



Northwest
Territories Environment and Natural Resources

Mr. Michael Neyelle
Chair
Sahtú Renewable Resources Board
PO BOX 134
TULÍ'A NT X0E 0K0

FEB 26 2016

Dear Mr. Neyelle:

Responses to Information Requests
Round No. 2 – Bluenose-East Management Proposal

On February 13 2016, the Department of Environment and Natural Resources (ENR), Government of the Northwest Territories (GNWT) received a list of information requests from the Sahtú Renewable Resources Board (SRRB) on behalf of the Colville Lake Renewable Resources Council, Behdzi Ahda" First Nation and Ayoni Keh Land Corporation. These information requests were sent to ENR in regards to the "Government of the Northwest Territories Proposal on Management Actions for Bluenose-East Caribou 2016-2019".

ENR would like to provide the attached response to the SRRB's information request.

Sincerely,

for
Ernie Campbell
Deputy Minister

Attachment

- c. The Honourable Wally Shuman, Minister of ENR, GNWT
- Mr. Jeff Walker, Superintendent, Sahtú Region, ENR, GNWT
- Mr. Roger Fraser, Acting Superintendent, North Slave Region, ENR, GNWT

.../2



Ms. Lynda Yonge, Director of Wildlife, ENR, GNWT

Ms. Deborah Simmons, Executive Director, SRRB

**Responses to Bluenose-East Caribou Herd Management Proposal:
Colville Renewable Resources Council, Behdzi Ahda" First Nation and
Ayonik Land Corporation Information Requests Round 2**

1. Why does ENR manage by herd, rather than manage by areas surrounding each community? In your response to SRRB questions, you indicated that management by herd was the "standard and appropriate practice" of management, and herds were the "appropriate units of management", but you gave no explanation why this approach is favoured. What comparative evidence (if any) is ENR relying on to make the determination that a herd-based management approach is appropriate in this instance?

This question was asked as part of the Sahtú Renewable Resource Board (SRRB) Round 1 Information Requests. The Department of Environment and Natural Resources (ENR)'s refers to its response to SRRB's Round 1 Information Request section 2 on herd definition for the Bluenose-East (BNE) caribou.

As indicated in Round 1 Information Request – section 2, managing barren-ground caribou by herds, as defined by their calving area, is a standard practice across North America and an independent scientific review (Fischer et al 2009) supported its continued use. The idea of managing by herd is not something new. Previously the caribou found in northern tundra and boreal regions of the Northwest Territories (NWT) and Nunavut between the Mackenzie and Coppermine Rivers were considered the "Bluenose" herd. New data and better technology showed these caribou currently migrate to three different and geographically distant calving areas in a predictable fashion and in 1999, based on the new science and recommendations from the co-management boards, ENR started surveying and reporting the results of these herds separately.

ENR recognizes defining caribou herds and exchange or movement between caribou herds was a "Hot Topic" during the development of "Taking Care of Caribou: The Cape Bathurst, Bluenose-West (BNW), and BNE Barren-ground Caribou Herds Management Plan" and that all partners are not in total agreement about these ideas, but the co-management partners felt there was enough agreement to support the Management Plan on a herd basis and collaboratively work together.

Comparative evidence to support the idea that the herd based management approach is appropriate in this instance is a complex question to answer. It is not ENR alone who decided to manage barren ground caribou based on herds. The current management system is based on recommendations to the Minister from the co-management partners who share responsibility for the herd. Using the movement of collared caribou we can see that in recent years caribou cows and

bull use the landscape in a somewhat predictable fashion and these movements take the BNE herd into areas near 9 different communities including areas from 4 different land claims at different times of the year. In addition, what happens in one area will affect the caribou, their migration, and what condition they are in when they arrive in other areas of the herd range. Therefore we cannot manage the areas around each community in isolation. In the Taking Care of Caribou management plan that the co-management boards developed with their partners, all agreed to work together to manage the herds.

2. Has ENR considered an area based approach? For example, if each community were to set up a monitoring program, many of the indicators that you claim are important could be measured, along with annual trends in distribution and abundance, and harvest patterns. Harvest rates could be adjusted by the community based on traditional knowledge assessments of caribou abundance, health and other factors. Such a model would also meet some of your obligations under the SDMCLC. If ENR has considered area based approaches, on what basis did it determine that such an approach is inappropriate?

The 2014 Taking Care of Caribou Management Plan and the Barren-ground Caribou Management Strategy for the Northwest Territories 2011-2015 (Caribou Forever – Our Heritage, Our Responsibility) recommended that ENR and co-management partners must strive to make the best use of all available knowledge (traditional, community and scientific) to recommend relevant monitoring and management actions. For example, the co-management boards and ENR benefit greatly from information obtained from community-based monitoring program such as harvest reporting, health and condition sampling (fatness level, diseases and parasites), patterns of caribou abundance and migration around the communities, observations about the number of calves reported by hunters each year, and sightings of predators.

ENR has not yet taken a position on an area based approach. ENR is very interested to hear more about the proposed area based approach and learn how it can complement existing monitoring programs.

Some of the things that are important to ENR to understand about an area based approach is how it fits in overall. Once developed, results from monitoring plans conducted on an area basis would need to be considered across the range of the BNE caribou. If monitoring near Délı̄nę in the fall showed very few calves, it might be hard to determine based on that information alone why this was the case – were few calves born, or was there a high rate of mortality? Yet, if monitoring earlier that year near Kugluktuk showed lots of calves born it would indicate it was a problem with survival and more monitoring could be focused to answer that question. What happens in one area on the range impacts the herd in all the areas on the range and monitoring needs to be coordinated.

3. Why is the Bluenose caribou herd considered two herds, and not one herd or three herds?

ENR concludes that caribou are faithful to a core calving area, and that there is some inter-annual movements between calving areas based on collar data, but have provided no other information as to the mixing of caribou from these calving areas during other times of the year. Is it not possible that the same herd can use two calving areas?

This question was also asked as part of the SRRB Round 1 Information Requests. ENR refers to its response to IR Round 1 #2 herd definition – BNE caribou.

What was historically considered the “Bluenose” herd was refined and named the Cape Bathurst, BNW and BNE herds based on new calving ground information. The grouping of the herds was supported using satellite tracking locations and statistical analyses called hierarchical and fuzzy clustering (Nagy et al. 2011).

The fall and winter ranges of these three herds do show overlap (Nagy et al. 2005) but the vast majority of collared cows are returning to the same calving area (see SRRB IR2 #2). Overall, fidelity to calving grounds by collared cows has generally been shown to be 96-98% in the NWT, with about 3% of cows switching to neighbouring calving grounds in the Bathurst, Beverly/Ahiak, BNE, BNW, and Cape Bathurst (CB) herds (Adamczewski et al. 2009, Davison et al. 2014). Several years of collar data indicate that the BNE and BNW herds show the same high rate of fidelity to their calving grounds that herds to the east and west show. This is why they are considered to be distinct herds.

Based on the calving ground definition it is scientifically valid to consider these as separate herds even though other seasonal ranges may overlap.

Managing multiple herds as one does not allow targeted management actions. Two adjacent herds might be in different stages of their cycle; one could be doing well and based on population levels no harvest limits are required while the adjacent herd could be at very low numbers and not be able to support an unrestricted harvest. If that were the case and the two herds were to be managed as one population, the potential exists that harvest disproportionately applied to the declining herd could accelerate the decline to a very low herd size or result in losing caribou entirely from an area. Alternatively if the decision was to reduce the risk to caribou by putting harvest limits on the population because of low numbers of one herd, harvesting from the adjacent herd could be restricted unnecessarily. Managing each herd separately allows co-management partners to target their management actions appropriately.

Over a long time-scale of hundreds of years in Alaska, there is evidence that some herds may disappear and then re-establish when conditions are more favourable (Skoog 1968), and this has also been recognized through Traditional Knowledge. However, knowingly taking that risk and allowing a herd to reach very low numbers or disappear and then having to wait decades or longer for re-establishment would leave nearby communities without caribou to harvest for an unknown period of time. It could mean the loss of a herd that may have been on the landscape for decades, centuries or longer.

4. The Wildlife Act prohibits harassment of animals. Why then does ENR exempt its staff and agents, through a special permit, from being charged with harassing caribou when they deploy radio collars? Dene Elders consider collaring to be an extreme form of harassment and abuse. In what ways does ENR consider or give weight to Dene traditional knowledge and values in relation to this practice?

Please refer to:

- SRRB IR Round 1 # 8 a, b and c, - Bluenose-East caribou.

Under section 52 of the *Wildlife Act*, no person shall engage in an activity that is likely to result in a significant disturbance to big game or unnecessarily chase, fatigue, disturb, torment or otherwise harass game or other prescribed wildlife without a licence or permit to do so. Any researcher, including government biologists must have a Wildlife Research Permit to do any wildlife research in the NWT, including deploying collars on caribou. To get a permit the researcher must submit an application and get support from local harvesting committees. When a project involves handling wildlife there are additional requirements. Any research that involves wildlife has the potential to disturb wildlife and when that work involves handling wildlife the risks are greater. When the local harvesting committees review applications for work in their area they need to assess if the

need for information for management purposes is great enough to warrant the potential risks. This is a case-by-case decision and there is not always consensus.

Radio collars on caribou are important tools that provide critical information for caribou management that currently cannot be obtained in any other manner. While ENR will continue to listen to communities, and recognizes the Dene values with respect to handling caribou, we also have to listen to all our co-management partners. When the use collars is critical to effectively monitor and manage caribou herds, ENR will use best practices for the safe handling of wildlife and conduct collaring in the most respectful manner possible. This includes using standard operating procedures designed to reduce the impact on caribou and includes limits on maximum chase time, keeping handling time to a minimum, and monitoring the response of caribou during and after the collaring procedure. Based on post-collaring behaviour, caribou appear to recover from the helicopter and collaring disturbance quickly, they often quickly return to feeding.

The effect of the collar itself and modification to the collaring process have been discussed in SRRB IR Round 1 #8. ENR has also had statistical analysis done to determine the optimal number of collars needed for different surveys (ENR 2014).

Decisions to collar caribou are not made lightly. It is recognized as a potentially high risk activity for both the caribou and the staff conducting the work. The need for the information must outweigh the risk and this assessment must be supported by co-management partners. ENR does not collar caribou without getting support for the program from the renewable resources boards.

5. What alternatives has ENR considered to replace the use of radio-collars? In your response to the SRRB you indicate that you are investigating fecal monitoring, and that satellite imagery might offer a possibility if the resolution improves, but have you considered other options such as drones with cameras, or the deployment of motion sensitive or remotely operated cameras at strategic sites?

ENR regularly monitors new developments and techniques to obtain key information needed to monitor and manage caribou, including advances in fecal monitoring and remote sensing techniques. ENR has embraced a number of new non-invasive techniques that have been demonstrated to be able to answer some specific questions, like fecal hormone sampling to determine pregnancy status.

At this time, ENR is not aware of any other tool or method that could be used to reliably monitor movement and distribution of barren-ground caribou for management purposes at the scale of the annual home range. Collars remain a vital tool to be able to conduct calving ground and post-calving surveys, an essential tool for tracking herd size and trends.

Remote sensing has future potential for use in estimating the size of caribou populations and ENR has investigated it for this purpose; however the resolution of commercially available satellite imagery is still not adequate and there are limitations on the size of the area that a satellite can photograph in one pass. ENR will continue to monitor changes in remote sensing as the technology continues to improve. Currently, the vast majority of the information acquired and shared by ENR to monitor caribou is directly or indirectly related to the use of collars.

ENR initiated contact in 2013 with a company operating drones with cameras just before the BNE calving ground photo survey. The objective was to design a pilot project to compare information acquired by drones with the results of the traditional airborne based photographic survey method used for the past 30 years. Technical and legal limitations associated with using drones based out of Kugluktuk (including limited range of currently available drones, difficult operating conditions caused by weather and limits to the use of drones under federal aviation law) prevented the project from going ahead. ENR also attempted to use airborne mounted infrared equipment during the June 2009 Bathurst calving ground survey but the results showed that this method was not adequate (and very expensive) to yield a reliable count of the number of caribou during calving. ENR in collaboration with the NWT Centre for Geomatics will continue to further explore the use of drones for future wildlife and enforcement surveys.

ENR has not made use of sensitive or remotely operated cameras at strategic sites yet but recognizes that it is certainly a technology that could potentially be used depending on the objectives of the study.

6. Why is it that ENR's management approach rests almost entirely on a point-in-time estimate of population size, and yet your models and caribou biologists maintain that there are "complex relationships between caribou, climatic variation and their forage" that influence caribou population trends?

ENR relies on a suite of herd status indicators not just point in time estimates of population size. These include:

- yearly composition surveys to estimate herd productivity,
- yearly reconnaissance-level surveys of the calving grounds in years that the photo survey is not conducted,
- monitoring of collared caribou,
- intermittent fall surveys to assess bull-cow ratios, and
- body condition/health monitoring.

Each of these indicators is assessed to help determine the relative herd status. These metrics are further analyzed using an integrated population model that is described in each of the calving ground survey reports. The integrated population model provides estimates of cow survival, calf survival, proportions of females breeding, bull survival, and yearling survival. In addition, this model tests for directional trends in each of the metrics. This model is being further developed to test for the effect of environmental trends on herd demographics.

What is important with these metrics of caribou population health, including the population number, is that information from one year cannot be used in isolation. Repeating the information collection to determine trends over time gives us information on whether the herd is increasing or decreasing.

Reports from communities and traditional knowledge are also important. The Taking Care of Caribou management plan outlines the different types of monitoring from both the community and science that can be used to assist in determining herd status.

7. Why does ENR's management response focus almost entirely on regulating indigenous harvesting when there are other "complex relationships "that affect caribou survival? What consideration has ENR given to alternative means of reducing caribou mortality, including predator control, habitat protection, fire suppression? Has ENR developed models that can predict the outcomes of such approaches? If so, are such approaches more or less successful in reducing caribou mortality?

These issues were raised as part of the questions asked as part of the Information Requests by the SRRB and the Wek'èezhì Renewable Resources Board (WRRB). ENR would refer to the answers it has provided to the following questions:

- SRRB Information Request Round 1 # 7– Bluenose-East caribou.
- WRRB Information Request Round 1 # 6, 9, 10, 14, 17 and 18 – Bathurst caribou.
- WRRB Information Request Round 2 # 2, 3, 4, 5, 6, 8, 9, 10, 11, 21, 22 and 28 – Bathurst caribou.

As noted in the management proposal, “the short-term goal of the management actions proposed is to slow the herd’s decline and promote recovery. Over the longer-term, the goal of management is to promote recovery of the herd so that sustainable harvesting that addresses community needs levels is again possible.” ENR recognizes that many factors affect the herd’s welfare and abundance, some of which (especially weather) are not subject to human management, and may have a profound influence on caribou condition and pregnancy rate, independent of the level of human harvest. The Taking Care of Caribou Management plan outlines other management actions – many longer term – to be considered for the herd in addition to harvest management.

Although management of harvest is a key area of focus in the proposal, actions proposed for the herd also include increased incentives for wolf harvest to increase caribou survival rates, and continued involvement in environmental assessment processes to ensure that any potential effects of the potential development on caribou are addressed and to advocate for calving ground protection .

As is the case in most jurisdictions, quantifying and assessing wolf predation rates and determining management approaches is a challenging issue to address. As outlined in the BNE Joint Management Proposal to the WRRB, ENR will be leading a collaborative technical feasibility assessment in 2016 to review options for monitoring, consider a full range of management options, and assess likely effectiveness of different management actions. Any proposed measures that arise from this review will require consultation with Aboriginal governments and organizations, and wildlife management authorities.

The deployment of 50 collars on BNE caribou (30 cows, 20 bulls) may also provide potential insight into the relative significance of predation. More intensive monitoring of collars that become stationary would provide an opportunity to promptly investigate the cause of mortality. Over time, the accumulation of mortality data may provide insight into the relative significance of predation of collared caribou.

With respect to fire, in the last two years the NWT has experienced unusual and exceptionally high fire weather indices which resulted in forest fires getting out of control quickly after initial ignition and continuing to burn throughout the summer. It is unclear if climate change is already affecting the severity and frequency of forest fires but the cost of the level of fire suppression in the past two years is not sustainable. ENR will continue to listen to community elders and leaders to explore options to identify and try to protect some key caribou habitat corridors but the potential for complete fire control is limited in big fire years like 2014. Additionally, forest fires are necessary to bring older and less productive forest types to a younger successional stage to maintain a mosaic of different forest growth required to ensure a healthy balance of habitat types for all northern wildlife. Finally, we would like to reiterate that the Government of the Northwest Territories (GNWT)'s primary objective and priority in fighting wildlife fires is the protection of human life and property.

In terms of habitat protection, the GNWT has provided submissions in support of protection of calving and post-calving ranges which are key caribou habitat to the Nunavut Land Use Planning Commission (NLUPC) process. GNWT staff biologists participated in caribou protection technical sessions (as part of the process Draft Nunavut Land Use Plan Technical Session) in Iqaluit June 23-26, 2015; and the supporting Protecting Caribou and their Habitat workshop hosted by the Nunavut Wildlife Management Board in November 2015, and will be participating in the upcoming caribou technical session in March in Iqaluit.

8. ENR appears to only be interested in harvest data from the communities. In what ways is ENR intending to meet its Wildlife Act obligations to develop policies and programs that promote cooperative and coordinated approaches to wildlife management?

ENR continually works with and engages with community members at various meetings, workshops and public presentations. The ENR Sahtú Regional Office has supported Renewable Resource Councils (RRCs) to conduct and be involved in monitoring programs. In fulfillment of the obligations under the *Wildlife Act* to promote cooperative and coordinated approaches to wildlife management ENR engages with the SRRB and RRCs in co-management partnerships and funds various wildlife management projects carried out by RRCs and the SRRB with ENR staff. For example, ENR has encouraged and supported SRRB and RRCs to actively collect harvest data to capture accurate harvest numbers to inform decisions on harvest need levels, sex ratio of harvested caribou, and overall health of harvested animals.

ENR holds an annual meeting of bodies and organizations responsible for wildlife management in the NWT with the purpose of promoting cooperative and collaborative working relationships for effective wildlife management at the local, regional and territorial levels. The first of these meetings was held October 13 – 14, 2015 and the Colville Lake RRC participated.

ENR provides financial and technical support to the Advisory Committee for Cooperation Wildlife Management (ACCWM), a committee that provides a forum for wildlife co-management boards to work together to ensure cooperative and collaborative approaches are taken to wildlife management. The Taking Care of Caribou management plan developed by the ACCWM was explicitly designed to ensure a cooperative and collaborative approach to wildlife management.

ENR also works through the various land claim agreement co-management systems and the co-management boards to implement any wildlife management actions to ensure a collaborative and cooperative approach is taken in each land claim area.

The *Species at Risk Act* has also established a process for species assessment, listing, and management or recovery that involves all wildlife management authorities in a coordinated, collaborative, consensus based process that the SRRB fully participates.

9. The Sahtu Dene Metis Comprehensive Land Claim Agreement provides the Sahtu Dene and Metis with the right to participate in decision-making concerning wildlife management, and in the collection of data respecting wildlife and wildlife habitat. Section 13.8.40 expressly requires RRCs and participants to be directly involved in research to the greatest extent possible. To what extent has the ENR met these obligations?

ENR's approach to fulfilling its obligations is to continuously engaging SRRB and RRCs on wildlife research projects. ENR has established co-management partnerships where members and other individuals working for the RRCs, Land Corporations and other land claim organizations are invited to directly participate in approval of wildlife research permits, formulate research questions, and take part in research activity on the land. ENR funds projects and provides technical and logistical support to SRRB and Sahtu RRCs to undertake work that allows participants to make informed decisions about wildlife management. Where RRC's have been invited to participate but are unable to attend ENR provides follow up information. ENR is fully committed to co-management.

Some Programs and projects that have involved Sahtú Dene Métis Comprehensive Land Claim Agreement community members or Sahtú RRCs include;

- Caribou surveys
- Wildlife health and condition monitoring
- Wolf carcass collection.
- Establishment of the Sahtú Environmental Research and Monitoring Forum
- Partnership with the United States Fish & Wildlife Duck Banding Project
- Community Based Water Monitoring Project

All research and monitoring of wildlife or wildlife habitat carried out by ENR Sahtú Regional Office biologists require a wildlife research permit. Applications for wildlife research permits are sent to the SRRB and the RRCs in the research area for assessment and approval. Many of these applications are supplemented with face-to-face meetings to ensure everyone has an understanding of what is proposed. Wherever possible, community participants are included in these projects. Community members have participated on nearly every type of wildlife survey that has been run by ENR in the Sahtú.

These include numerous barren-ground caribou surveys (including fall classification, spring recruitment, pre-collaring distribution, post-calving and calving ground surveys), moose surveys, muskox surveys, and Dall's sheep surveys.

10. Was the current research and monitoring data relied on by the ENR developed through joint decision-making, and designed and carried out with RRCs and participants to greatest extent possible?

ENR, as a co-management partner with SRRB and through a larger collaboration with other wildlife management boards (including the ACCWM), established research and monitoring programs under the overarching Taking Care of Caribou management plan. Local harvesters participate in setting out the design and implication of the various research and monitoring projects proposed for their area by directly having input in working groups, workshops, training, public meetings, field research, data collection use of information generated in balance with local traditional knowledge to make informed wildlife management action plans. As an example, currently ENR Sahtú Regional Office staff are in the process of trying to coordinate a ground-based spring BNE calf recruitment survey with the community of Colville Lake, who have expressed interest in doing surveys with ENR from the ground so that Colville Lake can share their knowledge, interactions and connections with the caribou to help inform research and management actions in the future.

11. Was ENR's caribou management model developed with participants in a direct and meaningful manner, and to what extent does it account for the traditional knowledge, cultural values and approaches of the Sahtu Dene and Metis?

ENR is committed to wildlife co-management and its implementation in the Sahtú Region as envisioned in the Sahtú Dene and Métis Comprehensive Land Claim Agreement. As noted in the response to question #8 above, ENR regularly engages with harvesters and land users, RRCs and the SRRB in collection of scientific and Traditional Knowledge within the Sahtú, which provides the information used to inform wildlife management. The GNWT Proposal on Management Actions for Bluenose-East Caribou 2016-2019 was developed in the spirit of co-management, and has been submitted to the SRRB for consideration in accordance with the inclusive and collaborative process laid out in the land claim agreement. This process ensures opportunities for community input, and reflects the role of the SRRB as the main instrument of wildlife management in the Sahtú. ENR has also worked with the community of Délı̨nę directly as they developed their community caribou conservation plan for the BNE caribou herd.

In developing the Proposal, ENR used information from the Taking Care of Caribou plan developed by the ACCWM, which will serve as GNWT's primary guidance on monitoring and management of the Cape Bathurst, Bluenose-West and Bluenose-East caribou herds. This plan reflects Traditional Knowledge as well as community perspectives and values from traditional users of these herds, and was informed by a summary of information recorded during community engagements by the ACCWM. The ACCWM management plan for the Cape Bathurst, Bluenose-West and Bluenose-East herds (ACCWM 2014) would indicate that the BNE herd is in the "orange" or declining phase between 20,000 and 60,000, where a Total Allowable Harvest may be set, with an emphasis on harvest of bulls (particularly younger bulls). ENR also considered the harvesting patterns of the traditional users of the BNE caribou herd, including Sahtú communities, to arrive at a proposed allocation that is based on and respects their relationship with and use of this herd.

12. Biologists Donald Thomas and James Schaefer in a report they wrote in 1991, said "in the late 1970 's it became obvious to government managers that the native people must be part of the solution to management ...",and that "co-management could not work until both parties had an understanding of the value of each others' contributions ". Does ENR believe that it has a full and complete understanding of the value of Sahtu Dene and Metis knowledge and contributions?

ENR recognizes that the value of the knowledge and contributions of its partners. Education is always on an on-going process. ENR is committed to co-management and understands that it will not work without mutual respect and consideration of all available information. The co-management process in the Sahtú is hinged on the SRRB and its ability to bring together Sahtú Dene and Métis knowledge and science to inform co-management decisions. ENR staff have a clear understanding of the importance and value of Dene and Métis knowledge and contributions – including the important role of traditional knowledge. Traditional knowledge is taken into account in ENR's ongoing work, and has been incorporated into the *Wildlife Act* (e.g. respect for wildlife). ENR values traditional knowledge, and strives to understand exactly how to best use and apply that knowledge, working with our co-management partners for support. As ENR, the Boards and RRCs move forward in collaborating on wildlife issues, including caribou, more is understood about Sahtú Dene and Métis knowledge and contributions and how they can be applied to management decisions. As an example, ENR and the SRRB have been working with the community of Délı̄nę in support of their community caribou conservation plan, which is based on traditional knowledge and values, and on finding ways to share information and work together collaboratively.

13. How does ENR estimate population size? Has this changed over time? If so, what other models or methods have been used? Do other jurisdictions use different methods? If so, why does ENR use the current method instead of the alternative methods? Is the ENR method more reliable?

Caribou calving ground and post-calving photographic surveys are the two methods that have been used not only by ENR but also by biologists in Alaska and in other parts of Canada since the 1980s to estimate caribou population size. Both of these techniques have been used to estimate the population size of the BNE herd.

The calving ground photo survey method is conducted at the peak of calving when at least 50% of the breeding cows have given birth. This coincides with the lowest daily movement rate of the entire annual migration cycle. Using a fixed wing aircraft, areas of the calving ground with a high density of breeding cows are photographed to be interpreted later, and areas of lower density are counted visually. This method is described in detail in the draft 2015 BNE survey report, which has been provided to the SRRB for posting on the public registry. This approach provides a precise estimate of the number of breeding cows in the herd but the total population size has to be extrapolated by adding an estimate of the number of bulls in the herd and an index of pregnancy rate to correct for the number of non-pregnant cows. This technique has also been used to estimate the population size of the BNE caribou herd since 2010 (2010, 2013 and 2015).

This is the method used to determine population size for the Bathurst herd and the Beverly, Ahlak and Qamanirjuaq herds in Nunavut.

The post-calving method is conducted in early to mid-July when warm weather is favourable to the emergence of biting flies, which will cause caribou to aggregate in large groups to avoid the insects. These large groups of caribou are photographed from the air and all caribou at least one year old on the photos are counted. This method greatly reduces the level of extrapolation needed to estimate population size, assuming that most of the group of aggregated caribou have been found and photographed. This is the technique that was used until 2010 to estimate the size of the BNE herd. It is also used to determine population size for the Alaskan barren-ground caribou herds including the Porcupine herd and also for the Tuktoyaktuk Peninsula, Cape Bathurst and BNW caribou herds in the NWT. Quebec and Labrador biologists also use this method.

Both techniques have their strengths and limitations and are very dependent on favourable weather to be carried out successfully. The post-calving method was used to determine population size of the BNE herd in 2000, 2005 and 2006. ENR staff attempted to do a post-calving survey of the BNE herd in July of 2009 and 2012 but were unable to find enough large aggregations of caribou during the biting fly season and the surveys were not successful. Both survey techniques were successfully conducted in 2010 and the results were compared. The population size provided by the calving ground method was 102,000 (+ 39,964 95% CI) caribou compared to a population estimate of 122,000 (+ 31,756) caribou obtained from the post-calving method. There was no statistically significant difference between the two estimates. Another comparative study of the two methods was done in the 1990s by the Quebec biologists on the George River herd and results of both methods were in agreement.

The calving ground photo technique was the method of choice in 2013 and 2015 for the BNE herd mostly because 1) ENR can track and predict timing and location of migrating breeding cows on the calving ground with a high level of confidence, 2) survey requirements are not as weather dependent as the post-calving method, and 3) the calving ground photo survey method does not require as many collars on caribou as the post-calving method. Both survey methods and results are described in detail in *A comparison of calving and post-calving photo surveys of the Bluenose-East of barren-ground caribou in the NWT in 2010*. (Adamczewski et al. 2010. Final manuscript report 244, ENR)

14. What is the extent of error in the population estimates? How has this been determined? Has ENR ever counted the entire herd?

In all caribou surveys the herd is sampled so that a proportion is counted and from this the herd population size is estimated. Statistical error is measured based upon the spatial variability of caribou counted within the survey area. From this, confidence intervals are generated that bracket the point estimate. This allows us to determine the range of estimates that are most likely for the herd. See the 2010 paper (cited in Information Request response 13) for details on the statistical methods for calculating confidence intervals. Generally, it is not possible to census or count an entire barren-ground caribou herd. For the BNE 2015 calving photo survey, the estimates of breeding females and extrapolated herd size with 95% Confidence Intervals were $17,396 \pm 2,308$ and $38,592 \pm 4,733$, as detailed in the survey report.

15. Do caribou change calving areas?

This question was asked by the SRRB as part of its Round 1 Information Requests. ENR refers to its answer to the SRRB, Information Request #2, Round 1 – Bluenose-East caribou.

ENR also would refer readers to its response to Question 2 above.

Overall, fidelity to calving grounds by collared cows has generally been shown to be 96-98% in the NWT, with about 3% of cows switching to neighbouring calving grounds in the Bathurst, Beverly/Ahiak, BNE, BNW, and Cape Bathurst (CB) herds (Adamczewski et al. 2009, Davison et al. 2014). Several years of collar data indicate that the BNE and BNW herds show the same high rate of fidelity to their calving grounds that herds to the east and west show.

16. Do barren-ground caribou calve in the Sahtu region?

ENR has no evidence that BNE caribou calving in the Sahtú region. The tracking of satellite collared caribou show that cows of that herd migrate to the area west of Kugluktuk, Nunavut to give birth. Systematic reconnaissance surveys conducted at the peak of calving for the herd confirm calving ground location. ENR has no evidence of any other barren-ground caribou herds calving in the Sahtú region.

17. Does the seasonal distribution of caribou change from year to year?

The tracking of satellite collared BNE caribou since 1994 shows that distribution and movement of the BNE caribou has been fairly consistent. The following generally describes the seasonal distribution of BNE:

- Calving:
 - BNE caribou return to their traditional area between Kugluktuk and Bluenose Lake in Nunavut.
- Post-calving and summer:
 - occurs in Nunavut east of Bluenose Lake.
- Late summer and fall migration:
 - the caribou move around the east side of Great Bear Lake on their way to the tree line.

- Late fall to late winter:
 - the BNE caribou extend their distribution from the area around Hottah Lake to southeast of Délı̄nę on the south side of Great Bear Lake and wintering caribou can be found as far south as the Keller Lake area. Occasionally a portion of the BNE caribou herd will winter in the area between Gamètì and Wekweètì and also on the northeast corner of Great Bear Lake near Caribou Point.
- Spring migration :
 - BNE caribou will move quickly along the corridor of lakes between Hardisty and Hottah Lake on their way north towards the calving ground, migrating east of Great Bear Lake.

At the upcoming SRRB BNE caribou public hearing to be held in Délı̄nę on March 1-3, 2016, ENR will present a caribou animation showing movement and distribution of all the barren-ground caribou herds across Nunavut and NWT based on collared caribou data for the period from 1994-2013.

18. Does ENR have any other evidence, besides the population census on the post-calving grounds, that the population has changed to the extent ENR claims it has?

The information on the BNE herd population trend over time is based primarily on the calving ground surveys conducted in 2010 to 2015. Additional key demographic indicators include pregnancy rates, calf recruitment, and cow survival support the assessment of a declining herd (refer to Section 3.A of the GNWT Proposal on Management Actions for BNE Caribou 2016-2019).

19. What factors does ENR believe impact the birth rates of caribou? Is this an exhaustive list? Is there a statistically valid model against which these factors can be weighted in terms of importance to birth rates?

This question was also asked by the WRRB with respect to both the BNE and the Bathurst. ENR would refer to its responses to the WRRB as follows:

- WRRB Information Request # 15, Round 1. – Bluenose-East caribou
- WRRB Information Request # 14 and 17, Round 1 – Bathurst caribou.
- WRRB Information Request # 12 and 28, Round 2 – Bathurst caribou.

Drivers of change in caribou abundance are the factors and/or ecological processes that affect birth rates in females (by age class) and death rates (by sex and age class) in caribou populations. Although a comprehensive discussion of drivers of change in caribou abundance would require an extensive response and is well beyond the scope of an Information Request, the main proximate drivers of birth rates in female caribou are those factors that affect physiological health (body condition and size) prior to the fall breeding season, whereas the main proximate drivers of death rates in caribou are predation and hunting (see Figure 8.2 in Gunn et al. 2011 and Figure 5 in Greig et al 2013 for examples of impact pathways on caribou abundance).

Long-term fluctuations in population size of migratory barren-ground caribou herds can be related to long-term weather cycles, but the relationships are complex and there is no single factor that fully accounts for these fluctuations (Gunn 2003, Joly et al. 2011). ENR recognizes that a full understanding of the multiple factors that drive the long-term changes in numbers of migratory caribou herds is incomplete. ENR generally supports further research using scientific methods and Traditional Knowledge studies that increase understanding of factors that affect caribou abundance and herd condition. At this point, models that incorporate the various influences on pregnancy rates, such as the Circum Arctic Rangifer Monitoring and Assessment (CARMA) network Caribou Cumulative Effects Integrative model (see White et al 2014) are not available for the BNE herd.

Some information on pregnancy rates for the Bluenose-East caribou herd is available from the Wildlife Health Monitoring (WHM) Program in the Sahtú and the *Tłı̄chǫ Caribou Monitoring Program* in Wek'èezhì. As noted in section 3.A of the proposal, there is evidence of low pregnancy rates in at least some years, including 2010, 2012 and 2015. Because multiple factors affect a caribou herd, it is important to consider pregnancy rates in the BNE herd together with other demographic rates including calf recruitment and adult cow survival, as well as natural and human sources of mortality.

The results of this monitoring are summarized in a draft summary report on monitoring of Bathurst and BNE caribou herds (GNWT ENR 2014).

20. Has ENR measured changes in the age structure of the herd, and built this into its model?

ENR has looked at the age structure for the Bathurst herd in the form of a demographic model. The main challenge is that it is difficult to obtain estimates of age structure from surveys, given that age can only be categorized into classes (calf, yearling, subadult, adult) and not specific ages. The current demographic model groups ages into calf, yearling, and adult age classes. This model has not been expanded to further age classes given difficulties in measuring changes in age structure.

ENR has not looked directly at the age structure of the BNE herd. Samples collected from community-based harvest sampling kits could provide some information on ages for harvested BNE caribou.

21. The climate assessment model (Don Russell's analysis) that ENR provided to the SRRB, indicates that accumulated heat available for plant growth was > 120 for 6 years preceding year 2000 (when ENR says caribou were abundant) and < 100 for years 2001- 2005 (when ENR says the caribou declined). ENR referenced studies that indicate that a composite index of summer range productivity was correlated with body condition and pregnancy rates, and that this affected recruitment rates. If there was a reduction in the number of young produced and surviving their first year for the 5 years of poor summer range (as the model suggests):

- a) has ENR modeled the effect of fewer young entering the population on the age structure and future production of caribou (total young produced, not the ratio);
- b) is it possible that low production for consecutive years would lead to an age structure shifted toward older less fecund cows?
- c) if so, would ENR not expect a slow recovery of the population as the population estimates suggest?

ENR actually predicts a continued decline and not a slow recovery as detailed in the 2015 BNE calving ground report. The main reason for this is that productivity has been low since 2011 as indicated the spring calf-cow ratios in the past 4 years. Low productivity combined with low adult survival indicates that the decline of the herd will continue.

The effect of constant harvest pressure on the declining population could accelerate the decline.

ENR recognizes that low productivity over consecutive years may have affected the age structure of the herd which might potentially result in a shift toward older less fecund females.

22. Harvest restrictions under the Sahtu Dene and Metis Comprehensive Land Claim Agreement are triggered based on conservation. How does ENR define conservation?

ENR is guided by the definitions and concepts of conservation set out in used in the land claim agreements and in the *Wildlife Act*.

Under the Sahtú Dene Métis Comprehensive Land Claim Agreement conservation is defined as “the management of wildlife populations and habitat to ensure the maintenance of the quality and diversity including the long-term optimum productivity of those resources, and to ensure a sustainable harvest and its efficient utilization.

BNE caribou are also harvested by Tłı̨chǫ citizens. Under the Tłı̨chǫ Agreement, “Both of the land claim definitions were considered during the collaborative process to develop the new Wildlife Act. The Wildlife Act Working Group that collaboratively developed the new *Wildlife Act* included representatives from the SRRB, and representatives and legal counsel from the Sahtú Secretariat Incorporated.

23. What evidence do you have that harvest limits are necessary for conservation?

As noted in the GNWT Proposal on Management Actions for BNE Caribou 2016-2019, the June 2015 BNE calving ground survey raised significant concerns about the current size and trend of the BNE herd. The 2015 population estimate and number of breeding females decreased by approximately half compared to the June 2013 photo survey. The results were alarming for two reasons: 1) the rate of decrease has accelerated in recent years (~29% per year since 2013); and 2) if the observed annual rate of change continues, the number of breeding females would be less than half the current estimate before the next survey scheduled for June 2018. In addition, key demographic indicators including pregnancy, calf recruitment and cow survival are below the levels needed for a stable herd, which suggests the declining trend may continue.

The response to Information Request #31 (below) reports on analyses that highlight the importance of harvest management to try to slow the current rapid decline:

To place the harvest in perspective with recent demographic trends of the BNE herd, the following example is provided. The most recent population analysis for the herd suggests an overall cow survival rate of 74% (Boulanger et al. 2016). At this cow survival rate, the herd will likely continue to decline rapidly as cow survival rates must be at least 80-85% for a stable herd. If the herd has 27,000 cows in total, then at a survival rate of 74%, 7,020 cows would die in a year. With a cow harvest of 3,000, this would mean that 4,020 cows would die of natural causes and 3,000 additional ones from harvest. If this harvest was eliminated and 4,020 cows still died of natural causes, then the overall cow survival rate would be 85%. At this cow survival rate, the herd should be stable. In this example, eliminating the cow harvest of 3,000 could be the difference between a herd that is stable and one that is declining at a fairly rapid rate. Eliminating the cow harvest is not a guarantee of the herd stabilizing or recovering, however, as natural factors (predators, weather effects) will still affect cow, calf and bull survival rates. If the natural survival rate of cows is low, or if pregnancy rates and calf recruitment are low, then the herd may still decline with no harvest.

24. ENR's data presented in the Bluenose Caribou Management Plan -Taking Care of Caribou, shows that the population of the Bluenose West Herd from 2005 to 2012 has been stable. Why does ENR believe further harvest restrictions are required for a stable population?

The current SRRB proceeding and public hearing is specific to the BNE caribou herd. The 2015 BNE Population Survey demonstrates that this herd is declining. ENR is not asking the SRRB to make any decisions about the Bluenose West caribou herd.

25. In response to the SRRB questions, ENR presented information from the Bluenose West Herd and the Cape Bathurst Herd, and claimed that harvest was eliminated or reduced substantively in these herds that had been "declining rapidly". ENR's own population information in the Bluenose Caribou Management Plan indicates the BNW population was stable from 2005 to 2007 before harvest restrictions were imposed. Please describe the basis and criteria for characterizing a population in "rapid decline."

The term "declining rapidly" is not a specific scientific term. However, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), the independent body that assesses the status of wildlife species at risk in Canada, considers a population with a reduction in the total number of mature individuals of 50% or more over the last 10 years to be endangered, and a population with a reduction in the total number of mature individuals of 30% or more over the last 10 years to be threatened. Rates of decline that could result in a species becoming classified as a species at risk can reasonably be considered rapid rates of decline.

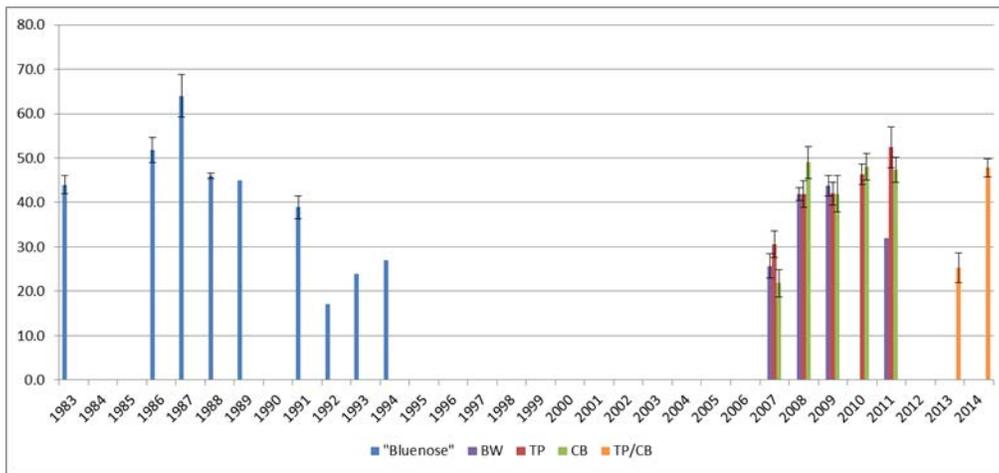
Surveys of the BNW herd in 2000, 2005 and 2006 showed that the number of adults in the herd declined by 75% in total from 2000 to 2006, with a 21% annual rate of decline over this period. There was no survey in 2007, and the herd continued to decline from the 2005 survey to the 2006 survey. Harvest was not restricted until after the 2006 survey, and approximate stabilization from 2006 to 2009 followed, in part due to harvest restrictions and in part due to an increase in calf recruitment. We would consider that the BNW herd was in rapid decline 2000-2006. The BNE decline 2013-2015, based on the estimates of breeding females, was 50% in total and the annual rate of decline over that period was 30%, thus the BNE herd's rate of decline over the last 2 years was greater than in the BNW herd 2000-2006.

26. In response to the SRRB questions, ENR indicates that for the Bluenose West Herd that calf recruitment had been low, but increased substantively when harvest was reduced in 2007. ENR's population data for the BNW indicates that the herd was relatively stable from 2005 to 2013. Please describe the basis and criteria for characterizing a "substantive increase" in calf recruitment.

ENR responses to SRRB Round 1 Information Request #3A (which is referred to in question 26) as follows:

"It is important to note that in each case, calf recruitment that had been low for the three herds increased substantially at about the same time that harvest was reduced. It is possible that natural adult survival rates also increased when calf recruitment increased, which would also have contributed substantially to a stabilizing trend in these herds."

As additional information to support the response in Information Request 3A, the following table provides the calf recruitment data which shows the increase between 2007 and 2008 and 2009 for the Bluenose West herd.



27. In your response to SRRB questions, you indicate that in several herds when harvesting was reduced, there was an increase in recruitment rate (calves/100 cows), and possibly an increase in natural cow survival and pregnancy rates. How does harvesting affect the ratio of calves to cows, natural cow survival rates, and pregnancy rates?

ENR responded to SRRB Round 1 Information Request #3A (which is referred to in question 26) as follows:

"It is important to note that in each case, calf recruitment that had been low for the three herds increased substantially at about the same time that harvest was reduced. It is possible that natural adult survival rates also increased when calf recruitment increased, which would also have contributed substantially to a stabilizing trend in these herds."

To clarify, the increase in calf recruitment and possible increase in natural cow survival and pregnancy rates occurred at the same time that the harvest was reduced, however the two are not related. Harvesting does not affect the ratio of calves to cows or natural cow survival rates. Harvest will not affect pregnancy rates unless all the large bulls are removed and there is no evidence of this occurring for the BNE herd.

28. The BNE harvest was reported at 2700, but ENR claims the true harvest to be 4000 based on "field estimates" that the result was underreported by 25-50%. "Why did ENR choose to apply the upper bound of this field estimate (48.2%) instead of the lower bound of 25%?"

Parts of this question were also asked by the SRRB. ENR would also refer to its responses to the following questions:

- SRRB Information Request # 5, Round 1– Bluenose-East caribou

Collection of complete and accurate caribou harvest information for all herds is a priority in the NWT but experience to date has shown that an unknown amount of harvest is not reported. Under-reporting and not reporting has been commented on by many people, and noted by officers manning check-stations. Over the years, repeated observations of wildlife officers in the field, community monitors and Aboriginal leaders and co-management board members have pointed to un-reported wounding losses, un-reported harvest, under-reported harvest, hunters avoiding check-stations, although the exact amount of un-reported harvest is difficult to estimate. Given this situation, an estimated harvest of about 4000 was deemed appropriate. This level of harvest, when combined with other demographic factors, was corroborated through the population model.

Getting accurate harvest reports remains a major challenge in monitoring and managing caribou harvest in the NWT and in understanding its significance to declining caribou herds. Accurate, complete harvest reporting requires a commitment from all hunters, communities, leaders and boards, in addition to continuing work by the GNWT. ENR is working with communities to develop methods to work together to collect better harvest information.

29. ENR also claims that the true harvest was 4000 not 2700 because it appears to fit your population model. On what basis does ENR believe that a population model can be used to generate a harvest estimate?

Please refer to:

- WRRB Information Request # 1, Round 1 – Bathurst caribou.
- WRRB Information Request # 10, 11 and 12, Round 1. – Bluenose-East caribou

Modeling is one way of simulating and exploring possible outcomes of management actions prior to action being taken. The main objective of modeling is to inform the selection of the most appropriate management actions to achieve desired outcomes. Models are not true reflections of reality but necessarily simplified versions of our understanding of complex systems of interacting influences at play in the barren-ground caribou ecosystem. In an adaptive management framework, modeling helps ENR predict outcomes that that can be monitored, assessed and evaluated to guide future actions that may need to be adjusted.

ENR has carried out harvest modeling to assess how various levels and sex ratios of harvest are likely to affect caribou herds varying in size and trend (e.g. Boulanger 2014). The basic trends resulting from that modeling were summarized in a “Rule of thumb” document (ENR 2014a) that includes a recommended range for the level and sex ratio of harvest depending on a herd’s relative size and trend. In general, herds declining rapidly and at relatively low numbers are most sensitive to additional mortality from harvest, particularly cow harvest. Conservative levels of harvest (low % of estimated herd size) with few or no cows are least likely to increase the likelihood of further decline in those situations as opposed to a large harvest that focus on cows. The recommended harvest rate of 2.5% of the herd and 100% bulls reflects the relatively low herd size and rapidly declining trend of the BNE herd (ENR 2014a).

30. ENR has indicated to SRRB that a number of factors are considered in developing a TAH (Total Allowable Harvest) and in a harvest allotment among regions. Please provide specific factors and weighting on describing how the TAH is determined, and how the harvest is allocated.

The ACCWM provided a summary of considerations and priorities for harvest allocation on page 48 of Taking Care of Caribou (ACCWM 2014). A detailed discussion of the process and factors used to put forward the harvest allocation in the Proposal is found in the response to SRRB Round 1 Information Request number 6 a & b. Decisions on allocation of the proposed 163 BNE caribou amongst Sahtú communities lie with the SRRB, and allocation, and decisions on allocation within a community would lie with the local RRC.

ENR also wishes to rely on its response to Round 1 Information Request # 11:

from the WRRB where a detailed description of the information and process used to determine the proposed TAH for the BNE caribou herd was also explained.

ENR has carried out harvest modeling to assess how various levels and sex ratio of harvest are likely to affect caribou herds varying in size and trend (e.g. Boulanger and Adamczewski 2014). The basic trends resulting from that modeling were summarized in a “Rule of thumb” document (ENR 2014b) that includes a recommended range for level and sex ratio of harvest depending on a herd’s relative size and trend.

In general, herds declining rapidly and at relatively low numbers are most sensitive to additional mortality from harvest, particularly cow harvest, thus conservative harvests (low % of herd size and few cows) are recommended for such herds.

A recommended harvest rate of 2.5% of the herd and 100% bulls was chosen because of the relatively low herd size and rapidly declining trend of the herd (ENR 2014b). The 2015 calving ground photo survey results indicate a decline of about 50% in the number of breeding cows in the herd in two years (Boulanger et al. 2016), which highlights the need to conserve the herd’s breeding cows as the single most important part of the herd for recovery.

Decisions about harvest of caribou herds should also reflect other management plans, including the Délı̄nę caribou conservation plan, and discussions amongst co-management partners and traditional users of the Bluenose-East caribou herd. The ACCWM management plan for the Cape Bathurst, Bluenose-West and Bluenose-East herds (ACCWM 2014) would indicate that the BNE herd is in the “orange” or declining phase between 20,000 and 60,000, where a Total Allowable Harvest (TAH) acceptable to the ACCWM may be set, with an emphasis on harvest of bulls (particularly younger bulls).

31. One of the goals of the caribou plan -Taking Care of Caribou - is to maintain herds within known natural range of variation. What evidence do you have that the herd, which you believe naturally fluctuates significantly over decades, is not within the range of natural variation? If the herd is within its natural cyclic variation, what evidence do you have that this is a critical conservation issue that requires the extreme action of Dene harvest restrictions?

Parts of this question were also asked by the SRRB & WRRB. ENR would also refer to its responses to the following questions.

- WRRB Information Request # 11 and 12, Round 1. – Bluenose-East caribou
- SRRB Information Request # 3, Round 1– Bluenose-East caribou

To place the harvest in perspective with recent demographic trends of the BNE herd, the following example is provided. The most recent population analysis for the herd suggests an overall cow survival rate of 74% (Boulanger et al. 2016). At this cow survival rate, the herd will likely continue to decline rapidly as cow survival rates must be at least 80-85% for a stable herd. If the herd has 27,000 cows in total, then at a survival rate of 74%, 7,020 cows would die in a year. With a cow harvest of 3,000, this would mean that 4,020 cows would die of natural causes and 3,000 additional ones from harvest. If this harvest was eliminated and 4,020 cows still died of natural causes, then the overall cow survival rate would be 85%. At this cow survival rate, the herd should be stable. In this example, eliminating the cow harvest of 3,000 could be the difference between a herd that is stable and one that is declining at a fairly rapid rate. Eliminating the cow harvest does not guarantee that the herd will stabilize or recover, however, because natural factors (such as predators and weather effects) will still affect cow, calf and bull survival rates. If the natural survival rate of cows is low, or if pregnancy rates and calf recruitment are low, then the herd may still decline even with no harvest – but will certainly decline faster with the added pressure from harvesting.

Table 2. Estimated BNE harvest in NWT and Nunavut for winters 2009-2010 to 2013-2014

Winter Season	Estimated Caribou Harvest	% Cows in Harvest
2009-2010	3,466	≥ 65%
2010-2011	2,918	≥ 65%
2011-2012	1,766	≥ 65%
2012-2013	2,562	≥ 65%
2013-2014	3,016	≥ 65%

Harvest information for winter 2014-2014 was incomplete; harvest was likely substantially reduced from previous winters as the herd was generally remote through the winter. Harvest was likely below the 1800 limit recommended for the herd in NWT.

32. Why do you need a scientific study to determine if fire is adverse to caribou? When severe fires destroy lichen stands and other caribou food, is it not obvious that such outcomes are adverse to caribou?

Parts of this question were also asked by the SRRB & WRRB. ENR would also refer to its responses to the following questions:

- SRRB Information Request # 7, Round 1– Bluenose-East caribou
- WRRB Information Request # 5 Round 2. – Bluenose-East caribou
- WRRB Information Request # 2 Round 2. – Bathurst caribou

Scientific studies are needed to better understand the effect of various fire disturbance on caribou. While ENR agrees that caribou avoid recently burned area, ENR also recognizes that fire is part of a natural disturbance regime to which caribou have adapted for thousands of years, and that part of the adaptive strategy used by caribou is through the use of space to disperse into unburned areas. For example, recent research on the impact of fires on the Bathurst caribou (Barrier 2011) showed that, as of 2009, a shortage of winter habitat has not likely contributed significantly to the decline of the Bathurst herd, as supplies of lichen-rich winter range could support a large, healthy herd. Studies of fire and caribou on the range of the Beverly herd in the 1980s by Don Thomas (e.g. Thomas et al. 1998) similarly indicated that despite large fires on that herd's winter range in the early 1980s the herd was not limited by the availability of lichen-rich winter range. Fire modeling studies from Alaska (Joly et al. 2012, Gustine et al. 2014) suggest that a greater frequency of large fire years (such as 2014 in the NWT) may occur with global warming and that these could affect caribou negatively if the boreal forest shifts to a much younger age distribution. A study was initiated in 2015 by J. Baltzer (Wilfrid Laurier University) to assess the environmental effects of the 2014 NWT fires on vegetation and its recovery; the results from this work may be useful in future in assessing fire effects on lichen availability, and recovery after fire on caribou range.

ENR, Forest Management Division delineates the area of forest impacted by fire on an annual basis across the NWT. This information is publicly available on ENR's Spatial Data Warehouse. Since records were started in 1966, 3,133,675 ha have burned on the BNE range which comprises approximately 13.3% of the herd's range (Table 1)

Table 1 – Amount of forest fire on the range of the Bluenose East caribou herd 1966-2015.

Year(s)	Area Burned (ha)	% of BNE Range
1966-69	111,922	0.5
1970-79	889,620	3.8
1980-89	252,537	1.1
1990-99	868,800	3.7
2000-09	311,311	1.3
2010-15	699,485	3.0
Total	3,133,675	13.3

33. Is fire fighting on caribou winter range a management option?

Please refer to:

- Part of this question was also asked by the SRRB. ENR also refers to its response to SRRB Information Request # 7, Round 1– Bluenose-East caribou

GNWT, ENR Fire Management Division has incorporated caribou habitat into its values at risk database for prioritizing the actioning of forest fires. The highest priority, however, is the protection of human life and infrastructure. In practice when it comes to allocating resources towards fighting fires in extreme fire years such as 2014 and 2015 existing resources are exhausted in protecting of human life and property.

34. Does the climate change model predict changes in ungulate distribution and abundance?

Weather can limit productivity of caribou herds through its influence on cow fall body condition and, in turn, probability of getting pregnant. A recent paper by Chen et al. (2014) found a correlation between spring calf:cow ratios in the Bathurst herd and a composite index of summer range productivity, with a time lag, with the suggested mechanism being poor summer feeding conditions leading to poor cow condition and low pregnancy rates the following winter and reduced calf ratios the following year.

Currently our understanding of climate on the range of the BNE is restricted to the trends in climate indices developed by CARMA. Winter snow depth, timing and growth of spring forage, insect harassment and availability of mushrooms (a valuable protein source) together affect the fall body condition of caribou. Trends in these indices for the BNE range show slightly decreasing spring snow depth; increased spring temperatures which leads to increased and earlier growth of spring forage for caribou; increasing oestrid fly harassment (warbles and bot flies) which results in energy expenditures; increasing summer drought resulting in reduced plant growth and nutritive quality; and decreasing mushroom abundance. These trends together may indicate poor summer feeding conditions for the BNE herd, which could be correlated with reduced cow condition in the fall, low pregnancy rate, and a subsequent low recruitment ratio in late winter.

ENR has issued a contract to summarize the environmental trends 1979-2014 for NWT barren-ground caribou herds based on these indicators with an interpretation of herd-specific trends and their implications to each herd. ENR expects those results in the early part of 2016 and will make them available to all interested parties as soon as a report is available.

35. Does the climate model predict changes in predator population or seasonal patterns of range use? Is there any effort to monitor such changes on the land?

The CARMA Caribou Cumulative Effects Integrated model currently does not make predictions related to predator abundance and distribution.

36. ENR indicates that a balanced sex ratio is desired, and that 42 bulls per 100 cows is acceptable. Does ENR have an estimate of sex ratio? At what point does the bull to cow ratio become undesirable?

Classification surveys conducted during the rut in the fall of 2009, 2013 and 2015 for the BNE herd showed sex ratios of 43, 43 and 42 bulls per 100 cows respectively.

Information gathered from monitoring the sex ratios and the status of some of the Alaskan herds suggest that a sex ratio of 50 bulls and more to 100 cows is usually associated with healthy and stable or increasing herds and a sex ratio between 30 and 40 bulls per 100 cows is associated with herds either declining or at low level.

A sex ratio below 30 bulls to 100 cows is not considered desirable for management purposes.

37. How will ENR achieve a balanced sex ratio when ENR is promoting a bull only harvest?

ENR recognizes the importance of maintaining a balanced and healthy sex ratio in the herd and will continue to conduct fall classification surveys during the rut to monitor this important indicator of herd status. If the sex ratio shifts to a level that is considered to be a concern for the health of the herd, recommendations for adjustments to harvest will be made to co-management partners and Aboriginal governments and organizations.

38. If conservation indicators are of enough concern to invoke restrictions on harvesting customs, what constraints will be placed on industry?

GNWT is working through several avenues to address the impact of mineral exploration and development on barren ground caribou in the NWT.

Actions related to individual projects are typically addressed on a case-by-case basis through environmental assessment, the regulatory permitting process and through the development, implementation and review of wildlife management and monitoring plans for proposed and existing developments. Specifically, ENR remains engaged in review processes of proposed developments within the BNE range in the NWT to ensure that possible effects on the herd are duly considered and mitigated where possible. For projects in the NWT, ENR is in the process of developing guidelines to industry to support development of Wildlife Management and Monitoring Plans which can now be required for operations that may cause significant disturbance to wildlife or wildlife habitat.

39. ENR acknowledges the importance of key habitats and agrees that core calving area must be protected. Are the core calving grounds protected from industrial development?

BNE calving grounds are in Nunavut. ENR has been engaged with Nunavut on issues of protection of caribou during calving and post-calving. GNWT, ENR is a registered participant in the Nunavut Planning Commission's (NPC) process for developing a Nunavut Land Use Plan. During technical meetings up to this point the GNWT has supported the Government of Nunavut's position that industrial activity of any type, including mineral exploration and production, construction of roads, pipelines and other infrastructure, should not be permitted in calving areas. ENR staff are participating in an upcoming NPC Technical Meeting specifically on the subject of protection of caribou habitat in Nunavut including calving and post-calving ranges. The purpose of the meeting is to build consensus on approaches for habitat and disturbance management through the combination of tools such as conservation areas, as well as seasonal and locational restrictions on development activities.

40. If the calving grounds were fully protected, what would the impacts be on the population? What steps can ENR take to protect the calving grounds?

Please refer to ENR's response Information Request # 38 above.

ENR supports the protection of barren-ground caribou calving grounds, including those of the BNE caribou herd. While this protection is very important, it is important to remember that BNE caribou are exposed to a wide range of natural stressors that can affect productivity, survival and mortality of caribou throughout their annual cycle. In addition to mortality related to predation, cows and calves are vulnerable to variation in natural conditions affecting their nutritional status and fitness level.

Cow and calves are highly sensitive and responsive to disturbance at the time of calving and in the weeks immediately following birth. It is critical that areas where cows return to give birth every year be granted permanent protection from development in order to cope with the added cumulative effect of anthropogenic and natural stressor that could potentially be permanently detrimental to barren-ground caribou.

ENR will continue to be active and involved in the Nunavut Land Use Planning Process with the ultimate objective to have all the core calving areas of the barren-ground caribou in Nunavut permanently protected through legislated measures.

41. Are there applications for exploration projects on the calving grounds? Are any current industrial activities on the calving grounds? Will any future activities be approved?

Proposals for industrial activities on the calving grounds in Nunavut are initially reviewed by the Nunavut Impact Review Board (NIRB). Depending on the level of proposed developments and potential impacts to caribou habitat, projects for development will be directed to go through a full environmental assessment process and after completion; NIRB makes recommendations to the appropriate federal Minister for final decision.

GNWT does not have jurisdiction in Nunavut but can make recommendations through the environmental assessment process for protection of the calving grounds.

Currently, ENR is aware of one exploration project that has operated in the core calving area of the BNE caribou herd in the summer of 2014 and 2015 and the GNWT has officially expressed its concerns to NIRB and will continue to monitor the status of this exploration project.