NSMA Winter Road Monitoring Interim report 2025

Cumulative Impacts Monitoring Program Year 2 of 3

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Acknowledgements

First and foremost, we would like to extend our heartfelt thanks to our winter road coordinator, Wayne Mercredi. As an NSMA guardian since 2020, Wayne has been instrumental in the success of this program. Over the years, he has conducted countless patrols along the ice road and has played a key role in the program's growth. Wayne's passion and respect for caribou are truly inspiring, and we are grateful for the invaluable knowledge he has shared with us. This program could not have succeeded without his guidance.

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Introduction

Background to the NSMA winter road program and previous years of monitoring

The NSMA represents a community that is deeply connected to the land, and the caribou have been a critical part of this relationship for generations. The NSMA Winter Road Monitoring Program began in 2020 in response to the population decline of barren-ground caribou in the Northwest Territories. Though both western science and Traditional Knowledge understand that barren-ground caribou populations fluctuate on 40-70 year cycles (Ferguson et al., 1998; Gunn, 2003), a decline this large is unprecedented and the cumulative effects of climate change and anthropogenic disturbance are likely exacerbating the decline (Bongelli et al., 2020; Mallory et al., 2018; Plante et al., 2018).

This program focuses on monitoring the cumulative impacts of human disturbance on the Bathurst, Beverly and Bluenose East caribou herds on their winter range, a time when, in recent years, these herds have experienced significant spatial overlaps (Gurarie et al., 2020).

Population estimates for Barren ground caribou herds

	Current	Maximum
Beverly	152,000 (2023)	276,000 (1994)
Bathurst	3,609 (2025)	472,000 (1986)
Bluenose East	28,759 (2025)	120,000 (2010)

These herds experience significant human disturbance on their winter range due to industrial development which includes mineral exploration and associated ice roads and work camps. NSMA members are particularly concerned about the effects of the Tibbit to Contwoyto Winter Road (an ice road constructed seasonally to service the Ekati, Diavik and Gahcho Kué diamond mines) on barren ground caribou. Roads can act as a physical barrier to movement to caribou, but they also allow vast regions of caribou habitat to become more accessible for sources of disturbance and mortality including vehicles, hunters, and predators such as wolves which use the road opportunistically (Blagdon and Johnson, 2021; Plante et al., 2017; Wilson et al., 2016). NSMA members are particularly concerned with the easy access for hunters created by the road (Beaupré and Phelan, 2023).

"Years ago, you had to go from Yellowknife to the hunting sites with snow machines. While now, all you have to do is drive there."- NSMA Guardian

Since 2020, NSMA Guardians have been patrolling the Tibbit to Contwoyto Winter Road during the operational season (February-March each year) to document caribou numbers, body condition and behaviour, as well as other factors such as predators, human disturbances and environmental conditions. In 2024, NSMA established a semi-permanent camp on the Gahcho Kué spur road so that Guardians could stay on the land for multiple days to collect more data. Each year that the program has been in effect, membership engagement and monitoring have increased. You can find more information about previous years of monitoring in the NSMA Winter Road Monitoring Interim report 2024, Cumulative Impacts Monitoring Program Year 1 of 3 (https://www.nsma.net/winterroad).

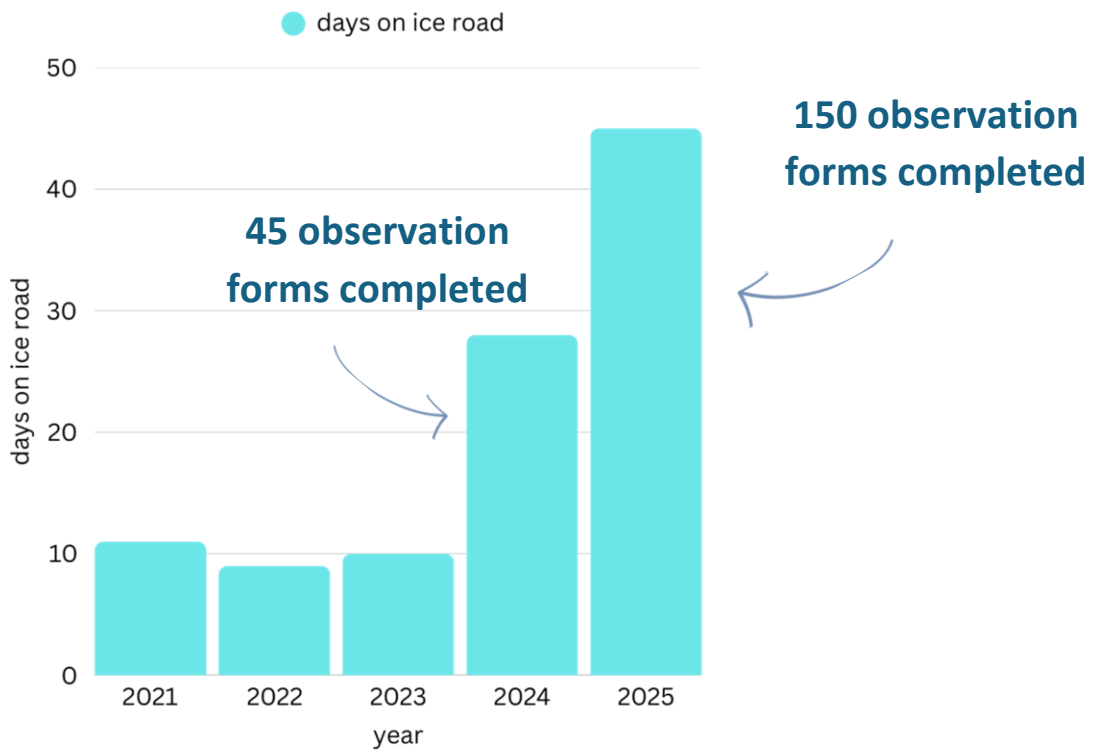
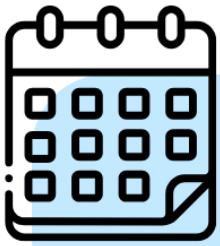


Figure 1. NSMA winter road program over engagement over time

Goals and Objectives

The overall goal of the NSMA Winter Road Monitoring Program is to have Indigenous Guardians on the ground, observing what is happening to caribou on their winter range. These observations are essential for providing context to research questions, and a Guardian presence on the road helps ensure they can act as the eyes and ears of the land, discouraging illegal and disrespectful harvesting.



Maintain a consistent schedule of guardians monitoring caribou and harvest on the winter road each year

Provide more local and Traditional Knowledge of barren-ground caribou to decision-makers

Develop NSMA's data analysis procedures through partnerships with government and academics

Build capacity within the NSMA to play an active role in the management of barren-ground caribou in the NWT

Methods

1. Community consultation and input

The development and expansion of the Guardianship-led caribou monitoring program has been greatly influenced by the input and guidance of NSMA members. Each year, we hold several workshops and engagement sessions to get feedback from members about their concerns and priorities in relation to caribou. Below is a timeline of the community events we held in 2024-2025.

Joint results presentation NSMA and SUNY - November 21st 2024

NSMA staff and winter road coordinator, Wayne Mercredi, gave a presentation to update NSMA members on the results of the 2024 season. Members from the Fate of the Caribou (FotC) team at State University New York presented preliminary results of their CIMP funded projects. The presentations given are listed below:

Orna Phelan (NSMA)- NSMA Winter Road Monitoring Program 2024 results

Megan Perra (PhD candidate)- Caribou and the acoustic environment

Chloe Beaupré (PhD candidate)- Comparative analysis of factors affecting caribou survival patterns

Eliezer Gurarie (Principal Investigator)- Exploring the impacts of the all-season road infrastructure on barren-ground caribou.

This workshop helped to facilitate member input, gather feedback on research approaches and preliminary findings and strengthen collaboration by continuing to foster strong relationships between FotC and NSMA. A report titled “Collaborative research on Barren-ground caribou. North Slave Métis Alliance (NSMA) and Fate of the Caribou (FotC)” was produced from this workshop.

Wilfred Laurier Guardian Training- November 30th 2024

Members of the Cold Regions Research Centre and Wilfrid Laurier University hosted a field training event for NSMA Guardians, aimed at developing hands-on skills in snow, ice, and water quality monitoring. This event combined practical outdoor fieldwork with an indoor session focused on data interpretation and application.

Participants were engaged in two field sessions:

1) Snow and Ice Monitoring: Learn how to conduct a snow-pit using tools like a ruler, snow tube, and crystal card to measure several key snow characteristics. This session explored how

snowpack evolution throughout the winter influences ice growth and formation, as well as its potential impact on wildlife.

2) Water Quality Monitoring: Guardians gained hands-on experience using a multiparameter sonde to measure key water quality metrics.

Following the field activities, the indoor session focused on interpreting the data collected, discussing its significance, and exploring how these metrics relate to broader environmental processes. By the end, participants had the skills to perform field observations and interpret snow, ice, and water quality data, enhancing their ability to apply these techniques in real-world contexts.

Figure 2*. NSMA members participating in in snow, ice, and water quality monitoring*

Meet and Greet Tlicho and NSMA Winter Road Monitors – January 13th 2025

NSMA was invited to Behchoko to participate in a joint session with Tlicho winter road monitors and ECC-wildlife officers. The purpose of this meeting was for Guardians from different Indigenous organizations to meet face-to-face to encourage more collaboration and data sharing while on the ice road. Wildlife officers with the Territorial government were also present to introduce themselves and give advice on the best ways to report illegal poaching or disrespectful

harvesting on the road. Through this meeting, a joint winter road communications plan was developed and shared with all groups.

NSMA Guardian Winter Road training- February 5th 2025

Each year before the ice road opens, NSMA staff and the winter road coordinator hold a training day for any NSMA Guardian who will be participating in caribou patrols. This workshop aims to equip guardians with the essential skills needed for effective monitoring. Topics covered during the training included the use of communication devices such as inReach units, satellite phones, and radios; check-in procedures to ensure Guardian safety and effective communication; completing caribou observation forms; identifying the sex of caribou and assessing body condition; and setting up camp upon arrival at designated monitoring sites.

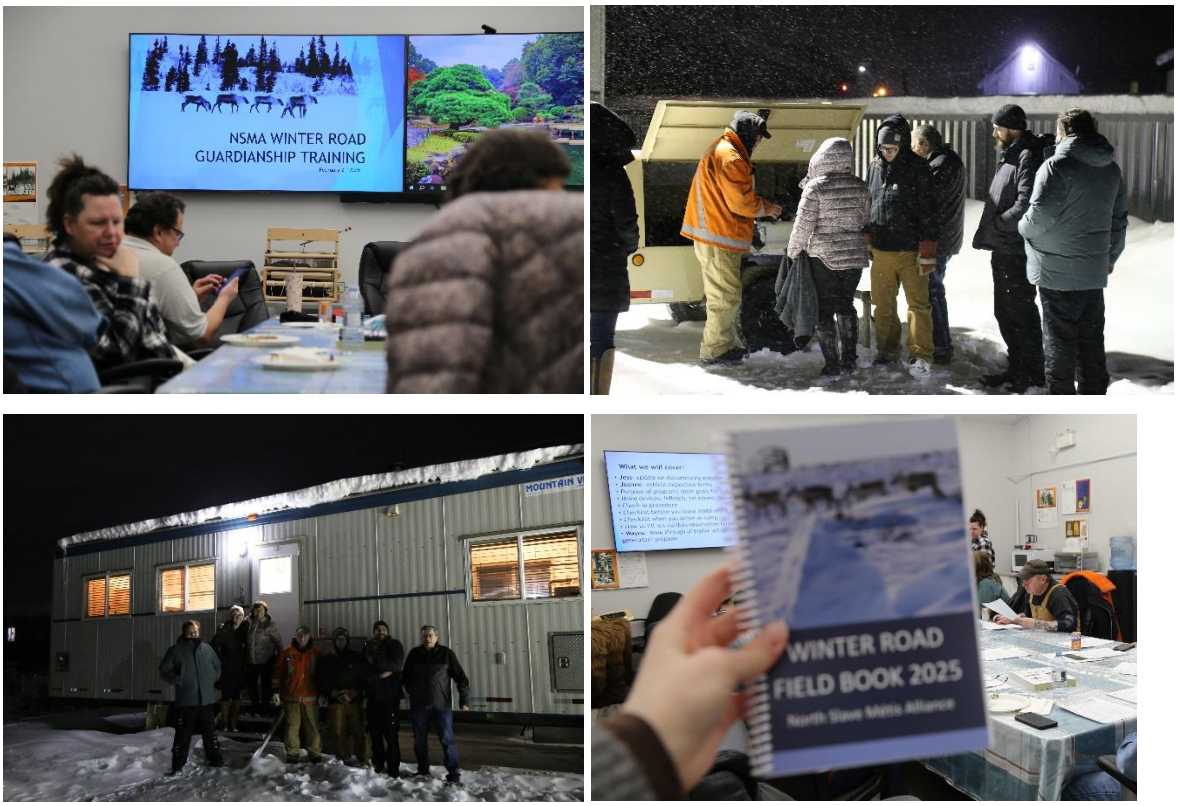


Figure 3*. NSMA Winter Road Guardian Training workshop*

2. Study Area

Through community engagement sessions, a few areas were highlighted as priority monitoring spots, including Lockhart Lake, Gahcho Kué mine spur road and Lac de Gras. Our camp was placed on portage 1 on the Gahcho Kué mine spur road.

3. Passive monitoring

In both 2024 and 2025, camera traps (Reconyx HF2 Pro Covert) were deployed at sites along the TCWR and GK Spur, each deployed in conjunction with an Autonomous Recording Unit (ARU). Cameras were positioned 10–150 m from the road, with some facing the road directly and others facing away to capture wildlife.

In 2024, 9 camera-ARU pairs were deployed across three areas: 3 on the GK Spur (deployed February 22), 3 near Mackay Lake on the main TCWR (deployed February 22), and 3 near Diavik (deployed March 13). Of the 6 cameras in the GK Spur and Mackay Lake areas, 4 faced the road.

In 2025, deployments were expanded to 18 camera-ARU pairs: 3 on the GK Spur, 11 near Mackay Lake, and 4 near Diavik. Cameras were deployed between February 13–22 and most operated through mid-to-late March. Of these, 9 cameras faced the road directly.

Overall, across both years, a total of 27 camera-ARU pairs were deployed at unique site-year combinations.

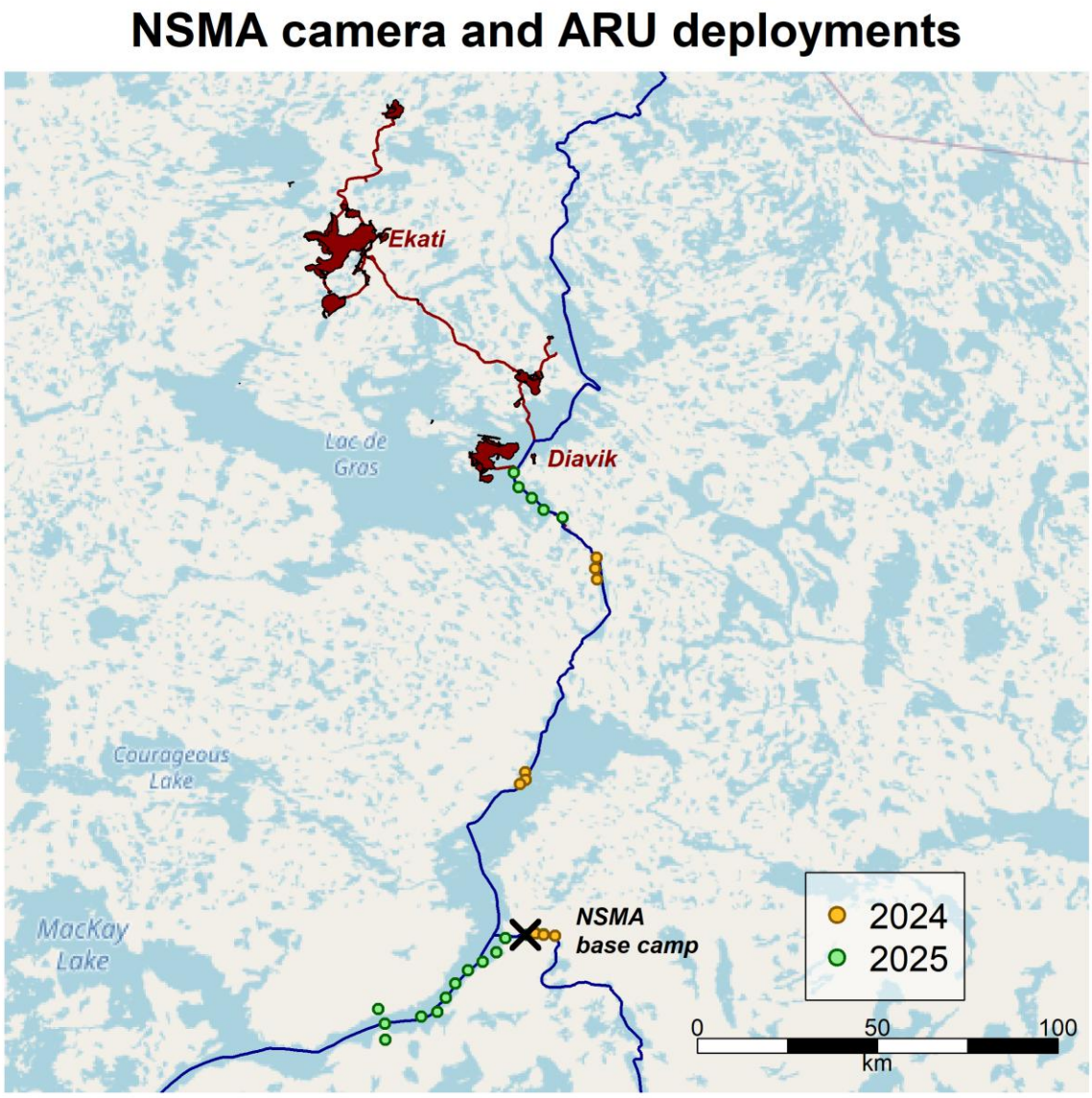


Figure 4. Map of NSMA Camera and ARU deployments coloured by year, Eliezer Gurarie

4. Guardian patrols

In addition to passive monitoring techniques, it was important to have guardians on the ground taking observations of caribou, disturbances and environmental conditions. Many of our guardians have been avid land users and hunters all their lives and have seen the decline of the Bathurst herd in real time. They can provide historic context to what we see in terms of caribou numbers today.

Guardians performed vehicle transects and took georeferenced observations of the following: caribou occurrences and mortalities, caribou predators (such as wolves) and hunting/ other human activities. They also took note of animal activity (i.e., whether caribou were feeding, laying down, running) and body condition. This year we added a new component and asked Guardians to record every gut pile they saw. Along with taking a GPS location for each gut pile, Guardians recorded how many animals they estimated a given gut pile represented, whether there was wastage present and how far from the road the gut pile was located.

Many members expressed an interest in investigating environmental conditions such as snow and ice formation and so we had members record snow depths and qualitative metrics whenever they stopped to take an observation. All data recorded was summarized into an excel spreadsheet for analysis.

Figure 5. NSMA Guardians setting up ARUs and taking pictures on caribou patrol

Results- 2025 Winter Road Season

Year	Number of cumulative days of monitoring	Number of observation forms completed	Number of km driven	Number of caribou seen
2024	27	45	6,934km	~4,500
2025	42	150	12,071km	~3094

In 2025, NSMA Guardians were out, patrolling the ice road from February 12th- March 28th. Aside from a 4-day window (February 24th-28th) when our generator broke down, Guardians were on the road, observing caribou and completing observation forms every day.

1. Caribou Group Size, Body Condition and Health

Most caribou were observed directly from the road along MacKay Lake with some being seen along the Gahcho Kué mine spur road.

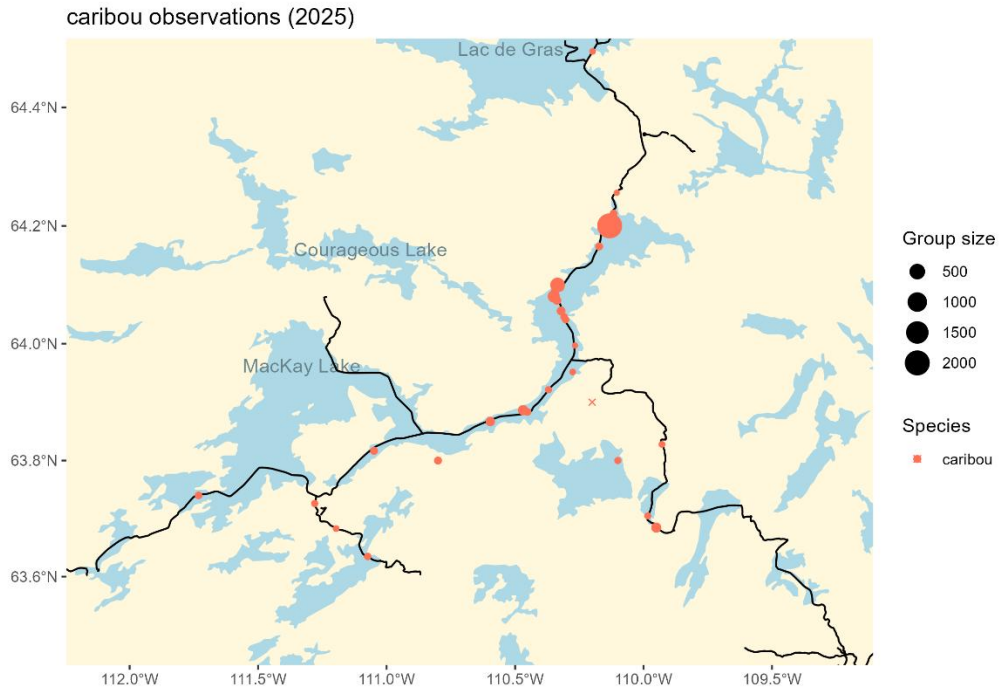


Figure 6*. Map of caribou observations 2025, Amelia Cox*

Due to the difficulty in classifying age structure from a far distance, it was only possible for NSMA Guardians to classify 89 caribou in 14 different groups.

Age group	Number
Bulls	18
Cows	59
Yearlings	2
Calves	10

111 caribou were evaluated for body condition. Most animals were considered normal- healthy and no skinny caribou were recorded.

Body Condition	Number
Skinny	0
Normal- healthy	94
Fat	17

Many Guardians reported lots of caribou on the west side of the road.

"Big herd on west side of road. Just north of hunters we saw"

"Groups of 8 to 100 to 1000. Total probably around 1500-2000. West side of road walking south."

"Caribou do not seem to be rushing, slowly walking towards eskers. They were very spread out. They are on the north side of the road, look to be heading west towards eskers."

Figure 7. *Caribou on west side of road*

2. Harvest and wastage

As in previous years, NSMA Guardians reported a high level of harvest along the road. Guardians reported 70 unique gut piles. Only 4 gut piles were recorded more than once, and these repeated observations were always within 3 days of initial discovery. Guardians reported that gut piles don't remain on the landscape for very long before they are scavenged by predators or hidden in snow.

Unfortunately, Guardians reported at least some level of wasted meat left behind at approximately 10% of kill sites. The average gut pile represented 20 (16-25) caribou, however there was considerable variation with one observation reporting a gut pile of 1200 caribou from a community hunt. Overall, Guardians recorded 2248 caribou harvested. However, we know that Guardians were not always able to count the number of caribou harvested at every gut pile and we know that Guardians did not travel every single monitoring route every single day and so, missed some gut piles. Taking these factors into account, we estimate a total TCWR harvest of 2814 (2610-3150) in 2025.

This estimate does not take include caribou harvested and gutted away from the road and so represents a minimum estimate.

"This makes me sad to see so many cows shot. How many were pregnant?"

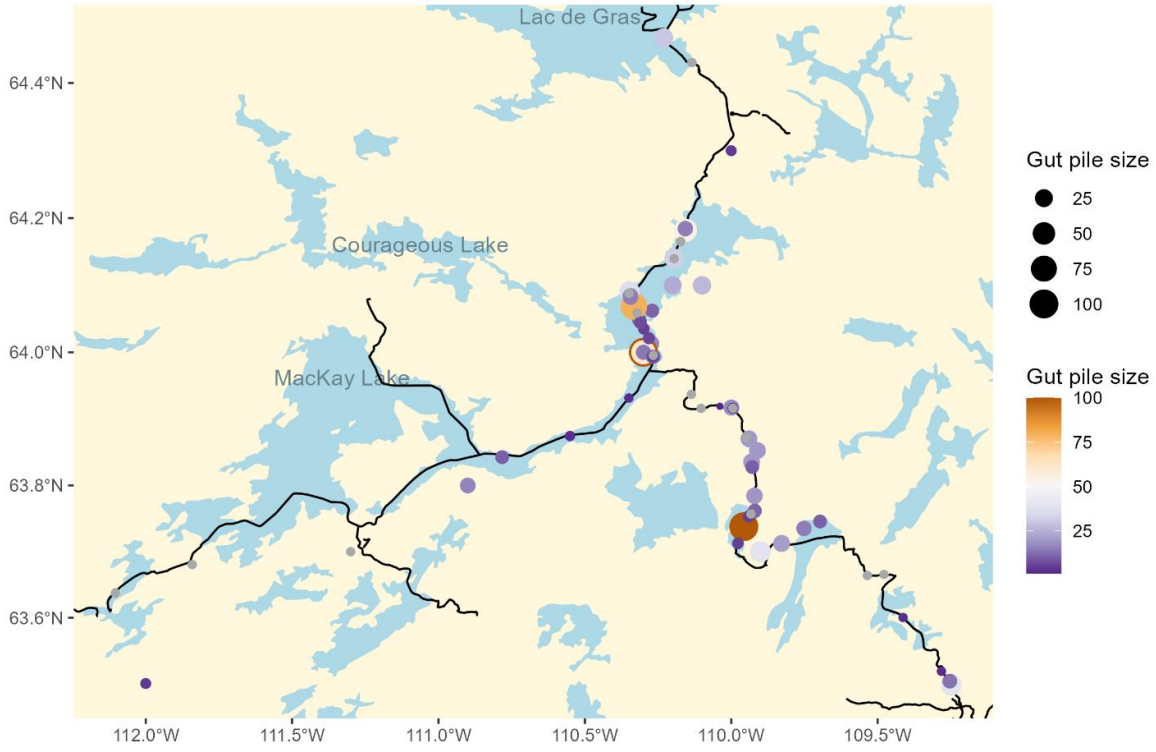


***Figure 8**. Map of caribou gut piles 2025, Amelia Cox*

In these observation forms, Guardians reiterated their concern that excessive harvesting is occurring along the road. Although the Mobile Conservation Zone is intended to protect Bathurst caribou herd from harvest, and tags are required for Bluenose-East caribou herd, in practice it is often difficult to determine a barren-ground caribou's herd fidelity by sight, particularly in areas where herds intermingle. NSMA Guardians have expressed concern that animals from both the Bathurst and Bluenose-East herds, populations that are already low and declining, may be harvested unintentionally.

"All this hunting is making me wonder if there is over-harvesting. I'm worried this easy access is depleting the herd permanently"

"Small herd, nothing like it was. Sad to see low numbers"

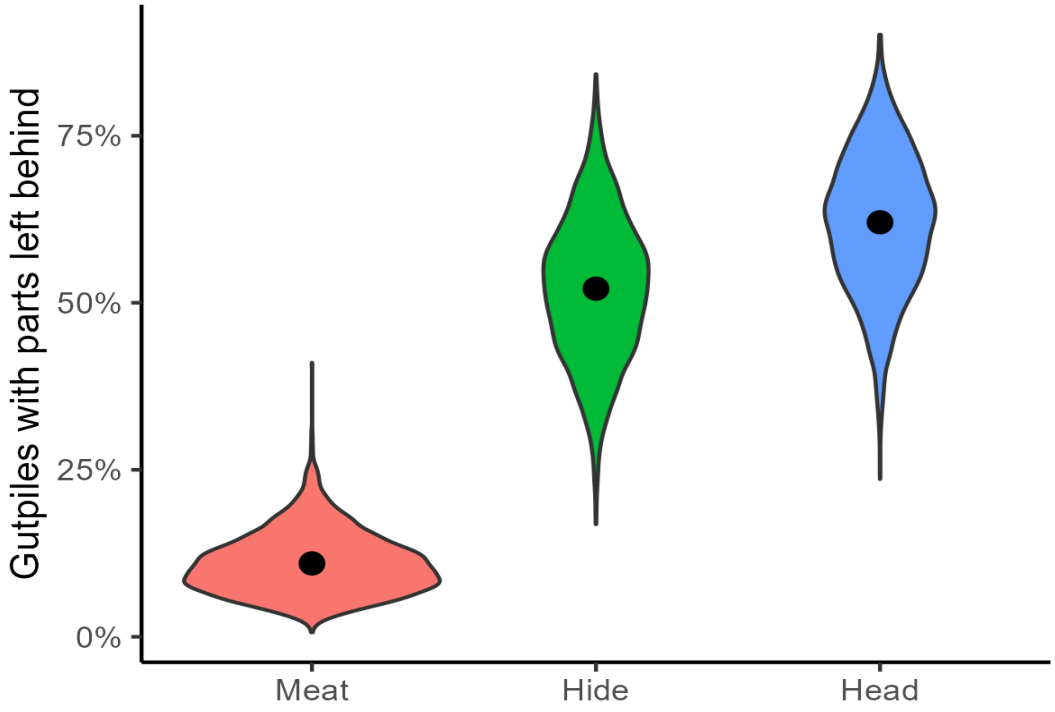


***Figure 9**. % of meat, hide and heads left behind across gut piles, Amelia Cox*

3. Caribou interactions with the road

Several Guardians reported on caribou behavior while close to the road. Most reported that caribou far from the road (>500 meters) seemed to be relaxed and undisturbed by the road. Caribou were described as walking slowly, parallel to the road.

"Approx 500m from road. All spread out, lying down. Chilling in the zone, safe"

"Caribou do not seem to be rushing, slowly walking towards eskers. They were very spread out"

"On south side of road. It's good to see caribou undisturbed and comfortable. They seem content, one got up and started to walk"

"Caribou seemed very relaxed, the calf/yearling was standing up and looking towards the road"

However, one Guardian observed that caribou very close to the road appeared to be frightened by big trucks.

"Approx. 50m from road. Caribou got startled by 3 big trucks passing. They started running and circled back after. Walking back to where we spotted them."

"Convoy scared him away; we disrupted his eating"

One Guardian directly observed caribou crossing the road. However, this occurred during a snowstorm when the road had been shut for several days. It is unclear how long it took for caribou to feel comfortable crossing the road after traffic had stopped passing.

"We saw a group of 8 caribou cross the road to meet with another large group. This was while the ice road was shut down due to weather so there was no traffic"

4. Wolves

In contrast to the 2024 season where no wolves were observed, 24 wolves were reported in 2025. Wolves were seen mostly on the north end of MacKay Lake and down the Gahcho Kué spur road. There were several reports of wolves feeding on discarded caribou carcasses.

"The wolves are taking advantage of all the hunting and eating well on scraps left. These two are just walking but another was spotted eating"

Figure 10. Wolf scavenging caribou carcass

During follow up engagement sessions, NSMA Guardians expressed concern about how this situation is making it easier to shoot wolves. Caribou get "trapped" on the west side of the road and can't cross due to traffic which makes them easy targets for hunters. In turn, wolves come to scavenge on discarded caribou gut piles and then also become easy targets for hunters.

Some Guardians made observations about the health and body condition of wolves:

"Wolf looked healthy with a heavy coat. Looked curious, walking around NSMA truck. Layed down approx 100 ft away after sniffing around the truck."

"White wolf has something in its mouth. Healthy size. Laid down to eat after carrying it halfway up a hill"

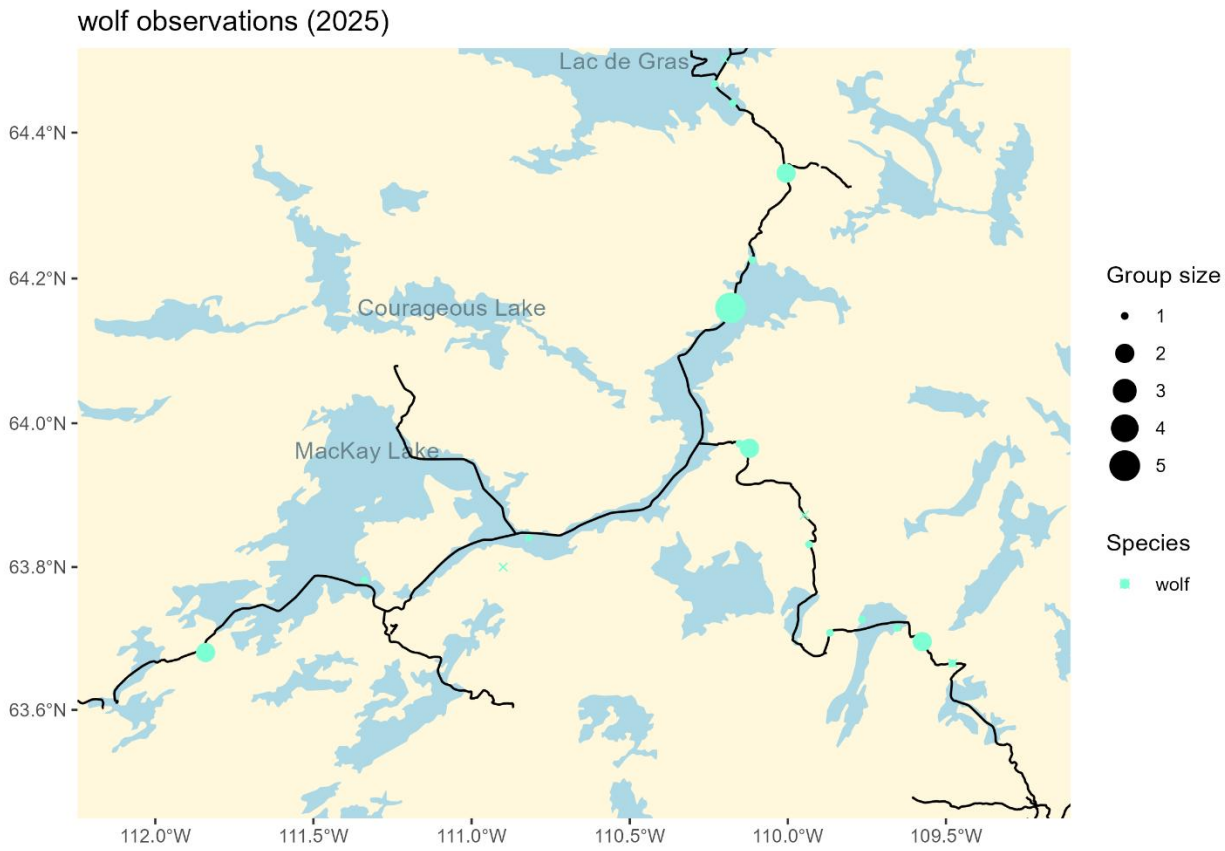


Figure 11. Map of wolf observations 2025

5. Camera and ARU deployments

5.1 Measuring traffic using cameras - Collaboration with Elie Gurarie, Sagnik Nandy, State University New York

The map below shows the locations of road-facing cameras in both deployment years. Camera sites are distributed along the TCWR main corridor between Mackay Lake and Diavik, and on the GK Spur.

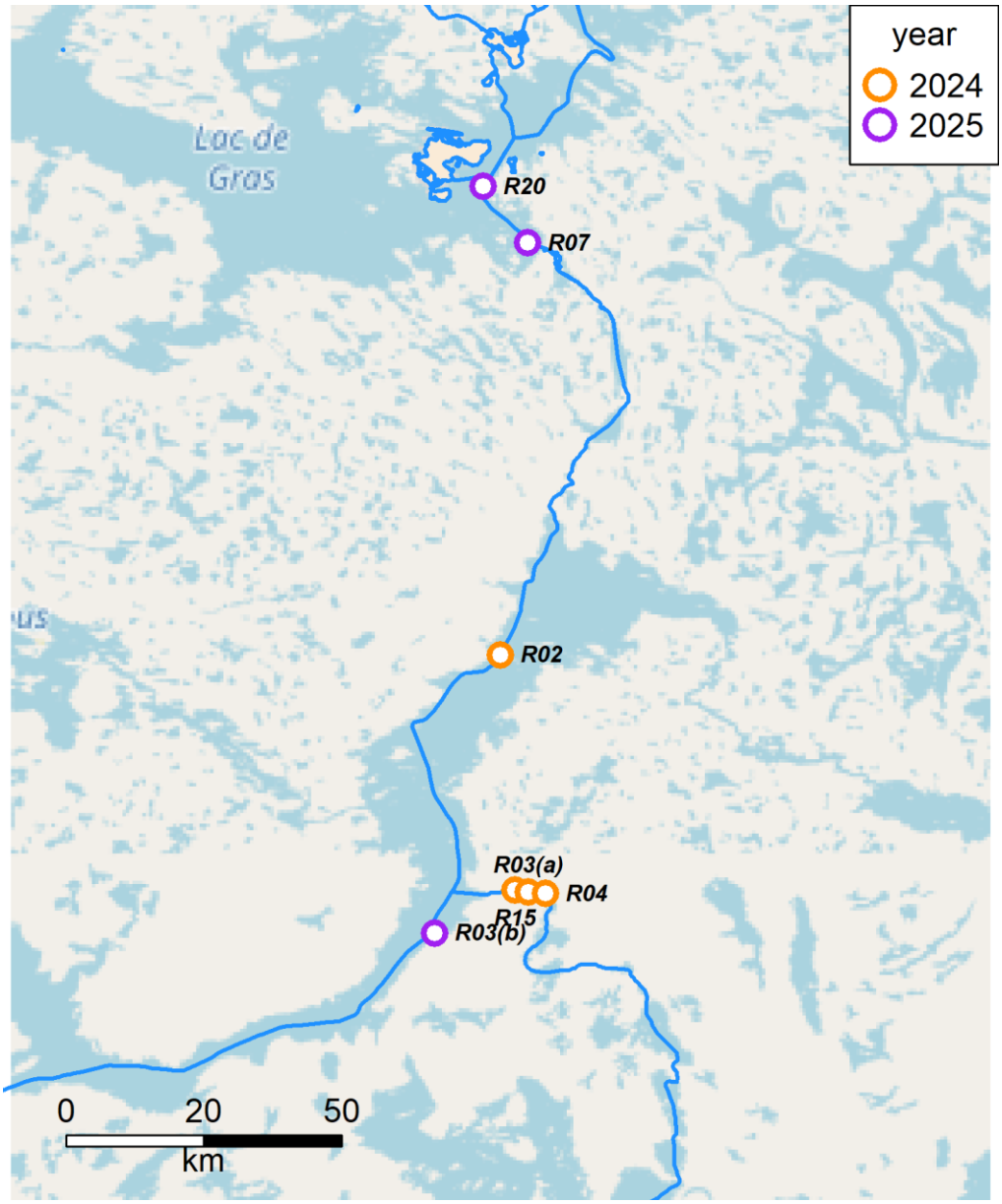


Figure 12. Road-facing camera locations in 2024 and 2025. Camera IDs are labeled, Eliezer Gurarie

We used four cameras to best estimate traffic intensity across road sections.

- On Spur (2024): R04
- Above Spur (2024): R02
- Above Spur (2025): R07
- Below Spur (2025): R03(b)

The table below shows a summary of vehicle traffic by camera deployment. A full description of how camera images were processed and analyzed can be found in the report "Estimating Traffic Intensity on the Tibbitt-to-Contwoyto Winter Road from NSMA Camera Trap Data, Gurarie, Sagnik, Phelan and NSMA Guardians, 2026".

Camera	Year	Section	Start	End	Total events	Days	Veh/day	Veh/hr
R04	2024	On Spur	Feb 22	Mar 28	3119	36	86.6 (23.9; 19–129)	3.7 (3.4; 0–27)
R02	2024	Above Spur	Feb 22	Mar 29	4030	35	115.1 (53.2; 2–227)	4.7 (4.6; 0–26)
R03	2025	Below Spur	Feb 14	Mar 26	5075	41	123.8 (65.6; 8–258)	5.3 (4.9; 0–27)
R07	2025	Above Spur	Feb 22	Mar 26	1893	33	57.4 (29.4; 2–106)	2.5 (2.7; 0–17)

Table 1. Summary of vehicle traffic by camera deployment

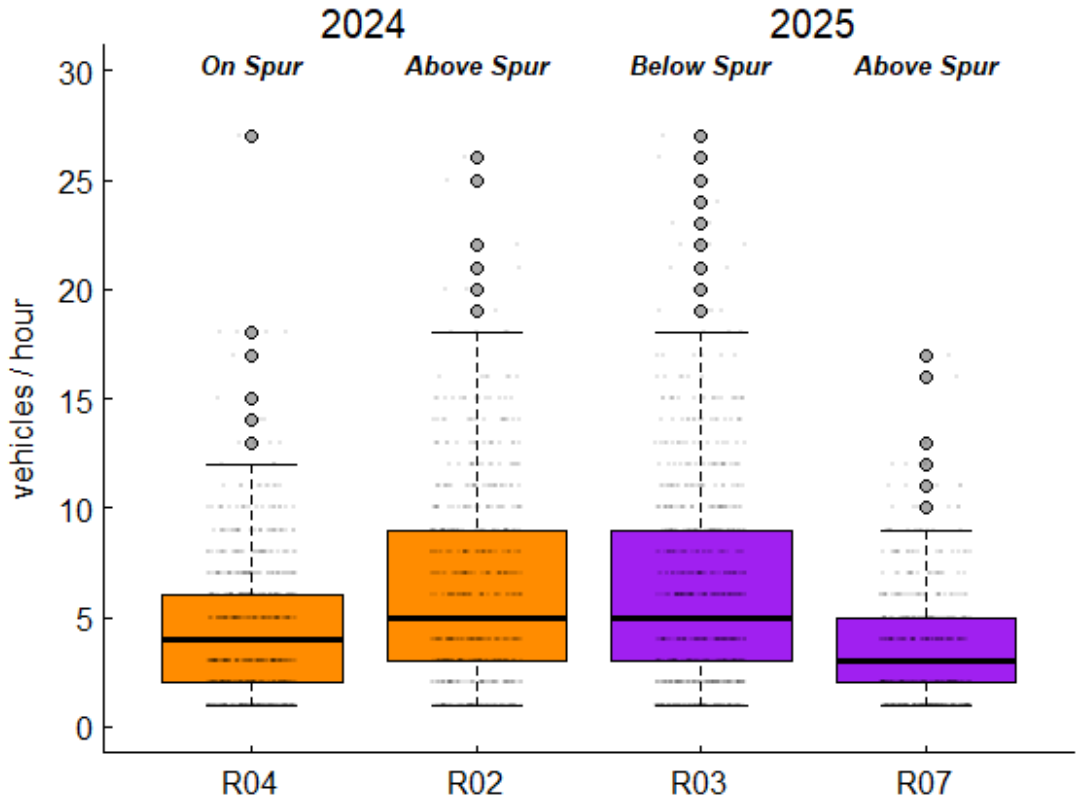


Figure 13. Distribution of hourly vehicle counts by camera deployment. Boxes show median and interquartile range; points are individual hourly counts jittered for visibility, Eliezer Gurarie

As you would expect, traffic intensity is higher during the daytime. There were multi-day gaps in activity throughout the season which likely reflect road closures during bad weather. Traffic intensity varied across the season, with the highest sustained rates in late February and early March at R03. However, it seems that traffic at R04 (GK spur road) is more evenly distributed across the day.

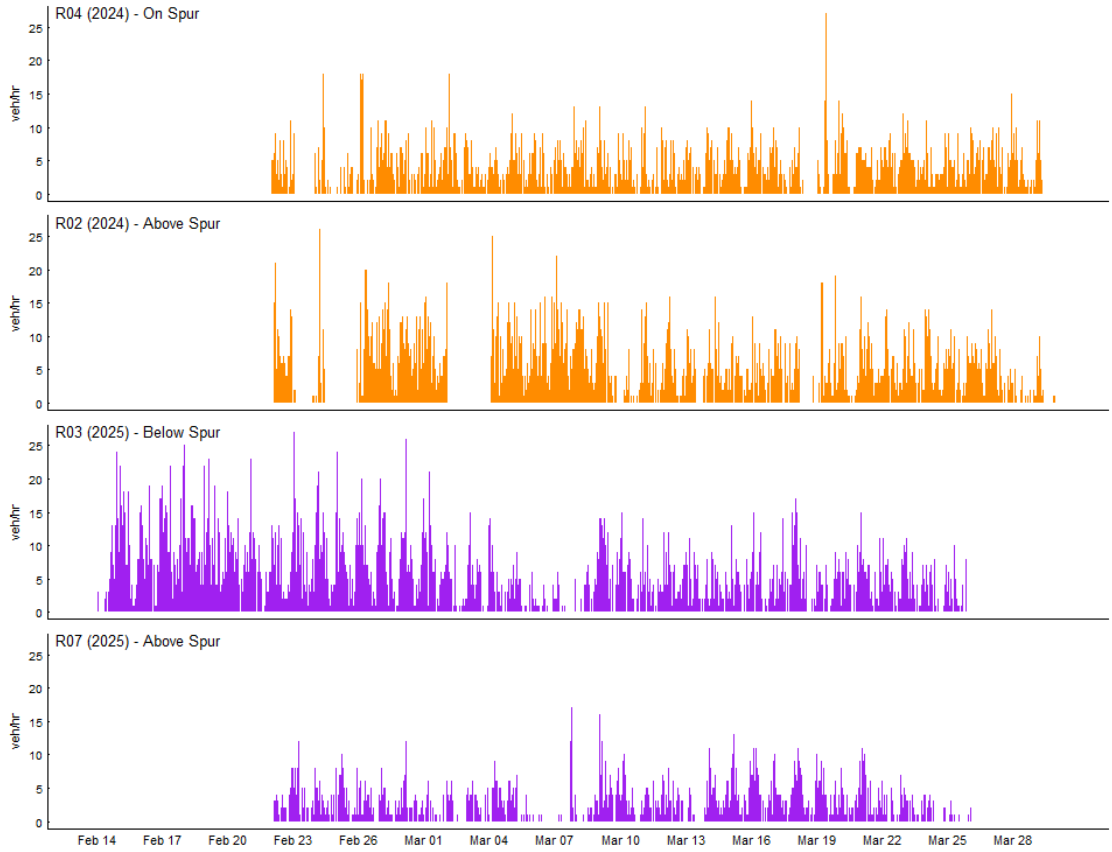


***Figure 14**. Hourly vehicle counts across the full monitoring period for each camera deployment. Orange: 2024; purple: 2025, Eliezer Gurarie*

5.2 Measuring anthrophony using ARUs – Collaboration with Megan Perra, State University New York

To investigate the level of human-made sound disturbance (anthrophony) that caribou experience on their winter range, we used ARU recordings to build a model that can predict anthrophony along the Tibbit-to-Contwoyto ice road. Anthrophony may include road noise, gravel mine blasting, aircraft overflights, etc. However, in this case, it is almost exclusively traffic. These predictions are built based on detections of anthrophony from the ARUs from 2024 and 2025, along with the following covariates: lake ice temperature, lake ice depth, wind speed, snowfall and the log distance to road. All weather covariates are from ERA5 land.

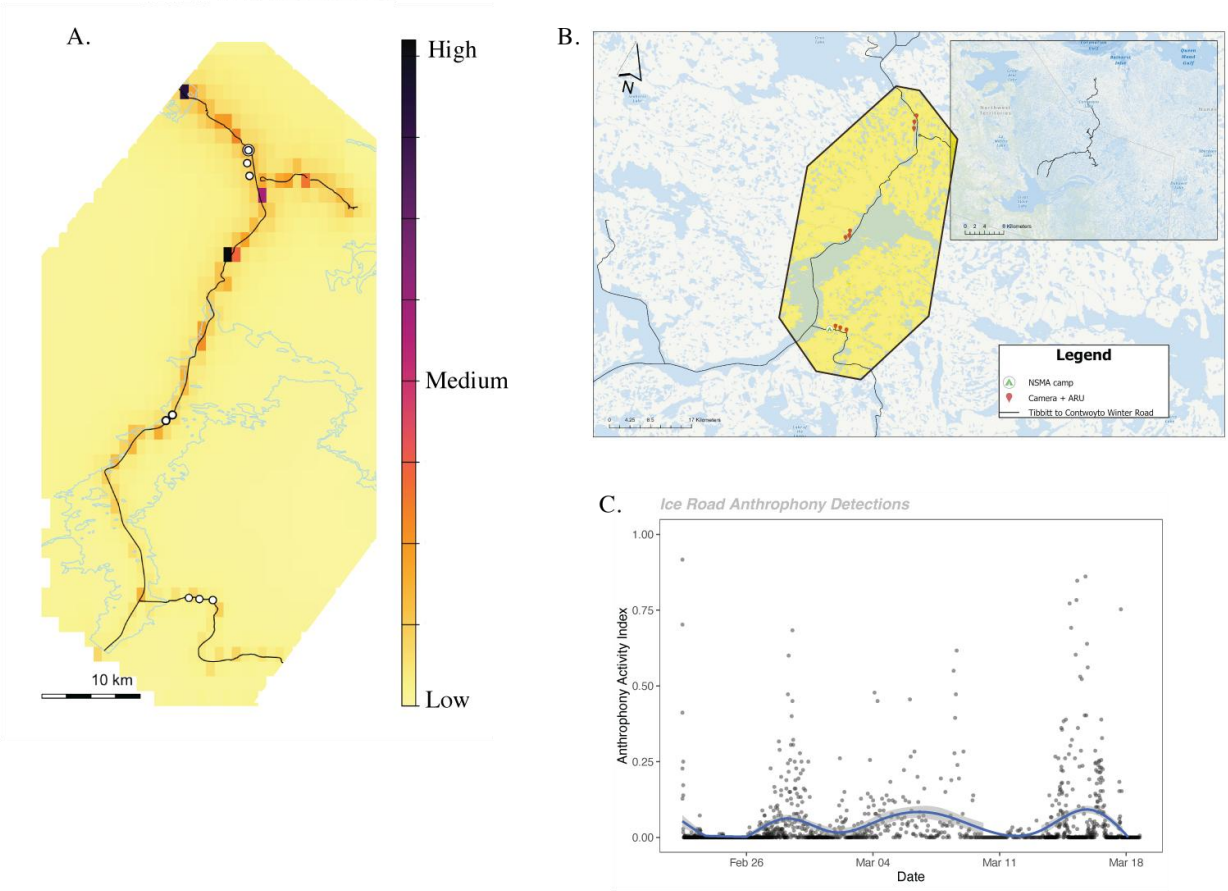


***Figure 15**. Anthrophony on the ice road*

Figure 15 A shows the model predictions of human-made sounds (Anthrophony) from the Tibbit-to-Contwoyto section of the ice road in 2024. The map's color represents high, medium or low anthrophony activity. The black line is the road, and lakes are outlined in light blue. The white

dots represent the sites where acoustic recording units (ARUs) were installed. B is a context map, with the approximate areal extent of the prediction map highlighted in yellow. C shows hourly anthrophony detections across the monitoring period; the anthrophony activity index is a ratio of anthrophony detections across all the possible ten second detection periods in an hour. A 1 indicates that anthrophony was detected in all detection periods in an hour (i.e. that anthrophony was constant), a 0 indicates that anthrophony was not detected in any of the hour's detection periods (i.e. anthrophony was absent).

Discussion

This report brings together a range of Traditional Knowledge and western science approaches to investigate the cumulative impacts of disturbance on barren-ground caribou in the Northwest Territories. The NSMA Winter Road Monitoring Program is a holistic, community-based initiative that is entirely Indigenous-led. In addition to collecting important and relevant data, the program provides training and employment for NSMA community members and supports reconnection to the land in the conservation of a culturally significant species.

NSMA Guardians are the on-the-ground leads of this work, conducting daily patrols throughout the ice road season to monitor caribou and collect field data. Through this consistent presence, Guardians have developed a detailed understanding of the challenges caribou face across their winter range. They have gathered critical information on caribou numbers, health, and behaviour, helping to contextualize and complement scientific reporting in the Northwest Territories.

Main Takeaways from 2025 season

- Guardians have reported that caribou are often unwilling to cross the road during periods of heavy traffic, leaving animals stranded on the west side where they may become more vulnerable to hunters and predators.
- NSMA members believe that too much harvesting is taking place on the TCWR. They have systematically documented and quantified gut piles, generating the first estimates of total harvest levels along the Tibbitt to Contwoyto Winter Road in 2025. While harvesting caribou remains a vital and culturally significant practice for Indigenous peoples in the North, many feel that the TCWR has enabled a level of access (and therefore harvest) that was not possible prior to the road's construction.
- Guardians observed that wolves are drawn to carcasses left near the road, which can subsequently increase hunting pressure of both wolves and caribou in these areas.
- The deployment of game cameras and acoustic recording units (ARUs) has further helped to fill key knowledge gaps regarding traffic intensity, information that is essential for assessing potential impacts on caribou and other wildlife.

Community members speak of a time when hunters travelled by dog sled to the barrenlands, limiting harvest to only what could be carried home. Today, trucks can drive directly into the heart of migrating herds and fill their trucks and sleds with caribou. This heavy harvest pressure is being compounded with other factors including climate change, habitat loss from industrial development, forest fires, and predation and negatively impacting caribou.

Next steps for 2026

The 2025 season was hugely successful for the NSMA winter road monitoring program. All together, seven community members and two staff completed 42 days of cumulative monitoring

and completed 150 observation forms. This report is just a brief overview of the season and more detailed reports in the form of scientific publications will be available in the future. In 2026, we plan to continue the program and have Guardians on the ground for the entire winter road season (February-March 2026). We plan to strengthen our existing partnerships with Tłı̨chǫ Government, Yellowknives Dene First Nation and Government of the Northwest Territories-Environment and Climate Change Canada to share data and collaborate across our programs.

2026 is our last year of GNWT-CIMP funding in this cycle and we plan to deploy 20 game cameras and ARUS in a grid on MacKay Lake at varying distances from the road. This will help us to understand how far noise is travelling from the road and eventually we hope to incorporate this data with caribou collar movement data to understand whether caribou are changing their movements close to the road.

Due to the success of our pilot gut pile monitoring, we plan to continue and expand this work to collect biological samples from discarded gut piles. We hope to use these samples to determine the sex, age and body condition of each sampled caribou and to test for important diseases and parasites.

Indigenous-led guardianship programs are increasingly recognized as vital tools for preserving biodiversity and protecting ecosystems. Rooted in the traditional knowledge, practices, and worldviews of Indigenous peoples, these programs leverage the deep connection community members have with their land and species. This on-the-ground monitoring is invaluable in tracking wildlife and environmental changes, particularly in northern ecosystems. Through this ongoing work, the NSMA aims to contribute essential data to help protect and conserve one of the North’s most precious resources, barren-ground caribou, for generations to come.

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