March 12, 2021

Mr. Joseph Judas, Chair
Wek'èezhìı Renewable Resources Board
4504 49TH AVENUE
YELLOWKNIFE NT X1A 1A7

Dear Mr. Judas:

WRRB Reasons for Decision Final Report – 2020 Dìga Management Proceeding

The Tłı̨chǫ Government and the Department of Environment and Natural Resources, Government of the Northwest Territories have received the Wek'èezhìı Renewable Resources Board (WRRB) *"Reasons for Decisions Related to a Joint Proposal for Dìga (Wolf) Management in Wek'èezhìı".* The document was delivered to the parties on January 8, 2021.

Please find attached our joint response to the WRRB Reasons for Decisions and recommendations included in the Final Report. We look forward to working with the WRRB for the management of the Bathurst and Bluenose-East barren-ground caribou herds.

Sincerely,

Grand Chief George Mackenzie
Tłı̨chǫ Government
Behchokǫ̀, NT

Minister Shane Thompson
Environment and Natural Resources
Yellowknife, NT

Attachment

c. Ms. Shaleen Woodward
Principal Secretary

Mr. Martin Goldney, Secretary to Cabinet/Deputy Minister
Executive and Indigenous Affairs

Dr. Erin Kelly
Deputy Minister
Environment and Natural Resources

Dr. Brett Elkin
Assistant Deputy Minister, Operations
Environment and Natural Resources

Mr. Bruno Croft
Superintendent, North Slave Region
Environment and Natural Resources

Chief Clifford Daniels
Community Government of Behchokǫ̀
Tłı̨chǫ Government

Chief David Wedawin
Community Government of Gamètì
Tłı̨chǫ Government

Chief Charlie Football
Community Government of Wekweètì
Tłı̨chǫ Government

Chief Alfonz Nitsiza
Community Government of Whatì
Tłı̨chǫ Government

Ms. Laura Duncan
Tłı̨chǫ Executive Officer
Tłı̨chǫ Government

Ms. Tammy Steinwand-Deschambeault, Director, Culture and Lands Protection
Tłı̨chǫ Government

Mr. Michael Birlea, Manager, Culture and Lands Protection
Tłı̨chǫ Government

Chief Edward Sangris and Band Council
Yellowknives Dene First Nation (Detah)

Chief Ernest Betsina and Band Council
Yellowknives Dene First Nation (N'Dilǫ)

Chief Darryl Marlowe and Band Council
Lutsel K'e Dene First Nation

Ms. Ethel Liske, ADFN Negotiations Coordinator
Akaitcho Dene First Nations

Grand Chief Gladys Norwegian
Dehcho First Nation

President William (Bill) Enge
North Slave Metis Alliance

President Garry Bailey
Northwest Territory Metis Nation

President Clem Paul
Mountain Island Metis

Ms. Jody Pellissey, Executive Director
Wek'èezhìi Renewable Resources Board

Mr. Daniel Shewchuk, Chairperson
Nunavut Wildlife Management Board

Ms. Aluki Kotierk, President
Nunavut Tunngavik Inc.

Mr. Larry Adjun, Chair
Kugluktuk Hunters and Trappers Organization

Mr. Stanley Anablak, President
Kitikmeot Inuit Association

Mr. Jimmy Noble Jr., Deputy Minister
Department of Environment, Government of Nunavut

Mr. Steve Pinksen, Assistant Deputy Minister
Department of Environment, Government of Nunavut

Mr. Drikus Gissing, Wildlife Director
Department of Environment, Government of Nunavut

Recommendation #1-2020 (Dìga): Update Objectives
The WRRB recommends that GNWT and TG update the objectives of the dìga management program to be measurable for effects on ekwǫ̀ and dìga in order to be able to assess the impacts of the program and provide these objectives to the WRRB by May 1, 2021. Updated objectives should consider that the Kǫ̀k'èetì and Sahtì ekwǫ̀ herds have different vulnerabilities and vital rates and, thus, success may be measured differently.

Response: Vary

The WRRB recommends that GNWT and TG update the objectives of the dìga management program to be measurable for effects on ekwǫ̀ and dìga in order to be able to assess the impacts of the program and provide these objectives to the WRRB by ~~May 1, 2021~~ July 31, 2021. Updated objectives should consider that the Kǫ̀k'èetì and Sahtì ekwǫ̀ herds have different vulnerabilities and vital rates and, thus, success may be measured differently.

Reasons:

Specific measurable objectives for wolf (dìga)-centered metrics have been challenging to develop, given limited information on wolf (dìga) abundance and uncertainties as to the degree of interchange of wolves from ranges of neighbouring caribou (ekwǫ̀) herds. As an initial step, a biomass equation was used to estimate likely numbers of wolves associated with each of the three herds (Bathurst, Bluenose-East and Beverly), based on their relative population size in 2018 and projected size in 2020. Targets of 60-80% of the estimated numbers of wolves were used for the 2020 wolf (dìga) removal program, derived from lessons learned in other jurisdictions.

ENR is planning a winter wolf (dìga) abundance survey for 2021 based on established methods used for wolves associated with barren-ground caribou (ekwǫ̀) in Alaska (Becker et al. 1998; Gardner and Pamperin 2014[1]), as well as wolf (dìga) surveys previously conducted in the Dehcho and South Slave regions of the NWT. If successful, this may provide an estimate of wolf (dìga) numbers on the range of the Bathurst and Bluenose-East herds with increased accuracy, and wolf (dìga) removal targets would be adjusted if these estimates differ from current estimates.

In addition, ENR plans to deploy 23 wolf (dìga) collars in 2021 in addition to the 7 active collars. Tracking movements of these wolves should allow for a better understanding of how much fidelity wolves have to a particular herd.

One approach that can be used to assess the effectiveness of wolf (dìga) removals is the relative success of the wolf (dìga) removal efforts themselves, both within a season and over the years of the wolf (dìga) removal program.

In the winter of 2020-2021, trends in catch-per-unit-effort (CPUE) metrics such as the number of km traveled or hours driven on snow machine by ground-based wolf (dìga) hunters will be used to assess relative occurrence of wolf (dìga) numbers, both within a season and between years. For example, a decrease in CPUE of wolves would be predicted if wolf occurrence (density) has declined because of wolf management actions. As wolves are removed from a system, they, they should become increasingly difficult to find (i.e. CPUE should decline), the number of wolves killed from

[1] Becker E.F., M.A. Spindler and T.O. Osborne. 1998. A Population Estimator Based on Network Sampling of Tracks in the Snow: The Journal of Wildlife Management, Vol. 62, No. 3 (Jul. 1998), pp. 968-977.
Gardner, C.L., and N.J. Pamperin. 2014. Intensive aerial wolf survey operations manual for Interior Alaska. Alaska Department of Fish and Game, Wildlife Special Publication ADF&G/DWC/WSP-2014-01, Juneau.

one year to the next should decline, and the age structure of the wolves removed should shift from adults to young wolves. Conversely, if these changes are not observed, it would suggest that wolf (dìga) management actions may not have been sufficient to reduce wolf (dìga) densities.

As referenced in the Revised Joint Proposal, "the goal of the proposed management actions is to sufficiently reduce wolf (dìga) predation on the Bathurst and Bluenose-East herds to allow for an increase in calf and adult caribou (ekwǫ̀) survival rates to contribute to the stabilization and recovery of both herds." The second objective of the Revised Joint Proposal is to "Ensure sustained removal of wolves, using aerial removals if required, on the winter ranges of the Bathurst and Bluenose-East caribou (ekwǫ̀) herds to achieve a level necessary to maintain low wolf (dìga) densities and elicit a response in caribou (ekwǫ̀) population. "

As stated in the first round of information requests, signs of a positive response in caribou (ekwǫ̀) would include improved trends in population indicators such as estimates of breeding females and extrapolated herd size, adult female survival, and/or calf recruitment. To produce a positive herd level response, improved trends in these indicators would have to be sustained over multiple years. ENR reports on caribou (ekwǫ̀) indicators for the Bathurst and Bluenose-East herds as soon as possible after analyses are completed, with updates to (a) the collar and model-based estimates of cow survival rates on an annual basis, (b) composition surveys in the summer, fall and late winter, and (c) population surveys every two years. ENR suggests that a suite of indicators, including population trends, cow survival rates and calf cow ratios, all clearly demonstrating, at minimum, a stable herd trend for at least 4 years would be suitable as quantitative objectives. Calf cow ratios and annual cow survival rates can vary from year to year, thus considering a summation of indicators over at least 3 years is appropriate.

Tłı̨chǫ Government and the GNWT will provide the WRRB with updated objectives for the Bathurst and Bluenose-East herds by July 31, 2021 (not May 1, 2021), which will allow for the incorporation of preliminary analyses from the wolf (dìga) abundance survey.

Recommendation #2-2020 (Dìga): Dìga Abundance
The WRRB recommends that GNWT and TG identify and implement alternative methods to measure and index dìga abundance and calibrate these with the Ungulate Biomass Index to ensure the most accurate and precise population estimates are used for dìga management by March 31, 2021.

Response: Vary

The WRRB recommends that GNWT and TG identify ~~and implement~~ alternative methods to measure and index dìga abundance and calibrate these with the Ungulate Biomass Index to ensure the most accurate and precise population estimates are used for dìga management by May 31 ~~March 31~~, 2021.

Reasons:

There is a strong desire to increase precision and accuracy of estimates of wolves that occupy the Bathurst and Bluenose-East winter ranges. To date, survey options to obtain robust estimates have been limited for technical and logistical reasons. Other approaches and indices of abundance have been used that provide less precise estimates. ENR is committed to trying alternative methods to achieve this important objective.

This winter, ENR plans to conduct a block survey within the 2021 Wolf Harvest Incentive Area. This effort will follow approaches established in Alaska (Becker *et al.* 2013; Gardner and Pamperin, 2014[2]) and used for wolf (dìga) surveys in the Dehcho and South Slave regions. If this survey technique proves successful, it should provide a more reliable estimate of wolf (dìga) numbers on the range of these caribou (ekwǫ̀) herds, allowing for a consequent adjustment of wolf (dìga) removal targets.

Obtaining precise and accurate measures of wolf (dìga) abundance on the central barrens continues to pose a significant challenge, given the vast geographic distribution of our migratory caribou (ekwǫ̀) herds. Obtaining estimates of wolf (dìga) abundance is also confounded by annual variability in caribou (ekwǫ̀) and wolf (dìga) movements, as well as the significant expense and logistical challenges involved in carrying out a survey.

While the Ungulate Biomass Index (UBI) provides an important approach for estimating wolf (dìga) density, field surveys help assess measures of wolf (dìga) abundance and trend, over time and space.

ENR has used various forms of field surveys to obtain measures of relative wolf (dìga) abundance, productivity, and trend. Previous monitoring of den occupancy and pup productivity on the Bathurst range documented a decline in the number of occupied den sites, and lower rates of pup production. During periods of low wolf (dìga) density, few active den sites on the Bathurst summer range could potentially be a limiting factor in terms of drawing broader conclusions about the status of the wolves on the summer range. It will be difficult to begin den occupancy surveys on the Bluenose-East range as little is currently known about the distribution or activity of wolf (dìga) dens.

ENR has conducted multi-year assessments of aerial wolf (dìga) sighting data (from caribou (ekwǫ̀) composition surveys and calving ground surveys) and concluded that annual wolf (dìga) sightings were variable, and didn't reveal a reliable measure of trend.

Systematic transect surveys were carried out on the Bathurst and Bluenose-East winter ranges in March 2020 and April/May 2020. Although results for interpreting caribou (ekwǫ̀) abundance seemed reasonable, interpreting wolf (dìga) counts from strip transects proved challenging.

The use of "Catch Per Unit Effort" has been applied to ground-based hunting efforts, as well as aerial survey hours and removal effort conducted as part of the 2020 Wolf (Dìga) Management Pilot Program. Applying this approach to ground-based harvesting effort will provide measures of seasonal and annual change in relative wolf (dìga) numbers over time.

Obtaining accurate and precise estimates of wolf (dìga) abundance on the Bathurst and Bluenose-East caribou (ekwǫ̀) ranges is challenging, and remains a priority.

[2] Becker E.F., M.A. Spindler and T.O. Osborne. 1998. A Population Estimator Based on Network Sampling of Tracks in the Snow: The Journal of Wildlife Management, Vol. 62, No. 3 (Jul. 1998), pp. 968-977.
Gardner, C.L., and N.J. Pamperin. 2014. Intensive aerial wolf survey operations manual for Interior Alaska. Alaska Department of Fish and Game, Wildlife Special Publication ADF&G/DWC/WSP-2014-01, Juneau.

Recommendation #3-2020 (Dìga): Sighting Rates
The WRRB recommends that dìga sighting rates, during ʔekwǫ̀ sex and age composition surveys, be assessed by GNWT to determine if and how it contributes to understanding seasonal trends in dìga abundance on the Kǫ̀k'èetì and Sahtì ekwǫ̀ ranges by May 1, 2021.

Response: Accept

Reasons:

During discussions at the Grizzly Bear and Wolverine Biological and Management Feasibility Working Group meetings in 2020, information on the sighting rates of grizzly bear and wolverines during ENR led caribou (ekwǫ̀) surveys was requested. ENR provided the WRRB with tables and maps of sightings of both grizzly bears and wolverines, as well as wolves for surveys of the Bathurst and Bluenose-East herds. In the WRRB's report on the wolf (dìga) proposal, these rates were used to generate four graphs of wolf (dìga) sighting rates in fall and spring for the two herds, including a graph that has both the fall and late-winter sighting rates for the Bathurst herd. Some regressions lines were generated that explain a minimal amount of variation; the R^2 values are between 0.07 and 0.16, which means that between 7% and 16% of the variation in wolf sightings is explained by year.

ENR notes that an earlier assessment from Frame and Cluff in 2011 of wolf (dìga) sightings on 17 late-winter Bathurst composition surveys concluded the following: *We conducted a meta-analysis of wolves observed during 17 late winter caribou surveys to investigate whether these sightings can be used for monitoring trends in wolf abundance. The number of wolves observed from year to year was variable with no apparent pattern. Search effort and number of caribou seen did not influence the number of wolves observed.*

The GNWT is willing to work with WRRB technical staff to discuss and undertake possible additional assessments of wolf (dìga) sighting rates, as required.

Recommendation #4-2020: Ground-Based Harvest
The WRRB recommends that the ground-based harvest proceed as proposed with the addition of harvester supports provided by TG and GNWT. This should include ʔekwǫ̀ and dìga distribution information, gas caching, and/or bait stations, starting in the 2020/2021 harvest season. These supports are necessary for ground-based harvest removals as per the *Wolf Technical Feasibility Assessment: Options for Managing Dìga on the Range of the Bathurst Barren-ground Caribou Herd* (2017).

Response: Vary

The WRRB recommends that the ground-based harvest proceed as proposed with the addition of harvester supports provided by TG and GNWT. This should include ʔekwǫ̀ and dìga distribution information, gas caching, and could include ~~/or~~ bait stations, starting in the 2020/2021 harvest season. These supports are necessary for ground-based harvest removals as per the *Wolf Technical Feasibility Assessment: Options for Managing Dìga on the Range of the Bathurst Barren-ground Caribou Herd* (2017).

Reasons:

In 2018, an enhanced Wolf Harvest Incentive Area was created in the North Slave region. This area is defined every year and overlaps with the wintering range of the Bathurst and Bluenose-East caribou (ekwǫ̀) herds. Increased incentives are offered for wolves harvested in this area. These incentives are $1200 and $900 per wolf (dìga) for NWT and Nunavut hunters respectively. Additional financial incentives are offered for pelts prepared to traditional or taxidermy standards, and pelts that meet the requirement for a prime fur bonus.

The Tłı̨chǫ Government's Community-based Harvest Training Program, provides training workshops, and establishes harvester camps to support training and dìga harvest by Tłı̨chǫ hunters on a rotational basis.

The GNWT has worked with the Tłı̨chǫ Government to provide trapper training, which has included the use of snares and the skinning of dìga. In addition, the GNWT has conducted aerial reconnaissance flights and provided caribou (ekwǫ̀) collar information to the Tłı̨chǫ Government to help find an optimal location for the Tłı̨chǫ wolf (dìga) harvester camps. The GNWT has provided fuel and equipment to support harvesting at these camps, which has been flown out to the Tłı̨chǫ harvester camp while picking up wolf (dìga) carcasses.

The GNWT allows baiting for wolf (dìga) harvesting for anyone who obtains a General Wildlife Permit. This approach allows the GNWT to regulate the use of baits by wolf (dìga) harvesters while ensuring it is done in a way that minimizes risk to public safety.

Recommendation #5-2020 (Dìga): Questionnaire Improvements
The WRRB recommends that GNWT and TG improve the harvest reporting program to ensure that appropriate information is being collected through questionnaires, starting 2020/2021 harvest season. This could be accomplished by using a contractor with expertise in this area.

Response: Accept

Reasons:

The GNWT has made minor changes to the questionnaires to simplify and improve question clarity during the 2020/2021 harvest season. There were also minor changes to the Nunavut harvester questionnaire to increase compatibility with Nunavut's wolf harvest incentive program.

Harvester questionnaires were designed to record the location of harvest, document the harvester's "effort" to find and harvest a wolf (dìga) (i.e. time and distance spent hunting), and include questions that relate to hunting conditions and other factors related to hunting success. Questionnaires are used to document effort for both successful and unsuccessful wolf (dìga) hunters, as both provide valuable information.

ENR will hire a contractor who specializes in survey science to review the questionnaire to evaluate overall survey effectiveness once this harvest season has ended. During this review, ENR will engage the Tłı̨chǫ Government and WRRB on potential changes to the survey.

ENR has increased the compensation provided for completing a questionnaire from $25 to $50 to encourage more hunters to complete and submit Wolf Harvest Questionnaires during this harvest season. ENR is also working with the Kugluktuk Hunters and Trappers Organization to obtain completed questionnaires from Nunavut harvesters who come to the NWT to hunt wolves but are

unsuccessful. In 2019/2020, a questionnaire was submitted for every wolf (dìga) harvested by Nunavut hunters.

Recommendation #6-2020 (Dìga): Nunavut Learnings
The WRRB recommends that GNWT and TG incorporate lessons learned from Nunavut's high success rate with their harvester's questionnaire responses and ensure Nunavut harvesters attend Harvester Training Workshops, starting 2020/2021 harvest season.

Response: Vary

The WRRB recommends that GNWT and TG incorporate lessons learned from Nunavut's high success rate with their harvester's questionnaire responses and ~~ensure~~ invite Nunavut harvesters to attend Harvester Training Workshops, starting 2020/2021 harvest season.

Reasons:

The GNWT and Tłı̨chǫ Government are continuing to take steps to increase the number of submitted harvester questionnaires. GNWT has learned from experience during the 2020 Wolf (Dìga) Management Pilot Program, and is working to ensure that a completed questionnaire is submitted for every harvested wolf (dìga). As an incentive for more North Slave harvesters to submit questionnaires, the reward for the completed questionnaires has increased from $25 to $50 to encourage harvesters to complete and submit their questionnaires.

The GNWT continues to work with the Government of Nunavut, the Kugluktuk Hunters and Trappers Organization, and Nunavut harvesters to support their participation in and contribution to the Enhanced North Slave Wolf Harvest Incentive Program. Unfortunately, the COVID-19 pandemic prevented Nunavut harvesters from attending workshops and/or hunting with NWT harvesters this season. Once the situation improves, Nunavut harvesters will be invited to participate in Harvester Training Workshops.

Recommendation #7-2020 (Dìga): Aerial Removal
The WRRB recommends GNWT and TG should not continue aerial removals of dìga on Kǫ̀k'èetì and Sahtì ekwǫ̀ ranges. Instead, more resources should be put towards ground-based harvest. Subject to review based on an annual assessment of evidence during the annual review of the program, the WRRB would consider a proposal of other methods of dìga removal.

Response: Vary

The WRRB recommends GNWT and TG should not continue aerial removals of dìga on Kǫ̀k'èetì and Sahtì ekwǫ̀ ranges in winter 2020-2021. Instead, more resources should be put towards ground-based harvest. Subject to review based on an annual assessment of evidence during the annual review of the program, the WRRB would consider a proposal of other methods of dìga removal.

Reasons:

GNWT and Tłı̨chǫ Government accept WRRB's recommendation to suspend aerial shooting of wolves for winter 2020-2021 and there will be an emphasis on ground-based shooting of wolves. The high spatial overlap of Bathurst, Bluenose-East and Beverly caribou (ekwǫ̀), based on collars, creates a situation where there is mixing of wolves associated with the three herds, which poses

challenges for setting and achieving appropriate wolf (dìga) harvest targets for the Bathurst and Bluenose-East caribou (ekwǫ̀) herds.

During this harvest season, increased effort will be focussed on improving knowledge of wolf (dìga) abundance, supplemented by a survey and the deployment of wolf (dìga) collars in March 2021. An increase in the number of collared wolves will provide more detailed information on movements of wolves associated with the three herds and the degree of seasonal mixing of wolves.

The GNWT and Tłı̨chǫ Government's Revised Joint Proposal covers a four-year period, with a goal of removing a sufficient number of wolves to reduce predation and support increased caribou (ekwǫ̀) survival rates. Multiple studies have shown that wolf removals need to occur for several years over a large area, and with substantial reduction of wolf numbers in order to be effective. Based on the best available information, the Revised Joint Proposal set a removal target of 60-80% of wolves associated with the Bathurst and Bluenose-East herds.

Given the importance of meeting wolf removal targets to meet the overall objectives of the Revised Joint Proposal, the GNWT and Tłı̨chǫ Government believe that aerial removals should remain an option in subsequent years if ground-based harvesting is unable to achieve wolf removal targets. The GNWT will use the pause in aerial removals in 2020/2021 to evaluate if ground based harvesting can meet these targets on their own, and to continue to consult with Indigenous governments and organizations in the North Slave Region on their support for this wolf (dìga) management technique.

Tłı̨chǫ Government and GNWT will continue to support ground-based wolf (dìga) harvest as outlined in Recommendation #4-2020. However, based on the experience to date it will likely be challenging for ground-based harvesters to reach wolf (dìga) removal targets without augmentation by other wolf (dìga) removal techniques because of terrain, remoteness and the difficulty in harvesting wolves from the ground. Wolf (dìga) removal programs in Alaska, BC and other jurisdictions have relied predominantly on aerial shooting as the most effective method that allows all areas, including those that are remote and/or have difficult terrain, to be reached.

The GNWT would like to clarify some of the points raised in Section 7.5 of the WRRB Reasons for Decision Final Report.

1. On page 51 of the report, the WRRB noted: *"Mostly, the total pursuit time ranged from 0-2 minutes, with one pack attempt that resulted in the removal of three wolves where the total pursuit time was 51 minutes."*

   The 51 minute period noted in the veterinary assessment includes the period of time from when this pack was first observed by the spotter/processing crew, and when the shooting crew subsequently arrived in a separate helicopter at this location. The wolves had dispersed during this period, and they were not actively pursued. Once the shooting crew initiated aerial removal of the pack, the time interval between the 1st and 3rd wolves being located and shot spanned 16 minutes. In each case, the time to death was recorded as immediate.

2. The fixed-wing aircraft referenced on page 51 was used to conduct 4 separate systematic transect surveys on the Bathurst and Bluenose-East winter ranges. The fixed-wing aircraft was not directly involved in the aerial removal activities.

3. On page 54, the WRRB noted that "the high rate of wounding and the veterinary pathologist's recommendations for closer scrutiny leaves room for doubt". It is unclear what the WRRB is referring to when referencing "the high rate of wounding", but it is important to note that 35 of the 36 wolves that were killed by aerial shooting were shot with a shotgun which used Buckshot ammunition. This ammunition generates multiple wound tracts. As noted on page 8 of the Veterinary Assessment of Aerial Removal Procedures "35/36 or 97.2% of wolves met an 'acceptable humaneness' criterion". Further, twelve of the 36 recorded times documented this time to the nearest second. The pathologist suggested that a camera could potentially be used to document each event, and provide another means of confirming to the nearest second the time from shot fired to animal being totally immobile. The pathologist's recommendation to document each event using a camera is different than the WRRB's interpretation that this is a "recommendation for closer scrutiny", and the WRRB's conclusion that this "leaves room for doubt" is unsubstantiated by the information presented in the report.

Overall, ENR is confident that our protocols were closely followed by an experienced marksman, which led to the wolves being dispatched quickly and humanely. This interpretation is supported by the detailed veterinary assessment provided which uses well defined criteria from the scientific literature.

Finally, Tłı̨chǫ Government notes the WRRB acknowledgement at page 54 of its Reasons for Decision that "… none of the Indigenous Governments or Organizations who participated in this process support aerial removals." Tłı̨chǫ Government assumes that by "none", the WRRB was referring to participants in the process as a class of intervener, because there is an Indigenous Government - the Tłı̨chǫ Government – that has supported responsible dìga aerial removals as an option.

Recommendation #8-2020 (Dìga): Assigning Dìga to Herds
The WRRB recommends that TG and GNWT explore alternative methods of assigning harvested dìga to an ʔekwǫ̀ herd and to statistically determine confidence in the allocation. GNWT and TG should provide enough information to determine how the uncertainty affects the success of the program and submit results to the WRRB by September 30, 2021.

Response: Vary

The WRRB recommends that TG and GNWT explore alternative methods of assigning harvested dìga to an ʔekwǫ̀ herd ~~and to statistically determine confidence in the allocation~~. GNWT and TG should provide enough information to determine how the uncertainty affects the success of the program and submit results to the WRRB by September 30, 2021.

Reasons:

As identified in the Revised Joint Proposal, "it is not well known how closely the tundra wolves (dìga) seasonal movements are affiliated with specific barren-ground caribou (ekwǫ̀) herds on an annual basis". This uncertainty makes it extremely difficult to statistically determine confidence in the allocation of wolves to a particular ekwǫ̀ herd.

The wolf (dìga) collaring program's key research objectives include investigating both seasonal and annual movements of wolves in relation to the Bathurst, Bluenose-East, and Beverly caribou (ekwǫ̀)

herds. Collar data will provide insight into the level of fidelity tundra wolves have to caribou (ekwǫ̀) herds. The GNWT plans to collar an additional 23 wolves this winter season.

Efforts are being made to document all wolf (dìga) harvest locations (through the questionnaire) in relation to available caribou (ekwǫ̀) collar locations, and Kernel Density Estimate contours for each herd. Wolf (dìga) collaring movements during the winter may provide insights into the interchange of wolves between caribou (ekwǫ̀) herd ranges, particularly in years of significant caribou (ekwǫ̀) herd overlap.

Although available wolf (dìga) collaring data is currently limited, initial indications suggest there is variability in how wolves are moving on the landscape. Some collared wolves display conventional north-south migratory movements, while others display east-west shifts between caribou (ekwǫ̀) herds. Additionally, there are three collared wolves found within the treeline that utilize a smaller spatial area and are believed to be boreal wolves.

The wolf (dìga) collar data will be used to conduct movement analyses and generate occupancy models (Brownian Bridge and Grid Cell Counts) to explore annual and seasonal space-use patterns. The GNWT will share this information with the WRRB by September 30, 2021. Additional analytical tools and academic support will be used to assist in addressing the more challenging task of reducing uncertainty involved in assigning wolves to a particular herd, if possible.

Recommendation #9-2020 (Dìga): Den Occupancy
The WRRB recommends that GNWT and TG monitor dìga den occupancy to measure pup production, recruitment, diet, and disease incidence to describe the extent of compensatory breeding and to better understand the minimum number of dìga on the Kǫ̀k'èetì and Sahtì ekwǫ̀ summer ranges, starting in the 2020/2021 harvest season.

Response: Vary

The WRRB recommends that GNWT and TG will review the feasibility of monitoring dìga den occupancy to measure pup production, recruitment, and diet ~~and disease incidence~~ to describe the extent of compensatory breeding and to better understand the minimum number of dìga on the Kǫ̀k'èetì and Sahtì ekwǫ̀ summer ranges, starting in the 2020/2021 harvest season.

Reasons:

Previous wolf (dìga) den surveys on the Bathurst caribou (ekwǫ̀) herd range (pers. comm. D. Cluff 2021, Klaczek 2015[3]) found that pup recruitment declined from 3.5 (1996-2000) to 1.8 (2007-2012) pups/pack. As well, the number of occupied wolf (dìga) dens, pack size at dens, and the number of wolf (dìga) dens observed/1000 km flown indicated clear patterns of decline over this time period. Given the subsequent further decline of the Bathurst herd, and current wolf (dìga) removal actions, it's anticipated that current efforts to re-activate a wolf (dìga) den occupancy survey on Bathurst summer range would likely result in relatively fewer active dens being found.

Although the relative abundance of wolves and active wolf (dìga) dens may be higher on the Bluenose-East summer range, there are a number of challenges in initiating a wolf (dìga) den survey. There is currently limited and dated historical data available for known wolf (dìga) dens on

[3] Klaczek, M. R. 2015. Denning ecology of barren-ground wolves in the central Canadian Arctic. MSc Thesis. University of Northern British Columbia, Prince George, British Columbia. 116 pp

the Bluenose-East caribou (ekwǫ̀) summer range, which spans the North Slave and Sahtú regions, as well as western portion of the Kitikmeot region. Conducting a wolf (dìga) den survey effort across this large and remote area is expected to be quite expensive, logistically challenging, and potentially difficult to implement.

Given the challenges listed above, it's expected that relatively few active wolf (dìga) dens might be found on the Bathurst and Bluenose-East caribou (ekwǫ̀) summer ranges. If the number of active dens found can be anticipated to be low, it would be difficult to obtain meaningful sample sizes that would provide precise and accurate estimates of wolf (dìga) abundance.

Current wolf (dìga) collaring efforts will strive to deploy a further 23 collars on wolves to bring the total number of collared wolves to 30. Depending on the success of collaring efforts in March 2021, there would be an opportunity to use these collared wolves as means of identifying a number of active wolf (dìga) dens. These active dens (dispersed on Bathurst, Bluenose-East and Beverly ranges) could potentially serve as a subset for determining pack size, pup production, and survival rates. Wolf (dìga) den surveys are often carried out with fixed-wing aircraft, making on the ground den visits difficult and preventing the measure of disease incidence given the sampling required.

GNWT is interested in monitoring wolf (dìga) pup production, recruitment, and summer diet. Searching broad areas, during a period of relatively low wolf (dìga) density, may not be cost effective. Therefore, GNWT will further explore the feasibility of monitoring active wolf (dìga) dens, but with the benefit of using collared wolves as the basis for starting this effort.

GNWT and Tłı̨chǫ Government would welcome the participation of WRRB staff in the review of the feasibility of monitoring wolf (dìga) den occupancy.

Recommendation #10-2020 (Dìga): Necropsy
The WRRB recommends that GNWT and TG ensure all dìga removed as part of this program from 2021-2024 undergo a full necropsy to determine injuries, physical condition, reproductive status, and diet, to fully understand health of the dìga on the ranges of the Kǫ̀k'èetì and Sahtì ekwǫ̀ herds.

Response: Vary

The WRRB recommends that GNWT and TG ensure ~~all~~ a sample of dìga removed as part of this program from 2021-2024 undergo a full necropsy to determine injuries, physical condition, reproductive status, and diet, to fully understand health of the dìga on the ranges of the Kǫ̀k'èetì and Sahtì ekwǫ̀ herds.

Reasons:

GNWT will conduct necropsies on as many harvested wolves as is logistically possible and sufficiently representative. The collection of carcasses from within the North Slave Wolf Harvest Incentive Area, including wolves harvested by Nunavut hunters within the incentive area, may prove challenging. GNWT will endeavor to examine the majority of wolves harvested. Comprehensive welfare assessments will be conducted on as many carcasses as is logistically feasible; a subsample of wolves may be sufficient to inform overall pattern of injuries and welfare outcomes, in addition to the information collected from the wolves as outlined in the Revised Joint Proposal.

Under the guidance of the ENR Wildlife Veterinarian, the GNWT will work with the Canadian Wildlife Health Co-operative, University of Saskatchewan Western College of Veterinary Medicine and their Undergraduate Summer Research Program to have a veterinary student assist in analyzing available wolf (dìga) condition and health data this summer. In addition to developing key indicators of general health, this research will focus on specific parasites that could inform and clarify predator-prey relationships. The plan is to develop a more comprehensive framework for monitoring the health and condition of wolves, which will be summarized in a report by late 2021. Depending on the outcomes of this pilot study, this work could potentially develop into a more comprehensive multi-year graduate-level wolf (dìga) research effort.

Recommendation #11-2020 (Dìga): Dìga Collaring
The WRRB recommends that GNWT continue the dìga collaring program, beginning in 2021, using a statistically rigorous design to measure dìga movements relative to the dìga-ʔekwǫ̀ spatial distribution, including reducing the uncertainties involved with assigning dìga to ʔekwǫ̀ herds.

Response: Accept

Wolf (dìga) collars will provide information on the annual and seasonal variability in the movements of wolves in relation to the Bathurst, Bluenose-East and Beverly caribou (ekwǫ̀) herds. As noted in our responses to recommendations #1-2020, #8-2020 and #9-2020, this winter the GNWT will aim to deploy 23 additional collars on wolves on the winter ranges of the three herds to bring the total to 30.

ENR has been working with a contractor with expertise in movement ecology to explore different approaches for analysis of the wolf (dìga) collar data. This includes developing annual movement profiles, generating occupancy models (to explore annual and seasonal space-use patterns), and conducting sensitivity analysis to determine the appropriate number of collars to deploy across these three herds. ENR may explore options for involving a graduate student in the analysis of the wolf (dìga) collaring data.

Caribou (ekwǫ̀) collar data, with the application of Kernel Density Estimate probability contours, are used to define winter distribution of caribou (ekwǫ̀), and the "assignment" of wolves to particular herds is based on these polygons. However, our understanding of wolf (dìga) movements in this system is still relatively limited. There is a high level of uncertainty and variability between individuals as to how wolves use the landscape. Collar data may ultimately reveal patterns of use that have implications for how management actions are carried out.

Both boreal and tundra wolves occupy the North Slave region; each use different feeding and movement strategies. For tundra wolves, there is uncertainty as to the proportion of wolves making broader movements between herds, versus displaying fidelity to a particular herd. Since the initial wolf (dìga) collars were deployed in March 2020, available data are still limited. Early indications from seven wolf (dìga) collars are that some wolves are showing limited localized movement patterns (i.e. likely boreal), with some collars indicating a directional north-south movement (i.e. suggesting herd fidelity), while others showing east-west movements (i.e. moving among herds).

Seasonal variation, such as during periods of overlap of two or three caribou (ekwǫ̀) herds on their winter ranges, may pose further challenges. In addition to spatial overlap this year, there are likely

more wolves associated with the Beverly herd than wolves associated with the Bathurst and Bluenose-East herds.

Recommendation #12-2020 (Dìga): Calf Mortality Study
The WRRB recommends that GNWT and TG complete a calf mortality study in conjunction with 2021 calving ground surveys to determine the effect of dìga on calf survival on both Kǫ̀k'èetì and Sahtì ekwǫ̀ calving grounds. This calf mortality study should, if possible, be done in cooperation with Government of Nunavut and with the assistance of experienced Dene and Inuit elders as field observers.

Response: Vary

The WRRB recommends that GNWT and TG develop an approach to assessing ~~complete a~~ caribou (ekwǫ̀) calf mortality ~~study in conjunction with 2021 calving ground surveys~~ to determine the effect of dìga and other predators on calf survival beginning on the ~~both~~ Kǫ̀k'èetì ekwǫ̀ calving ground, and potentially expanding to the Sahtì ekwǫ̀ calving grounds, if feasible. This calf mortality study should, if possible, be done in cooperation with Government of Nunavut and with the assistance of experienced Dene and Inuit elders as field observers.

Reasons:

Tłı̨chǫ Government and the GNWT support efforts to improve our understanding of predator abundance on the Bathurst and Bluenose-East calving grounds and their significance to calf mortality. A number of approaches have been used historically to assess early calf mortality on calving grounds, including helicopter surveys to find dead calves to evaluate likely causes of death, and, in Alaska, the deployment of collars on newborn calves followed by close monitoring by helicopter of any collared calves that die. The Alaskan method provides very detailed information on calf mortality and its causes, but is not likely suitable for NWT or Nunavut as it would involve capturing and collaring newborn calves and very close tracking of those collared calves in very remote locations.

A novel approach using a camera grid on caribou (ekwǫ̀) calving grounds may provide quantitative information on abundance of wolves, bears and other possible predators, and may allow tracking of calf cow ratios over the first few weeks of calf life. A funding proposal developed collaboratively by the Government of Nunavut, GNWT and University of Alberta (with support of the Kugluktuk Hunters and Trappers Organization) was forwarded to the WRRB, Tłı̨chǫ Government and other NWT organizations in January 2021. ENR cautions, however, that this would be a pilot project and that full funding is currently not in place. If successful, this approach could be extended to the Bluenose-East calving grounds in a future year.

ENR notes that additional composition surveys were flown in July 2020 for the Bathurst and Bluenose-East herds to assess calf cow ratios when caribou (ekwǫ̀) calves were approximately 5 weeks of age. These surveys were specifically flown to gain greater insight into the timing of early calf mortality. Calf cow ratios in July 2020 were similar to calf cow ratios in late October 2020, which suggested that most of the calf mortality that year happened in the first 4-5 weeks of life. ENR plans to conduct calving ground photo surveys for both herds in June 2021, and will repeat the July composition surveys to assess whether the patterns in 2020 are confirmed. Estimates of the proportion of breeding females and a calf cow ratio near the peak of calving in June 2021 and a July calf cow ratio might then be compared to calf cow ratios from the camera project for the Bathurst herd.

GNWT and Tłı̨chǫ Government would welcome the participation of WRRB staff in developing an approach to assessing caribou calf mortality to determine the effect of wolves and other predators on calf survival.

Recommendation #13-2020 (Dìga): Dìga and ʔekwǫ̀ Relationship
The WRRB recommends that TG collect and document stories about the changes that Tłı̨chǫ elders and their families have observed to the dìga and ʔekwǫ̀ relationship through time, and in the present considering other animal behaviour, climate change, loss of habitat, and population declines.

Response: Accept

Recommendation #14-2020 (Dìga): Ekwǫ̀ Nàxoède K'è
The WRRB recommends that TG collect Tłı̨chǫ stories about dìga and ʔekwǫ̀, while on the land, from elders participating in the Ekwǫ̀ Nàxoède K'è program to increase the understanding of the current relationship between dìga and ʔekwǫ̀ and how it has changed through time.

Response: Accept

Recommendation #15-2020 (Dìga): Mortality Study
The WRRB recommends that GNWT and TG undertake field studies and modelling to determine causes of death of collared ʔekwǫ̀ so that the assumption that 60% of mortality is caused by dìga predation can be tested, and to estimate the influence of other factors in mortality in the 2020/2021 harvest season.

Response: Vary

The WRRB recommends that GNWT and TG explore possibilities and develop an approach ~~undertake field studies and modelling~~ to determine causes of death of collared ʔekwǫ̀ ~~so that the assumption that 60% of mortality is caused by dìga predation can be tested~~, and to estimate the influence of other factors in mortality of caribou (ekwǫ̀), by Sept. 30, 2021 ~~in the 2020/2021 harvest season~~.

Reasons:

A better understanding of collared caribou (ekwǫ̀) mortalities and the extent to which wolves are responsible is desirable. However, a practical, affordable and effective way of conducting this work is currently not readily apparent.

Determining causes of death in all collared caribou (ekwǫ̀) is highly challenging and would be cost prohibitive. In recent years, ENR has placed an emphasis on investigating any collared caribou (ekwǫ̀) that become stationary within the first 4-6 weeks after capture, in part to assess potential role of capture-related impacts. With very rare exceptions, sites with stationary collared caribou (ekwǫ̀) that are checked within 24-48 hours of becoming stationary invariably include nothing more than a collar, some fur, an antler and some skeletal remains. There may be signs of wolves present, and there is often sign of scavengers, but it is not possible to determine whether the caribou (ekwǫ̀) died from other causes and was scavenged, or was killed by wolves or other predators. It is also important to note that these caribou (ekwǫ̀) utilize remote areas only accessible by air and are very expensive to access. Chartering a helicopter from Yellowknife to fly to the

Bathurst Inlet area, for example, to check on a stationary collar would likely require 7-8 helicopter hours (at about $1800/hour) and fuel caches. Given the low likelihood of finding a carcass that is suitable for investigation, this approach has not proven effective to date.

With respect to modeling, Tłı̨chǫ Government and GNWT suggest that further investment in population modeling to date is unlikely to be productive as it can only be done with the use of multiple untested assumptions and inputs. We suggest that the emphasis going forward should be on securing empirical information on predators and predation rates.

The Tłı̨chǫ Government and GNWT are willing to work with the WRRB to explore possibilities for other approaches to increase understanding of causes of caribou (ekwǫ̀) mortality and the importance of wolves and other predators. It may be useful to engage with additional topic area experts on options that could be considered.

GNWT and Tłı̨chǫ Government would welcome the participation of WRRB staff in exploring possibilities and developing an approach to determine causes of death of collared caribou (ekwǫ̀) and to estimate the influence of other factors in mortality of caribou.

Recommendation #16-2020 (Dìga): Adaptive Co-Management
The WRRB recommends that GNWT and TG, in collaboration with the WRRB through the Barren-ground Caribou Technical Working Group, establish benchmarks for key vital rates and integrate them into the Adaptive Co-Management Framework to identify at which point dìga removals would stop by March 31, 2020.

Response: Vary

The WRRB recommends that GNWT and TG, in collaboration with the WRRB through the Barren-ground Caribou Technical Working Group, establish benchmarks for key caribou (ekwǫ̀) vital rates and integrate them into the Adaptive Co-Management Framework to identify at which point dìga removals would stop in time for the annual fall meeting ~~by March 31, 2020~~.

Reasons:

Tłı̨chǫ Government and GNWT will continue to work with the WRRB through the Barren-Ground Caribou Technical Working Group on benchmarks for caribou (ekwǫ̀) vital rates that would be associated with stability or an increasing caribou (ekwǫ̀) population trend. Existing population modeling has already identified combinations of cow survival rate and calf cow ratios associated with stable caribou (ekwǫ̀) herds. However, the GNWT would like to note a number of considerations relevant to working with the current Adaptive Co-Management Framework.

Current wolf (dìga) management program: The wolf (dìga) management program proposed by the Tłı̨chǫ Government and GNWT is for a 5-year period. This, in large part, reflects the experience from many other wolf (dìga) management programs that has shown that wolf (dìga) reductions need to occur over at least 4-5 years, over a large area, and with significant reductions in the wolf (dìga) population to have a measurable effect on caribou (ekwǫ̀) survival rates. While it is useful to review results and new information annually, and consider adjustments to the program, Tłı̨chǫ Government and GNWT remain committed to a 5-year program based on the available evidence and experience elsewhere.

Importance of sustained caribou (ekwǫ̀) demographic indicators: Collar-based survival rates, calf cow ratios and other indicators can vary annually. Collar-based survival rates are still based on a

limited sample (20-30 cows/year) and variance remains high. Calf cow ratios often show a "saw-tooth" pattern of higher and lower ratios alternating in succeeding years. Annual review of new information on caribou (ekwǫ̀) vital rates is useful; however, Tłı̨chǫ Government and the GNWT suggest that the main emphasis should be placed on cumulative vital rates over at least a three year period (e.g. a moving average) in terms of assessing herd status and any potential adjustments to the wolf (dìga) program. GNWT also notes that updates on some indicators, like fall calf cow ratios, can be made available fairly quickly after surveys, but others like collar-based or model-based cow survival rates require some time to generate and will only be available once a year.

Other factors influencing caribou (ekwǫ̀) demographic indicators: Over the last 10 years or so, dynamics of the Bathurst and Bluenose-East herds have shown substantial variability, with low cow survival rates, low calf survival and in some years low pregnancy rates all contributing to declines. Natural variability will continue to influence these herds' vital rates, meaning it will be difficult to conclusively associate improved demographics (if and when they occur) with the wolf (dìga) management program. We note, for example, that collar-based cow survival rates increased from 2017 to 2019 in the Bathurst herd (year starting in June that year and ending in May the following year): 2017 76%, 2018 91%, 2019 95%. Collar-based cow survival rates for the Bluenose-East herd also show an increasing trend: 2017 76%, 2018 85%, 2019 85%. These improving trends pre-dated the wolf (dìga) removals of 2020, thus likely reflecting other factors. Assessing possible effects of wolf (dìga) removals will need to bear in mind that these other factors will continue to collectively influence caribou (ekwǫ̀) demographic indicators.

Recommendation #17-2020 (Dìga): Adaptive Co-Management
The WRRB recommends that any key vital rates of dìga and Kǫ̀k'èetì and Sahtì ekwǫ̀ collected by GNWT and TG be reported to the Barren-ground Caribou Technical Working Group throughout the year, in alignment with the Adaptive Co-Management Framework, to contribute to the implementation of the adaptive management framework.

Response: Vary

The WRRB recommends that any key vital rates of dìga and Kǫ̀k'èetì and Sahtì ekwǫ̀ collected by GNWT and TG be reported to the Barren-ground Caribou Technical Working Group throughout the year~~, in alignment with the Adaptive Co-Management Framework, to contribute to the implementation of the adaptive management framework~~.

Reasons:

The reference to the Adaptive Co-Management Framework has been removed because the Framework has not been finalized or accepted by all parties of the Barren-ground Caribou Technical Working Group. Tłı̨chǫ Government and GNWT look forward to continuing the collaborative discussions and work on the Framework.

Tłı̨chǫ Government and GNWT report all key information related to the wolf (dìga) management program and provide verbal updates and draft reports on all Bathurst and Bluenose-East caribou (ekwǫ̀) surveys to the Barren-ground Caribou Technical Working Group. Both governments will continue the practice of sharing this information with the WRRB as soon as practicable.

Recommendation #18-2020 (Dìga): Adaptive Co-Management
The WRRB recommends that the annual review of the dìga management program be collaborative with TG, GNWT, and the WRRB and coincide with the November Barren-ground Caribou Technical Working Group Meeting, beginning in 2021.

Response: Accept

Reasons:

Tłı̨chǫ Government and GNWT will summarize the information from each season of the wolf (dìga) management program into a technical report similar to the 2020 Wolf (Dìga) Management Pilot Program Technical Report, as stated in the response to Recommendation #20-2020.

Recommendation #19-2020 (Dìga): Adaptive Co-Management
The WRRB recommends that, in time for the 2021 annual review, GNWT and TG implement the recommendations in the Wolf Technical Feasibility Assessment: Options for Managing Dìga on the Range of the Bathurst Barren-ground Caribou Herd (2017) to develop the annual monitoring protocols for efficiency, effectiveness, and humaneness.

Response: Accept

Reasons:

The annual monitoring protocols for efficiency, effectiveness, and humaneness for the aerial removal of wolves were reported on during the 2020 Wolf Management Proceeding.

For ground-based harvesting of wolves, as was stated in the response to Recommendation #10-2020, the GNWT will facilitate the necropsy of as many harvested wolves as is logistically possible. Comprehensive welfare assessments will be conducted on as many wolf (dìga) carcasses as is logistically feasible; a subsample of wolves may be sufficient to inform overall pattern of injuries and welfare outcomes.

Also, as stated in the response to Recommendation #6-2020, Tłı̨chǫ Government and GNWT are continuing to work to increase the number of completed harvester questionnaires submitted to improve knowledge on field time and effort by ground-based harvesters.

Recommendation #20-2020 (Dìga): Adaptive Co-Management
The WRRB recommends that an annual report be prepared by GNWT and TG and presented to the Board at a scheduled board meeting to allow for the discussion of adjustments in methodology based on the evidence, beginning fall 2021.

Response: Vary

The WRRB recommends that an annual report on the wolf (dìga) management program be prepared by GNWT and TG and presented to the Board at a scheduled board meeting to allow for the discussion of adjustments in methodology based on the evidence, beginning fall 2021.

Reasons:

Tłı̨chǫ Government and GNWT accept and have incorporated the concept of adaptive co-management as a way of regularly reviewing the results of the wolf (dìga) management program

and considering adjustments to the program. This is best accomplished via an annual fall meeting where results of the wolf (dìga) removals, wolf (dìga) research and monitoring (surveys and collars), as well as information on caribou (ekwǫ̀) indicators and surveys can be summarized and reviewed. Possible changes to monitoring and management actions can be considered at that time. This format has worked effectively for the Advisory Committee for Cooperation on Wildlife Management annual status meeting of the Cape Bathurst, Bluenose-West and Bluenose-East herds.