January 31, 2024

Donna Schear
Acting Chairperson
Sahtú Renewable Resources Board
PO BOX 134
TULÍT'A NT X0E 0K0
info@srrb.nt.ca

Dear Donna Schear:

Responses to Information Requests - Tłegǫ́hłı̨ (Norman Wells) 2024 Ɂełets'éhkwę Godı (Public Listening Session) - on Caribou Conservation, Climate Change and Wildfires [Ɂekw'ǫ́ heots'edıgha go ʔeʔá, Ɂehdagókégha, nek'e areyone gok'erek ǫ Tulít'a Got'ı̨ nę) / ʔyah hehḱgudı yant'a ʔadę̀ ʔagodin, ne ké ʔedeli (Délı̨nę Got'ı̨nę) / Sahtú ?ekwe ?eʔá, dırınéné k'e guluʔagotı, nek'e k'ǫ́ yarék'ǫ́ (K'áhsho Got'ı̨ nę)

On January 2, 2024, the Department of Environment and Climate Change (ECC), Government of the Northwest Territories (GNWT), received the second round of information requests from the Sahtú Renewable Resources Board (SRRB).

ECC is pleased to provide the attached responses to the SRRB's second round of information requests and is looking forward to participating in the public listening session scheduled for February 20-22, 2024, in Norman Wells.

Sincerely,

Erin Kelly

Erin Kelly, Ph.D.
Deputy Minister
Environment and Climate Change

Attachment

c. Distribution List

Distribution List:

Dr. Brett Elkin, Assistant Deputy Minister, Wildlife and Forest Management
Environment and Climate Change

Michael Hennin, Executive Director
Sahtú Renewable Resources Board

Heather Sayine-Crawford, Director Wildlife Management Division
Environment and Climate Change

Mike Gravel, Director, Forest Management Division
Environment and Climate Change

Dennis Marchiori, Director, Climate Change, Cumulative Impacts and Knowledge Division
Environment and Climate Change

Jeff Walker, Superintendent, Wildlife and Forest Management
Environment and Climate Change

Tłegǫ́hłı̨ Ɂełets'éhkwę Godı
Ɂekw'ǫ́ heots'edıgha go ɔeɔá, Ɂehdagókégha, nek'e areyone gok'erek ǫ́

NORMAN WELLS 2024 PUBLIC LISTENING SESSION – INFORMATION REQUEST ROUND 2

Environment and Climate Change

January 31, 2024

Government of Northwest Territories

Information Requests

Tłegǫ́hłı̨ 2024 Public Listening Session

Question from Information Request Round 1:
C: Additional Questions

1. What effects does government forestry management have on wildfires?

In responding to this question, GNWT sought clarification from the SRRB about the meaning of 'forestry management'. The response indicated that the SRRB was referring to forestry management planning/plans.

There is an opportunity to incorporate aspects of wildfire management planning into forest management plans if there is interest. Forest management plans would not have a direct impact on wildfires, but could provide guidance on priority areas to target for forest management activities that assist with community protection, such as fire breaks or woodlots that target dense conifer areas near a community that could be removed to improve fire resilience.

F: Communications about climate change

1. How do you communicate information on climate changes with communities? For example, how do you share information about bugs or ticks or other illnesses that may impact caribou?

The 2030 NWT Climate Change Strategic Framework highlights the importance of and need for enhanced knowledge sharing to build awareness about climate change in the Northwest Territories (NWT). There are a number of ways that the Government of Northwest Territories (GNWT) shares knowledge and information on climate change including websites, meetings, workshops, letters, social media, webinars and training. The NWT Climate Change Council (https://www.gov.nt.ca/ecc/en/services/climate-change/climate-change-council) provides a forum for the sharing of information, for collaboration, and for engagement between non-elected staff of Indigenous governments and Indigenous organizations, representatives of NWT communities and the GNWT. The NWT Climate Change Youth Council provides an engagement forum for youth.

The 2030 NWT Climate Change Strategic Framework – 2019-2023 Action Plan includes "Leadership, communication and capacity" as one of the cross-cutting themes which includes actions that would apply to all three of the goals of the Action Plan.

The GNWT's Climate Change website (https://www.gov.nt.ca/ecc/en/services/climate-change) provides information to NWT residents on why climate change is an important issue and what the GNWT and our partners are doing in response. The GNWT regularly updates this site to make sure the most up to date information is available to the public.

Information and knowledge will continue to be shared on climate change through in-person events organized and hosted by the GNWT or our partners. For instance, the GNWT organizes an annual Climate Change Advisory Group Gathering where information and knowledge on climate change is shared. Other GNWT events such as the Water Stewardship Strategy Annual Gathering and the *Wildlife Act* Section 15 meetings provide opportunities to discuss changes being seen across the NWT and the actions that need to be taken.

GNWT's NWT Cumulative Impact Monitoring Program (CIMP) co-hosts annual workshops to share results of caribou, water and fish monitoring and research projects from science and Traditional Knowledge perspectives. These workshops rotate between the regions, and are a venue where community members, decision-makers, researchers and government meet to discuss important and relevant project outcomes. Many of these projects have a climate change component.

The GNWT also shares information at a range of different events when requested by our partners, such as the NWT Association of Communities (NWTAC) annual general meetings and the annual Arctic Development Expo.

The GNWT also publishes plain language reports and dedicated webpage to update NWT partners and residents on the impacts of climate change and other environmental stressors on NWT ecosystems. Selected publications and webpage include:

- The State of the Environment report (https://www.gov.nt.ca/ecc/en/services/nwt-state-environment-report)
- NWT Environmental Research Bulletins (NERB) which are summaries of various NWT environmental research findings. https://www.gov.nt.ca/ecc/en/services/nwt-cumulative-impact-monitoring-program-nwt-cimp/nwt-environmental-research-bulletin
- Changes being seen in permafrost have been summarized into a story map with videos and pictures (https://storymaps.arcgis.com/stories/becbcf4a703547d7844d5f52414eb905)
- The Northwest Territories Geological Survey regularly publishes Open Reports and Open Files on permafrost and permafrost-related topics (https://www.nwtgeoscience.ca/our-publication-types).

The GNWT also collaborates with a wide range of NWT partners, providing funding for initiatives focussed on communicating information on climate change to communities and the public. For instance, the GNWT has provided financial support to Ecology North to develop and deliver a range of resources and public events intended to help inform NWT residents and communities about climate change. Key initiatives include annual Earth Week activities, Preparing for Climate Change Posters (https://ecologynorth.ca/portfolio/preparing-for-climate-change-posters/) and Climate Change Action Training (https://ecologynorth.ca/portfolio/climate-action-training/).

The GNWT is currently developing an online NWT Climate Change Library to share technical climate change information relevant to the public and decision-makers including those in government, industry and communities. The Library will provide a single, central online 'one-stopshop' for accessing technical resources related to climate change in the NWT they may need to take informed action and decisions. The Library will be launched in February 2024.

To complement the Library, the GNWT is developing a Climate Services Help Desk position to support access to relevant and credible technical information on climate change. The Help Desk will launch shortly after the Library.

NWT CIMP maintains the NWT Discovery Portal (https://nwtdiscoveryportal.enr.gov.nt.ca/geoportal/catalog/main/home.page), an online database of environmental information that is georeferenced and searchable by map. The results (data, presentations, maps, reports, etc) from NWT CIMP funded projects and other NWT projects are hosted on this portal. Caribou is a main focus of NWT CIMP.

Information and data on water quality in the NWT, including community-based water quality data, is available online via the Mackenzie Datastream https://mackenziedatastream.ca/en/.

More information about bugs or ticks or other illnesses that may impact caribou are included in the response to Information Request G.2.

The Department of Environment and Climate Change (ECC) is always interested in hearing of other opportunities to share information and knowledge on climate change.

2. What is the GNWT doing to learn from communities about the effects of climate change? How is the GNWT taking these perspectives into account?

The GNWT established a Climate Change Council and a Youth Advisory Council that advises them, to build connections and hear from the residents of the NWT on climate change:

1) The NWT Climate Change Council was established in March 2021, and includes non-elected staff of Indigenous governments, Indigenous organizations, representatives of NWT communities and the GNWT, and supports engagement with external partners. The Council provides guidance and advice to inform and advance GNWT climate change and environment programs in alignment with Indigenous government, Indigenous organization and community perspectives, interests, and knowledge. Further, the Council provides an opportunity to build on and strengthen relationships, shared understandings and trust. The Climate Change Council also engages with the NWT Council of Leaders, consisting of elected officials of Indigenous governments and Indigenous organizations to provide feedback on specific climate change initiatives. More information about the members of the Council and their activities can be found here: https://www.gov.nt.ca/ecc/en/services/climate-change/climate-change-council.

2) The NWT Climate Youth Advisory Council was established in 2023 as an advisory group to the Climate Change Council, bringing together the critical perspectives of youth from all NWT regions. For more information, please visit https://www.gov.nt.ca/ecc/en/services/climate-change/climate-youth-advisory-group

The GNWT is currently working to complete the first *NWT Climate Risks and Opportunities Assessment* which will help prioritize climate action in the NWT. The assessment is the outcome of a two-year engagement which began in October 2022. Key engagement activities to gather and incorporate perspectives from NWT partners and stakeholders included:

- The first and second Climate Change Advisory Group (CCAG) Gatherings (in October 2022 and 2023) to identify important values being impacted by climate changes as well as the types of impacts.
- Five interactive thematic workshops (in March 2023) to identify and prioritize key climate risks.
    - CCAG and workshop participants included representatives from the GNWT, Indigenous governments, Indigenous organizations, communities, academia, non-governmental organizations, and Climate Youth Advisory Group members.
- A public survey which ran from November to December 2023. There were over 190 responses from residents across the NWT.
- Engagement with the NWT Climate Change Council, which includes a Sahtu member, to keep them informed and engaged on the process and content.
- All of our work continues to be reviewed and guided by the NWT Climate Change Council, the NWT Climate Youth Advisory Group, and the NWT Council of Leaders.
- Additionally, virtual meetings were held in January 2022 to update NWT CIMP's monitoring and research blueprints. The Sahtú Renewable Resources Board (SRRB) was invited, and Leon Andrew and Janet Winbourne (TK consultant) attended. The NWT CIMP Steering Committee reviewed and approved the final draft of the blueprints. The Steering Committee is made up of representatives of 8 regional Indigenous governments and Indigenous organizations, including SSI. The SSI representative was in attendance during the meeting where the blueprints were approved.

G: Observations of caribou and climate change in general

1. Please indicate what the GNWT has measured and observed; and share any data the GNWT has collected relevant to these questions and explain your methodology used to collect that data? What changes has the GNWT measured and observed in:

a. *Weather systems and patterns*
    - Climate change is occurring faster in Canada's north than other parts of Canada, with most warming occurring in the winter. In the Canadian north, on average, yearly warming was 2.3 °C from 1948 to 2016, roughly three times the warming rate of global mean temperature. Over that period, winter has experienced the greatest warming, with an increase of 4.3 °C, while summer has experienced an increase of 1.6 ° C.
    - Further information can be found in Canada's Changing Climate Report produced by Environment and Climate Change Canada (ECCC) (https://changingclimate.ca/) and the 2022 NWT State of Environment Report (https://www.gov.nt.ca/ecc/en/services/nwt-state-environment-report).
    - Indigenous Knowledge holders have noted changes in weather. At the 2022 Climate Change Annual Gathering, an Elder from Fort Simpson said: "This

summer, we had a very limited amount of rain. I used to cut the grass two or three times a week in the summer and now I only cut it two times in the entire season.". At the 2018 Climate Change Forum and Charrette, hosted by the NWTAC and supported by GNWT, Elders and locals in the Sahtu regional session discussed unpredictable weather.

b. *Freeze up and thaw dates*

- ECCC calculates climate frost free statistics for Norman Wells Airport for 30-year climate normal periods. As seen in Table 1 below, from the 30-year period of 1951-1980 to the 30-year period of 1991-2020, the average date of last spring frost has moved five days earlier, and the average date of first fall frost has moved seven days later, extending the frost-free period by 12 days. These changes correlate with the many local observations of seasonal changes that have been noted through various GNWT community engagement opportunities in Sahtu communities.
- Indigenous Knowledge holders have been observing changes in freeze up and thaw dates. At the 2018 Climate Change Forum and Charrette, hosted by the NWTAC and supported by GNWT, locals and Elders discussed how the ice and land was not freezing, and that thinner ice was causing a danger of falling through the ice. At the 2022 Climate Change Annual Gathering, a local Łutsël K'é resident said, "I've noticed the ice itself is freezing differently because it is warmer and freezes over like slush. The cracks are smaller in the spring and it's thawing faster making it unstable and safety has become a real issue. The importance of Traditional Knowledge must be recognized."

Table 1: Change in Frost Free days between 1951-1980 climate normals and 1991-2020 climate. Data is derived from https://climate.weather.gc.ca/climate_normals/

	1951-1980	1991-2020
Average Date of Last Spring Frost	May 28	May 23
Average Date of First Fall Frost	Sep 1	Sept 8
Average Length of Frost Free Period	95 days	107 days

c. *Permafrost*

- The NWT Geological Survey has established the Northwest Territories Thermokarst Mapping Collective to map thaw-sensitive terrain. In the Sahtu region, preliminary maps have been produced for five communities and will be published in the near future. More information on the Thermokarst Mapping Collective can be found at: https://doi.org/10.1139/as-2023-0009
- At the 2018 Climate Change Forum and Charrette, locals and Elders spoke about how permafrost thaw was shifting the ground and in some cases, damaging their buildings.

- Natural Resources Canada has been measuring long term ground temperatures in the Mackenzie Valley since the 1980s. Permafrost temperatures across the NWT are increasing in response to climate warming. The mean annual ground temperature has increased by up to 0.3°C per decade at sites between Norman Wells and Fort Good Hope. Figure 1 shows mean annual ground temperatures in the discontinuous permafrost zone, in the central and southern Mackenzie Valley at a site near Norman Wells, near Wrigley and between Wrigley and Fort Simpson. As seen in Figure 1, there is a clear trend of increasing temperatures for two of the three sites measured.
- For further information see the State of Environment Report: https://www.gov.nt.ca/ecc/en/services/nwt-state-environment-report/13-state-permafrost

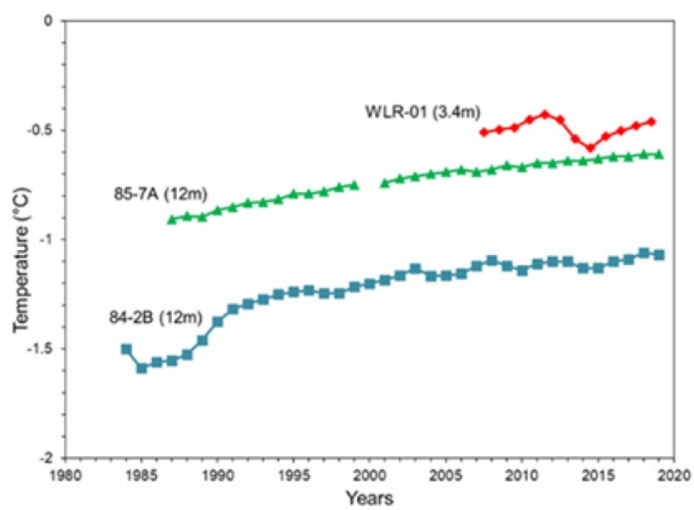

Figure 1. Warming in ground temperatures at three locations in the central Mackenzie Valley near Norman Wells.

d. *Watercourses and sediment*

- Many creeks in the NWT are being impacted by increasing sediment due to thawing permafrost resulting in landslides (thaw slumps) that release sediment into creeks.
- Research in the Gwich'in Settlement Area found that permafrost thaw slumps resulted in increasing dissolved sediment (water cloudiness) that reduced the number of insects and other invertebrates in creeks. This is important as this means the food available to fish is decreased. For further information see: How slumps are impacting aquatic systems in the Gwich'in Settlement Area 128-cimp_bulletin_v1i5-press.pdf (gov.nt.ca)

e. *Ice build up on snow*

- Outside the Sahtú, research has been undertaken that investigates ice on snow across the Canadian high Arctic and finds that these events have been increasing over time, and also links these events to changes in caribou populations: https://www.sciencedirect.com/science/article/abs/pii/S0034425716304370
- Further research outside the Sahtu has linked die-offs and reductions in caribou and muskox to ice-on-snow or rain-on-snow events: https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2017GL076752 and https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/2009EO260002

f. *Wind speeds and/or direction*

- ECCC calculates climate wind speed and direction statistics for the Norman Wells Airport for 30-year climate normal periods, which is an average of the variable over a 30-year period. As seen in Table 2 below, from the 30-year period of 1951-1980 to the 30-year period of 1991-2020, the average yearly wind speed has decreased by 3 km/h. Given this is such a small decrease it is likely not significant. The most frequent wind direction has changed from WNW to SE. This magnitude of change is small enough that it would suggest a negligible trend in windspeed. It should also be noted that measurements of wind speed and direction at existing climate stations should be interpreted with caution, due to changes in instrumentation and overall unreliability in instrumentation consistency over long periods of time.

Table 2: Change in Wind Speeds for Norman Wells Airport between 1951-1980 and 1991-2020. Data is derived from https://climate.weather.gc.ca/climate_normals/

	Avg Yearly Speed	Most Frequent Direction	Month with highest Average Speed	Prevailing Direction in Month with Highest Speed
1951-1980	12.2 km/h	WNW	June 14.4 km/h	SE
1991-2020	9.2 km/h	SE	May 11.2 km/h	SE

g. *Rain in winter events*

- ECCC provides rainfall amounts by month for Norman Wells. The rainfall and temperature for the Norman Wells Airport is provided in the Canadian Climate Normals. Normals for 1991 to 2020 were not completed by ECCC, and as such normals for 1981-2010 were used instead of 1991-2020. Trace (T) is less than 0.1 mm liquid precipitation.
- As seen in Table 3 below, from the 30-year period of 1951-1980 to the 30-year period of 1981-2010 rainfall did not experience much change with the exception of October and May, which each experienced large increases in rainfall. This can be explained as an increase in warm days on either side of winter causing an extended rain period instead of snowfall. With the exception of November, average minimum temperature experienced an increase in every month for the

measured months of the year (September to May).

Table 3: Change in Rainfall and Average Minimum Temperature for Norman Wells Airport between 1951-1980 and 1981-2010. Data is derived from https://climate.weather.gc.ca/climate_normals/.

	1951-1980 rain mm	1951 –1980 Avg Minimum Temp °C	1981-2010 rain mm	1981-2010 Avg Minimum Temp °C
Sep	24.1	1.7	26.7	2
Oct	2.8	-7.8	4.6	-7.7
Nov	0.2	-21.7	0	-22.2
Dec	T	-30.3	0.2	-27.1
Jan	0.1	-32.9	0.2	-29.9
Feb	T	-30.7	0.0	-28.4
March	0.2	-25.8	0.1	-24.2
April	1.2	-13.4	1.2	-11.1
May	8.7	-0.4	13.3	0.6

h. *Other changes to weather and climate*

- GNWT-ECC worked with ECCC and the NWTAC to develop climate change profiles for NWT communities.
- The profile for Norman Wells is provided at the following link: https://climatechange.toolkitnwtac.com/wp-content/uploads/sites/21/2021/01/NWT-Community-Report-Norman-Wells-Jan-2021-min.pdf
- Winter temperature is projected to increase from –29.7 °C for the recent past to –22.7 °C for the 2051-2080 period under a high emissions future scenario.
- The profile for Délı̨nę (https://climatechange.toolkitnwtac.com/wp-content/uploads/sites/21/2021/01/NWT-Community-Report-Deline-Jan-2021-min.pdf) shows that the number of cold (-30°C) days is projected to decrease from 54 days in the recent past to 15 days for 2041 to 2080 under a high emission future.

2. How has the quality of the caribou been affected by these changes, if at all?

In responding to this question, GNWT sought clarification from the SRRB about the meaning of 'quality' in the question. The response indicated a focus on barren-ground caribou from the Bluenose-East herd and asked the following questions: (i) How has the quality of the caribou been affected by these changes, if at all? (ii) Are you noticing changes in population? Population composition? (iii) Are you noticing any changes in health? I.e. fatter, skinnier, more disease.

Changes in populations. GNWT-ECC works with a range of partners to monitor the population size and trends of all barren-ground caribou herds in the NWT. This involves regular aerial surveys to estimate a herd's overall size (i.e. population estimate) and composition. GNWT-ECC also collars individual animals to collect information on demographic indicators, such as survival rates. Location information provided by these collars are also very important to help plan and implement aerial surveys.

The most recent population estimate for the Bluenose-East barren-ground caribou herd was obtained from a calving ground survey that took place in June 2023. The herd estimate from this survey is approximately 39,500 caribou, a statistically significant increase since the herd was last estimated at 23,200 in 2021 (Figure 2). Population indicators for the Bluenose-East herd, such as pregnancy rate, calf:cow ratios, cow survival rate and bull:cow ratios (Figures 3 & 4), which are obtained through collaring and composition surveys, have all shown consistently high values since 2018, consistent with stabilization of the herd between 2018 and 2021 and an increasing trend since 2021.

The results of the 2023 Bluenose-East population survey were shared with Indigenous governments and Indigenous organizations in a letter from ECC in November 2023. A report on the 2023 survey findings and methods is currently being drafted and will be made public later in 2024. Reports on the 2018 and 2021 population surveys for the Bluenose-East herd are available online:

- 2021: https://www.gov.nt.ca/ecc/sites/ecc/files/resources/325_manuscript.pdf
- 2018: https://www.gov.nt.ca/ecc/sites/ecc/files/resources/mr278.pdf

It is challenging to attribute specific changes in caribou herds to changes in any one climatic or environmental factor, including those listed in observations detailed above in Information Request G. 1. However, favourable conditions (cool, wet, and windy weather) observed on-the-ground by Indigenous hunters and monitoring programs (Kugluktuk HTO and Tłı̨chǫ observers) and information in global climate datasets, have been seen on the summer ranges of the Bluenose-East herd in recent years. It is likely that these cool, wet, and windy conditions have contributed to improved population indicators and growth of the Bluenose-East herd over recent years by reducing insect harassment and improving foraging conditions. Good summer feeding conditions likely lead to many females being in good condition during the fall breeding season, which is reflected in high pregnancy rates and high spring calf productivity. Although not collected systematically, incidental observations of Bluenose-East caribou on recent helicopter-based composition surveys in October and March by GNWT-ECC staff are consistent with ground-based Indigenous observations of large calves, males with large antlers in the fall, and males and females in good condition.

Additional pathways through which climate and landscape change can impact caribou populations are described in GNWT-ECC's response to the question "What are the impacts of climate change in the Sahtú Settlement Area on caribou and caribou habitat?" in Information Request Round 1, which is available at: https://www.srrb.nt.ca/documentrepository/public/public-hearings-registry/caribou-conservation-climate-change-and-forest-fire/02-1-submissions-response-to-infomation-requests/2239-23-12-08-ecc-response-to-information-request-round-1/file

Changes in health. GNWT-ECC monitors various indicators of health and disease in caribou of all ecotypes across the NWT. ECC staff collects a range of samples, measurements and observations to help assess the health status of individuals and populations. ECC has been assessing body condition, nutrition and mineral status, pregnancy status, contaminants, stress, and exposure to various diseases and parasites which may cause illness, death, or reproductive success. ECC makes the results of this work available through reports and presentations at meetings. Some examples of caribou health monitoring conducted over the past few years include:

- ECC is monitoring caribou across the NWT for a range of diseases, parasites and contaminants, and investigates individual cases and outbreaks of diseases.
- *Brucella suis* (a bacterium that causes brucellosis): In the past few years, no evidence of exposure to Brucella has been detected in the different ecotypes of caribou in the Sahtu.
- In 2022, increasing trends of exposure to certain viruses (pestivirus and alphaherpesvirus) were noted in some barren-ground caribou populations. ECC has partnered with the Tłı̨chǫ Government, Kugluktuk Angoniatit Association, Délı̨nę Renewable Resource Council, and the University of Calgary to examine the distribution, prevalence and potential effects of these viruses on barren-ground caribou using a community-based harvester sampling approach.
- ECC partners with external collaborators and the federal government to monitor contaminants in barren-ground caribou using samples from harvesters, community-based programs and existing GNWT archives.
- In Fall 2023, ECC was made aware of reports from Kugluktuk of harvested caribou that had internal lesions from parasites, including *Onchocerca spp* and *Setaria spp*. This may have been related to recent warm temperatures and heavy insect burdens. ECC will continue to monitor for signs of these and other parasites in caribou.
- The Tłı̨chǫ Ekwǫ̀ Nàxoèhdee K'è program has reported that barren-ground caribou observed in recent summers have been in good body condition, and less skinny animals have been observed.

Community-based monitoring and observations, samples and photographs from harvesters is an important part of caribou health monitoring. If you observe sick, injured, or dead wildlife, please reach out to our ECC Wildlife Veterinarian at WildlifeVeterinarian@gov.nt.ca, 1-867-445-3536, or contact your local ECC Wildlife Office.

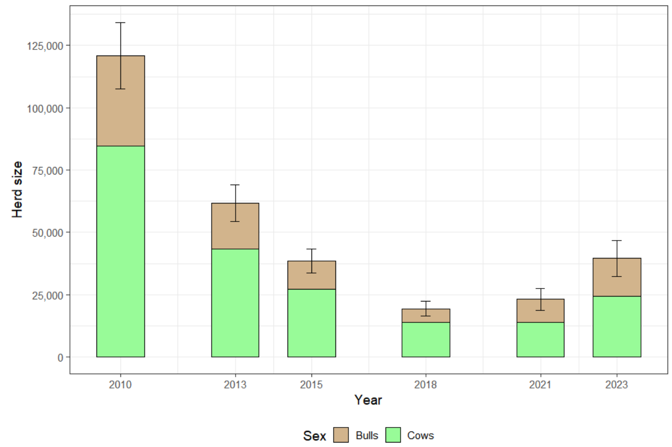

Figure 2. Bluenose-East herd estimates, 2010-2023. The height of each bar indicates the mean herd estimate and error bars show the 95% confidence interval. Green shows the estimated number of cows and brown shows the estimated number of bulls.

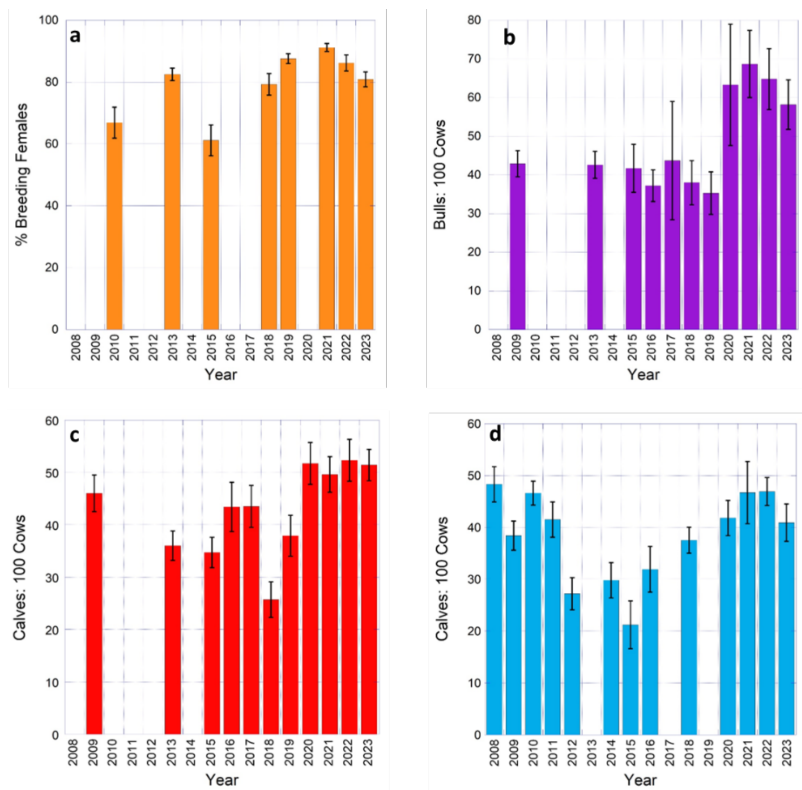

Figure 3. Bluenose-East population indicators, 2008-2023. (a) Pregnancy rates expressed as percent of breeding females in June on the calving grounds; (b) Fall (October) sex ratios expressed as the number of bulls per 100 cows; (c) Fall (October) calf-to-cow ratios expressed as the number of calves per 100 cows; (d) Late winter (March) calf-to-cow ratios expressed as the number of calves per 100 cows. In all four panels the height of each bar indicates the mean estimate and error bars show the 95% confidence interval.

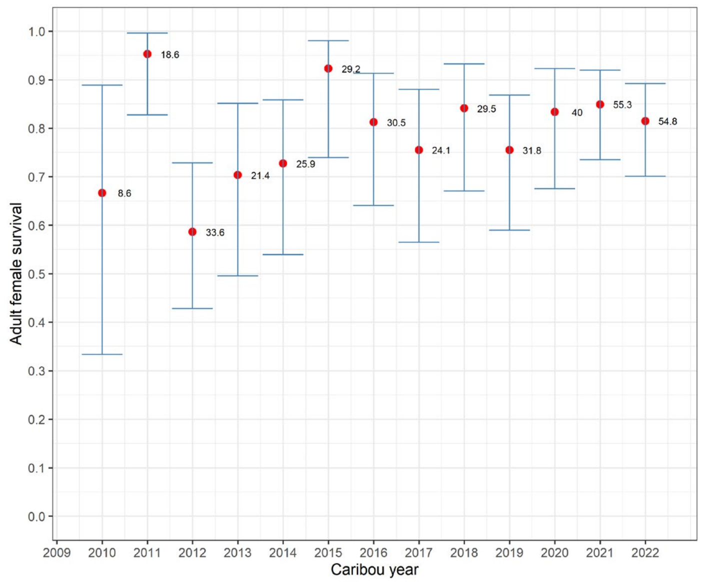

Figure 4. Bluenose-East collar-based adult female survival estimates, 2009-2022. Red points show the mean survival estimate and error bars represent the 95% confidence interval. The numbers next to each point indicate the average number of collared animals contributing to the annual survival estimate.

3. What, if any, new dangers or safety concerns are showing up on the land with the changes observed?

While GNWT-ECC does not formally collect information on safety concerns associated with environmental changes, there are a few themes regarding on-the-land safety that are often heard in discussions with individual harvesters, land users, communities and other co-management partners. The most common concerns expressed are that warming temperatures, increased climate variability, and thawing permafrost are resulting in more dangerous conditions. Travel over ice is becoming less predictable and more treacherous due to thinner ice, and permafrost thaw is changing the landscape in unpredictable ways, affecting travel routes. Research partners such as Wilfrid Laurier University and SmartICE are developing community-based monitoring of freshwater ice in the NWT.

4. Has the GNWT observed changes in ticks and other bugs or illnesses that impact ɂəkwę (caribou)?

GNWT-ECC has not had any reports of ticks affecting ɂəkwę (barren-ground caribou), but have received confirmed observations and samples of ticks from boreal caribou in some regions of the NWT. Previous work from the University of Calgary tested 25 whole barren-ground caribou hides collected by Délı̨nę harvesters between 2010 and 2012 as part of work looking at winter ticks (*Dermacentor albipictus*) in moose and caribou. Twenty pieces from each hide were checked for ticks. Winter ticks have been found on moose hides in the Sahtú, they have had low numbers of ticks, but winter ticks have not been found in any of the barren-ground caribou hides tested.

A new NWT CIMP project with the University of Calgary (CIMP239-BG) is researching health indicators for barren-ground caribou, such as body condition, pregnancy, parasites, trace elements, viral and bacterial exposure or infection, cortisol, and herpes.

GNWT-ECC is collaborating with eTick (etick.ca), a citizen science reporting platform for identifying and reporting ticks. Community members and harvesters who find ticks can contribute their observations by submitting a photo directly to the eTick app or to your local ECC office who will submit it on your behalf. The website is easy to use and can be easily searched for submissions from within the NWT. Currently, there are 3 submissions in eTick (1 from 2022 and 2 from 2023) from the NWT, but not from barren-ground caribou. In the Sahtu, we have not received any reports of ticks found on barren-ground caribou by community members or harvesters.

In addition, whenever ECC staff interact with a caribou they take the opportunity to collect valuable samples to inform the health of individuals and populations. We have not had any reports of ticks on any barren-ground caribou captured for collaring. For more information on the health of barren-ground caribou see the response to Information Request G. 2.

5. Has the GNWT observed changes in mice and/or other small rodents or birds.

Small mammals are a major prey species for many northern carnivores. The numbers of small mammals go through cycles, with can be related to population fluctuations in their predators. Since 1990, ECC has been monitoring populations of small mammals near many communities across the NWT. This long-term data set allows us to track how small mammal numbers are changing from year to year and from community to community.

The number of mice and voles peaked in numbers across many sites in the NWT in 2021, including the survey sites in Norman Wells.

The NWT State of the Environment Report (https://www.gov.nt.ca/ecc/en/services/nwt-state-environment-report) includes a section on trends in birds (https://www.gov.nt.ca/ecc/en/services/nwt-state-environment-report/15-state-wildlife). The information for the trends in birds came from the report "The State of Canada's Birds 2019" (http://nabci.net/resources/state-of-canadas-birds-2019/). Overall, this report finds that bird species across Canada including insectivores, grassland birds and shorebirds are declining.

6. What is GNWT doing to monitor climate change in the Sahtú?

The GNWT and its partners are engaged in a number of initiatives to monitor climate change in the Sahtu. This includes community-based water quality monitoring (Community-based Monitoring | Environment and Climate Change (gov.nt.ca)) and snow surveys by GNWT-ECC. Water levels and climate stations are measured by ECCC.

The GNWT has a partnership with Wilfrid Laurier University that includes climate change research in the NWT. Projects are listed at this link: https://www.wlu.ca/academics/research/reports/gnwt-report/sahtu.html

The GNWT's Cumulative Impact Monitoring Program (CIMP) also supports research and monitoring looking at cumulative impacts, including climate change, throughout the NWT including the Sahtu. An example of work supported by CIMP includes 'Aquatic Ecosystems in the Fort Good Hope Area as Indicators of Environmental Change' (128-CIMP_Bulletin_62_EN.indd (gov.nt.ca)).

H. Wildfires

1. What plans does the GNWT currently have for future actions in response to wildfires in Sahtú communities?

The GNWT Forest Fire Management Policy informs ECC's decisions on wildfire management and operational procedures, and recognizes that wildfire is an important, natural and necessary part of the forest ecosystem. ECC's wildfire management approach includes a strong emphasis on community collaboration and using all available Indigenous, local and scientific knowledge to inform wildfire management decisions.

Planning for the wildfire season begins well before the season starts. Pre-season planning includes meeting with communities to discuss the upcoming season and review Community Wildfire Protection plans. Fire crews and other seasonal wildfire management positions are brought on before the season begins to complete all necessary pre-season training and preparations. In the Sahtú, basic fire crew training will be held for up to 25 firefighters per community.

Planning also includes fire prevention and mitigation measures, including fuel breaks and implementing fire fuel reduction strategies, some of which is being funded by $20 million of federal funding for the NWTAC announced in 2022. It is important for communities to have pre-response plans in place which ensures that everyone who needs to implement actions in the event a fire threatens a community know what their role is.

As the upcoming season approaches, GNWT-ECC closely monitors weather and fire forecasts and the conditions in neighbouring jurisdictions to the south (e.g. Alberta). Depending on these conditions, the start dates for fire crews or equipment can be adjusted to ensure that people and equipment are in place when they are needed. Given the early start to the 2023 season and forecasted continued drought going into the 2024 season, crews will be brought on early to be ready for a possible early start to the season.

During the NWT's wildfire season, ECC's forest management staff make decisions based on a hierarchical values-at-risk approach with human life always being the first priority. Every fire in the NWT is assessed by wildfire experts and managers, who decide how to respond based on the values at risk, land management objectives, the available resources, fire weather, fire risk, and other active wildfires. Fire bans can be used when fire conditions and risk are considered extreme to reduce the risk of person-caused fires.

2. How long does it take for caribou food and habitat to grow back after a wildfire?

Summary:

- Summer foods for boreal caribou, grasses, forbs, and deciduous shrub species, recover quickly after a fire. They tend to be most abundant within the first 25-40 years after a fire, and then decline in abundance as forests get older.
- Winter foods for caribou, including terrestrial lichen species, take much longer to recover. Lichen don't start to increase substantially until around 40 years after fire, and approximately 75 years is generally required for lichen biomass to reach half of the peak levels of abundance seen in much older stands (up to 250 years old).
- Since female boreal caribou with calves require higher nutrition food during the summer season, young boreal forest burns that contain a lot of summer food resources may be as important as older forests that contain abundant lichen resources that support their needs in the winter.

Caribou feed on a number of different species of plants (grasses, forbs, shrubs, and trees), lichens and fungi throughout the year and their diet varies with the season. Despite the diversity of vegetation species available as potential food, caribou appear to be highly selective about what they prefer to eat. Caribou will eat less lichen in the summer and in the calving period, eating grasses, shrubs and forbs[1]. For example, a study (Denryter et al. 2017) based on observations of tame boreal caribou feeding in different natural habitats in northeastern BC found that caribou selected only 28 out of the 234 species they encountered (91 species were neither selected nor avoided). Boreal caribou exhibited the strongest selection for deciduous shrubs, forbs, lichens, and mushrooms, whereas they avoided non-deciduous, non-lichen plant groups, especially evergreen shrubs, conifers, ferns, clubmosses, mosses, and some terrestrial lichens. A Tłįchǫ traditional knowledge study identified 28 different species/vegetation types that were considered important for boreal caribou (Legat et al. 2018 cited in Species at Risk Committee 2022). Jorgensen (2021) identified approximately 80 different species of vegetation consumed by woodland caribou (boreal and mountain ecotypes) based on a review of reports from across Canada and Alaska. Based on food preferences described in Denryter et al. (2017), Cook et al.

[1] A 'forb' is a herbaceous flowering plant (not a woody plant) that is not a grass, sedge or rush (i.e. they have broad leaves and are not grass-like)

(2023) listed 24 different species/species groups of grasses, forbs, deciduous shrubs, lichens and mushrooms that boreal caribou prefer which occur in the southern part of their range in the NWT.

Both Indigenous knowledge and western science indicate that the diet of caribou changes throughout the year, switching from a wider range of food species consumed in the summer months, to relying mainly on ground (terrestrial) lichens and hanging (arboreal) lichens during winter (Russel et al. 1993). For example, a study with Gwich'in knowledge holders reported that boreal caribou eat willows, sedges and grass in the summer, but when hunted in the winter they generally only have lichen in their stomachs (Benson 2011 cited in Species at Risk Committee 2022).

While many tend to think of lichens as being the most important food for caribou, , the nutritional value of foods available to lactating females (cows) with calves at heel during the summer may also be critical given their higher energetic demands (Denryter et al. 2022; Klein, 1990; Webber et al. 2022).

Lichens are known to take much longer to recover after a fire than grasses, forbs and shrubs. Cook et al. (2023) found that lichen abundance only tended to increase substantially in stands that were greater than 40 yrs old, and lichens were generally more abundant in bogs and upland black spruce forests than other forest types. Similarly, in a separate study, Greuel et al. (2021) assessed patterns of lichen forage recovery (biomass) in 131 sites across the southern NWT (including some sites in the Sahtú region), in forests ranging from 1 to almost 250 years old. They found that forest stands in the Taiga Plains ecoregion needed about 75 years for lichen biomass to reach 50% of the peak biomass observed in older stands. Lichens were observed to be rare in deciduous stands, most common in jack pine stands, and the highest amounts of lichen were observed in poorly drained spruce and jack pine stands.

Cook et al. (2023) found that mushrooms had the highest nutritional value of all of the food species they sampled, but the abundance of mushrooms varied more as a function of time of year and precipitation (more abundant in late summer and in wetter years) rather than time since fire.

The relationships between food abundance and time since fire observed in these studies is generally consistent with observations from Indigenous knowledge holders across the NWT boreal caribou range. In the Gwich'in region, hunters noted that deciduous foods become quickly available following a fire, whereas lichens may take decades to return (Benson 2011 cited in Species at Risk Committee 2022). Elders in the Tłı̨chǫ region stated that it can take 20-30 years or even longer for lichen to recover after a fire, but other plants start to grow back within five years of a fire (Legat et al. 2018 cited in Species at Risk Committee 2022). Sambaa K'e residents in the Dehcho region have reported seeing caribou in recently burnt areas in summer looking for fresh shrubs and morel mushrooms (Species at Risk Committee 2022).

In the 1980s, Thomas and associates carried out a series of studies in the winter range of the Beverly barren-ground caribou herd. Results related to re-growth of terrestrial lichens in burned areas were summarized by Thomas et al. (1996) as follows: “Species of lichens attained peak biomass at different periods after fire - as early as 40-60 years for *Cladonia* spp. to > 150 years for *Cladina rangiferina* and *Cetraria nivalis.* Biomass of the primary "caribou lichen", *Cladina mitis,* increased rapidly from 21-30 years after fire to 41-50 years and attained maximum biomass at 81-90 years in the west and 41-60 years in the east. However, total lichen biomass increased with age of forest to 100-150 years because biomass of *Stereocaulon* spp. did not peak until after 100 years. The biomass of "caribou lichens" *(Cladina* spp. and *Cetraria nivalis)* stabilized after 61-80 years in the west and 41-60 years in the east.” Arboreal lichens were scarce in forest stands 1-40 years after fire and increased substantially until forests were 60-80 years old, then increased more slowly in forests older than 80 years (Thomas and Kiliaan 1998).

3. Why doesn’t ECC fight all fires?

Fires are recognized as a necessary and natural process in the forests of the NWT. While ECC responds to all new fires, not all wildfires are “fought” or “suppressed”. Fires are first assessed to determine if they should be monitored, addressed to protect values at risk, or suppressed (fought).

Wildfire response depends on many factors: the presence of values-at-risk and the cost of protecting them, the economic, environmental, or cultural importance of an area, fire weather and behaviour, the risk of fire in higher value areas, other current wildfires across the NWT, and the number of resources available. ECC also listens to our residents in helping us decide what is important. When a wildfire does not threaten public safety, property or other values, the fire may be monitored, rather than actively fought, to allow for the important ecological benefits of wildfire.

Wildfire in the boreal forest is necessary to help forests regenerate and stay healthy. A healthy forest is needed to sustain the biodiversity living within, including caribou and other wildlife species. The trees in the boreal forest have evolved with fire and many rely on fire for regeneration. For example, the cones on Jack Pine trees need heat from fires to open their cones and release the seed stored inside. Black Spruce are also dependent of fires for regeneration while many deciduous trees such as Aspen take advantage of the open space to re-sprout and grow under less crowded conditions.

Removal of all wildfire from the landscape results in an unnatural aging of the forest and loss of the habitat mosaic. As a forest ages it becomes less resistant to insects and disease, and wildfires help keep those insects and diseases in check by killing the pathogens infecting a stand. Natural fire cycles also help burn off excess fuel on forest floors protecting us from bad fire seasons because there’s less fuel to burn in the forest. If we remove fire from the landscape it can lead to excessive fuel loading, meaning that when fires do start in these areas, they can be much more difficult to control and can cause catastrophic fires putting communities and life at greater risk. This is why ECC only fights about one-third of wildfires in the NWT – while keeping a close eye on the rest. Protecting human life and communities is our top priority, and we focus our resources on fighting fires that pose a threat to our communities and other important values at risk.

1. How does the use of fire-retardant impact animals? How does the use of fire-retardant impact water?

Fire retardants (dropped from airtankers) are an important tool in responding to wildfires that help slow or stop the spread of a fire. ECC has used fire retardant in fire operations for many years, but it is used selectively on approximately a quarter of all fires that receive some type of action or to support ignition operations. Retardant can also be used to protect cabins in some instances where there is not enough time to set up sprinkler systems.

Retardants are considered safe for use and have minor effects on the environment. Retardants normally consist of ammonium sulphates, which are also used in agricultural fertilizers. Fire retardant is applied on or near a fire where it is considered important to assist with fire management efforts. It is possible that retardants dropped directly onto water bodies may cause growth of algae (eutrophication), however, pilots try to avoid applying retardants near waterways.

2. How long does it usually take for trees to grow back after a wildfire?

Wildfire is the main agent of regeneration and renewal in the boreal forest. How quickly trees regenerate depends on the type of trees growing before the fire, the intensity of the fire, and the conditions of the site after the fire, particularly soil moisture availability. Deciduous species such as trembling aspen, balsam poplar and paper birch can re-establish quickly, sometimes during the same season as the fire or the year after because they can re-sprout from unburned roots. Deciduous seedlings also re-establish within a year or two post-fire. Jack pine will re-establish very quickly after a fire, as the heat from a wildfire will release tens of thousands of seeds in jack pine dominated areas. Other species such as black spruce, white spruce and tamarack may take longer to establish, typically 3-10 years. White spruce may take the longest of all northern tree species, as it typically establishes in the understory of other species. Often seedlings will sprout but will remain very small until overstorey species such as aspen begin to thin out and make more light available.

Please indicate what the GNWT has measured and observed; and share any data the GNWT has collected relevant to these questions and explain your methodology used to collect that data:

1. What changes in wildfires has the GNWT observed over time?

- *When the GNWT first notice these changes?*
- *Where have the wildfire changes been seen?*

For millennia, NWT ecosystems and species (including boreal caribou) have evolved with wildfire as the principal driver of forest health and renewal. In recent times, active fire suppression was introduced to protect people, communities, critical infrastructure and other values at risk. Where active wildfire suppression has been concentrated, typically around the communities, there has been a shift from the younger, less-flammable forests that would be typical of the natural fire regime to older, fuel-rich, less stable, and more flammable forests.

Forest ecosystem carbon balance, which has been relatively stable for thousands of years, is in essence maintaining forest age-class distribution by controlling production, loss/removal, and resulting quantity of forest biomass/carbon at the landscape scale. Forests accrue biomass/carbon through photosynthesis every year, which has tended to remain in balance through losses/removal of almost the same amount primarily via carbon emissions from wildfire and, less substantially, by rotting in the natural ecosystems.

With very little logging in the NWT, biomass removal is principally done by wildfire. Under historic natural fire regimes in the NWT, the area affected by wildfire (or *burn rate*) in the absence of fire suppression has been 0.03-3.01. For the Taiga Shield and Taiga Plains Level II ecoregions, the estimated natural historical burn rate is 1.75% and 1.37% respectively, averaging at 1.56% per year. Most of the Sahtu is within the Taiga Plains ecoregion (Figure 5).

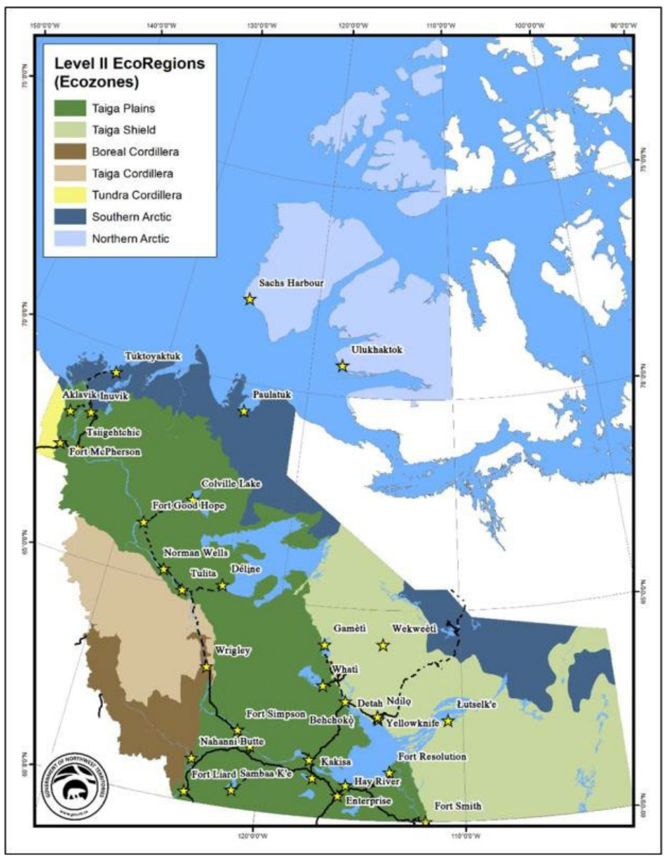

Figure 5*. Ecoregions of the Northwest Territories.*

Under natural conditions, historically about 1.56% of the total area of NWT Taiga Shield and Taiga Plains forests was burned annually. Under this natura fire regime, forests were renewed and maintained by high-intensity crown stand-replacing fires, moderate crown and surface fires, and low-intensity surface fires. The resulting mosaic of fire-generated forest stands of varying age classes and species composition provided diversity, health, and stability of the ecosystems.

The introduction of extensive fire suppression during the last few decades has resulted in a forest biomass removal (forest renewal) rate in the Taiga Shield and Taiga Plains below 1.56%. As a result, these forest ecosystems are more susceptible to fire as fuel builds up due to stand age class distribution shifting to older vegetation community types. This increases the amount of forest areas vulnerable to diseases, and results in a higher fuel accumulation than occurs under a natural fire regime.

During the last 58 years (1965-2022), there were over one hundred successful initial attacks (see dot-shaped fires in Figure 6) near Kakisa and Hay River, which prevented natural fuel removal. During the 2023 wildfire season, the combination of extreme drought, unprecedented fire weather and available fuels resulted in extreme fire behaviour that posed a threat to communities and public safety.

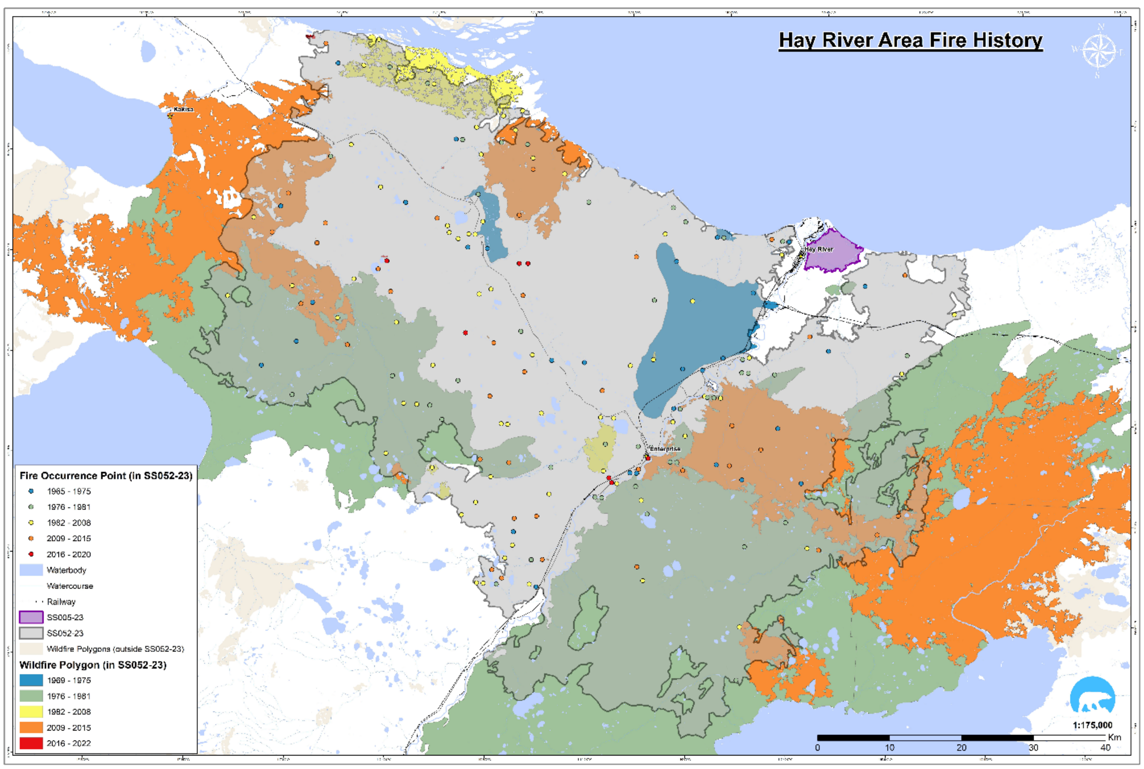

***Figure 6**. 1965-2021 Tathilina Lake-Buffalo lake area fire history map (GNWT-ECC). The 104 dots on the map represent fire starts that were put out since 1989, resulting in older forests and higher fire risk.*

A firestorm occurs when the heat from one or more fires is so intense that it creates its own wind system. The Kakisa and Hay River fires described above as well as fires near Yellowknife and Fort Smith were combined into one firestorm event with an enormous atmospheric fire-smoke column on August 13, 2023.

2. What changes has the GNWT observed in smoke and any lingering effects? In humans? In caribou?

The GNWT has been responsible for monitoring and managing air quality in the NWT since 1974, generating annual air quality reports for the public since the mid 1990s.

The GNWT works closely with ECCC to monitor air quality. ECCC tracks air parameters across Canada, and provinces and territories with the equipment needed to measure and share data. ECCC also has guidelines for quality assurance and quality control of air quality data. The GNWT in partnership with ECCC operates five monitoring stations in Yellowknife, Inuvik, Fort Smith, Fort Simpson, and Norman Wells.

Overall, the 2018-2020 data shows air quality in the NWT is very good and well below the Canadian Ambient Air Quality Standards (CAAQS) for the four parameters, which reflects the NWT's low population density and limited industrial emission sources. However, wildfires and long-range pollutants can affect the air quality.

Wildfire smoke was the largest contributor to fine particulate matter ($PM_{2.5}$) in the 2018-2020 reporting period. Figure 7 compares $PM_{2.5}$ levels with and without wildfire smoke (that is, before and after removing the data influenced by transboundary flows and wildfires).

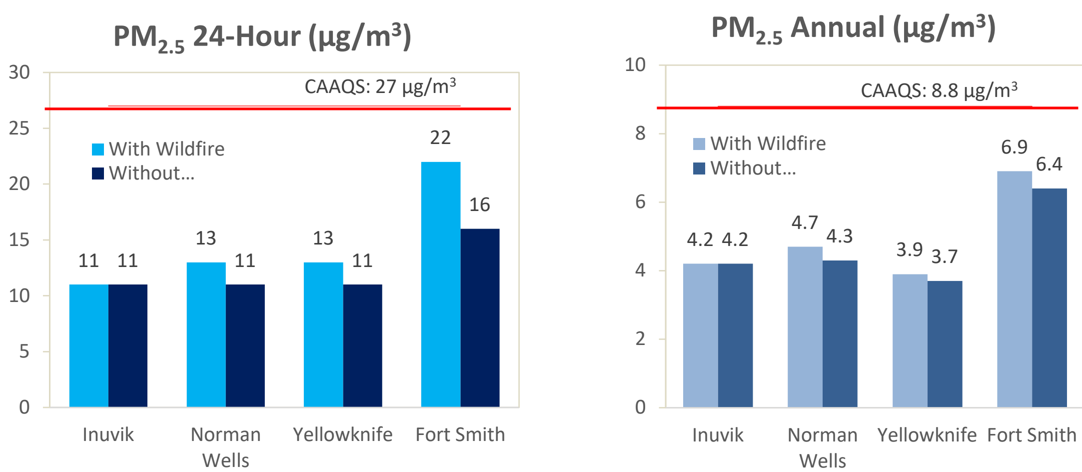

Figure 7. Fine particulate matter concentrations during 2018-2020.

Table 4 shows territorial air quality for each parameter at each station that represents an air zone. NWT monitoring results all fall in green and yellow levels (after removing the data influenced by transboundary flows and wildfires) —the lowest and second lowest levels of air quality management. None of the results fall in the red or orange levels, which exceed or approach air quality standards and would set next management steps in motion.

Table 4. Northwest Territories Air Zone Management Level Results 2018-2020.

Air Zone	Fine Particulate ($PM_{2.5}$)	Ozone (O_3)	Nitrogen Dioxide (NO_2)	Sulphur Dioxide (SO_2)
North Slave	Yellowknife	Yellowknife	Yellowknife	Yellowknife
South Slave	Fort Smith	Fort Smith	Fort Smith	Fort Smith
Beaufort Delta	Inuvik	Inuvik	Inuvik	Inuvik
Sahtu	Norman Wells	Norman Wells (insufficient data)	Norman Wells	Norman Wells

How has air quality changed over the last 15 years?

Over this time, $PM_{2.5}$ and NO_2 have increased while SO_2 and O_3 have decreased relative to the 2006 levels.

- The increase in $PM_{2.5}$ is mostly because of wildfire smoke.
- The slight increase in NO_2 is likely because of higher emissions from residential and commercial heating.
- The decrease in O_3 may be linked to a decrease in average background O_3.
- The decline in SO_2 can be related to lower emissions from combustion and mobile sources. This is a cross-country trend that is likely because of lower sulphur levels in fuel.

3. What changes in wind and how wind affects wildfires has the GNWT observed?

ECC contracts a fire weather meteorologist who has over 30 years of fire weather forecasting in the NWT, and has provided the following observations:

- We appear to be seeing climate change play-out in real-time across the NWT, especially through the last 10 years. Climate change appears to be promoting an overall increase in the number of hectares burned in the NWT, but also appears to be leading to considerable variation in seasonal severity. In other words, while a large proportion of our most severe seasons, in terms of hectares burned, have occurred in the last 10 years, a number of recent seasons also rank amongst the slowest wildfire seasons in 70 years.
- There appears to be a number of key changes in the atmosphere that explain fire season variability to some extent, and can shed some light on the wind field.
    - First, the upper-level jet stream appears to be much stronger than it used to be.
    - Secondly, the strengthening jet stream seems to be helping trigger the development of unusually strong surface cyclones/low pressure systems from time to time. While strong surface lows have always affected the NWT periodically during the summer, the presence of strong upper winds is highly problematic. In terms of wind speeds, these unusually deep lows create very tight pressure gradients and very strong surface winds. In terms of weather and precipitation, the strong upper winds move these systems across the NWT very quickly, often limiting the amount of precipitation in some areas. Further, the strong upper flow often creates very pronounced 'dry slots' with ferocious winds and low relative humidity readings.

- It is perceived that when these unusually strong weather systems move across the NWT, surface winds are often stronger than we have seen previously. When such systems move rapidly across the NWT, precipitation is highly shortened. In some seasons, however, we have seen such systems stall over the zone, yielding significant precipitation relief and slower fire years.

- Increasingly strong upper-level jet stream appears to be helping support more frequent strong low-level winds, such as low-level jets. In the Délı̨nę area, in particular, the last few years have seen very strong low-level jets developing west of Great Bear Lake with highly ferocious winds affecting the zone from time to time.
- Lastly, another source of strong winds is an unstable atmosphere and thundershowers. In an unstable atmosphere, upper winds are pulled to the surface as wind gusts. When the upper/low level winds are strong, very strong surface wind gusts occur. Not surprisingly, recent studies suggest that lightning activity over the northern NWT has been increasing with climate change. This, overall, would result in a gustier fire environment.

4. What effects of wildfires on caribou or caribou habitat has the GNWT observed?

Summary:

- Caribou have co-existed with forest fires for thousands of years.
- Boreal caribou can be directly impacted or displaced from areas that are actively burning or have heavy smoke.
- As areas recover following fires, boreal caribou tend to select recent burns (<10 yrs old) in the snow-free season and then switch selecting older burns (41-60 yrs old and >60 yrs old) as the winter progresses.
- Barren-ground caribou avoid high density burn areas (Barrier and Johnson 2012).
- Mature forest stands give caribou better and higher quality forage (Barrier and Johnson 2012).
- Overall, wildfires seem to have smaller impact on boreal caribou population trends than human disturbances such as roads, seismic lines and forestry cut blocks.

Wildfires are a natural process that creates a dynamic landscape for caribou that contains a constantly shifting mosaic of habitats in different successional stages (different fire ages). Wildfires can have both immediate impacts on caribou, as well as longer-term impacts that reflect how caribou habitat (and habitat for other competitors and predators) changes with time since fire, and the amount of area in different fire ages.

During an active wildfire event, individual boreal caribou could potentially be injured or killed directly or be displaced by the fire. Indigenous knowledge holders have reported that boreal caribou may stay in burning areas to protect their young instead of trying to leave the area, and will swim to islands to escape fires (Environment Canada 2010b [Whatì] cited in Species at Risk Committee 2022). Boreal caribou may avoid places with smoke and avoid vegetation that is burned or covered in ash (Legat et al. 2018 cited in Species at Risk Committee 2022).

There are a range of views and information from Indigenous knowledge holders about how long it takes for boreal caribou habitat to recover following fire. In the Gwich'in region, hunters reported that boreal caribou may return to a burned area within the first few years, and then take two to four decades (or even longer) to return to the same area again (Benson 2011 cited in Species at Risk Committee 2022). In the Tłı̨chǫ region, boreal caribou were reported not to return to burned areas for at least 30 years, but some elders reported them returning to burned areas in winter within 15-25 years after a fire (Cluff et al. 2006; Environment Canada 2010c [Behchokǫ̀], and Legat et al. 2018 cited in Species at Risk Committee 2022). In the Sahtú region, some interviewees stated that boreal caribou return to burned areas once there is new growth, while others felt that caribou will never return to these sites again (McDonald 2010 cited in Species at Risk Committee 2022). In the southern NWT, members of the West Point and K'átł'odeeche First Nations reported that it takes at least ten years before a boreal caribou will use a burn (ENR 2007c [West Point First Nation and K'átł'odeeche First Nation] cited in Species at Risk Committee 2022).

GNWT-ECC undertook a comprehensive assessment of how boreal caribou select habitat based on fire age and the type of vegetation that burned or grew back following a fire (DeMars et al. 2020), using collar location data from over 300 adult female boreal caribou collected between 2002 and 2018 across the NWT range. Boreal caribou generally showed higher selection for younger burns (<10 years old) and older burns (>30 years old) and avoided middle-aged burns (11–30 years old). Selection for recent burns by caribou in the NWT appeared to be strongest during the snow-free seasons (calving, summer and into fall), followed by increasing avoidance of burns ≤40 years old from early to late-winter. During late winter, areas that hadn't burned in 41-60 years or greater than 60 years, were the most strongly selected, unless they were dominated by deciduous tree species. This pattern of selection for recent (<10 years) burns during the snow-free season and then switching to selection for older forests (41-60 years, and >60 years) during the winter months is generally consistent with patterns in summer and winter food abundance observed by Cook et al. (2023); however, boreal caribou seem to avoid mid-aged forests (11-30 yrs) despite having peak levels of summer food abundance. It is possible that boreal caribou avoid stands in this age category because of high amounts of fallen trees killed in the fire, or because other browsers such as moose are selecting these areas, which in turn might attract more wolves and increase predation risk for boreal caribou.

The impact of fires on boreal caribou habitat, and their use of regenerating burns, may also depend on fire severity. In 2015, GNWT began monitoring boreal caribou within the large 2014 Birch Lake fire complex situated between Fort Providence and Behchokǫ̀. Using collar location data from between 2015 to 2021, boreal caribou were observed to prefer unburned and low-severity burn areas to medium and high severity burn areas within the fire perimeter throughout the year (Kelly et al. 2023). During the calving and summer seasons boreal caribou used all burn severity classes roughly equally (low to high), and during calving, early fall and late fall preferred low-severity burn areas over unburned areas within the fire perimeter. Medium and high burn severity areas were avoided during late winter. These findings suggest that burn severity and fire age are both important considerations for understanding how wildfires affect boreal caribou habitat. Despite the high proportion of recently burned habitat within the Mackenzie monitoring area (which includes the Birch Lake fire complex), the boreal caribou population has been increasing in that area since 2016 (see Figure 21b in Species at Risk Committee 2022).

Despite being the dominant source of habitat disturbance for boreal caribou in the NWT, wildfires have been found to have a smaller impact on boreal caribou population dynamics than human disturbance. Johnson et al. (2020) assessed the effects of fire and human disturbances (like roads, seismic lines, forestry cut blocks) using information about survival rates of adult female boreal caribou and calf recruitment rates from 58 study areas across Canada (including study areas from the NWT). They found that the negative effect of fires on calf recruitment rates was three to four times smaller than that of human disturbance, and models that only included human disturbance best explained patterns of adult female survival (suggesting a negligible impact of fires on adult female survival).

Thomas et al. (1996) and Thomas and Kiliaan (1998) noted that the Beverly barren-ground caribou herd tended to use forest stands 151-250 years after fire more than other age classes; however, use of forests 51-100 and 101-150 years after fire was substantial. Use of forests 0-50 years after fire was limited. Thomas (1998a) found that lichens were the main component in the diet of the Beverly barren-ground caribou herd based on fecal and rumen samples, and lichens were 87-90% of relative density. Further, "Cladina-type lichens, including Cladina, Cladonia, Stereocaulon and Alectoria dominated the lichen component and usually comprised 60-85% of fragments." (Thomas and Kiliaan 1998).

A study of burned and unburned sites used by the Bathurst barren-ground caribou herd in winter 2008-2009 (Barrier and Johnson 2012, Anderson and Johnson 2014) found that "Winter range habitats important to caribou were characterized by a high percentage of ground cover of lichen and herbaceous forage and a close proximity to lakes and rivers. Although caribou avoided areas densely populated with burns, there was considerable use of early-seral habitats as well as areas adjacent to the burn boundary." (Anderson and Johnson 2014). In addition, Anderson and Johnson (2014) found "that at some spatial and temporal scales, individual barren-ground caribou may be less averse to fire than previously thought". Recently regenerated green growth of forbs and graminoids after fire may be attractive to caribou because the plants are readily digestible and have high nitrogen content, whereas lichens are highly digestible but low in nitrogen (Klein 1990).

Studies of barren-ground caribou range use in Alaska are generally consistent with the study results from the NWT (e.g. Joly et al. 2010). Joly et al. (2007a) studied winter range use by the Western Arctic barren-ground caribou herd and found that "caribou strongly selected against burned areas within the tundra ecosystem. Recent burns were selected against at both large (range-wide) and intermediate (5658 m) spatial scales. Caribou particularly selected against 26- to 55-year-old burns and the interior (core) portions of all burns. We found that caribou were more likely to select burned areas in the late fall and early spring than midwinter." In addition, Joly et al. (2007b) found that lichens made up 50-58% of plant fragments in fecal samples in winter from this herd. In the range of the Nelchina herd in interior Alaska, Joly et al. (2003) found that "caribou used recently burned areas (<50 years old) much less than expected, regardless of methodologies used. Moreover, within burns, caribou were more likely to use habitat within 500 m of the burn perimeter than core areas." Russell et al. (1993) found that in winter, lichens made up 62-66% of fecal fragments of Porcupine caribou; they noted further that lichens in fecal samples of caribou are under-represented because they are easily digested, hence that the percentage of lichens in the diet was likely significantly higher (over 70%). The remainder of the winter diets was made up of a wide range of plants (Russell et al. 1993, Joly et al. 2007b).

5. Where on the land and/or water have these changes been noticed?

Wildfires occurring within the NWT have been mapped by the Government of Canada and the GNWT since the 1950's. Figure 7 from the *Species Status Report for Boreal Caribou (*Rangifer tarandus caribou*) in the Northwest Territories* (Species at Risk Committee 2022) shows the wildfires that have occurred within the range of boreal caribou from the 1950s until 2020. Although wildfires are common throughout the NWT range of boreal caribou, there tends to be more fire disturbance in the southern parts of the range (southern NWT [Dehcho and South Slave] and Wek'èezhìı portions of the range), than in northern parts of the range (Sahtú, Gwich'in and Inuvialuit portions of the range).

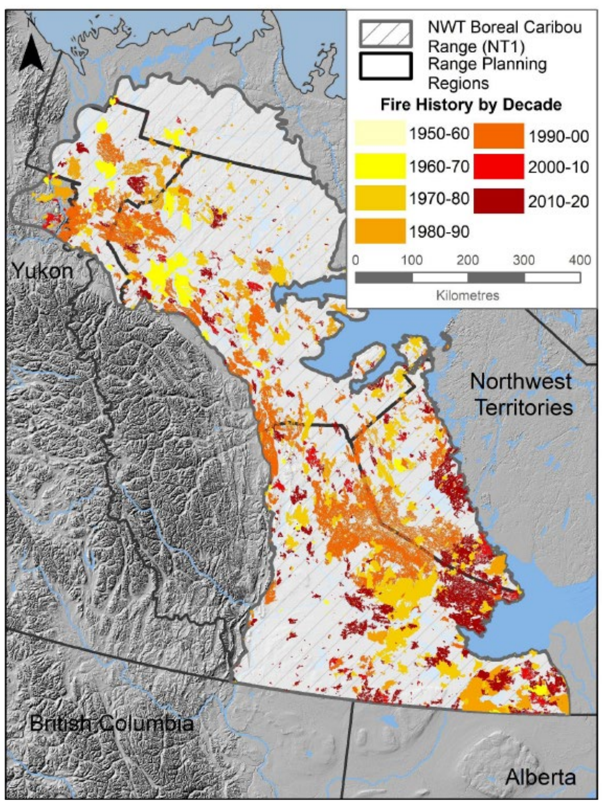

Figure 7. Locations of fires that burned between 1950 and 2020 within boreal caribou range in the NWT.

Barren-ground caribou winter range use has included a large portion of the northern boreal forest in the NWT. There can be overlap with boreal caribou range in the winter. In some herds, ranges have contracted northward as these herds have reached lower numbers; larger herds use larger ranges and the southernmost winter ranges are used only by herds at high numbers. Notably the range of the Bathurst herd in recent years is less than 20% of its range at high numbers, and the herd has wintered above tree-line or near tree-line in recent years.

Studies of winter range use of the Beverly barren-ground caribou herd in the 1980s in burned and unburned areas by D. Thomas and associates (e.g. Thomas et al. 1996) were in the NWT southeast of Great Slave Lake and described earlier. Studies of winter range use in burned and unburned areas on the Bathurst herd's winter range in the NWT in 2008-2009 (Barrier and Johnson 2012, Anderson and Johnson 2014) were over a large area between Great Bear Lake and Great Slave Lake. These results were also described earlier. Both these study programs concluded that those two herds, at the time of the research, were not limited by availability of high-quality lichen-rich winter range (Thomas 1998b, Barrier and Johnson 2012).

It is significant that the two largest fire years in the NWT since fire mapping began in the 1950s were 2014 and 2023. For Canada as a whole, 2023 was the largest fire year recorded, with 18.5 million hectares burned, far exceeding the 7.6 million hectares burned in 1989, which was previously the record year for Canada. Simulation modeling of potential fires on the winter range of the Western Arctic Herd in Alaska (Joly et al. 2012) suggested that the frequency of big fire years and the area burned annually could increase with a warming climate. A significant shift towards a younger forest in this region could be associated with a significant loss of prime caribou winter range (Joly et al. 2012). While the size and location of any year's fires cannot be predicted in the NWT or elsewhere, the potential exists for a significant reduction of the high-quality older forests preferred by barren-ground and boreal caribou in the NWT if the frequency of big fire years like 2023 increases.

6. What is the GNWT doing to monitor and fight fires in Délı̨nę District?

GNWT-ECC uses a combination of remote sensing, public reports, and targeted ground and aerial observers to monitor NWT wildfires. This includes flights with fixed wing or helicopter patrols with ECC fire personnel and local fire crews. ECC's fire response within the Délı̨nę District is consistent with our approach to any fire that starts in the NWT. All new fires are assessed, and the appropriate response is determined based on values at risk, fire behaviour, available resources, fire and weather predictions, fire risk in other areas and other land or resource management objectives.

I. Hį̨dó Gogha Sénégots'ıá (Planning for the Future – PFF) – Planning, Climate Change and Wildfires

1. How can Hį̨dó Gogha Sénégots'ıá (Planning for the Future – PFF) reflect and respond to climate change impacts and wildfires?

2. How could the impacts of wildfires and climate change on caribou and caribou habitat inform community Hį̨dó Gogha Sénégots'ıá (Planning for the Future – PFF)?

Community conservation plans contribute to broader management planning and processes that include communities and co-management partners from across a caribou herd's range. ECC remains supportive of community conservation planning as part of an overall coordinated approach to caribou management and conservation. ECC will continue to engage with Sahtú communities on how to support and advance the development and implementation of community-based plans. ECC strongly encourages communities to invite ECC staff to take part in meetings during the development of their plans to support and increase knowledge transfer, communication, and a collaborative working relationship. As communities move forward with their planning processes, it is important to include opportunities to learn and adapt, allowing new information to inform future reviews and actions.

J. Hį̨dó Gogha Sénégots'ıá (Planning for the Future – PFF) – Planning Process

1. What is the GNWT's perspective on the minimum requirements of a Hį̨dó Gogha Sénégots'ıá (Planning for the Future – PFF) planning process (developing the plan) and the final written plan?

Settled land claim agreements in the NWT include processes for Indigenous governments to submit wildlife management proposals to renewable resources boards established as the main instrument of wildlife management in each settled land claim area. These processes utilize the best available information for decisions and recommendations, including all available local, community, Indigenous and scientific knowledge. Community conservation plans can play an important role in overall wildlife management and conservation, working together with overall herd management plans that ensure input and collaboration from all communities, Indigenous governments and co-management partners from across a caribou herd's range.

Wildlife management plans that are collaboratively developed by the GNWT, Indigenous governments, renewable resources boards and other co-management plan are intended to be goal oriented with clear objectives, measures and timelines to achieve specific management and conservation goals. Management plans tend to be living documents that are updated over time as new information and approaches become available. Plans need to be consistent with land claims, territorial and federal legislation, and established wildlife co-management processes. Draft management plans go through a number of review and approval processes, Section 35 consultation with Indigenous governments and Indigenous organizations, and engagement with other stakeholders, governments and the public.

Similar to other collaborative caribou management processes, the Hįdó Gogha Sénégots'ıá (Planning for the Future – PFF) planning process can be an important part of overall caribou management and conservation efforts. A final written plan that is clear and concise, adaptable, allows for improvement, and includes and incorporates the best available local, Indigenous and scientific knowledge. If there are components of community conservation plans that the community and/or SRRB want the GNWT to implement or follow, it is helpful for the plans to clearly articulate how they help to meet GNWT's legal obligations under federal legislation (e.g. obligations to maintain at least 65% undisturbed habitat in boreal caribou range, and provide effective protection of critical habitat).

2. Has the GNWT – ECC been involved in any community Hįdó Gogha Sénégots'ıá (Planning for the Future – PFF) since the second PLS (April 2022)

GNWT-ECC staff attended the Hıdę́ó Gogha Sénégots'ıɔ́á (Planning for the Future) Gathering – October 24-26, 2023 in Tłegǫ́hłı̨ (Norman Wells). For other gatherings, the GNWT was not invited to participate with the SRRB and communities. ECC is committed to work with the SRRB and communities moving forward, and welcomes all opportunities to support communities in the development of their community conservation plans when requested.

3. What are GNWT – ECC perspectives on community-based planning, best practices, and community involvement in conservation planning?

Community conservation plans and community-based self-regulation can make important contributions at a local or regional scale as part of a coordinated overall approach to caribou management, habitat management and harvest management. The GNWT has worked closely with communities on a range of collaborative caribou planning initiatives (e.g. management plans, range plans, protected areas planning, etc.), and is committed to ongoing engagement and consultation with communities. Community members have a valuable wealth of knowledge and information to contribute to conservation initiatives, and are an important voice at the table.

4. Do you have any other contributions or comments to share about how communities plan and Hįdó Gogha Sénégots'ıá (Planning for the Future – PFF)?

GNWT-ECC welcomes the opportunity to provide support and assistance to communities in the development of community conservation plans. ECC staff are always open to attending meetings and helping to support the development and contributing to planning initiatives, and can share their scientific knowledge and expertise in wildlife and habitat management to complement local Indigenous knowledge systems and expertise to support the wise management of caribou for future generations.