Government of Northwest Territories
Gouvernement des Territoires du Nord-Ouest

Barren-ground Caribou Research Workshop February 2020 in Yellowknife, Summary Report

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EXECUTIVE SUMMARY

Most barren-ground caribou herds that occur entirely or partially in the Northwest Territories (NWT) were at low numbers in 2018 and they were assessed as a Threatened species at risk federally and territorially. Some aspects of the declines are understood, but a clear understanding of the key drivers of change in barren-ground caribou numbers remains incomplete. The Government of the Northwest Territories (GNWT) Department of Environment and Natural Resources (ENR) has biologists trained in research, but the department is primarily an applied management agency. ENR has had collaborative relationships with several universities to support ecological research on various subjects relevant to barren-ground caribou, often through graduate students. ENR would like to increase research on NWT barren-ground caribou through a collaborative, cost-shared program. Scientific research and traditional knowledge (TK) should both be part of future research programs.

A two-day workshop was hosted by ENR February 18 and 19 in Yellowknife to explore options for an increased research program on NWT barren-ground caribou. There were 26 participants and a facilitator, and 15 presentations. Presentations were on scientific research programs, TK programs, and community-based monitoring programs. All speakers were asked to address three main themes, recognizing that programs will vary:

- Brief overview of your caribou research program.
- What does it take to build a productive research program?
- Your ideas on how we can build a focused barren-ground caribou research program for the NWT.

Discussions and comments from participants were positive and encouraging. There was broad support for increasing research on barren-ground caribou (Figure 1), particularly if additional programs included scientific and TK research. Participants made many suggestions on next steps. Some of the key recommendations included:

1. A collaborative steering committee should be formed to identify priorities for research.
2. One or more academic champions at academic institutions may be needed to manage funds and graduate students and other researchers. One possibility is two academic champions, one focused on science and one focused on TK.
3. There are successful programs for both scientific and TK caribou research that can be models.
4. Community-based guardian programs should be linked to an overall research program.

5. There is strong interest in NWT communities in further research that helps to understand the effects of climate change, predators and other key factors on barren-ground caribou.

A number of key themes and ideas were recorded by facilitator Jason Ash and organizer Jan Adamczewski, and those are included. In addition, a number of ideas presented by Chris Johnson from the University of Northern British Columbia were particularly relevant and are included to stimulate further discussion. An appendix includes brief summaries of each presentation and their key recommendations.

ENR will work toward a vision/strategy on barren-ground caribou research based on the presentations and recommendations of this workshop. This will be developed in a collaborative manner with co-management partners across the NWT and its neighbours.

Figure 1. Part of a post-calving aggregation in the Bluenose-East caribou herd, July 2020.

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BACKGROUND/INTRODUCTION

Most barren-ground caribou herds that occur entirely or partially in the Northwest Territories (NWT) were at low numbers in 2018 and they were listed as Threatened by the federal Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the NWT Species at Risk Committee (SARC) in 2017-2018. The Bathurst herd was estimated at about 470,000 in 1986 and has declined by 98% to an estimated 8,200 in 2018. The Porcupine herd, by contrast, was at high numbers and increasing in 2017. There are likely multiple factors that have contributed to the widespread declines, and each herd has its own set of conditions. Some aspects of the declines are understood, but a clear understanding of the key drivers of change in barren-ground caribou numbers remains incomplete. Effects of predators and the multiple effects of climate change are often raised at meetings as subjects where better knowledge is needed. The Government of the Northwest Territories (GNWT) Department of Environment and Natural Resources (ENR) has biologists trained in research, but the department is primarily an applied management agency and basic monitoring of caribou herds (population and other surveys, and satellite collars) is a main priority.

ENR has had collaborative relationships with several universities to support ecological research on various subjects relevant to barren-ground caribou, often through graduate students. ENR would like to increase research on NWT barren-ground caribou through a collaborative, cost-shared program. The Caribou Ungava program (www.caribou-ungava.ulaval.ca/en/accueil/) in Québec and Labrador is one model that could be useful in developing a program for NWT caribou. The overall goal is to improve our understanding of the factors that drive changes in abundance of barren-ground caribou, and what likely trends in the future may be. For the NWT, both scientific research and traditional knowledge (TK) should be part of future research programs.

A workshop was held on February 18 and 19, 2020 in Yellowknife to explore options for increased research on NWT barren-ground caribou ecology (Figure 2). Speakers presented information on successful scientific and TK caribou research programs in the NWT and elsewhere in Canada, and on northern community-based monitoring and research programs. Discussions at the workshop were focused on key considerations for development of further barren-ground caribou research for the NWT. This report is a summary on the workshop presentations and discussions, with a number of recommendations on next steps. A one-page summary of each presentation and key ideas on caribou research is included; each summary was reviewed by the respective speaker(s).

ENR will work toward a vision/strategy on barren-ground caribou research based on the presentations and recommendations of this workshop. This will be developed in a collaborative manner with co-management partners across the NWT and its neighbours.

Figure 2. Three caribou bulls with velvet antlers in the Cape Bathurst herd, July 2015.

Agenda Day 1 (February 18, 2020)

Time	Speaker	Topic	Notes
830	Coffee, Welcome		
900-910	Brett Elkin	Welcome from GNWT & Introductions	
910-940	Jan Adamczewski	Workshop Objectives	
940-1010	Steeve Côté	Caribou Ungava: population dynamics of migratory caribou in Nunavik and Labrador	Laval University
1010-1030	Break		
1030-1100	Susan Kutz	Caribou Health & Community-Based Research	University of Calgary
1100-1130	Colin Robertson*	Caribou Research at Laurier University	Hiring Wildlife Research Chair
1130-1215	Discussion		
1215-1315	Lunch		
1315-1330	John B. Zoe	Gonaewo: Our Way of Life	Tłı̨chǫ Government
1330-1400	Allice Legat	People, caribou and the land	
1400-1430	Natasha Thorpe & Joanne Barnaby	Grounding Decisions: Caring for Caribou through Two Ways of Knowing	
1430-1500	Break		
1500-1530	Prairie Desjarlais	Ni Hat Ni program: Caribou Watchers	Lutsel K'e Dene First Nation
1530-1545	Randi Jennings	Wek'èezhìı Renewable Resource Board (WRRB) Perspective on Caribou Research	
1545-1645	Discussion	Comments, Responses, Common Themes	

Agenda Day 2 (February 19, 2020)

Time	Speaker	Topic	Notes
830	Coffee, Welcome		
900-920	Facilitator	Summary from day one	
920-950	Rob Serrouya	Learning from social and ecological contrasts: A key part of adaptive research and management	University of Alberta
950-1020	Chris Johnson	Working with Governments to Conduct Student-led Research	University of Northern BC
1020-1040	Break		
1040-1110	Don Russell	CARMA Caribou & Reindeer Program	Circum Arctic Rangifer Monitoring & Assessment
1110-1140	Ryan Danby	A Multiscale Perspective on Caribou Range Dynamics	Queens University
1140-1230	Discussion		
1230-1330	Lunch		
1330-1400	Petter Jacobsen & Tyanna Steinwand	Ekwǫ̀ Nàxoède K'è - Tłı̨chǫ Caribou Monitoring	Tłı̨chǫ Government
1400-1430	Don Russell	Arctic Borderlands Knowledge Coop	
1430-1500	Walter Bezha & Colin MacDonald	Sahtú ?ekwe?	Sahtú Perspective on Barren-Ground Caribou
1500-1520	Break		
1520-1620	Discussion	Comments, Responses, Common Themes	
1620-1645	Facilitator	Summary and Next Steps	

RESEARCH OPTIONS: CHRIS JOHNSON

Chris Johnson from the University of Northern British Columbia (UNBC) presented a comprehensive look at options for government-university research partnerships. Text from three of his key summary slides is presented here (with minor formatting changes) as offering some options for future planning and for accommodating scientific and TK research, and for conversations between these ways of knowing caribou (Figure 3). Other speakers also addressed the same topics.

A. Developing a Program and Partnerships: Models for developing government-university partnerships

1. Single ad hoc research projects

- develop an idea, identify a university/government partner – *repeat*

Strength: low commitment, flexible, few administrative costs
Weakness: little research continuity, difficult to achieve a research vision/broader set of objectives

2. Clustered ad hoc research partnerships

- develop set of related ideas, seek a team of researchers, build the partnership around federal (NSERC, SSHRC) funding – *repeat*

Strength: flexible, low administrative cost, opportunity for co-funding
Weakness: little long-term (>5 years) research continuity

3. Funded research program ('WKSS model')

- develop a set of multi-year research objectives and provide mechanism for funding and review
- open call from broad spectrum of researchers

Strength: involve many researchers and ideas
Weakness: little research continuity among projects, administrative cost

4. Fund or co-fund a university research chair

- support research program of one person at one university

Strength: create a champion and focus for barren-ground caribou research
Weakness: may result in research program with a specific focus

B. Making Space for TK and Western Science

A team oriented research model for caribou

1. support separate researchers/programs/chairs with expertise in TK and western scientific knowledge (WSK)

2. encourage co-champions to work collaboratively
   - identifying common program objectives
   - graduate student co-supervision
   - oversight from advisory committee

3. *few* graduate students will develop projects that integrate TK and WSK

4. *all* graduate students working in the north should understand the relationship between caribou, people, and culture

Figure 3. Cows and calves in the Bluenose-East caribou herd, July 2020.

MAIN THEMES: JAN ADAMCZEWSKI

The following themes were recorded shortly after the workshop February 18 and 19 by lead organizer Jan Adamczewski as key points from speakers and from discussions by participants.

1. Solid research on caribou, whether using TK methods or scientific methods, will require real resources (funding and personnel with dedicated time).
2. Long-term funding will be needed to sustain a strong research program, but this can be a real challenge.
3. Assessment of barren-ground caribou as Threatened at NWT and federal levels may provide an opportunity to seek increased funding for research.
4. There is urgency in the very large declines of some herds (e.g. Bathurst) and the need to take actions to stem declines and promote recovery; i.e., one priority for research may be associated with applied management.
5. One of the clear knowledge gaps for NWT caribou and declines is predators, predator-prey relations and their significance to caribou herds. In terms of "management levers", reduction of wolves and potentially other predators is one of the few levers that may make a difference in the short-term.
6. Research so far on NWT barren-ground caribou has resulted in a variety of useful projects, many carried out by graduate students. However, overall the research has been piece-meal. It may be time to develop a more cohesive approach where research is focused on a few clearly identified priorities. The Caribou Ungava program is one potential model of a strong research program.
7. To date, ENR has not had any dedicated research positions for caribou or other key wildlife species. ENR has biologists trained in research, but the priorities for the barren-ground caribou program have been basic population monitoring (surveys and satellite collars) and applied collaborative management.
8. As in-depth wildlife research (scientific or TK) requires personnel able to invest substantial time, collaboration with university researchers or other researchers would be needed to secure the graduate students, postdoctoral fellows or other researchers who would be able to carry out research projects.
9. An academic champion, or potentially more than one champion, could be a key part of developing a focused barren-ground caribou research program.
10. A related possibility is two academic champions, one focused on scientific research and one on TK research. There should be links between these programs, but the disciplines are different.
11. There are examples of research and monitoring programs that include scientific methods and are focused on community knowledge and monitoring. Examples are

research on community knowledge of caribou and muskoxen in Ekaluktutiak (Nunavut) and Arctic Borderlands Ecological Knowledge Society (Yukon).

12. Community-based monitoring and guardian programs would be an essential part of an overall caribou research and monitoring program.
13. Building northern capacity for research and monitoring will be important.
14. A steering committee or group would be needed to identify priorities for research. Research priorities should be identified in the NWT through collaborative processes, and the steering group would need to have representation from Indigenous organizations, boards and governments.
15. There are existing "blueprints" for research, or priorities identified through existing processes, that should be considered in any new research programs.
16. Comparative projects across herds can be very informative, and collaboration across regions can be very useful (e.g. Circum-Arctic Rangifer Monitoring and Assessment (CARMA) program for all migratory caribou and reindeer herds).
17. All research projects would need to build in budgets and mechanisms for researchers to report back to NWT communities and organizations on their findings, and in ways suitable for diverse audiences.
18. It may be useful to start on a smaller scale with a few research projects and then build on them.
19. It will be important to focus on respectful communication throughout any research programs that are developed.

Figure 4. Tundra-forest transition zone along the Thelon River in July 2016.

MAIN THEMES: JASON ASH

Facilitator Jason Ash summarized some of the key themes that he heard during the February 18-19 workshop in a flow-chart graphic, provided below (Figures 5 and 6). Ash summarized a holistic view of elements that would contribute to a successful barren-ground caribou research program in the future.

Figure 5. Themes that emerged from caribou research workshop in February 2020, identified by Jason Ash.

Figure 6. Dene drummers at meeting of Beverly and Qamanirjuaq Caribou Management Board, May 2019 in Winnipeg.

SUMMARY AND NEXT STEPS

From ENR's perspective and from positive comments from many workshop participants, the workshop was successful in generating a wealth of ideas about how a focused barren-ground caribou research program for NWT could be developed and what should be involved. The draft workshop report was circulated to all participants with a request for suggestions to verify content accuracy and to add any final comments.

An appendix is included with a brief summary of each presentation, recommendations from each speaker, and one to two key slides from the presentation. In a few cases, speakers did not use slides. Each summary was reviewed and approved by the speaker(s). A longer version of this report will also be developed that has the presentations in PDF format.

The main next step will be to develop a vision or strategy for a focused barren-ground caribou research program. This will be developed in a collaborative manner with co-management partners across the NWT and its neighbours. ENR will take the lead on this and will engage with a number of the February 2020 workshop participants in developing this strategy.

Figure 7. Caribou bulls with velvet antlers, Cape Bathurst herd, July 2015.

WORKSHOP PARTICIPANTS

(In order of alphabetical surnames):

1. Jan Adamczewski, Ungulate Biologist, ENR
2. Jason Ash, Edaxats'edeh Professional Services, (Facilitator)
3. Joanne Barnaby, TK Researcher (Independent)
4. Walter Bezha, Dèlıne Got'ine Government (Manager)
5. Kevin Chan, Sahtú Regional Biologist, ENR
6. Dean Cluff, North Slave Regional Biologist, ENR
7. Steeve Côté, Université Laval (Professor)
8. Ophélie Couriot, University of Maryland (Post Doctoral Fellow)
9. Ryan Danby, Queens University (Professor)
10. Tracy Davison, Beaufort Delta Regional Biologist, ENR
11. Prairie Desjarlais, Łutsël K'é Dene First Nation (Ni Hat Ni Coordinator)
12. Doug Doan, Gwich'in Renewable Resources Board (Board member)
13. Petter Jacobsen, TK Researcher (Tłıchǫ Government)
14. Randi Jennings, Wek'èezhìı Renewable Resources Board (Biologist)
15. Chris Johnson, University of Northern British Columbia (Professor)
16. Allicia Kelly, South Slave Regional Biologist, ENR
17. Susan Kutz, University of Calgary (Professor)
18. Allice Legat, TK Researcher (Independent)
19. Colin MacDonald, Sahtú Renewable Resources Board (Consultant)
20. Laura Jane Michel, Łutsël K'é Dene First Nation
21. Robert Mulders, Carnivore Biologist, ENR
22. Rosemin Nathoo, Wildlife Management Advisory Council – NWT (Biologist)
23. Colin Robertson, Wilfrid Laurier University (Professor)
24. Don Russell, Circum Arctic Rangifer Monitoring and Assessment Network (Biologist)
25. Rob Serrouya, Alberta Biodiversity Monitoring Unit, Caribou Monitoring Unit (Researcher)
26. Tyanna Steinwand, Tłıchǫ Government (Researcher)
27. Natasha Thorpe, TK Researcher (Independent)

Figure 8. Part of a post-calving aggregation of Bluenose-East caribou northwest of Kugluktuk, July 2020.

APPENDIX: PRESENTATION BRIEF SUMMARIES

Day 1 (February 18, 2020)

Jan Adamczewski: Workshop Objectives

Jan presented an update on the status of barren-ground caribou in the NWT and introduced the workshop objectives. Barren-ground caribou in the NWT have been assessed as Threatened at the federal and territorial levels, due to widespread declines. There are likely many factors for the declines, among them a long-term natural fluctuation between high and low numbers. ENR has had collaborative research programs with various researchers and universities on caribou, but is looking to develop an increased research program to better understand what drives caribou numbers up or down, using scientific and TK methods. The main purposes of this workshop are to consider successful caribou research programs in the north and across Canada, and explore options for how the GNWT could develop a focused research program on barren-ground caribou (Figure 9). All speakers were asked to address three main themes, recognizing that programs will vary:

(1) Brief overview of your caribou research program;
(2) What does it take to build a productive research program? and
(3) Your ideas on how we can build a focused barren-ground caribou research program for the NWT.

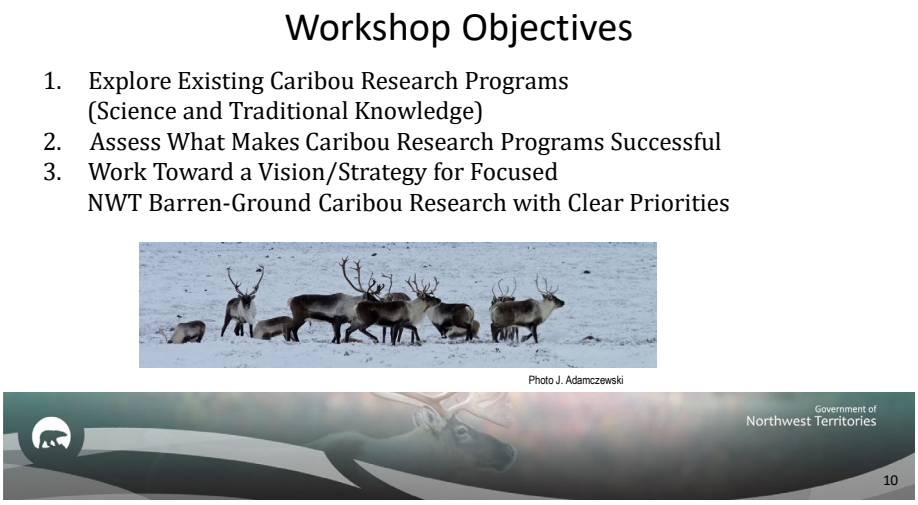

Figure 9. Workshop objectives from introductory presentation by J. Adamczewski, February 2020.

Steeve Côté: Caribou Ungava: Population dynamics of migratory caribou in Nunavik and Labrador

Steeve presented an overview of the Caribou Ungava program based at Laval University in Québec (Figure 10). Caribou Ungava was launched in 2009 and seeks to identify the factors influencing the population dynamics of migratory caribou and their use of space. This program is focused on the two migratory tundra caribou herds in Québec/Labrador: the Rivière-aux-Feuilles (RAF or Leaf River) and Rivière-George (RG or George River) herds, both of which have gone through very large declines. Among the questions that researchers in the Caribou Ungava program are asking are: What are the factors controlling population dynamics? What are the drivers of body condition, survival and reproduction? Which habitats are important, when and why? How stable are migration routes? What are the cumulative impacts of climate change and industrial development on habitat and space use?

With respect to developing a barren-ground caribou research program for the NWT, Steeve spoke about the importance of (1) consideration of concerns from all stakeholders; (2) a focus on applied components but recognition of the role of fundamental science; (3) highly interested and committed partners (e.g. Natural Sciences and Engineering Research Council (NSERC) $$); (4) task sharing (government and Non-Government Organizations (NGOs), communities, industry, and universities); (5) implications to government of funding, logistics and a common long-term monitoring commitment, and (6) a well thought out and active communication strategy.

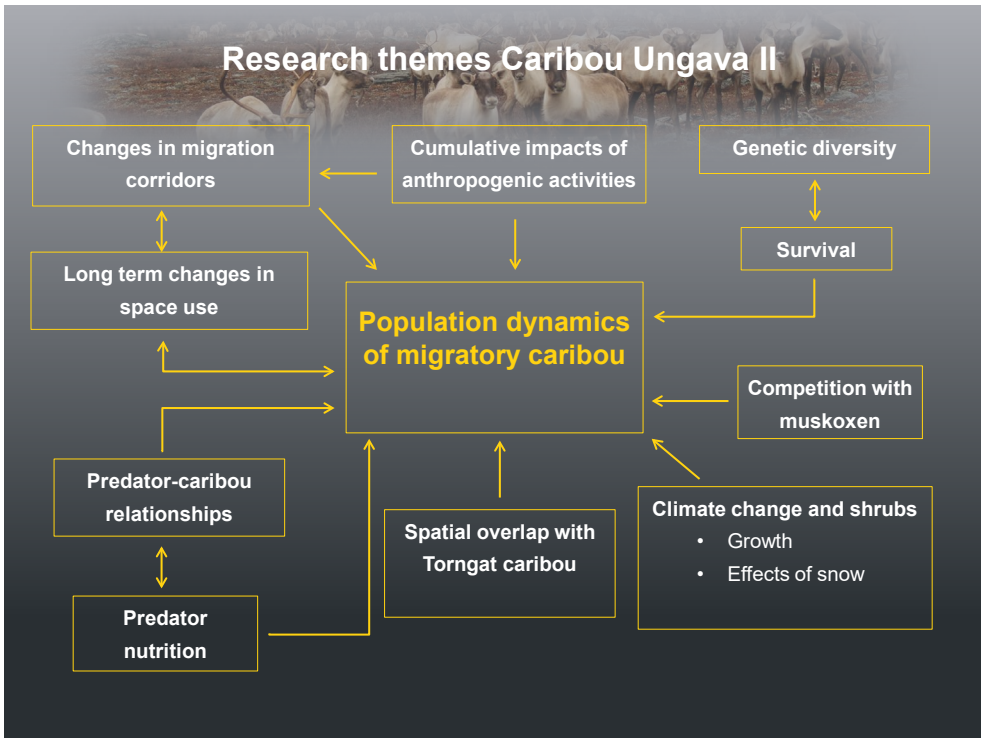

Figure 10. Example slide from presentation by S. Côté on Caribou Ungava program, February 2020.

Susan Kutz: Caribou health and community-based research

Susan heads the Kutz Research Group at the University of Calgary, which includes a number of graduate students, postdoctoral fellows and supporting staff. The overall theme for this group is "One Health in the Arctic" and research has emphasized health, parasites and pathogens affecting northern wildlife like caribou and muskoxen (Figure 11). Some of the key questions under study are: (1) What is the role of infectious disease (and trace minerals) in caribou and muskox population dynamics? (2) How does climate and climate change affect pathogen dynamics and diversity? and (3) How do we best anticipate, monitor and respond to wildlife health issues in the Arctic and subarctic to promote wildlife conservation, human health and ecosystem health?

A focus in recent years has been research in communities focused on community members' knowledge of trends in wildlife populations and reasons for these patterns. Results highlight the importance of traditional and local knowledge; harvester-based monitoring can provide early detection of ecological and demographic changes in wildlife populations. Such programs provide one way to combine the strengths of scientific research with knowledge and experience of communities.

With respect to a barren-ground caribou research program for the NWT, Susan spoke about a number of key themes: (1) The caribou problem is complex and requires collaboration among communities, governments, industry and academia, and across disciplines; (2) the importance of commitment from research partners; (3) the value of graduate students and postdocs, and dedicated individuals; (4) community support and partnerships; (5) affordable housing for researchers in northern communities (often scarce and expensive) will facilitate better and more community-engaged research, and (6) longer term financial support for continuity of ongoing monitoring programs (instead of from grant to grant). Susan also stressed the complexity of northern caribou biology and the need to draw on all sources of knowledge, including TK.

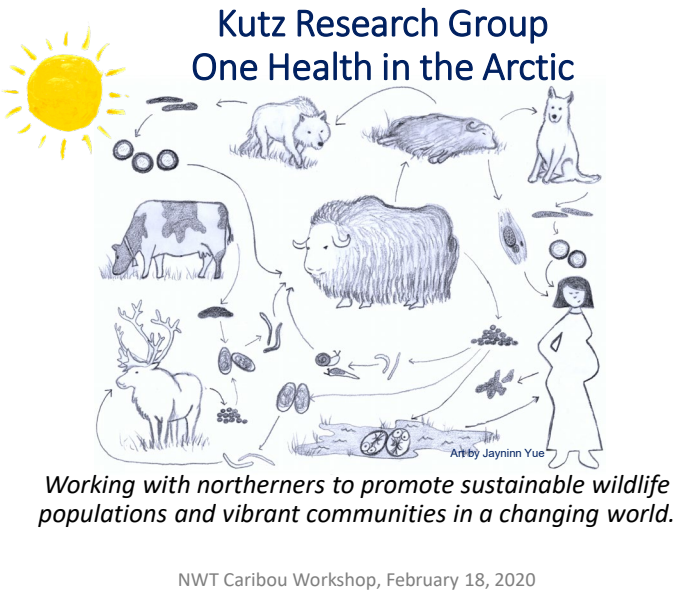

Figure 11. Two example slides from presentation on wildlife health research by S. Kutz, February 2020.

Colin Robertson, Wilfrid Laurier University: Caribou research at Laurier University

Colin teaches at Wilfrid Laurier University in the Department of Geography and Environmental Studies. He presented an overview of some of the current research that Laurier researchers are conducting in the NWT. Laurier University has a strong interest in increasing its presence in the NWT and has an office on Franklin Avenue in Yellowknife. GNWT has had a ten-year agreement on research with Laurier (2010-2020) and a further agreement has been approved through 2030. Among current research programs are: (1) Mike English – Snowpack characteristics and caribou space utilization; (2) Jennifer Baltzer – Landcover transitions in caribou habitat, with a focus on 2014 NWT fires and changes in vegetation; and (3) Colin Robertson – Caribou home range mapping techniques and spatial data integration.

Colin presented an update on a new Canada Research Chair (CRC) that will be hired at Laurier in 2020 and will provide leadership and expertise in wildlife biology in northern ecosystems. Among the criteria for hiring the CRC is a "research focus on key northern species (e.g. ungulates), that can be linked to priorities in Indigenous communities and food security issues would be an asset". This position may have an interest in research on NWT barren-ground caribou and other ungulates.

On barren-ground caribou research for the NWT, Colin presented a range of options and approaches that may build on existing work (Figure 12). Themes included (1) building on institutional investments and long-term engagement; (2) co-learning and knowledge sharing activities; (3) processes for ongoing alignment of research needs with research activities; (4) support for community-centred monitoring of caribou; and (5) an emphasis on synthesis and intersections in research.

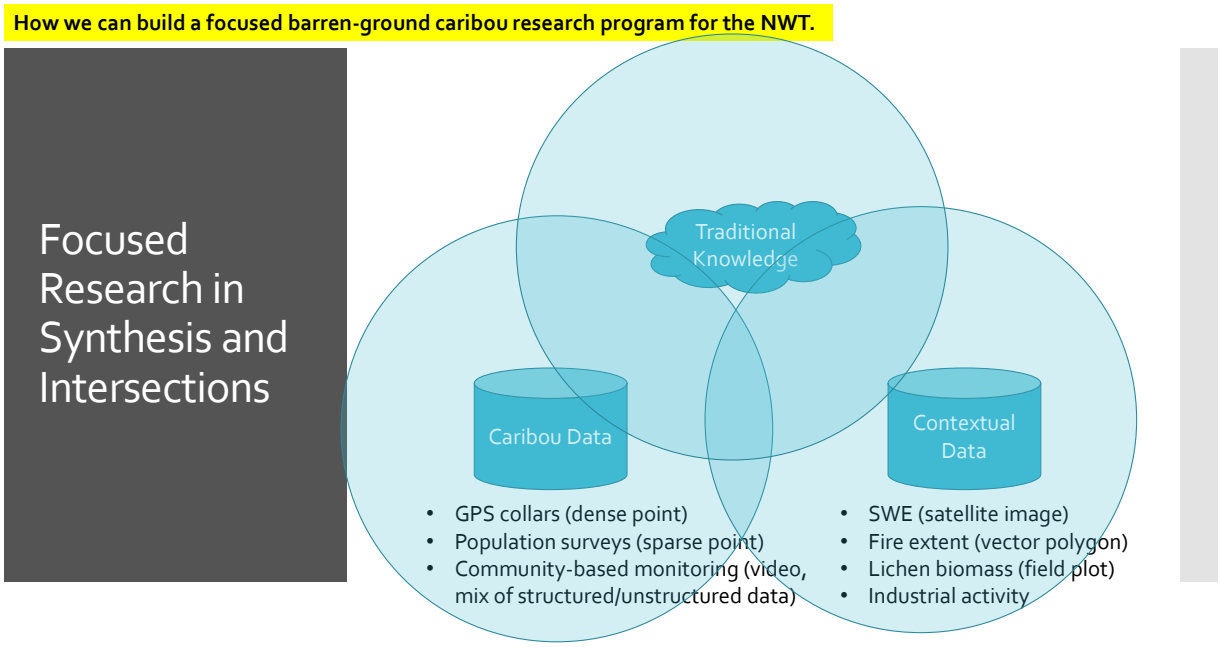

Figure 12. Two example slides from presentation on caribou research by C. Robertson, February 2020.

John B. Zoe: Gonaewo: Our way of life

John B. Zoe is a senior advisor to the Tłı̨chǫ Government. He presented a wide-ranging view of Tłı̨chǫ lands, language, culture and way of life (Figure 13). He began with times before contact with Europeans in the Canadian north, when people had a natural relationship with wildlife. He described changes to the Tłı̨chǫ way of life associated with the explorers, fur trade and churches and eventual commercialization of renewable and non-renewable resources, the Indian Act of 1867, modern treaties, residential schools, and the negotiation of the Tłı̨chǫ Agreement that came into effect in 2005. In the last number of years, the Tłı̨chǫ people have been developing programs to reconnect their members back to the land by developing their own programs based on their own way of life. An example is the Trails of our Ancestors project about remembering the trails and the stories, using canoe trips shared with younger and older people. There is the Imbe program for young people who return for the summer from schools to learn about their history by interacting with elders while learning traditional harvesting methods and train to become managers. There is the Ekwǫ̀Nàxoède K'è program (formerly Boots on the Ground) where harvesters and elders go out on the land in the summer and watch caribou using traditional holistic methods ("We watch everything"). All these programs have been developed and are run by the Tłı̨chǫ Government. New research partnerships that include universities, government and other entities like industry can be explored, but the Tłı̨chǫ Government will continue its own programs centred on Tłı̨chǫ culture, language and way of life. John B. Zoe did not use slides but drew a schematic (photo below) of the historic and present-day events and processes he described.

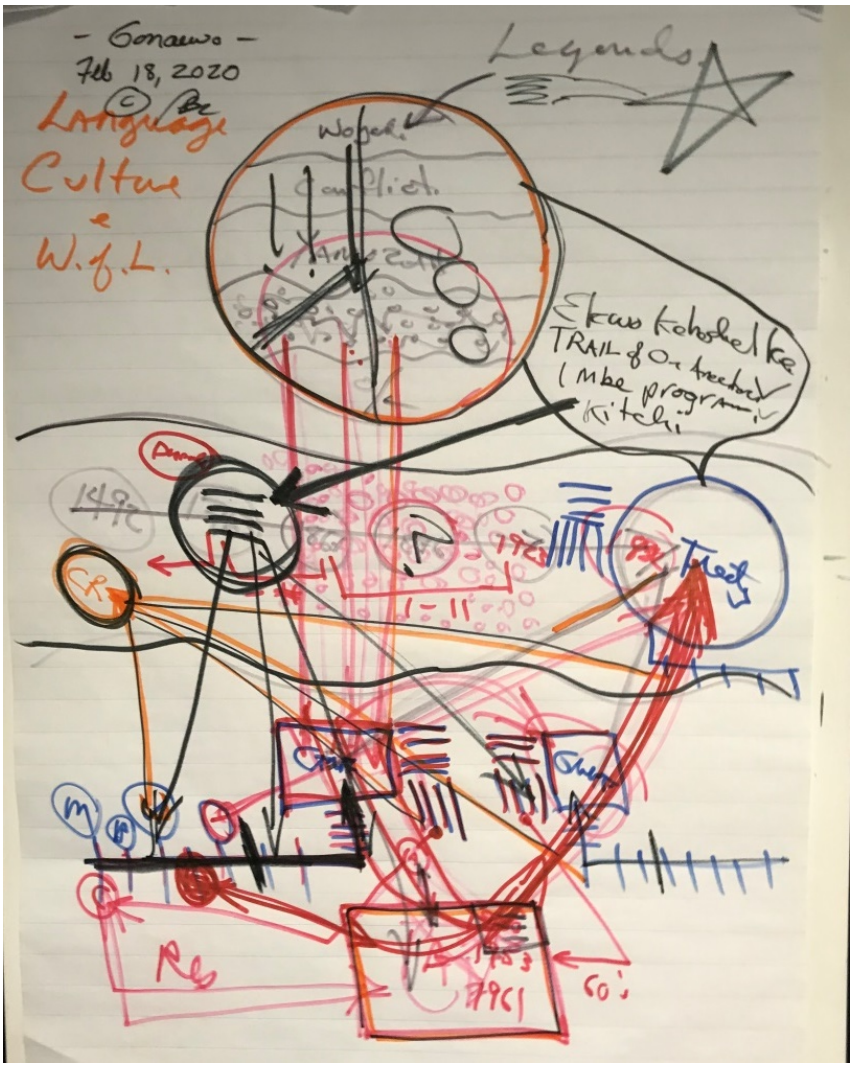

Figure 13. Composite flipchart graphic from presentation by John B. Zoe, February 2020.

Allice Legat: People, caribou and the land

Allice has been an environmental and cultural anthropologist, with a specific interest in Indigenous knowledge (TK) for over three decades, including over twenty years working with Tłı̨chǫ. Much of her work with Tłı̨chǫ elders was part of the West Kitikmeot Slave Society (WKSS) program in the late 1990s and early 2000s (Figure 14). This was a cost-shared research program to increase knowledge of wildlife and people in the western Kitikmeot region of Nunavut and the adjacent north slave province of the NWT. Indigenous communities, governments, and universities were able to apply for funds for scientific and TK research. Allice had a lead role in two Tłı̨chǫ projects and the WKSS reports finalized in 2001: Habitat of Dogrib [Tłı̨chǫ] Traditional Territory: Place names as Indicators of biogeographical knowledge and Caribou Migration and the State of Their Habitat. The Tłı̨chǫ research used participatory action research methodology with elders directing the research. This methodology is based on the premise that Indigenous communities control the research process and knowledge gathered, from beginning to end: from initiation to verification. Community researchers worked and trained with Allice: following their own knowledge system when documenting elders' stories, doing field research with elders and harvesters, and analyzing oral narratives containing knowledge of caribou, migration behaviour, and their habitat.

With any research that contributes to public knowledge and policy decisions—including barren-ground caribou research—Allice is certain that science and TK both need to use rigorous methodologies appropriate to and recognized by that knowledge system. Outcomes need to be verified using knowledge holders from that system; one system should not be used to test or justify the findings of the other. When research is done well, decision makers can respect the findings from each knowledge system and apply the findings appropriately.

Figure 14. Example slide from presentation on Traditional Knowledge research by A. Legat, February 2020.

Natasha Thorpe and Joanne Barnaby: Grounding decisions: caring for caribou through two ways of knowing

Joanne and Natasha are independent researchers with many years of experience, particularly around TK and community guardian programs. They gave a joint presentation that focused on TK research and guardian programs, and explored ways for scientific and TK research to work together (Figure 15). A recent development in 2020 is a Caribou Guardians Coalition, which arose in part due to collaborative work on the Bathurst Caribou Range Plan; this would create a regional network of guardian programs sharing information and knowledge. A key aspect of these kinds of programs is the ancient people-caribou relationship and the need to restore the health of this relationship. Support for TK programs should include (1) TK research driven by communities, (2) finding ways to support Indigenous students and researchers that are not necessarily housed in academia, (3) formation of a Volunteer TK Research Panel to support /advise graduate students in all research, (4) collaboration with Universities that support social science methods, in particular Participatory Action and Mapping Research approaches, (5) support for students interested in learning 'two ways', and (6) provision for knowledge exchanges.

On barren-ground caribou research programs, Natasha and Joanne felt that TK and science can be interwoven, but they also need to be recognized as separate knowledge systems. They emphasized that both TK and scientific research must address the following points:

- **Respond**: Listen to community insights and priorities to drive action - now more than ever
- **Legacy:** Develop TK research capacity
- **Learn Together**: Provide for collaboration with science - but not require it
- **Empower:** Use research methods that respect and honour knowledge holders (e.g. community timelines, Elder advisors, UNDRIP, TRC Recommendations…)

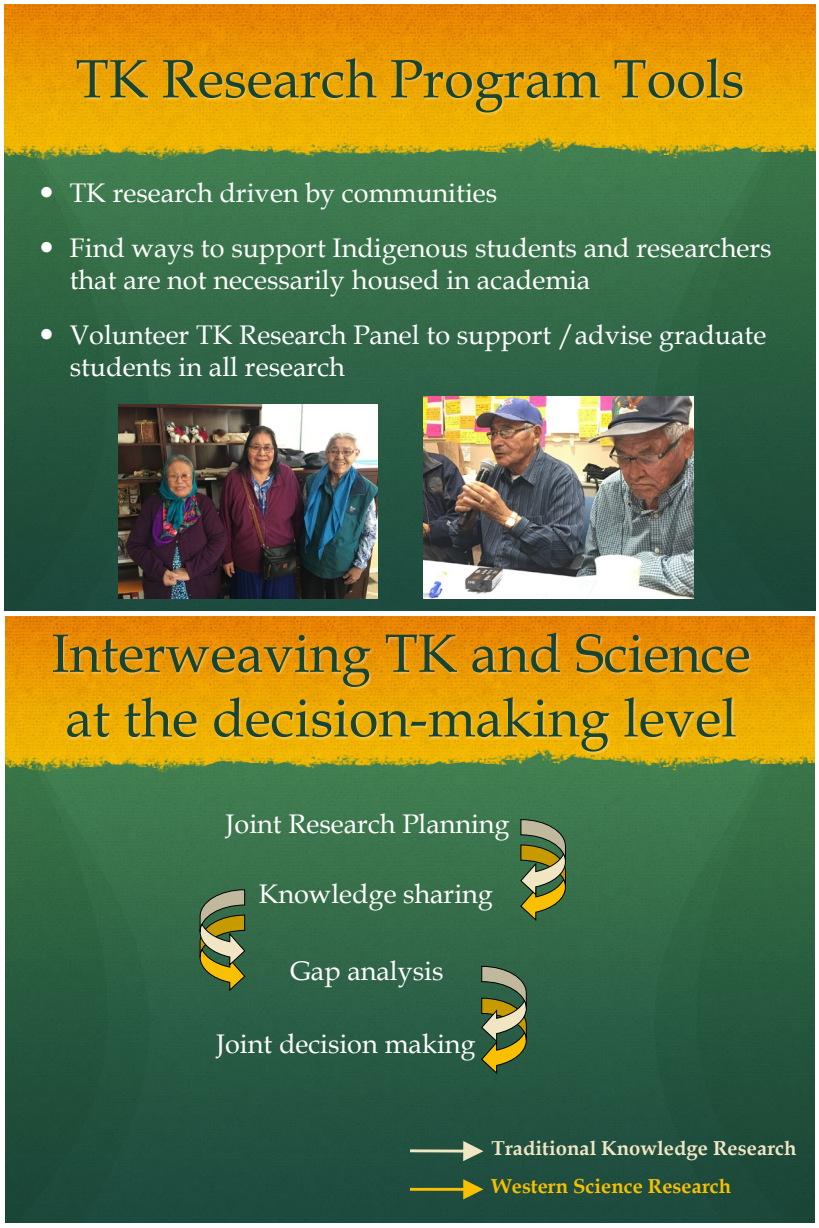

Figure 15. Two example slides from presentation on two ways of knowing by J. Barnaby and N. Thorpe, February 2020.

Prairie Desjarlais: Ni Hat Ni program, Łutsël K'é Dene First Nation

Prairie and Laura Jane are both involved in a very recently initiated community-based guardian program developed by Łutsel K'e Dene First Nation (LKDFN). The caribou monitoring program began in winter 2019-2020 and runs from December to April annually. There are four full time winter monitors made up of two senior and two junior monitors/rangers. The intent of this new program through Thaidene Nene is to monitor and watch the caribou. With the decreasing numbers of the Bathurst herd we have had widespread concerns for the herd. The caribou has been our main source of food for thousands of years. We wanted this program to "protect the herds and monitor". In the winter, Nithatni Dene Rangers often travel large distances by skidoo within Thaidene Nene where local Dene Harvesters hunt to ensure the Dene Harvesting Protocols are followed. A number of specific goals for the program are in the graphic below.

The overall mission of the Ni Hat Ni Dene (Figure 16) is to (1) Protect the cultural sites and the natural beauty in the area, (2) Welcome, host and provide interpretive tours for visitors in the area, (3) Monitor and document visitor activity, cultural artefacts and environmental/wildlife values, and (4) Teach cultural knowledge to younger generations.

Community-based guardian programs like Ni Hat Ni, along with similar programs in other communities, will be an important part of an overall approach to barren-ground caribou research and monitoring in the NWT.

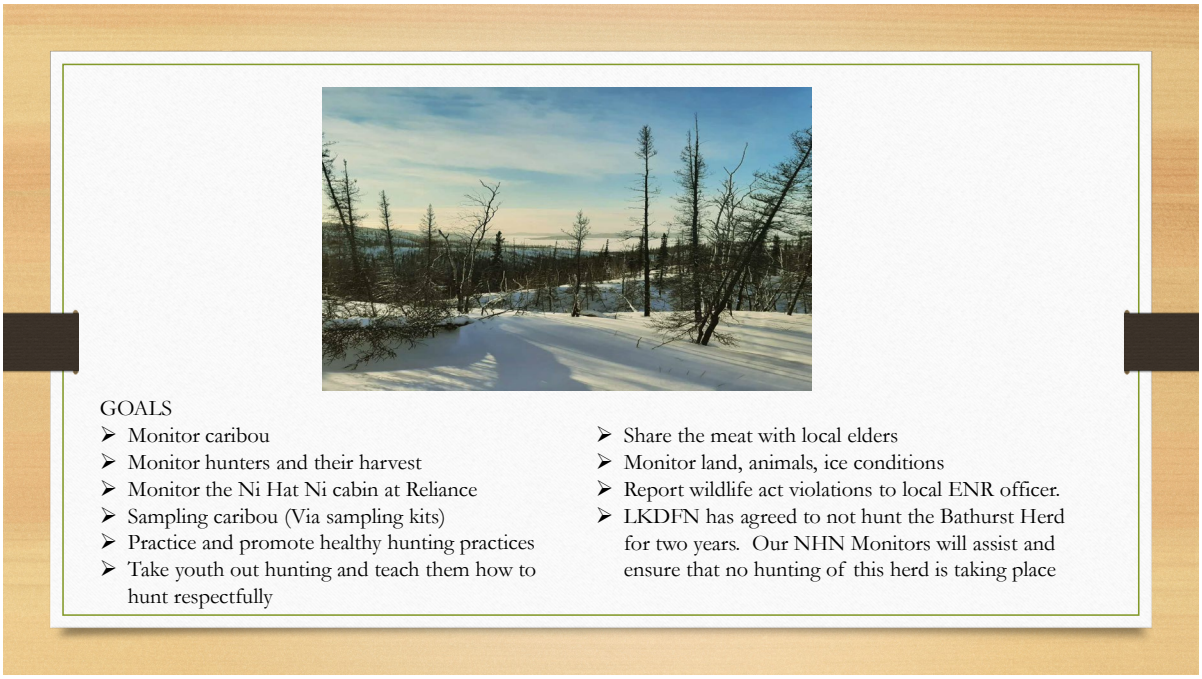

Figure 16. An example slide from presentation on Ni Hat Ni program by P. Desjarlais, February 2020.

Randi Jennings, Wek'èezhìı Renewable Resources Board (WRRB): Wek'èezhìı Renewable Resource Board (WRRB) perspective on caribou research

Randi is a biologist with the WRRB. She gave a brief presentation with no slides. The WRRB had sent ENR a letter with a number of ideas and recommendations on a potential barren-ground caribou program. Randi highlighted some of the main points and a paraphrased summary of the WRRB letter is given below.

The WRRB supports a research program that will improve our understanding of the factors that drive changes in abundance of ʔekwǫ̀ (barren-ground caribou) by relying on community and scientific (or technical) knowledge. Ideas on how we can build a focused ʔekwǫ̀ research program for the NWT are:

1) The research program should initially build on research needs already identified through community and co-management planning, which may need the compilation of an annotated catalogue. Examples are the "Caribou Blueprint" of the GNWT CIMP (Cumulative Impact Monitoring Program) and research priorities identified in the "Taking Care of Caribou" plan developed by co-management boards for the Cape Bathurst, Bluenose-West and Bluenose-East caribou herds.

2) The research program's governance framework should build on existing models, such as ArcticNet and WKSS (Figure 17), to ensure that governance represents co-management boards and communities as well as university and governments to be involved in research decisions. Another useful example is the CARMA network. The CARMA network includes communities, universities and governments at a circum-arctic scale and is a recognized expert group within the Arctic Council organizations. (A presentation on CARMA was part of the February 2020 workshop on Day 2).

3) The research program should follow a reporting protocol, such as CIMP's Discovery Portal, to ensure accessibility and availability of research findings and data.

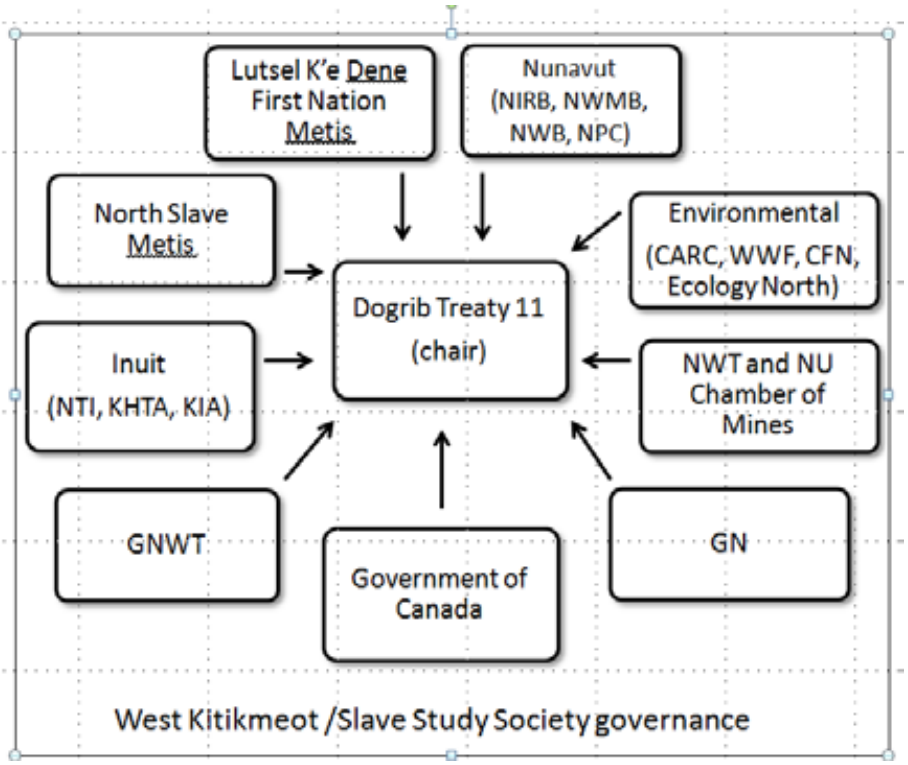

Figure 17. Organizational structure for West Kitikmeot Slave Society (WKSS) program in 1990 and early 2000s (from WRRB letter to ENR, February 2020).

Rob Serrouya: Learning from social and ecological contrasts: A key part of adaptive research and management

Rob Serrouya is part of the Caribou Monitoring Unit of Alberta Biodiversity Monitoring Institute associated with the University of Alberta. He and his colleagues have been involved in applied research of boreal caribou and southern and central mountain caribou in Alberta (AB) and British Columbia (BC). Most of these populations have declined to very low numbers and some have been extirpated. These declines have primarily resulted from extensive development-associated habitat change in the old forests that caribou prefer. Habitat change has altered predator-prey relationships where other ungulates (moose, deer, and elk) sustain higher wolf numbers, leading to higher caribou mortality and declines in caribou numbers. The most recent research has been built around intensive management actions, including wolf reduction operations and maternal penning in BC and AB. The focus of these programs is to identify the "management levers" that in a crisis situation can be "pulled" and may have a positive effect on caribou population trend (Figure 18). A recent paper evaluated 18 caribou populations that were in decline in BC and AB; various combinations of management actions were applied. The six populations where intensive wolf removals have been applied have been the only ones with a change to a positive population trend.

Serrouya suggested that some of the barren-ground caribou herds in the NWT, e.g. Bathurst, are in a conservation emergency situation analogous to boreal and mountain caribou herds in BC and AB. There are also large differences, including the vast remote areas that barren-ground caribou herds range in, and less clarity as to reasons for declines. Where resources are limited, a priority of research could be to focus on "pulling management levers" such as wolf reduction, that may in the short-term have an effect on caribou abundance. Key principles in this approach are (1) Credibility: strong technical evidence and arguments; (2) Relevance: addressing the needs of managers and communities; and (3) Legitimacy: being respectful of stakeholder values and beliefs. Where intensive management actions are taken, clearly documenting and communicating results of the actions is essential, as is support of partners and communities.

Barren-Ground Caribou Herds are in a conservation emergency

With limited resources: Focus "Research" on the levers

- Harvest
- Habitat
  - Fires
  - Diamond Mines
- Wolves
- Weather and Climate
  - Insects
  - Drought
  - Disease
  - Snow and Ice
- Food and animal density

CMU

Governance is bedrock

1. Credibility
   foundation of scientific credibility (strong technical evidence and arguments);
2. Relevance
   designed to address the needs of resource managers, policy analysts, and community; and
3. Legitimacy
   respectful of stakeholders' divergent values and beliefs, unbiased in its conduct, and fair in its treatment of opposing views and interests.

Knowledge systems for sustainable development

David W. Cash*†, William C. Clark*, Frank Alcock*, Nancy M. Dickson*, Noelle Eckley‡, David H. Guston§, Jill Jäger¶, and Ronald B. Mitchell‖

CMU

Figure 18. Two example slides from caribou research presentation by R. Serrouya, February 2020. Note top slide was amended slightly for clarity.

Chris Johnson: Working with governments to conduct student-led research

Chris Johnson teaches at the University of Northern British Columbia (UNBC) in Prince George, BC. He has carried out research on the effects of mines on barren-ground caribou and he has had a series of graduate students studying Bathurst caribou use of burned and unburned winter ranges, effects of insect harassment on Bathurst caribou in the summer, ecology of wolves associated with a declining Bathurst caribou herd, and (currently) effects of diamond mines and mine roads on wintering caribou (Figure 19). Chris included a summary of four possible options for research partnerships on barren-ground caribou, and those were included earlier in the workshop report (pages 5 and 6). In addition, Chris summarized five elements of a successful research program:

1. ***Government leadership:*** (1) invest in the development of research topics/questions, (2) serve as champion for research within and among governments and industry, and (3) facilitate the activity of research: field work, access, returning results, and integration with communities.

2. ***Recruiting an Effective University Partner:*** (1) find researchers willing to develop questions that work for decision makers and northerners, (2) find researchers willing to return results to the north, and (3) find researchers who care about northern people and their environment.

3. ***Contribute to the funding and facilitation of research:*** (1) working in the north is expensive: travel, data collection, AND accommodating students, (2) high financial and time costs are a disincentive for many to conduct northern research, and (3) reducing logistical challenges reduces time costs (e.g. charter aircraft, facilitate access to communities).

4. ***Contribute to the funding and facilitation of students:*** (1) deliver formal/informal northern 'training' for southern graduate students, (2) student stipend can be a barrier: $18,000-22,000/year, and (3) identify and mentor qualified students from the north.

5. ***Engagement and communication:*** (1) researchers want to involve northern communities in research – *help* them, (2) provide guidance on how and when engagement, involvement and communication should happen, and (3) ensure that researchers understand the community consultation and permitting process.

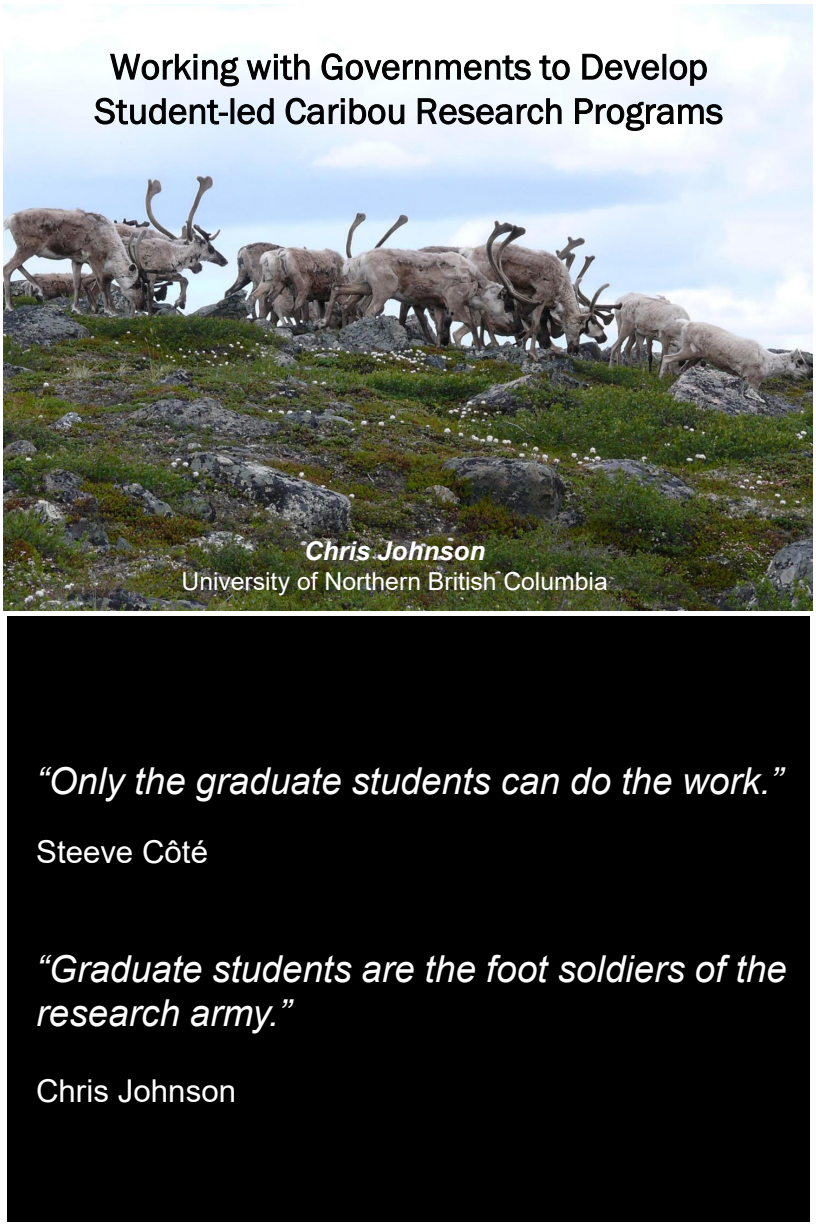

Figure 19. Two example slides from presentation on graduate student research by C. Johnson, February 2020.

Don Russell: CARMA (Circum Arctic Rangifer Monitoring and Assessment) Caribou and Reindeer Program

Don Russell was a caribou biologist with the Canadian Wildlife Service for many years. He presented an overview of the CARMA program (Figure 20) for migratory caribou and reindeer herds across the global north (North America, Europe and Russia). The first of a series of meetings was held in 2004 and the most recent in 2018. CARMA is a network of government staff, co-managers and university researchers with representation from all circum-arctic countries. CARMA's mission is to monitor and assess the impacts of global change on Human-Caribou systems across the circum-arctic, through cooperation, both geographically and across disciplines. CARMA has links to the international Arctic Council and promotes links to communities and co-management organizations. CARMA was most active 2005-2011 with 35 projects associated with the International Polar Year (IPY). Many of these projects were for university students but other projects focused on community involvement, a hunter training video and the Caribou Atlas of anatomy. CARMA has developed standardized caribou condition monitoring protocols, a remote-sensing based climate database, and a set of models that have been used for environmental assessments and cumulative effects studies.

On a barren-ground caribou research program, Don suggested that a clear vision was needed of why and for whom the research is needed, such as adaptive management. He also pointed out that a strong governance structure was needed to make sure the research served the needs of the GNWT and its caribou co-management partners. Collaboration, trust and sharing knowledge would be key requirements for a research program, as would sufficient funding. CARMA has many years of relevant experience, particularly with its international network of collaborators.

What CARMA does . . .

- Monitor and assess global change
- Links Arctic Council to communities and co-management
- Clearing house for information

Tools and resources

- Protocol manuals
- Standardized databases
- Education: Caribou Atlas, hunter video
- Voices of People
- Integrative Modeling

Figure 20. Two example slides from presentation by D. Russell on CARMA network, February 2020.

Ryan Danby: A multiscale perspective on caribou range dynamics

Ryan Danby teaches at Queens University and has had a field research program with graduate students in the NWT for several years, including summer studies at ENR's Daring Lake Tundra Ecological Research Station. Climate change is most pronounced at high latitudes in northern Canada, and changes to vegetation have been profound. Ryan's research in recent years has focused on vegetation change at three diverse North American sites: the Greater Kluane Ecosystem in the Yukon, the Bathurst caribou range, and the Algonquin-to-Adirondacks region in southeastern Canada and the United States. Understanding vegetation change requires thinking at a diversity of spatial and time scales, and the methods depend on the scales of interest (Figure 21). In the Bathurst caribou range, project objectives include (1) Mapping and analyzing vegetation change using satellite image analysis, (2) identifying what these changes look like "on the ground" using vegetation sampling, and (3) assessing how caribou distribution has changed in response using spatial analysis.

On a barren-ground caribou research program, Ryan identified a number of useful design elements: (1) committed and supportive partners, (2) well-defined questions governed by a broad, overarching goal, (3) modular design of projects, (4) long-term/sustained base funding, and (5) a systems perspective. He also identified some specific items that can help support research: (1) graduate student involvement, (2) for southerners, extended time in the north, (3) available resources (in-kind) in communities, cost & task sharing (e.g. piggy-backing, coordinating, etc.), (4) patience, (5) a clearly identified geographic focus, and (6) facilities supporting research. Ryan also spoke about the value of manipulative experiments, natural experiments, exploiting system gradients and thinking big. In terms of designing a caribou research program, Ryan also spoke about the value of information gap analysis: identifying what we do know and what we don't (gaps). He also pointed out that there may be opportunities for historical ecology and gaining long-term perspectives of change, which may be one avenue for 'braiding' TK and western science.

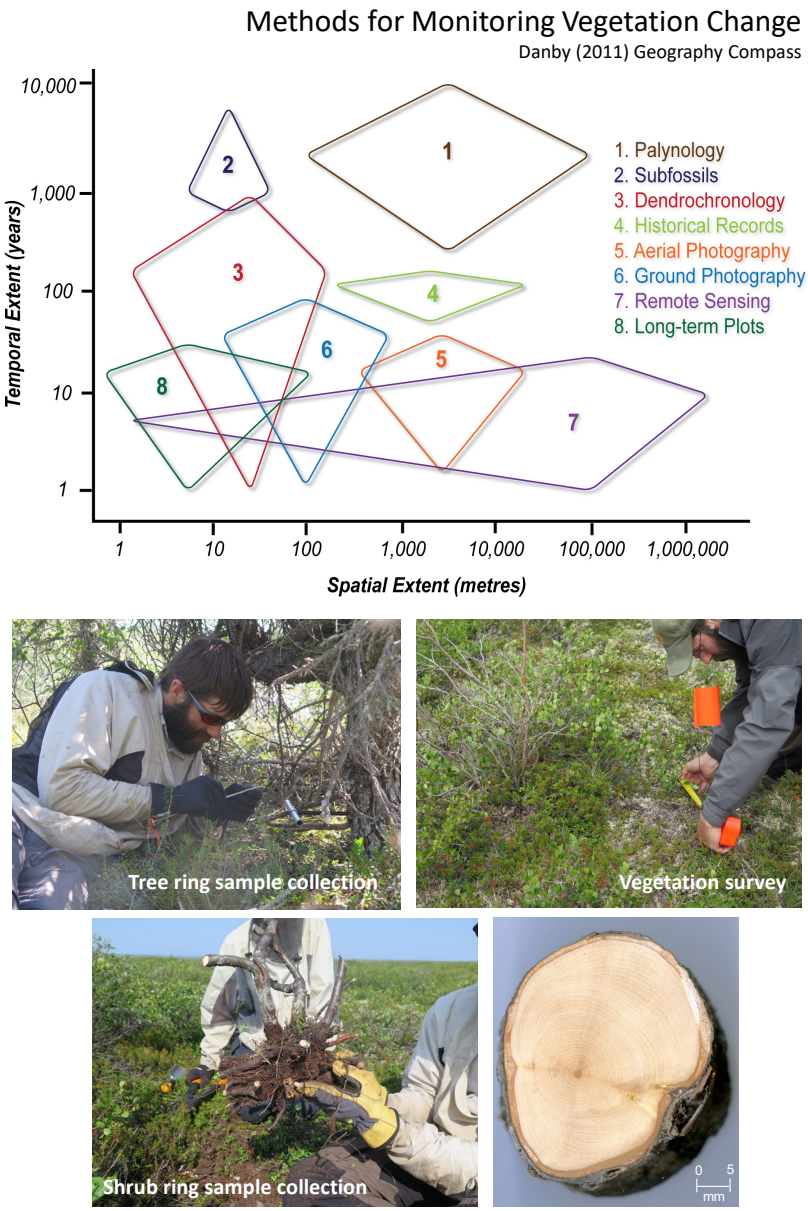

Figure 21. Two example slides from presentation on research on vegetation change by R. Danby, February 2020.

Petter Jacobsen and Tyanna Steinwand: Ekwǫ̀ Nàxoède K'è - Tłı̨chǫ Caribou Monitoring

Petter Jacobsen and Tyanna Steinwand both work for the Tłı̨chǫ Government and have been involved in the Ekwǫ̀ Nàxoède K'è program (formerly called Boots on the Ground). This program has operated for three years on the summer range of the Bathurst caribou herd, and is based on traditional holistic ways of watching caribou and the land (Figure 22). Teams of observers are based at Contwoyto Lake, the heart of the Bathurst summer range even at the herd's all-time low numbers. They travel on the lake by boat and on land they travel on foot. Satellite caribou collar locations help to identify areas to explore for caribou. Methods were in large part defined by elders, and in effect Tłı̨chǫ observers are doing "what they have always done". The field program is based on building on people's strengths and a high degree of commitment. The Tłı̨chǫ Government is considering expanding the program to other seasons and potentially to the range of the Bluenose-East caribou herd. Observations and videos recorded in the field have provided information on calf numbers, predators like wolves, climate change, and cumulative effects of development.

Petter and Tyanna identified a number of challenges they had found in building a successful long-term program: (1) logistics: transport of people and gear by plane-only to isolated camps, (2) administrative challenges: paperwork, (3) data management: how to synthesize 57 days of field observations from multiple research teams, (4) complementing TK and science methods - avoid focusing only on one method; (5) knowledge translation to decision-makers, (6) format of knowledge: numbers vs. paragraph, and (7) long-term funding.

With respect to overall ideas for building a long-term research program, Petter and Tyanna identified these themes: (1) build on projects and structures already in place, (2) complement TK and science, (3) work with all Indigenous groups, (4) include youth/young adults, (5) use methods that are non-intrusive to caribou, and (6) focus on research that informs management and solutions.

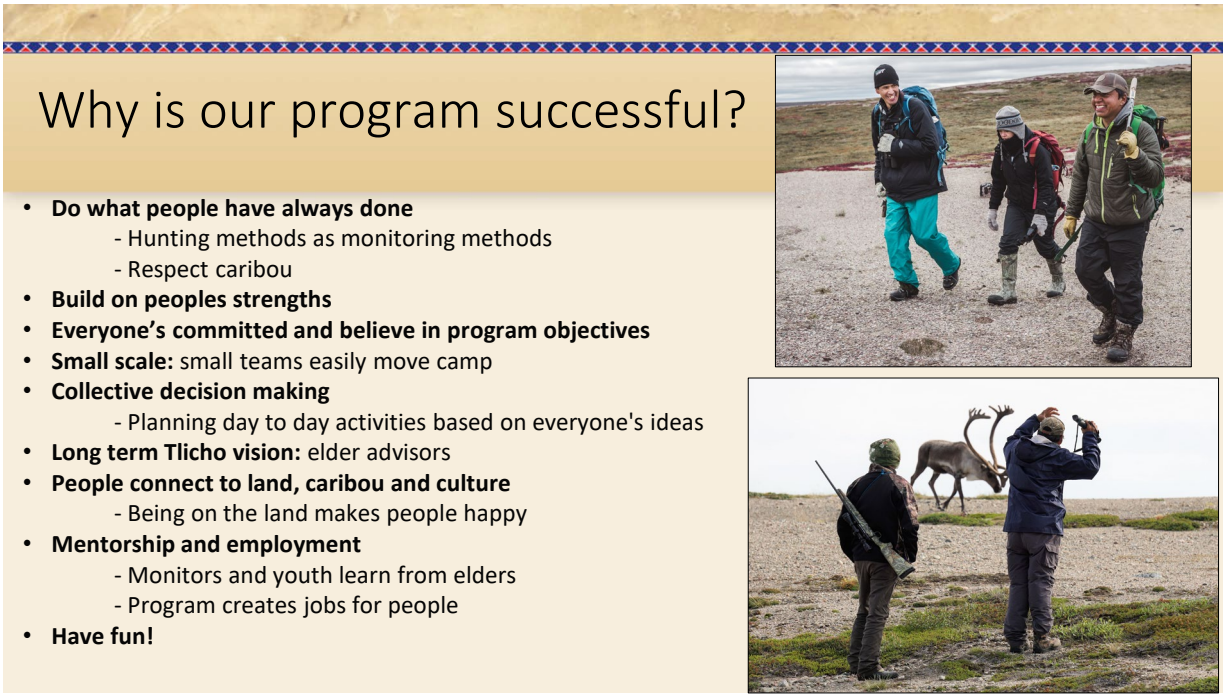

Figure 22. Example slide from presentation on Tłı̨chǫ Caribou Monitoring by P. Jacobsen and T. Steinwand, February 2020.

Don Russell: Arctic Borderlands Ecological Knowledge Society (ABEKS)

Don Russell presented an overview of community-based monitoring carried out by the Arctic Borderlands Knowledge Ecological Society (ABEKS; Figure 23). The program began in 1996 and has continued to the present day (2020). The vision of the programs is to empower Gwich'in and Inuvialuit harvesters to share their knowledge and strengthen adaptive management and decision making. The goals are to document and assess changing environmental conditions in the range of the Porcupine Caribou Herd (PCH), and to share and use local, traditional and scientific knowledge for co-management. ABEKS directors, participants and partners are from Gwich'in and Inuvialuit organizations and governments, and seven communities (Aklavik, Fort McPherson, Inuvik, Tuktoyaktuk, Tsiigehtchic) in the northern NWT, Yukon (Old Crow) and Alaska (Arctic Village) are involved. Interviews are carried out annually from and by community members. There are 42 questions about animals, plants, land, weather and community, and 11 caribou questions. Interviews are conducted in November. Results are compiled and reported in February, and incorporated into annual PCH Harvest Management Strategy meetings.

Overall, ABEKS coop data can help us understand linkages between climate, caribou body condition and demography, and communities meeting their needs. Interviews provide a legitimate, important, and relatively low cost data source to better understand caribou, and caribou-communities linkages. Challenges include (1) keeping funders participating, (2) capacity, (3) staying relevant, (4) a changing political environment, and (5) board participation.

With respect to an NWT barren-ground caribou research program, the success of the ABEKS highlights the importance of co-production of knowledge. Community observations should be a key element in an adaptive management process, which any research program should be developed around.

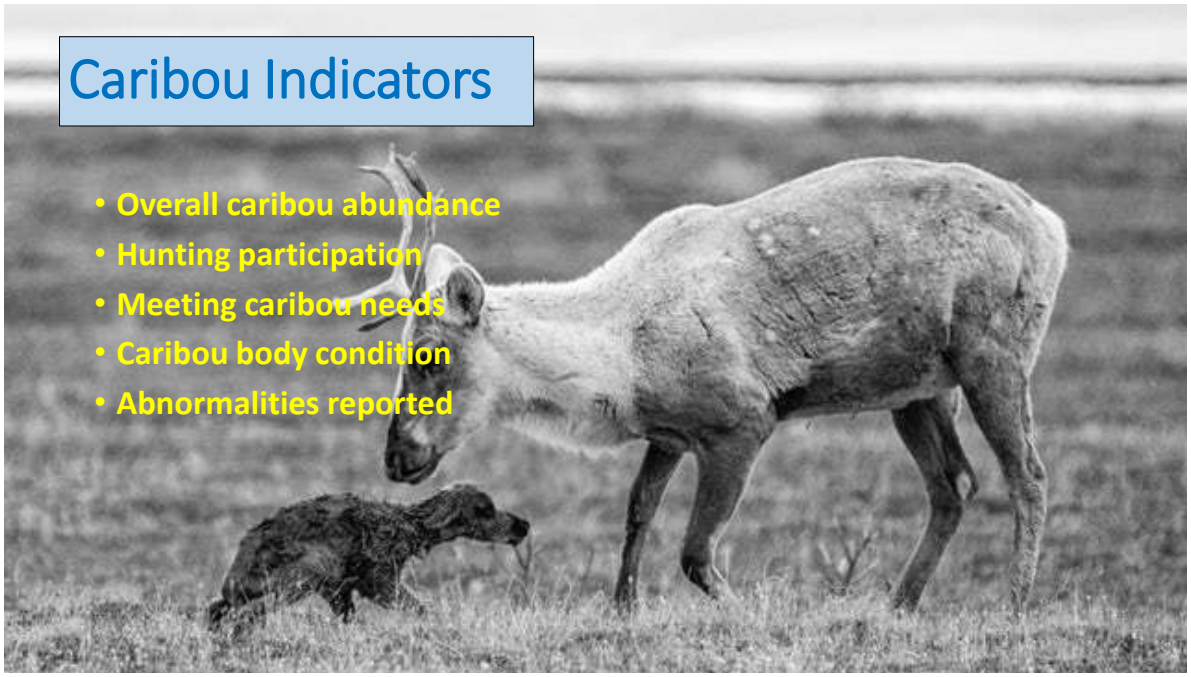

Figure 23. Example slide from presentation on ABEKS program by D. Russell, February 2020.

Walter Bezha and Colin MacDonald: Sahtú Perspective on Barren-Ground Caribou and Research

Walter Bezha works in Délı̨nę for the Délı̨nę Got'ı̨nę Government. He has been involved in management of barren-ground caribou and other wildlife for many years. This has included being a chairperson on the Sahtú Renewable Resources Board (SRRB) and a long-time wildlife officer for the GNWT. Colin MacDonald is a science advisor to the SRRB. The presentation was organized around a number of questions that Colin posed to Walter, and some of Walter's main points are paraphrased here. Walter spoke on a wide range of topics, including community-based conservation programs, how to manage caribou harvest, re-building our relationship with caribou, public hearings and listening sessions, and Dene concepts of conservation.

With respect to developing a caribou research program, Walter spoke about the value of hearings and public listening sessions (Figure 24), community-based initiatives, language, co-management and building relationships. Having a community-based approach to defining research priorities and questions would help to re-build trust and respect. Note that the SRRB held the first of a planned series of "public listening sessions" in Colville Lake in January 2020 on Sahtú Ragóʔa (Dene Hunting Laws) and Approaches to Wildlife Harvesting. Walter spoke about Délı̨nę's interest in listening sessions to focus on listening and finding the truth, re-building relationships with caribou, moving beyond regulation and enforcement, people doing things for themselves like harvesting other animals (when caribou are scarce), and food security. One of the Dene concepts of conservation is: when the earth provides it, harvest it (e.g. caribou), and when it doesn't, you don't harvest that animal. Délı̨nę has developed its own community-based conservation plan for Bluenose-East caribou (Belarewíle Gots'ę̨ ʔekwę̨ Caribou for All Time, Délı̨nę Got'ı̨nę Government), and the community will follow it and respect traditional laws because, that is being Dene. The Dene of Sahtú have harvested caribou for thousands of years and will continue, when they are available.

Figure 24. Dene drummers at Colville Lake public listening session organized by Sahtú Renewable Resources Board, January 2020.