwest Alaskan moose populations**

Sara Germain^{1*}, Shawn Crimmins², Lincoln Parrett¹, Knut Kielland³

¹Alaska Dept. of Fish and Game, Division of Wildlife Conservation; ² University of Alaska - Fairbanks (Alaska Cooperative Fish & Wildlife Research Unit); ³ University of Alaska - Fairbanks

34 **Movement ecology of caribou during a covid-19 mediated pause in winter recreation**

Ryan Gill^{1,2*}, Robert Serrouya², Adam Ford^{1,2}, Anna Calvert³, Robin Steenweg⁴, Michael Noonan¹

¹ UBCO; ² Biodiversity Pathways; ³ Environment and Climate Change Canada; ⁴ Canadian Wildlife Service

35 **Overview of the Federal Subsistence Management Program**

Lisa Grediagin^{1*}, Hannah Voorhees^{2*}, Thomas Plank^{1*}

¹ Office of Subsistence Management, U.S. Fish and Wildlife Service; ² U.S. Fish and Wildlife Service

36 **Improving snow densification in the SNOWPACK multilayer snow model: A context for Peary caribou habitat characterization in the Canadian Arctic**

Élise Groulx-Maurer^{1*}

¹ University of Sherbrooke/Centre d'Étude Nordique

37 **The good, the bad and the ugly: Updates on muskox trends in abundance and health**

Anne Gunn^{1*}, Christine Cuyler², Susan Kutz³, Jan Adamczewski⁴, Vincent Brodeur⁵, Mitch Campbell⁶, Dean Cluff⁴, Tony Gorn⁷, Letty Hughes⁸, Lisa-Marie Leclerc⁶, Marc Nelson⁷, Brynn Parr⁸, Tara Sipko⁹, Michael Suitor¹⁰, Joëlle Taillon⁵, Matilde Tomaselli¹¹

¹ Independent; ² Pinngortitaleriffik - Greenland Institute of Natural Resources; ³ Faculty of Veterinary Medicine, University of Calgary; ⁴ Environment and Natural Resources, Government of the Northwest Territories; ⁵ Ministère de l'Environnement, de la Lutte contre les Changements Climatiques, de la Faune et des Parcs, Gouvernement du Québec; ⁶ Government of Nunavut, Dept. of Environment; ⁷ Alaska Dept. of Fish and Game; ⁸ Arctic Network Inventory & Monitoring Program, National Park Service; ⁹ A.N. Severtsov Institute of Ecology and Evolution of the Russian Academy of Sciences; ¹⁰ Fish and Wildlife, Environment Yukon; ¹¹ Polar Knowledge Canada - High Arctic Research Station

38 **Moving beyond research and monitoring and towards policy for caribou conservation**

Andrea Hanke^{1*}, Amanda Niptanatiak Dumond², Beverly Maksagak³, Rosemin Nathoo⁴, Lisa-Marie Leclerc⁵, Amélie Roberto-Charron⁵, Susan Kutz¹

¹ University of Calgary; ² Kugluktuk Angoniatit Association; ³ Ekaluktutiak Hunters and Trappers Organization; ⁴ Wildlife Management Advisory Council (NWT); ⁵ Government of Nunavut

39 **Insect harassment and its effects on barren ground caribou behavior and energetics**

William Hein^{1*}, Murray Humphries¹, Heather Johnson², Chris Buddle¹, Michael Suitor³

¹ McGill University; ² U.S. Geological Survey, Alaska Science Center; ³ Yukon Government

40 **Predicting the future range of northern mountain caribou mediated by ecological change**

Oliver Holt^{1*}

¹ University of Northern British Columbia

41 **Habitat use of semi-domesticated reindeer in response to the exotic tree species *Pinus contorta***

Tim Horstkotte^{1*}, Per Sandström², Wiebke Neumann³, Anna Skarin⁴, Sven Adler², Ulrika Roos², Jörgen Sjögren³

¹ Dept. of Ecology and Environmental Science, Umeå University, Sweden; ² Dept. of Forest Resource Management, Swedish University of Agricultural Sciences; ³ Dept. of Wildlife, Fish, and Environmental Studies, Swedish University of Agricultural Sciences; ⁴ Dept. of Animal Nutrition and Management, Swedish University of Agricultural Sciences

42 **Learning by herding: circumpolar reindeer husbandry curriculum**

Jacqueline Hrabok^{1*}

¹ University of Alaska Fairbanks

43 **Nome's urban muskoxen - their habitat choices in town and their interactions with people**

Claudia Ihl^{1*}

¹ University of Alaska - NW Campus, Nome

44 **Multispecies modelling of an intact taiga-tundra transitional zone, Thaidene Nëné Indigenous Protected Area, Northwest Territories**

Eric Jolin^{1*}

¹ Wilfrid Laurier University

45 **A multi-year timeline of reproductive and stress-related hormone concentrations and dietary stable isotopes from serial sections of muskox skirt hairs**

Shawna Karpovich^{1*}, Brynn Parr¹

¹ Alaska Dept. of Fish and Game

46 **Population assessment of the hart ranges caribou subpopulation and response to recovery actions**

Michael Klaczek^{1*}, Doug Heard²

¹ British Columbia Ministry of Forests; ² Tithonus Wildlife Research

47 **Restoring winter caribou habitat with lichen transplants: Substrate and fragment size effects on lichen in the greenhouse**

Ricky Kong^{1*}, Binyam Tedla¹, Michael Schultz², Jean-Marie Sobze¹

¹ Northern Alberta Institute of Technology - Centre for Boreal Research; ² Portage College

48 **Interpreting satellite imagery, model outputs and in situ snow measurements governing winter foraging conditions for Arctic ungulates through the sharing of traditional and local knowledge**

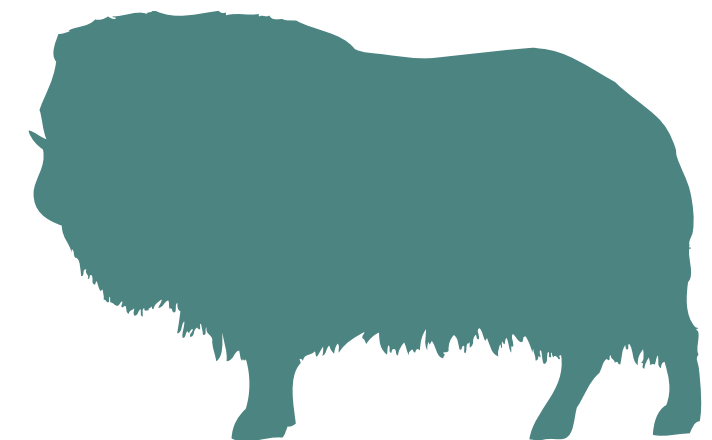
Josée-Anne Langlois^{1*}, Alexandre Langlois¹, Cheryl-Ann Johnson²

¹ Université de Sherbrooke, Centre d'études nordiques; ² Environment and Climate Change Canada

49 **Science helps inform the creation of a 10,000 km² protected area for boreal caribou**

Mathieu Leblond^{1*}, Tyler Rudolph², Dominic Boisjoly³, Christian Dussault³, Martin-Hugues St-Laurent⁴

¹ Environment and Climate Change Canada; ² Natural Resources Canada; ³ Ministère de l'Environnement, de la Lutte contre les Changements Climatiques, de la Faune et des Parcs, Gouvernement du Québec; ⁴ Université du Québec à Rimouski



*Denotes presenter

50 **Genetic relationships of small understudied caribou herds in Alaska and central Yukon**

Karen Mager^{1*}, Michael Sutor², Khoa Nguyen³, My Hoang⁴, Jim Herriges⁵, Jeff Statz⁶,
Kelsey Russell²

¹ Southern Oregon University, Environmental Science & Policy Dept.; ² Government of the Yukon Territories, Dept. of Environment; ³ Notre Dame University, Integrated Biomedical Sciences Program; ⁴ Washington University, School of Medicine; ⁵ Bureau of Land Management; ⁶ Alaska Dept. of Fish and Game

51 **Ancestral relationships with caribou are essential to caribou conservation in the Tr'ondëk Hwëch'in Traditional Territory, Yukon, Canada**

Alice McCulley^{1*}

¹ Tr'ondëk Hwëch'in

52 **A two-eyed seeing approach to modelling moose winter habitat suitability in northeastern Ontario**

Elena McCulloch^{1*}, David Flood², Jesse Popp¹

¹ School of Environmental Sciences, University of Guelph; ² Wahkohtowin Development GP Inc

53 **Large-scale caribou fecal surveys across shield-lowlands boundary**

Samantha McFarlane^{1*}, Allison Kroeze¹, Judith Girard¹

¹ Canadian Wildlife Service - Ontario Region

54 **Using low-frequency species detections to monitor caribou predators from autonomous recording units**

Samantha McFarlane^{1*}, Rich Russell¹

¹ Canadian Wildlife Service - Ontario Region

55 **What do caribou need? A first step towards the identification of critical habitat for eastern migratory caribou in northern Québec-Labrador**

Adèle Michaud^{1*}, Mathieu Leblond², Joëlle Taillon³, Steeve Côté¹

¹ Laval University, Caribou Ungava; ² Environment and Climate Change Canada; ³ Ministère de l'Environnement, de la Lutte contre les Changements climatiques, de la Faune et des Parcs, Gouvernement du Québec

56 **Novel digital tools for reindeer husbandry**

Kirsi Muuttoranta^{1*}, Karoliina Majuri¹

¹ Lapland University of Applied Sciences

57 **Projecting changes to woodland caribou habitat quality after climate-derived landscape disturbance in Jasper National Park**

Eric Neilson^{1*}, Melodie Kunegel-Lion¹, Devin Goodsman¹, Nicolas Mansuy¹

¹ Canadian Forest Service

58 **Understanding the future of umingmak/dachan tat gwa'aak`ij on the Yukon North Slope: How the reintroduced population has changed over time and what the future may hold**

Jessica Norris^{1*}, Jessi Pascal², Aklavik Hunters and Trappers Committee³, Eugene Pascal⁴,
Michael Sutor⁵, Murray Humphries¹

¹ McGill University; ² Wildlife Management Advisory Council - North Slope; ³ Aklavik Hunters and Trappers Committee; ⁴ Ehditit Renewable Resource Council; ⁵ Yukon Government

59 **Implications of the first collaborative non-invasive DNA survey for boreal caribou in British Columbia**

Agnes Pelletier^{1*}, Katherine Wolfenden²

¹ Government of British Columbia; ² Fort Nelson First Nation

60 **Emerging tools for processing audio data from animal-borne recorders**

Megan Perra^{1*}, Enis Çoban², Todd Brinkman³, Michael Mandel⁴, Eliezer Gurarie¹

¹ State University of New York - College of Environmental Science and Forestry; ² The City University of New York; ³ University of Alaska Fairbanks; ⁴ The City University of New York - Brooklyn College

61 **Indigenous-led monitoring of Whudzih (caribou) using non-invasive methods: Supporting the Southern Dakelh Nation's role in Southern Mountain Caribou recovery**

Pauline Priadka^{1*}

¹ Southern Dakelh Nation Alliance

62 **Long-term effects of winter feeding on reindeer habitat selection and fine-scale foraging behaviour**

Heidi Rautiainen^{1*}, Paul Blackwell², Moudud Alam³, Birgitta Åhman¹, Anna Skarin¹

¹ Dept. of Animal Nutrition and Management, Swedish University of Agricultural Sciences; ² School of Mathematics & Statistics, University of Sheffield, United Kingdom; ³ School of Information and Engineering, Dalarna University

63 **Collaborative wildlife-snow science: Integrating wildlife and snow expertise to improve research and management**

Adele Reinking^{1*}, Stine Højlund Pedersen^{1,2}, Kelly Elder³, Glen Liston¹

¹ Cooperative Institute for Research in the Atmosphere, Colorado State University; ² Dept. of Biological Sciences, University of Alaska Anchorage; ³ U.S. Forest Service, Rocky Mountain Research Station

64 **Muskoxen in mainland Northwest Territories: Where are they now?**

Charlotte Rentmeister^{1*}, Kevin Chan², Frances Stewart¹

¹ Wilfrid Laurier University; ² Government of Northwest Territories

65 **Mapping winter food security for the Klinse-Za caribou herd**

Carmen Richter^{1*}

¹ Saulneau First Nations

66 **Co-management of Baffin Island Caribou**

John Ringrose^{1*}

¹ Government of Nunavut

67 **Understanding productivity of migratory tundra caribou: Role of vital rates and climate**

Don Russell^{1*}, Robert White², Anne Gunn¹

¹ CARMA; ² Institute of Arctic Biology UAF

68 **Evidence of summer nutritional limitation in an Alaskan caribou herd and its relation to reproductive success and disease**

Renae Sattler^{1*}, Dominic Demma¹, John Crouse¹

¹ Alaska Dept. of Fish and Game

69 **High latitude range management: what reindeer husbandry means to me**

Bonnie Scheele^{1*}, Jacqueline Hrabok¹

¹ University of Alaska, Northwest Campus, High Latitude Range Management Program

70 **Post-lambing spatial distribution of Dall's sheep in southwest Yukon**

Mary Anne Schoenhardt¹, Carmen Wong², Ryan Danby^{1*}

¹ Queen's University; ² Parks Canada

*Denotes presenter

- 71 **Habitat use by Boreal and Eastern Migratory Caribou along the interface of two ecozones in Northern Ontario**
Geoffrey Sherman^{1*}, Jon Pleizer¹, Angela Brooks¹
¹ SNC Lavalin
- 72 **Métis land use specialist/collaborative research and monitoring for the eastern migratory Cape Churchill Caribou population: Linking Wapusk National Park and an Indigenous Protected and Conserved Area**
Connor Staub^{1*}, Riley Bartel¹, Jessica Lagimodiere¹, Russell R Turner², Matthew Webb², Ryan Brook³
¹ Manitoba Métis Federation; ² Parks Canada; ³ University of Saskatchewan
- 73 **Stairway to heaven or highway to hell? How characteristics of forest roads shape their use by large mammals in the boreal forest**
Fabien St-Pierre^{1*}, Pierre Drapeau², Martin-Hugues St-Laurent¹
¹ Université du Québec à Rimouski; ² Université du Québec à Montréal
- 74 **Wild Icelandic reindeer or alien domestic Norwegians?**
Skarphedinn Thorisson^{1*}
¹ East Iceland Nature Research Centre
- 75 **Looking after caribou: The Kivalliq Inuit Association (Nunavut) approach to caribou and mining**
Jeff Tulugak^{1*}, Luis Manzio¹, Kim Poole², Anne Gunn³
¹ Kivalliq Inuit Association; ² Aurora Wildlife Research; ³ CARMA
- 76 **Boreal caribou conservation and recovery in Canada**
Melissa Vance^{1*}, Ariana Bonder¹, Heather Boyd¹
¹ Environment and Climate Change Canada
- 77 **Accounting for cumulative disturbances in range-scale estimates of probabilistic space use: The case for dynamically weighted mean kernel density estimators**
Virginie Vanlandeghem¹, Tyler Rudolph², Guillaume Szor¹, Jérôme Plourde¹, Alexis Brodeur¹, Sabrina Plante^{1*}
¹ Ministère de l'Environnement, de la Lutte contre les Changements Climatiques, de la Faune et des Parcs, Gouvernement du Québec; ² Service canadien des forêts, Ressources naturelles Canada, Gouvernement du Canada
- 78 **Identifying priority caribou habitat to restore in the boreal forest of Canada**
Nikita Wallia^{1*}, Rachel Plotkin², Nicole Boucher²
¹ David Suzuki Foundation; ² University of Victoria
- 79 **Effects of hunting risk on the spatial dynamics of a subarctic caribou population**
Jeff Wells^{1,2*}, Shawn Crimmins³, Torsten Bentzen¹, Jeff Gross¹, Todd Brinkman²
¹ Alaska Dept. of Fish and Game; ² University of Alaska Fairbanks, Institute of Arctic Biology; ³ University of Alaska Fairbanks, Alaska Cooperative Fish and Wildlife Research Unit
- 80 **Mapping indicators of fugitive dust from mining activities within barren-ground caribou habitat zones**
H. Peter White^{1*}, Liming He¹, Wenjun Chen¹
¹ Canada Centre for Remote Sensing, Natural Resources Canada

- 81 **Simulation of ruminal microbial protein synthesis in Rangifer**
Robert White^{1*}, Don Russell², Leonardo Fri³, Colin Daniel⁴, Anne Gunn⁵, Donald Spalinger⁶
¹ IAB, University of Alaska Fairbanks; ² Yukon University; ³ Apex Management Solutions; ⁴ University of Toronto; ⁵ CARMA; ⁶ University of Alaska Anchorage
- 82 **Migratory patterns and plasticity of Southern Mountain caribou in a changing environment**
Brianna Winkel^{1*}, David Ausband^{1,2}, Matthew Falcy^{1,2}, Robert Serrouya³, Brittany Morlin⁴
¹ Idaho Cooperative Fish and Wildlife Research Unit, Dept. of Fish and Wildlife Sciences, University of Idaho; ² U.S. Geological Survey; ³ Alberta Biodiversity Monitoring Institute, University of Alberta; ⁴ U.S. Fish and Wildlife Service, Idaho Fish and Wildlife Office
- 83 **Climatic drivers behind recruitment in iconic mountain ungulates**
Carmen Wong^{1*}
¹ Parks Canada

ART, HANDICRAFTS & OTHER VISUALS

7:00 - 10:00pm | Anchorage Museum at the Rasmuson Center

Twenty Mile Trading | Bonnie Scheele

I am an Inupiaq Reindeer Herder and business owner. I also make items from the byproducts of my reindeer.

The Ten-Oh-Two | Caitlin Scarano and Megan Perra

This chapbook has select pieces of visual art and poetry from our exhibit "The Ten-Oh-Two" (Bear Gallery, Fairbanks, May 2021), which details a year in the migration of the Porcupine Caribou Herd (PCH) and the herd's intersections with human and other non-human animals through a series of narrative poems paired with visual art.

Relief prints of harvested ungulates | Megan Perra

This series of printed ungulates is inspired by the Japanese tradition of fish prints, called Gyotaku. These prints are made out of respect for the animals that were harvested, and act as an artistic record of each individual. They are made by coating the animal's head or body in oil paint, and pressing fabric onto the animal.

Arctic Seasons | Anna Brose, Arctic Haven Studio

The series is meant to showcase the unique adaptations required for life in the north, and the continuity between these species and their landscapes - both physical and intrinsic. Each piece is created with hundreds of hand-cut pieces of paper, accented with colored pencil, pastels, and paints.

Reindeer migration route shifts, RoS, and combined effects on Indigenous people's livelihoods in eastern Siberia | Shirow Tatsuzawa^{1*}, Innokentiy Okhlopkov², Egor Kirillin², Nikolay Mamaev²

¹ Hokkaido University; ² IBPC, RAS, Russia



K. Joly

*Denotes presenter

ANNOUNCEMENTS

8:30 - 8:40am | Fore Deck

PLENARY

Bridging Indigenous and Western Ways of Knowing in Ungulate Management, Policy, and Research

Shelley Calliou¹, Jim Dau², Amanda Dumond³, Andrea Hanke⁴, Scott McNay⁵, Chief Roland Willson⁶, Jean Polfus⁷, Elmer Seetot, Jr.⁸

¹Kelly Lake Cree Nation; ²Alaska Dept. of Fish and Game (Retired); ³Kugluktuk Angoniatit Association; ⁴University of Calgary; ⁵Wildlife Informatics; ⁶West Moberly First Nations; ⁷Canadian Wildlife Service; ⁸Western Arctic Caribou Herd Working Group

8:40 - 10:00am | Fore Deck

CONCURRENT TALKS & SYMPOSIA

10:20am - 5:00pm

STORYTELLING EVENT

7:00 - 9:00pm | Williwaw Social, 609 F Street, Anchorage

Stories are a powerful way to share diverse knowledge and experiences related to the ecology, management, use, and importance of Arctic ungulates. Storytelling has been used by Indigenous peoples to pass down information since time immemorial and is increasingly used by western scientists for communication with each other and the public. Join us at the Williwaw Social for an evening of fun co-hosted by Anchorage's popular storytelling organization, Arctic Entries. We will feature stories from pre-selected storytellers who have workshopped their stories and end with an open mic for those that feel inspired to share their own stories. One beverage ticket will be provided, with additional beverages and food available for purchase. There is no additional charge for this event, but please wear your conference name tag.

PLENARY

Bridging Indigenous and Western Ways of Knowing in Ungulate Management, Policy, and Research

Shelley Calliou¹, Jim Dau², Amanda Dumond³, Andrea Hanke⁴, Scott McNay⁵, Chief Roland Willson⁶, Jean Polfus⁷, Elmer Seetot, Jr.⁸

¹Kelly Lake Cree Nation; ²Alaska Dept. of Fish and Game (Retired); ³Kugluktuk Angoniatit Association; ⁴University of Calgary; ⁵Wildlife Informatics; ⁶West Moberly First Nations; ⁷Canadian Wildlife Service; ⁸Western Arctic Caribou Herd Working Group

8:40 - 10:00am | Fore Deck

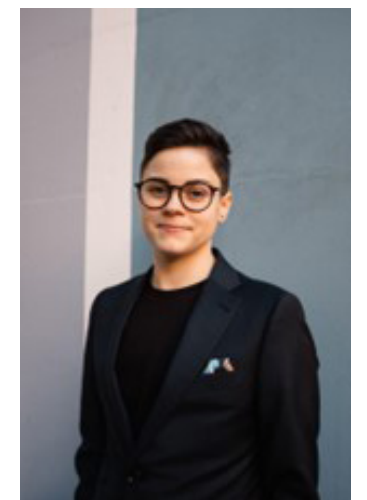
Many agree that bridging Indigenous and western ways of knowing ungulates is important, but it can be challenging to know how to build meaningful relationships and partnerships that blend different knowledge streams and approaches. This plenary will feature a group of experts who have worked to creatively bridge Indigenous and western knowledge in support of ungulate management, policy, and research. In fish bowl and panel formats, speakers from a variety of backgrounds will share stories and lessons learned in pursuit of meaningful partnerships, and answer questions about their respective endeavors and approaches. We hope this encourages others to pursue open communication and collaboration across boundaries within their own work.



Jim Dau (b. 1952, northern Michigan) spent 4 years (1972-1976) in the Navy Seabees as a heavy equipment operator and explosives handler. After his discharge, he earned a Bachelor's degree in wildlife management from the University of Alaska Fairbanks in 1982. He worked for the Alaska Department of Fish and Game on the Susitna Hydroelectric moose, wolf and wolverine projects during 1981-1982. During 1982-1985, he returned to UAF to earn a master's degree in wildlife management studying Central Arctic Herd caribou movements and distribution in relation to weather, insect harassment and oilfield infrastructure in the Kuparuk Oil Field. In 1986-1988, he held a research associate position with the UAF Reindeer Research Project and moved to Nome, Alaska. In 1988, he accepted a wildlife biologist position with the Alaska Dept. of Fish and Game and moved to Kotzebue.

He was initially an area wildlife management biologist for Unit 23 (Kotzebue Sound) and later became the Departments' lead research and management biologist for the Western Arctic Caribou Herd. In 1992, he became a state-certified pilot for ADF&G and, for the rest of his career, assisted with surveys for all species of wildlife in northwest Alaska. Dau retired from ADF&G in 2016. He continues to live in Kotzebue and is an amateur wildlife and bird photographer.

Andrea Hanke (they/them) is a PhD candidate in the Faculty of Veterinary Medicine at the University of Calgary, Canada. They are a queer and non-binary researcher who works with Inuit harvesters to document Indigenous knowledge of caribou, including trends in their abundance, distribution, and health. In 2017, Andrea began working in Kugluktuk, Nunavut alongside Amanda Dumond. They have been also working with harvesters in Ekaluktutiak, Nunavut, and Ulukhaktok, Northwest Territories.



Amanda Dumond is an Inuk who lives and works in Kugluktuk, Nunavut. She is a hunter, mother and daughter and has been raised on the land. She is the current manager at the hunters and trappers organization.

Scott McNay is the Senior Wildlife and Forest Ecologist at Wildlife Infometrics Inc. in Mackenzie, British Columbia (BC) where he implements and manages wildlife research and inventory projects for the firm. Scott is a registered professional biologist in both Alberta



(AB) and BC, a registered professional forester in BC, and holds a PhD in forest wildlife ecology. Throughout his 30+ year career, Scott has championed the use of habitat supply modeling and adaptive management as basic tools to resolve difficult problems in the integrated management of wildlife resources. During the past 23 years, Scott's interest has focused on the challenge of recovering threatened populations of woodland caribou leading to his participation in many provincial-level recovery programs, his work with many caribou herds across northern BC and one in AB, and his role as manager of the caribou recovery program undertaken by the Nikanese Wah tzee Stewardship Society in the Central Group of Southern Mountain Caribou in BC. (photo credit: Jayce Hawkins/The Narwhal)



Shelley Calliou is a Cultural advisor, and Nehiyaw iskwew — a Cree woman — from Kelly Lake Cree Nation (KLCN). She was raised in Kelly Lake and currently resides in her community. She is a mother of three and an Aunty to many. Wahkotowin is a strong Cree value of being aware of our relatives and how we are relative to the land. Shelley was raised in a horse culture and grew up learning inherent land teachings. Shelley is a researcher for KLCN and has spent the last six years researching the Nation's footprint. She feels most at home when on the land.

Shelley works with the Nation to develop and plan cultural camps, fueling her passion for Elder Knowledge. She currently sits as KLCN's representative on the Jasper Indigenous Forum, as well as the Indigenous Advisory Committee for the South Peace Archives. Shelley is actively involved in many Indigenous platforms, working and collaborating with other First Nations on Truth and Reconciliation. She currently works for her Nation assisting as a Cultural Advisor and in the Lands Department. She recently completed an Environmental Certificate with UNBC.



Shelley takes great pride in giving a voice to those who have not been heard for 120 years. Her people were displaced from Jasper National Park in 1907 and Flyingshot Lake near Grande Prairie, Alberta in 1911. Many of the ancestors are still buried in these places. As a result of the displacement, the As'in'i'wa'chi Ni'yaw people were not signatories to Treaty 6 or Treaty 8. Today most of the community's members are considered "Non Status Indians," excluding them from many of the benefits and protections afforded to Treaty members. KLCN has been fighting for recognition in a land grievance against Canada since 1996.

Kelly Lake is located in the northeast British Columbia (BC) near the BC-Alberta border. KLCN represents more than 800 citizens whose territory includes extensive areas in present day northeastern BC and west-central Alberta.

Elmer Seetot, Jr. is from Brevig Mission, Alaska. He has been part of the Western Arctic Caribou Herd Working Group since its establishment, helping to support management of the herd and its use. He also joined the Seward Peninsula Regional Advisory Council in 1995.

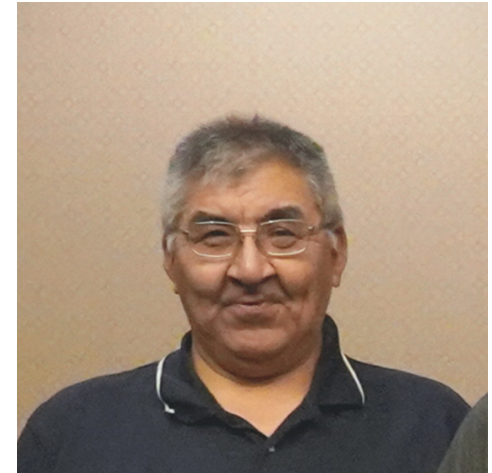
Roland Willson was first elected as Chief of the West Moberly First Nations in August 2000, and has continued to serve in that position for the past 23 years. Chief Willson sits on several boards and councils, including the BC First Nations Energy and Mining Council, the BC First Nations Gaming Committee, the Pacific Trails Pipeline First Nations Limited Partnership and the Northeast Aboriginal Business and Wellness Centre. In recent years, he has made numerous presentations at various forums and seminars concerning



issues important to First Nations, including the duty to consult, aboriginal land and resource management, and the impacts of the oil and gas and shale gas industries on First Nations in northeastern BC. In the past five years, the Chief has presented at forums and seminars held by the Canadian Institute, Insight Information, the University of Waterloo, the Munk School of Global Affairs at the University of Toronto, the BC Land Summit, the University of Alberta Faculty of Native Studies, the Alberta Society of Professional Biologists, the federal Department of Justice (Ottawa), the Planning Institute of BC, and the University of British Columbia's Natural Resources and Environmental Studies

Colloquium. He has also appeared twice before the Standing Senate Committee on Aboriginal Peoples, once with respect to the federal Specific Claims policy and once on the topic of aboriginal economic development. Chief Willson is an active enthusiast of Land and Treaty preservation and has been an outspoken advocate for the recovery of caribou populations. (photo credit: Ryan Dickie/The Narwhal)

Jean Polfus is a conservation biologist who is interested in interdisciplinary approaches to conservation that respect the lives and experiences of people that depend on natural resources for their livelihood. She received her B.A. from Dartmouth College, M.S. from the University of Montana, Ph.D. from the University of Manitoba and was a Liber Ero Postdoctoral Fellow. Currently, Jean is a Senior Species at Risk Biologist with the Canadian Wildlife Service of Environment Climate Change Canada, in Kelowna, BC. Her work has focused on building collaborative research projects with Indigenous partners to better understand relationships among caribou populations and people in order to inform and prioritize management efforts. She is interested in helping to find creative ways to decolonize the language we use to describe caribou by collaborating with Indigenous communities and focusing on Indigenous languages and descriptions of caribou biodiversity from an Indigenous perspective. Jean has an expertise in art (drawing, illustration, painting, photography and design) which complements and enhances her professional interests through science communication and outreach tools. In her free time Jean enjoys skijoring, taking photos, and spending time outdoors with her family, including her three young children and dog.



SYMPOSIA

Caribou Lichen and Habitat Modeling

Organizers: Wenjun Chen¹, Jerome Theau² and Darren Pouliot¹

¹ Government of Canada; ² University of Sherbrooke

10:20am - 3:00pm | *Aft Deck*

In this session, we will highlight the advances in baseline caribou lichen and habitat mapping, tempo-spatial change detection in caribou lichen and habitat, and assessment of cumulative effects of human and natural disturbances on caribou habitat and caribou demographics.

Integrating Historical Data into Caribou Conservation and Management

Organizers: Joshua Miller¹, Jeff Rasic², and Kyle Joly²

¹ University of Cincinnati; ² U.S. National Park Service

10:20am - 3:00pm | *Adventure*

A major challenge for managing and conserving caribou (*Rangifer tarandus*) is quantifying natural variability in core herd characteristics such as population size and patterns of seasonal landscape use (e.g., calving ground geography). A major contributor to this challenge is that the timescales across which biomonitoring records are available are often shorter than natural multi-decadal fluctuations in herd ecology and demographics. Historical proxies, data on generations that predate biomonitoring records by decades to millennia, are well-positioned to expand our understanding of herds and fill important knowledge gaps. Our symposium brings together wildlife biologists, paleoecologists, archaeologists, museum curators, ethnographers, and traditional knowledge holders to showcase the variety of historical proxy data available on caribou, as well as how such information integrates

with contemporary conservation and management priorities. A roundtable discussion will follow symposium presentations, during which we invite conference delegates to join the conversation as we continue seeking best practices for integrating historical proxy data with contemporary wildlife data to address fundamental questions about caribou biology and challenges facing their conservation.

Imago Initiative Brainstorming Session

Organizers: Danielle Stickman¹, Karlin Itchoak¹, and Meda DeWitt¹

¹The Wilderness Society

3:20 - 5:00pm | *Adventure*


The Imago Initiative Brainstorming Workshop– This workshop will explore with participants their interim and long-term ideas for co-management, co-stewardship, a just economic transition, and a sustainable rural economy focused on Indigenous-led conservation and subsistence economy. We will engage the audience to brainstorm with us to identify Indigenous values; Conservation values; identify needs of Indigenous communities to protect under new land protections; Identify new ideas for land protections through an Indigenous worldview; Identify “Traditional Indigenous Conservation Plans & Practices”; reimagine how land protections could benefit local Indigenous people through concurrent management, access, governance, guardianship/stewardship, and shared-ownership. And have fun!

The Imago Initiative is a process for exploring new possibilities for Indigenous-led land protection and management that would contribute to a just and sustainable rural economy. It began in mid-2020 with the goal of establishing open dialogue and increasing trust among and between conservationists, government managers, and Indigenous peoples. Our investment in this Indigenous-led process requires time, transparency, and consistency. We focus on strong collaboration, community-led conservation, quiet diplomacy (relationship-building), and incremental steps to overcome communication barriers with pro-development advocates.

CONCURRENT TALKS & SYMPOSIA: SCHEDULE (MORNING)

	<i>Fore Deck</i>	<i>Mid Deck</i>	<i>Aft Deck</i>	<i>Endeavor</i>	<i>Adventure</i>
Session	Habitat Use and Movement	Integrating Knowledge	<i>Symposium: Modeling Habitat</i>	Harvest Management	<i>Symposium: Historical Data</i>
10:20am	Behavioral adaptation to mitigate impacts of seasonal resource scarcity (Kyle Joly)	Caribou conservation and biocultural diversity: Creating space and dissolving barriers by decolonizing the language of caribou (Jean Polfus)	New approaches to field data collection and information extraction to support caribou habitat mapping over large spatial extents (Darren Pouliot)	Establishment and evaluation of the Bathurst Caribou Mobile Conservation Zone for hunter harvest protection (H. Dean Cluff)	The Pleistocene history of caribou on the mammoth steppe: Using fossil and historical records to characterize caribou responses to global change (Danielle Fraser)
10:40am	Quantifying effects of snow depth on caribou winter range selection and movement in Arctic Alaska (Stine Højlund Pedersen)	Shared responsibility in boreal caribou range planning (Kathy Unger)	Satellite detected significant decrease of reindeer lichen cover in Eastern Canada during the last three decades (Liming He)	Tłı̨chʔ Ekwò (Barrenground Caribou) Harvest Monitoring Program: A possible solution to harvesting concerns of ekwò along the Tibbitt to Contwoyto Winter Road (Stephanie Behrens)	Including ancient DNA to understand implications of historical overharvest, recolonization and climate change for the genetic diversity and structure of wild Svalbard reindeer (Mathilde Le Moullec and Fabian Kellner)
11:00am	Wild reindeer responses to warmer high-Arctic winters: Spatial foraging strategies, individual variation, and fitness implications (Larissa Beumer)	Crossing knowledge systems: Using Traditional Knowledge and Western science to monitor the transboundary Bistcho caribou herd in northern Alberta led by the Dene Tha' First Nation (Gillian Chow-Fraser)	Scaling plant functional groups for large extent mapping and monitoring of caribou habitat (Blair Kennedy)	Caribou harvest assessments for communities located in the range of the Western Arctic Caribou Herd in Alaska (Morgan Urquia)	The use of dental calculus in metagenomic research on ancient reindeer (Fabian Kellner)
11:20am	Pasture peace for reindeer – does it matter? (Gabi Wagner)	Atik across Canada: A review of Cree perspectives of “caribou” through anthropological and grey literature (Max Pospisil)	Lichen transplant for restoration of lichen communities after forest harvest and fire (Michael Schulz)	Considerations in harvest strategy to manage caribou population dynamics in Alaska (Thomas Paragi)	Shed female caribou antlers serve as mineral reserves for parturient caribou (Madison Gaetano)

CONCURRENT TALKS & SYMPOSIA: SCHEDULE (AFTERNOON)

	<i>Fore Deck</i>	<i>Mid Deck</i>	<i>Aft Deck</i>	<i>Endeavor</i>	<i>Adventure</i>
Session	Habitat Use and Movement	Integrating Knowledge	<i>Symposium: Modeling Habitat</i>	Disease / Parasites	<i>Symposium: Historical Data</i>
1:00pm	Habitat-selection and movement of boreal caribou in a northern fire-prone landscape: Forage benefits or a risky move? (Geneviève Degré-Timmons)	Integrated science based and First Nations knowledge to help inform caribou and cultural value conservation strategies on the Pessamit Nitassinan (Parvin Kalantari)	Predicting lichen biomass: A spatially discrete Cladonia lichen recovery model for the boreal forest in the Northwest Territories, Canada (Maria Belke Brea)	Genomic analysis of an emerging bacterial pathogen of ungulates in the Canadian Arctic (Sreejith Radhakrishnan)	The archaeology of mountain caribou hunting: Cultural landscape management and artifact design data related to hunting caribou in the ancient past (Christian Thomas)
1:20pm	Boreal caribou response to wildfire burn severity varies across seasons (Alicia Kelly)	Reindeer increased their tolerance to wind turbines during severe winter conditions and high predator abundance (Anna Skarin)	Time-series maps of cover and biomass for plant functional types in Alaska and northwestern Canada (Matthew Macander)	CWD in wild reindeer: Norway's responses to a new and much feared disease (Olav Strand)	Ancient caribou hunting facilities as proxy records for caribou paleoecology (Jeffery Rasic)
1:40pm	Spatial aggregations of satellite-collared migratory caribou, an indicator of insect harassment in the Arctic (Ophélie Couriot)	Coupled analysis of Indigenous and scientific knowledge connects climate, caribou and human needs (Catherine Gagnon)	Applications of AI technology and open geospatial platforms for simplified and high-quality ground-truth data collection in support of regional mapping (Julie Lovitt)	Interactive threats and management dilemma: Can habitat fragmentation help save the European wild reindeer? (Brage Bremset Hansen)	Estimating ages of <i>Rangifer tarandus</i> based on mandibular tooth wear (Grace Kohut)
2:00pm	Hierarchical selection of wetlands by boreal caribou in northeast Alberta (Troy Hegel)	Weaving knowledge systems to discern drivers of moose population decline (Pauline Priadka)	Evaluating snow density and spatial variability of Arctic snowpacks using a frequency-modulated continuous wave (FMCW) radar (Érika Boisvert-Vigneault)	Determining the geographic distribution of <i>Setaria</i> spp. and <i>Rumenfilaria</i> spp. in caribou in central Canada (Aparna Mariyam Thomas)	Millennial-scale consistency in Coastal Plain calving grounds revealed by shed female caribou antlers, Arctic National Wildlife Refuge, AK (Joshua Miller)
2:20pm	Functional connectivity of island-dwelling caribou – where melting sea ice and human activity increase isolation (Deborah Jenkins)	Moving beyond icky feelings to a more expansive mind-set: Cognitive dissonance as a guide for learning (Andrea Hanke)	Peary caribou winter habitat characterisation using snow modeling and passive microwave satellite images (Vincent Sasseville)	Health surveillance of thimhorn sheep (<i>Ovis dalli</i>) herds in Alaska: <i>Toxoplasma gondii</i> (Caeley Thacker)	Strontium isotope applications to modern and ancient caribou in Alaska (Audrey Rowe)
2:40pm	Connecting the (historic data) dots on Northern Mountain caribou herd connectivity (Sarah Arnold)	Integrating Indigenous/Western Knowledge Q&A	Modeling Habitat Q&A	Wounded but unstressed: moose tolerate injurious flies in the boreal forest (Bridgett Benedict)	Historical Data Q&A
3:00-3:20pm	<i>Snack Break</i>				
Session	Habitat Use and Movement	Recovery Planning I	Population Ecology I	Habitat II	<i>Symposium: Imago Initiative</i>
3:20pm	Environmental drivers of migration timing and winter use in a partially migratory Alaskan caribou herd (Timothy Fullman)		Environmental and demographic drivers of a rapidly growing sub-Arctic moose population (Vassily Zavoico)	Long-term vegetation monitoring of Western Arctic Caribou Herd winter range, Alaska (Aliza DuComb)	Imago Initiative
3:40pm	Carry-over effects of exploiting ephemeral resource pulses in a time of food scarcity (Samantha Dwinnell)	Collaborative development of land use objectives for the recovery of the Central Group of Southern Mountain caribou in British Columbia (Megan Watters and Robert Seaton)	Seasonal and spatial variation in climate change impacts on wild Svalbard reindeer, with implications for community dynamics (Mathilde Le Moullec)	Integrating forestry, conservation areas, and caribou range planning in northeast Alberta (Tom Habib)	
4:00pm	Climate-mediated “boundary” crossing by migratory and sedentary caribou in northern Ontario (Michelle Bacon)	The path towards co-management - case of Medzih (boreal caribou) recovery in Northeast B.C. (Michael Huck)	Patterns of growth and survival of male caribou, Denali National Park and Preserve, Alaska (Layne Adams)	Terrestrial lichen caribou forage transplant success: Year 5 and 6 results (Sean Rapai)	
4:20pm	The diversity of migration and importance of low-elevation habitat for Southern Mountain caribou (Robin Steenweg)	Overview of habitat-based offsets for caribou in British Columbia - successes and opportunities (Gregory Sharam)	Assessing the influence of environmental factors on Arctic caribou reproduction (Matthew Cameron)	Alternative harvesting and silvicultural approaches for caribou habitat (Bob Christian)	
4:40pm	How do impacts accumulate? Increasing impacts on reindeer living in a fast-paced changing Arctic (Anna Skarin)	Reconciling boreal caribou conservation with sustainable forestry practices using systematic conservation planning (Pierre-Alexandre Labranche)	Differential impacts of environmental conditions and movement behavior on Arctic ungulate survival across seasons (Chloe Beaupré)	Nunivak Island Then and Now; a review of 10 permanent vegetation monitoring locations through the last 32 years on this Bering Sea Island, home to herds of muskoxen and reindeer (Karin Sonnen)	

CONCURRENT TALKS & SYMPOSIA: DETAILS

Habitat Use and Movement

10:20am - 5:00pm | Fore Deck

10:20 Behavioral adaptation to mitigate impacts of seasonal resource scarcity

Kyle Joly^{1*}, Matthew Cameron¹, D. Alexander Hansen², Robert White³

¹ National Park Service; ² Alaska Dept. of Fish and Game; ³ University of Alaska Anchorage

10:40 Quantifying effects of snow depth on caribou winter range selection and movement in Arctic Alaska

Stine Højlund Pedersen^{1,2*}, Torsten Bentzen³, Adele Reinking¹, Glen Liston¹, Kelly Elder⁴, Elizabeth Lenart³, Alexander Prichard⁵, Jeffrey Welker^{2,6}

¹ Cooperative Institute for Research in the Atmosphere, Colorado State University; ² Dept. of Biological Sciences, University of Alaska Anchorage; ³ Alaska Dept. of Fish and Game; ⁴ U.S. Forest Service, Rocky Mountain Research Station; ⁵ ABR Inc Environmental Research & Services; ⁶ Ecology and Genetics Research Unit, University of Oulu, University of the Arctic, Finland

11:00 Wild reindeer responses to warmer high-Arctic winters: Spatial foraging strategies, individual variation, and fitness implications

Larissa Beumer^{1,2*}, Åshild Ønvik Pedersen¹, Marie-Anne Blanchet¹, Mathilde Le Moullec³, Ronny Aanes¹, Ingrid Paulsen¹, Jennifer Pohle⁴, Brage Hansen^{3,5}

¹ Norwegian Polar Institute; ² Dept. of Ecoscience, Aarhus University, Denmark; ³ Dept. of Biology, Centre for Biodiversity Dynamics, Norwegian University of Science and Technology; ⁴ Institute of Biochemistry and Biology, University of Potsdam, Germany; ⁵ Dept. of Terrestrial Ecology, Norwegian Institute for Nature Research

11:20 Pasture peace for reindeer – does it matter?

Sara Meier¹, Melanie Furrer², Nora Nowak², Reto Huber², Monica Sundset³, Renato Zenobi⁴, Steven Brown², Gabi Wagner^{5*}

¹ Institute of Pharmacology and Toxicology, University of Zurich, Switzerland; ² University of Zurich, Switzerland; ³ University of Tromsø, Norway; ⁴ ETHZ, Switzerland; ⁵ NIBIO, Norwegian Institute of Bioeconomy Research

1:00 Habitat-selection and movement of boreal caribou in a northern fire-prone landscape: Forage benefits or a risky move?

Geneviève Degré-Timmons^{1*}, Eliot McIntire², Jennifer Baltzer³, Alicia Kelly⁴, Julie Turner⁵, John Cook⁶, Rachel Cook⁶, James Hodson⁴, Steve Cumming¹

¹ Dept. of Wood and Forest Sciences, Université Laval; ² Canadian Forest Service, Pacific Forestry Centre, Natural Resources Canada; ³ Dept. of Biology, Wilfrid Laurier University; ⁴ Government of the Northwest Territories; ⁵ University of British Columbia/Biodiversity Pathways; ⁶ U.S. National Council for Air and Stream Improvement

1:20 Boreal caribou response to wildfire burn severity varies across seasons

Alicia Kelly^{1*}, Elie Gurarie², Eric Palm³, Ellen Whitman⁴, James Hodson¹

¹ Dept. of Environment and Natural Resources, Government of the Northwest Territories; ² Dept. of Environmental Biology, State University of New York – College of Environmental Science and Forestry; ³ Computational Ecology Lab, School of Public and Community Health Sciences, University of Montana, U.S. Forest Service, Aldo Leopold Wilderness Research Institute, Rocky Mountain Research Station; ⁴ Natural Resources Canada, Canadian Forest Service

1:40 Spatial aggregations of satellite-collared migratory caribou, an indicator of insect harassment in the Arctic

Ophélie Couriot^{1*}, Eliezer Gurarie¹, Anne Gunn², Jan Adamczewski³

¹ Dept. of Environmental Biology, State University of New York – College of Environmental Science and Forestry; ² Independent researcher; ³ Government of the Northwest Territories

2:00 Hierarchical selection of wetlands by boreal caribou in northeast Alberta

Troy Hegel^{1*}, Elena Price¹, Joann Skilnick², David Johns¹

¹ Alberta Environment and Protected Areas; ² Saskatchewan Ministry of Environment

2:20 Functional connectivity of island-dwelling caribou – where melting sea ice and human activity increase isolation

Deborah Jenkins^{1*}, James Schaefer¹, Glenn Yannic², Geoff Andrews¹, Erin Koen³, William Peterman⁴, Nicolas Lecomte⁵

¹ Trent University; ² Université Grenoble Alpes, Université Savoie Mont Blanc; ³ Ontario Ministry of Northern Development, Mines, Natural Resources, and Forestry, Cherokee Nation Systems Solutions, contracted to U.S. Geological Survey; ⁴ Ohio State University; ⁵ University of Moncton

2:40 Connecting the (historic data) dots on Northern Mountain caribou herd connectivity

Sarah Arnold^{1*}, Colleen Murchison¹, Alexandra Heathcote¹, Cory Fournier², Micheline Manseau³

¹ Nahanni National Park Reserve; ² Trent University; ³ Environment and Climate Change Canada

3:20 Environmental drivers of migration timing and winter use in a partially migratory Alaskan caribou herd

Timothy Fullman^{1*}, Shawna Karpovich², Joelle Hepler², Alex Prichard³, Brian Person⁴, Heather Savage⁵

¹ The Wilderness Society; ² Alaska Dept. of Fish and Game; ³ ABR Inc; ⁴ North Slope Borough; ⁵ Bureau of Land Management

3:40 Carry-over effects of exploiting ephemeral resource pulses in a time of food scarcity

Samantha Dwinnell^{1,2*}, René Van der Wal³, Larissa Beumer^{2,4}, Steve Albon⁵, Åshild Pedersen⁶, Leif Egil Loe¹

¹ Environmental Sciences and Natural Resource Management, Norwegian University of Life Sciences; ² The University Centre in Svalbard, Norway; ³ Dept. of Ecology, Swedish University of Agricultural Sciences; ⁴ Senckenberg Biodiversity and Climate Research Centre, Germany; ⁵ The James Hutton Institute, Aberdeen, UK; ⁶ Norwegian Polar Institute

4:00 Climate-mediated “boundary” crossing by migratory and sedentary caribou in northern Ontario

Michelle Bacon^{1*}, Erin Greenaway¹, Grace Enns¹

¹ WSP Golder

4:20 The diversity of migration and importance of low-elevation habitat for Southern Mountain caribou

Robin Steenweg^{1*}, Clayton Lamb², Rob Serrouya², Adam Ford³, Carolyn Shores⁴, Jean Polfus¹, Dave Hervieux⁵, Mike Russell⁵, Sara Williams⁶

¹ Canadian Wildlife Service - Pacific Region, Environment and Climate Change Canada; ² Biodiversity Pathways, University of British Columbia - Okanagan; ³ Biology Dept., Irving K. Barber School of Science, University of British Columbia - Okanagan; ⁴ Caribou Recovery Program - British Columbia Water, Land and Resource Stewardship; ⁵ Fish and Wildlife Stewardship - Alberta Environment and Protected Areas; ⁶ Panthera

4:40 How do impacts accumulate? Increasing impacts on reindeer living in a fast-paced changing Arctic

Bernardo Brandão Niebuhr¹, Manuela Panzacchi¹, Lucie Lelotte², Torkild Tveraa¹, Audun Stien³, Knut Langeland¹, Anna Skarin^{4*}, Per Sandström⁴, Bram van Moorter¹

¹ Norwegian Institute for Nature Research; ² University of Liège, Belgium; ³ UiT The Arctic University of Norway; ⁴ Swedish University of Agricultural Sciences

*Denotes presenter

Integrating Indigenous and Western Knowledge

10:20am - 3:00pm | *Mid Deck*

10:20 Caribou conservation and biocultural diversity: Creating space and dissolving barriers by decolonizing the language of caribou

Jean Polfus^{1,2*}, Robin Steenweg^{1,2}, Carmen Chelick³, Kate Curtis⁴, Ana Giovanetti¹, Emily Sunter¹, Laura Machial¹, Jahan Kariyeva¹

¹ Canadian Wildlife Service - Environment and Climate Change Canada; ² Biology Dept., Irving K. Barber School of Science, University of British Columbia; ³ Biodigenous Consulting Ltd; ⁴ School of Environmental Studies, University of Victoria

10:40 Shared responsibility in boreal caribou range planning

Kathy Unger^{1*}, Dieter Cazon²

¹ Government of Northwest Territories; ² Łı́ı́dlı́ Kú́ę First Nation

11:00 Crossing knowledge systems: Using Traditional Knowledge and Western science to monitor the transboundary Bistcho caribou herd in northern Alberta led by the Dene Tha' First Nation

Gillian Chow-Fraser^{1*}, Matthew Munson², Fred Didzena², Nicole Doll¹

¹ CPAWS Northern Alberta; ² Dene Tha' First Nation

11:20 Atik across Canada: A review of Cree perspectives of "caribou" through anthropological and grey literature

Max Pospisil^{1*}

¹ University of Saskatchewan

1:00 Integrated science based and First Nations knowledge to help inform caribou and cultural value conservation strategies on the Pessamit Nitassinan

Parvin Kalantari^{1*}, André Arsenault¹, Dominique Boucher¹, Yan Boulanger¹, Louis De Grandpré¹, Christian Hebert¹, Guy Larocque¹, Christine Martineau¹, Solange Nadeau¹, Jesus Pascual Puigdevall¹, M.-H. Rousseau²

¹ Natural Resources Canada/Laurentian Forestry Centre; ² Première Nation Innu de Pessamit

1:20 Reindeer increased their tolerance to wind turbines during severe winter conditions and high predator abundance

Anna Skarin^{1*}, Per Sandström¹, Moudud Alam², Sven Adler¹, Daniela Sant Ana³, Kerstin Lilja⁴, Anja Fjellgren Walkeapää⁵, Bernardo Brandão Niebuhr³

¹ Swedish University of Agricultural Sciences; ² Dalarna University; ³ Norwegian Institute for Nature Research; ⁴ Tässåsen Sami reindeer herding community; ⁵ Mittådalen Sami reindeer herding community

1:40 Coupled analysis of Indigenous and scientific knowledge connects climate, caribou and human needs

Catherine Gagnon^{1,2*}, Sandra Hamel³, Don Russell⁴, James Andre⁵, Annie Buckle⁶, David Haogak⁷, Jessi Pascal⁸, Esau Schafer⁹, Todd Powell¹⁰, Michael Svoboda¹¹, Dominique Berteaux^{1,2,12}

¹ Canada Research Chair on Northern Biodiversity, Université du Québec à Rimouski; ² Centre for Northern Studies, Université du Québec à Rimouski; ³ Dépt. de biologie, Université Laval; ⁴ Yukon University; ⁵ Arctic Borderlands Ecological Knowledge Society, Tsiigehtchic; ⁶ Arctic Borderlands Ecological Knowledge Society, Aklavik; ⁷ Parks Canada, Inuvik; ⁸ Gwich'in Renewable Resources Board, Inuvik; ⁹ Arctic Borderlands Ecological Knowledge Society, Old Crow; ¹⁰ Yukon Government; ¹¹ Environment and Climate Change Canada; ¹² Québec Center for Biodiversity Science, Université du Québec à Rimouski

2:00 Weaving knowledge systems to discern drivers of moose population decline

Pauline Priadka^{1*}, Brittany Moses², Cory Kozmik³, Steven Kell⁴, Jesse Popp¹

¹ University of Guelph; ² Biigtigong Nishnaabeg; ³ Magnetawan First Nation; ⁴ Shawanaga First Nation

2:20 Moving beyond icky feelings to a more expansive mind-set: Cognitive dissonance as a guide for learning

Andrea Hanke^{1*}, Susan Kutz¹

¹ University of Calgary

Symposium: Caribou Lichen and Habitat Modeling

10:20am - 3:00pm | *Aft Deck*

10:20 New approaches to field data collection and information extraction to support caribou habitat mapping over large spatial extents

Darren Pouliot^{1*}, Blair Kennedy¹, Mao Mao¹, Donald McLennan², Serguei Ponomarenko¹, Robert Fraser³, Wenjun Chen³, Sylvain Leblanc³, Liming He³, Jurjen van der Sluijs⁴

¹ Environment and Climate Change Canada; ² Arctic Research Foundation; ³ NRCAN; ⁴ NWT Centre for Geomatics

10:40 Satellite detected significant decrease of reindeer lichen cover in eastern Canada during the last three decades

Liming He^{1*}, Wenjun Chen¹, Robert Fraser¹, Sylvain Leblanc¹, Julie Lovitt¹, Peter White¹, Isabelle Schmelzer², André Arsenault³, Sabrina Plante⁴

¹ Canada Centre for Remote Sensing, Natural Resources Canada; ² Forestry and Wildlife Research Division, Fisheries Forestry and Agriculture, Government of Newfoundland and Labrador; ³ Atlantic Forestry Centre, Natural Resources Canada; ⁴ Ministère de l'Environnement, de la Lutte contre les Changements Climatiques, de la Faune et des Parcs, Gouvernement du Québec

11:00 Scaling plant functional groups for large extent mapping and monitoring of caribou habitat

Blair Kennedy^{1*}, Darren Pouliot¹, Mao Mao¹, Donald McLennan², Serguei Ponomarenko¹

¹ Environment and Climate Change Canada; ² Arctic Research Foundation

11:20 Lichen transplant for restoration of lichen communities after forest harvest and fire

Binyam Tedla¹, Ricky Kong¹, Michael Schulz^{2*}, Jean-Marie Sobze¹

¹ Northern Alberta Institute of Technology - Centre for Boreal Research; ² Portage College

1:00 Predicting lichen biomass: A spatially discrete Cladonia lichen recovery model for the boreal forest in the Northwest Territories, Canada

Maria Belke Brea^{1*}, Geneviève Degré-Timmons², Ruth Greuel³, Andres Caseiro Guilhem², Jennifer Baltzer¹, Steve Cumming²

¹ Wilfrid Laurier University; ² Université Laval; ³ University of Saskatchewan

1:20 Time-series maps of cover and biomass for plant functional types in Alaska and northwestern Canada

Matthew Macander^{1*}, Kathleen Orndahl²

¹ ABR Inc. Environmental Research & Services; ² Northern Arizona University

*Denotes presenter

1:40 **Applications of AI technology and open geospatial platforms for simplified and high-quality ground-truth data collection in support of regional mapping**

Julie Lovitt^{1*}, Galen Richardson², Wenjun Chen¹, Sylvain Leblanc¹, Liming He¹, H. Peter White¹, Isabelle Schmelzer³, André Arsenault⁴

¹ Canada Centre for Remote Sensing, Natural Resources Canada; ² University of Ottawa, Faculty of Arts, Dept. of Geography, Environment and Geomatics; ³ Forestry and Wildlife Research Division, Fisheries Forestry and Agriculture, Government of Newfoundland and Labrador; ⁴ Atlantic Forestry Centre, Natural Resources Canada

2:00 **Evaluating snow density and spatial variability of Arctic snowpacks using a frequency-modulated continuous wave (FMCW) radar**

Érika Boisvert-Vigneault^{1,2*}, Alexandre Langlois^{1,2}

¹ Université de Sherbrooke; ² Centre for Northern Studies, Université Laval

2:20 **Peary Caribou winter habitat characterisation using snow modeling and passive microwave satellite images**

Vincent Sasseville^{1,2*}, Alexandre Langlois^{1,2}, Jérôme Théau^{1,3}, Cheryl Ann Johnson⁴

¹ Centre d'Applications et Recherches en Télédétection, Université de Sherbrooke; ² Centre d'Études Nordiques, Québec; ³ Québec Centre for Biodiversity Science; ⁴ Wildlife Landscape Science Division, Environment and Climate Change Canada

Harvest Management

10:20 - 11:40am | *Endeavor*

10:20 **Establishment and evaluation of the Bathurst Caribou Mobile Conservation Zone for hunter harvest protection**

H. Dean Cluff^{1*}, Jan Adamczewski¹, John Boulanger², Bruno Croft¹, John Nishi³, Aimee Guile⁴, Laura Meinert⁴, Michael Birlea⁵

¹ Environment and Natural Resources, Government of the Northwest Territories; ² Integrated Ecological Research, Nelson, BC; ³ Ecoborealis Consulting, Inc., Millarville, AB; ⁴ Wek'èezhì Renewable Resources Board; ⁵ Tẖchq̱ Government, Behchoko, NT

10:40 **Tẖchq̱ Ekwò (Barrenground Caribou) Harvest Monitoring Program: A possible solution to harvesting concerns of ekwò along the Tibbitt to Contwoyto Winter Road**

Stephanie Behrens^{1*}, Birlea Michael¹

¹ Tẖchq̱ Government

11:00 **Caribou harvest assessments for communities located in the range of the Western Arctic Caribou Herd in Alaska**

Helen Cold¹, Morgan Urquia^{1*}

¹ Alaska Dept. of Fish and Game, Division of Subsistence

11:20 **Considerations in harvest strategy to manage caribou population dynamics in Alaska**

Thomas Paragi^{1*}, Neil Barten², David Crowley², Jeffrey Gross¹, Heidi Hatcher¹

¹ Alaska Dept. of Fish and Game; ² Alaska Dept. of Fish and Game (retired)

Symposium: Integrating Historical Data into Caribou Conservation and Management

10:20am - 3:00pm | *Adventure*

10:20 **The Pleistocene history of caribou on the mammoth steppe: Using fossil and historical records to characterize caribou responses to global change**

Danielle Fraser^{1*}, Grant Zazula²

¹ Palaeobiology, Canadian Museum of Nature; ² Palaeontology Program, Dept. of Tourism and Culture, Government of Yukon

10:40 **Including ancient DNA to understand implications of historical overharvest, recolonization and climate change for the genetic diversity and structure of wild Svalbard reindeer**

Mathilde Le Moullec^{1*}, Fabian Kellner^{2*}, Vanessa Bieker², Brage Hansen^{1,3}, Michael Martin^{1,2}

¹ Center for Biodiversity Dynamics, Dept. of Biology, Norwegian University of Science and Technology; ² Dept. of Natural History, Norwegian University of Science and Technology; ³ Dept. of Terrestrial Ecology, Norwegian Institute for Nature Research

11:00 **The use of dental calculus in metagenomic research on ancient reindeer**

Fabian Kellner^{1,2*}, Vanessa Bieker^{1,2}, Jaelle Brealey¹, Michael Martin¹

¹ Dept. of Natural History, University Museum, Norwegian University of Science and Technology; ² Centre for Biodiversity Dynamics, Dept. of Biology, Norwegian University of Science and Technology

11:20 **Shed female caribou antlers serve as mineral reserves for parturient caribou**

Madison Gaetano^{1*}, Joshua Miller¹, Eric Wald², Patrick Druckenmiller³

¹ University of Cincinnati; ² U.S. Fish and Wildlife Service; ³ University of Alaska Museum

1:00 **The archaeology of mountain caribou hunting: Cultural landscape management and artifact design data related to hunting caribou in the ancient past**

Christian Thomas^{1*}, Glen MacKay², Kelsey Pennanen³

¹ Yukon Government; ² Government of Northwest Territories; ³ University of Calgary

1:20 **Ancient caribou hunting facilities as proxy records for caribou paleoecology**

Jeffery Rasic^{1*}, Kyle Joly¹

¹ U.S. National Park Service, Gates of the Arctic National Park and Preserve

1:40 **Estimating ages of *Rangifer tarandus* based on mandibular tooth wear**

Grace Kohut^{1*}

¹ University of Saskatchewan

2:00 **Millennial-scale consistency in Coastal Plain calving grounds revealed by shed female caribou antlers, Arctic National Wildlife Refuge, AK**

Joshua Miller^{1*}, Eric Wald², Patrick Druckenmiller³

¹ University of Cincinnati; ² U.S. National Park Service; ³ University of Alaska Fairbanks and University of Alaska Museum

2:20 **Strontium isotope applications to modern and ancient caribou in Alaska**

Audrey Rowe^{1*}, Clement Bataille², Torsten Bentzen³, Shawna Karpovich³, Greg Breed¹, Josh Reuther¹, Matthew Cameron⁴, Alex Hansen³, Kyle Joly⁴, Jeff Rasic⁴, Karen Spaleta¹, Matthew Wooller¹

¹ University of Alaska Fairbanks; ² University of Ottawa; ³ Alaska Dept. of Fish and Game; ⁴ National Park Service



*Denotes presenter

Disease and Parasites

1:00 - 3:00pm | *Endeavor*

- 1:00 **Genomic analysis of an emerging bacterial pathogen of ungulates in the Canadian Arctic**
Sreejith Radhakrishnan^{1*}, Fabien Mavrot², Lakshmi Vineesha Seru², Matej Medvecký³, Angela Schneider², McCaide Wooten², Augustin Clessin⁴, Amélie Roberto-Charron⁵, Susan Kutz², Taya Forde¹
¹ School of Biodiversity, One Health and Veterinary Medicine, University of Glasgow, UK; ² Faculty of Veterinary Medicine, University of Calgary; ³ Dept. of Chemistry, University of Hradec Kralove, Hradec Kralove, Czech Republic; ⁴ CEFE, Université Montpellier, France; ⁵ Dept. of Environment, Government of Nunavut, Kugluktuk
- 1:20 **CWD in wild reindeer: Norway's responses to a new and much feared disease**
Olav Strand^{1*}, Atle Myrseth², Geir Rune Rauseth¹, Brage Bremset Hansen¹, Christer Rolandsen¹
¹ Norwegian Institute for Nature Research; ² University of Oslo
- 1:40 **Interactive threats and management dilemma: Can habitat fragmentation help save the European wild reindeer?**
Brage Bremset Hansen^{1*}, Atle Myrseth², Christer Moe Rolandsen¹, Geir Rune Rauseth¹, Olav Strand¹
¹ Norwegian Institute for Nature Research; ² University of Oslo
- 2:00 **Determining the geographic distribution of *Setaria* spp. and *Rumenfilaria* spp. in caribou in central Canada**
Aparna Mariyam Thomas^{1*}, John Soghigian¹, Naima Jutha², Judy Williams², Ashley McLaren², Liam Case², Eve Lamontagne², Susan Kutz³
¹ University of Calgary; ² Government of Northwest Territories; ³ University of Calgary
- 2:20 **Health surveillance of thinhorn sheep (*Ovis dalli*) herds in Alaska: *Toxoplasma gondii***
Caeley Thacker^{1*}, Helen Schwantje², Thomas Lohuis³, Kathreen Ruckstuhl⁴, Douglas Whiteside⁴
¹ British Columbia Ministry of Forests; ² BC Ministry of Forests Emeritus; ³ Alaska Dept. of Fish and Game; ⁴ University of Calgary
- 2:40 **Wounded but unstressed: moose tolerate injurious flies in the boreal forest**
Bridgett Benedict^{1*}, Dan Thompson², John Crouse², Dominique Wiener¹, Gabriel Hamer¹, Verocai Guilherme¹, Matthew Kulpa¹, Katia Grouch¹, Perry Barboza¹
¹ Texas A&M University; ² Alaska Dept. of Fish and Game

Recovery Planning and Implementation I

3:20 - 5:00pm | *Mid Deck*

- 3:40 **Collaborative development of land use objectives for the recovery of the Central Group of Southern Mountain caribou in British Columbia**
Megan Watters^{1*}, Robert Seaton^{2*}, Tamara Dokkie³, Teena Demeulemeester⁴, Lucy Reiss⁵, Robin Streenweg⁵, Scott McNay⁶, Joshua Lam⁷, James Hickling⁸
¹ British Columbia Ministry of Water, Land, and Resource Stewardship; ² Brinkman Group; ³ West Moberly First Nations; ⁴ Sauleau First Nations; ⁵ Environment and Climate Change Canada; ⁶ Wildlife Infometrics Inc.; ⁷ Sage Legal LLP; ⁸ Hickling Harrison Law

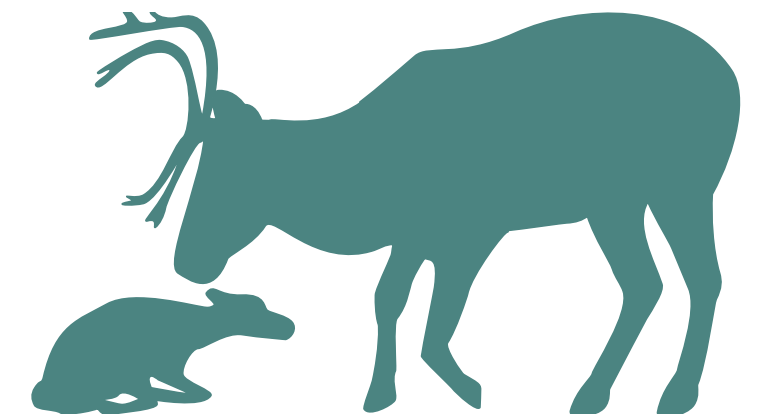
*Denotes presenter

- 4:00 **The path towards co-management - case of Medzih (boreal caribou) recovery in Northeast B.C.**
Michael Huck^{1*}, Katherine Wolfenden², Susan Leech³
¹ British Columbia Ministry of Land, Water, and Resource Stewardship; ² Fort Nelson First Nation; ³ Fort Nelson First Nation - Firelight Group
- 4:20 **Overview of habitat-based offsets for caribou in British Columbia - successes and opportunities**
Gregory Sharam^{1*}, Jessica Lowey¹
¹ ERM Canada
- 4:40 **Reconciling boreal caribou conservation with sustainable forestry practices using systematic conservation planning**
Pierre-Alexandre Labranche^{1*}, Monique Poulin², Jérôme Cimon-Morin¹
¹ Wood and Forest Sciences Dept., Université Laval, Centre for Forest Research; ² Phytology Dept., Université Laval, Québec Centre for Biodiversity Science

Population Ecology I

3:20 - 5:00pm | *Aft Deck*

- 3:20 **Environmental and demographic drivers of a rapidly growing sub-Arctic moose population**
Vassily Zavoico^{1*}, Joseph Eisaguirre², Shawn Crimmins³, Christa Mulder⁴, Andrew Aderman⁵, Graham Frye⁶, McCrea Cobb⁷, Mark Lindberg⁴
¹ University of Alaska; ² U.S. Geological Survey; ³ Alaska Cooperative Fish and Wildlife Research Unit; ⁴ University of Alaska Fairbanks; ⁵ Togiak National Wildlife Refuge; ⁶ Alaska Dept. of Fish and Game; ⁷ U.S. Fish and Wildlife Service
- 3:40 **Seasonal and spatial variation in climate change impacts on wild Svalbard reindeer, with implications for community dynamics**
Mathilde Le Moullec^{1*}, Brage B. Hansen²
¹ Center for Biodiversity Dynamics, Dept. of Biology, Norwegian University of Science and Technology; ² Dept. of Terrestrial Ecology, Norwegian Institute for Nature Research/Center for Biodiversity Dynamics, Dept. of Biology, Norwegian University of Science and Technology
- 4:00 **Patterns of growth and survival of male caribou, Denali National Park and Preserve, Alaska**
Layne Adams^{1*}
¹ U.S. Geological Survey, Alaska Science Center
- 4:20 **Assessing the influence of environmental factors on Arctic caribou reproduction**
Matthew Cameron^{1*}, Kyle Joly¹, Greg Breed², D. Alexander Hansen³, Knut Kielland²
¹ National Park Service; ² Dept. of Biology and Wildlife, University of Alaska Fairbanks; ³ Alaska Dept. of Fish and Game



4:40 **Differential impacts of environmental conditions and movement behavior on Arctic ungulate survival across seasons**

Eliezer Gurarie¹, Kyle Joly², Ophélie Courriot¹, Chloe Beaupré^{1*}, D. Alexander Hansen³, Matthew Cameron²

¹ State University of New York, College of Environmental Science and Forestry; ² National Park Service, Arctic Inventory and Monitoring Program, Gates of the Arctic National Park and Preserve; ³ Alaska Dept. of Fish and Game, Division of Wildlife Conservation

Quantifying Habitat / Habitat Management II

3:20 - 5:00pm | Endeavor

3:20 **Long-term vegetation monitoring of Western Arctic Caribou Herd winter range, Alaska**

Aliza DuComb^{1*}, Matthew Carlson², Justin Fulkerson^{2,3}

¹ Bureau of Land Management; ² Alaska Center for Conservation Science, University of Alaska Anchorage; ³ University of Alaska Anchorage Herbarium

3:40 **Integrating forestry, conservation areas, and caribou range planning in northeast Alberta**

Tom Habib^{1*}, Lindsay McBlane², Sandra Cardinal¹, Ryan Cheng³, Jordan Dyck¹, Elston Dzus¹, Troy Hegel⁴, Kris McCleary⁵, Matthew Smith⁶, Kiera Stewart-Shepherd¹, Kecia Kerr⁴

¹ Alberta-Pacific Forest Industries Inc; ² Ducks Unlimited Canada; ³ Canadian Parks and Wilderness Society - Northern Alberta Chapter; ⁴ Alberta Environment and Protected Areas; ⁵ Kris McCleary Consulting; ⁶ Verlo Spatial Services

4:00 **Terrestrial lichen caribou forage transplant success: Year 5 and 6 results**

Sean Rapai^{1*}

¹ Chu Cho Environmental

4:20 **Alternative harvesting and silvicultural approaches for caribou habitat**

Joshua Killeen¹, Casi Bouchie¹, Bob Christian^{1*}, Ted Gooding¹

¹ FORCORP Solutions

4:40 **Nunivak Island Then and Now; a review of 10 permanent vegetation monitoring locations through the last 32 years on this Bering Sea Island, home to herds of muskoxen and reindeer**

Karin Sonnen^{1*}

¹ United States Dept. of Agriculture - Natural Resources Conservation Service

*Denotes presenter

Tracking Collars for Caribou

All Telonics collars are built to order and customized for specific species and projects. Telonics can currently provide GPS/Globalstar RECON or GPS/Iridium collars for caribou. VHF circuitry is included in all satellite-linked systems; thus allowing tracking from the ground or aircraft if desired.



GPS/Iridium (Two-Way Systems)

Model	Housing Dimensions L x W x H (in, cm)	Housing Weight (g)	Estimated Weight with Collar (g)	GPS Schedule	Operational Life (years)
					VHF 4 hr/day
TGW-4570-4	2.8 x 2.0 x 1.5	260	~500 - 880	4/day	5.1
TGW-4577-4	7.3 x 5.1 x 3.7			6/day	4.1
				12/day	2.6
TGW-4670-4	3.5 x 2.7 x 2.3	590	~900 - 1500	4 GPS/day	10+
TGW-4677-4	8.9 x 6.9 x 5.9			6 GPS/day	10+
				12 GPS/day	7

Operational life estimates for these units assume temperatures of 0°C, VHF pulse period of 1500 msec (40 beats per minute), and Iridium transmitting every other day.

GPS/Globalstar RECON (One-Way Systems)

Model	Housing Dimensions L x W x H (in, cm)	Housing Weight (g)	Estimated Weight with Collar (g)	Battery Life (years) with daily Globalstar transmission, and...	
				GPS schedule	VHF 8 hr/day
RECON-4560-4	2.8 x 2.0 x 1.5 7.1 x 5.1 x 3.8	~250	366 - 700	3 GPS/day	0.8
				4 GPS/day	0.7
RECON-4660-4	3.0 x 2.7 x 1.9 7.6 x 6.9 x 4.8	~450	800 - 1000	4 GPS/day	7
				6 GPS/day	6
TGW-4560-4	2.8 x 2.0 x 1.5 7.1 x 5.1 x 3.8	~250	366 - 700	4 GPS/day	3.5
				6 GPS/day	3
TGW-4660-4	3.0 x 2.7 x 1.9 7.6 x 6.9 x 4.8	~450	~800 - 1000	4 GPS/day	7
				6 GPS/day	6

Operational life estimates assume temperatures of 0°C, VHF pulse period of 1500 msec (40 beats per minute), and average time to GPS fix as 75 seconds.



ANNOUNCEMENTS

8:30 - 8:40am | *Fore Deck*

PLENARY

Caribou Crossing: Collaborative Caribou Stewardship in a Changing Arctic

Vern Cleveland, Sr.¹, Naungaq Cyrus Harris¹, Karen Linnell², Dan Dunaway³, Joe Tetlichich⁴, Deana Lemke⁴, Earl Evans⁵, Jody Pellissey⁶, Henry Huntington⁷

¹Western Arctic Caribou Herd Working Group; ²Ahtna Intertribal Resource Commission; ³Bristol Bay Regional Advisory Council; ⁴Porcupine Caribou Management Board; ⁵Beverly and Qamanirjuaq Caribou Management Board; ⁶Wek'èezhì Renewable Resources Board; ⁷Moderator

8:40 - 10:00am | *Fore Deck*

CONCURRENT TALKS & SYMPOSIA

10:20am - 5:00pm

CLOSING CEREMONY & BANQUET

6:00 - 10:00pm | *Discovery Ballroom*

Join us as we wrap up the conference with a banquet, entertainment, and closing remarks. This will be a chance to enjoy the relationships we have built and reflect on all that we have learned, then dance the night away. The Qikiqtagruq Northern Lights Dancers from Kotzebue and Anchorage will share traditional songs and dances from Iñupiat culture. Tickets are required for banquet attendance. One ticket is provided with each Regular or Student registration.

PLENARY

Caribou Crossing: Collaborative Caribou Stewardship in a Changing Arctic

Vern Cleveland, Sr.¹, Naungaq Cyrus Harris¹, Karen Linnell², Dan Dunaway³, Joe Tetlichich⁴, Deana Lemke⁴, Earl Evans⁵, Jody Pellissey⁶, Henry Huntington⁷

¹Western Arctic Caribou Herd Working Group; ²Ahtna Intertribal Resource Commission; ³Bristol Bay Regional Advisory Council; ⁴Porcupine Caribou Management Board; ⁵Beverly and Qamanirjuaq Caribou Management Board; ⁶Wek'èezhì Renewable Resources Board; ⁷Moderator

8:40 - 10:00am | *Fore Deck*

This plenary panel will focus on collaborative management, co-stewardship, and Indigenous arrangements for taking care of caribou herds across Alaska and Canada. Discussion will examine challenges to conservation and subsistence and invite co-management “success stories.” How are Indigenous and local organizations, biologists, and managers working to overcome challenges to conservation, continuation of subsistence use, and inclusion of people who rely on caribou through collaborative or Indigenized arrangements? This panel will also consider harvest regulations and how they might better align with local and Indigenous paradigms and contribute to flexible management practices that are responsive to the increasing unpredictability of caribou populations due to climate change.



Vern Cleveland Sr. was born and raised in the Northwest Arctic Region of Alaska, specifically in the Upper Kobuk River village of Shungnak. He was raised by his parents and learned how to hunt and fish from an early age. Vern married into the community of Noorvik and has lived there for 35 years. He has served as a Council member on the Noorvik Native Community Tribal Council as well as Mayor of the City of Noorvik. Vern is the current Chair of the Western Arctic Caribou Herd Working Group and also serves on the Northwest Arctic Federal Subsistence Regional Advisory Council. Vern has been hunting caribou and moose throughout his life and feels there's a need to preserve their populations so that future generations can continue to provide these resources for their families.

Naungaq Cyrus Harris, Iñupiaq, Sisualik, Alaska: Cyrus Harris was raised at Sisualik by his parents and grandparents. He grew up following them around hunting, fishing and living off the land and continues to live at Sisualik (located on a spit of land 12 miles across the bay from Kotzebue) as much as possible, living a subsistence lifestyle. His passion is for raising and training sled dogs. He is the Natural Resource Advocate for Maniilaq Association which allows him to participate in many different forums like the Western Arctic Caribou Working Group (currently vice-chair) and the Alaska Migratory Bird Co-management Council representing the people of northwest Alaska. He manages the Hunter Support Program which funds people in the region to hunt for the Elders and he maintains the traditional foods program facility (the Sigluaq) which provides traditional foods to the Elders residing at Kotzebue's Long-Term Care facility. Currently, Cyrus serves on the Ice Seal Committee, the Alaska Beluga Whale Committee, and the Alaska Nannut Co-Management Council as the Native Village of Kotzebue representative. He has served on the Native Village of Kotzebue Tribal Council for the last 9 years.



Dan Dunaway was born and raised in Anchorage, Alaska. He obtained a Bachelor's Fisheries Science from UAF in 1977. Dan worked for ADFG seasonally on fishery field projects in Bristol Bay, Cook Inlet and Alaska Peninsula 1973-1979. He first joined ADFG as a full time assistant crab biologist in 1980 working in Unalaska and Sand Point. Since 1990 he has lived in Dillingham where he was the assistant Sport Fishery Biologist then from 1998 as Area Biologist until retirement in 2002. He has maintained his keen interest in fish and wildlife issues and currently serves as secretary on the Nushagak ADFG Advisory Committee over 15 years and on the Bristol Bay Federal Subsistence Advisory Council about 15 years. During his tenure on these advisory groups, Dan has helped develop moose and caribou regulations and management plans. Dan is married and has 2 adult sons, one in pilot training and the other fishes commercially. Dan grew up fishing and hunting and remains an avid subsistence and sport angler, hunter, sometimes trapper. One of his favorite activities is helping with an annual Fly Fishing and Guide Academy to help local youth learn about the business. He is also a Hunter Education instructor.



Earl Evans has lived and worked in the Fort Smith, Northwest Territories area his entire life. He has an extensive background in hunting and trapping and is working hard to keep alive many of the traditional ways by passing on knowledge to the young people of his region and beyond. He has represented the communities in the South Slave region (Northwest Territory Metis Nation, Fort Smith) on the Beverly and Qamanirjuaq Caribou Management Board (BQCMB) since 2003, and has served as the Chair of the BQCMB since 2012.

Henry Huntington lives in Eagle River, Alaska. His research includes documenting Indigenous knowledge of marine mammals, examining Inupiat and Inuit knowledge and use of sea ice, and assessing the impacts of climate change on Arctic communities. Huntington has been involved in several international research programs and is currently lead author of the Alaska chapter of the Fifth National Climate Assessment. He also works for Ocean Conservancy to promote evidence-based conservation of the Arctic marine environment. Huntington has made long trips in the Arctic by dog team, small boat, and snowmobile.



Deana Lemke has lived in Whitehorse, Yukon since 1979. She has served as the Executive Director of the Porcupine Caribou Management Board since 2003. With a background in administrative and program support and financial management for various First Nation, government, and non-government organizations, she has operated her business (Beyond Words Business Services Inc.) in Yukon since 1993. Deana holds an Adult Instructor Diploma and is a certified boards and committees trainer. She has a keen interest in supporting co-management and developing effective collaborative networks among government and northern communities built on meaningful and respectful stakeholder engagement. She has been involved in the development and implementation of several management plans and coordinated various projects focused on integrating science and Indigenous knowledge related to the Porcupine Caribou herd.

Karen Linnell is the Executive Director for the Ahtna Intertribal Resource Commission (AITRC). Ms. Linnell has been involved with AITRC since its inception and has served as chair from 2011-2015 and brings more than 18 years of experience in project management and cost control. Having worked in Ahtna's land department and served as Land Committee Chair, Ms. Linnell has been actively participating in resource management and protecting customary and traditional hunting and fishing rights for many years. Ms. Linnell was appointed by the Secretary of Interior to the Wrangell-St. Elias Subsistence Resource Commission and has served from 2011-2017. She has served as an officer to the Copper Basin Fish and Game Advisory Committee from 2008-2016 and 2021-Present. Ms. Linnell has served on Alaska Governor Bill Walker's Transition Team as the Chair of the Wildlife Committee and has served Alaska Board of Game 2016-2019 and the Governor's Tribal Advisory Committee Natural Resources subcommittee 2017-2018. Ms. Linnell currently serves as Co-Chair to the Western Region-Tribal Conservation Advisory Committee and as an Alaskan Representative to the Tribal Interior Budget Committee.



Jody Pellissey has worked as the executive director for the Wek'èezhì Renewable Resources Board (2010 to present) and the Sahtu Renewable Resources Board (1999 – 2009). As a part of this co-management work, Jody has helped develop and implement caribou range plans and caribou management plans with the Advisory Committee for the Cooperation of Wildlife Management and the Bathurst Caribou Advisory Group.

Joe Tetlich has served as the Chair of the Porcupine Caribou Management Board (PCMB) since his appointment in 1995. He was born at his family's traditional camp on the Peel River 75 kilometers upstream from Fort McPherson, Northwest Territories. After 12 years in residential school, Joe decided to spend some time out on the land to reconnect with his parents, living a traditional subsistence way of life. Twenty years later, he decided to move back into the community. He served as Chair of the Tetlit Gwich'in Renewable Resource Council and Chief of the Tetlit Gwich'in First Nation in the Northwest Territories.

Joe moved to Old Crow, Yukon, in 1995 and lived there with his wife and two sons until 2008. He presently lives in Whitehorse, Yukon but shares his time between Old Crow and Fort McPherson as well.

As Chair of the PCMB, Joe has traveled extensively to share the PCMB's co-management experience with other groups and organizations that may be struggling with similar challenges and situations. The Board continues to seek ways of complementing the wealth of science-based knowledge with more local and traditional knowledge, with the goal of making balanced, informed decisions and building positive, enduring relationships among governments and community stakeholders. Joe also has served as a member of the International Porcupine Caribou Board since 1995.



SYMPOSIA

Health Ecology of Ungulates / Traditional and Indigenous Knowledge in Monitoring Ungulate Health

Organizers: Eleanor Dickinson¹, Olivia Hee¹, Javier Fernandez Aguilar¹, Benjamin Padilla¹, Fabien Mavrot¹, Andrea Hanke¹, and Susan Kutz¹

¹University of Calgary

10:20am - 3:00pm | *Aft Deck*

This symposium will underscore the importance of wildlife health in the ecology, management, and conservation of Arctic ungulates, and will cover three main topics: 1) highlighting research bridging ecology and health (e.g., parasites, disease, nutrition) in Arctic ungulates, 2) novel approaches, methods, and tools in wildlife health ecology research, and 3) how Traditional, Indigenous, and Local Knowledge can provide valuable insight to improve monitoring and management of wildlife health. Contributed and invited presentations will discuss research at the cutting edge of ungulate health in the Arctic and sub-Arctic with a focus on action-oriented work on topics ranging from methodological innovations and demographic impacts of disease to Indigenous led monitoring programs and One Health. The symposium will conclude with a panel discussion including select speakers focusing on Indigenous knowledge and Arctic ungulate health ecology.

A Framework for Monitoring Genetic Composition and Diversity in *Rangifer*

Organizer: Micheline Manseau¹

¹Government of Canada

1:00 - 3:00pm | *Adventure*

The aim of this session is to facilitate a discussion among those involved in caribou genetic research. Large genetic/genomic datasets have been generated for *Rangifer* over the last decade, and this session will help advance the development of a comprehensive framework to measure genetic diversity for *Rangifer*, support the integration of genetic data/results in management and monitoring, assess threats across the range and inform planning activities and policies. The presenters will share their experience with different genetic data used in the assessment of genetic diversity, the suite and complementarity of diversity metrics, the availability of analytical pipelines and data management framework. We will also explore linkages between genetic diversity in caribou and Indigenous expert knowledge.

Ungulate Management in Alaska

Organizer: Lisa Grediagin¹

¹Office of Subsistence Management

3:20 - 5:00pm | *Quarter Deck*

This session is intended as a neutral forum for interested parties to discuss ungulate (i.e., caribou, moose, and other ungulates) management in Alaska, specifically regarding harvest regulations. The format will be a facilitated discussion where participation by all attendees is encouraged. Specific topics will address common management concerns across Alaska such as harvest reporting, habitat changes, or hunter ethics.

CONCURRENT TALKS & SYMPOSIA: SCHEDULE (MORNING)

	<i>Fore Deck</i>	<i>Mid Deck</i>	<i>Aft Deck</i>	<i>Endeavor</i>	<i>Adventure</i>
Session	Co-management & Local Knowledge	Management & Conservation	<i>Symposium: Health Ecology</i>	Recovery Planning II	Reindeer Pastoralism & Husbandry
10:20am	Achieving breakthroughs: How governance systems support consensus building and collaboration in multi-stakeholder conservation organizations (Kristy Burke)	A controversial tool for conservation — challenges when planning a fence to prevent hybridization between wild and domesticated reindeer (Johannes Jokitalo)	Hair element profiles as an indicator of muskox population trends (Susan Kutz)	Effectiveness of interim recovery measures for threatened southern mountain caribou (Clayton Lamb)	The ethnoarchaeology of reindeer castration and its place in current and ancient Fennoscandian reindeer (<i>Rangifer tarandus tarandus</i>) herding communities (Mathilde van den Berg)
10:40am	Beyond conservation: A toolkit for respectful collaboration with Indigenous Peoples (Kristin Clark)	A Finnish wild forest reindeer reintroduction project reaches important milestone - two new herds have been created (Milla Niemi)	Hair Cortisol as a health monitoring tool in two herds of barren-ground caribou (Filip Rakic)	Frameworks for prioritizing recovery among subpopulations and prioritizing habitat restoration within subpopulations (Michelle Mclellan)	Reindeer husbandry and Global Environmental Change: book presentation (Tim Horstkotte)
11:00am	First Nation, ENGO, government and industry joint initiative provides results in the management of the transboundary habitat of Detour-Kesagami boreal caribou, Canada (Marie-Eve Sigouin)	Physical and political boundaries are threatening survival of the last European wild reindeer (Vemund Jaren)	The potential role of parasites in dramatic declines of barren-ground caribou (Benjamin Padilla)	A missed opportunity: How the “wait-and-see attitude” has led to the abandonment of several boreal populations of woodland caribou (Martin-Hugues St-Laurent)	Economic-ecological system analysis of reindeer husbandry, supplementary feeding, and the costs of difficult winter conditions (Antti-Juhani Pekkarinen)
11:20am	First Nations in Québec working towards caribou and moose management and conservation on their traditional territories (Jacinthe Gosselin)	The evolution of ungulate management through the Umbrella Final Agreement (Graham Van Tighem)	Bridging Indigenous and Western knowledge systems to support collaborative moose ecology research (Kathryn Yarchuk)	Woodland caribou in the Yukon: The status and threats to herds (Sebastian Jones)	Being with reindeer on the Iamal Peninsula in Arctic Siberia (Tatiana Nomokonova)

CONCURRENT TALKS & SYMPOSIA: SCHEDULE (EARLY AFTERNOON)

	<i>Fore Deck</i>	<i>Mid Deck</i>	<i>Aft Deck</i>	<i>Endeavor</i>	<i>Adventure</i>
Session	Co-management & Local Knowledge	New Methods & Technology	<i>Symposium: Health Ecology</i>	Behavioral Responses to Development	<i>Symposium: Genetics</i>
1:00pm	Collaborative research and monitoring for the eastern migratory Cape Churchill caribou population: Linking Wapusk National Park and an Indigenous Protected and Conserved Area (Russell Turner)	Using auditory recording units to monitor insect activity and infer harassment intensity (Megan Perra)	Changing indices of nutrition, productivity, and survival in a migratory caribou herd through a peak in population size (Torsten Bentzen)	Local weather and anthropogenic disturbances result in synergistic effects for habitat selection of boreal caribou across an extensive climate gradient (Éloïse Lessard)	Intra-specific diversity in caribou: A status assessment and monitoring approach using whole genome analysis (Rebecca Taylor)
1:20pm	Collaborative implementation of the Intergovernmental Caribou Partnership Agreement for Central Group of Southern Mountain Caribou in British Columbia (Joelle Ward and Naomi Owens-Beek)	Modelling reindeer rut behaviour using animal-borne acoustic recorders and deep learning (Alexander Boucher)	Guide-outfitter knowledge and ecological stewardship support caribou health surveillance (Naima Jutha)	Effects of vehicle traffic on space use and road crossings of caribou in the Arctic (John Severson)	Resolving the historical population demography of caribou with genomic data (Daria Martchenko)
1:40pm	Aklavik community perspectives and knowledge of umingmak/dachan tat gwi'aak'ii (Muskoxen) on the Yukon North Slope (Kate Curtis)	Opportunities and challenges of using camera traps to monitor Arctic wildlife (Scott Leorna)	Wildlife disease management and community resilience: The case of chronic wasting disease in Norwegian wild reindeer (Kathleen Epstein)	Behavioural and physiological responses of barren-ground caribou to an industrial winter road in the central Northwest Territories (Angus Smith)	Ecological genomics applied to caribou conservation in western Canada (Maria Cavedon)
2:00pm	Co management in crisis. How Norway responded to chronic wasting disease in wild reindeer (Marianne Singsaas)	Caribou community dynamics through the lens of camera trap surveys (Cole Burton)	Traditional Knowledge collection for wildlife health surveillance, a case study in a declining muskox population in the Canadian Arctic (Fabien Mavrot)	Caribou distribution and movements along a roadless elevated pipeline in northern Alaska (Alexander Prichard)	The <i>Rangifer tarandus</i> SNP Chip: Design, validation and recent uses for population conservation (Joëlle Taillon)
2:20pm	Ekwò Nàxoèhdee K'è: Watching caribou with 'boots on the ground' (Joe Zoe)	GPS video collars prove a powerful tool for collecting caribou data (Gabrielle Coulombe)	Assessing the patterns of abnormally high dental fracturing in muskoxen from the Canadian Arctic (Erica Suito)	The old and the (re)new(able): Cumulative impacts of mines and wind turbines on habitat and calving site-selection of semi-domesticated reindeer (<i>Rangifer tarandus</i>) in Sweden (Léonie Duris)	Níó Nę P'ęné - Trails of the Mountain Caribou: A biocultural approach to understanding and conserving diversity (Leon Andrew)
2:40pm	Caribou as Curiosity - 50 years of tuttu tourism along the Alatna River in Gates of the Arctic National Park (John Gaedeke)	Leveraging community-based samples to determine muskox pregnancy status in the Canadian Arctic (Olivia Hee)	Health Ecology Q&A	Caribou distribution and movements relative to recently constructed and proposed infrastructure at two scales in the National Petroleum Reserve-Alaska (Joseph Welch)	The adoption of genetic measures in conservation: An assessment of different methods of analysis to report on trend, connectivity and diversity using a national boreal woodland caribou dataset (Micheline Manseau)
3:00-3:20pm	<i>Snack Break</i>				



K. Joly

CONCURRENT TALKS & SYMPOSIA: SCHEDULE (LATE AFTERNOON)

	<i>Endeavor</i>	<i>Adventure</i>	<i>Quarter Deck</i>
Session	Population Ecology II	Resource Development	<i>Symposium: Ungulate Management in Alaska</i>
3:20pm	Monitoring and management of an expanding introduced muskox population in northern Québec, Canada (Joëlle Taillon)	Past climate change alone cannot explain boreal caribou range recession in Québec since 1850 (Chloé Morineau)	Ungulate Management in Alaska
3:40pm	Demographic profile of a rapidly growing muskox population in southeast Northwest Territories, Canada (Jan Adamczewski)	Caribou monitoring and subsistence harvest patterns on Alaska's North Slope: Influencing oilfield design and mitigations (Christina Pohl)	
4:00pm	Assessing variability, trends and status of wild reindeer populations: The importance of long-term annual monitoring (Brage Bremset Hansen)	Habitat disturbance as a necessary and sufficient cause of caribou decline (Steven Wilson)	
4:20pm	Status and management of the Nushagak Peninsula Caribou Herd, Alaska, 1988-2022 (Andrew Aderman)	Caribou habitat and Federal pipeline oversight in Canada (Dylan Adderley)	
4:40pm	Status of woodland caribou critical calving habitat in the traditional territory of the Cree First Nation of Waswanipi (Xavier Giroux-Bougard and Eliane Grant)	Barren-ground caribou behaviour around Arctic roads: a novel approach to behaviour monitoring (Nina Morrell)	

THURSDAY | 11 MAY

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CONCURRENT TALKS & SYMPOSIA: DETAILS

Co-management and Local Knowledge

10:20am - 3:00pm | Fore Deck

10:20 Achieving breakthroughs: How governance systems support consensus building and collaboration in multi-stakeholder conservation organizations

Matthew Pyper^{1*}, Kristy Burke¹, Matthew Dance²

¹ Fuse Consulting Ltd; ² Matthew Dance Consulting

10:40 Beyond conservation: A toolkit for respectful collaboration with Indigenous Peoples

Kristin Clark^{1*}, Amanda Sheedy², Indigenous Knowledge Circle of the NBCKC³

¹ Landscape Science and Technology Division, Science and Technology Branch, Environment and Climate Change Canada; ² Sheedy Consulting; ³ National Boreal Caribou Knowledge Consortium

11:00 First Nation, ENGO, government and industry joint initiative provides results in the management of the transboundary habitat of Detour-Kesagami boreal caribou, Canada

Marie-Eve Sigouin^{1*}, Benoit Croteau², Pier-Olivier Boudreault³, Annie Claude Bélisle²

¹ GreenFirst Forest Products; ² Conseil de la Première Nation Abitibiwinini; ³ Société pour la nature et les parcs, Québec

11:20 First Nations in Québec working towards caribou and moose management and conservation on their traditional territories

Jacinthe Gosselin^{1*}, Raphaële Piché¹

¹ First Nations of Québec and Labrador Sustainable Development Institute

1:00 Collaborative research and monitoring for the eastern migratory Cape Churchill caribou population: Linking Wapusk National Park and an Indigenous Protected and Conserved Area

Russell Turner^{1*}, Ryan Brook², Connor Staub³, Riley Bartel⁴, Jessica Lagimodiere⁵, Matthew Webb⁶

¹ Parks Canada - Wapusk National Park; ² Indigenous Land Management Institute & Dept. of Animal and Poultry Science, University of Saskatchewan; ³ Resource Management Coordinator, Energy, Infrastructure and Resource Management, Manitoba Métis Federation; ⁴ Conservation Coordinator, Energy, Infrastructure and Resource Management, Manitoba Métis Federation; ⁵ Métis Land Use Specialist, Energy, Infrastructure & Resource Management, Manitoba Métis Federation; ⁶ Wapusk National Park - Parks Canada

1:20 Collaborative implementation of the Intergovernmental Caribou Partnership Agreement for Central Group of Southern Mountain Caribou in British Columbia

Joelle Ward^{1*}, Tamara Dokkie², Joshua Lam³, James Hickling⁴, Lucy Reiss⁵

¹ Habitat Team Lead - BC Provincial Caribou Recovery Program, Water, Land and Resource Stewardship; ² Land Use Manager, West Moberly First Nations; ³ Managing Partner, Sage Legal LLP; ⁴ Founder, Hickling Harrison Law; ⁵ Senior Terrestrial Habitat Planner, Environment and Climate Change Canada, Canadian Wildlife Service, Pacific Region

Co-presenter: Naomi Owens-Beek^{*} Treaty Rights and Environmental Protection Manager for the Sauleau First Nation

1:40 Aklavik community perspectives and knowledge of umingmak/dachan tat gwi'aak'ii (Muskoxen) on the Yukon North Slope

Aklavik Hunters and Trappers Committee¹, Ehdiitat Renewable Resource Council², Kate Curtis^{3*}, Trevor Lantz³, Michael Suitor⁴, Jessi Pascal⁵

¹ Aklavik Hunters and Trappers Committee; ² Ehdiitat Renewable Resource Council; ³ University of Victoria;

⁴ Government of Yukon; ⁵ Wildlife Management Advisory Council (North Slope)

2:00 Co management in crisis: How Norway responded to chronic wasting disease in wild reindeer

Marianne Singsaas^{1*}, Kathleen Epstein²

¹ Telemark Research Institution, Norway; ² Cornell University

2:20 Ekwò Nàxoèhdee K'è: watching caribou with 'boots on the ground'

Petter Jacobsen¹, Tyanna Steinwand¹, Joe Zoe^{1*}

¹ Th̄chq̄ Government

2:40 Caribou as Curiosity - 50 years of tuttu tourism along the Alatna River in Gates of the Arctic National Park

John Gaedeke^{1*}

¹ Independent

Management and Conservation

10:20 - 11:40am | Mid Deck

10:20 A controversial tool for conservation — challenges when planning a fence to prevent hybridization between wild and domesticated reindeer

Johannes Jokitalo^{1*}, Pekka Kilpeläinen¹, Milla Niemi¹

¹ Metsähallitus Wildlife Service Finland

10:40 A Finnish wild forest reindeer reintroduction project reaches important milestone - two new herds have been created

Milla Niemi^{1*}, Sakari Mykrä-Pohja¹

¹ Metsähallitus Wildlife Service Finland

11:00 Physical and political boundaries are threatening survival of the last European wild reindeer

Vemund Jaren^{1*}, Olav Strand², Christer Moe Rolandsen²

¹ Norwegian Environment Agency; ² Norwegian Institute for Nature Research

11:20 The evolution of ungulate management through the Umbrella Final Agreement

Graham Van Tighem^{1*}

¹ The Yukon Fish and Wildlife Management Board

Symposium: Health Ecology of Ungulates

10:20am - 3:00pm | Aft Deck

10:20 Hair element profiles as an indicator of muskox population trends

Jesper Bruun Mosbacher¹, Eleanor Dickinson¹, Colleen Arnison², Kimberlee Beckmen³, Steeve Côté⁴, Juliette Di Francesco¹, Sofia Veronica Hansson⁵, Elham Zeini Jahromi⁶, David Kinniburgh⁶, Gaël Le Roux⁵, Lisa-Marie Leclerc⁷, Fabien Mavrot¹, Niels Martin Schmidt⁸, Michael Suitor⁹, Joëlle Taillon¹⁰, Matilde Tomaselli¹¹, Susan Kutz^{1*}

¹ Department of Ecosystem and Public Health, Faculty of Veterinary Medicine, University of Calgary; ² Parks Canada; ³ Alaska Dept. of Fish and Game; ⁴ Caribou Ungava, Département de biologie & Centre d'études Nordiques, Université Laval; ⁵ ECOLAB, Université de Toulouse, France; Université Laval; ⁶ Alberta Centre for Toxicology, University of Calgary; ⁷ Dept. of Environment, Government of Nunavut; ⁸ Arctic Research Centre, Department of Bioscience, Aarhus University, Denmark; ⁹ Fish and Wildlife Environment Yukon; ¹⁰ Service de la gestion des espèces et des habitats terrestres, Ministère des Forêts, de la Faune et des Parcs; ¹¹ Polar Knowledge Canada, Canadian High Arctic Research Station

*Denotes presenter

10:40 **Hair cortisol as a health monitoring tool in two herds of barren-ground caribou**

Filip Rakic^{1*}, Xavier Fernandez Aguilar¹, Mathieu Pruvot¹, Douglas Whiteside¹, Gabriela Mastromonaco Gabriel², Leclerc Lisa-Marie³, Naima Jutha⁴, Susan Kutz¹

¹ University of Calgary; ² The Toronto Zoo; ³ The Government of Nunavut; ⁴ The Government of the Northwest Territories

11:00 **The potential role of parasites in dramatic declines of barren-ground caribou**

Benjamin Padilla^{1*}, Mathieu Pruvot¹, Ale Aleuy², Naima Jutha³, Petter Jacobsen⁴, Joe Zoe⁴, Susan Kutz¹

¹ University of Calgary Faculty of Veterinary Medicine; ² University of California - Santa Barbara; ³ Government Northwest Territories; ⁴ Tlicho Government

11:20 **Bridging Indigenous and Western knowledge systems to support collaborative moose ecology research**

Kathryn Yarchuk^{1*}, Allyson Menzies¹, Nadine Perron², Joseph Northrup³, Claire Kemp¹, Jesse Popp¹

¹ University of Guelph; ² Magnetawan First Nation; ⁴ Ontario Ministry of Northern Development, Mines, Natural Resources and Forestry

1:00 **Changing indices of nutrition, productivity, and survival in a migratory caribou herd through a peak in population size**

Torsten Bentzen^{1*}, Jeff Gross², Jeff Wells², Michael Suitor³, Jim Herriges⁴

¹ Alaska Dept. of Fish and Game, Division of Wildlife Conservation; ² Alaska Dept. of Fish and Game; ³ Dept. of Environment, Government of Yukon; ⁴ Bureau of Land Management

1:20 **Guide-outfitter knowledge and ecological stewardship support caribou health surveillance**

Naima Jutha^{1*}, Tahltan Guide and Outfitters Association², Helen Schwantje³, Craig Gerlach⁴, Claire Jardine¹, Susan Kutz⁵

¹ Dept. of Pathobiology - Ontario Veterinary College, University of Guelph; ² Tahltan Guide and Outfitters Association, Dease Lake, BC; ³ Emeritus, Government of British Columbia, Ministry of Forests, Lands, Natural Resource Operations, and Rural Development - Wildlife and Habitat Branch; ⁴ Dept. of Architecture, Planning, and Landscape, University of Calgary; ⁵ Dept. of Ecosystem and Public Health - Faculty of Veterinary Medicine, University of Calgary

1:40 **Wildlife disease management and community resilience: The case of chronic wasting disease in Norwegian wild reindeer**

Kathleen Epstein^{1*}, Marianne Singsaas²

¹ Cornell University; ² Telemark Institute

2:00 **Traditional Knowledge collection for wildlife health surveillance, a case study in a declining muskox population in the Canadian Arctic**

Fabien Mavrot^{1*}, Olokhaktomiut Hunters and Trappers Committee², Stephanie Peacock³, Susan Kutz¹

¹ Faculty of Veterinary Medicine, University of Calgary; ² Community of Ulukhaktok, Northwest Territories, Canada; ³ Pacific Salmon Foundation, British Columbia, Canada

2:20 **Assessing the patterns of abnormally high dental fracturing in muskoxen from the Canadian Arctic**

Erica Suitor^{1*}, Fabien Mavrot¹, Mathieu Pruvot¹, Eleanor Dickinson¹, Lisa-Marie Leclerc², Beverly Maksagak³, Amanda Dumond⁴, Bessie Inuktalik⁵, Susan Kutz²

¹ University of Calgary; ² Government of Nunavut; ³ Ekaluktutiak Hunters & Trappers Organization; ⁴ Kugluktuk Angoniatit Association; ⁵ Olokhaktomiut Hunters & Trappers Committee

Recovery Planning and Implementation II

10:20 - 11:40am | *Endeavor*

10:20 **Effectiveness of interim recovery measures for threatened southern mountain caribou**

Clayton Lamb^{1*}, Robert Serrouya¹

¹ Biodiversity Pathways

10:40 **Frameworks for prioritizing recovery among subpopulations and prioritizing habitat restoration within subpopulations**

Michelle McLellan^{1*}, Melanie Dickie¹, Rob Serrouya², Stan Boutin³, Marcus Becker⁴, Bevan Ernst⁵, Darcy Peel⁵, Kathryn Zimmerman⁵, Robert Serrouya¹, Carline Bamfylde⁶, Michael Cody⁷, Kendal Benesh⁸, Mandy Kellner⁹

¹ Wildlife Science Centre, Biodiversity Pathways, Dept. of Biology, University of British; ² Alberta-Pacific Forest Industries Inc; ³ Dept. of Biological Science, University of Alberta; ⁴ Alberta Biodiversity Monitoring Institute, University of Alberta; ⁵ B.C. Ministry of Water, Land and Resource Stewardship; ⁶ Biomath; ⁷ Cenovus Energy; ⁸ Independent Contractor; ⁹ Kingbird Biological Consultants Ltd

11:00 **A missed opportunity: How the “wait-and-see attitude” has led to the abandonment of several boreal populations of woodland caribou**

Martin-Hugues St-Laurent^{1*}

¹ Université du Québec à Rimouski

11:20 **Woodland caribou in the Yukon: The status and threats to herds**

Sebastian Jones^{1*}, Kirsten Reid¹

¹ Yukon Conservation Society



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Reindeer Pastoralism and Husbandry

10:20 - 11:40am | *Adventure*

10:20 **The ethnoarchaeology of reindeer castration and its place in current and ancient Fennoscandian reindeer (*Rangifer tarandus tarandus*) herding communities**

Mathilde van den Berg^{1*}

¹ University of Oulu, Finland

10:40 **Reindeer husbandry and Global Environmental Change: book presentation**

Tim Horstkotte^{1*}, Øystein Holand², Jouko Kumpula³, Jon Moen¹, Anna Skarin⁴

¹ Dept. of Ecology and Environmental Science, Umeå University, Sweden; ² Dept. of Animal and Aquacultural Sciences, Norwegian University of Life Sciences; ³ Natural Resources Institute Finland; ⁴ Dept. of Animal Nutrition and Management, Swedish University of Agricultural Sciences

11:00 **Economic-ecological system analysis of reindeer husbandry, supplementary feeding, and the costs of difficult winter conditions**

Antti-Juhani Pekkarinen^{1*}, Jouko Kumpula¹, Sirpa Rasmus², Olli Tahvonen³

¹ Natural Resources Institute Finland; ² Arctic Centre, University of Lapland; ³ University of Helsinki

11:20 **Being with reindeer on the Iamal Peninsula in Arctic Siberia**

Tatiana Nomokonova^{1*}, Robert Losey², Stella Razdymakha³, Andrei Plekhanov³, Andrei Gusev³

¹ University of Saskatchewan; ² University of Alberta; ³ Arctic Research Center, Russian Federation

New Methods and Technology

1:00 - 3:00pm | *Mid Deck*

1:00 **Using auditory recording units to monitor insect activity and infer harassment intensity**

Megan Perra^{1*}, Shawn Crimmins², Ophélie Couriot¹, Todd Brinkman², Liston Glen³, Adele Reinking³, Çoban Enis⁴, Michael Mandel⁴, Natalie Boelman⁵, Eliezer Gurarie¹

¹ State University of New York - College of Environmental Science and Forestry; ² University of Alaska Fairbanks; ³ Colorado State University; ⁴ City University of New York; ⁵ Columbia University

1:20 **Modelling reindeer rut behaviour using animal-borne acoustic recorders and deep learning**

Alexander Boucher^{1*}, Robert Weladji¹, Øystein Holand², Jouko Kumpula³

¹ Concordia University; ² Norwegian University of Life Sciences; ³ Natural Resources Institute of Finland

1:40 **Opportunities and challenges of using camera traps to monitor Arctic wildlife**

Scott Leorna^{1*}, Todd Brinkman¹

¹ University of Alaska Fairbanks, Institute of Arctic Biology

2:00 **Caribou community dynamics through the lens of camera trap surveys**

Cole Burton^{1*}, Christopher Beirne¹, Catherine Sun¹

¹ University of British Columbia

2:20 **GPS video collars prove a powerful tool for collecting caribou data**

Gabrielle Coulombe^{1*}, Heather Johnson¹, Michael Sutor², Martin Kienzler²

¹ U.S. Geological Survey, Alaska Science Center; ² Yukon Government, Dept. of Environment

2:40 **Leveraging community-based samples to determine muskox pregnancy status in the Canadian Arctic**

Olivia Hee^{1*}, Fabien Mavrot¹, Eleanor Dickinson¹, Amanda Dumond², Bessie Inuktalik³, Beverly Maksagak⁴, Lisa-Marie Leclerc⁵, John Blake⁶, Susan Kutz¹

¹ University of Calgary; ² Kugluktuk Angoniatit Association; ³ Olokhtomiut Hunters and Trappers Committee;

⁴ Ekaluktutiak Hunters and Trappers Organization; ⁵ Government of Nunavut; ⁶ University of Alaska Fairbanks

Behavioral Responses to Development

1:00 - 3:00pm | *Endeavor*

1:00 **Local weather and anthropogenic disturbances result in synergistic effects for habitat selection of boreal caribou across an extensive climate gradient**

Éloïse Lessard^{1*}, Martin-Hugues St-Laurent¹, Chris Johnson²

¹ Université du Québec à Rimouski; ² University of Northern British Columbia

1:20 **Effects of vehicle traffic on space use and road crossings of caribou in the Arctic**

John Severson^{1*}, Heather Johnson¹, Timothy Vosburgh²

¹ U.S. Geological Survey, Alaska Science Center; ² Bureau of Land Management, Arctic District Office

1:40 **Behavioural and physiological responses of barren-ground caribou to an industrial winter road in the central Northwest Territories**

Angus Smith^{1*}, Chris Johnson¹, Karin Clark²

¹ University of Northern British Columbia; ² Wildlife Division, Government of the Northwest Territories

2:00 **Caribou distribution and movements along a roadless elevated pipeline in northern Alaska**

Alexander Prichard^{1*}, Elizabeth Lenart², Brian Lawhead¹, Joseph Welch¹

¹ ABR Inc. Environmental Research & Services; ² Alaska Dept. of Fish and Game

2:20 **The old and the (re)new(able): Cumulative impacts of mines and wind turbines on habitat- and calving site-selection of semi-domesticated reindeer (*Rangifer tarandus*) in Sweden**

Léonie Duris^{1*}, Bernardo Niebuhr², Erik Cronvall³, Moudud Alam⁴, Per Sandstrom⁵, Anna Skarin⁶

¹ Environmental Analyst; ⁴ Associate professor; ⁵ Researcher; ⁶ Professor

2:40 **Caribou distribution and movements relative to recently constructed and proposed infrastructure at two scales in the National Petroleum Reserve-Alaska**

Joseph Welch¹, Alexander Prichard¹, Matthew Macander¹

¹ ABR Inc. Environmental Research & Services



M. Cameron

*Denotes presenter

Symposium: Monitoring Genetic Composition and Diversity in *Rangifer*

1:00 - 3:00pm | *Adventure*

- 1:00 **Intra-specific diversity in caribou: A status assessment and monitoring approach using whole genome analysis**
Rebecca Taylor^{1*}, Micheline Manseau¹, Julia Geue², Daria Martchenko², Paul Wilson²
¹ *Environment and Climate Change Canada*; ² *Trent University*
- 1:20 **Resolving the historical population demography of caribou with genomic data**
Daria Martchenko^{1*}, Micheline Manseau², Paul Wilson¹
¹ *Biology Dept., Trent University*; ² *Landscape Science and Technology, Environment and Climate Change Canada*
- 1:40 **Ecological genomics applied to caribou conservation in western Canada**
Maria Cavedon^{1*}, Troy Hegel², Anita Michalak¹, Lalenia Neufeld³, Jean Polfus⁴, Helen Schwantje⁵, Robin Steenweg⁴, Caeley Thacker⁵, Jocelyn Poissant¹, Marco Musiani¹
¹ *University of Calgary*; ² *Fish and Wildlife Stewardship Branch, Alberta Environment and Parks*; ³ *Jasper National Park of Canada*; ⁴ *Canadian Wildlife Service - Pacific Region, Environment and Climate Change Canada*; ⁵ *Wildlife and Habitat Branch, Ministry of Forests, Lands, Natural Resource Operations and Rural Development, Government of British Columbia*
- 2:00 **The *Rangifer tarandus* SNP Chip: Design, validation and recent uses for population conservation**
Claude Robert¹, Joëlle Taillon^{2*}, Mallorie Trottier-Lavoie¹, Julien Prunier³, Alexandra Carrier¹, William Poisson¹, Isabelle Gilbert¹, Vicky Albert², Cecilia Hernandez², Vincent Bourret², Arnaud Droit³, Steve Côté⁴
¹ *Dépt. des Sciences Animales, Faculté des Sciences de l'Agriculture et de l'Alimentation, Université Laval*; ² *Ministère de l'Environnement, de la Lutte contre les Changements Climatiques, de la Faune et des Parcs, Gouvernement du Québec*; ³ *Dépt. de Médecine Moléculaire, Faculté de Médecine, Université Laval*; ⁴ *Caribou Ungava, Dépt. de Biologie, Faculté des Sciences et de Génie, Université Laval*
- 2:20 **Níó Nę P'ęńę - Trails of the Mountain Caribou: A biocultural approach to understanding and conserving diversity**
Leon Andrew^{1*}
¹ *Sahtú Renewable Resource Board, Northwest Territories*
- 2:40 **The adoption of genetic measures in conservation: An assessment of different methods of analysis to report on trend, connectivity and diversity using a national boreal woodland caribou dataset**
Micheline Manseau^{1,2*}, Cory Fournier¹, Bridget Redquest², Sonesinh Keobouasone¹, Peng Liu¹, Merriell Brandon², Dave Hervieux³, Troy Hegel³, Curtis Stambaugh³, Gigi Pittoello⁴, Vicki Trim⁵, Dennis Brannen⁵, Allicia Kelly⁶, Leon Andrew⁷, Paul Wilson²
¹ *Environment and Climate Change Canada*; ² *Trent University*; ³ *Government of Alberta*; ⁴ *Government of Saskatchewan*; ⁵ *Government of Manitoba*; ⁶ *Government of the Northwest Territories*; ⁷ *Sahtú Renewable Resources Board*

Population Ecology II

3:20 - 5:00pm | *Endeavor*

- 3:20 **Monitoring and management of an expanding introduced muskox population in Northern Québec, Canada**
Joëlle Taillon^{1*}, Vincent Brodeur¹, Alexandre Paiement¹, Rachel Guindon², Stéphane Lair³
¹ *Ministère de l'Environnement, de la Lutte contre les Changements Climatiques, de la Faune et des Parcs, Gouvernement du Québec*; ² *Environmental Coordinator, Makivik Corporation*; ³ *Faculté de médecine vétérinaire, Université de Montréal, Centre québécois sur la santé des animaux sauvages*
- 3:40 **Demographic profile of a rapidly growing muskox population in southeast Northwest Territories, Canada**
Jan Adamczewski^{1*}, Judy Williams¹, Dean Cluff¹, Dave Olesen², Kristen Olesen², Kevin Chan¹, John Boulanger³
¹ *Government of the Northwest Territories Environment and Natural Resources*; ² *Hoarfrost River Huskies Ltd., Yellowknife, NT*; ³ *Integrated Ecological Research, BC, Canada*
- 4:00 **Assessing variability, trends and status of wild reindeer populations: the importance of long-term annual monitoring**
Brage Bremset Hansen^{1*}, Christer Moe Rolandsen¹, Atle Mysterud², Geir Rune Rauset¹, Roy Andersen¹, Olav Strand¹
¹ *Norwegian Institute for Nature Research*; ² *University of Oslo*
- 4:20 **Status and management of the Nushagak Peninsula Caribou Herd, Alaska, 1988-2022**
Andrew Aderman^{1*}, Patrick Walsh¹, James Woolington³
¹ *USFWS - Togiak National Wildlife Refuge*; ² *Alaska Dept. of Fish & Game (retired)*
- 4:40 **Status of woodland caribou critical calving habitat in the traditional territory of the Cree First Nation of Waswanipi**
Xavier Giroux-Bougard^{1*}, Eliane Grant^{2*}
¹ *Independent*; ² *Cree First Nation of Waswanipi*



Resource Development

3:20 - 4:40pm | *Adventure*

3:20 Past climate change alone cannot explain boreal caribou range recession in Québec since 1850

Chloé Morineau^{1*}, Yan Boulanger², Martin-Hugues St-Laurent¹

¹ Université du Québec à Rimouski; ² Natural Resources Canada

3:40 Caribou monitoring and subsistence harvest patterns on Alaska's North Slope: Influencing oilfield design and mitigations

Christina Pohl^{1*}, Lisa Pekich¹, Curtis Ahvakana¹, Lance Hathaway¹

¹ ConocoPhillips Alaska, Inc

4:00 Habitat disturbance as a necessary and sufficient cause of caribou decline

Steven Wilson^{1*}

¹ EcoLogic Research

4:20 Caribou habitat and Federal pipeline oversight in Canada

Dylan Adderley^{1*}, Suzanne Brown¹, Zoe Pfeiffer¹

¹ Canada Energy Regulator

4:40 Barren-ground caribou behaviour around Arctic roads: a novel approach to behaviour monitoring

Nina Morrell^{1*}, Greg Sharam¹

¹ ERM

COLOR-A-MOOSE



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THURSDAY | 11 MAY



Brown Jug

**WELCOME
2023 NACW-AUC
PARTICIPANTS!**

COME VISIT US ACROSS THE STREET!

FIELD TRIPS

Meeting locations for field trips will be announced on Thursday. Prior registration is required for all field trips.

Alaska Wildlife Conservation Center Tour

11:30am - 5:00pm

Take a trip 45 miles south of Anchorage to Portage and visit the Alaska Wildlife Conservation Center (AWCC). AWCC is a not-for-profit organization and wildlife sanctuary dedicated to preserving Alaska's wildlife through conservation, education, research, and quality animal care. The sanctuary maintains over 200 acres of spacious habitats for resident animals including caribou, reindeer, moose, muskox, and wood bison. During this field adventure, tour the sanctuary with AWCC Naturalists, hear about ungulate human care practices, learn about AWCC's contributions to the wood bison reintroduction project, and enjoy an up-close experience with resident ungulates. Learn more about AWCC on their website, www.alaskawildlife.org.

Foraging Ecology and Wildlife Nutritional Analysis Lab

8:00am - 1:00pm

Have you ever wondered how researchers study food habits, nutrition, and physiology of tame animals? If so, consider attending a field trip to the Foraging Ecology and Wildlife Nutritional Analysis (FaWNA) research facility of the Alaska Department of Fish and Game (ADFG). The facility is home to tame moose and caribou as well as a laboratory where researchers determine the nutritional quality of ungulate foods using traditional wet chemistry techniques (e.g., sequential fiber analysis). Attendees will have opportunities to directly observe animals foraging on seasonally available forages, tour the lab, and ask questions of ADFG staff and collaborators about methods, analyses, and future research directions.

Hiking and Botany Trip to Chugach State Park

9:00am - 4:00pm

Join Dr. Elizabeth Bella, Botanist and National Park Service Environmental Planning and Compliance Team Lead for Alaska Region, and Karin Sonnen, Botanist/Lichenologist and Natural Resources Conservation Service State Rangeland Specialist on a walk in the alpine of the Chugach National Forest to experience and learn about the hardy plants and lichens that our Arctic ungulates depend on for winter survival and what these plants and lichen can tell us about the ecology and grazing history of an area. Come and experience some of the beautiful vistas Alaska has to offer and learn about our local flora. Hike difficulty will be easy to moderate and exact location will be snowpack-dependent.

Prince William Sound Tour

9:30am - 6:30pm

Journey into Prince William Sound with Lazy Otter Charters to view tidewater glaciers and magnificent waterfalls. Sit at the face of a wall of ice and get a chance to cruise up to an active bird rookery. A lunch will be served onboard this intimate boat cruise. The lunch includes: sandwich of choice (ham, turkey, roast beef or veggie) on ciabatta bread, fresh baked cookies, Alaska Chips, trail mix, and fruit. Coffee, tea, soft drinks and water available all day.

Please bring a refillable water bottle to help us reduce single use plastic – bonus the water in Whittier has won national awards, seriously Award-Winning Whittier Water! We go rain or shine! Prince William Sound is a temperate rainforest, so you should expect rain - that is what gives us all the beautiful glaciers and spectacular waterfalls! Any adventure on the water will be 10-20 degrees cooler than on shore. Dress in layers - be sure to bring a fleece layer, waterproof jacket, waterproof pants and closed toed, water resistant hiking shoe.

Trip includes:

- Local Alaskan guide(s)
- Admission through the Anton Anderson Memorial Tunnel into Whittier
- Photo stops
- Lunch
- Snacks and water
- Anchorage hotel pick up
- Anchorage hotel drop off

Not included:

The crew today consists of your local driver/guide from Anchorage, Captain and Deckhand on the larger boats. We recommend a basic guide gratuity for your driver/guide at \$10 per person. Gratuity received on board the day cruise is split evenly between the captain and deckhand. In general, the recommended gratuity for a day cruise is \$20 per person.

UNGULATE SEARCH

R C R B T H S T E W A R D S H I P L I R
 F A Q E O A S Q S D X C F T B J X T D E
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 Z E A Q C V D X J N T I A K S U V D H A
 S C R S G S T E O G U B Q K M U N T G R
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 T L A D N A S E E L U M J C Z Z L E Z X
 D N D T L E C G L R O V I B O S C A B S
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 X O K S U M E F N E R A A C S E M X E P
 R A N G I F E R G Z Z E E H R T R A Q Y

- | | |
|---------------|-------------|
| Alaska | lichen |
| antler | management |
| Arctic | migrate |
| calf | modeling |
| caribou | moose |
| climate | muskox |
| collaboration | Ovibos |
| crepuscular | population |
| cud | Rangifer |
| ecology | reindeer |
| habitat | research |
| harvest | ruminant |
| herd | sausage |
| hooves | stewardship |
| horn | survey |
| hunt | tuttu |
| knowledge | |

Answers on page 85

THANK YOU TO THE SPONSORS OF
THE 2023 NACW-AUC!

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This project was undertaken with the financial support of:
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NANA

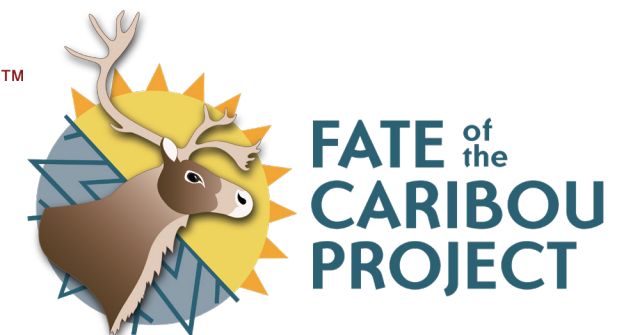
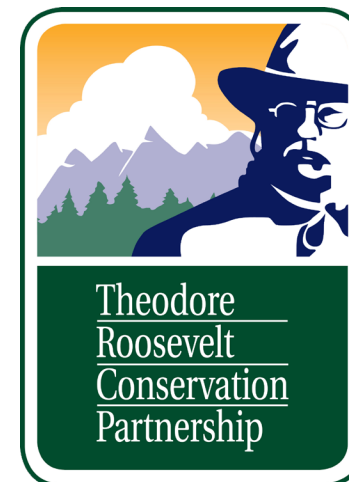


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ABOUT THE CONFERENCE LOGO & SWAG



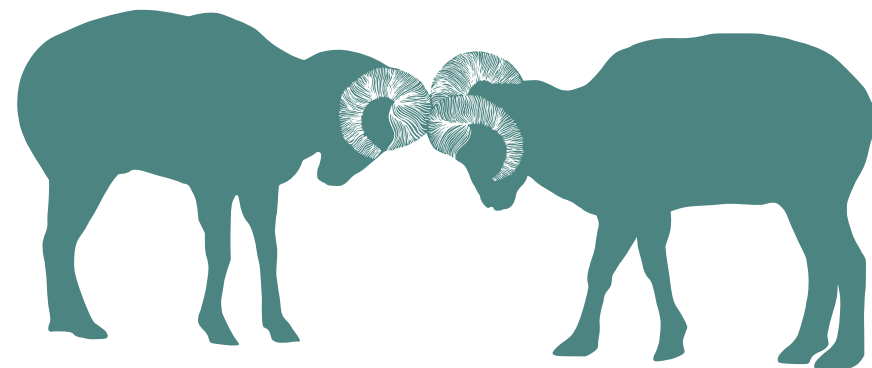
In 2022, the 2023 NACW-AUC organizing committee solicited submissions from artists in Alaska and beyond to design the conference logo. We received many excellent submissions and ultimately selected the final logo through an anonymous vote. The winning logo was designed by Anna Brose of Arctic Haven Studio. Brose says the logo was intended to “embody the conference theme of ‘Crossing Boundaries.’ The caribou is simultaneously part of the landscape and transcending the boundaries of the logo itself. In homage to the conference being held in Alaska this year, the Big Dipper and North Star (the flag of Alaska) are prominent.”

The runner-up logo, designed by Christina Nelson of Kotzebue, Alaska, was too good to pass up! A sticker with Nelson’s design is included in each conference attendee’s swag bag. Nelson said of her design: “The concept is to show a caribou running down a hill, moving forward and crossing boundaries because migration has no human-defined boundaries. I wanted to depict the caribou in a more stylized watercolor style on top, with an etched appearance similar to the scratched scrimshaw style (but in my own style of drawing) on the reflected side, representing that both scientific and Indigenous perspectives are equally important in addressing and working towards a sustainable future of management. I also included the northern lights to represent the spiritual side of all beings that is part of many Indigenous cultures today.”



The 2023 NACW-AUC organizing committee was committed to supporting local businesses and using sustainable practices as much as possible. Conference materials and swag were made possible through partnerships with:

- **HappyAK** | Custom neck buffs in swag bags
- **Brecht Studio** | *Eagle River, AK* | Custom ceramic mugs for behind-the-scenes conference supporters
- **Denali Brewing Company** | *Talkeetna, AK* | Crossing Boundaries Hazy IPA
- **Demientieff Promotions** | *Anchorage, AK* | Reusable bags for all that sweet swag
- **The Printer** | *Anchorage, AK* | Swag stickers
- **AT Publishing** | *Anchorage, AK* | Sustainable program printing
- **Visit Anchorage** | *Anchorage, AK* | Anchorage-themed swag



ABOUT ANCHORAGE

Anchorage is the bustling heart of southeastern Alaska. It is the largest city in Alaska, with just under 300,000 people, but maintains the wild character of Alaska, surrounded by the stunning Chugach Mountains and the waters of Cook Inlet. The conference will take place in downtown Anchorage, conveniently located less than 15 minutes from the Ted Stevens Anchorage International Airport.

Downtown Anchorage is a pedestrian-friendly grid of streets, where you’ll find restaurants, brewpubs, coffee shops, tour companies, visitor information and shops (see map on p. II-III). If you want to get outside, it’s easy to take the extensive trail network starting downtown and connecting to the many parks and green spaces spread throughout Anchorage. Along the way, you might see some of Anchorage’s nearly 1500 resident moose or some of the bald eagles, beluga whales, or other creatures that call Anchorage home.

For a walk or run – Check out the Coastal Trail, accessible from 2nd Avenue and H Street or 5th Avenue and M Street. The trail runs 11 miles, but for a shorter trip try out the stretch between downtown and Westchester Lagoon.

Bike Rentals – The trail is also a good spot for a bike ride. Rentals by the hour are inexpensive and available from companies in downtown. Visit Pablo’s Bicycle Rentals at 415 L St. and show your conference name badge for 10% off a rental!

Hiking – The Chugach Mountains are filled with trails, with the closest less than 20 minutes from downtown. Stretch your legs and get a stunning view of the city and surrounding natural spaces.

History and Culture – The Anchorage Museum and Alaska Native Heritage Center offer great showcases of Alaska Native cultures and Alaska history. The Anchorage Museum’s art collections are the biggest in Alaska. The Alaska Native Heritage Center focuses on Native culture through live song and dance performances, as well as life-sized examples of traditional buildings. There’s a combined admission, the Culture Pass, for both attractions. There’s also a free shuttle connecting the two stops.

Looking to add more Alaskan adventure to your trip? Options abound for accessing the rest of Alaska by road, rail, or air from Anchorage. Visit iconic Denali National Park, relax in the luxury of Alyeska Resort and spa in nearby Girdwood, and much more!

Rail Tours – Anchorage is the place to begin a railroad trip in Alaska. Trains depart daily for Prince William Sound, Kenai Fjords National Park, or Spencer Glacier in Chugach National Forest.

Flightseeing – Small airplane and helicopter flights are incredible. Flights from Merrill Field or Lake Hood in Anchorage take off for glaciers in the nearby Chugach Mountains, the waters of Prince William Sound, or even circle Denali by air.

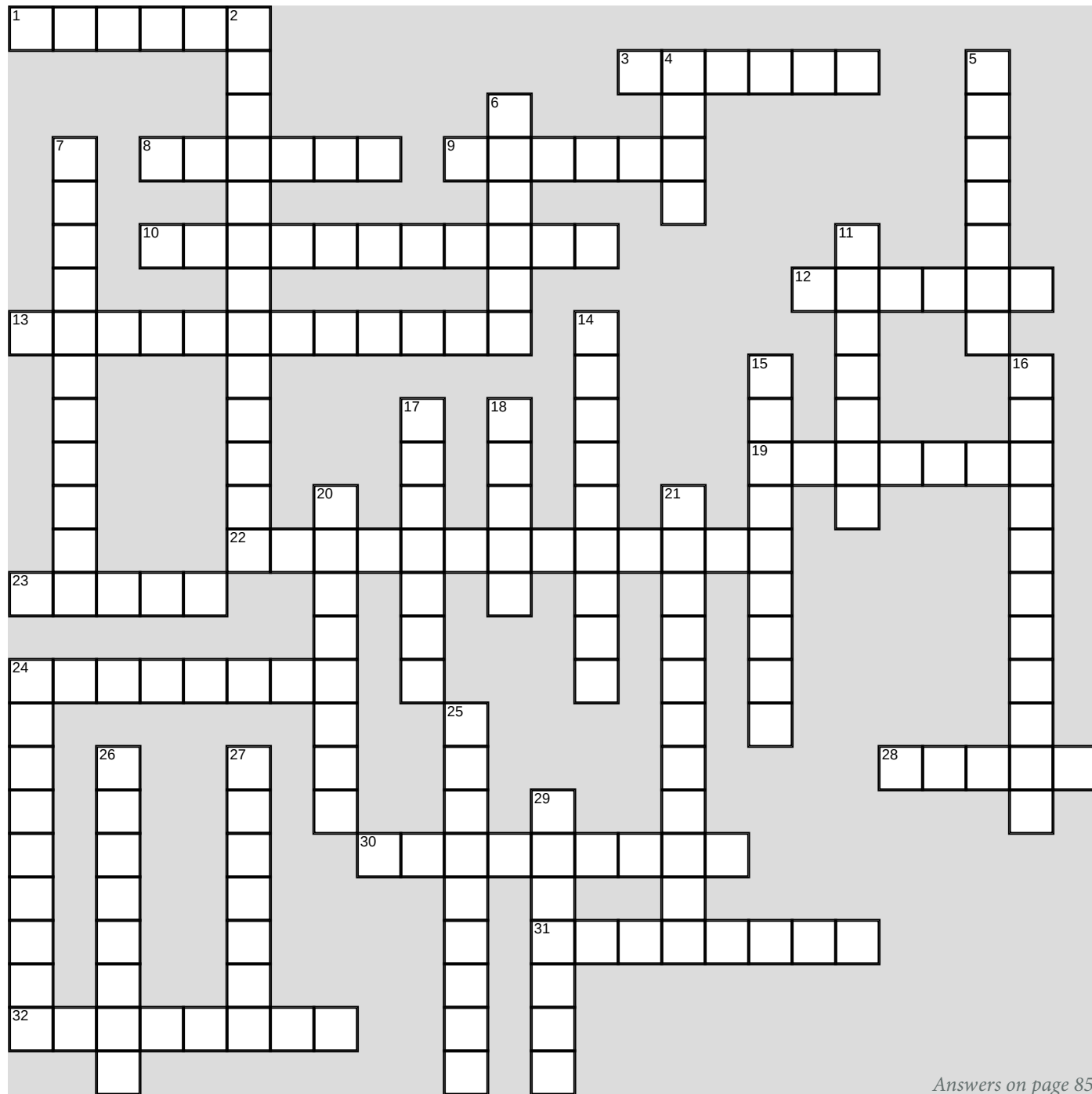
Day Cruises – See tidewater glaciers and wildlife including whales, seals, otters, sea lions and birds. Cruises sail daily from the port towns of Whittier and Seward, both accessible by rail or road.

2023 NACW-AUC PARTICIPANTS GET 10% OFF BIKE RENTALS AT PABLO’S BIKE RENTALS!

Show your conference nametag for a discount before you hit the trails!



CROSSING BOUNDARIES CROSSWORD



Answers on page 85

Across

1. Characteristic of moose guard hairs
3. Could make a dress or an antler
8. Subcutaneous pest
9. A moose's favorite snack
10. Fancy name for birth
12. Moose's goatee
13. My cousin is a pronghorn, how embarrassing!

19. Alaska's largest lake
22. Caribou nursery
23. Glacial ridge, caribou sanctuary
24. The bane of caribou and biologists
28. Antlers go pokey-poke
30. Trans-boundary herd of barren ground caribou
31. Workhorse of Alaskan field work
32. Caribou by any other name would smell as sweet

Down

2. Alaska's largest caribou herd from 1985 - 2015
4. Caribou, in Tlicho
5. An animal's home
6. Super soft ungulate wool
7. Dr. Seuss plants of the tundra
11. What a Dall sheep's helmet is made of
14. Caribou locomotion style
15. Northern sheep, scientifically
16. Colloquial name for moose

17. The antler's footstool
18. Sub-Arctic forests
20. Genus of caribou's winter dietary staple
21. Way of life for food harvest, preparation, and sharing
24. Characteristic to keep an eye out for predators
25. On the move, together
26. Clickity-clack bones
27. Moose, in Denaakk'e (Koyukon Athabascan)
29. Ankle twister

MOOSE LIBS

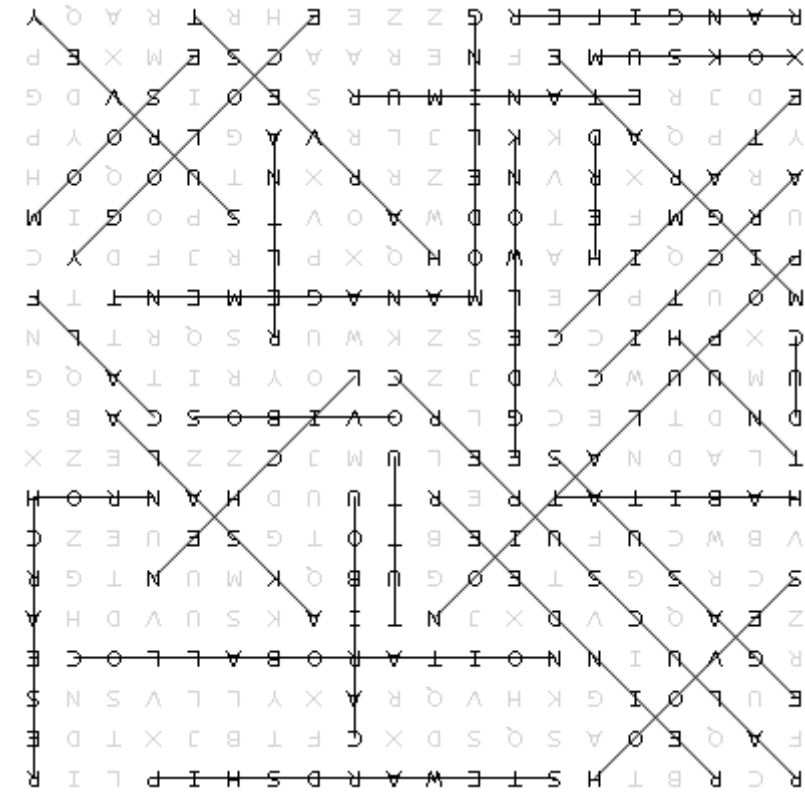
Grab a neighbor (maybe someone you don't know!) and have them fill in the blanks before reading the story aloud.

It was my first day studying _____ *Ungulate*. Searching primarily in _____ *Location*, I was sure I would see one before _____ *Time of Day*. To start off right, I woke up, ate my _____ *Food* and headed out. Naturally, I immediately spilled my _____ *Beverage* all over my coveralls and the _____ *Vehicle* was broken down, but that's just part of the job. I pulled out my trusty _____ *Tool* and had the _____ *Same vehicle* running in no time. My first win of the day! Heading across the _____ *Geologic feature*, I realized I forgot my _____ *Field equipment* at the _____ *Lodging*. "_____ *Exclamation*!"; I thought, but I decided to go on without it. I started seeing some _____ *Noun* that indicated a _____ *Same ungulate* was near. The morning wore on and I started to wonder if all this _____ *Verb ending in -ing* would ever result in finding a _____ *Same ungulate*. The _____ *Weather feature* beat down as I went on my way. Pretty soon, I was so _____ *Adverb, past tense* in my tracking I forgot to plot where I was on my _____ *Field equipment*. However, I didn't have time to _____ *Reaction* because right then a _____ *Same ungulate* popped out of the _____ *Environmental feature*! I did my best to find my location on my _____ *Field equipment* and note where I saw the _____ *Same ungulate*. I tracked it through the bushes throughout the rest of the day, sustaining scratches from all the _____ *Plant* branches I had to push through and bites from _____ *Animal*s I couldn't swat off. Finally, I followed the _____ *Same ungulate* to a clearing where the _____ *Geologic feature* _____ *Verb, past tense* in the afternoon sun. It was so _____ *Adjective* and _____ *Adjective*, I knew I would remember that moment forever. It certainly beat wrestling _____ *Animal*s in _____ *Place* National Park!

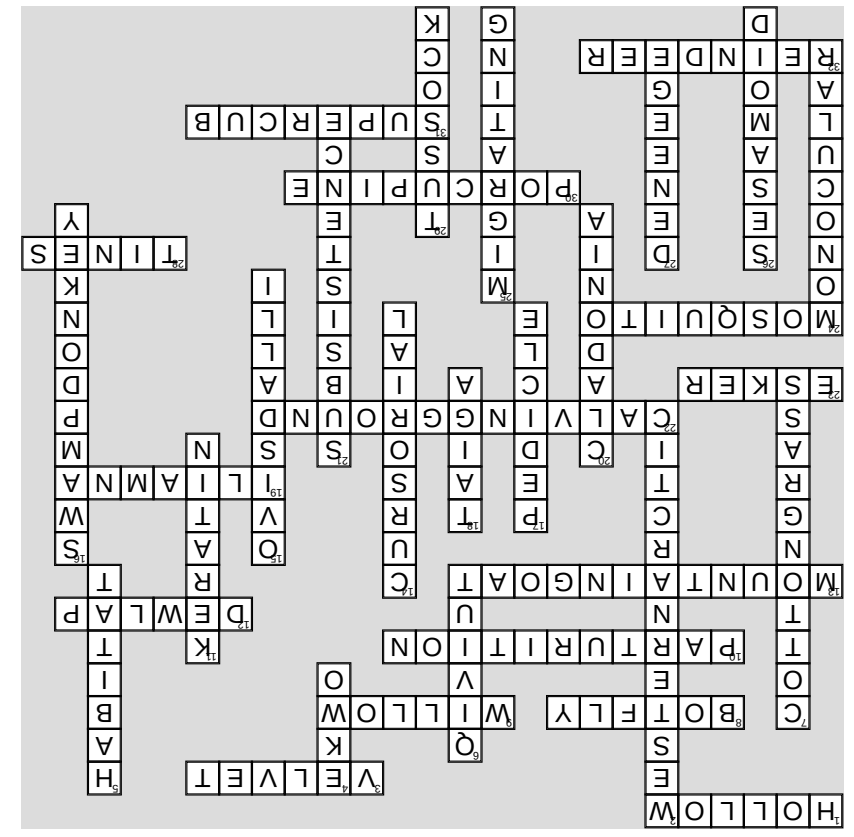
CONNECT THE CARIBOU



WORDSEARCH SOLUTION



CROSSWORD SOLUTION



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THANK YOU FOR BEING PART OF THE 2023 NORTH AMERICAN CARIBOU WORKSHOP & ARCTIC UNGULATE CONFERENCE

Thank you | Merci | Quyanainni | Chin'an | Tack | Haɫ' | Bedankt | Quyanaq | Kiitos | Danke | Máhsı Máhsı
| Qujanaq | Pakka þér fyrir | Marsı | Takk | Kinanāskomitin | Quana Qujannamiik | Mahsı Cho



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