

# CARIBOU WORD CLOUD

- What are your biggest concerns related to caribou?
  - Please use one- or two-word answers



# **ECCC CARIBOU SURVEYS IN NORTHERN ONTARIO**

Samantha McFarlane, Wildlife Biologist  
Canadian Wildlife Service (CWS), Environment and Climate Change Canada (ECCC)  
November 27, 2024



Environment and  
Climate Change Canada

Environnement et  
Changement climatique Canada

Canada

# CWS WILDLIFE SURVEYS IN NORTHERN ONTARIO

- Collecting and sharing information will improve our understanding of species at risk and migratory birds and their habitats in the region, and support strong decision making
- Work to date includes:
  - Caribou surveys
  - Caribou predator surveys
  - Bird surveys; aerial surveys of ducks and geese and surveys of land birds with recording devices
- Striving to work collaboratively with Indigenous communities and organizations



# CARIBOU IN NORTHERN ONTARIO

- Two types of caribou occur in northern Ontario: Boreal Caribou and Eastern Migratory Caribou
  - Distinguished based on female predator avoidance strategies during calving and their migration strategy
- Boreal and Eastern Migratory Caribou ranges overlap extensively, with the greatest overlap occurring in early winter



Map: Chris Brackley/Can Geo

# CARIBOU SURVEY CONSIDERATIONS

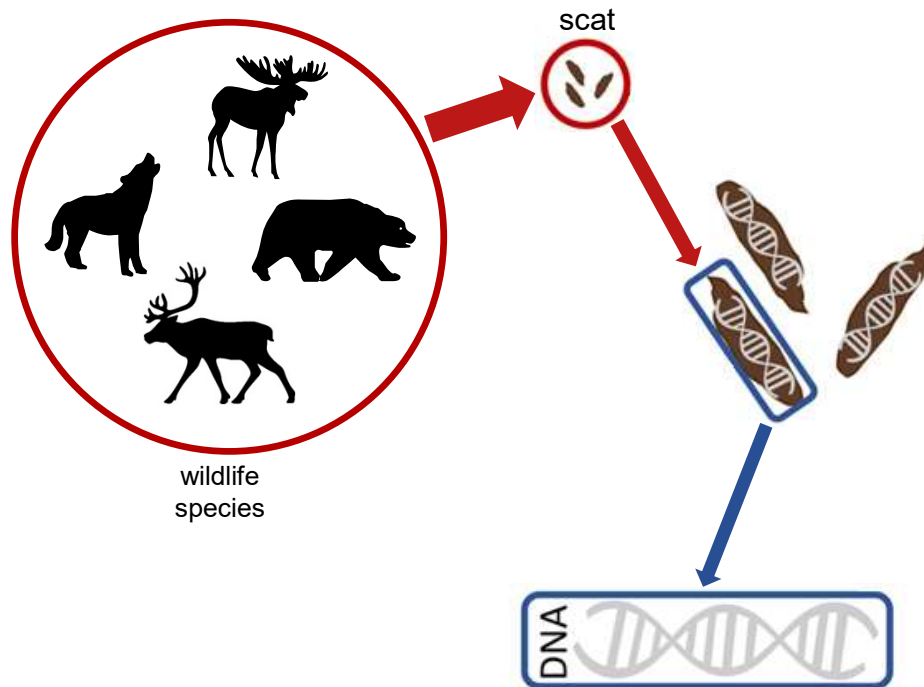
- Addressing the broad strategies in caribou recovery requires monitoring changes in the distribution of the species, the population size, and population trends
- Obtaining reliable population estimates can be difficult for species such as caribou
  - Caribou are found in low densities throughout the boreal forest, wary of humans, and found in northern areas with little human development



# CARIBOU SURVEY OBJECTIVES

- Obtain population data on caribou occurring in northern Ontario, including abundance and distribution
  - Both boreal caribou and eastern migratory caribou are found here
  - Non-invasive genetic sampling using fecal DNA is a cost-effective approach to establish baseline data at a large geographic scale
    - Useful approach for both short- and long-term monitoring
    - Can provide data on many different parameters
    - Complements data available from other methods, e.g. radio-collaring

# NON-INVASIVE GENETIC SAMPLING



As scat moves through an animal's digestive tract, it picks up cells containing the animal's DNA.

## The collected DNA can:

1. Confirm the species
2. Identify unique individuals
3. Determine the sex of the individual

## Which can then tell us:

1. Sex ratio of the population (numbers of males and females)
2. Abundance estimate (total number of animals in the population)
3. Genetic structure of the population (genetic differences between individuals)
4. ...and more



# POTENTIAL OUTCOMES FROM DNA SURVEYS

One population-level DNA survey can provide information on:

Number of animals

Number of pregnant females

Movement of individuals

Family relationships between individuals

Mapping out different populations

Telling different types of caribou apart

How related breeding individuals are

*DNA surveys cannot provide direct information on habitat use or movements of individuals*



# AERIAL CARIBOU DNA SURVEY

## Phase 1



1. Follow 10-km transect lines by aircraft



2. Identify caribou feeding sites

## Phase 2



3. Fly to identified craters by helicopter



4. Land at caribou feeding sites and collect fecal samples

# CARIBOU DNA COLLECTION



1. Fly to caribou feeding locations

2. Collect caribou scat

3. Label collected scat with location

4. Return frozen samples to lab to extract DNA

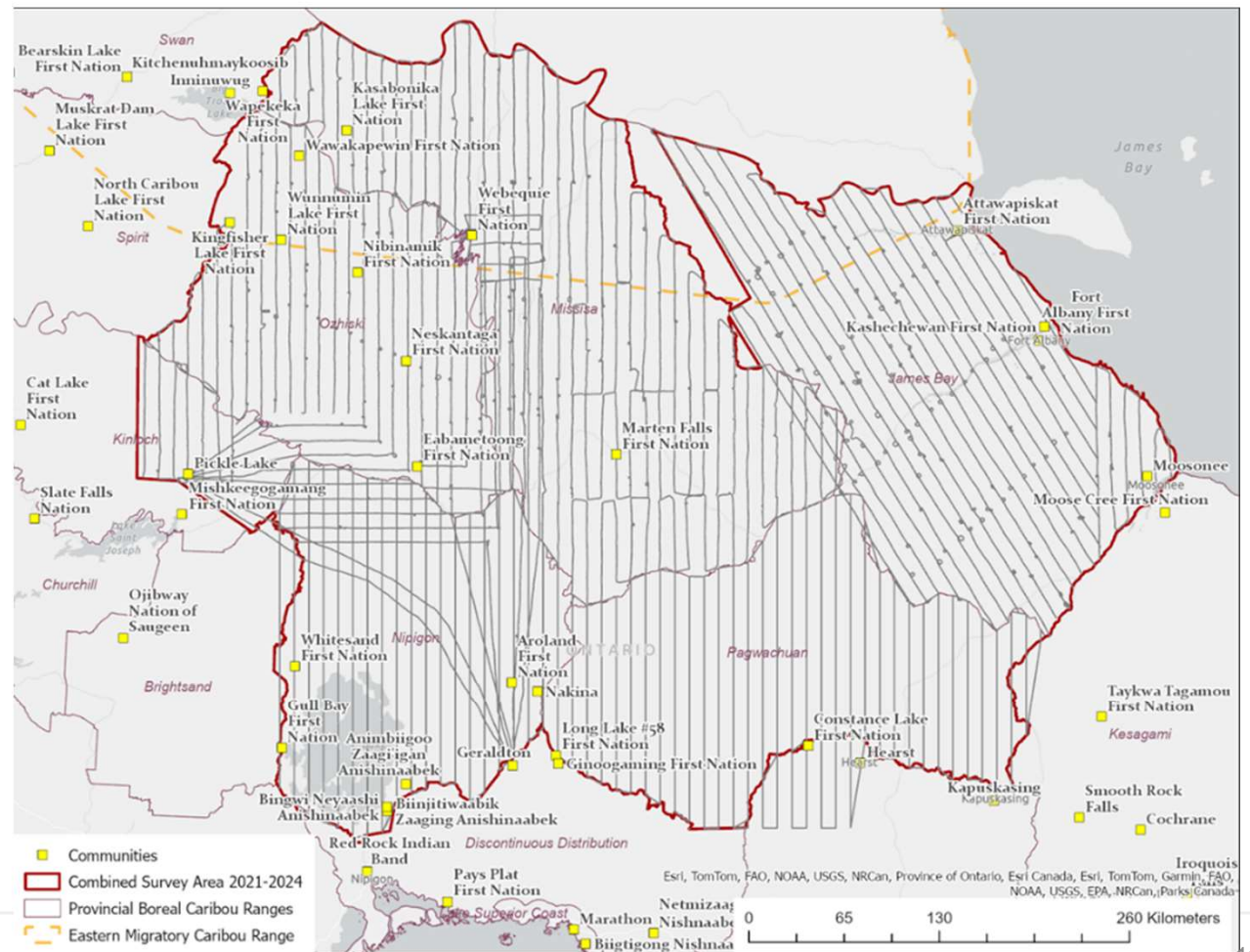
# 2021-2024 FECAL DNA SURVEYS OVERVIEW

5 caribou ranges surveyed:

- 2021 – Missisa
- 2022 – Ozhiski
- 2023 – James Bay
- 2024 – Nipigon, Pagwachuan

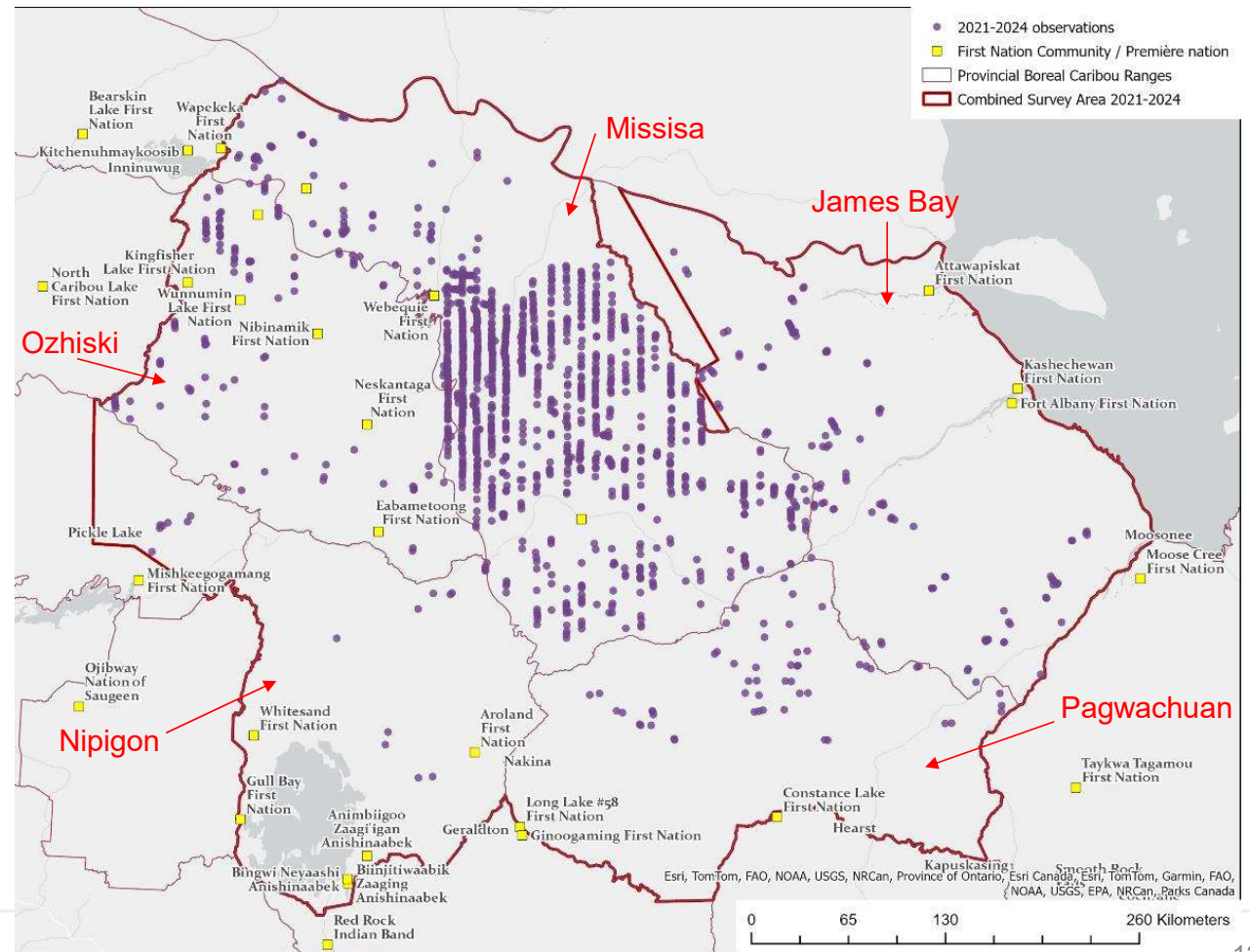
Surveys occur in February & March, covering the entirety of the range

Total combined survey area of **257,503 km<sup>2</sup>** = 3x the size of Lake Superior!



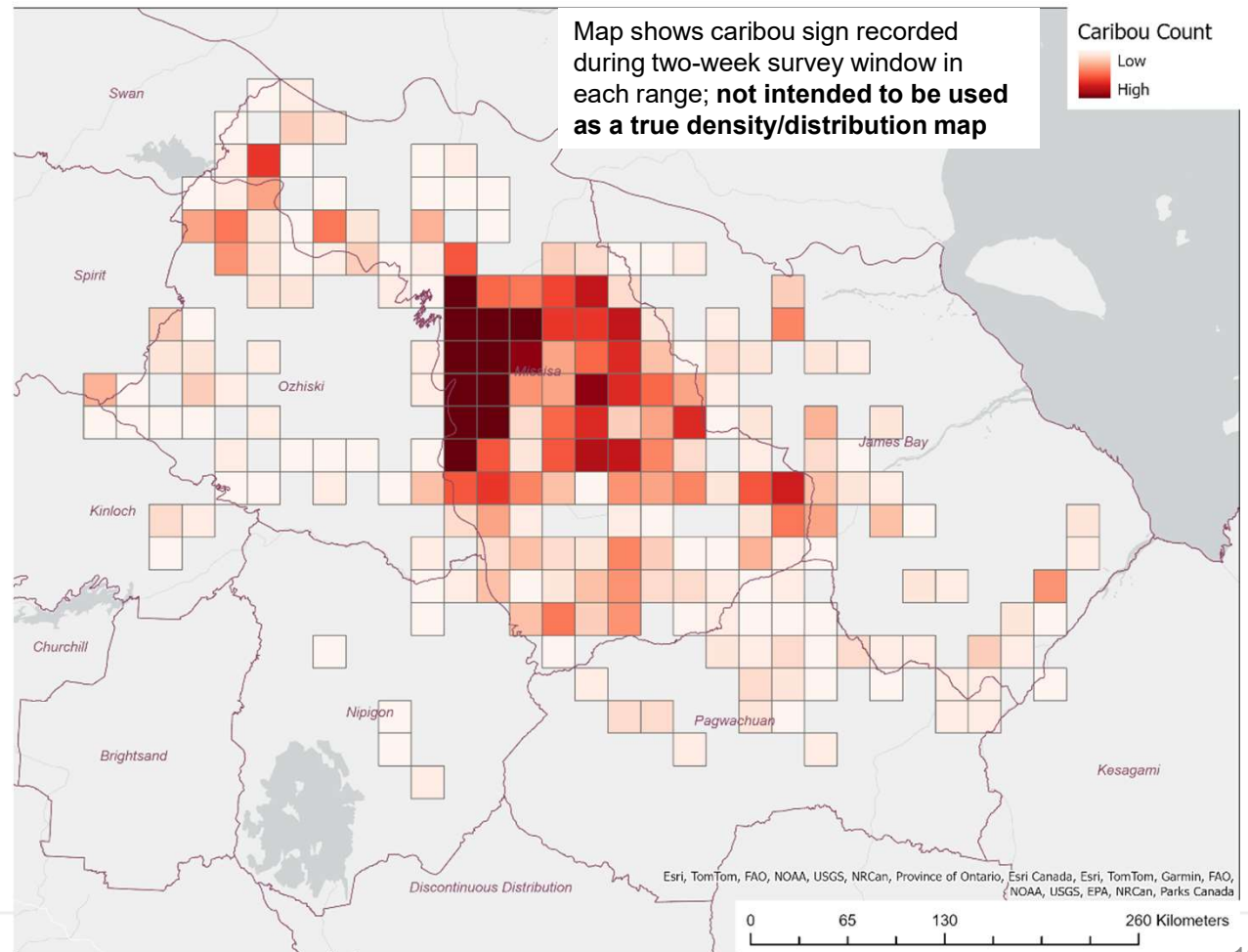
# 2021-2024 FECAL DNA SURVEYS RESULTS

- Collected approximately 2,800 fecal samples
- Highest concentration of caribou sign in central Missisa

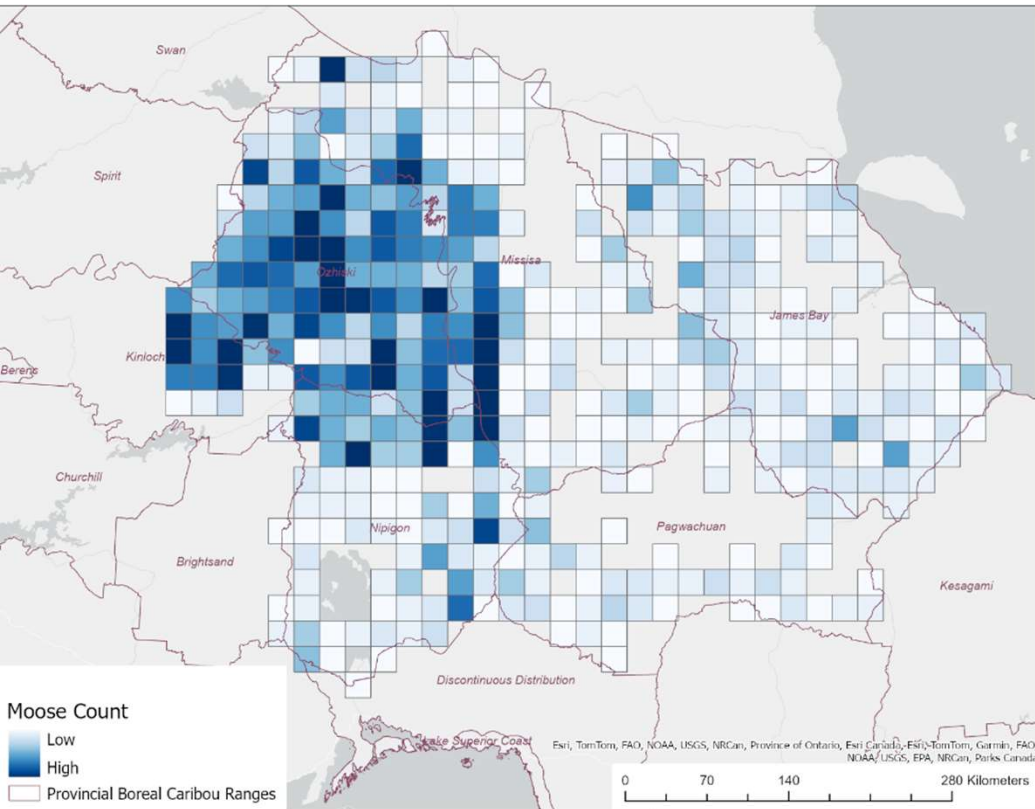


# 2021-2024 FECAL DNA SURVEYS RESULTS

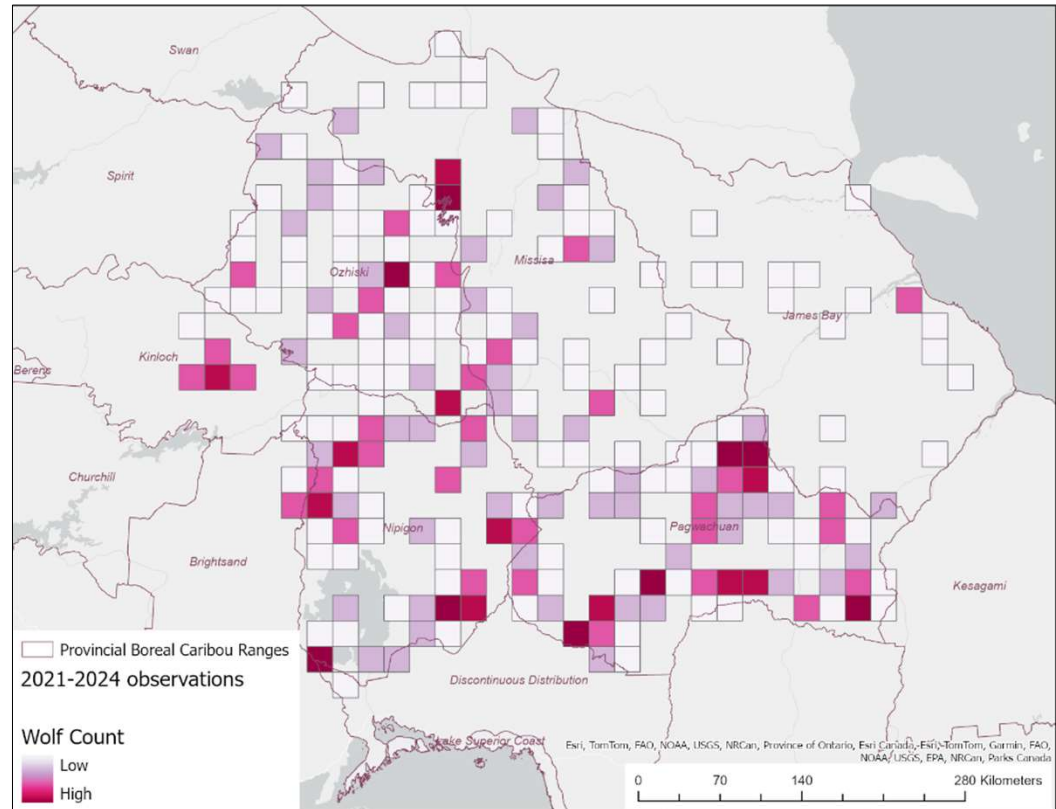
- Collected approximately 2,800 fecal samples
- Highest concentration of caribou sign in central Missisa
- Very little caribou sign in central Ozhiski, along James Bay coast, Nipigon, or the southern portion of Pagwachuan



# 2021-2024 FECAL DNA SURVEYS INCIDENTAL OBSERVATIONS

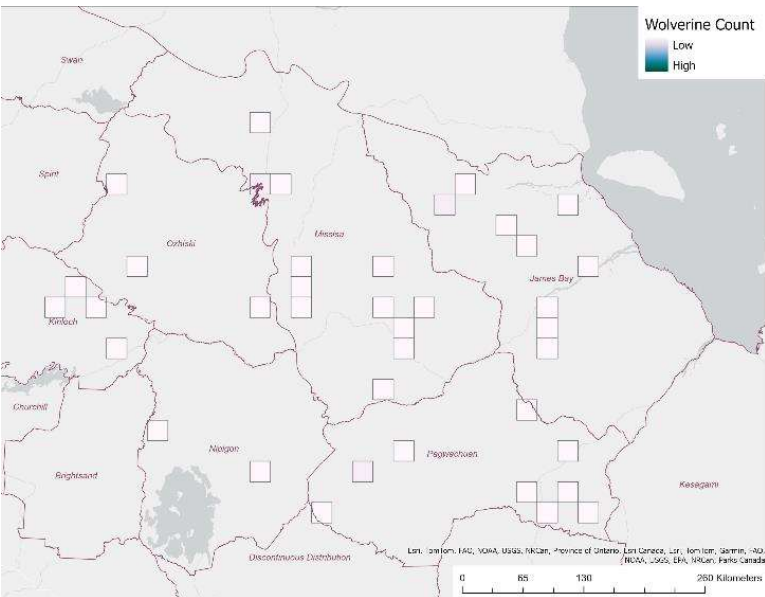


Moose

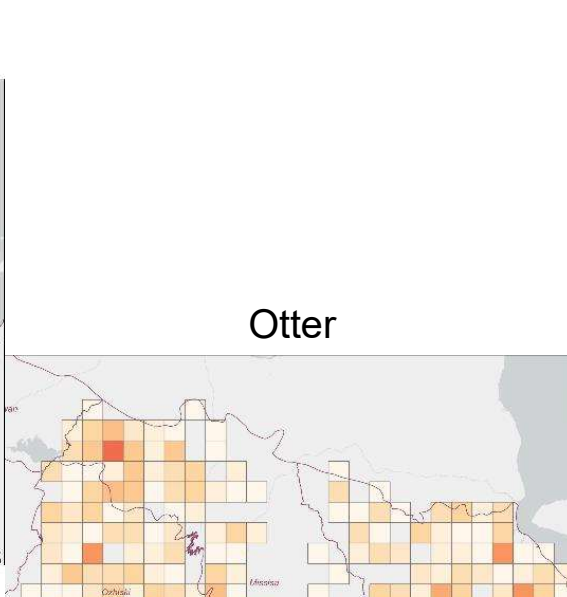


Wolf

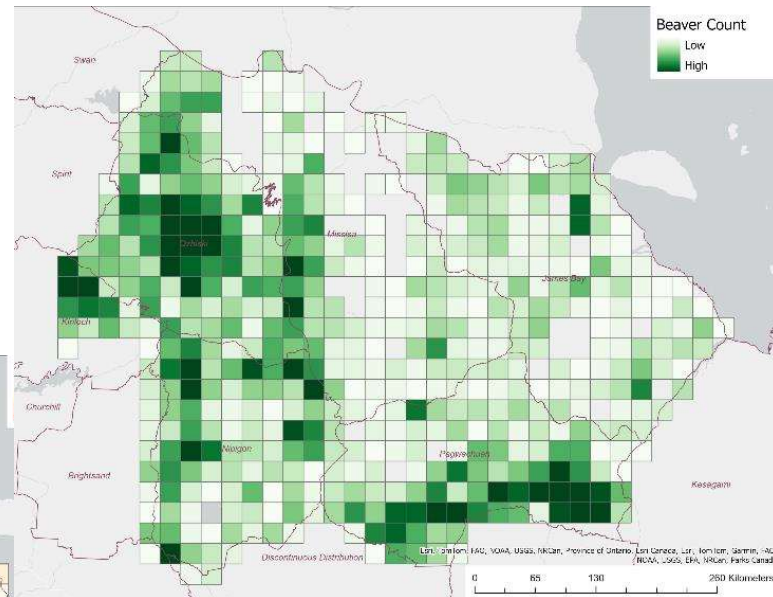
# 2021-2024 FECAL DNA SURVEYS INCIDENTAL OBSERVATIONS



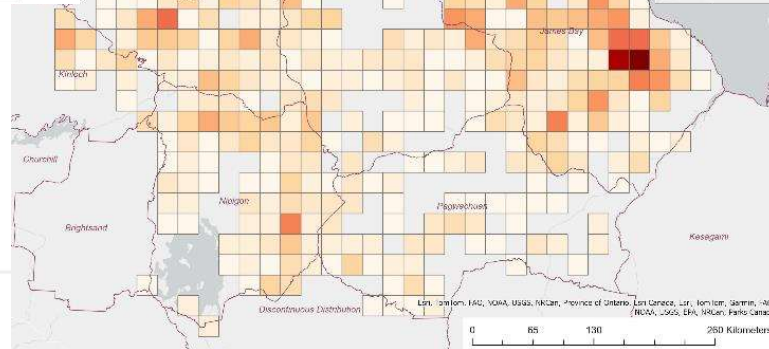
Wolverine



Otter



Beaver



# FECAL DNA LAB ANALYSIS

- All caribou scat samples collected from surveys were delivered to Trent University
- Lab and data analysis are being completed through funding agreements between the Science and Technology Division of ECCC and Trent University
  - The project has received NSERC Alliance funding to complete additional research activities
- Work to refine methods for telling Boreal Caribou and Eastern Migratory Caribou apart is ongoing





# Implementing genomics-based monitoring of caribou in the Far North region of Ontario

NSERC Alliance & ECCC (CWS & STB) G&C (2022-2026)

Genome Canada (2020-2024)

Ontario Caribou Conservation Stewardship Program (2024-2029)

**Dr. Paul J. Wilson**, Trent University

**Dr. Micheline Manseau**, Environment and Climate Change Canada



Environment and  
Climate Change Canada

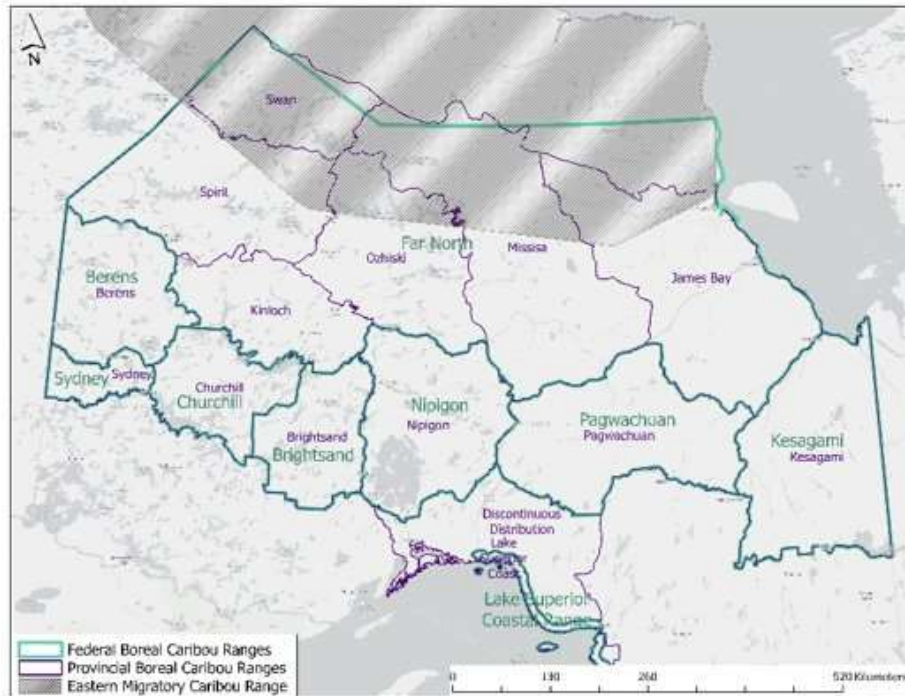
Environnement et  
Changement climatique Canada



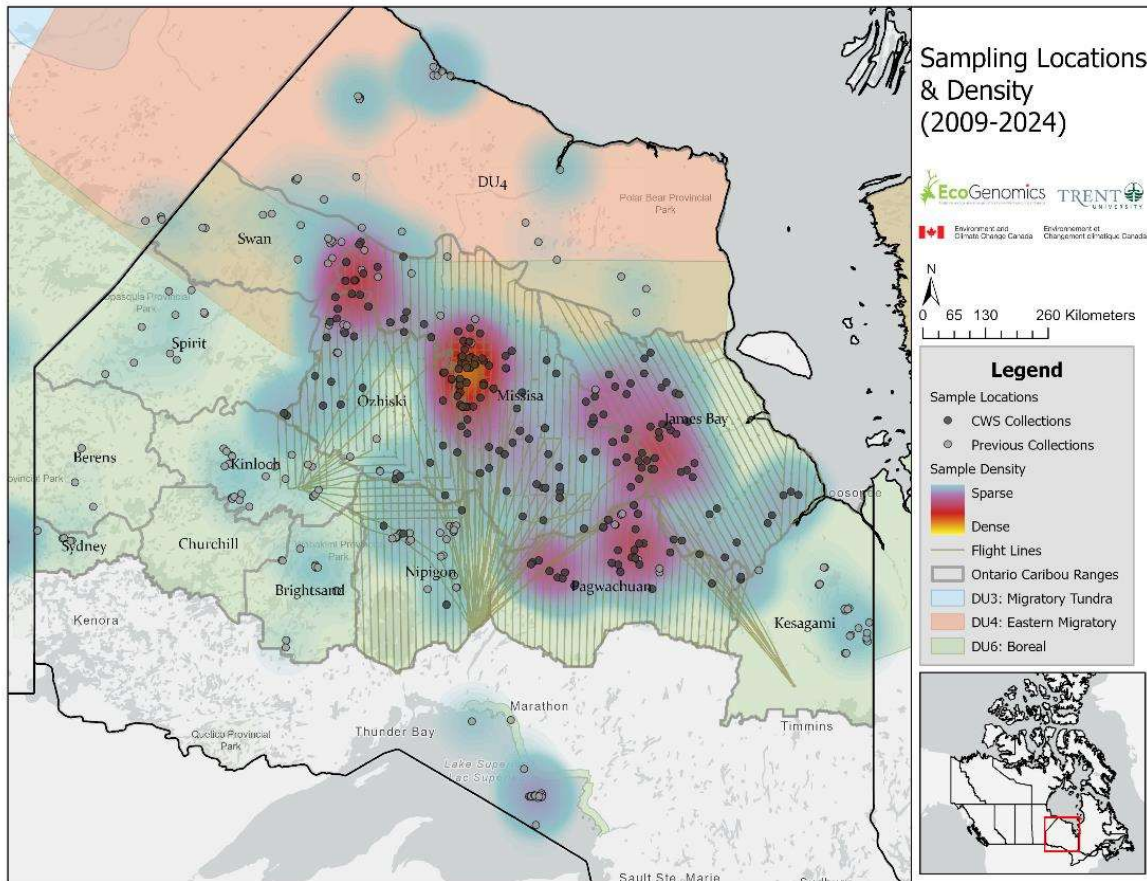
# Caribou genomics

Using novel genomic methods, we are asking ..

- 1) Are both boreal and eastern migratory caribou ecotypes in the central far northern ON?
- 2) Are both caribou ecotypes subdivided into different populations and if so, what is the extent of movement or exchange between populations?
- 3) How do genetic connectivity and diversity vary across the Province, are there signs of population fragmentation or population loss?
- 4) What are the best options for a genomic-based (non-invasive) monitoring strategy going forward?



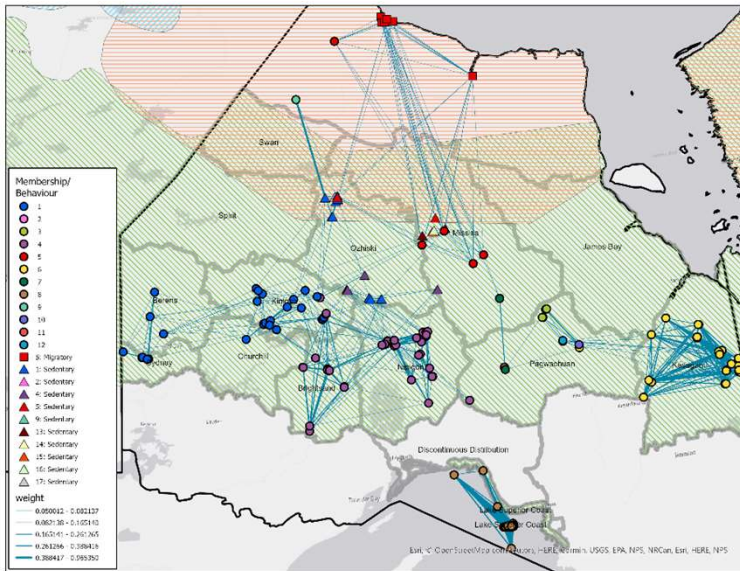
# Sampling locations and density



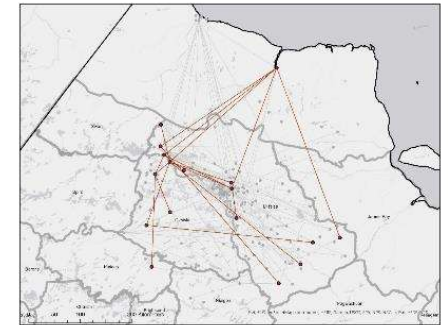
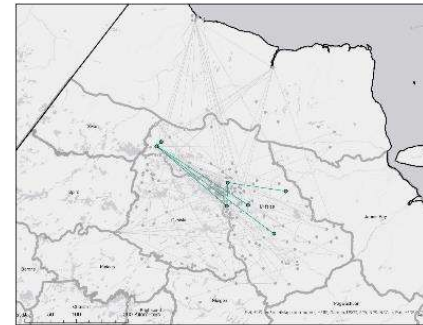
- Samples available at EcoGenomics collected between 2009-2024
- Genotyped at 20 microsatellite loci and sex
- Systematic surveys / collections led by CWS:
  - 1047 samples from Missisa (2021)
  - 634 samples from Ozhiski (2022)
  - 785 samples from James Bay (2023) being analysed.
  - 358 samples (2024) from Nipigon and Pagwachuan also being analyzed.
  - A total of 2824 samples !
- Analysis of genetic data yielded 1378 unique individuals (so far).
- Whole genomes for 320 individuals were also sequenced.

# Presence and distribution of boreal and eastern migratory caribou ecotypes

Network results using whole genomes



Familial networks identifying boreal (left) and eastern migratory (right) caribou.



## Results

- Results show the presence of both boreal and eastern migratory caribou in central far northern ON, and geographical overlap of the two ecotypes in winter. Caribou, as depicted in the familial network, move across large areas and over multiple ranges.

**Additional lab and data analyses ongoing – more results will be available in winter 2025**



Marchenko, Manseau, Fournier, Taylor, Wilson. 2024. In prep.



# FECAL HORMONE ANALYSIS

- Extracting hormones from collected fecal samples to assess:
  - Pregnancy status of female caribou
  - Stress levels of male and female caribou



*SHORT BREAK*



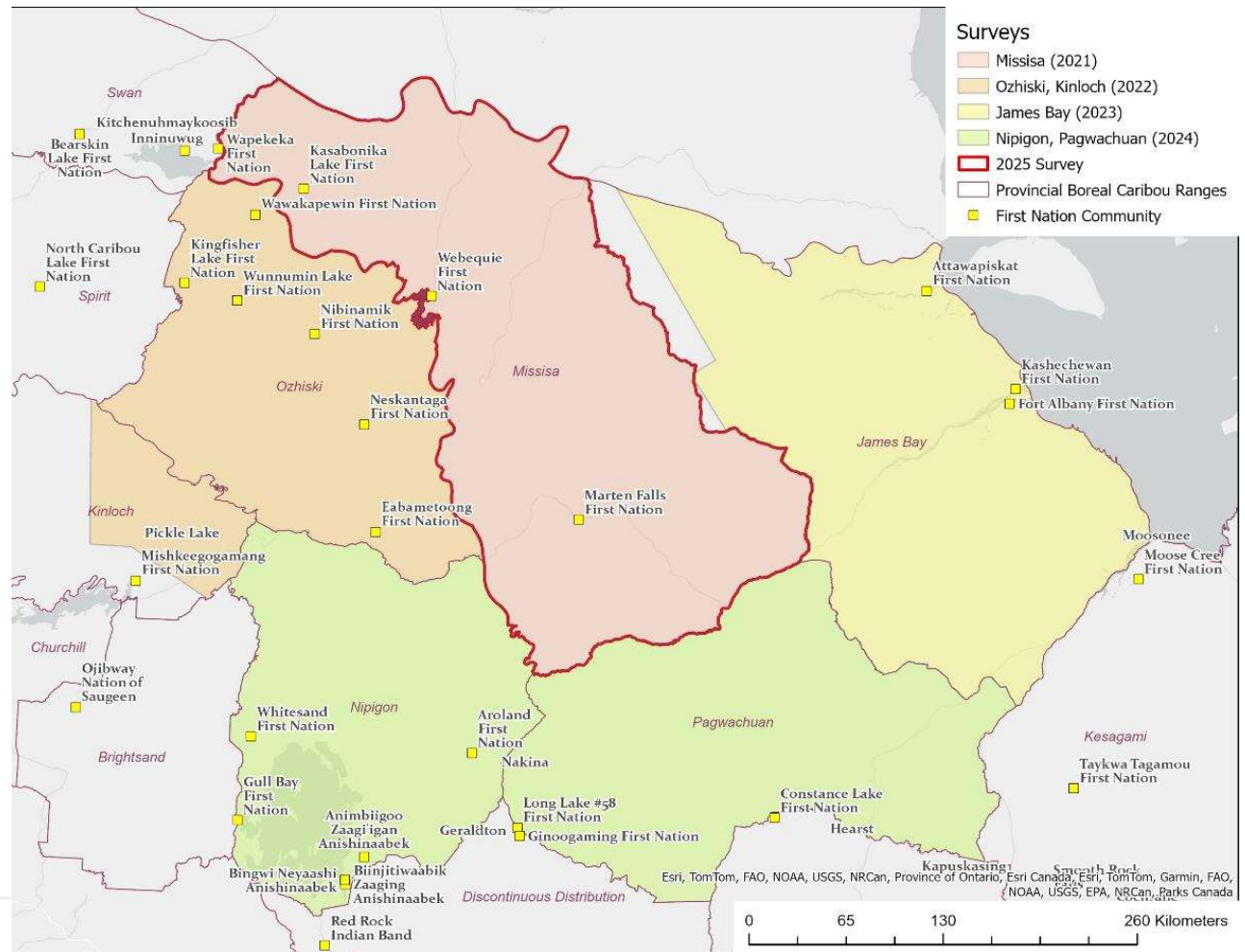
# HABITAT WORD CLOUD

- What types of habitat are you aware of that caribou use in winter?
  - Please use one- or two-word answers

# 2025 FECAL DNA PLANNED SURVEY

Fecal DNA survey planned for early 2025:

- Re-survey of Missisa range (red outline)
- Provide more information for genomic analysis and winter habitat use, comparison to 2021 survey
- Same method as the 2021-2024 surveys – two stage survey following pre-established 10 km transect lines

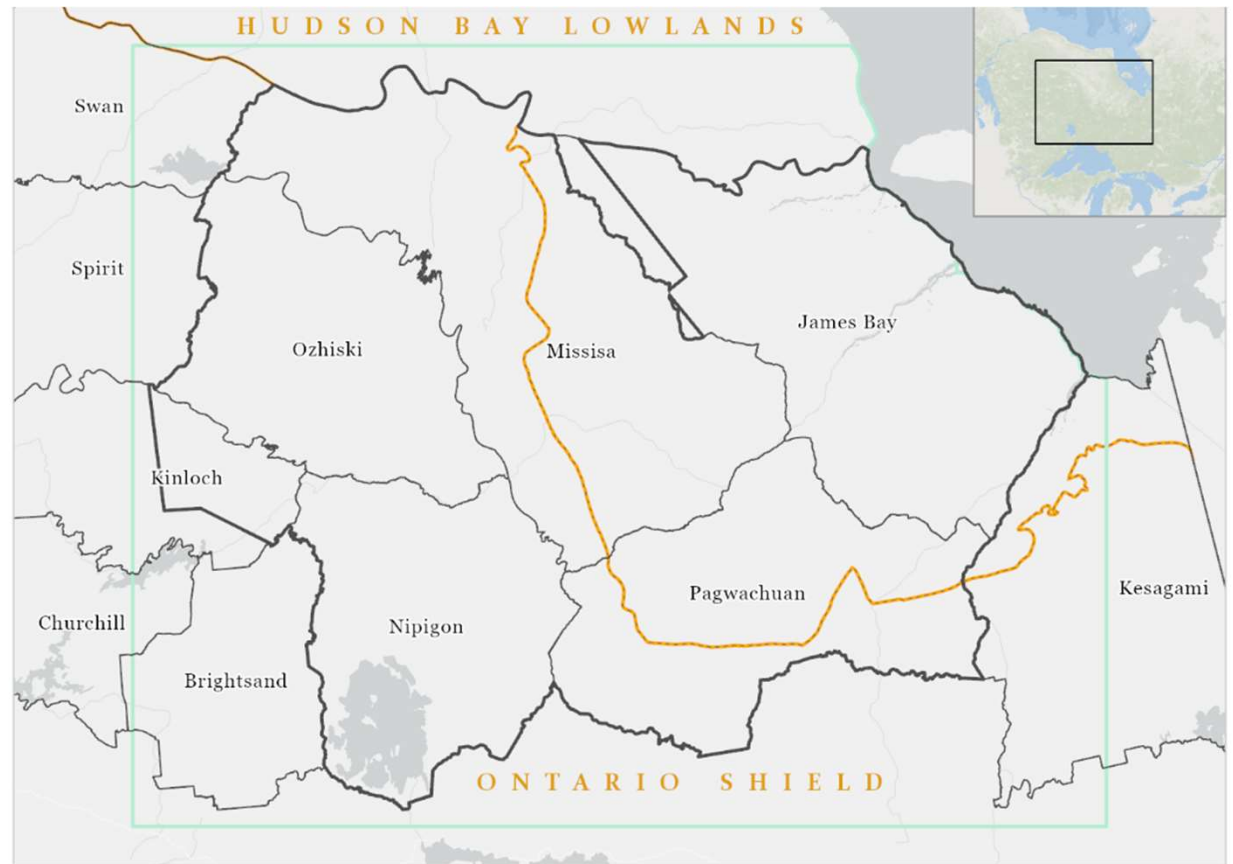




# WINTER HABITAT SUITABILITY ANALYSIS

## Objectives:

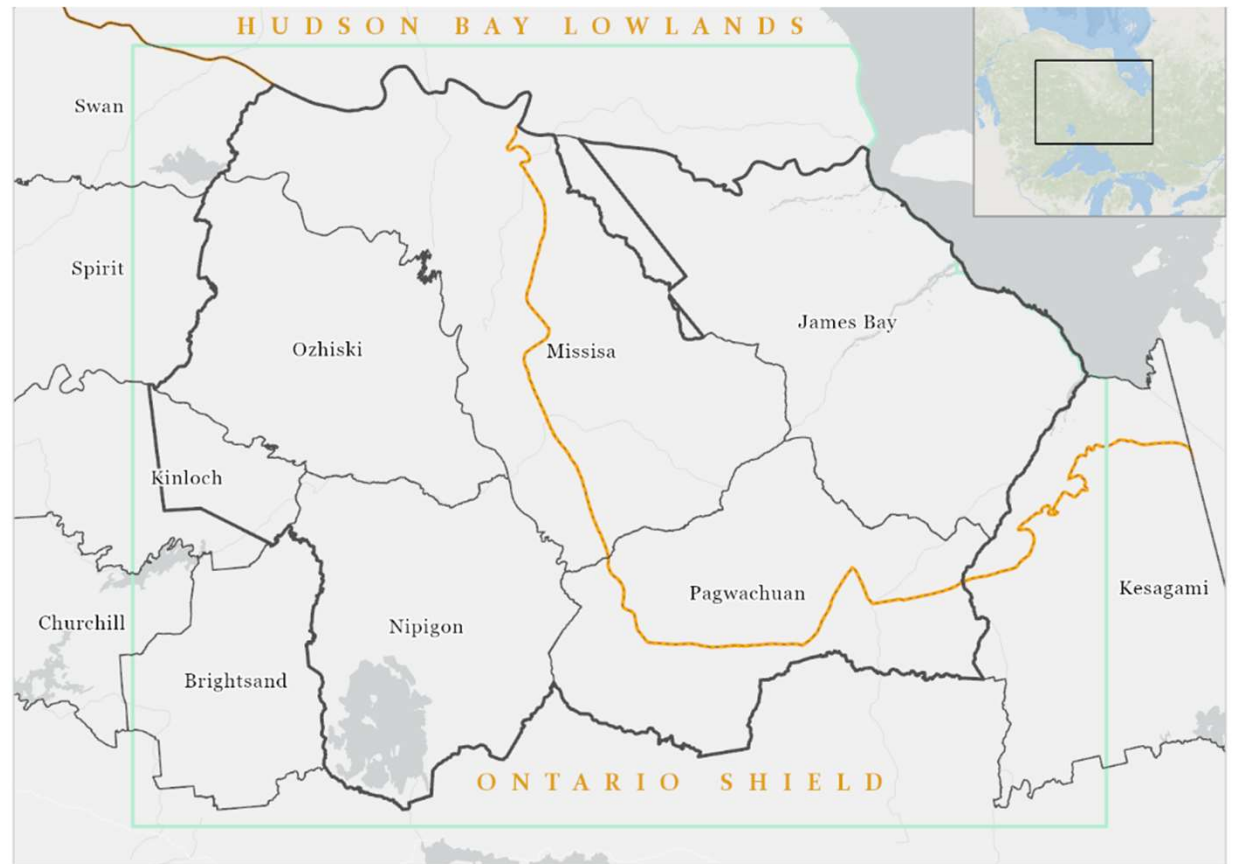
- Assess the extent and distribution of *suitable winter habitat* within northern Ontario
  - Suitable habitat = probability that a specific habitat is suitable for caribou
- Explore the importance of specific wetland types for caribou winter habitat suitability in this region



# WINTER HABITAT SUITABILITY ANALYSIS

Included several variables in habitat analysis:

- Resources
  - Landcover types (e.g. wetlands, peatlands, forests)
- Climatic
  - Temperature, precipitation (rain and snow)
- Topographic
  - Elevation, terrain ruggedness
- Disturbances

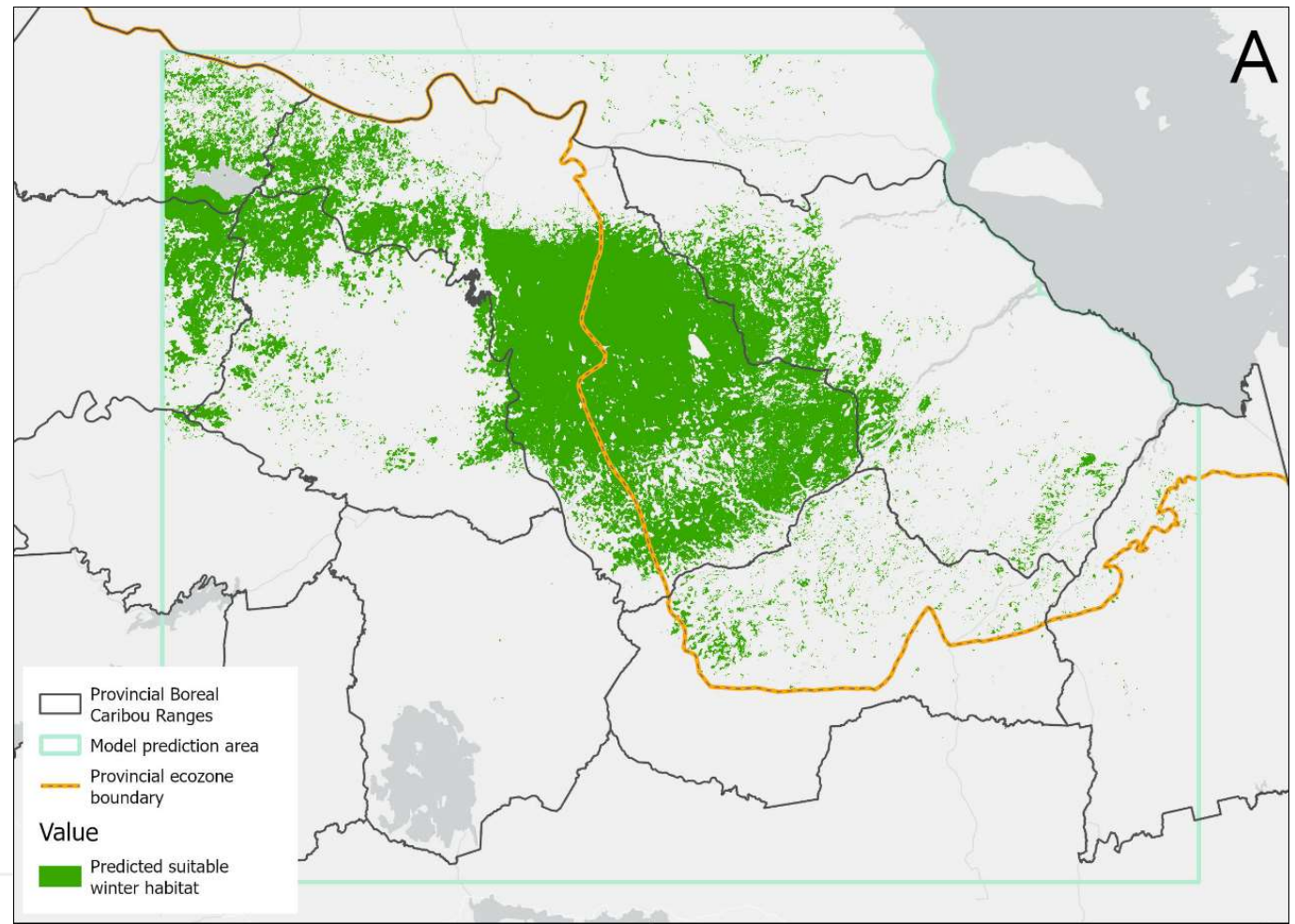


— Provincial ecozone boundary    □ Survey area  
□ Provincial Boreal Caribou Ranges    □ Model prediction area

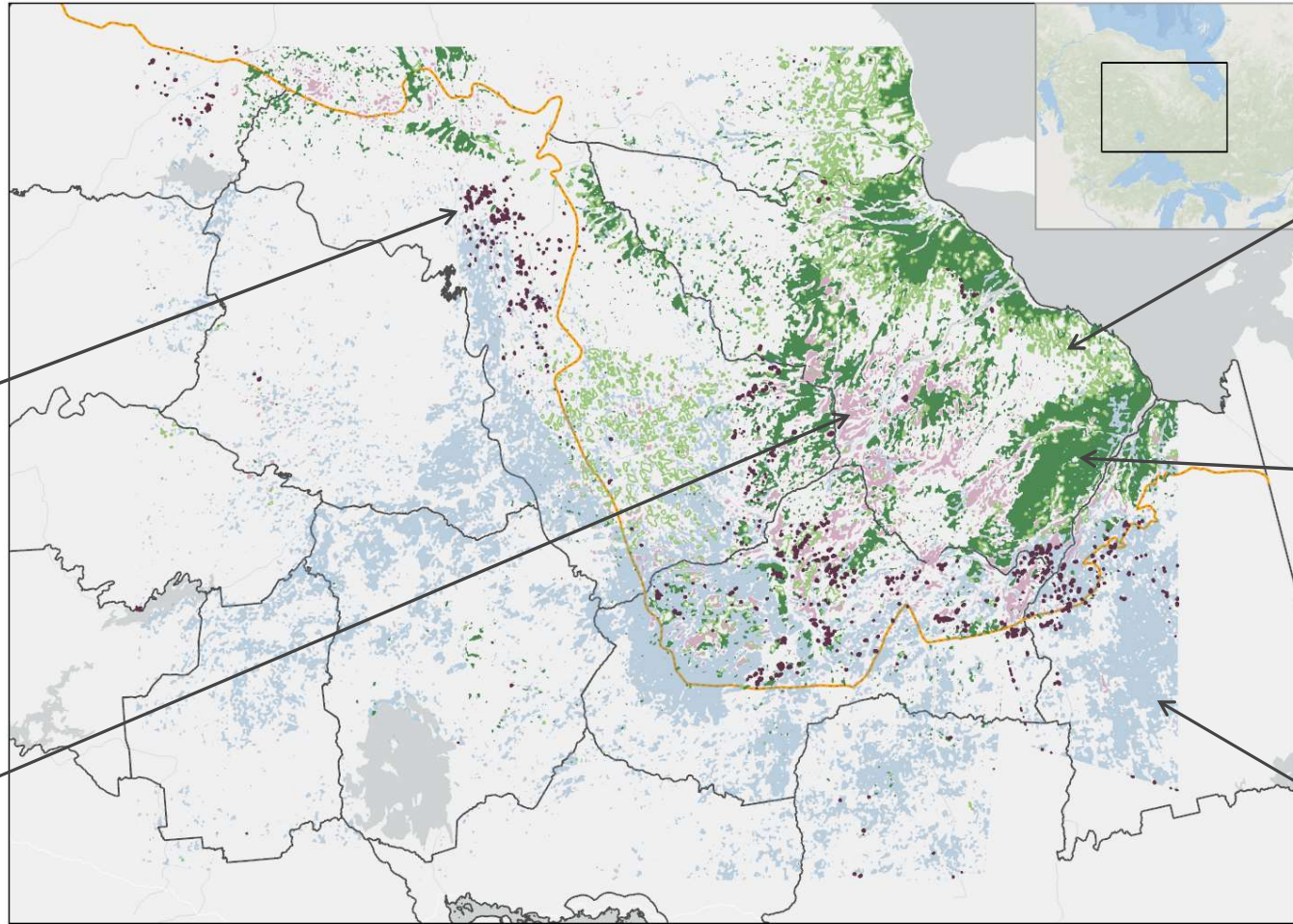
0 50 100 200 Kilometers

# WINTER HABITAT SUITABILITY ANALYSIS

- Predicted suitable winter habitat primarily concentrated in the Missisa range and NW Ozhiski range
- Low winter habitat suitability in central Ozhiski, eastern James Bay, southern Pagwachuan, and all of Nipigon



# Peatland types



Open Fen



Treed Fen



Coniferous Swamp



Treed Bog



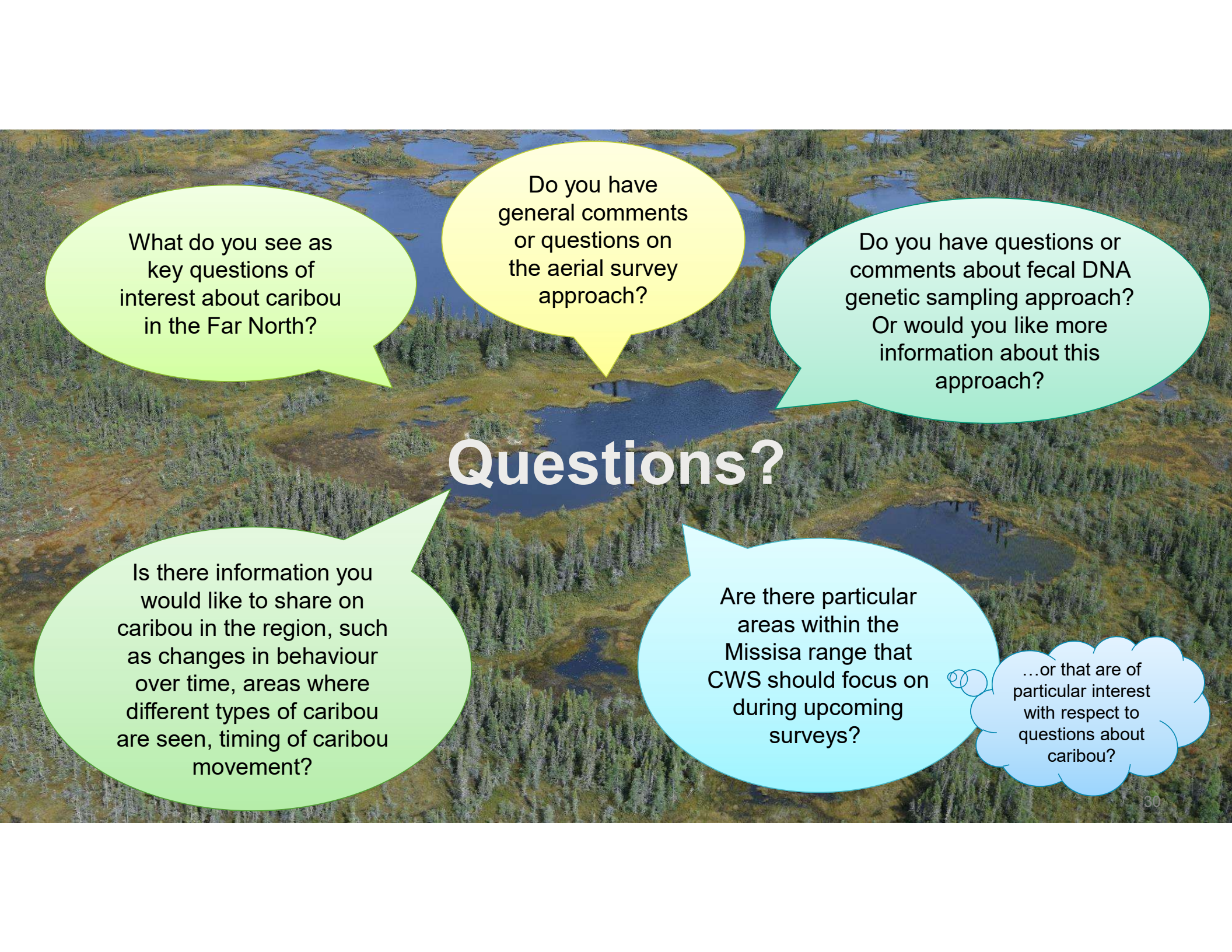
Open Bog



# NEXT STEPS

- 2025 survey of the Missisa caribou range
- Publication of caribou winter habitat suitability journal article
- Continued genetic analysis of data from 2021-2024 caribou DNA surveys
- Looking for opportunities for further collaboration/engagement with Indigenous communities
  - Questions or regions of interest to local communities
  - Community-led projects, including those that are ITK related
  - Discussion of potential for funding opportunities
- All observational data are available for sharing with Indigenous communities and organizations





What do you see as key questions of interest about caribou in the Far North?

Do you have general comments or questions on the aerial survey approach?

Do you have questions or comments about fecal DNA genetic sampling approach? Or would you like more information about this approach?

# Questions?

Is there information you would like to share on caribou in the region, such as changes in behaviour over time, areas where different types of caribou are seen, timing of caribou movement?

Are there particular areas within the Missisa range that CWS should focus on during upcoming surveys?

...or that are of particular interest with respect to questions about caribou?

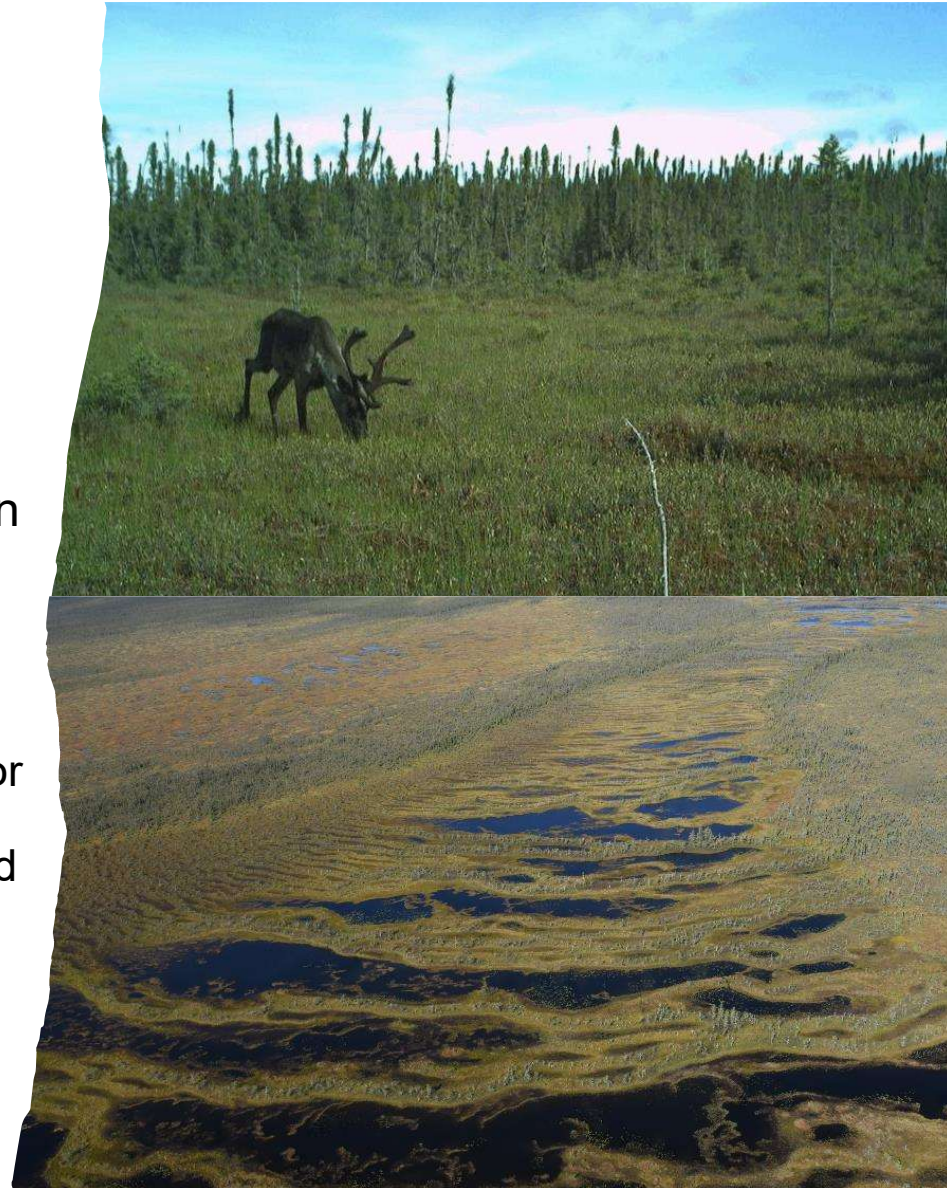
# FUNDING

1. Indigenous Partnerships Initiative
2. Application-based Programs
  - Indigenous Partnerships for Species at Risk (IPSAR - formerly AFSAR)
3. Species at Risk Act – Consultation, Cooperation and Accommodation (SARA-CCA)

## Examples of funded projects to date:

- biodiversity data collection and capacity building for surveys; collection and compilation of ITK; documenting of community biodiversity values; and mapping of peatlands.

Contact [tineasha.emmett@ec.gc.ca](mailto:tineasha.emmett@ec.gc.ca) for more information



# SARA-CCA INFO

- CIER to present





**THANK YOU FOR  
PARTICIPATING**

If you have any further questions regarding this presentation, feel free to contact myself, Samantha McFarlane, at:

**Samantha McFarlane**  
Wildlife Biologist  
Tel: 1 (343) 809-3358  
Email: [samantha.mcfarlane@ec.gc.ca](mailto:samantha.mcfarlane@ec.gc.ca)

---