

**Reasons for Decisions Related to a  
Joint Proposal for Dìga (Wolf) Management  
in Wek'èezhì**

**Submitted to Tìchq Government and Department of  
Environment & Natural Resources, Government of the  
Northwest Territories**

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## LIST OF ACRONYMS

COSEWIC	Committee on the Status of Endangered Wildlife in Canada
ENR	Environment & Natural Resources
GNWT	Government of the Northwest Territories
IR	Information Request
LKDFN	Łutsel K'e Dene First Nation
NSMA	North Slave Métis Alliance
NT	Northwest Territories
SARC	Species at Risk Committee
TAH	Total Allowable Harvest
TG	Tłıchǫ Government
TK	Tłıchǫ Knowledge; traditional knowledge
WRRB	Wek'èezhì Renewable Resources Board

## LIST OF TŁIČHŦ TERMS

Dedił	moose
Diga	wolf
Dìgati	wolf-lake
ʔekwò	barren-ground caribou
K`àowo	leaders
K`àowodeè	important leader who knows everything
Kòk`èeti	Contwoyto Lake
Kòk`èeti Ekwò	Bathurst caribou
Nògha	Wolverine
Sahti Ekwò	Bluenose-East caribou
Tatsò	raven
Tòdzı	boreal caribou
Wek`èezhì	Management area; within the boundaries of

## 1.0. Executive Summary

The Wek'èezhì Renewable Resources Board (WRRB or the Board) is responsible for wildlife management in Wek'èezhì and shares responsibility for managing and monitoring the *Kòk'èeti and Sahti Ekwò* (Bathurst and Bluenose-East caribou) herds. Since 2006, the Department of Environment and Natural Resources (ENR), Government of the Northwest Territories (GNWT) has reported on the significant declines in the *Kòk'èeti and Sahti ekwò* herds and identified the requirement for management actions. In Board proceedings during 2010, 2016, and 2019, the WRRB made decisions about harvest, including total allowable harvests (TAH) for both herds, and recommendations to urge government actions to halt both the *Kòk'èeti and Sahti ekwò* herds' declines.

However, restrictions on harvest have not been enough despite the hardships borne by harvesters. As such, the WRRB has also made recommendations to increase *ʔekwò* (barren-ground caribou) survival and offset natural hardships for *ʔekwò* by increasing *Diga* (wolf) harvesting, conducting a feasibility assessment for *diga* management, proposing *diga* control, and supporting habitat conservation and monitoring.

On January 31, 2020, GNWT and the Tłıchq̓ Government (TG) submitted the “*Joint Proposal on Management Actions for Wolves (diga) on the Bathurst and Bluenose-East Barren-ground Caribou (ʔekwò) Herd Winter Ranges: 2020 – 2025*”. Following initial assessment, the Board undertook a Level 2 management proposal review. However, to address concerns identified by GNWT and TG, following internal Board discussions in March 2020, the WRRB made the decision to amend its procedure for the review of the 2020 *diga* management actions as proposed in the *diga* joint management proposal to a Level 1 review and to treat the 2020 *diga* management actions as a pilot project only. Further, the Board requested that TG and GNWT resubmit the *diga* management actions proposed for 2021-2025 in the Proposal for a Level 2 review with the inclusion of lessons learned from the implementation of the 2020 management actions in August 2020.

On August 25, 2020, GNWT and TG submitted a revised joint management proposal, entitled “*Revised Joint Proposal on Management Actions for Wolves (diga) on the Bathurst and Bluenose-East Barren-ground Caribou (ʔekwò) Herd Winter Ranges: 2021 – 2024*” (hereafter called the Revised Joint Proposal), as well as a technical report with lessons learned from the implementation of the 2020 Pilot Project and a plain-language summary. Following an initial assessment of the Revised Joint Proposal, the Board determined that a Level 2 review was appropriate, as per its Rule for Management Proposals.



The WRRB concluded, based on current evidence, that a serious conservation concern for both the Kòk'èetì and Sahtì ekwò herds exists and, as such, increased management and monitoring actions are warranted. In addition to harvest limitations and reducing disturbance to the ʔekwò herds and their habitat, additional management and monitoring actions that focus on reducing predation, specifically dìga, are required to support the recovery of the Kòk'èetì and Sahtì ekwò herds.

The WRRB recommended that GNWT and TG update the objectives, or their measures of success, for the dìga management and monitoring program to ensure that the results of the program are measurable and are related to ʔekwò recovery.

To ensure the most accurate and precise population estimates are available, the Board recommended that GNWT and TG identify and implement alternate methods to measure and index dìga abundance. These methods should be calibrated with the Ungulate Biomass Index. The Board further recommended that the dìga sighting rate indicator be assessed to determine if and how it contributes to the understanding of seasonal trends in dìga abundance on the ʔekwò herd ranges.

The WRRB urged GNWT and TG to proceed with the ground-based harvest as proposed with the addition of harvesters supports, including ʔekwò and dìga distribution information, gas caching, and/or bait stations as per the *Wolf Technical Feasibility Assessment: Options for Managing Dìga on the Range of the Bathurst Barren-ground Caribou Herd* (2017). Additionally, it was recommended to put financial resources toward improving the harvest questionnaires used for the harvest reporting program as well as incorporating learnings from Nunavut's high success rate with their harvest reporting techniques.

The WRRB recommended that GNWT and TG should not continue aerial removals of dìga on the Kòk'èetì and Sahtì ekwò herd ranges; instead, more resources should be put towards ground-based harvest. The Board also recommended that GNWT and TG explore alternative methods of assigning harvested dìga to an ʔekwò herd and to statistically determine confidence in the allocation.

To better understand dìga on the ranges of the Kòk'èetì and Sahtì ekwò herds, the WRRB recommended monitoring dìga den occupancy through aerial surveys and remote cameras, conducting necropsies on all dìga removed through the management program, continuing the dìga collaring program using a statistically robust design to measure dìga movements, completing a calf mortality study to measure the effects of dìga on calf survival, conducting Tìchq Knowledge (TK) research studies through storytelling and on-the-land collections that document observations of dìga and ʔekwò relationship as well as the changes in dìga behaviours, and undertaking field studies

and modelling to determine the cause of death of collared ʔekwò to test the assumption that 60% of mortality is caused by d̄iga predation.

Finally, the Board recommended implementation of the Adaptive Co-Management Framework, through the collaborative Barren-ground Caribou Technical Working Group, by establishing and integrating benchmarks for key vital rates, reporting of key vital rates of d̄iga, Kòk'èetì ekwò, and Sahtì ekwò throughout the year, and conducting an annual review of the d̄iga management and monitoring program in November. Additionally, the WRRB recommended GNWT and TG develop annual monitoring protocols for efficiency, effectiveness, and humaneness to ensure the d̄iga management and monitoring program is comprehensively evaluated, and to present to the Board annually on the d̄iga program.

## 2.0. Introduction

The Kòk'èetì ekwò herd declined from approximately 472,000 in 1986 to about 8,200 in 2018, and the Sahtì ekwò herd declined from 103,000 in 2010 to about 19,300 in 2018.<sup>1</sup> Unfortunately, due to the Covid-19 global pandemic, the calving ground surveys scheduled for June 2020 were not conducted. Therefore, wildlife managers are unable to confirm whether the accelerated rates of decline for each herd has continued or the herds' vital rates have improved. The WRRB is still uncertain of what the future holds for the Kòk'èetì and Sahtì ekwò herds.

In Board proceedings during 2010, 2016, and 2019, the WRRB made decisions about harvest and then, subsequently a TAH, as well as recommendations to urge government action to halt decline of both the Kòk'èetì and Sahtì ekwò herds.<sup>2</sup> Those 2010, 2016, and 2019 determinations and recommendations that were accepted by governments and implemented were focused on harvest reductions to increase survival of adult ʔekwò. Unfortunately, restrictions on harvest alone have not proved to be successful in stopping the decline of these herds despite the hardships borne by harvesters. As result, the WRRB also made recommendations to increase ʔekwò survival and offset natural hardships for ʔekwò by increasing d̄iga harvesting,

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<sup>1</sup> PR (Wolf 2020): 026 – Estimates of Breeding Females and Adult Herd Size and Analyses of Demographics for the Bathurst Herd of Barren-ground Caribou: 2018 Calving Ground Photographic Survey; and PR (Wolf 2020): 035 - Estimates of Breeding Females and Adult Herd Size and Analyses of Demographics for the Bluenose-East Herd of Barren-ground Caribou: 2018 Calving Ground Photographic Survey.

<sup>2</sup>PR (Wolf 2020): 099 – Report on a Public Hearing Held by the Wek'èezhì Renewable Resources Board, 22-26 March & 5-6 August 2010, Behchokò, NT; PR (Wolf 2020): 102 - Report on a Public Hearing Held by the WRRB, 6-8 April 2016, Behchokò, NT., & Reasons for Decisions Related to a Joint Proposal for the Management of the Bluenose-East ʔekwò (Barren-ground caribou) Herd - Part A; PR (Wolf 2020): 100 - Report on a Public Hearing Held by the WRRB, 23-24 Feb 2016, Yellowknife, NT., & Reasons for Decisions Related to a Joint Proposal for the Management of the Bathurst ekwò (Barren-ground caribou) Herd - Part A; PR (Wolf 2020): 104 - Report on a Public Hearing Held by the Wek'èezhì Renewable Resources Board 9-11 April 2019 Behchokò, NT & Reasons for Decisions Related to a Joint Proposal for the Management of the Sahtì Ekwò (Bluenose-East Caribou) Herd.and PR (Wolf 2020): 103 - Reasons for Decisions Related to a Joint Proposal for the Management of the Kòk'èetì Ekwò (Bathurst caribou) Herd. 2019.

conducting a feasibility assessment for dīga management, proposing dīga control, and supporting habitat conservation and monitoring.

Increased dīga harvesting and management is reported in the 2020 Joint Proposal, entitled “*Joint Proposal on Management Actions for Wolves (dīga) on the Bathurst and Bluenose-East Barren-ground Caribou (ᔨekwò) Herd Winter Ranges: 2020 – 2025*.”<sup>3</sup> TG and GNWT submitted the Joint Proposal on January 31, 2020. Following initial assessment, the Board undertook a Level 2 management proposal review, as per its Rule for Management Proposals.<sup>4</sup> However, following internal Board discussions in March 2020, the Board made the decision to amend its procedure for the review of the 2020 dīga management actions to a Level 1 review and to treat the 2020 dīga management actions as a pilot project only. Further, the Board requested that TG and GNWT resubmit the dīga management actions proposed for 2021-2025 in a Proposal for a Level 2 review with the inclusion of lessons learned from the implementation of the 2020 management actions in August 2020.

On August 25, 2020, GNWT and TG submitted a revised joint management proposal, entitled “*Revised Joint Proposal on Management Actions for Wolves (dīga) on the Bathurst and Bluenose-East Barren-ground Caribou (ᔨekwò) Herd Winter Ranges: 2021 – 2024*” (hereafter called the Revised Joint Proposal),<sup>5</sup> as well as a technical report<sup>6</sup> with lessons learned from the implementation of the 2020 Pilot Project and a plain-language summary.<sup>7</sup> Following an initial assessment of the Revised Joint Proposal, the Board determined that a Level 2 review was appropriate, as per its Rule for Management Proposals. The Revised Joint Proposal can be found in Appendix A.

The goal of the Pilot Project and Revised Joint Proposal’s management actions is to present a coordinated approach to dīga management actions aimed at reducing dīga predation on ᔨekwò. Reducing dīga predation in combination with ongoing harvest management is anticipated to have a positive influence on survival rates of the Kòk’èeti and Sahtì ekwò herds.<sup>8</sup>

This report describes the WRRB’s assessment of the evidence on the record and is the basis for the Board’s recommendations.

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<sup>3</sup> PR (Wolf 2020): 001 - GNWT and TG Joint Proposal on Management Actions for Wolves (dīga) on the Bathurst and Bluenose-East Barren-ground Caribou (ᔨekwò) Herd Winter Ranges: 2020 – 2025.

<sup>4</sup> <https://www.wrrb.ca/sites/default/files/REV%20FINAL%20Rule%20-%20Management%20Proposals%20-%2016oct18.pdf>

<sup>5</sup> PR (Wolf 2020): 017 - GNWT & TG’s Revised Joint Proposal on Management Actions for Wolves (dīga) on the Bathurst and Bluenose-East Barren-ground Caribou (ᔨekwò) Herd Winter Ranges: 2021 – 2024.

<sup>6</sup> PR (Wolf 2020): 018 - 2020 Wolf Management Pilot Program Technical Report.

<sup>7</sup> PR (Wolf 2020): 017 - GNWT & TG’s Revised Joint Proposal on Management Actions for Wolves (dīga) on the Bathurst and Bluenose-East Barren-ground Caribou (ᔨekwò) Herd Winter Ranges: 2021 – 2024.

<sup>8</sup> PR (Wolf 2020): 019 - Summary Caribou Population Modeling of Varying Levels of Wolf Removal BATH BNE

### 3.0. The Board and Its Authorities

The WRRB is responsible for the wildlife management functions set out in the Tłıchq Agreement in Wek'èezhìı <sup>9</sup> and shares responsibility for the management and monitoring of dıga and ɤekwò herds. The WRRB is a co-management tribunal established by the Tłıchq Agreement to exercise advisory and decision-making responsibilities related to wildlife, forest, plant, and protected areas management in Wek'èezhìı (Figure 1). The Board's legal authorities came into effect at the time the Tłıchq Agreement was ratified by Parliament.<sup>10</sup>

Sections 12.1.5 and 12.1.6 of the Agreement requires the Parties<sup>11</sup> to manage wildlife based on the principles of conservation, on an ecosystemic basis, in an adaptive fashion, and acquire and use traditional knowledge.<sup>12</sup> The WRRB's major authorities and responsibilities in relation to wildlife are further set out in Chapter 12 of the Tłıchq Agreement.<sup>13</sup>

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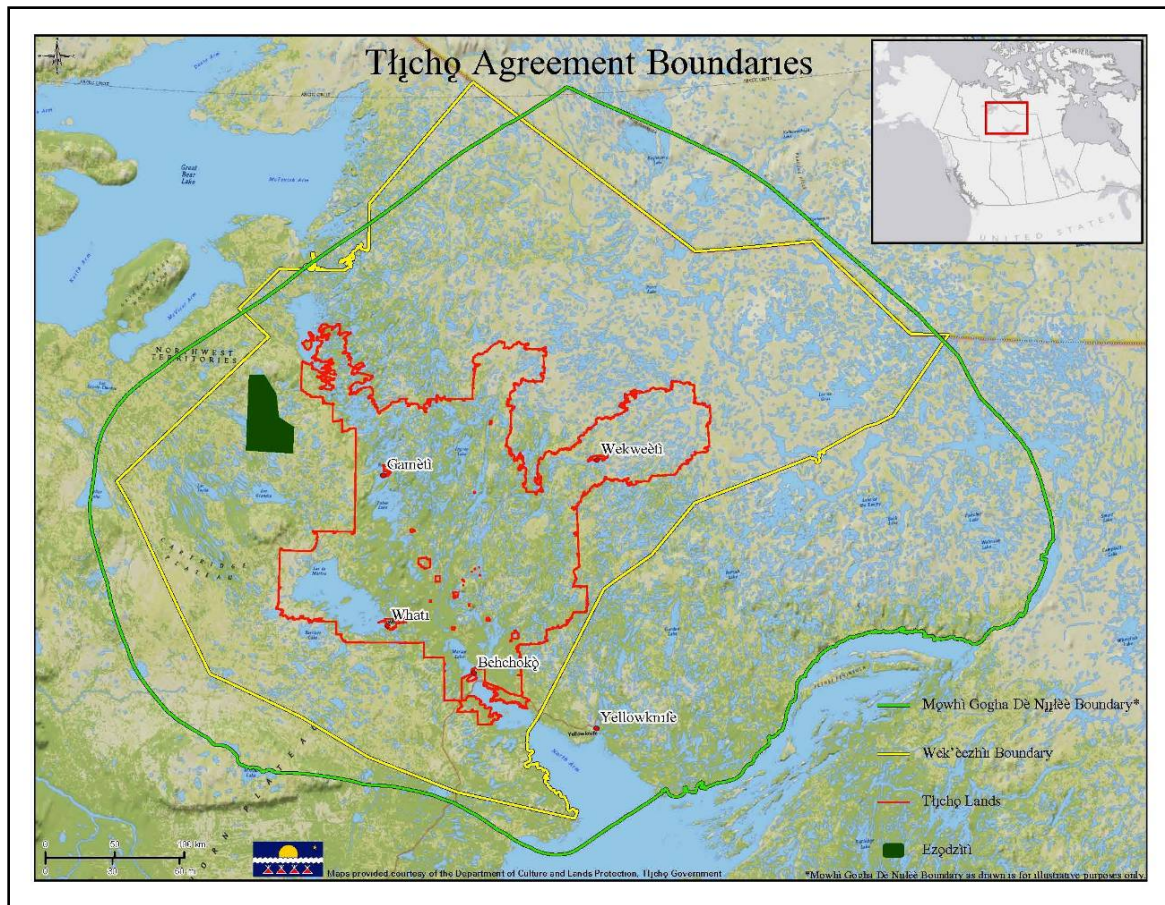
<sup>9</sup> Section 12.1.2 of the Land Claims and Self-Government Agreement Among the Tłıchq and the Government of the Northwest Territories and the Government of Canada, Indian Affairs and Northern Development, Ottawa, 2003 (hereinafter the "Tłıchq Agreement").

<sup>10</sup> Tłıchq *Land Claims and Self-Government Act*, S.C. 2005, c.1. Royal assent February 15, 2005. See s.12.1.2 of the Tłıchq Agreement.

<sup>11</sup> This includes the Tłıchq Government, the Government of the Northwest Territories, and the Government of Canada.

<sup>12</sup> See Section 12.1.5 paragraphs (a) and (d) and Section 12.1.6 of the Tłıchq Agreement.

<sup>13</sup> See Section 12 of the Tłıchq Agreement.



**Figure 1. Wek'èezhìi Management Area.**<sup>14</sup>

As required by Sections 12.5.1 and 12.5.4 of the Tłıchq Agreement, any Party<sup>15</sup> proposing a wildlife management action in Wek'èezhìi must submit a management proposal to the WRRB for review, including the establishment or adjustment of a TAH. Prior to making a recommendation, the WRRB must consult with any body that has authority over that wildlife species both inside and outside of Wek'èezhìi.

The WRRB acts in the public interest. It is an institution of public government, which makes its decisions on the basis of consensus. Part 12.1 of the Tłıchq Agreement requires the coordination of the functions of governments (authorities whose responsibilities include wildlife management among other functions).<sup>16</sup> The WRRB works closely with Tłıchq communities, TG, and GNWT. The Board also collaborates with other territorial government departments, such as Lands and Industry, Tourism and

<sup>14</sup> Department of Culture & Lands Protection, Tłıchq Government. 2014.

<sup>15</sup> As defined in the Tłıchq Agreement, "Parties" mean the Parties to the Agreement, namely the Tłıchq, as represented by the Tłıchq Government, the Government of the Northwest Territories, and the Government of Canada.

<sup>16</sup> See Section.12.1.4 of the Tłıchq Agreement.

Investment, and federal government departments, such as Environment and Climate Change Canada, Fisheries and Oceans Canada, and Crown-Indigenous Relations and Northern Affairs Canada. In addition, the WRRB works with other wildlife management authorities, Indigenous organizations, and stakeholders.

Wildlife management is a central and vital component of the Tłıchq Agreement.<sup>17</sup> The rights of Tłıchq citizens to use wildlife for sustenance, cultural, and spiritual purposes are protected by the Tłıchq Agreement and the Constitution,<sup>18</sup> subject to the management framework set out in Chapter 12.

The Tłıchq Agreement defines conservation as follows:

*“conservation” means*

- (a) the maintenance of the integrity of ecosystems by measures such as the protection and reclamation of wildlife habitat and, where necessary, restoration of wildlife habitat; and*
- (b) the maintenance of vital, healthy wildlife populations capable of sustaining harvesting under the Agreement.*

In addition to the substantive legal protection for Tłıchq citizens' harvesting rights set out in the Tłıchq Agreement, the WRRB is also bound by the requirements of fairness. Section 12.3.10 gives the Board the authority to order a public hearing on a wildlife management proposal and makes it mandatory for the WRRB to hold a public hearing when it intends to consider establishing a TAH in respect of a species or a population.

### **3.1. Rule for Management Proposals**

Under Section 12.3.6, the WRRB has the authority to make rules respecting the procedure for making applications to the Board. The WRRB has developed a Rule for Management Proposals<sup>19</sup> as a guide for making management proposal submissions, including actions taken in the issuance of licences, permits, and other authorizations.

Section 12.5.1 of the Tłıchq Agreement is mandatory. Except in an emergency situation as set out in 12.5.14, it requires that a Party, before taking *“any action for management of wildlife in Wek’èezhìi submit its proposals to the WRRB for review under 12.5.4”*. This section of the Agreement is intended to be broadly inclusive of wildlife management initiatives.

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<sup>17</sup> See Section 12.1.1 of the Tłıchq Agreement.

<sup>18</sup> *Constitution Act*, 1982, Section 35.

<sup>19</sup> <https://www.wrrb.ca/sites/default/files/REV%20FINAL%20Rule%20-%20Management%20Proposals%20-%2016oct18.pdf>.

The WRRB, depending on the nature, content, and context of a management proposal, will undertake one of three levels of review:

- Level 1 – will require Board or Board Staff (as directed by the Board) review but no public consultation;
- Level 2 – will require Board review and Board-led public consultation (no public hearing); or,
- Level 3 – will required Board review and Board-led public consultation with a public hearing.

Except where in the Board’s view the proposal will require the establishment of a TAH as stated in Section 12.3.10 of the Tłıchq Agreement, all submissions are treated initially as a Level 1 review. Following assessment, the Board has the discretion to increase the level of review as it deems appropriate. For Level 2 management proposals, the Board may establish a proceeding and an online public registry. Notification of the proceeding and a request for comments will be made via its website, newspaper, social media, and radio advertisements with a reasonable period granted to allow affected stakeholders and the public to provide comment.

Following closure of the public comment period, the WRRB reviews and provides recommendations. Level 2 management proposals may require up to 90 days for consultation, review, and response. As per Section 12.5.8 of the Tłıchq Agreement, the Board “*shall give public notice of their recommendations*” by posting them on their website ([www.wrrb.ca](http://www.wrrb.ca)).

WRRB determinations are final but recommendations made by the Board may be accepted, rejected, or varied by the Party with the jurisdiction affected by the recommendation. However, once a recommendation is accepted, that Party doing so must implement it “*to the extent of its power under legislation*”.<sup>20</sup> This framework and these relationships are central to effective wildlife management in Wek’èezhìı.

Following submission of its recommendations to a Party, the Board expects a response within 42 days of receipt of its recommendations for a Level 1 or Level 2 management proposal. Section 12.5.11 of the Tłıchq Agreement states that “*each Party with power under its laws to implement a recommendation of the WRRB made under 12.5.5, 12.5.6, 12.5.7, 13.4.1 or 14.4.1 shall accept, reject or vary such recommendation*”. A Party must tell the Board whether its recommendation has been accepted. If a recommendation is varied, the Party must provide reasons for that decision, and, in addition, provide the change in wording so that the Board and all affected persons are clear about the final outcomes of the Board proceeding and necessary implementation

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<sup>20</sup> See Sections 12.5.11 and 12.5.12 of the Tłıchq Agreement.

actions. This ensures clarity with respect to the obligations under Section 12.5.12 of the Tłıchq Agreement, that “each Party shall, to the extent of its power under legislation or Tłıchq laws, establish or otherwise implement a) a determination of the WRRB under 12.5.5 or 12.5.6; and b) any recommendation of the Board as accepted or varied by it”.

If a recommendation is rejected, the Party must provide specific reasons and an explanation of why the rejection has occurred.

#### **4.0. Previous WRRB Dìga Recommendations**

The objective of Chapter 12, Wildlife Harvesting Management, of the *Tłıchq Agreement* is to recognize the importance of wildlife and its habitat to the Tłıchq First Nation well-being, way of life, and land-based economy.<sup>21</sup> The WRRB takes this objective seriously while making its decisions. The Board also acknowledges the tremendous importance that ʔekwò and dìga play in the language, culture, and way of life of the Tłıchq people.

The Board has kept this in mind over the last decade, since receiving the first management proposal for Kòk'èetì and Sahtì ekwò, by making determinations and recommendations using scientific and Tłıchq knowledge. While the Board's decisions have dealt with harvest management actions, including TAH for the Kòk'èetì and Sahtì ekwò, the WRRB has also made recommendations related to predator management actions, biological and environmental monitoring, and cumulative effects.

Outlined below are the Board's predator management and monitoring recommendations from the 2010, 2016, and 2019 proceedings to demonstrate the effort the WRRB has put in to manage and monitor predator populations in an effort to slow and/or halt the decline of Kòk'èetì and Sahtì ekwò.

##### **4.1. 2010 Proceeding**

On November 5, 2009, TG and GNWT submitted a *Joint Proposal on Caribou Management Actions in Wek'èezhìl*, which proposed nine management actions and eleven monitoring actions, including harvest limitations, for the Kòk'èetì, Sahtì and Beverly/Ahiak ʔekwò herds.

Upon review of the proposal, the WRRB ruled that it was required to hold a public hearing. Originally scheduled for January 11-13, 2010, the public hearing took place March 22-26, 2010 in Behchokò, Northwest Territories (NT). Once the evidentiary phase of the proceeding was completed, TG requested the WRRB adjourn the hearing in order to give TG and GNWT time to work collaboratively to complete the joint management proposal.

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<sup>21</sup> See Section 12.1.1 of the Tłıchq Agreement.



On May 31, 2010, TG and GNWT submitted the *Revised Joint Proposal on Caribou Management Actions in Wek'èezhìi*. This revised proposal changed the original management and monitoring actions, including a targeted increase of wolf mortality through increased hunting and trapping effort and wolf removal programs, and incorporated an adaptive co-management framework and rules-based approach to harvesting. As such, the WRRB reconvened its public hearing on August 5-6, 2010 in Behchokò, NT, where final presentations, questions and closing arguments were made.

On October 8, 2010, the WRRB submitted its final recommendations and reasons for decision report to TG and GNWT.<sup>22</sup> Many of the recommendations were related to the Kòk'èeti and Sahtì ekwò herd and relevant management actions vital for herd recovery, including harvest restrictions. The Board also made harvest recommendations for the Beverly/Ahiak ekwò herd. Additionally, the WRRB recommended the implementation of detailed scientific and Tìchq knowledge ðekwò monitoring actions and an adaptive co-management framework; the collaborative development of best practices for mitigating effects on ðekwò during calving and post-calving, including the consideration of implementing mobile ðekwò protection measures; the monitoring of landscape changes, including fires, industrial exploration, and development, to assess potential impacts to ðekwò habitat.

Specific to dìga, the WRRB recommended three scientific and TK monitoring actions related to 1) wolf abundance (den occupancy), 2) wolf condition and reproduction, and 3) wolf harvest. TG agreed to all of the Board's TK recommendations for dìga, noting their commitment to documenting and reporting on observations and trends observed by ðekwò harvesters and elders, and indicating implementation of the Tìchq Knowledge Research and Monitoring Program within eight months (approximately September 2011).

Though GNWT indicated that it would continue current wolf den surveys to provide an index of wolf abundance, the recommendation was varied to provide a proposal with potential options and costings that are relevant to wolf monitoring, research, and management. To monitor wolf condition and reproduction as well as wolf harvest, GNWT stated that a collection report, including all intact wolf carcasses provided by harvesters, and a harvest report would be provided to the Board by June 2011.

The Board also recommended that the harvest of dìga should be increased through incentives, but assistance for harvesters to access wolves on wintering grounds should not be provided. The WRRB also recommended that focused dìga control not be implemented; however, if TG and GNWT believed that focused dìga control was

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<sup>22</sup> PR (Wolf 2020): 099 – Report on a Public Hearing Held by the Wek'èezhìi Renewable Resources Board, 22-26 March & 5-6 August 2010, Behchokò, NT.

necessary in the future, a management proposal would be required for WRRB consideration. TG and GNWT accepted both of these recommendations as written.

## 4.2. 2016 Proceedings

On December 15, 2015, TG and GNWT submitted the “*Joint Proposal on Caribou Management Actions for the Bathurst Herd: 2016-2019*” and the “*Joint Proposal on Management Actions for Bluenose-East Caribou 2016-2019*” to the Board outlining proposed management actions for the Kòk’èetì and Sahtì ekwò herds in Wek’èezhì, including new restrictions on hunter harvest, predator management, and ongoing monitoring. More specifically, TG and GNWT proposed implementing a herd wide TAH for both ʔekwò herds and conducting a feasibility assessment of a full range of dìga management actions. The WRRB considered the proposed restrictions of harvest as the establishment of a TAH and, therefore, was required to hold a public hearing. The Kòk’èetì ekwò public hearing took place February 23-24, in Yellowknife, NT while the Sahtì ekwò public hearing took place April 6-8, 2016 in Behchokò, NT.

On May 26, 2016, the WRRB submitted its final determinations and recommendations and Part A Reasons for Decision Report for the Kòk’èetì ekwò herd to TG and GNWT.<sup>23</sup> On June 10, 2016, the Board submitted its final determinations and recommendations and Part A Reasons for Decision Report for the Sahtì ekwò herd to TG and GNWT.<sup>24</sup> Both reports dealt with the proposed harvest management actions for each herd as well as the proposed dìga feasibility assessment. The Board recommended that the dìga feasibility assessment set out in the proposal be led by the Board with input and support from TG and GNWT. GNWT and TG varied this recommendation noting that since ENR initiated work on a feasibility assessment in November 2015 with TG, WRRB, North Slave Métis Alliance (NSMA), Yellowknives Dene First Nation, and Łutsel K’e Dene First Nation (LKDFN), ENR would continue as lead with a completion date for a final report by October 2016. The Board continued to support the implementation of the Community-based Dìga Harvesting Project as a training program, subject to several conditions. As well, if deemed successful, the Community-based Dìga Harvesting Project would be extended in 2016-2017 to the Sahtì ekwò herd and incorporated into an adaptive wolf management approach. TG and GNWT accepted these two recommendations as written.

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<sup>23</sup> PR (Wolf 2020): 100 - Report on a Public Hearing Held by the WRRB, 23-24 Feb 2016, Yellowknife, NT., & Reasons for Decisions Related to a Joint Proposal for the Management of the Bathurst ekwò (Barren-ground caribou) Herd - Part A

<sup>24</sup> PR (Wolf 2020): 102 - Report on a Public Hearing Held by the WRRB, 6-8 April 2016, Behchokò, NT., & Reasons for Decisions Related to a Joint Proposal for the Management of the Bluenose-East ʔekwo (Barren-ground caribou) Herd - Part A.

On September 27, 2016, the WRRB submitted its final recommendations and Part B Reasons for Decision Report for the Kòk'èetì ekwò herd to TG and GNWT.<sup>25</sup> On October 3, 2016, the WRRB submitted its final recommendations and Part B Reasons for Decision Report for the Sahtì ekwò herd to TG and GNWT.<sup>26</sup> In addition to recommendations for TK research and monitoring programs focusing on dìga and *Sahcho* (grizzly bear), the Board recommended a biological assessment of *sahcho*. While TG strongly agreed that TK studies are required, TG varied the Board's recommendation by combining all TK research and monitoring programs into one comprehensive study, based on the elder's direction, for completion by September 2018. GNWT and TG proposed that the NWT Species at Risk Committee's Status Report for Grizzly Bears in the NWT would provide a thorough biological assessment and would be released in April 2017. Additionally, GNWT and TG would engage with the Government of Nunavut to discuss grizzly bears within the Kòk'èetì and Sahtì ekwò herd ranges.

### 4.3. 2019 ʔekwò Proceedings

On January 14, 2019 and January 22, 2019, respectively, the Tłıchų Government (TG) and GNWT submitted the "*Joint Proposal on Management Actions for the Bluenose-East ʔekwò (Barren-ground caribou) Herd 2019-2021*" and the "*Joint Proposal on Management Actions for the Bathurst ʔekwò (Barren-ground caribou) Herd 2019-2021*" to the Board outlining proposed management actions for the Sahtì and Kòk'èetì ekwò herds in Wek'èezhìı, including restrictions on hunter harvest, predator management, and ongoing monitoring. The management actions proposed by TG and GNWT in the Joint Proposals were grouped under the five categories: harvest, predators, habitat and land use, and education as well as research and monitoring. Specifically, the Joint Proposals proposed the following management actions for dìga: 1) joint dìga management proposals for Kòk'èetì and Sahtì ekwò ranges; 2) continued TG program to train dìga harvesters; 3) increased GNWT incentives for dìga harvesters; and 4) collaboration between NWT and NU managers about predator management.

The WRRB considered the proposed new restrictions of harvest for the Sahtì ekwò herd as the establishment of a TAH and, therefore, was required to hold a public hearing. The WRRB held a public hearing in Behchokò, NT on April 9-11, 2019. Since the Board was not required to consider a change in harvest restrictions for the Kòk'èetì ekwò herd, the WRRB undertook a Level 2 management proposal review, as per its Rule for

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<sup>25</sup> PR (Wolf 2020): 101 - Reasons for Decisions Related to a Joint Proposal for the Management of the Bathurst ekwò (Barren-ground caribou) Herd - PART B.

<sup>26</sup> PR (Wolf 2020): 137 - Reasons for Decisions Related to a Joint Proposal for the Management of the Bluenose-East (Barren-ground caribou) Herd 2016, PART B.

Management Proposals.<sup>27</sup> The Board established a proceeding, which included an open public comment period from February 4 to April 5, 2019.

On June 14, 2019, the Board submitted its final determinations and recommendations and Reasons for Decision Report for the Sahti ekwò herd to TG and GNWT.<sup>28</sup> The WRRB recommended that GNWT provide harvest information from its Enhanced North Slave Dìga Harvest Incentive Program to allow the Board to determine the success of the program. Further, the Board recommended that GNWT and TG develop a framework to evaluate the effectiveness of the Enhanced North Slave Dìga Harvest Incentive Program in achieving ʔekwò conservation goals. GNWT and TG accepted the recommendation to provide harvest information while varying the timeline to develop a framework to evaluate the effectiveness of the Enhanced North Slave Dìga Harvest Incentive Program. The WRRB also recommended that GNWT and TG monitor *Nògha* (wolverine) populations in Wek'èezhìi and work cooperatively with the Government of Nunavut (GN) to protect the calving grounds of the Sahti ekwò from predators. GNWT and TG varied the nògha recommendation to undertake a review of existing monitoring of nògha abundance and distribution in the NWT to be used for consideration of potential future monitoring. Further, GNWT and TG varied the recommendation to work cooperatively with GN for calving ground protection to engagement with GN to explore methods that may be used to reduce predation on the Sahti ekwò calving grounds.

On October 4, 2019, the WRRB submitted its final recommendations and Reasons for Decision Report for the Kòk'èeti ekwò herd to TG and GNWT.<sup>29</sup> To improve the understanding of the role of predators on the decline of the Kòk'èeti ekwò herd, the WRRB recommended that TG and GNWT provide information on the sighting rates of predators and the criteria to be used in determining the targeted number of predators to be removed annually. TG and GNWT varied this recommendation to provide, by December 2020, annual sighting rates and criteria to determine target levels of dìga for annual removal.

The WRRB recommended that harvest information from GNWT's Enhanced North Slave Dìga Harvest Incentive Program and TG's Community-based Harvest Training Program be provided to determine the success of the program. The Board also recommended that GNWT and TG develop frameworks to 1) evaluate the effectiveness of the Enhanced North Slave Dìga Harvest Incentive Program in achieving ʔekwò conservation goals and 2) evaluate how the Community-based Harvest Training

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<sup>27</sup> <https://www.wrrb.ca/sites/default/files/REV%20FINAL%20Rule%20-%20Management%20Proposals%20-%202016oct18.pdf>.

<sup>28</sup> PR (Wolf 2020): 104 - Report on a Public Hearing Held by the Wek'èezhìi Renewable Resources Board 9-11 April 2019 Behchokò, NT & Reasons for Decisions Related to a Joint Proposal for the Management of the Sahti Ekwò (Bluenose-East Caribou) Herd.

<sup>29</sup> PR (Wolf 2020): 103 - Reasons for Decisions Related to a Joint Proposal for the Management of the Kòk'èeti Ekwò (Bathurst caribou) Herd. 2019.

Program will contribute to future d̄iga harvesting and management. TG and GNWT varied the timelines to provide harvest information as well as evaluate the effectiveness of both programs. Additionally, the Board recommended that TG and GNWT coordinate the Enhanced North Slave D̄iga Harvest Incentive Program and the Community-based D̄iga Harvest Training Program to determine their role in removing the targeted number of d̄iga. TG and GNWT varied this recommendation to ensure that harvest of d̄iga is contributing to the conservation of ʔekw̄ by using both caribou-centered and wolf-centered indicators in their wolf management proposals.

The WRRB is collaboratively working with TG and GNWT on a saḥcho biological and management feasibility assessment. In order to improve efficiencies, the Board recommended that n̄gha be included in this assessment and to work cooperatively with the Government of Nunavut to jointly manage predators across territorial borders for the K̄k'̄et̄i and Saḥti ekw̄ herds. TG and GNWT accepted the n̄gha recommendation as written. The GN recommendation was varied to GNWT and GN further developing the existing Memorandum of Understanding for collaboration in the shared management responsibilities of wildlife, including ʔekw̄ and their ranges.

#### **4.4. 2019 Predator Management Recommendations**

In January 2019, the WRRB received joint management proposals for the K̄k'̄et̄i and Saḥti ekw̄ herds. However, despite WRRB recommendations for the implementation of predator control dating as far back as 2010, neither of the management proposals included a plan for predator management in either the K̄k'̄et̄i or Saḥti ekw̄ herd ranges. Instead TG and GNWT indicated their intention to address the control of predators, more specifically d̄iga, in a separate joint management proposal later in the spring of 2019.

The WRRB felt the situation for both of these herds was dire. During its 2016 public hearings and the 2019 TG-ENR ʔekw̄ consultation tours, the Board heard from the T̄ich̄ community members that d̄iga continued to put pressure on ʔekw̄ populations and they would like to see action taken immediately. The 20% rate of annual decline of the K̄k'̄et̄i and Saḥti ekw̄ herds was in the Board's opinion so serious that waiting any longer to act would make recovery of the herds even more difficult. The Board was convinced that early action was essential. As such, the Board chose not to wait for ENR and TG to submit their predator management proposal to the Board in spring of 2019. Consequently, the WRRB put forward their predator management proposal<sup>30</sup> to begin in May 2019 in order to promote the recovery of the K̄k'̄et̄i and Saḥti ekw̄ herds.

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<sup>30</sup> PR (Wolf 2020): 007 - WRRB to TG and GNWT Re: Predator Management Recommendations, Dated 6 February 2019.

The WRRB supported continuing the ENR's Enhanced North Slave Dìga Harvest Incentive Program and the TG's Community Based Dìga Harvesting Project as education tools. The WRRB recommended that dìga monitoring be undertaken so that population estimates, or indexes would be generated. In addition, as much information as possible, including condition, diet, and reproductive status, would be collected from each harvested dìga. In accepting this recommendation, GNWT and TG noted that they would develop and pilot a protocol for monitoring relative abundance of dìga in an adaptive manner to evaluate feasibility of sampling and robustness of results.

The WRRB recommended that dìga management be undertaken in Wek'èezhìi, using the *“Wolf Technical Feasibility Assessment: Options for Managing Wolves on the Range of the Bathurst Barren-ground Caribou Herd”*<sup>31</sup> to determine the most effective, humane, and cost-efficient methods that would have the least impact and disturbance on the ʔekwò herds themselves. Further, the Board recommended that dìga management should be closely monitored for effectiveness of halting or slowing the decline of the Kòk'èetì and Sahtì ekwò herds in order to provide future harvesting opportunities. ENR and TG accepted these recommendation as written.

By December 2019, no management proposal had been submitted to the WRRB. As such, on December 18, 2019, the Board again requested that TG and GNWT submit a dìga management proposal on or before January 31, 2020.

## 5.0. Summary of 2020 Wildlife Management Proposal and Board Process

### 5.1. Receipt of 2020 Joint Proposal

On January 31, 2020, the WRRB received a joint management proposal, entitled *“Joint Proposal on Management Actions for Wolves (dìga) on the Bathurst and Bluenose-East Barren-ground Caribou (ʔekwò) Herd Winter Ranges: 2020 – 2025”*,<sup>32</sup> outlining proposed management actions for dìga in Wek'èezhìi. Specifically, aerial shooting of dìga on the Kòk'èetì and Sahtì ekwò herd winter ranges as part of an overall tiered approach designed to meet target dìga removal levels. Following an initial assessment of the Joint Proposal, the Board determined that a Level 2 review was appropriate, as per its Rule for Management Proposals.

The Board initiated its 2020 Wolf Management Proceeding on March 2, 2020 and established an online public registry: <http://www.wrrb.ca/public-information/public-registry>. Additionally, on March 2, 2020, public notice of the WRRB decision to open the

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<sup>31</sup> PR (Wolf 2020): 106 - Wolf Technical Feasibility Assessment – Options for managing wolves on the range of the Bathurst barren-ground caribou herd.

<sup>32</sup> PR (Wolf 2020): 001 - GNWT and TG Joint Proposal on Management Actions for Wolves (dìga) on the Bathurst and Bluenose-East Barren-ground Caribou (ʔekwò) Herd Winter Ranges: 2020 – 2025.

2020 Wolf Management Proceeding was provided to potentially interested organizations in and out of Wek'èezhìi via email, WRRB website and social media.

On March 9, 2020, after hearing from GNWT and TG, the WRRB held an emergency meeting and revised the procedure to be used to review the Proposal. The WRRB decided to amend its procedure for the review of the dīga management actions occurring in 2020 as proposed in the Joint Proposal to a Level 1 review and to treat these 2020 dīga management actions as a pilot project only. Further, the Board requested that TG and GNWT resubmit in August 2020, a revised proposal for the dīga management actions for 2021-2025 for a Level 2 review. This revised proposal would include lessons learned from the implementation of the management actions occurring in 2020. Notifications of the revised proceeding schedule were made in the NWT News/North and Yellowknifer newspapers on March 18, 20, 23, 25, 27, and 30, 2020.

The proceeding was conducted in accordance with the WRRB's *Rules of Procedures, June 14, 2017*.<sup>33</sup>

## 5.2. Receipt of 2020 Revised Joint Proposal

On August 25, 2020, GNWT and TG submitted a revised joint management proposal, entitled "*Revised Joint Proposal on Management Actions for Wolves (dīga) on the Bathurst and Bluenose-East Barren-ground Caribou (ᑲekwò) Herd Winter Ranges: 2021 – 2024*" (hereafter called the Revised Joint Proposal),<sup>34</sup> as well as a technical report<sup>35</sup> with lessons learned from the implementation of the 2020 Pilot Project and a plain-language summary<sup>36</sup>. Following an initial assessment of the Revised Joint Proposal, the Board determined that a Level 2 review was appropriate, as per its Rule for Management Proposals.

Public notice of the WRRB decision to continue the 2020 Wolf Management Proceeding was provided to potentially interested organizations in and out of Wek'èezhìi via email, WRRB website and social media. Notifications of the revised proceeding schedule were made in the NWT News/North, Nunavut News, and Yellowknifer newspapers on September 9, 11, 14, 16, 18, and 21, 2020. The public comment period was open until October 23, 2020.

An additional technical report on pathology was not submitted with the Revised Joint Proposal in August 2020, but the Board felt that it was essential to be able to determine

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<sup>33</sup> [https://www.wrrb.ca/sites/default/files/WRRB%20Rules%20of%20Procedure%2014jun2017\\_1.pdf](https://www.wrrb.ca/sites/default/files/WRRB%20Rules%20of%20Procedure%2014jun2017_1.pdf).

<sup>34</sup> PR (Wolf 2020): 017 - GNWT & TG's Revised Joint Proposal on Management Actions for Wolves (dīga) on the Bathurst and Bluenose-East Barren-ground Caribou (ᑲekwò) Herd Winter Ranges: 2021 – 2024.

<sup>35</sup> PR (Wolf 2020): 018 - 2020 Wolf Management Pilot Program Technical Report.

<sup>36</sup> PR (Wolf 2020): 017 - GNWT & TG's Revised Joint Proposal on Management Actions for Wolves (dīga) on the Bathurst and Bluenose-East Barren-ground Caribou (ᑲekwò) Herd Winter Ranges: 2021 – 2024.

the humaneness of the Pilot Project. As such, the WRRB requested that the GNWT provide the “*Wildlife Pathologist’s Final Report on the Necropsy of Wolves Taken by Aerial Removal*”<sup>37</sup> by October 1, 2020. The report was received as requested by the deadline date.

Following the completion of the Science and Traditional Knowledge Technical Sessions, the WRRB reviewed its work plan and schedule to discuss whether a public hearing would be required to ensure sufficient consultation. On October 16, 2020, the Board provided notice that no significant public concern had been identified and, as such, would not hold a public hearing for the 2020 Wolf Management Proceeding.

The public record was closed on October 23, 2020. Final written arguments were submitted by registered participants on October 28, 2020, and by TG and ENR on October 30, 2020. The WRRB’s deliberations followed.

### **5.3. Registered Participants**

Interested organizations or individuals were required to register as participants via the Board’s website or to notify the WRRB in writing via email by September 11, 2020. Two organizations registered by the deadline date: NSMA and LKDFN. Full participant status was granted to NSMA and LKDFN on September 18, 2020. Notice of participants was made on September 25, 2020.

### **5.4. Public Comment Period**

The public comment period was first opened on March 2, 2020. However, following the Board decision on March 9, 2020 to treat the proposed 2020 dīga management actions as a pilot project only, and to request that GNWT and TG submitted a revised joint management proposal in August 2020, the public comment period was suspended. Upon receipt and review of the revised joint management proposal in August 2020, the public comment period was reopened from September 4 to October 23, 2020.

The Board received 22 comments from 12 individuals or organizations. All public comments are available on the public registry.

### **5.5. Information Requests**

In order to obtain the information necessary for the WRRB to consider as part of the record of this proceeding, a series of Information Requests (IRs) were issued to the TG,

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<sup>37</sup> PR (Wolf 2020): 108 - Veterinary Assessment of Aerial Removal Procedures: GNWT and Tłıchǫ Government 2020 Wolf (Dīga) Management Pilot Program.



GNWT and the registered participants. The IRs and responses are all available on the online public registry.

The first round of IRs was issued March 2, 2020, requesting that TG and GNWT provide additional Tłıchǫ knowledge and scientific information and rationale on the proposed management and monitoring actions. GNWT and TG provided their responses on March 13, 2020. On September 18, 2020, the Board requested consent from all Parties to post supporting documentation referenced by TG and ENR in their management proposal and IR No.1 responses to the public registry. No concerns were raised, and documents were posted after September 28, 2020.

The second round of IRs was issued October 15, 2020, requesting additional information related to modelling, mapping, and biological indicators. Additionally, the LKDFN submitted 13 IRs to TG and GNWT, and TG submitted one IR each to NSMA and LKDFN. GNWT and TG provided their responses on October 22, 2020. The NSMA and LKDFN provided their response on October 21 and October 22, 2020, respectively.

## **5.6. Technical Sessions**

To ensure that any outstanding scientific and traditional knowledge (TK) technical aspects of the proceeding were clarified, the Board hosted a science technical session as well as a TK technical session. The information gathered during each session is available on the public record as part of the body of evidence used by the WRRB to make its final decision.

### ***5.6.1 Science Technical Session***

The WRRB notified the Parties of the science technical session on September 25, 2020 along with a list of topics for discussion, including 1) the projected effects on caribou, based on PR (Wolf 2020): 019 - Summary Caribou Population Modeling of Varying Levels of Wolf Removal, and scenarios with a higher wolf abundance; 2) estimating wolf numbers, including the Ungulate Biomass Index (UBI) and its sensitivity to wolf removals and alternate prey. Options for additional methods; 3) herd assignment of wolf removals and herd overlap, including discussion on how to reduce uncertainty and the wolf collaring program; 4) the effectiveness of ground harvesting in removing wolves assigned to Bathurst or Bluenose East herds and how to increase effectiveness; and 5) discussion of the program's adaptive management, including the precision and accuracy of candidate indicators and how to identify benchmarks.

The science technical session was hosted online via Zoom on October 5, 2020. A summary of the technical session was produced and is available on the public registry.

## 5.6.2 Traditional Knowledge Technical Session

The WRRB notified the Parties of the TK technical session on October 2, 2020, along with a list of topics for discussion, including 1) maintaining a balance between dīga and ʔekwò and 2) managing a balance between dīga, ʔekwò, and people.

It was anticipated that the list of topics would bring out Dene perspectives on dīga movements, harvest of ʔekwò by dīga, and predator control.

The TK technical session was hosted online via Zoom on October 13, 2020. Elders from each Tłıchq̓ community were supported by an interpreter and a youth for technical support. A summary of the technical session was produced and is available on the public registry.

## 6.0. Why is the Board Considering Dīga Management?

### 6.1. ʔekwò Decline

The Kòk'èetì and Sahtì ekwò herds have both declined significantly in recent years and the situation for both herds is dire. The decline of the Kòk'èetì ekwò herd was first documented in 1996 when the population was estimated at 349,000 animals, down from 472,000 in 1986.<sup>38</sup> Management actions to date have included harvest restrictions and dīga harvest incentives, starting in 2010; these actions have failed to halt the decline, and the herd was estimated at 8,200 animals in 2018.<sup>39</sup> The decline of the Sahtì ekwò herd was first documented in 2013 when it was estimated at 68,000 animals, down from 121,000 in 2010.<sup>40</sup> In 2018, the herd's population was estimated at 19,300 animals.<sup>41</sup> TG and GNWT's closing argument stated that *"the Kòk'èetì and Sahtì ekwò herds had reached the lowest numbers on record"*.<sup>42</sup>

During the 2019 Kòk'èetì and Sahtì ekwò proceedings, the Board repeatedly heard from governments, communities, and members of the public of their concerns over the continued decrease of the ʔekwò herds, including recognition of the rapid rate of the decline. Vital rates associated with the herd, including the cow survival rate, calf recruitment, and pregnancy rate, all indicated that the herds would likely continue to decline.<sup>43</sup>

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<sup>38</sup> PR (Wolf 2020): 017 - GNWT & TG's Revised Joint Proposal on Management Actions for Wolves (dīga) on the Bathurst and Bluenose-East Barren-ground Caribou (ʔekwò) Herd Winter Ranges: 2021 – 2024.

<sup>39</sup> Ibid.

<sup>40</sup> Ibid.

<sup>41</sup> Ibid.

<sup>42</sup> PR (Wolf 2020): 172 - GNWT & TG Final Written Comments - Revised Joint Wolf Management Proposal.

<sup>43</sup> PR (Wolf 2020): 104 - Report on a Public Hearing Held by the Wek'èezhì Renewable Resources Board 9-11 April 2019 Behchokò, NT & Reasons for Decisions Related to a Joint Proposal for the Management of the Sahtì Ekwò

Despite the management actions taken over the past 13 years, the Kòk'èetì and Sahtì ekwò herds are still declining, and recovery of the herds remain uncertain. In 2016, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assessed barren-ground caribou (*Rangifer tarandus* barren-ground population) as Threatened. The status of barren-ground caribou under federal Species at Risk legislation is currently under review. Within the NWT, barren-ground caribou (*Rangifer tarandus groenlandicus*) were assessed by the Species at Risk Committee (SARC) as Threatened in 2017 and were later listed as Threatened under the *Species at Risk (NWT) Act* in 2018.<sup>44</sup> A barren-ground caribou recovery strategy for the NWT was completed and released to the public on July 9, 2020. The Conference of Management Authorities has until April 9, 2021 to develop a consensus agreement on the implementation of the recovery strategy and management plan.

The Revised Joint Proposal did not describe rates of calf or adult survival for the Kòk'èetì and Sahtì ekwò herds but did acknowledge that the proposed dìga removal actions directly impact on ʔekwò survival. During the Science Technical Session, GNWT updated the ʔekwò adult survival rates, which revealed, that for the Kòk'èetì ekwò herd, an annual trend toward increased survival since 2016 has continued (Figure 2).<sup>45</sup> For 2018 and 2019, the annual survival rates were 92% and 95%, respectively, with the trend toward increased survival being stronger on the summer range than the winter range.<sup>46</sup> For the Sahtì ekwò herd, adult survival stabilized at 85% in 2018-2019 (Figure 3).<sup>47</sup>

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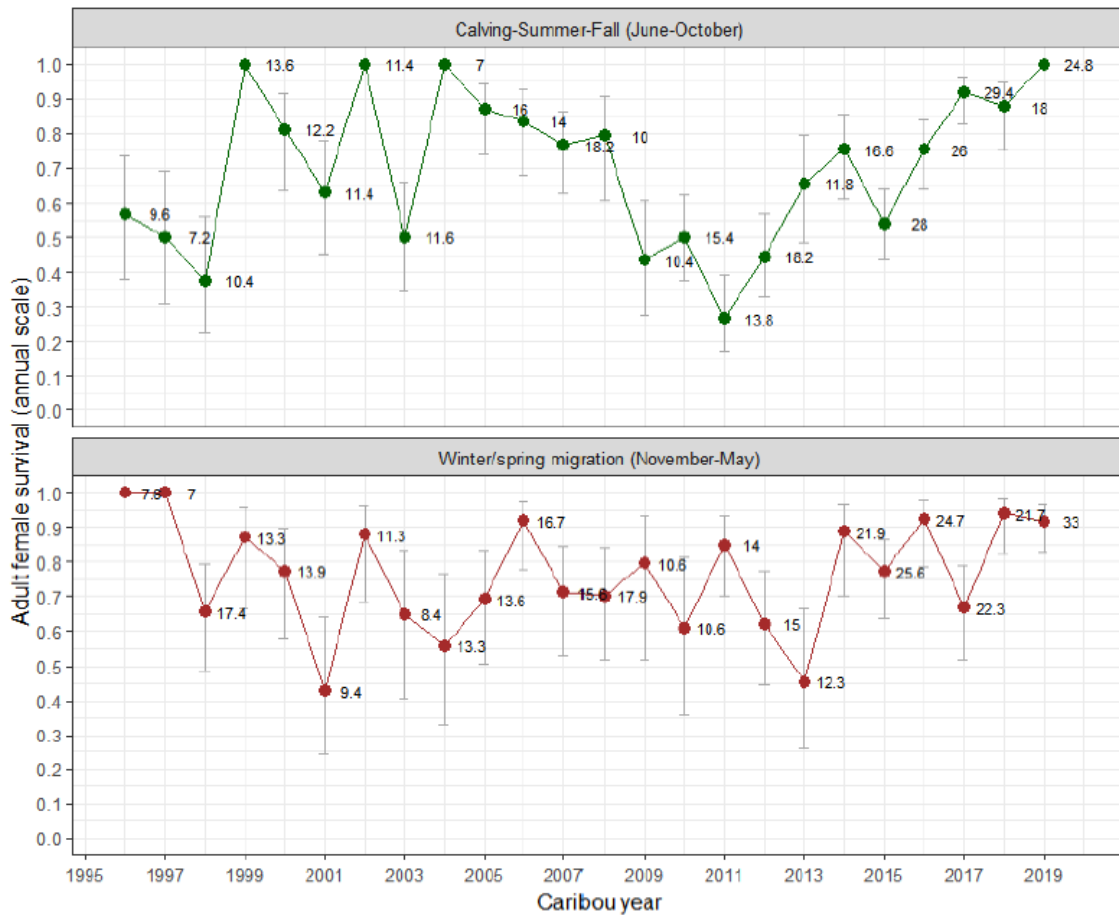
(Bluenose-East Caribou) Herd; and PR (Wolf 2020): 103 - Reasons for Decisions Related to a Joint Proposal for the Management of the Kòk'èetì Ekwò (Bathurst caribou) Herd. 2019.

<sup>44</sup> <https://www.nwt-species-at-risk.ca/species/barren-ground-caribou>.

<sup>45</sup> PR (Wolf 2020): 118 - Commitment #3 - WRRB's Science Technical Session, October 5, 2020.

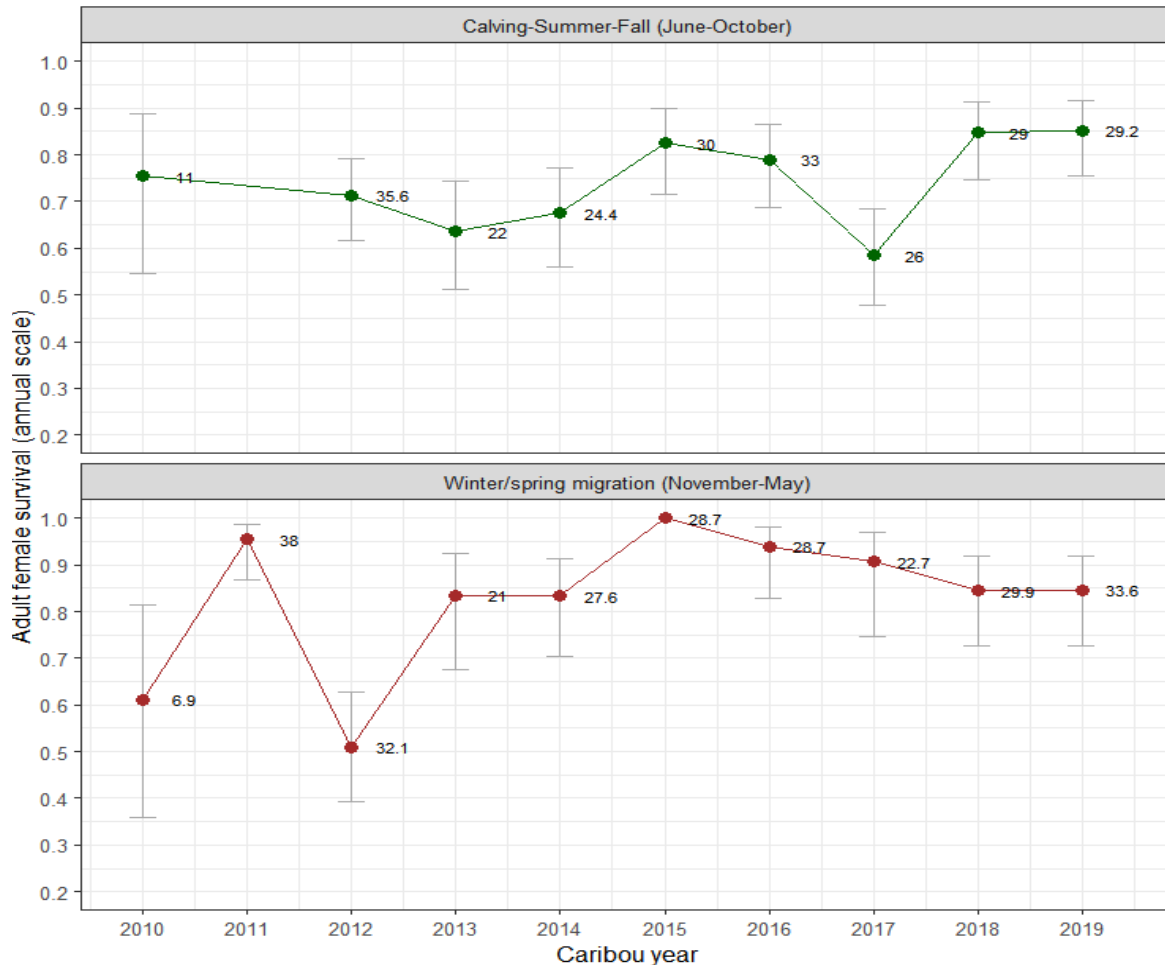
<sup>46</sup> Ibid.

<sup>47</sup> Ibid.



**Figure 2. Seasonal survival rate estimates for the Kòk'èti ekwò herd (note that they are on the annual scale for comparison purposes). The mean number of collars available each month is shown beside each estimate.<sup>48</sup>**

<sup>48</sup> PR (Wolf 2020): 118 - Commitment #3 - WRRB's Science Technical Session, October 5, 2020.



**Figure 3. Seasonal survival rates for the Sahtì ekwò herd. Note that rates are expressed on the annual scale. The mean number of collars available each month is shown beside each estimate.<sup>49</sup>**

The Revised Joint Proposal acknowledges that traditional and scientific knowledge describes barren-ground Ɂekwò herds as having 30-60 year cycles in abundance.<sup>50</sup> The cycles may vary because of many factors (harvest, habitat, predators, climate, and disease). In the past, Tłıchq elders would say there are enough or not enough Ɂekwò to feed a camp/extended family or community, which is documented in *“Caribou Migration and the State of the Habitat”*.<sup>51</sup> During the TK Technical Session, the Tłıchq elders referred to the bigger picture in relation to the decline of Ɂekwò numbers. They did not focus only on dıga. They referred to the ongoing reduction of Ɂekwò over time as more people using resources that were once only used by Indigenous people. They discussed the slow, consistent decline and changes associated with an alternative form

<sup>49</sup> PR (Wolf 2020): 118 - Commitment #3 - WRRB's Science Technical Session, October 5, 2020.

<sup>50</sup> PR (Wolf 2020): 017 - GNWT & TG's Revised Joint Proposal on Management Actions for Wolves (dıga) on the Bathurst and Bluenose-East Barren-ground Caribou (Ɂekwò) Herd Winter Ranges: 2021 – 2024.

<sup>51</sup> PR (Wolf 2020): 081 – Wolf: Tłıchq Knowledge and Perspective; and PR (Wolf 2020): 054 - Ekwò Nàxoède K'è - Boots on the Ground 2018 Results.

of decision-making and behaviour causing changes to the migration routes and, therefore, ʔekwò range. They also referred to resulting occurrences associated with climate change and fires that have changed the interaction between animals, and the reduction of ʔekwò habitat.<sup>52</sup>

The elders recommended there should be TK research projects over several years to really grapple with the complexity of the current situation that is impacting all animals. The elders know that TK research projects will provide them with information they would understand and allow them the time to observe and discuss how to maintain a balance between all animals and their habitats given the current scenario.

A member of the public provided a mathematical modelling paper on ʔekwò cycles. The analysis attributes the cycles to habitat productivity.<sup>53</sup> The model fits a regular sine curve to estimated herd size, then projects the curve forward in time that mirrors previous cycles. This apparent inevitability of recovery led the paper's senior author to suggest that dīga control is unnecessary for recovery<sup>54</sup>. However, the author also noted that the mathematical analysis does not describe whether dīga control would shorten the recovery time for the Kòk'èetì and Sahtì ekwò herds. Another member of the public commented on the mathematical analysis and ʔekwò cycle but also commented<sup>55</sup> on how technology (radios, radio-collars, ice-roads high-speed snow machines etc.) has made the current low in ʔekwò caribou numbers so different because the ʔekwò are never out of reach.

## 6.2. Dīga Status and Tìchq Knowledge

Nationally, the northern grey wolf (*Canis lupus occidentalis*) has been assessed as Not at Risk by COSEWIC in 1999. In the NWT, the SARC has not assessed dīga. The WRRB considers dīga as part of ʔekwò ecology, i.e., the role of dīga can change and contribute to either increasing the decline or slowing the recovery of ʔekwò.<sup>56</sup> As expressed by the Tìchq elders during the TK Technical Session, the balance between ʔekwò, dīga, and people has changed.<sup>57</sup>

The Board recognizes the cultural and biological importance of dīga and their role in the ecosystem and their cultural significance. Their importance within the ecosystem was expressed by Elder Joe Suzie Mackenzie,

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<sup>52</sup> PR (Wolf 2020): 124 - WRRB Traditional Knowledge Technical Session Summary, October 13, 2020.

<sup>53</sup> PR (Wolf 2020): 114 - Do North American Migratory Barren-Ground Caribou Subpopulations Cycle?

<sup>54</sup> PR (Wolf 2020): 113 - Public Comment from E. Bonello to the WRRB; and PR (Wolf 2020): 145 - Additional Public Comment from E. Bongelli to the WRRB.

<sup>55</sup> PR (Wolf 2020): 148 - Public Comment from D. Olesen to the WRRB.

<sup>56</sup> PR (Wolf 2020): 106 - Wolf Technical Feasibility Assessment – Options for managing wolves on the range of the Bathurst barren-ground caribou herd.

<sup>57</sup> PR (Wolf 2020): 124 - WRRB Traditional Knowledge Technical Session Summary, October 13, 2020.

*“Wolves, [bears], fox, raven and people are supposed to eat ʔekwò [barren ground caribou]. Raven and fox scavenge on the ʔekwò and wolves, grizzly and people harvest the ʔekwò.”<sup>58</sup>*

Further, the ecosystem is strengthened by social relationships between dīga and other animals as is explained in the Tłı̄chq̄ story, told by Elder Joe Mantla, where dīga, with the cooperation of others, freed the ʔekwò corralled by Tatsò (raven) so all the animals, including humans, would benefit.

*“At one time Raven, could eat anything. He could hunt animals for food. Then Raven became very greedy. Raven could fly and could see everything, so was very knowledgeable. Others depended on Raven for knowledge of where animals such as the ʔekwò were travelling. Raven was responsible for the survival of others who were restricted to the ground. Raven and Wolf were brothers-in-law as Wolf’s sister was married to Raven and Raven’s sister was married to Wolf. Both Raven and Wolf were k`àowo for their camps. Wolf was a good hunter, so he had many people following him. Even though he killed a lot of ʔekwò, the meat was gone in no time because so many people followed Wolf. Raven was more powerful than Wolf because Raven was considered k`àowodeè (an important leader who knows everything because – in this case – Raven could see everything from the air). He flew and could see everything. He had the ability to provide people with information because he knew everything. There was no food, and everyone was starving. It is said that Wolf and Raven would meet and tell stories, everyone listened. Once they met at Wolf’s house. They took turns telling stories. Wolf noticed that Raven was happy. He said, ‘Raven, my brother-in-law, you are happy, yet we are starving. We will starve to death unless we find food. You, who are flying around, do you know where all the ʔekwò are? You are happy about something. What is it? I can hardly make it around, I am so hungry for food’. Raven denied that he knew anything. ‘My brother-in law, there is nothing around. We are both in the same predicament; there are no ʔekwò around’. Wolf could not understand why Raven was so happy, so when Raven was telling a story, Wolf went out and told the kids, ‘Find Raven’s packsack, look in it and see if there is anything there. He may be carrying ʔekwò meat with him. So look’. The kids looked and they found dried meat. After a while Raven said, ‘My brother-in-law, it is getting dark, I’m going home. My home is very far.’ Wolf said, ‘Yes, it is time. It is late.’ Raven left. Wolf told two men with... [the intelligence] to work together. Each had the ability to see a long way, so they watched where he went. The men watched Raven travel towards the sunrise. Finally, after one put charcoal on his eyes and the other wiped it off, the one with charcoal could see further. He saw where Raven was hiding all the ʔekwò, and he saw that they were contained behind a snow fence. Wolf sent for Fox and told*

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<sup>58</sup> PR (Wolf 2020): 081 - Wolf: Tłı̄chq̄ knowledge and perspective.

*Fox, 'Go and find the fire. Put your tail in the fire, and free the ʔekwò'. Fox travelled to the ʔekwò. When he arrived, he lit his tail on fire and walked among the ʔekwò. The smoke bothered them, and they ran away from the smoke even though the snowbank was high, and they do not like the snow touching their bellies. That is the reason Fox now has a black tip on his tail. Raven was upset when the ʔekwò ran free. He felt they were his; he had become greedy. Wolf spoke strongly to Raven, 'We are living here together. We are here to help each other and because you are greedy, you are not helping others. I am your brother-in-law. Do you want your sister to starve? Do you want my sister, your wife, to starve?' Wolf and the other people put Raven in a circle and talked to him. They talked and talked to him. They knew they would have to be harsh, as the people almost starved. People who deliberately hide or steal food from others should be excluded from the group. Finally, after listening to everyone, Wolf decided Raven could only eat decomposing food because he had caused so much distress by hoarding fresh meat. Wolf said, 'When the animals die you will eat them. People will live around you and you will eat their garbage. You can no longer kill for food'. That is how Raven lives now. When water is poured outside, Raven drinks the dirty water. When garbage is put out, he will eat it and that is how he survives. Joe continued saying 'What a thing to happen! It is pitiful for a hunter to lose his right to hunt! That is what happened to Raven. It was very 'pitiful', and is very degrading for a great hunter, who had also been an important k`àowodeè to lose the ability to hunt because he did not follow social rules.'*<sup>59</sup>

As is evident above, d̐ga is both teacher and helper, and due to d̐ga's strong spirit, d̐ga must be treated with both respect and caution. As Elder Philip Chocolate explained,

*"We elders know about wolves. When we caught d̐ga we do not bring the d̐ga into the tent. We tie and hang it on the tree. Only the person that knows and has power can skin and work on wolves. And when a person is sick, the man with d̐ga medicine has to do his ritual to help and heal. They always put it ... where no one can touch it".*<sup>60</sup>

During the 2013 Tł̐chq̐ Wildlife Research workshop, Tł̐chq̐ elders agreed the d̐ga is a great, spiritual animal that can cause Indigenous people to be sick if they are not respectful when being handled on the appropriate manner, such as bringing d̐ga into the community or a home, or when a sensitive person harvests a d̐ga. These actions will negatively impact members of the community, particularly children and women who

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<sup>59</sup> PR (Wolf 2020): 081 - Wolf: Tł̐chq̐ knowledge and perspective.

<sup>60</sup> Ibid.



are likely to get sick or die so the men in their families are extremely cautious. Nevertheless, people with dīga power are often called on to cure, particularly children.<sup>61</sup>

The Tłı̄chq̄ have a special connection to dīga, and like many other circumpolar north Indigenous people<sup>62</sup>, emphasize thoughtful behaviour towards dīga by telling origin stories. Take for example, a public meeting held by the Wisconsin Natural Resources on dīga harvest quotas. Anishinaabe Elder Joe Rose Sr, a member of the Grand Medicine society and an associate professor of Native American Studies at Northland College, told their creation story. He ended by saying, “*And you, Anishinaabes, if your brother Ma’iingan [wolf] passes out of existence you will soon follow*”.<sup>63</sup>

During 2013 Tłı̄chq̄ Wildlife Research Workshop in Gamètì, members from each of the four communities explain how dīga behaved in the past and how dīga behaviour has changed.<sup>64</sup>

Tłı̄chq̄ elders and harvesters are clear that there are two types of dīga, which behave differently.<sup>65</sup> One type is more commonly found year round near the communities and has a different appearance from the dīga, which travel with the ɤekwò.<sup>66</sup> In 2016, Elder Joe Rabesca emphasized the differences to the Dene when he said,

*“... if you talk about the wolf, look at the map. It’s a huge country. And the wolves are different. ... The wolf to the west [timber dīga] ... Those wolves, they’re bigger. And the wolf to the east [tundra dīga] that follows the caribou are a lot smaller. A lot smaller. The wolf on this side to the west are very aggressive, I know, ... —and they’re dangerous too”.*<sup>67</sup>

The Revised Joint Proposal notes that south of the ɤekwò winter range in the boreal forest, the boreal dīga tend to have dark fur and are genetically distinguishable from migratory tundra dīga.<sup>68</sup> However, the Revised Joint Proposal does not specify whether, and how, the proposed management and monitoring actions relate only to the migratory tundra dīga or whether the boreal dīga are also included.

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<sup>61</sup> PR (Wolf 2020): 081 - Wolf: Tłı̄chq̄ Knowledge and Perspective.

<sup>62</sup> PR (Wolf 2020): 081 - Wolf: Tłı̄chq̄ Knowledge and Perspectives; PR (Wolf 2020): 056 - Boundaries and Passages: Rule and Ritual in Yup’ik Eskimo Oral Tradition (ABSTRACT); PR (Wolf 2020): 057 - Relationships Between Indigenous American Peoples and Wolves 1: Wolves as Teachers and Guides (ABSTRACT); and PR (Wolf 2020): 092 - Comparative Ethnology of the Wolf and the Chipewyan, Chapter 4 (ABSTRACT).

<sup>63</sup> PR (Wolf 2020): 046 - Ma’iingan is our brother. Ojibwe ways of speaking about wolves.

<sup>64</sup> PR (Wolf 2020): 081 - Wolf: Tłı̄chq̄ Knowledge and Perspectives.

<sup>65</sup> PR (Wolf 2020): 170 - Additional Information from TG for Question #4, Round No.2 Information Requests.

<sup>66</sup> PR (Wolf 2020): 124 - WRRB Traditional Knowledge Technical Session Summary, October 13, 2020.

<sup>67</sup> PR (Wolf 2020): 081 - Wolf: Tłı̄chq̄ Knowledge and Perspectives.

<sup>68</sup> PR (Wolf 2020): 017 - GNWT & TG’s Revised Joint Proposal on Management Actions for Wolves (dīga) on the Bathurst and Bluenose-East Barren-ground Caribou (ɤekwò) Herd Winter Ranges: 2021 – 2024.

The WRRB considers evidence about the role of the boreal d̄iga in the review of the evidence for the assessing the Revised Joint Proposal. In particular, the WRRB is concerned about whether the behavioral difference between the boreal and migratory tundra d̄iga has implications for the effects of the proposed management actions and monitoring.

### 6.3. Conclusion

The T̄l̄ich̄q̄ Agreement defines conservation as “(b) *the maintenance of vital, healthy wildlife populations capable of sustaining harvesting under the Agreement*”. As shown, a serious conservation concern for both the K̄k̄'èet̄i and Saht̄i ekw̄ò herds exists and, as such, increased management and monitoring actions are warranted. The WRRB believes that ,in addition to harvest limitations and reducing disturbance to the ʔekw̄ò herds and their habitat, additional management and monitoring actions that focus on reducing predation, specifically d̄iga, are required to support the recovery of the K̄k̄'èet̄i and Saht̄i ekw̄ò herds.

## 7.0. Evidence, Analysis, and Recommendations

### 7.1. Introduction

The WRRB, in reviewing the Revised Joint Proposal, has used the evidence in the Technical Pilot Project Report, a d̄iga-ʔekw̄ò computer modeling report, information provided as responses to Information Requests, and the commitments, and their subsequent documents, from the Science and Traditional Knowledge Technical Sessions.

The WRRB was concerned with the high degree of uncertainty surrounding the Revised Joint Proposal. The WRRB notes three things that have increased the degree of uncertainty in addition to the uncertainty inherent in ecological systems. First, lapses in monitoring d̄iga, despite the WRRB's 2010 recommendations, mean that knowledge of d̄iga numbers is limited. Second, delays in implementing a d̄iga management program have increased complexity from the continued decline of both the ʔekw̄ò and d̄iga numbers on the ʔekw̄ò herds' summer range. Third, the extent that the results of the Pilot Project influenced the Revised Joint Proposal is not clear as explained in the following sections.

Consistent with the requirements of *T̄l̄ich̄q̄ Agreement*, the WRRB is taking a precautionary approach<sup>69</sup> while recognizing the complexity of the current d̄iga-ʔekw̄ò relationship. While the WRRB is most concerned about the status of the ekw̄ò, the

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<sup>69</sup> See paragraph 12.1.5(c) of the *T̄l̄ich̄q̄ Agreement*.

Board also recognizes the cultural and biological importance of d̐ga and their role in the ecosystem and in history.

## **7.2 Goal and Objectives of the Revised Joint Proposal**

### **7.2.1. Introduction**

Management proposals establish their purpose through describing a goal. How the goal will be implemented is then articulated through objectives. Objectives allow the success or failure of the proposal to be assessed and, thus, have measurable benchmarks. Reliable measures of success are a critical component for a robust and defensible wildlife management proposal.

### **7.2.2 Proponent’s Evidence**

The Revised Joint Proposal’s goal is stated to be “...reduce d̐ga numbers sufficiently to enable an increase in survival rates of both calf and adult ekwo promoting stabilization and recovery of these herds [K̐k’èeti and Sahti ekw̐]”.<sup>70</sup>

The objectives to implement the goal are:

- 1) Increase annual ground-based harvest of d̐ga on the winter range of the K̐k’èeti and Sahti ekw̐ by increasing participation of harvesters in the traditional economy related to d̐ga harvest and hide preparation; and,
- 2) Ensure sustained removal of d̐ga, using aerial removals if required, on the winter ranges of K̐k’èeti and Sahti ekw̐ to achieve a level necessary to maintain low d̐ga densities and elicit a response in ʔekw̐ populations.

The Revised Joint Proposal states that there is an urgent need to continue enhanced actions put in place during the Pilot Project to increase ʔekw̐ cow and calf survival rates of the K̐k’èeti and Sahti ekw̐ herds.<sup>71</sup> Even though the goal refers to increased ʔekw̐ survival rates through the proposed d̐ga removal actions, the Revised Joint Proposal does not describe rates of calf or adult survival for the K̐k’èeti and Sahti ekw̐ herds. However, during the Science Technical Session<sup>72</sup>, GNWT did update the adult survival rates. For the K̐k’èeti ekw̐ herd, an annual trend toward increased adult survival since 2016 has continued and, for 2018 and 2019, the annual survival is 92% and 95%, respectively. The trend toward increasing survival is stronger on the summer

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<sup>70</sup> PR (Wolf 2020): 017 - GNWT & TG’s Revised Joint Proposal on Management Actions for Wolves (d̐ga) on the Bathurst and Bluenose-East Barren-ground Caribou (ʔekw̐) Herd Winter Ranges: 2021 – 2024.

<sup>71</sup> Ibid.

<sup>72</sup> PR (Wolf 2020): 115 - WRRB Science Technical Session Summary, October 5, 2020.

range than the winter range. For Sahti ekwò, adult survival stabilized at 85% in 2018-2019, which is close to the benchmark for herd recovery.<sup>73</sup>

### **7.2.3 Other Participant's and Public Evidence**

The other Parties and public did not provide any specific evidence related to the Joint Project's goal and objectives.

### **7.2.4 Analysis and Recommendations**

The WRRB does acknowledge that removing dìga to halt ʔekwò declines and to support recovery has many uncertainties and risks. In the long term, ʔekwò and dìga have an intricate and complex relationship. Complex systems often harbor surprises to management interventions. The WRRB is also conscious of the difficulty that dìga management causes for the some of the public and wildlife managers. Hunting and trapping of dìga as well as dìga removed to safeguard their prey are controversial<sup>74</sup> and require careful examination of underlying assumptions.<sup>75</sup> For these reasons, the WRRB is anxious to see clearly stated goals and objectives to justify the levels of dìga removals.

The Revised Joint Proposal's goal is to reduce dìga numbers to stabilize and support recovery of the Kòk'èeti and Sahti ekwò herds by increasing survival rates of both calf and adult ʔekwò.<sup>76</sup> The WRRB is concerned about this goal for two reasons. First, the Revised Joint Proposal acknowledges that dìga are not the only cause of ʔekwò deaths and suggests relying on computer modeling to address this uncertainty in measuring the effects of dìga removal.<sup>77</sup> The WRRB suggests that the modeling will not be sufficient, and a more robust approach based on adaptive management is needed (see Recommendations in Section 7.7.6). The Board believes that annual reviews would be more prudent than waiting for a five-year review that may be too late if the risks of removing too few or too many dìga are not anticipated.

Second, the GNWT updated the adult ʔekwò survival rates during the Science Technical Session but did not provide any interpretation of the higher rates in the context of the Revised Joint Proposal's goal or objectives. The rates have increased to an upper limit for the Kòk'èeti ekwò herd and, thus, a further increase in response to dìga removal is unlikely to be measurable.

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<sup>73</sup> PR (Wolf 2020): 115 - WRRB Science Technical Session Summary, October 5, 2020.

<sup>74</sup> PR (Wolf 2020): 133 - Questionable policy for large carnivore hunting.

<sup>75</sup> PR (Wolf 2020): 129 - Meta-Analysis of Relationships between Human Offtake, Total Mortality and Population Dynamics of Gray Wolves (*Canis lupus*).

<sup>76</sup> PR (Wolf 2020): 017 - GNWT & TG's Revised Joint Proposal on Management Actions for Wolves (dìga) on the Bathurst and Bluenose-East Barren-ground Caribou (ʔekwò) Herd Winter Ranges: 2021 – 2024.

<sup>77</sup> Ibid.

In the Revised Joint Proposal, the current two objectives are focused on how to remove dīga.<sup>78</sup> Given the goal has two parts (removing dīga and increasing adult and calf survival), the Board believes there should be two types of objectives: one type focused on ʔekwò and the other focused on dīga. Technical objectives should be concrete, measurable, attainable, and phrased to be able to minimize inferring inappropriate conclusions.

The WRRB notes that specific objectives for ʔekwò will clarify the possible effects of dīga removal on the Kòk'èetì and Sahtì ekwò herds. The objectives should accommodate the updated information on adult and calf survival available during the October 2020 Science Technical Session. For example, the updated high Kòk'èetì adult survival suggests that dīga removal is unlikely to increase adult survival further as annual survival rates of over 90% are as high as is reasonably possible, based on ʔekwò biology. The increase preceded the dīga removals undertaken during the Pilot Project, which raises questions about whether the low dīga numbers on the summer range are already benefiting adult ʔekwò survival.

The revised October 2020 model runs did use the improved adult survival for a 5- year and a 3-year period.<sup>79</sup> The updated survival raises questions about whether and how the causes of calf survival and adult survival may differ and how that relates to measuring effects of dīga removal. (This is addressed in Section 7.7.5.)

The WRRB requested specific objectives in the first round of Information Requests for the Joint Proposal received in January 2020. TG and GNWT responded with two objectives of which the first was to maintain dīga removals of 60-80% on the winter ranges and the second was [to improve] trends in ʔekwò population indicators, including adult survival.<sup>80</sup> However, in the Revised Joint Proposal received in August 2020, the objective for ʔekwò was not included. This is a concern to the WRRB.

The Revised Joint Proposal states that *“If annual dīga removals are maintained at a meaningful level, there is a reasonable likelihood of detecting a measurable effect on improved ekwò survival rates within a 5-year time frame”*.<sup>81</sup> However, the Joint Management Proposal additionally states

*“Given the complexity and uncertainty regarding interaction of key factors influencing barren-ground caribou (ekwò) populations, caution is required when attempting to attribute the specific contribution of dīga (dīga) reduction to*

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<sup>78</sup> PR (Wolf 2020): 017 - GNWT & TG's Revised Joint Proposal on Management Actions for Wolves (dīga) on the Bathurst and Bluenose-East Barren-ground Caribou (ʔekwò) Herd Winter Ranges: 2021 – 2024.

<sup>79</sup> PR (Wolf 2020): 166 - Commitments #4 to #8 - WRRB's Science Technical Session, October 5, 2020.

<sup>80</sup> PR (Wolf 2020): 017 - GNWT & TG's Revised Joint Proposal on Management Actions for Wolves (dīga) on the Bathurst and Bluenose-East Barren-ground Caribou (ʔekwò) Herd Winter Ranges: 2021 – 2024.

<sup>81</sup> Ibid.

*observed changes in caribou (ekwò) productivity and/or population trends. For example, the influence of other factors such as environmental conditions, biting insect severity indices, anthropogenic disturbance, and caribou (ekwò) harvesting may also be affecting caribou (ekwò) productivity and/or survival rates. Modeling caribou (ekwò) population response with covariates for diga (diga) removal, and environmental indices such as insect harassment and vegetation productivity will be important for overall analyses.”<sup>82</sup>*

The WRRB is uncertain if the above quoted statement is a rationale for not retaining the specific objective to measure rates of ʔekwò recovery, including adult survival. The WRRB is being persistent about recommending the need for a ʔekwò objective because the objectives are key to the measuring the effectiveness of the diga removal and, thus, its justification. The WRRB (see Section 7.7. Monitoring) suggests that TG and GNWT’s reluctance to measure the effects of diga removal on the ʔekwò can and needs to be resolved.

The Board is concerned that there are no objectives or stopping points before the five-year review related to ekwò indicators. The Revised Joint Proposal’s aim is to halt the decline and promote recovery of ʔekwò; yet there is no scenario in which improving ʔekwò vital rates would cause the Revised Joint Proposal to pause or reduce operations.

#### **Recommendation #1-2020 (Diga): Update Objectives**

The WRRB recommends that GNWT and TG update the objectives of the diga management program to be measurable for effects on ekwò and diga 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 Kòk’èetì and Sahtì ekwò herds have different vulnerabilities and vital rates and, thus, success may be measured differently.

### **7.3. Estimating Diga Populations**

#### **7.3.1. Introduction**

The Revised Joint Proposal’s three actions to reduce diga predation on Kòk’èetì and Sahtì ekwò are ground and aerial removals as well as annual monitoring for a minimum of five years, including the Pilot Project year.<sup>83</sup> This approach is based on first estimating the number of diga on the ranges of the Kòk’èetì and Sahtì ekwò herds, then removing a target level of 60-80% of those diga numbers. The 60-80% target is based

<sup>82</sup> PR (Wolf 2020): 017 - GNWT & TG’s Revised Joint Proposal on Management Actions for Wolves (diga) on the Bathurst and Bluenose-East Barren-ground Caribou (ʔekwò) Herd Winter Ranges: 2021 – 2024.

<sup>83</sup> Ibid.

on experiences in the Yukon and Alaska<sup>84</sup> and assumes immigration and reproduction will replace the harvested d̄iga, which means the levels of removal need to be annually maintained. The target levels for 2020 were 60-80% of the estimated number of d̄iga on the K̄k'èetì and Sahtì ekw̄ herd winter ranges (29-39 and 73-97, respectively).<sup>85</sup>

The approach described in the Pilot Project was to establish the herd-specific target levels and then support harvesters to remove the d̄iga – if the target was not met, then aerial removal was undertaken. The Covid-19 pandemic added an unexpected and unpredicted complication during the pilot project year.

### **7.3.2. Proponent's Evidence**

TG and GNWT's approach to establishing the number of d̄iga to be removed depends on estimating d̄iga numbers. However, in the absence of a robust survey methodology for tundra d̄iga on winter ranges of barren-ground ʔekw̄, TG and GNWT relied on an indirect index estimated from the amount of potential prey.

The UBI was calculated from densities of ʔekw̄ on the winter range and herd size estimates. The UBI mathematically relates the amount of prey to the number of d̄iga that could likely be supported. The UBI estimates in winter 2020<sup>86</sup> were:

- K̄k'èetì ekw̄ range: 55 d̄iga (43-66 95% CI)
- Sahtì ekw̄ range: 138 d̄iga (120-155 95%CI)
- Beverly range: 1,029 d̄iga (956-1,102 95% CI).

The Technical Pilot Project Report reported few d̄iga seen during aerial surveys in March-April 2020.<sup>87</sup> This was attributed in the report to difficulty detecting the d̄iga rather than low numbers of d̄iga.<sup>88</sup> Although the d̄iga sighting rate by Inuit hunters was higher than that of the North Slave harvesters, these sightings were tabulated over many months with possible duplication of sightings. This leaves uncertainty about estimating d̄iga numbers on the winter range. On the K̄k'èetì ekw̄ summer range, d̄iga pup survival and den occupancy declined between 1996 and 2012 and modeling suggested a steep decline in d̄iga abundance in that area.<sup>89</sup> Recent information on d̄iga on the Sahtì ekw̄ herd's summer range is lacking.

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<sup>84</sup> PR (Wolf 2020): 106 - Wolf Technical Feasibility Assessment – Options for managing wolves on the range of the Bathurst barren-ground caribou herd.

<sup>85</sup> PR (Wolf 2020): 017 - GNWT & TG's Revised Joint Proposal on Management Actions for Wolves (d̄iga) on the Bathurst and Bluenose-East Barren-ground Caribou (ʔekw̄) Herd Winter Ranges: 2021 – 2024; and PR (Wolf 2020): 106 - Wolf Technical Feasibility Assessment – Options for managing wolves on the range of the Bathurst barren-ground caribou herd.

<sup>86</sup> PR (Wolf 2020): 018 - 2020 Wolf Management Pilot Program Technical Report.

<sup>87</sup> Ibid.

<sup>88</sup> Ibid.

<sup>89</sup> Ibid.

### **7.3.3. Other Participants and Public Evidence**

The NSMA, in their final written comments, say that many NSMA harvesters have been observing d̄iga population declines, but that since d̄iga have not recently been well monitored, the lower population is not reflected in the Revised Joint Proposal's d̄iga removal targets.<sup>90</sup> The NSMA further stated that they understand that adaptive management is planned to be used to set d̄iga removal targets each year, but note concerns that the short project timeline does not allow for proper adaptive management.

The LKDFN write that they have observed through their participation in the review of the Revised Joint Proposal that there is a high degree of uncertainty regarding the number of d̄iga currently within the Enhanced Incentive Area (see Figure 5), and that they are not certain when the removal targets will be met or exceeded.<sup>91</sup>

Dave Olesen, an experienced local aerial survey pilot, commented that low d̄iga numbers during aerial surveys was not indicative of low detectability.<sup>92</sup>

*“This utter absence of wolves from the core areas of the Bathurst caribou winter range was nothing short of astounding to me in that 2018 survey. It still is. In February and again in March of 2020.”*

A further comment was that, as the main pilot for GNWT's d̄iga den occupancy survey and with knowledge of the den sites, during the course of other flying, Mr. Olesen was not seeing occupancy of the dens on the K̄k'èetì ekw̄ range.

### **7.3.4. Analysis and recommendations**

The WRRB is concerned about having both precise and accurate estimates of the number of d̄iga because it is the essential first step in the Revised Joint Proposal's approach to d̄iga removals. The Revised Joint Proposal acknowledged uncertainty in the estimated d̄iga abundance on K̄k'èetì and Sahtì ekw̄ ranges. Counting d̄iga is difficult but agencies such as in Alaska have well-tested methods.<sup>93</sup> In the absence of a robust survey methodology for tundra d̄iga on winter ranges of ʔekw̄, the UBI d̄iga estimate method can be used to help inform management options. The UBI is the number of d̄iga expected from ʔekw̄ aerial surveys in 2020, empirical estimates from 2018, and projected 2020 estimates. The precision of those estimates was then used to estimate the precision of the UBI estimates of d̄iga numbers but the accuracy of the UBI is unknown.

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<sup>90</sup> PR (Wolf 2020): 168 - NSMA Final Written Comments - Revised Joint Wolf Management Proposal.

<sup>91</sup> PR (Wolf 2020): 171 - LKDFN Final Written Comments - Revised Joint Wolf Management Proposal.

<sup>92</sup> PR (Wolf 2020): 148 - Public Comment from D. Olesen to the WRRB.

<sup>93</sup> PR (Wolf 2020): 061 - Intensive aerial wolf survey operations manual for interior Alaska.



Back in 2010, GNWT and TG had accepted the WRRB recommendation to determine d̄iga abundance and while some effort was made, it was not sustained. This has led to an uncertain baseline for d̄iga removals. The GNWT’s earlier efforts were aerial surveys in 2006 and 2013 on the K̄òk’èetì ekw̄ winter range that estimated a d̄iga number of  $211 \pm 66SE$ . From satellite collared d̄iga and territory size, 177 d̄iga on the K̄òk’èetì ekw̄ summer range were extrapolated.<sup>94</sup> There had been a long-term dataset from annual monitoring of trends in litter size and den occupancy since 1996, but this was inexplicably halted in 2014.<sup>95</sup> Modeling in 2013 estimated d̄iga numbers on the K̄òk’èetì ekw̄ summer range declined 95% from 1996 to 2013. Based on the recent observations of an experienced wildlife pilot, this trend has continued and d̄iga are essentially absent from the K̄òk’èetì ekw̄ range.<sup>96</sup>

In the absence of robust d̄iga survey methodology, the UBI was used as a proxy and calculated based on densities of  $\eta$ ekw̄ on the winter range and herd size estimates. The UBI mathematically relates the amount of prey to the number of d̄iga that could likely be supported. When *Ded̄i* (moose) are included as potential prey biomass, more d̄iga can be supported. The 2020 K̄òk’èetì and Sahtì ekw̄ winter distribution overlapped 15-20% with a 2016 ded̄i density survey.<sup>97</sup> Including the results of this ded̄i survey increased the prey biomass and added 10-13 d̄iga (95%CI) on the Sahtì ekw̄ winter range and 9-11 d̄iga on the K̄òk’èetì ekw̄ winter range.<sup>98</sup> For K̄òk’èetì ekw̄, this adds approximately 25% more d̄iga to the UBI estimate (Table 1).<sup>99</sup>

**Table 1. D̄iga numbers from Ungulate Biomass Index.<sup>100</sup>**

Sahtì ekw̄	Low 95%CI	Mean	High 95% CI	K̄òk’èetì ekw̄	Low 95%CI	Mean	High 95%CI
<b>D̄iga estimate</b>	120	138	155	<b>D̄iga estimate</b>	43	55	66
<b>60% removal</b>	72	83	93	<b>60% removal</b>	26	33	40
<b>80% removal</b>	96	110	124	<b>80% removal</b>	34	44	53

The precision (95% confidence intervals) of  $\eta$ ekw̄ estimates was applied as a precision of the UBI d̄iga estimates. The accuracy of the UBI d̄iga estimates remains unknown. The accuracy of the UBI at the beginning of the Pilot Project depended on two assumptions: (1) d̄iga numbers have had time to adjust to prey biomass in the Pilot Project area, and (2) d̄iga numbers have not been reduced by unsustainable harvest

<sup>94</sup> PR (Wolf 2020): 106 - Wolf Technical Feasibility Assessment – Options for managing wolves on the range of the Bathurst barrenground caribou herd.

<sup>95</sup> PR (Diga 2020): 148 - Public Comment from D. Olesen to the WRRB.

<sup>96</sup> Ibid.

<sup>97</sup> PR (Wolf 2020): 169 - Commitment #9 - WRRB's Science Technical Session, October 5, 2020.

<sup>98</sup> Ibid.

<sup>99</sup> Ibid.

<sup>100</sup> Ibid.

prior to the Pilot Project.<sup>101</sup> As well as the earlier decline in denning dīga, more recently the incidental sightings of dīga during ʔekwò sex and age surveys have declined.<sup>102</sup> This brings into question the validity of the first assumption. It is possible that dīga numbers were lower than predicted by the UBI. The second assumption, that dīga were being already harvested at a higher than sustainable harvest was not examined or modelled.

There is evidence that dīga numbers had declined on the Kòk'èetì ekwò herd summer range.<sup>103</sup> Dīga pup survival and den occupancy declined between 1996 and 2012 and modeling suggested a steep decline in dīga abundance.<sup>104</sup> Recent information on dīga on the Sahtì ekwò herd's summer range is lacking. GNWT did not address the assumption that the dīga are not being sustainably harvested. Since 2010, the annual harvest in the North Slave Region averaged 53 dīga ( $\pm 6.21$  SE). An incentive to increase the dīga harvest is paid if the dīga are harvested within an incentive area, based on the ʔekwò winter range as mapped from the satellite-collared ʔekwò. Nunavut hunters from Kugluktuk also take dīga on the ranges of Kòk'èetì and Sahtì ekwò.<sup>105</sup>

The WRRB is concerned that the Revised Joint Proposal requires an annual estimate of dīga numbers but is unclear which method will be used. For example, the Revised Joint Proposal states that a snow track method may be tested but other methods are not detailed.<sup>106</sup> After the removals reported in the Pilot Project, the number of dīga remaining on the winter range will be low. This introduces further difficulty into estimating dīga numbers relative to the target level.

Considering that estimating a reasonably accurate number of dīga on the ʔekwò winter range remains a challenge, the WRRB would like to see other methods to monitor dīga removal effectiveness. For example, the incidental sightings of dīga during ʔekwò sex and age surveys are a potential indicator for trend in dīga numbers. These dīga sightings may be used as an index of how many dīga the ʔekwò expect to encounter in early and late winter.<sup>107</sup> The *WRRB Technical Response to Summary of Wolf Incidental Sightings from Bathurst and Bluenose-East Barren-ground Caribou Surveys, GNWT ENR, August 13, 2020* can be found in Appendix B. While accepting the limitations of indices compared to abundance estimates, including variable detectability and possible duplicated sightings, the Board notes that trends in the dīga sighting rate were stable

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<sup>101</sup> PR (Wolf 2020): 169 - Commitment #9 - WRRB's Science Technical Session, October 5, 2020.

<sup>102</sup> Appendix B – WRRB Technical Response to Summary of Wolf Incidental Sightings form Bathurst and Bluenose-East Barren-ground Caribou Surveys, GNWT, ENR, August 13, 2020.

<sup>103</sup> PR (Wolf 2020): 106 - Wolf Technical Feasibility Assessment – Options for managing wolves on the range of the Bathurst barrenground caribou herd.

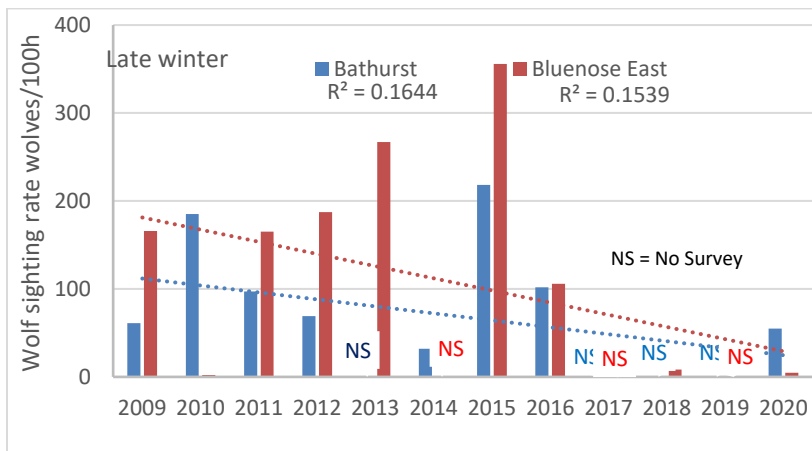
<sup>104</sup> Ibid.

<sup>105</sup> PR (Wolf 2020): 017 - GNWT & TG's Revised Joint Proposal on Management Actions for Wolves (dīga) on the Bathurst and Bluenose-East Barren-ground Caribou (ʔekwò) Herd Winter Ranges: 2021 – 2024.

<sup>106</sup> Ibid.

<sup>107</sup> Appendix B – WRRB Technical Response to Summary of Wolf Incidental Sightings form Bathurst and Bluenose-East Barren-ground Caribou Surveys, GNWT, ENR, August 13, 2020.

from 1986-2008 but declined from 2009 to 2019 (Figure 4).<sup>108</sup> However, the lack of sex and age composition surveys in 2017 and 2018 hinders inferences.



**Figure 4. Incidental sightings of d̐ga during ʔekw̐ sex and age composition surveys in late winter on the ranges of the K̐k'̐et̐i ekw̐ and Sahti ekw̐ herds, 2009-2020. NS means Not Surveyed (from Appendix B).<sup>109</sup>**

Overlapping ʔekw̐ winter ranges restricted inferences from efforts to estimate d̐ga abundance on the winter ranges of the K̐k'̐et̐i and Sahti ekw̐ herds. However, herd overlap is infrequent on the calving and summer ranges, which would be an argument for d̐ga denning surveys combined with d̐ga collaring to determine d̐ga movements between ʔekw̐ summer and winter ranges (see Section 7.7).

In summary, for K̐k'̐et̐i ekw̐, at low numbers of d̐ga, accurately estimating the number of d̐ga will be difficult although necessary. Assumptions about increases through breeding and emigration are questionable without monitoring. Implications of reduced d̐ga abundance for predator-prey dynamics are unexplored in the published literature on d̐ga and the Revised Joint Proposal does not examine any implications for the removal program over the proposed four-year program.

The Revised Joint Proposal does not address if or how a d̐ga decline on the summer range relates to d̐ga numbers on the winter range. Existing information<sup>110</sup> is that the d̐ga breeding on the summer range follow ʔekw̐ in the fall to the winter ranges. On the K̐k'̐et̐i ekw̐ herd's fall ranges, the high sighting rate from 2014 – 2018 may suggest that emigration and/or pup production and survival had increased, or detection had

<sup>108</sup> PR (D̐ga 2020): 126 - Head to Head - Response to Engleman: Index Values Rarely Constitute Reliable Information.

<sup>109</sup> Appendix B – WRRB Technical Response to Summary of Wolf Incidental Sightings from Bathurst and Bluenose-East Barren-ground Caribou Surveys, GNWT, ENR, August 13, 2020.

<sup>110</sup> PR (Wolf 2020): 018 - 2020 Wolf Management Pilot Program Technical Report

changed.<sup>111</sup> The increase in the d̐ga sightings may be a compensatory response to a d̐ga decline measured in 2014. It is complicated by changes for the K̐k'èet̐i ekw̐ herd with shifts in summer and fall ranges. For example, this shift was a factor in the decline of d̐ga on the summer range<sup>112</sup> and has contributed to the recent change in d̐ga sightings at a diamond mine. D̐ga sightings peaked in 2017 (93) and 2016 (95).<sup>113</sup>

The Revised Joint Proposal requires an annual estimate of d̐ga numbers but does not specify which method will be used. Consideration should be given to how d̐ga numbers derived from the UBI can be compared to estimates derived from other methods. Accuracy is especially important as there is evidence of low or reduced number of d̐ga on the winter range.<sup>114</sup>

The success and evaluation of the d̐ga management program will rely heavily on knowing the number of d̐ga removed and whether the d̐ga population is decreasing or stable. It is evident that there is a lack of confidence in the estimate of d̐ga populations on the ranges of the K̐k'èet̐i and Saht̐i ekw̐ herds.

#### **Recommendation #2-2020 (D̐ga): D̐ga Abundance**

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

#### **Recommendation #3-2020 (D̐ga): Sighting Rates**

The WRRB recommends that d̐ga sighting rates, during ̐ekw̐ sex and age composition surveys, be assessed by GNWT to determine if and how it contributes to understanding seasonal trends in d̐ga abundance on the K̐k'èet̐i and Saht̐i ekw̐ ranges by May 1, 2021.

## **7.4. Ground-Based Harvest**

### **7.4.1. Introduction**

D̐ga removals are proposed to occur primarily through winter ground-based removals by harvesters. Enhanced support for harvesters is proposed to be achieved through

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<sup>111</sup> Appendix B – WRRB Technical Response to Summary of Wolf Incidental Sightings from Bathurst and Bluenose-East Barren-ground Caribou Surveys, GNWT, ENR, August 13, 2020.

<sup>112</sup> PR (Wolf 2020): 078 - Wolf-caribou dynamics within the central Canadian Arctic.

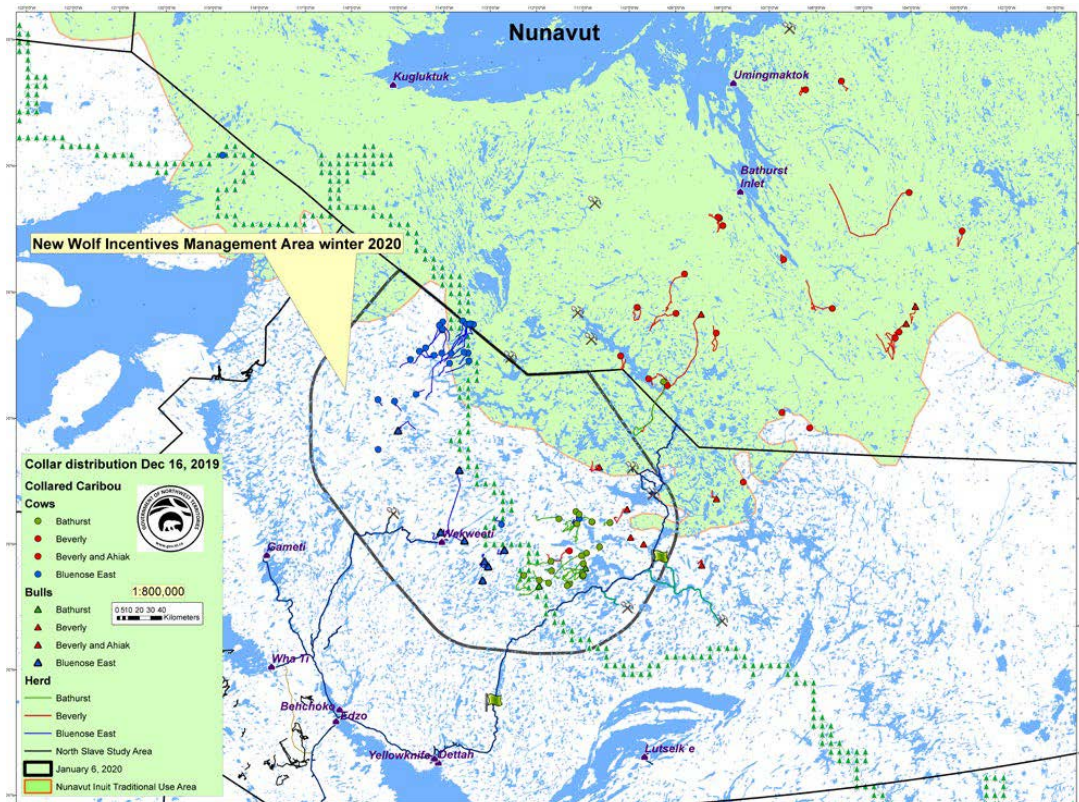
<sup>113</sup> PR (Wolf 2020): 130 - Ekati Diamond Mine - 2018 Wildlife Effects Monitoring Program - Wolf Excerpts.

<sup>114</sup> Appendix B – WRRB Technical Response to Summary of Wolf Incidental Sightings from Bathurst and Bluenose-East Barren-ground Caribou Surveys, GNWT, ENR, August 13, 2020

dìga harvester training, Tìchq̄ Government dìga harvest camps, enhanced incentives, participation of Nunavut harvesters, and the use of bait to support removals.

### 7.4.2. Proponent's Evidence

To achieve the target number of dìga removals in the Kòk'èetì and Sahtì ekwò herd winter ranges, harvesters in the GNWT's North Slave region were paid an additional incentive if a dìga was killed in the North Slave Harvest Incentive Area (Figure 5).



**Figure 5. Enhanced North Slave Wolf Harvest Incentive Area in 2019/20. Mapped from Kòk'èetì and Sahtì ekwò collared ãekwò locations from early January 2020.<sup>115</sup>**

Hunters from Kugluktuk, Nunavut were able to hunt in the northern part of the Incentive Area where it overlaps with the customary Nunavut Inuit Traditional Use Area. Hunters from Kugluktuk also harvested dìga in Nunavut using a basecamp near Kòk'èetì (Contwoyto Lake).<sup>116</sup>

<sup>115</sup> PR (Wolf 2020): 018 - 2020 Wolf Management Pilot Program Technical Report.

<sup>116</sup> Ibid.

In the 2020, a total of 171 d̄iga were killed during the Pilot Project. Harvesters from the NWT’s North Slave region and Nunavut took 130 d̄iga while 36 d̄iga were shot from a helicopter.<sup>117</sup> A further 5 d̄iga died during the d̄iga collaring project.<sup>118</sup>

The level of effort to find and kill the d̄iga was determined using questionnaires, which asked harvesters to report the time and distances travelled to kill d̄iga. The information was used to estimate Catch per Unit Effort (CPUE) (Table 2).

**Table 2. North Slave and Kugluktuk Ground Harvesters – Catch per Unit Effort (CPUE).<sup>119</sup>**

	Total # d̄iga (Incentive Area)	No. questionnaires (harvested d̄iga)	Average CPUE km (number d̄iga)		Average CPUE (Hours)	
			Harvest/ 1,000 km	Seen/ 1,000 km	Harvest/ 24 hours	Seen/ 24 hours
North Slave	68 (10)	29 (1)	0.07 (1)	0.28 (2)	0.05	0.19
Nunavut	57 (38)	38 (38)	3.35 (38)	7.06 (88)	0.75	1.88

66% of d̄iga harvested by Nunavut harvesters were taken in the Enhanced Incentive Area and they harvested more d̄iga per 1000 km or per 24 hours than North Slave harvesters. The North Slave harvesters harvested the most d̄iga, but only 15% of the d̄iga were taken in the Enhanced Incentive Area (Table 2).

The ground harvesting from the NWT and Nunavut resulted in 38% d̄iga associated with the K̄k̄'èetì and Sahtì herds; 24% with the Beverly herd; and 38% were possibly *T̄q̄dzì* (boreal caribou) as they were shot south of the three ʔekw̄ herd ranges outside the Enhanced Incentive Area.<sup>120</sup> The number of d̄iga determined to be associated with specific herds does not include the 50 d̄iga harvested in the North Slave outside and mostly south and southwest of the Enhanced Incentive Area.<sup>121</sup>

During the Science Technical Session, TG agreed that CPUE does index effectiveness of d̄iga removals. The CPUE was based on North Slave harvesters in the Enhanced Incentive Area self-reporting through a questionnaire as they passed through a winter road check station. Although 29 harvesters returned the questionnaires, only one had

<sup>117</sup> PR (Wolf 2020): 018 - 2020 Wolf Management Pilot Program Technical Report.

<sup>118</sup> Ibid.

<sup>119</sup> Ibid.

<sup>120</sup> Ibid.

<sup>121</sup> Ibid.

harvested a dīga. The Nunavut ground harvesters took 57 dīga with 35 from the Enhanced Incentive Area and submitted 38 questionnaires.

### **7.4.3. Other Participant's and Public Evidence**

The NSMA stated that a portion of the dīga removed during the 2019-2020 year were taken from outside the Sahtì and Kòk'èetì ekwò regions,<sup>122</sup> and that dīga should not be shot if they are outside of a defined acceptable dīga removal area.

LKDFN did not comment on the ground-based harvest portion of the dīga management proposal.

Dave Olesen described the immense effort required by on-the-ground harvesters to kill each dīga<sup>123</sup>, calculating that a harvester would have to drive four times around the circumference of the earth at 64 degrees north and only kill 5 dīga.

### **7.4.4. Analysis and Recommendations**

The dīga ground-based removals resulted in 63% (36) and 45% (54) of the targeted levels recommended in the Pilot Project on the Kòk'èetì and Sahtì ekwò herds ranges, respectively.<sup>124</sup> TG and GNWT considered these results indicative of low effectiveness partly because there was an absence of ʔekwò in the vicinity of the winter road. However, a percentage of dīga were also taken outside the Enhanced Incentive Zone.

The *Wolf Technical Feasibility Assessment*<sup>125</sup> defines ground-based shooting on the winter range as

*“On the caribou winter range, bait would be used to attract the dīga, which would be shot by marksmen on the ground. Helicopters, fixed-wing, and snow machines support is necessary”.*

The humaneness, efficiency, and effectiveness of ground-based removals in the *Wolf Technical Feasibility Assessment* were calculated based on ground-based removals occurring as they were defined. TG and GNWT cite the *Wolf Technical Feasibility Assessment* as the “basis for developing the current proposal”;<sup>126</sup> however, no helicopter or fixed-wing support is outlined in the methods of the Revised Joint Proposal or in the Technical Pilot Project Report. The only snow machine support described is a

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<sup>122</sup> PR (Wolf 2020): 168 - NSMA Final Written Comments - Revised Joint Wolf Management Proposal.

<sup>123</sup> PR (Wolf 2020): 148 - Public Comment from D. Olesen to the WRRB.

<sup>124</sup> PR (Wolf 2020): 018 - 2020 Wolf Management Pilot Program Technical Report.

<sup>125</sup> PR (Wolf 2020): 106 - Wolf Technical Feasibility Assessment – Options for managing wolves on the range of the Bathurst barrenground caribou herd.

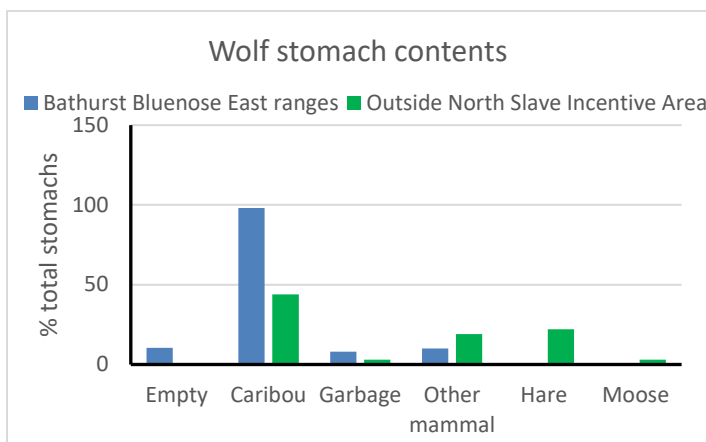
<sup>126</sup> PR (Wolf 2020): 017 - GNWT & TG's Revised Joint Proposal on Management Actions for Wolves (dīga) on the Bathurst and Bluenose-East Barren-ground Caribou (ʔekwò) Herd Winter Ranges: 2021 – 2024.

\$25 gas card given out to those who completed a questionnaire. While the Revised Joint Proposal allows harvesters to use their own bait, the only bait stations set up by GNWT were done so on the Sahti ekwò range to assist in aerial removals.

There is evidence that the number of d̐ga is low after the first year of removal. Practicalities of harvesting at low numbers may become increasingly challenging. The WRRB believes the Revised Joint Proposal should include avenues to increase support for ground-based harvest to enhance efficiency and effectiveness as outlined in the *Wolf Technical Feasibility Assessment* and used by the proponents as the basis for the program.

The WRRB also notes that the humaneness of the ground-based harvesting was not monitored, and cultural practices may not align with the criteria for assessment in the *Wolf Technical Feasibility Assessment*.

The Pilot Project reported an unexpected finding: a relatively high number of boreal d̐ga were harvested.<sup>127</sup> The Revised Joint Proposal did not, despite the findings of the Pilot Project, address the inadvertent harvesting of boreal d̐ga. The Pilot Project mapped the 50 d̐ga harvested outside the Enhanced Incentive Area as being likely 'boreal' d̐ga. The stomach contents of the d̐ga killed outside the Enhanced Incentive Area<sup>128</sup> had higher percentages of hare, other mammals, and ded̐ and half as much ʔekwò than d̐ga killed in the Enhanced Incentive Area (Figure 6).



**Figure 6. Stomach content analysis of North Slave d̐ga compiled from GNWT’s information.<sup>129</sup>**

<sup>127</sup> PR (Wolf 2020): 018 - 2020 Wolf Management Pilot Program Technical Report.

<sup>128</sup> PR (Wolf 2020): 166 - Commitments #4 to #8 - WRRB's Science Technical Session, October 5, 2020.

<sup>129</sup> Ibid.



However, the WRRB acknowledges that avoiding boreal d̄iga by limiting d̄iga removal to the Enhanced Incentive Area may not be feasible. While limited information from the 2020 D̄iga Collaring Program is available, comparing monthly home ranges with the initial herd assignment at capture suggests complexity. The three d̄iga collared on the K̄òk'èetì winter range summered elsewhere. Of eight d̄iga collared on the Sahtì ekw̄ò range, five summered outside the herd ranges while three summered on the Sahtì ekw̄ò summer range.<sup>130</sup> The implications of removing boreal d̄iga is additional uncertainty as their numbers will be difficult to estimate and their lower use of ʔekw̄ò means their removal has a lower effect on ʔekw̄ò recovery.

**Recommendation #4-2020 (D̄iga): 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 ʔekw̄ò and d̄iga 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 D̄iga on the Range of the Bathurst Barren-ground Caribou Herd (2017)*.

The WRRB agrees with TG and GNWT in that there is a high value in the results of the harvester questionnaires. The Board, however, is not impressed with the lack of meaningful improvements described for the harvester questionnaire after the Pilot Project's unsuccessful performance.

**Recommendation #5-2020 (D̄iga): 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.

The WRRB noted the higher success rate in both harvester questionnaire returns and ground-based d̄iga removal from Nunavut harvesters compared to NWT harvesters.

**Recommendation #6-2020 (D̄iga): 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.

<sup>130</sup> PR (Wolf 2020): 166 - Commitments #4 to #8 - WRRB's Science Technical Session, October 5, 2020.

## 7.5. Aerial Removals

### 7.5.1. Introduction

In the Revised Joint Proposal, GNWT and TG describe that jurisdictions such as Alaska, British Columbia, Alberta, and Yukon have demonstrated the effectiveness of aerial shooting of d̄iga.<sup>131</sup> Recent efforts to remove a targeted number of d̄iga in northern British Columbia have successfully resulted in reductions to t̄odz̄ı mortality, increased calf recruitment, and increased herd size.<sup>132</sup>

GNWT and TG propose that aerial removals of d̄iga should occur if ground-based harvesting does not meet targets by March 15 each year.<sup>133</sup> If K̄òk'èet̄ı and Saht̄ı ekw̄ò herds overlap, targets will be combined and applied across the combined winter ranges of the two herds such that removal effort can be allocated to areas of the highest d̄iga density. If there is overlap with the Beverly ekw̄ò herd, removal targets will be assessed based on the amount of overlap and estimated number of d̄iga associated with the Beverly ekw̄ò herd.

Aerial removals will be continued until the target is met or until the operation period has ended. D̄iga collar locations will be used to orient removal crews to the general vicinity of d̄iga. Every effort will be made to avoid the removal of the collared d̄iga or its pack mates. Aerial removal crews will attempt to remove all un-collared d̄iga encountered, removing entire packs, where possible to reduce the possibility of splitting d̄iga packs, which may result in dispersal and/or establishment of additional packs. Every effort will be made to recover d̄iga carcasses and transport them for subsequent skinning and necropsy.

### 7.5.2. Proponents Evidence

The Technical Pilot Project Report reported that the ground-based harvesters did not achieve the targets set based on 60-80% of the estimated d̄iga numbers, and so GNWT undertook aerial shooting between 22 April and 17 May 2020.<sup>134</sup> For aerial shooting, all 36 d̄iga were assigned to the K̄òk'èet̄ı and Saht̄ı ekw̄ò herds.

The distribution of collared K̄òk'èet̄ı and Saht̄ı ekw̄ò in March 2020 was used to define aerial survey areas, which were surveyed twice in March and April 2020. The results had been intended to direct aerial shooting but few d̄iga were seen. Further support for

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<sup>131</sup> PR (Wolf 2020): 106 - Wolf Technical Feasibility Assessment – Options for managing wolves on the range of the Bathurst barren-ground caribou herd.

<sup>132</sup> PR (Wolf 2020): 036 - South Peace caribou recovery following five years of experimental wolf reduction.

<sup>133</sup> PR (Wolf 2020): 017 - GNWT & TG's Revised Joint Proposal on Management Actions for Wolves (d̄iga) on the Bathurst and Bluenose-East Barren-ground Caribou (̄ekw̄ò) Herd Winter Ranges: 2021 – 2024.

<sup>134</sup> PR (Wolf 2020): 018 - 2020 Wolf Management Pilot Program Technical Report.

low dīga numbers is apparent when, in mid-May 2020, four days were spent checking approximately 50 dens on the Kòk'èeti ekwò range and no dīga were found at the dens. However, three dīga were killed on 10 May 2020 close to a den.<sup>135</sup>

The aerial removals were completed using a fixed wing aircraft, and two helicopters. The fixed-wing aircraft flew a survey grid to identify groups of dīga. A helicopter crew, consisting of the pilot, marksman, and navigator, then flew to these locations, shot the dīga, and placed the carcasses together. A crew in a second helicopter then tagged the dīga, took samples and photographs, and prepared the dīga for transport.<sup>136</sup> Out of an available 31 days for the aerial removal program, 19.5 were lost to weather, one day was lost to mechanical issues, for a total of 10 aerial removal flying days.<sup>137</sup>

All dīga shot during the aerial removal were necropsied as reported in the “Veterinary Assessment of Aerial Removal Procedures” report submitted to the WRRB<sup>138</sup>. All dīga were shot using 00 buckshot, except one dīga was shot with a high-powered rifle. Mostly, the total pursuit time ranged from 0-2 minutes, with one pack attempt that resulted in the removal of three dīga where the total pursuit time was 51 minutes. The Veterinary Assessment of Aerial Removal Procedures<sup>139</sup> included carcass examination to assess humaneness for all dīga removed during aerial shooting. Data and field sheets were not included in the Pilot Project or Veterinary Assessment. The assessment noted that seven dīga escaped and that all dīga shot at were recovered suggesting none of the dīga that escaped were injured.

The number and type of wounds was summarized and the time to unconsciousness was gauged from the wound determined to be the fatal one. Based on the injuries, 97% of dīga would have been unconscious within 180-300 seconds (2-5 minutes) which meets criteria to be considered humane death. For the 30 chase times where the “time to death” classification was ranked, the helicopter crew selected “Immediate” 22 times. The vet’s recommendations for video monitoring, oversight of the Animal Care Committee, and an external audit may suggest doubts about, for example, the wounding rate, and the accuracy of timing to unconsciousness.

Most dīga were in good condition (86%) and 9 of 15 females were pregnant. One female was near-term and with evidence of lactation (the aerial dīga removals extended 22 April to 15 May 2020).<sup>140</sup> Almost half the dīga had tooth damage consistent with

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<sup>135</sup> PR (Wolf 2020): 018 - 2020 Wolf Management Pilot Program Technical Report.

<sup>136</sup> Ibid.

<sup>137</sup> Ibid.

<sup>138</sup> PR (Wolf 2020): 108 - Veterinary Assessment of Aerial Removal Procedures: GNWT and Tłı̄chq̄ Government 2020 Wolf (Dīga) Management Pilot Program.

<sup>139</sup> Ibid.

<sup>140</sup> Ibid.

exposure to the canine distemper virus while teeth are growing, which is an observation which may relate to the likelihood of pup recruitment if the disease is prevalent.<sup>141</sup>

As d̐ga are a social carnivore, fragmentation of packs during removal is a concern.<sup>142</sup> Pack fragmentation was only reported for the aerial removals: the 14 packs had an average pack size of  $2.6 \pm 0.41$  SE (range 1-6) and packs were removed in their entirety except one d̐ga from a pack of six and two d̐ga from a pack of five escaped.<sup>143</sup> The Revised Joint Proposal does not describe welfare aspects such as inadvertent increases in harvesting<sup>144</sup> of other carnivores during the d̐ga removals such as n̐gha (wolverine). The Technical Pilot Project Report does list n̐gha harvested during the ground-based d̐ga removals and sightings, including n̐gha caught on camera at the bait sites, but does not provide any views on the implications of the information.

Regarding the cost of the program, GNWT and TG have stated that approximately \$500,000 has been budgeted annually for all d̐ga management related activities and that the final costs for the Pilot Project to be within this range.<sup>145</sup> A significant portion of the Pilot Project's costs supported aerial surveillance and removal.<sup>146</sup>

### **7.5.3. Other Participant's and Public Evidence**

Of the public comments received, eleven of twelve individuals or organizations heavily criticized and did not support the aerial removal program. The Sahtú Renewable Resources Board, neither supported nor criticized the aerial removal program.<sup>147</sup>

Multiple public and participant comments criticized the Revised Joint Proposal's ineffectiveness and inhumaneness. LKDFN opposed the proposal as a whole, stating:

*“D̐ga hold a sacred place for many people of our community. They are respected co-dependents of caribou, and while some of our people harvest d̐ga, no one attacks them. The Dene have lived with d̐ga since time immemorial. D̐ga are skillful adversaries and the means by which they are being killed is contrary to respecting animals”.*<sup>148</sup>

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<sup>141</sup> PR (Wolf 2020): 108 - Veterinary Assessment of Aerial Removal Procedures: GNWT and Tł̐chq̐ Government 2020 Wolf (D̐ga) Management Pilot Program.

<sup>142</sup> PR (Wolf 2020): 106 - Wolf Technical Feasibility Assessment – Options for managing wolves on the range of the Bathurst barrenground caribou herd.

<sup>143</sup> PR (Wolf 2020): 166 - Commitments #4 to #8 - WRRB's Science Technical Session, October 5, 2020.

<sup>144</sup> PR (Wolf 2020): 106 - Wolf Technical Feasibility Assessment – Options for managing wolves on the range of the Bathurst barrenground caribou herd.

<sup>145</sup> PR (Wolf 2020): 147 - TG and GNWT Responses to Information Request Round No. 2.

<sup>146</sup> Ibid.

<sup>147</sup> PR (Wolf 2020): 167 - Public Comment from Sahtu Renewable Resources Board to the WRRB.

<sup>148</sup> PR (Wolf 2020): 171 - LKDFN Final Written Comments - Revised Joint Wolf Management Proposal.

Regarding the management actions proposed, LKDFN stated in their closing arguments that *“Such and enhanced measures would be expected for consideration only if all other strategies for improving caribou survival rates were in force”*.<sup>149</sup>

NSMA did not specifically comment on aerial removals in any of their submissions.

Dave Olesen wrote: *“I have real concerns about the wisdom, the efficiency, and what I predict will ultimately be the fruitless outcome of this program”*.<sup>150</sup> Garth Wallbridge noted *“the easiest purported solutions, in this case a cull, are often done to appease people by offering some solution without knowing that it is the best solution”*.<sup>151</sup>

The Délı̄nę Renewable Resources Council stated that they *“...do not believe that aerial shooting is respectful of the dı̄ga and is concerned that this approach will not protect ʔekwə”*.<sup>152</sup> The Délı̄nę Renewable Resources Council did not support the program as a whole<sup>153</sup>, stating

*“Elders from all 5 Sahtú communities described the important relationship between dı̄ga and ʔekwə (caribou). The Elders explained that the dı̄ga keep the ʔekwə populations healthy, that killing all the dı̄ga might actually wipe out the ʔekwə, and that dı̄ga must be respected”*.

Regarding the cost of the program, Dave Olesen stated

*“I know that in the North, in government, money seems to fall from the sky in huge, unencumbered bundles, but it still should carry with it some caveats and conscience, in order to use taxpayer dollars wisely. So please, crunch the numbers again, and look at what this is costing. And remember that this cost is not just in money, but in time and effort by everyone involved. A five-year program like the one proposed eats up an enormous proportion of the daily workload of an entire team of professionals, in ENR and elsewhere. These people would otherwise be able to focus their talents on other urgent matters... The main questions to consider, I think, are two: First, do the results make this a wise investment of effort and money? and second, what is the benefit of this wolf kill for the caribou herds? The latter is the fundamental question here”*.<sup>154</sup>

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<sup>149</sup> PR (Wolf 2020): 171 - LKDFN Final Written Comments - Revised Joint Wolf Management Proposal.

<sup>150</sup> PR (Wolf 2020): 148 - Public Comment from D. Olesen to the WRRB.

<sup>151</sup> PR (Wolf 2020): 119 - Public Comment from G. Wallbridge to the WRRB.

<sup>152</sup> PR (Wolf 2020): 122 - Public Comment from Délı̄nę Renewable Resources Council to the WRRB.

<sup>153</sup> Ibid.

<sup>154</sup> PR (Wolf 2020): 148 - Public Comment from D. Olesen to the WRRB.

#### **7.5.4. Analysis and Recommendations**

Overall, aerial d̐ga removals appear effective, but the required effort indicated low d̐ga numbers or d̐ga were hard to detect. In contrast to the limited efforts to increase efficiencies and effectiveness for the ground-based harvesting, considerable effort was made to increase the effectiveness of the aerial shooting, e.g., aerial survey, use of the collared ʔekw̐ locations, den sites and the bait sites.

Although the necropsy report indicated that, overall, the aerial d̐ga removal procedures would meet criteria consistent with humane death, the high rate of wounding and the veterinary pathologist's recommendations for closer scrutiny leaves room for doubt. The WRRB is concerned that the timing of the proposed removal should not extend into May as the pregnant females are near-term.

The WRRB notes concerns from the public about the cost of aerial removals and the d̐ga management program generally. The WRRB notes that funds from aerial removals could be put towards implementing a more robust ground-based harvesting program, as per the *Wolf Technical Feasibility Assessment*, the required research and monitoring, and habitat protection.

The WRRB acknowledges that there is significant public concern about the use of aerial removals as a methodology for d̐ga removals on the K̐k'èetì and Sahtì ekw̐ range. The WRRB also acknowledges that none of the Indigenous Governments or Organizations who participated in this process support aerial removals. As there are means in which d̐ga can be managed and removed to halt the ʔekw̐ declines and promote recovery of the herds, the WRRB does not support aerial removals at this time. Should additional efforts to meet targets through ground-based harvests be unsuccessful, the Board would consider a proposal for other methods of d̐ga removal.

#### **Recommendation #7-2020 (D̐ga): Aerial Removal**

The WRRB recommends GNWT and TG should not continue aerial removals of d̐ga on K̐k'èetì and Sahtì ekw̐ 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 d̐ga removal.

#### **7.6. Overall Analysis of Ground-based Harvest and Aerial Removals**

A relatively large number (171) of d̐ga were killed during the Pilot Project, including TG's d̐ga training program (Table 3). Harvesters from the North Slave Region and Nunavut took 130 d̐ga while 36 d̐ga were shot from a helicopter with a further 5 d̐ga

that died during the collaring project.<sup>155</sup> The removals related to the target levels for the Kòk'èetì ekwò herds at 34 dîga was within the 60-80% target level of 29-39 wolves. For the Sahtì ekwò herd, 54 wolves were removed, which is less than the 60-80% target of 73-97.

**Table 3. Summary of dîga numbers, target levels, removal and dîga left compiled from the Pilot Project.**<sup>156</sup>

Year 1	Target herds		Non-target		
	Sahtì	Kòk'èetì	Beverly	Boreal?	
UBI estimate dîga numbers	121	49			
Target based 60-80%	73-97	29-39			
North Slave & Nunavut ground removal	29	20	31	50	130
Aerial shooting + collaring	25	16			41
<b>Total harvest 2020</b>	<b>54</b>	<b>36</b>			<b>171</b>
Year 2					
Desired level to maintain 20-40% of original estimate	24-48	10-20			
Likely Survived May 2020	67	18			
UBI estimate less no. removed					

The WRRB is concerned about the three underlying assumptions for the dîga reduction program. These concerns stem from the results from the Pilot Project. In the Revised Joint Proposal, the three assumptions are: 1) a 60-80% initial removal rate is required to meet objectives, 2) there is sufficient knowledge of the number of dîga to which the 60-80% removal rate is applied, and 3) there is sufficient knowledge to assign dîga removals to individual ʔekwò herds.

First assumption: The first uncertainty, based on experience in Alaska and Yukon, is the rule of thumb that 60-80% of the estimated number of dîga have to be removed in the first year and subsequently kept at that level to meet stated objectives. However, the published examples were not based on either declining dîga or dîga in a multi-prey system. Other evidence on the effects of dîga removal raise doubts about under what conditions such high rates are necessary<sup>157</sup>.

A second concern that follows from the 60-80% rule of thumb is the assumption that the dîga will rapidly replace their numbers by breeding and immigration. During dîga

<sup>155</sup> PR (Wolf 2020): 018 - 2020 Wolf Management Pilot Program Technical Report.

<sup>156</sup> Ibid.

<sup>157</sup> PR (Wolf 2020): 129 - Meta-Analysis of Relationships between Human Offtake, Total Mortality and Population Dynamics of Gray Wolves (*Canis lupus*).

removal for the Fortymile herd, the breeding dīga were removed and so recruitment was low.<sup>158</sup> The WRRB notes that half of the 15 female dīga killed during the aerial removal were pregnant, suggesting that possibly recruitment will be reduced. The Board suggests that the dīga collaring project and a dīga den survey will reduce uncertainty inherent in this assumption.

Second assumption: The WRRB is concerned that there may not be adequate information on the number of dīga. The WRRB is surprised that after the experience of the Pilot Project, where relatively low number of dīga were found, that the Revised Joint Proposal was not revised to consider implications of low dīga numbers for the removal program. The WRRB comments that the low number of dīga will add difficulty to estimating dīga numbers, removing dīga, and possible changes in dīga behavior, such as increased influx of boreal dīga to the ʔekwò winter ranges. Consequently, with respect to this assumption, the WRRB is recommending improvements to estimating dīga numbers.

Third assumption: TG and GNWT assigned the killed dīga to the ʔekwò herds based on an application of a distribution analysis using collared ʔekwò over the previous four years. The analytical technique, kernel distribution estimation, was selected as appropriate at regional scales. This technique describes the likelihood of monthly distribution weighted by herd. The dīga kills were assigned to a herd based on the kill's location to the closest ekwò distribution probability contours for the same month when the dīga died. When two herd's distribution overlapped, the dīga was assigned to the closest probability contour.

Assignment becomes increasingly uncertain when there is high spatial overlap and a large discrepancy between herd sizes.<sup>159</sup> Considering the geospatial analyses and the most recent ʔekwò collaring data, the GNWT rationalized assigning herd identity to target dīga for the Pilot Project that will be used in future years of the program.

The WRRB believes the Revised Joint Proposal's methods of assigning dīga kill location to a herd is only partially adequate as GNWT did not provide a table listing the distances of the kill locations to isopleths describing herd distribution. The use of distances could allow for confidence limits being applied to the herd assignments.

The WRRB suggests that providing descriptive statistics for the assignment of dīga kill sites to a herd will resolve difficulties such as revealed in the Technical Pilot Project Report (Figure 7).<sup>160</sup> The map depicts the location of nine dīga outside of the 95%

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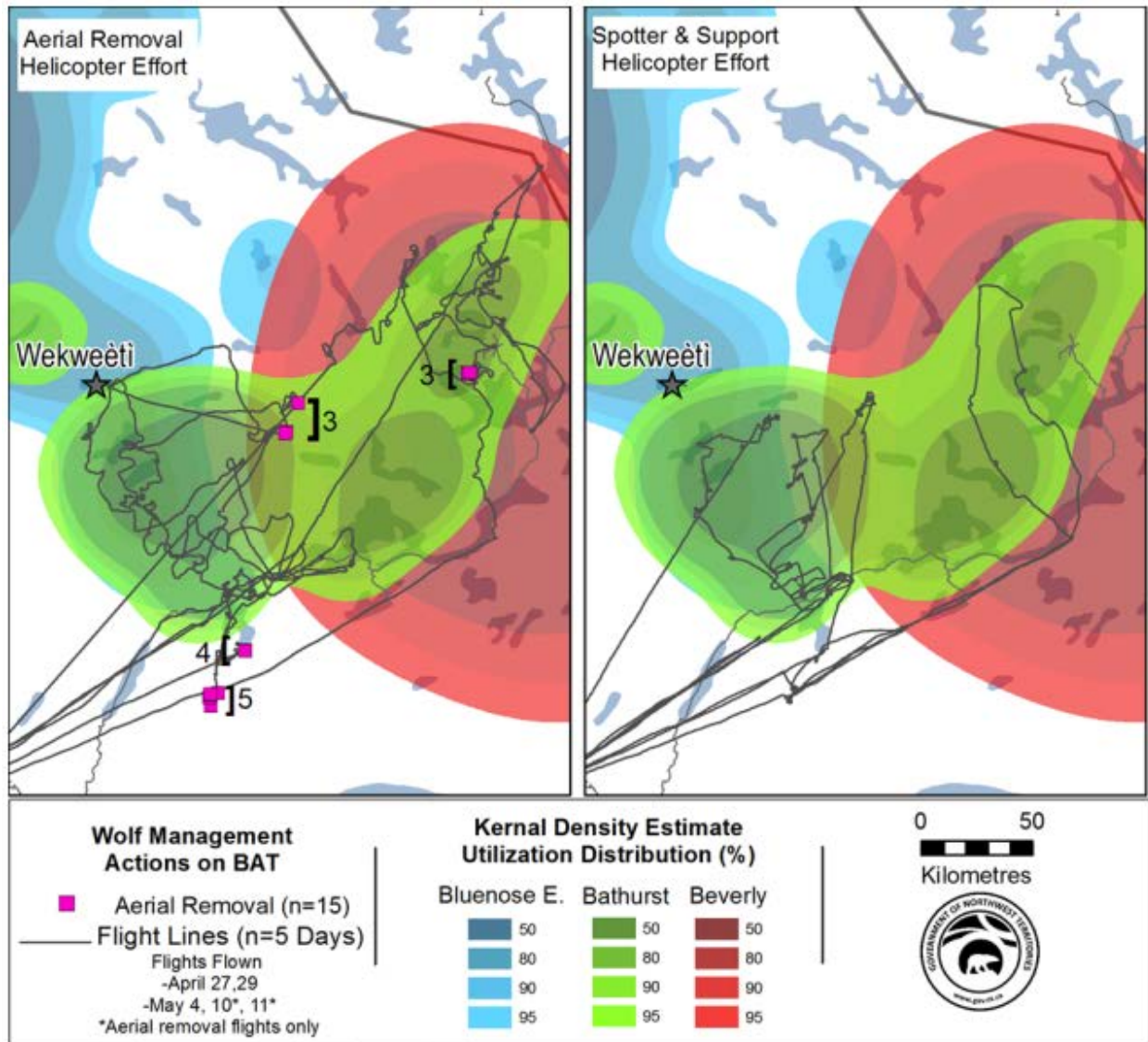
<sup>158</sup> PR (Wolf 2020): 132 - Effects of Control on the Dynamics of an Adjacent Protected Wolf Population in Interior Alaska.

<sup>159</sup> PR (Wolf 2020): 017 - GNWT & TG's Revised Joint Proposal on Management Actions for Wolves (dīga) on the Bathurst and Bluenose-East Barren-ground Caribou (ʔekwò) Herd Winter Ranges: 2021 – 2024.

<sup>160</sup> PR (Wolf 2020): 018 - 2020 Wolf Management Pilot Program Technical Report.



kernel density estimate utilization distribution, but these diga were assigned to the Kòk'èeti ekwò herd. The Board believes a distance from the core ɤekwò density area is necessary to determine how each diga can be associated to a herd.



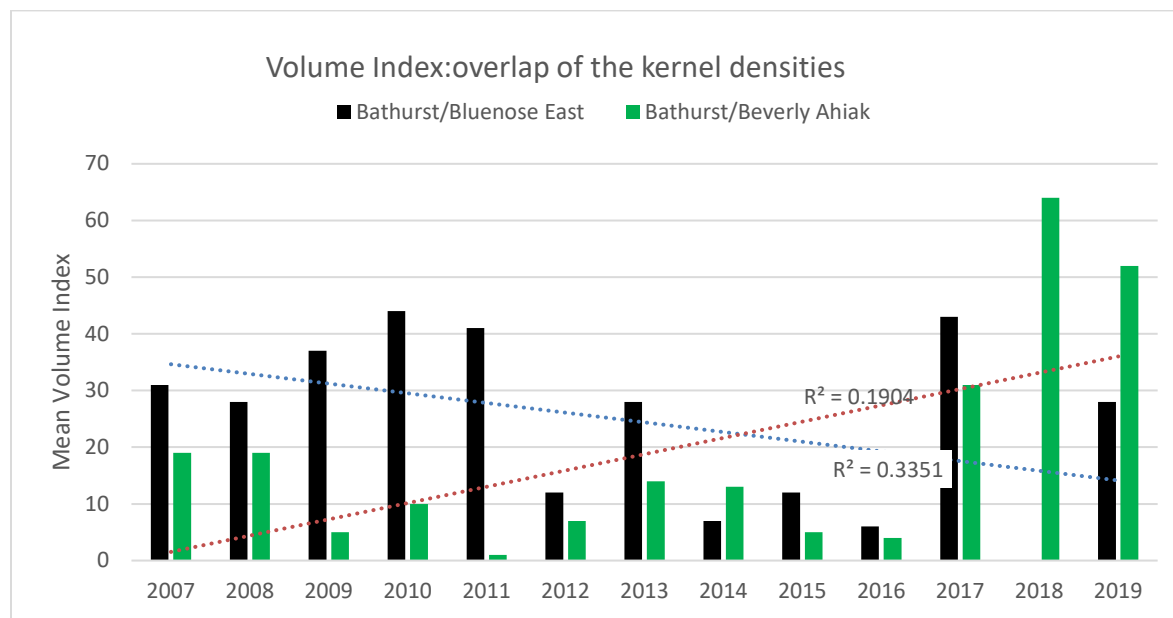
**Figure 7. Flight paths of aerial crews and support helicopter on Bathurst winter range area. April-May 2020.<sup>161</sup>**

While the Technical Pilot Project Report describes the ɤekwò distribution analysis in detail with monthly ɤekwò distribution maps,<sup>162</sup> it does not measure the overlap between the herds or the proximity of the diga kill sites to the ɤekwò distribution contours. The

<sup>161</sup> PR (Wolf 2020): 018 - 2020 Wolf Management Pilot Program Technical Report.

<sup>162</sup> PR (Wolf 2020): 111 - Appendix 11.9 Bathurst, Bluenose-East and Beverly Caribou Winter Range Analysis - Figures (Part 1).

WRRB has undertaken a preliminary analysis to measure overlap in Ɂekwò herd distribution<sup>163</sup> at the scale of the herd and individual collared Ɂekwò (Figure 8).



**Figure 8. Trends in overlap between the Bathurst and Bluenose East and Bathurst and Beverly/Ahiak herds based on the Volume Index (Gurarie et al. In Prep).<sup>164</sup>**

The Kòk'èeti Ɂkwò herd has recently shifted its winter distribution northeast, which reduced overlap with Sahtì Ɂkwò and increased overlap with the Beverly/Ahiak Ɂkwò herd. The overlap starts relatively early in winter (October) and persists until May at the beginning of pre-calving migration. The overlap at the herd scale is less measurable at the scale of 200m between individual collared Ɂekwò either within a herd or across herds. The individual encounter rate based on proximity was highest for the Kòk'èeti Ɂkwò herd with fewest Ɂekwò. The WRRB suggests that such an analysis or an alternative approach could be useful in refining the assignment of òiga removed to individual Ɂekwò herds.

TG and GNWT note uncertainty in whether an assignment of a òiga removal based on kill date and location relative to the concurrent distribution of collared Ɂekwò is robust and biologically accurate or not.<sup>165</sup> The WRRB agrees with this uncertainty especially at a timescale of weeks to seasons as the òiga seasonal movements are currently unknown relative to Ɂekwò seasonal distribution. Although òiga previously denning on a

<sup>163</sup> PR (Wolf 2020): 112 - Appendix 11.9 Bathurst, Bluenose-East and Beverly Caribou Winter Range Analysis - Figures (Part 2).

<sup>164</sup> PR (Wolf 2020): 135 - Preliminary analysis of winter range overlaps between the Bluenose East, Bathurst and Beverly/Ahiak migratory tundra caribou herds.

<sup>165</sup> PR (Wolf 2020): 018 - 2020 Wolf Management Pilot Program Technical Report.

ᗕᗕᗕᗕ herd's summer range migrated with the ᗕᗕᗕᗕ to the herd's winter range,<sup>166</sup> this seasonal pattern may have changed. The WRRB agrees with TG and GNWT that movement patterns of collared dīga may help in resolving uncertainty. The WRRB also agrees with the Pilot Project report about the need for an ecological understanding of ᗕᗕᗕᗕ and dīga interactions, such as dīga movement and spatial use patterns from collars. This is because it is not known how the spatial fidelity of a dīga to a specific herd persists over the timescale of days to seasons. The preliminary table<sup>167</sup> with seasonal locations of collared dīga suggests that fidelity to seasonal ranges is low.

The WRRB is concerned about the limited ecological evidence for assigning the dīga kills to a specific ᗕᗕᗕᗕ herd when winter distribution overlaps. Basing it on the proximity of a dīga kill to the contours describing ᗕᗕᗕᗕ distribution is reasonable in the absence of understanding dīga movements but it is an uncertainty. To expect the dīga during an entire winter or at any time would show fidelity to ᗕᗕᗕᗕ from one herd when ᗕᗕᗕᗕ from another herd are in the vicinity is unlikely.

The Board is also concerned that the difficulty and ambiguity in assigning dīga removals within the Enhanced Incentive Area to ᗕᗕᗕᗕ herds complicates widespread understanding of the program. While the WRRB understands that TG and GNWT have developed formulae to use in these situations, the Board believes more information is needed to understand how and at what timescale a dīga is assigned to which ᗕᗕᗕᗕ herd or to ᗕᗕᗕᗕ.

#### **Recommendation #8-2020 (Dīga): Assigning Dīga to Herds**

The WRRB recommends that TG and GNWT explore alternative methods of assigning harvested dīga to an ᗕᗕᗕᗕ 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.

## **7.7. Research & Monitoring**

### **7.7.1. Introduction**

Ongoing research and monitoring actions are required to make informed and timely management decisions for the Kᗕᗕ'èetì and Sahtì ᗕᗕᗕᗕ herds. Research and monitoring as part of the dīga management program will include monitoring of dīga and dīga

<sup>166</sup> PR (Wolf 2020): 017 - GNWT & TG's Revised Joint Proposal on Management Actions for Wolves (dīga) on the Bathurst and Bluenose-East Barren-ground Caribou (ᗕᗕᗕᗕ) Herd Winter Ranges: 2021 – 2024.

<sup>167</sup> PR (Wolf 2020): 166 - Commitments #4 to #8 - WRRB's Science Technical Session, October 5, 2020.

harvest, a collaring program, and monitoring and modelling ʔekwò response to the actions.<sup>168</sup>

## **7.7.2. Monitoring Dìga**

### **7.7.2.1. Introduction**

The Revised Joint Proposal outlines five proposed monitoring activities for dìga. The WRRB notes that the proposed monitoring only includes estimating the level of dìga removals and information that supports the removals:<sup>169</sup>

1. Collecting information from dìga harvester
2. Monitoring catch per unit effort
3. Estimating dìga removal levels on ʔekwò winter range
4. Monitoring dìga condition, diet, health, and humaneness of aerial removals
5. Monitoring dìga movements (collaring program under a separate proposal).

### **7.7.2.2. Proponents Evidence**

#### **Collecting information from dìga harvesters**

TG and GNWT propose to require all dìga harvesters to fill out a questionnaire and to provide information at check stations to describe among other things, their time expended and distanced travelled.

#### **Monitoring catch per unit effort**

The information from the questionnaires will be used to estimate CPUE, which the Revised Joint Proposal describes as a key indicator. As the number of dìga is reduced, the effort (hours travelled) by harvesters to find dìga will increase. However, TG and GNWT acknowledge that overlapping herd distribution adds uncertainty to the use of the CPUE.

#### **Estimating dìga removal levels on ʔekwò winter ranges**

The level of dìga removal is required when assessing the effectiveness of harvester training, enhanced incentives, harvest camps, efficiency of search and removal techniques, and for evaluating effectiveness of dìga removal actions on ʔekwò.<sup>170</sup>

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<sup>168</sup> PR (Wolf 2020): 017 - GNWT & TG's Revised Joint Proposal on Management Actions for Wolves (dìga) on the Bathurst and Bluenose-East Barren-ground Caribou (ʔekwò) Herd Winter Ranges: 2021 – 2024.

<sup>169</sup> Ibid.

<sup>170</sup> Ibid.

The monitoring will also address the question of assigning d̄iga removal to specific herds when the herds overlap in their winter ranges. The approach depends on ʔekw̄ distribution information at the monthly scale and harvester's information. Assigning d̄iga to ʔekw̄ herds will also depend on collared d̄iga to study their movements on the winter ranges and their fidelity to summer ranges where they breed.

### **Monitoring d̄iga condition, diet, and welfare outcomes**

Examination of the d̄iga carcasses through post-mortem necropsies on a selection of harvested d̄iga will be used to monitor diet, condition, and humaneness of kills.<sup>171</sup>

### **Monitoring d̄iga movements**

Monitoring d̄iga movements within and among the ʔekw̄ herds both seasonally and annually depends on using collared d̄iga.

#### ***7.7.2.3. Other Participant's and Public Evidence***

In their final written argument, the NSMA requested that denning studies be conducted in the region to estimate d̄iga recruitment and inform the Revised Joint Proposal more generally. NSMA stated that they have heard from harvesters that d̄iga populations have been declining in the past decades.<sup>172</sup> Further, NSMA stated that there has been a lack of population estimates and thus this has not been captured.

In their final written comments, the LKDFN criticize the proposal for its high degree of uncertainty regarding the number of d̄iga within the incentive area and lack of updated data on d̄iga dens.<sup>173</sup>

Dave Olesen heavily criticized the Revised Joint Proposal's claim of a moderate number of d̄iga on the ʔekw̄ ranges.<sup>174</sup> He stated that d̄iga are easy for him to see from his plane and he has seen substantially fewer in recent years. Olesen objects to the GNWT's claim that sightability is an issue for aerial surveys and removal of d̄iga on the tundra. Olesen says he has been the main pilot for ENR's d̄iga-den occupancy surveys and has not been seeing occupancy of the dens on the K̄k'èetì ekw̄ range.

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<sup>171</sup> PR (Wolf 2020): 017 - GNWT & TG's Revised Joint Proposal on Management Actions for Wolves (d̄iga) on the Bathurst and Bluenose-East Barren-ground Caribou (ʔekw̄) Herd Winter Ranges: 2021 – 2024.

<sup>172</sup> PR (Wolf 2020): 168 - NSMA Final Written Comments - Revised Joint Wolf Management Proposal.

<sup>173</sup> PR (Wolf 2020): 171 - LKDFN Final Written Comments - Revised Joint Wolf Management Proposal.

<sup>174</sup>PR (D̄iga 2020): 148 - Public Comment from D. Olesen to the WRRB.

#### 7.7.2.4. Analysis and Recommendations

Although the listed monitoring activities are largely those that were tested during the Pilot Project, TG and GNWT have provided no explanation of how the findings of the Pilot Project have led to changes in the proposed monitoring actions.

The Technical Pilot Project Report had specific recommendations to increase the clarity of the CPUE questions, but none about the level of reporting other than improving relationships with harvesters. The recommendations also stated that *“more effort is needed to direct harvesters to areas of high d̄iga abundance when caribou are distributed away from winter road corridors”* but did not specify how this would be done. In the Enhanced Incentive Area, only 15% of the North Slave harvested d̄iga were assigned to the Saht̄i or K̄òk’èet̄i ekw̄ herds and only 21% of the Nunavut harvest was assigned to the K̄òk’èet̄i and Beverly/Ahiak ekw̄ herds.<sup>175</sup> The encounter rate for d̄iga based on 88 d̄iga sighted is high for Nunavut CPUE and suggests that follow-up is needed in the questionnaire to learn more about d̄iga availability.

The Revised Joint Proposal identifies d̄iga removal levels as a key indicator, but not the effects of the removals on d̄iga population ecology. Monitoring on the d̄iga summer ranges should resume to measure if breeding and pup recruitment change during d̄iga removal and to update the den inventory. Fall recruitment levels are a potential indicator of winter predation rates. The possible confounding effect of diseases including rabies, canine distemper, and parvo viruses on d̄iga recruitment is an uncertainty, which limits the use of d̄iga age structure as an indicator of the effects of d̄iga removal.<sup>176</sup>

#### **Recommendation #9-2020 (D̄iga): Den Occupancy**

The WRRB recommends that GNWT and TG monitor d̄iga 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 d̄iga on the K̄òk’èet̄i and Saht̄i ekw̄ summer ranges, starting in the 2020/2021 harvest season.

The Revised Joint Proposal states that only a subset of d̄iga will be necropsied for an evaluation of condition, diet, and welfare outcomes. The WRRB holds the strong view that d̄iga welfare be a priority and that the d̄iga management program be implemented as humanely as possible. As such, all d̄iga should be necropsied and evaluated for humaneness criteria.

<sup>175</sup> PR (Wolf 2020): 018 - 2020 Wolf Management Pilot Program Technical Report.

<sup>176</sup> PR (Wolf 2020): 117 - Commitment #2 - WRRB's Science Technical Session, October 5, 2020.

### **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 Kòk'èetì and Sahtì ekwò herds..

### **7.7.3. Collaring**

#### **7.7.3.1. Introduction**

On January 8, 2020, the ENR submitted a Wildlife Research Permit application for collaring 30 dìga on ranges of the Kòk'èetì, Sahtì, and Beverly ekwò herds. The WRRB did not support this Wildlife Research Permit as the Board was then unable to undertake the process of reviewing and providing recommendations on the 2020-2025 Dìga Joint Management Proposal to which it is closely tied. ENR issued themselves Wildlife Research Permit #WL500830 for the dìga collaring program. A dìga collaring program occurred in early 2020.

On June 24, 2020, ENR submitted an amendment to Wildlife Research Permit #WL500830. The WRRB replied to ENR on September 4, 2020 informing them that until the Board could provide recommendations on the 2021-2024 Dìga Revised Joint Management Proposal, the WRRB could not provide support for the WRP Application to collar dìga on the central barrens.

#### **7.7.3.2. Proponents Evidence**

Thirty satellite collars are proposed to be placed on dìga with approximately ten each being deployed on Kòk'èetì, Sahtì and Beverly ekwò.<sup>177</sup> The Revised Joint Proposal states that collared dìga will be used to determine 1) how dìga travel among ʔekwò herds on their winter ranges, 2) broader dìga movement patterns across ʔekwò ranges on an annual and multi-year basis, and 3) fidelity of dìga to send sites and ʔekwò ranges and assist in the evaluation of dìga management actions.<sup>178</sup>

The secondary objective of the collar program is to direct aerial removals. GNWT and TG proposed that dìga collars would be used to direct aerial harvesters to dìga packs, with every effort being made not to remove collared dìga or their pack mates.

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<sup>177</sup> PR (Wolf 2020): 017 - GNWT & TG's Revised Joint Proposal on Management Actions for Wolves (dìga) on the Bathurst and Bluenose-East Barren-ground Caribou (ʔekwò) Herd Winter Ranges: 2021 – 2024.

<sup>178</sup> Ibid.

### **7.7.3.3. Other Participant's and Public Evidence**

In regard to the uncertainties of the program, the LKDFN wrote

*“At the most basic level, uncertainty on the number of wolves currently within the wolf incentive area during caribou migration, including a lack of updated data on wolf dens, will mean that we will not be sure as to when cull targets will be met, or exceeded”.*<sup>179</sup>

NSMA supports the proposed monitoring and looks forward to seeing the number of collars deployed on ḏiga increase in future years.<sup>180</sup>

### **7.7.3.4. Analysis and Recommendations**

The WRRB is perplexed by how little information on the 2020 ḏiga collaring is available on the public record to provide a foundation for the Revised Joint Proposal. The number of ḏiga collared was fewer than expected although the WRRB does not know whether it was difficulty in finding ḏiga or technical problems (four ḏiga died during the collaring and one ḏiga was euthanized as in poor health) that resulted in the low success rate of the collaring during the Pilot Project.

One objective of the collaring program was to determine the movements of ḏiga relative to the ʔekw̱ seasonal ranges. The preliminary results of the collar data suggest a complex ḏiga-ʔekw̱ system, but the Board is unable to make conclusions as the sample size of collared ḏiga is low and there is only four months of data available.<sup>181</sup> With adequate sample size, the collared ḏiga movements may reduce uncertainty of assigning ḏiga removals to ʔekw̱ herds. Effective statistical design including precisely worded objectives is essential to detect and measure rates of immigration. Measuring if boreal ḏiga shift to migratory tundra ʔekw̱ winter range as a response to low numbers of tundra ḏiga could reduce uncertainty as to whether the removals are drawing in ḏiga from the boreal forest.

The Technical Pilot Project Report also noted the need for an ecological understanding of ʔekw̱ and ḏiga interactions, such as ḏiga movement and spatial use patterns from collars, and genetic variability which can be added isotope analysis of ḏiga diet.<sup>182</sup>

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<sup>179</sup> PR (Wolf 2020): 171 - LKDFN Final Written Comments - Revised Joint Wolf Management Proposal.

<sup>180</sup> PR (Wolf 2020): 168 - NSMA Final Written Comments - Revised Joint Wolf Management Proposal.

<sup>181</sup> PR (Wolf 2020): 166 - Commitments #4 to #8 - WRRB's Science Technical Session, October 5, 2020.

<sup>182</sup> PR (Wolf 2020): 018 - 2020 Wolf Management Pilot Program Technical Report.



### **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-ṛekwò spatial distribution, including reducing the uncertainties involved with assigning dìga to ṛekwò herds.

#### **7.7.4. Monitoring ṛekwò Response**

##### **7.7.4.1. Introduction**

There are many factors likely influencing the current trend in ṛekwò populations including environmental factors, disturbance, and predation. To monitor whether the objectives of the Revised Joint Proposal are met, ṛekwò herd demographic data must be monitored for improvement. This is achieved through aerial surveys, on-the-ground monitoring, and collars.

##### **7.7.4.2. Proponents Evidence**

The final part of the monitoring program was to monitor adult survival, age ratios, and herd size through traditional surveys.<sup>183</sup> The Ekwò Nàxoède K'è (Boots on the Ground) program will observe calf survival and ṛekwò health. These are all activities that are currently occurring, and nothing new was proposed. The Revised Joint Proposal does state, however, that other factors affect ṛekwò survival and so determining the effects of dìga removal may be difficult.

##### **7.7.4.3. Other Participant's and Public Evidence**

In their closing arguments, the NSMA writes

*“while large natural changes in the abundance of migratory barren-ground caribou populations have been documented, the current declining trend is seen as an unusual, prolonged low in caribou abundance. The low number of Bathurst caribou on the calving grounds in recent years is a suspected result of low adult survival rates, reduced recruitment, and to a lesser extent, harvest. However, there is still no consensus about the main cause of the decline, with several factors such as habitat degradation and fragmentation, predation, climate change, parasitism, and disease being blamed”.*<sup>184</sup>

The LKDFN stated in their closing arguments that

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<sup>183</sup> PR (Wolf 2020): 017 - GNWT & TG's Revised Joint Proposal on Management Actions for Wolves (dìga) on the Bathurst and Bluenose-East Barren-ground Caribou (ṛekwò) Herd Winter Ranges: 2021 – 2024.

<sup>184</sup> PR (Wolf 2020): 168 - NSMA Final Written Comments - Revised Joint Wolf Management Proposal.

*“LKDFN has participated in a review of this proposal and a review of material provided to the WRRB. Through this participation we have observed a high degree of uncertainty regarding whether wolf culling measures will lead to caribou recovery”.*<sup>185</sup>

One member of the public<sup>186</sup> criticized the Revised Joint Proposal’s remote language and reminded the Board that they are talking about the *“beleaguered hunters of a shockingly reduced caribou herd”*.

#### **7.7.4.4. Analysis and Recommendations**

The Revised Joint Proposal lists monitoring of estimated and modelled adult female Ɂekwò survival, age ratios and population trends, but it will be challenging to attribute changes in those factors to d̄iga reductions.<sup>187</sup> The means to address this complexity are not outlined in the Revised Joint Proposal, apart from modelling. There are no plans to include statistical power in evaluating the program, although in the response to information request to LKDFN, GNWT identified increasing sample sizes to minimize the risk of drawing incorrect conclusions about the effect of the d̄iga removals.<sup>188</sup> To evaluate the impact that d̄iga removals have on Ɂekwò populations, a better understanding of what is causing calf mortalities on the calving grounds is required.

#### **Recommendation #12-2020 (D̄iga): 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 d̄iga on calf survival on both K̄òk’èetì and Sahtì ekwò 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.

As early as the 1990s, T̄ìchq̄ elders and harvesters spoke of the importance of understanding the state of habitat for Ɂekwò. Habitat became more of a focus in the 2000s, with statements such as one by Harvester Alfred Arrowmaker in 2008,

*“Different animals’ habitat are lush at different times. Sometimes the wolves are healthy because their habitat is lush, and sometimes the Ɂekwò are healthy because their habitat is lush”.*<sup>189</sup>

<sup>185</sup> PR (Wolf 2020): 171 - LKDFN Final Written Comments - Revised Joint Wolf Management Proposal.

<sup>186</sup> PR (Wolf 2020): 148 - Public Comment from D. Olesen to the WRRB.

<sup>187</sup> PR (Wolf 2020): 017 - GNWT & TG’s Revised Joint Proposal on Management Actions for Wolves (d̄iga) on the Bathurst and Bluenose-East Barren-ground Caribou (Ɂekwò) Herd Winter Ranges: 2021 – 2024.

<sup>188</sup> PR (Wolf 2020): 146 - LKDFN Response to Question #6, Information Request Round No. 2.

<sup>189</sup> PR (Wolf 2020): 081 – Wolf: T̄ìchq̄ Knowledge and Perspective.

Elder Phillip Dryneck, during the Bluenose-East Caribou Public Hearing in 2016, was concerned with the loss of habitat when he said, “*Caribou have been with us for many, many years. And now they’re...blaming the predators, like wolves, bears...[it] is not possible because they always co-existed.*”<sup>190</sup>

During the TK Technical Session, the elders called for more TK research to better understand d̄iga and ʔekw̄ò relationships through time. As noted by T̄l̄ch̄ò elders, boreal d̄iga and tundra d̄iga behave differently; and recently the behaviour of d̄iga has changed. Other TK studies have found that d̄iga that are linked to migrating prey will travel much longer distances than territorial d̄iga.<sup>191</sup> Since tundra d̄iga have been researched much less than other d̄iga, TK research will be valuable to understand differing behaviour through time and space.

### **Recommendation #13-2020 (D̄iga): D̄iga and ʔekw̄ò Relationship**

The WRRB recommends that TG collect and document stories about the changes that T̄l̄ch̄ò elders and their families have observed to the d̄iga and ʔekw̄ò relationship through time, and in the present considering other animal behaviour, climate change, loss of habitat, and population declines.

The Ekw̄ò Nàxoède K’è program collects T̄l̄ch̄ò knowledge on K̄òk’èet̄i ekw̄ò and their relationship to the land, and predators. The WRRB acknowledges the importance of this program and sees an opportunity for a concerted effort to collect T̄l̄ch̄ò Knowledge about d̄iga while on the land. The need for this comes at a time of change where past stories from the 1990s can be compared to the present. For example, members of the T̄l̄ch̄ò Elders Regional Committee often mention places named after d̄iga, such as *D̄igat̄i* (wolf-lake). One of which was named “*because the wolves have dens in the esker and chase the caribou when they migrate across this lake. It is a long lake, with narrows*”.<sup>192</sup>

Elder Johnny Eyakfwo, like other elders, explained that,

*“If there were some other animals or a wolf, bigger caribou would block [the smaller caribou from] it. Because that big caribou have antlers, the wolf is afraid of them, [and] the smaller caribou are unable to defend themselves, so the big animal like a big caribou will shield the little caribou. That is how they move. If it were not so and if the bigger animal were not with it [the young], [the wolves] would easily kill it. That is what we learned from our elders [and by walking the land]”.*<sup>193</sup>

<sup>190</sup> PR (Wolf 2020): 081 – Wolf: T̄l̄ch̄ò Knowledge and Perspective.

<sup>191</sup> PR (Wolf 2020): 074 - Traditional Knowledge on Caribou Ecology: Vegetation → Caribou → Wolf Food Chain.

<sup>192</sup> PR (Wolf 2020): 081 – Wolf: T̄l̄ch̄ò knowledge and Perspective.

<sup>193</sup> Ibid.

Elders at the TK Technical Session called for more TK research that would include stories of the past and occurrences in the present as a way of finding solutions to the current situation.

**Recommendation #14-2020 (Dìga): Ekwò Nàxoède K'è**

The WRRB recommends that TG collect Tìchọ stories about dìga and ʔekwò, while on the land, from elders participating in the Ekwò Nàxoède K'è program to increase the understanding of the current relationship between dìga and ʔekwò and how it has changed through time.

**7.7.5. Modelling ʔekwò Response**

**7.7.5.1. Proponents Evidence**

The potential effects of dìga removals were explored through statistical modeling.<sup>194</sup> The October 2020 model used two levels of adult survival (averaged for the last three and five years) and average or low calf survival.<sup>195</sup> The model assumed that 60% of adult and calf mortality was a result of dìga predation.<sup>196</sup> This assumption was conservative and although field data is mostly lacking, there is support from the Fortymile herd where about 78% of the adult cow's death rate was shown to be from dìga predation.<sup>197</sup> Additional model scenarios examined the effect of reducing dìga predation on calf mortality from 60% to 25% and for adults from 60% to 30% (Table 4).<sup>198</sup>

**Table 4. Vital rates used as input to the demographic model, Russell 2020.**<sup>199</sup>

	<b>Kọk'èetì Ekwò</b>	<b>Sahtì Ekwò</b>
<b>2018 herd size</b>	8,200	19,800
<b>% decline 2015 - 2018</b>	29%	23%
<b>Adult survival 2018-2020</b>	88%	82%
<b>Adult survival 2015-2020</b>	83%	85%
<b>Spring calf: cow from 2016-2019</b>	33:100	36:100
<b>Fall calf: cow from 2016-2019</b>	34:100	38:100
<b>July 2020 calf: cow</b>	44:100	47:100

<sup>194</sup> PR (Wolf 2020): 019 - Summary Caribou Population Modeling of Varying Levels of Wolf Removal BATH BNE.

<sup>195</sup> Ibid.

<sup>196</sup> Ibid.

<sup>197</sup> Ibid.

<sup>198</sup> PR (Wolf 2020): 166 - Commitments #4 to #8 - WRRB's Science Technical Session, October 5, 2020.

<sup>199</sup> Ibid.

For both herds, in the absence of d̐ga removals, when calf survival was average, Ɂekw̐ numbers increased or were stable depending whether adult survival was higher or lower. When calf survival was low, the numbers declined for either level of adult survival. With 80% d̐ga removal, despite low calf survival, K̐k'èeti ekw̐ numbers increased. Without d̐ga removal, the low calf survival resulted in a stable trend in herd size.

The modelling for the Sahti ekw̐ herd projects a need for d̐ga reduction if the herd is to increase as although adult survival is high, it is not sufficient for the herd to increase. Without d̐ga removal and average calf survival, the herd will stabilize, but with reduced calf survival, the herd declines. However, as with any simple modelling projection, caution is advisable. The model illustrates the reduced effectiveness of d̐ga reduction if d̐ga are not responsible for 60% all mortality, especially on the calf cohort.

#### **7.7.5.2. Other Participant's and Public Evidence**

There were no comments received from the other parties or the public specific to the modelling work completed by the GNWT.

#### **7.7.5.3. Analysis and Recommendations**

The modelling scenarios emphasize the vulnerability of the K̐k'èeti and Sahti ekw̐ herds to small differences in adult survival and the importance of average or low calf survival. While the results of the modeling are not surprising, they do illustrate the difference between the K̐k'èeti and Sahti ekw̐ herds. That is that the Sahti ekw̐ herd is more dependent on d̐ga removal for recovery due to its lower adult survival rate.

By projecting trends in herd size, the model scenarios also allow a comparison of the sensitivity of the d̐ga removal effectiveness to model assumptions. Of particular interest is the potential impact on the results if d̐ga predation rates are not as high as assumed. If, for example, d̐ga were only responsible for 25%, not 60%, of total calf mortality, then d̐ga removal would be 24% less effective.<sup>200</sup> If d̐ga predation causes only 25% of the calf deaths, and 30% of adult deaths, the 60% and 80% d̐ga removal levels would be 38% and 51% less effective, respectively.<sup>201</sup> The scenarios that project reduced effectiveness of the d̐ga removals when predation rates are lower may be of particular significance given the documented declines in d̐ga abundance.

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<sup>200</sup> PR (Wolf 2020): 166 - Commitments #4 to #8 - WRRB's Science Technical Session, October 5, 2020.

<sup>201</sup> Ibid.

### **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 ʔekwò 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.

## **7.7.6 Adaptive Co-Management**

### **7.7.6.1. Introduction**

Adaptive management is simply a process which uses monitoring results to inform ongoing management decisions as well as to determine the effectiveness of management actions. Clear thresholds must be identified in an adaptive management framework to generate specific management implementation decisions that could lead to timelier implementation of management and monitoring actions.

The Barren-ground Caribou Technical Working Group has been working collaboratively to develop an Adaptive Co-Management Framework for Kòk'èeti and Sahti ekwò herds.<sup>202</sup> These efforts resulted from recommendations made by the WRRB during their 2019 Kòk'èeti and Sahti ekwò proceedings. The intent of this Adaptive Co-Management Framework is to utilize the monitoring work that is already taking place to make decisions about the implementation of management actions throughout the year. The concept of an adaptive co-management framework includes thresholds for monitoring indicators that trigger an evaluation of existing management actions and could lead to changes in their implementation. A key component to the success of the Adaptive Co-Management Framework will be the timely reporting of monitoring results.

Adaptive management is an efficient mechanism to respond to uncertainty in the implementation of management actions. Uncertainty can be from low precision or inaccurate measurements, environmental variability such as unexpected weather, or incomplete knowledge about the biological systems.

### **7.7.6.2. Proponents Evidence**

The Revised Joint Proposal lists adaptive co-management as an underlying premise for the project. It is stated that an annual evaluation will occur and then, at the end of the five-year implementation phase, GNWT and TG will undertake a comprehensive review

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<sup>202</sup> PR (Wolf 2020): 103 - Reasons for Decisions Related to a Joint Proposal for the Management of the Kòk'èeti Ekwò (Bathurst caribou) Herd. 2019; and PR (Wolf 2020): 104 - Report on a Public Hearing Held by the Wek'èezhì Renewable Resources Board 9-11 April 2019 Behchokò, NT & Reasons for Decisions Related to a Joint Proposal for the Management of the Sahti Ekwò (Bluenose-East Caribou) Herd.

of the dīga management program with the WRRB and other Indigenous governments and organizations.

### **7.7.6.3. Other Parties and Public Evidence**

The NSMA<sup>203</sup> states the need for effective communication with collaborators to ensure dīga are not over harvested. They write that consistent communication between the GNWT and Government of Nunavut should occur, with sharing of aerial removal results as well as ground-based harvest information.

In their final written comments, NSMA noted that many NSMA harvesters have been observing dīga population declines, but since dīga have not recently been well monitored, the lower population is not reflected in the Revised Joint Proposal's dīga removal targets.<sup>204</sup> The NSMA further stated that they understand that adaptive management is planned to be used to set dīga removal targets each year, but that they have concerns that the short project timeline does not allow for proper adaptive management.<sup>205</sup>

LKDFN stated that other factors than dīga may be more important to the ʔekwò decline, such as linear disturbance<sup>206</sup>, and that the GNWT's proposed Slave Geological Province Road Corridor Project would have substantially more impact to the ʔekwò than this "last ditch" effort.<sup>207</sup>

The Délı̄nē Renewable Resources Council<sup>208</sup> additionally requested information on where the dīga kills will be occurring and what impact they will have on dīga near Délı̄nē and within the Sahtú region as a whole.

### **7.7.6.4. Analysis and Recommendations**

The WRRB believes that a detailed approach to adaptive management is the key to resolving many of the uncertainties identified in the Revised Joint Proposal. Although the Revised Joint Proposal does list adaptive management as an action, it lacks details. The missing details include benchmarks for indicators such as CPUE, adult and calf ʔekwò survival, and overlapping ʔekwò winter distribution. The Revised Joint Proposal also does not describe how dīga removals will be incorporated into the adaptive co-management framework already being developed for Kòk'èetì and Sahtì ekwò herds.

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<sup>203</sup> PR (Wolf 2020): 168 - NSMA Final Written Comments - Revised Joint Wolf Management Proposal.

<sup>204</sup> PR (Wolf 2020): 017 - GNWT & TG's Revised Joint Proposal on Management Actions for Wolves (dīga) on the Bathurst and Bluenose-East Barren-ground Caribou (ʔekwò) Herd Winter Ranges: 2021 – 2024.

<sup>205</sup> PR (Wolf 2020): 168 - NSMA Final Written Comments - Revised Joint Wolf Management Proposal.

<sup>206</sup> PR (Wolf 2020): 171 - LKDFN Final Written Comments - Revised Joint Wolf Management Proposal.

<sup>207</sup> Ibid.

<sup>208</sup> PR (Wolf 2020): 122 - Public Comment from Délı̄nē Renewable Resources Council to the WRRB.

Dìga removal is a treatment being applied to the ʔekwò herds and, as such, a means to evaluate the success or failure of dìga removals is required. The weaknesses in the current objectives mean that the question of at what point benchmarks would modify the aerial removal program, the ground-based harvesting, and the incentives be halted or intensified due to changing biological indicators in either dìga or ʔekwò is left until the five-year review.<sup>209</sup> The Board believes that comprehensive and collaborative annual reviews are more prudent than waiting for a five-year review that may be too late if the risks of removing too few or too many dìga are not anticipated and mitigated.

The WRRB emphasises that it is essential to avoid reporting delays. For example, the delay in providing the updated adult survival rates is detrimental. While the WRRB is recommending that the Barren-ground Caribou Technical Working Group consider results of monitoring vital rates throughout the year, the WRRB is also suggesting that individual rates such as adult and calf survival rates are reported as summer and winter rates.

**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.

**Recommendation #17-2020 (Dìga): Adaptive Co-Management**

The WRRB recommends that any key vital rates of dìga and Kòk'èetì and Sahtì ekwò 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.

The Revised Joint Proposal does not outline how the annual evaluation for the Dìga Management Program will be undertaken, who will be involved, or how information will be shared. The Board is concerned that conditions could change significantly. The annual review should be sufficiently comprehensive that changes to the dìga removal program, even to the extent of a pause, are possible without having to wait until the five-year review.

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<sup>209</sup> PR (Wolf 2020): 115 - WRRB Science Technical Session Summary, October 5, 2020.



### **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.

The *Wolf Technical Feasibility Assessment* states that monitoring is essential to determine whether dìga management has been effective in halting the decline and beginning the recovery of ʔekwò.<sup>210</sup> Three key questions were identified by the *Dìga Feasibility Working Group*:

- 1) Were actions conducted in a verifiable manner that achieved the humaneness objectives?
- 2) Were numerical targets for dìga removal met?
- 3) Were proposed changes in the ʔekwò herd's demography achieved?

To address these questions the *Dìga Feasibility Working Group* compiled a list of components that would need to be monitored for each dìga removal option discussed<sup>211</sup>. For ground-based shooting on the winter range this includes information that should be recorded by harvesters and field support, and information that should be collected from a post-mortem necropsy.<sup>212</sup>

### **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.

The WRRB is a central part of adaptive co-management as set out in the Tłıchq Agreement, and co-management is key to the success of dìga management. Regular updates from GNWT and TG can help the WRRB in making timely, and informed management decisions.

<sup>210</sup> PR (Wolf 2020): 106 - Wolf Technical Feasibility Assessment – Options for managing wolves on the range of the Bathurst barren-ground caribou herd.

<sup>211</sup> Ibid.

<sup>212</sup> Ibid.

<b>Recommendation #20-2020 (Dìga): Adaptive Co-Management</b>
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.

## 8.0. Conclusion

The future of the Kòk'èeti and Sahti ekwò herds is uncertain. The WRRB is of the opinion that the need to implement effective management and monitoring actions is critical. In addition to harvest limitations and reducing disturbance to the ʔekwò herds and their habitat, additional management and monitoring actions that focus on reducing predation, specifically dìga, are unfortunately necessary to support the recovery of the Kòk'èeti and Sahti ekwò herds.

The Board's decisions in this report have been structured to provide the greatest benefit to ʔekwò at this time while recognizing that dìga are an essential part of the ecosystem. Collaborative and adaptive management is essential to ensure a future for the Kòk'èeti and Sahti ekwò herds.

## APPENDIX A      2020 Revised Joint Management Proposal

# Wek'èezhii Renewable Resource Board (WRRB) Management Proposal

## 1. Applicant Information

### Project Title:

Government of the Northwest Territories and Tłıchǫ Government Joint Proposal on Management Actions for Wolves (Diga) on the Bathurst and Bluenose-East Barren-ground Caribou (Ekwò) Herd Winter Ranges: 2021 – 2024

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## 2. Management Proposal Summary

<b>Start Date:</b> January, 2021	<b>Projected End Date:</b> July 1, 2024
<b>Length:</b> 4 years	<b>Project Year:</b> 2 of 5

The Government of the Northwest Territories (GNWT) and Tłıchǫ Government have prepared this joint management proposal for enhanced wolf (diga) management actions to support recovery of the Bathurst and Bluenose-East barren-ground caribou (ekwò) herds. The proposal outlines a range of existing and enhanced wolf (diga) management actions to support recovery of these herds, and builds upon lessons learned from the 2020 Wolf (Diga) Management Pilot Program (Wolf (Diga) Management Pilot Program Technical Report attached), Predator Management Recommendations from the Wek'èezhii Renewable Resource Board (WRRB letter of February 6, 2019) and the response from the Tłıchǫ Government and GNWT (March 7, 2019).

There is an urgent need to continue enhanced actions put in place during the Wolf (Dìga) Management Pilot Program to increase caribou (ekwò) cow and calf survival rates of the Bathurst and Bluenose-East barren-ground caribou (ekwò) herds. Caribou harvest restrictions and wolf (dìga) reduction are the two management actions most likely to influence the direct mortality of Bathurst caribou (ekwò), which has declined to a critical status, and the Bluenose-East herd, which is currently in the 'red' herd status as defined by the January 2020 Bluenose-East Action Plan (Advisory Committee for Cooperation on Wildlife Management 2020). Proposed actions to reduce the number of wolves on the winter ranges of the Bathurst and Bluenose-East herds, combined with ongoing caribou (ekwò) harvest restrictions, is predicted to improve caribou (ekwò) survival and promote population recovery for both herds. The 2019-2021 Bathurst and Bluenose-East ʔekwò (Barren-ground caribou) Herd proposals also identify additional management actions for habitat and land use, education and research and monitoring.

This proposal recommends that multiple approaches to reduce wolf (dìga) predation on Bathurst and Bluenose-East caribou (ekwò) be undertaken in conjunction with annual monitoring for a minimum of 5 years (including the 2020 Wolf (Dìga) Management Pilot Program). If annual wolf (dìga) removals are maintained at a meaningful level there is a reasonable likelihood of detecting a measurable effect on improved caribou (ekwò) survival rates within a 5-year time frame (Wolf Feasibility Assessment Technical Working Group (WFATWG), 2017). Recent caribou (ekwò) population modeling of various levels of wolf (dìga) removal predicted caribou (ekwò) population stability over five years with a high level of removal initially followed by sustained removal to keep wolf numbers low (see attached Caribou Modeling Summary). The modeling also showed that with a sustained effort in maintaining low wolf numbers, a reduction in the rate of decline in a caribou population is achieved even when wolf abundance has been underestimated.<sup>i</sup>

Wolf (dìga) removal levels in the 2020 Wolf (Dìga) Management Pilot Program were 31 from the Bathurst winter range and 54 from the Bluenose-East winter range. The 60 to 80% target removal levels for these two herds were 29-39 on the Bathurst and 73-97 for Bluenose-East range based on caribou (ekwò) densities on the winter range, extrapolated herd population size and an Ungulate Biomass Index (see 2020 Wolf (Dìga) Management Pilot Program Technical Report). Based on these results, the Pilot Program was successful in reaching target removal levels on the Bathurst herd, and achieved removal of 45% of estimated wolves on the Bluenose-East caribou (ekwò) herd range. However, it is likely that the aerial program could have removed more wolves on the Bluenose-East range had the COVID-19 pandemic not delayed the program and impacted where the crew was based. Poor weather conditions also severely impacted the program as the crew was unable to fly on 20 of the 30 available days. Sustained removal effort will be required over the next 4 years to keep wolf (dìga) predation rates as low as possible on these herds.

An evaluation of the Wolf (Dìga) Management Program will be undertaken each year to identify challenges, areas for improvement and to adapt procedures to any new information and understandings. At the end of the 5-year implementation phase, Tìchq̄ Government and the GNWT will conduct a comprehensive analysis of information collected, as well as a full program review with the WRRB and other Indigenous governments and organizations to:

- Assess the effectiveness of wolf (dìga) reduction actions in achieving program goals and objectives;

<sup>i</sup> The modeling exercise did not consider environmental variability or other factors influencing caribou demography.

- Determine whether wolf (dìga) reductions should continue based on the effectiveness of the Wolf (Dìga) Management Program; and
- Implement improvements to the overall program, as required.

Attributing caribou (ekwò) population response to specific management actions will be complex, involving consideration of the interacting effects of harvest, predation and environmental conditions. Caribou (ekwò) population models will be used to help tease out the contribution of multiple factors affecting caribou (ekwò) population response including the effect of predator management.

This proposal includes 3 main approaches to wolf (dìga) management:

1. Enhanced Support for Wolf (Dìga) Harvesters and the Traditional Economy:
  - Continuation of Tłıchq Government's Community-based Dìga Harvest Training Program
  - GNWT workshops on wolf (dìga) harvesting and pelt preparation
  - Continuation of Enhanced North Slave Wolf Harvest Incentive Program
    - Increased incentives are available to all NWT Resident and Indigenous harvesters
  - Participation of Tłıchq wolf (dìga) harvesters
  - Participation of Nunavut wolf (dìga) harvesters
  - Use of bait by hunters to support wolf (dìga) removals
2. Aerial Wolf (Dìga) Reduction Actions (if required):
  - Aerial shooting of wolves on Bathurst and Bluenose-East winter ranges
3. Monitoring, Research and Assessment:
  - Collecting information from wolf (dìga) harvesters
  - Monitoring catch per unit effort
  - Estimating wolf (dìga) removal levels on caribou (ekwò) winter range
  - Monitoring wolf (dìga) condition, diet, health and humaneness of aerial removals
  - Monitoring wolf (dìga) movements (collaring program under a separate proposal)
  - Monitoring changes in caribou (ekwò) herd demographic rates

This proposal builds on the lessons learned during the 2020 Wolf (Dìga) Management Pilot Program which implemented new and enhanced management actions for wolf (dìga) reduction, monitoring and assessment. These actions align with current and ongoing management and monitoring of the Bathurst and Bluenose-East herds and previous WRRB recommendations.

Please list all permits required to conduct proposal:

- a) NWT General Wildlife Permit will be issued to anyone wishing to use bait to harvest wolves and to permit aerial removals.

### **3. Background** *(Provide information on the affected wildlife species and management issue)*

The Bathurst and Bluenose-East caribou (ekwò) herds have both declined significantly in recent years and the situation for both herds is dire. The decline of the Bathurst herd was first documented in 1996 when the population was estimated at 349,000 animals, down from 472,000 in 1986. Management actions to date have included harvest restrictions and wolf (dìga)

harvest incentives starting in 2010; these actions have failed to halt the decline, and the herd was estimated at 8,200 animals in 2018.

The decline of the Bluenose-East herd was first documented in 2013 when it was estimated at 68,000 animals, down from 121,000 in 2010. In 2018, the herd's population was estimated at 19,300 animals. Calving-ground photographic surveys, which take place in Nunavut, were scheduled in June 2020 for both these herds, but were postponed to 2021 due to restrictions put in place through Government of Nunavut Public Health Orders related to COVID-19.

Both traditional and scientific knowledge have shown that barren-ground caribou (ekwò) experience population cycles that can be between 30–60 years long. These cycles can be hard to predict and at times do not follow the same pattern. What drives these cycles in barren-ground caribou (ekwò) is not fully understood but likely include many factors such as harvest, habitat, predators, climate and disease. Previous low points in the cycle for the Bathurst herd occurred in the 1920s, and again during the period of 1950-1970 based on Tłìchq knowledge and spruce root scar frequency along key caribou movement corridors (Zalatan *et al* 2006).

The current population estimates for the Bathurst and Bluenose-East herds are the lowest estimates from survey results going back to the 1980s. To promote recovery of these two herds our goal is to reduce mortality rates of caribou (ekwò) and improve survival and encourage population growth. In 2016, the WRRB set a total allowable harvest (TAH) of zero for all users of the Bathurst herd within Wek'èezhìi which will continue until at least the 2020/21 harvest season. In 2016, a TAH of 750, bulls only, was established for all users of the Bluenose-East herd within Wek'èezhìi. In 2019, the WRRB determined that the TAH for Bluenose-East would be further reduced to 193 bulls. The Nunavut Wildlife Management Board is currently considering proposals from the Government of Nunavut to reduce harvest of Bathurst caribou (ekwò) in the Kitikmeot region, to zero from 30 and for the Bluenose-East to 107, bulls only, from 340.

This proposal presents a coordinated approach to wolf (dìga) management actions aimed at reducing wolf (dìga) predation on caribou (ekwò). Reducing wolf (dìga) predation in combination with ongoing harvest management is anticipated to have a positive influence on survival rates of caribou (ekwò) in the Bathurst and Bluenose-East herds.

Previous joint management proposals for the Bathurst herd submitted by the Tłìchq Government and the GNWT resulted in the WRRB holding public hearings in 2010 and again in 2016. Public hearings were also held to address management proposals for the Bluenose-East herd in 2016 and 2019. During the 2016 and 2019 public hearings, through consultation conducted January 21-23, 2019, and more recent engagements (GNWT, GN and Indigenous leaders meeting, February 2020; Tłìchq community engagement February 2020) the WRRB, the GNWT and Tłìchq Government heard concern from community members that wolves are continuing to put pressure on barren-ground caribou (ekwò) populations.

The WRRB expressed at the public hearings for the Bluenose-East herd in April 2019 that the 20% rate of annual decline for the Bathurst and Bluenose-East herds is so serious that waiting any longer to implement predator management would make recovery of the herds even more difficult.

A preliminary summary of the 2020 Wolf (Dìga) Management Pilot Program was provided to Indigenous governments and organizations on July 22, 2020 inviting feedback including any concerns (See attached Plain Language Summary). No responses were received by the time

of this submission. Consultation with Indigenous governments and organizations on the current proposal was initiated at time of the submission (detailed engagement log attached).

A collaborative assessment of wolf (dìga) management options for the Bathurst caribou (ekwò) range was conducted by the WRRB, GNWT and Tłìchò Government, and a final report entitled “Wolf Technical Feasibility Assessment: Options for Managing Wolves on the Range of the Bathurst Barren-ground Caribou Herd” was released in 2017 (WFATWG 2017). The assessment considered 11 options, including both lethal and non-lethal methods, their potential effectiveness, cost and humaneness. The feasibility assessment provided a basis for developing the current proposal for wolf (dìga) management actions for the Bathurst and Bluenose-East herds which is comprised of a combination of three of the options presented: snaring, ground-based shooting and aerial shooting on the winter range. These options were selected as they allowed for a high level of involvement of harvesters and the traditional economy and focus on removal activities from the winter range within the NWT where Tłìchò Government and the GNWT have jurisdiction.

Wolves on the range of the Bathurst and Bluenose-East herds are migratory and their diet relies heavily on barren-ground caribou (ekwò). This is different than wolves in the boreal forest that are territorial and prey on multiple species in an area. It has been shown that wolves associated with barren-ground caribou (ekwò) herds can, on average, take 23 to 29 caribou (ekwò) per year (WFATWG 2017). This can vary seasonally and is likely influenced by factors such as pack size (Dale et al. 1994, Hayes and Russell 2000, Vucetich et al. 2004). As is the case in many jurisdictions, the GNWT does not have reliable estimates of wolf (dìga) abundance across the NWT, or for populations of wolves associated with specific barren-ground caribou (ekwò) herds. The difficulty in obtaining estimates of wolf (dìga) abundance arise from behavioural characteristics such as organization into packs resulting in clumped distributions, lack of territoriality and the tendency to be elusive resulting in reduced sightability from the air.

Monitoring of wolf (dìga) abundance and denning activity on the Bathurst range indicated a significant decline in rates of wolf (dìga) pup survival and den occupancy between 1996 and 2010 (D. Cluff pers. comm. 2019; Klaczek 2015). These lower rates are believed to be directly linked to the decline in Bathurst caribou (ekwò) numbers. Efforts to conduct more recent winter wolf (dìga) abundance survey on the ranges of the Bluenose-East and Bathurst have been confounded by the fact that 3 caribou (ekwò) herds (Bathurst, Bluenose-East and Beverly) sometimes converge across a large, shared winter range.

Unlike wolves that live in the boreal forest, which defend permanent territories and prey upon multiple resident species such as moose and woodland caribou (ekwò), migratory tundra wolves associate with barren-ground caribou (ekwò) on their winter ranges and move northwards with spring migratory movements of caribou (ekwò), ultimately denning south of the caribou (ekwò) calving grounds (Heard and Williams 1992, Musiani et al. 2007, Hansen *et al* 2013). However, it is not well known how closely the tundra wolves (dìga) seasonal movements are affiliated with specific barren-ground caribou (ekwò) herds on an annual basis, and whether the association between tundra wolves (dìga) and caribou (ekwò) herds may establish a basis for defining wolf (dìga) populations for management purposes.

Early research by Kennedy et al. (1991) assessed genetic variability of wolves sampled across ranges of barren-ground caribou (ekwò) in the Mackenzie delta, tundra range of the Bluenose herd (as it was known through the 1980s and 1990s), forested ranges in the Sahtu Region associated with woodland caribou and the Bluenose herd, and the area of the Richardson Mountains associated with the Porcupine caribou herd. This work found that wolves across



these different caribou ranges were generally similar suggesting a large panmictic population. This understanding was supported by field observations of extensive movements of wolves (dìga) throughout the study area, with many changes in pack structure and formation attributed to disruptions from hunting and trapping, with packs splitting and moving to new areas. Some males associated with two or three different packs and reproduction by more than one adult female per pack were observed (Clarkson and Liepins 1989a, 1989b). More recent research suggests that prey specialization may be a primary determinant of wolf (dìga) population structure (Carmichael et al. 2001), and that there are clear patterns of genetic differentiation between migratory wolves that rely on barren-ground caribou (ekwò) in the taiga and tundra biomes, and non-migratory, territorial wolves that live in the boreal forest (Carmichael et al 2007, Musiania et al. 2007).

While research has shown that the abundance and productivity of wolves on the range of the Bathurst herd has declined since 2000 (D. Cluff pers. comm. 2019; Klaczek 2015), the relative abundance of wolves today may still be having a significant impact on both the Bathurst and Bluenose-east caribou (ekwò) herds, and inhibiting population recovery.

The overall goal of the proposed wolf (dìga) management program is to reduce wolf (dìga) numbers sufficiently to enable an increase in survival rates of both calf and adult caribou (ekwò) promoting stabilization and recovery of these herds. The proposal is based on the following assumptions and caveats:

- Wolves are the primary predator of barren-ground caribou (ekwò), and on average can take 23-29 caribou (ekwò) per year;
- Wolf (dìga) management occurs within a broader social-ecological system where people are important harvesters of barren-ground caribou (ekwò) and wolves;
- Caribou (Ekwò) are a cultural keystone species that are an important foundation to culture, language and way of life to Tìchq and other Indigenous peoples;
- There is some uncertainty in our knowledge of the caribou (ekwò)-wolf (dìga)-human system because of the complex dynamics and interactions of barren-ground caribou (ekwò), wolves, people, land and environmental conditions;
- Wolf (dìga) reductions on the Bathurst and Bluenose-East winter ranges should be carried out through a combination of coordinated management actions to help increase caribou (ekwò) survival and support herd recovery, including support for wolf (dìga) harvesters and the traditional economy; and
- The adaptive co-management approach recognizes uncertainty including the likely effectiveness of wolf (dìga) reduction actions, and emphasizes the importance of monitoring to enhance learning, revising approaches as our understanding improves and making decisions in a co-management context.

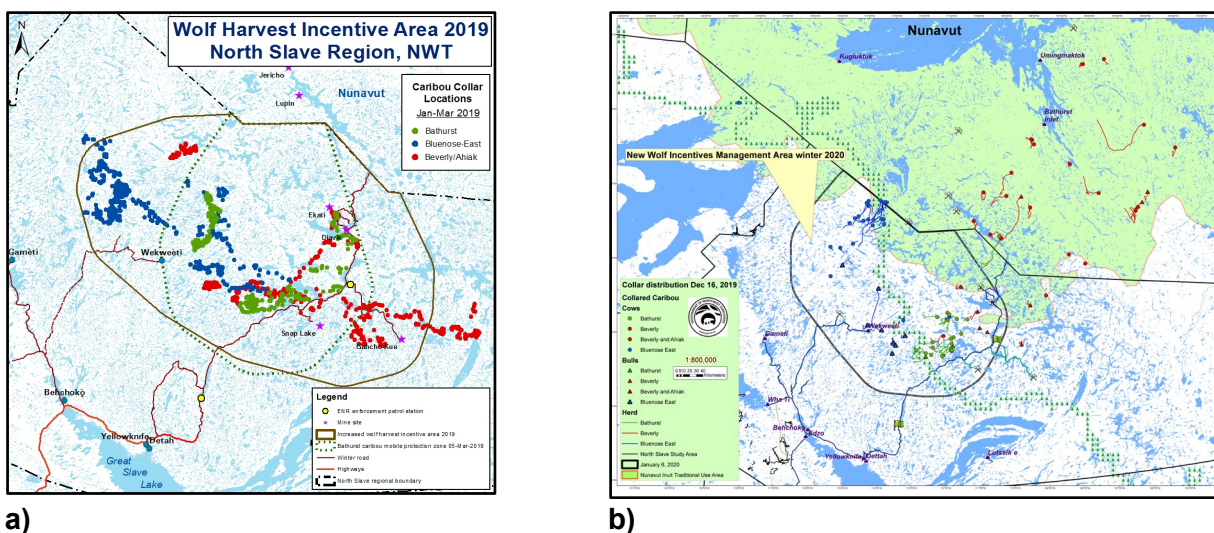
Since 2010, to encourage increased harvest of wolves (dìga) to facilitate recovery of caribou (ekwò), ENR's North Slave Region has administered a region-wide harvest incentive program (Cluff 2019, unpublished report, ENR, 05 Sep. 2019). The incentive was originally set at \$100/carcass (skinned) for any wolf (dìga) harvested within the North Slave Region. The incentive was increased to \$1200/wolf (dìga) for the 2019/20 harvest season with an additional \$400 advance for the pelt and \$350 prime fur bonus for those of taxidermy quality. Further, the tag fee for all licence holders was eliminated in 2019/20.

In winter 2019/2020, wolf (dìga) harvesting within the North Slave Region occurred mostly outside of the North Slave Wolf Harvest Incentive Area. Of a total of 68 wolves harvested by NWT harvesters only 18 were within the North Slave Wolf Harvest Incentive Area. In addition,

Nunavut harvesters took 57 wolves in the Inuit traditional harvesting area within the NWT with 35 harvested within the North Slave Wolf Harvest Incentive Area (Cluff 2020).

The North Slave Wolf Harvest Incentive Area is defined on an annual basis based on Bluenose-East and Bathurst caribou (ekwò) collar locations (methods described in Caslys Consulting Ltd. 2016). In 2018/2019, a high degree of herd overlap led to defining a large North Slave Wolf Harvest Incentive Area. In 2019/2020, these two herds exhibited less overlap than in recent years, and the North Slave Wolf Harvest Incentive Area was adjusted as a result (Figure 1). Caribou (ekwò) herd mixing is an obstacle to estimating abundance of wolves associated with a specific caribou (ekwò) herd and poses a significant challenge when attempting to target harvest pressure on wolves associated with the Bathurst and Bluenose-East caribou (ekwò) herds. Given the June 2018 estimate of the Beverly herd (103,372  $\pm$  5109 SE caribou (ekwò), Campbell et al. 2019), wolves associated with that herd will likely also travel into the North Slave Region significantly increasing wolf (dìga) numbers and predation pressure in the area over the winter.

It has been shown that removing up to 30% of the wolves in a population will have no numerical impact on wolf populations, within a year numbers will be back to pre-removal levels because of their high reproductive potential (large litters and a potential for more than one litter per pack) and their ability to disperse from far away (immigrating into areas of recent removals). These characteristics also allow wolf (dìga) populations to quickly rebound once management actions are no longer applied.



**Figure 1:** Enhanced North Slave Wolf Harvest Incentive Area in a) 2018/19 and b) 2019/20.

The purpose of the proposed wolf (dìga) management actions is to reduce wolf (dìga) numbers sufficiently for caribou (ekwò) survival rates to increase and facilitate population growth; it is not to eliminate wolves (dìga). Our understanding of wolf (dìga) ecology is that the risk of population extirpation is exceedingly low, because juvenile wolves (dìga) can immigrate from hundreds to thousands of kilometers away particularly with a larger caribou (ekwò) herd such as the Beverly herd and its associated wolves overlapping or wintering near the Bathurst and Bluenose-East herds.

#### 4. Description of Proposed Management Action

##### GOAL OF MANAGEMENT ACTIONS

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 (ekwò) survival rates to contribute to the stabilization and recovery of both herds. Recent modelling which updated the work in the Wolf Technical Feasibility Assessment, suggests that with aggressive wolf (dìga) removal efforts (all else being equal) caribou (ekwò) herd size could potentially stabilize to extrapolated 2020 levels over the five year program (see attached Caribou Modeling Summary). The proposed actions will be adaptively managed to improve the program throughout its implementation.

The objectives of the program are:

1. Increase annual ground-based harvest of wolves (ekwò) on the winter range of the Bathurst and Bluenose-East caribou (ekwò) herds by increasing participation of harvesters in the traditional economy related to wolf (dìga) harvest and hide preparation.
2. Ensure sustained removal of wolves (dìga), using aerial removals if required, on the winter ranges of the Bathurst and Bluenose-East caribou (ekwò) herds to achieve a level necessary to maintain low wolf (dìga) densities and elicit a response in caribou (ekwò) population.

The following section outlines the proposed management actions to achieve the goal and objectives of this joint proposal with a summary describing the rationale for each.

##### **1: Enhanced Support for Wolf (Dìga) Harvesters and the Traditional Economy**

###### **Action 1.1: Tłıchq Government Wolf (Dìga) Harvester Training**

The Tłıchq Government proposes to take a similar approach to its Community-based Dìgà Harvest Training Program as it did during the 2019/20 season which consisted of three phases:

- 1) community consultation meetings with Tłıchq harvesters and elders to ensure the program follows and respects Tłıchq protocols of harvesting dīgà and plan logistics for the harvesting camps;
- 2) conducting a training workshop for local Tłıchq harvesters; and
- 3) establishing harvester camps to further support training and dīgà harvesting by Tłıchq on a rotational basis.

Community engagement meetings will be held as needed to review and seek guidance on improvements and revisions to the program (see 2020 Wolf (Dìga) Management Pilot Program Technical Report for more detail).

###### **Action 1.2: GNWT Wolf (Dìga) Harvester Training**

The GNWT will continue to provide trapper training workshops to support the traditional economy. Wolf (dìga) harvester training workshops will be hosted each fall to provide hunters and trappers in the North Slave Region with training opportunities to increase harvest success and enhance skinning skills specifically for wolves (dìga). In the 2019/2020 harvest season ENR hosted a wolf (dìga) harvester training workshop with Yellowknives Dene First Nation

(YKDFN) in December 2019 and supported Tłı̄ch̄ Government in hosting a workshop in Wekweèti in January 2020. Based on feedback from the 2020 Wolf (Dìga) Management Pilot Program, more effort is needed to direct harvesters to areas of high expected wolf (dìga) abundance when caribou (ekwò) are located away from winter road corridors. Additional work is also needed to encourage and support higher rates of reporting for harvest effort and success by wolf (dìga) hunters.

In support of the goals of the Enhanced North Slave Wolf Harvest Incentive Program, the focus of training workshops is to:

- Draw on the skills, expertise and techniques used by experienced and successful wolf (dìga) harvesters;
- Offer training on the use of snares;
- Improve skinning techniques to maximize pelt value for harvesters;
- Teach best practices for humane hunting and trapping of wolves (dìga);
- Discuss opportunities for obtaining information on areas of high wolf (dìga) abundance based on current caribou locations;
- Provide training on how to fill out questionnaires, focusing on how to collect “catch per unit effort” information and importance of completing the questionnaires; and
- Review the wolf (dìga) carcass sampling program and the biological data being collected and explain how it is used.

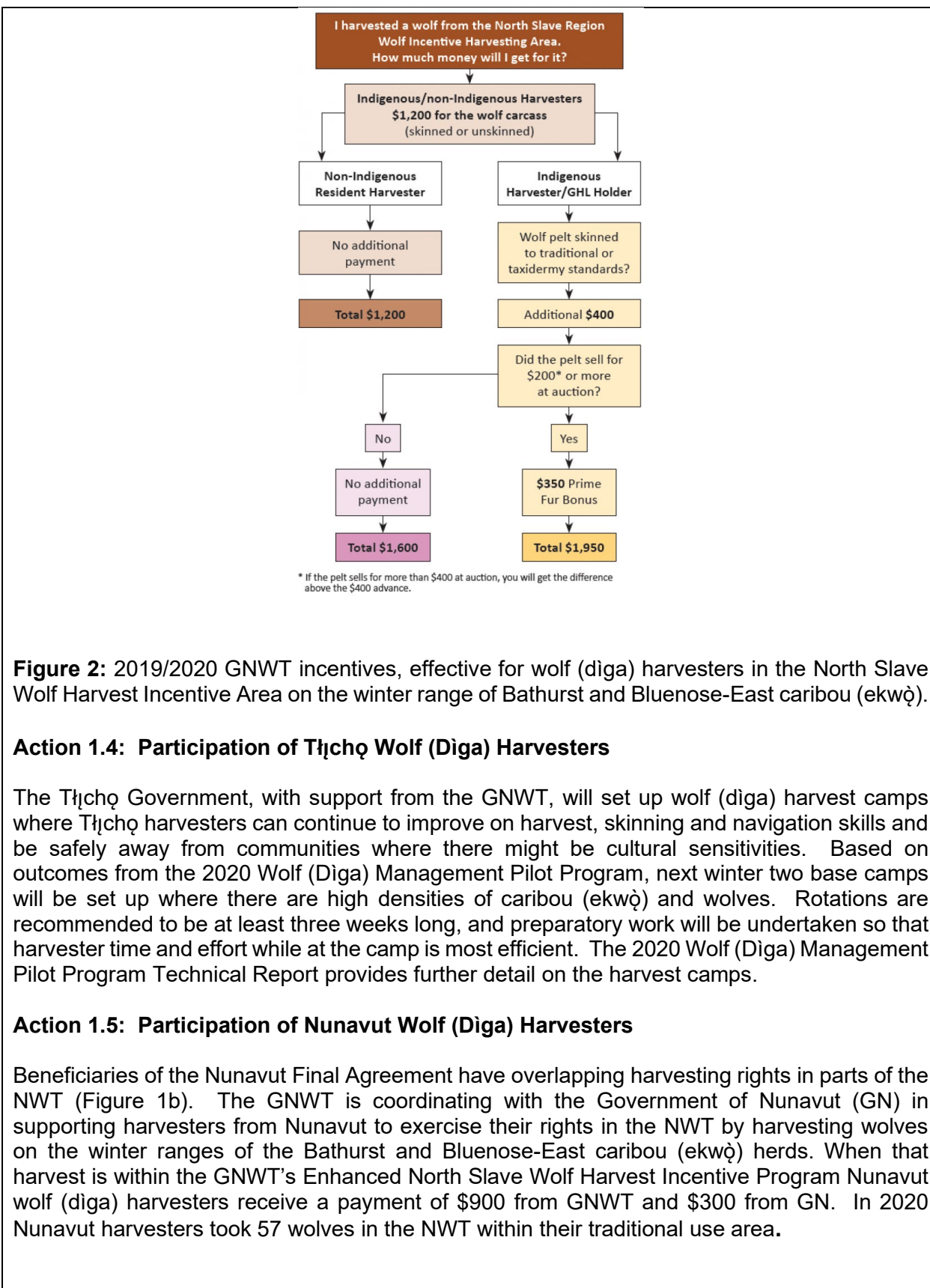
Workshop trainers will include representatives from the Fur Harvesters Auction, experienced northern wolf (dìga) harvesters, experienced southern wolf (dìga) trapper(s) and GNWT staff to discuss the Enhanced North Slave Wolf Harvest Incentive Program. As was done during the December 2019 training workshop with the YKDFN, the GNWT may also invite experienced Inuit harvesters to share their wolf (dìga) harvesting techniques and experiences on the central barrens.

The GNWT will promote best practices to ensure the humane hunting and trapping of wolves (dìga), as addressed in the “Wolf Technical Feasibility Assessment: Options for Managing Wolves on the Range of the Bathurst Barren-ground Caribou Herd”..

### **Action 1.3: Continuation of Enhanced North Slave Wolf Harvest Incentive Program**

In 2010, the GNWT implemented a wolf (dìga) harvest incentive program for wolf (dìga) harvesters across the NWT. Harvest incentives have subsequently been increased in portions of the North Slave Region (North Slave Wolf Harvest Incentive Area) to encourage harvest of wolves associated with Bathurst and Bluenose-East caribou (ekwò). In addition, tag fees are no longer required (effective July 1, 2019) by licensed hunters. Wolf (dìga) harvest over this time period has been variable, generally increasing with the increased incentives. However, the rate of harvest is also strongly influenced by the location of the caribou (ekwò) and their accessibility. In 2020, for example, harvest did not reach 2019 levels because wolves were more difficult to access due to the distribution of caribou (ekwò) which was further from the winter road.

The GNWT is proposing to continue the Enhanced North Slave Wolf Harvest Incentive Program for the next 4 years. A summary of the current price structure for wolf (dìga) harvesting can be found in Figure 2.



**Figure 2:** 2019/2020 GNWT incentives, effective for wolf (diga) harvesters in the North Slave Wolf Harvest Incentive Area on the winter range of Bathurst and Bluenose-East caribou (ekwò).

#### Action 1.4: Participation of Tłıchǵ Wolf (Diga) Harvesters

The Tłıchǵ Government, with support from the GNWT, will set up wolf (diga) harvest camps where Tłıchǵ harvesters can continue to improve on harvest, skinning and navigation skills and be safely away from communities where there might be cultural sensitivities. Based on outcomes from the 2020 Wolf (Diga) Management Pilot Program, next winter two base camps will be set up where there are high densities of caribou (ekwò) and wolves. Rotations are recommended to be at least three weeks long, and preparatory work will be undertaken so that harvester time and effort while at the camp is most efficient. The 2020 Wolf (Diga) Management Pilot Program Technical Report provides further detail on the harvest camps.

#### Action 1.5: Participation of Nunavut Wolf (Diga) Harvesters

Beneficiaries of the Nunavut Final Agreement have overlapping harvesting rights in parts of the NWT (Figure 1b). The GNWT is coordinating with the Government of Nunavut (GN) in supporting harvesters from Nunavut to exercise their rights in the NWT by harvesting wolves on the winter ranges of the Bathurst and Bluenose-East caribou (ekwò) herds. When that harvest is within the GNWT's Enhanced North Slave Wolf Harvest Incentive Program Nunavut wolf (diga) harvesters receive a payment of \$900 from GNWT and \$300 from GN. In 2020 Nunavut harvesters took 57 wolves in the NWT within their traditional use area.

### **Action 1.6: Use of Baiting to Support Wolf (Dìga) Removals**

Harvesters can obtain a General Wildlife Permit from the GNWT to use bait to harvest wolves within the North Slave Wolf Harvest Incentive Area. This approach gives permit holders the ability to enhance their wolf (dìga) removal success, while allowing the GNWT to regulate this activity and promote public safety. Baiting will also be used to support aerial removal efforts, if required.

Permits will be issued, under specific terms and conditions, to allow individuals to use approved forms of bait at known locations, directed by the GNWT. These locations will be kept a minimum distance from roads for public safety reasons and may occur across the North Slave Wolf Harvest Incentive Area to extend coverage across caribou (ekwò) winter range. Approving the location of baiting sites enables the GNWT to monitor and ensure permit holders are complying with their permit and all listed conditions.

The GNWT recognizes that while the use of bait will likely improve wolf (dìga) hunting success within the North Slave Wolf Harvest Incentive Area, it needs to be carried out responsibly so that public safety is not compromised.

The Tłıchų Government was approved to use baits in association with their wolf (dìga) harvest camps during the 2020 Wolf (Dìga) Management Pilot Program (see attached Technical Report).

### **Action 2: Aerial Wolf (Dìga) Reduction Actions**

#### **Action 2.1: Aerial Shooting of Wolves on Bathurst/Bluenose-East Winter Range**

While our focus is on supporting harvesters to achieve the wolf removal levels necessary to support caribou recovery, aerial removal will be considered at the end of March if wolf removal targets cannot be met by harvesters alone. By waiting until later in the season, we give our harvesters the best chance to make an impact on wolf populations.

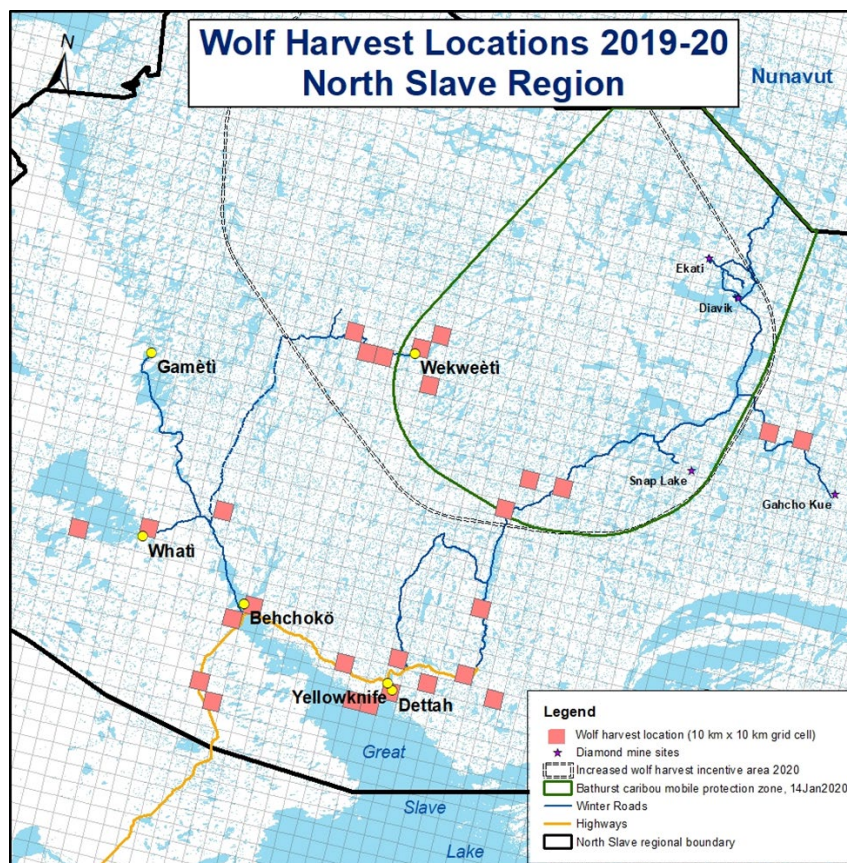
A successful wolf (dìga) management program, according to the feasibility assessment (WFATAW 2017), must meet the following conditions:

- Define initial target wolf (dìga) removal levels and track over time;
- Support and allocate effort for wolf (dìga) removal; and
- Assess the effects of wolf (dìga) removal levels on caribou (ekwò) and wolves.

Other jurisdictions such as Alaska, British Columbia, Alberta and Yukon have demonstrated the effectiveness of aerial shooting of wolves (WFATWG 2017; McLaren 2016; Russell 2010). Recent efforts to remove a targeted number of wolves in northern BC have successfully resulted in reductions to boreal caribou (ekwò) mortality, increased calf recruitment and increased herd size (Bridger 2019). In addition, a review of wolf management programs implemented elsewhere has shown that improvement in caribou (ekwò) survival rates is associated with wolf (dìga) removal efforts of approximately 60-80% initially and then sustained removals for the duration of the management program to maintain low wolf (dìga) density (WFATWG 2017).

If at the end of March, harvesters have not met removal targets, aerial removal efforts will be undertaken in a manner that avoids interference with ground-based harvesting activities, which occur primarily along the winter road system and near communities (Figure 3). Aerial removal

will focus on areas away from roads and harvesting locations reported in previous years, and will be done to minimize temporal and spatial overlap with ground-based harvesters.



**Figure 3:** Distribution of North Slave wolf (dìga) harvest in 2020; primarily along the winter road and near communities.

Aerial removal of wolves each season will be undertaken in the manner described below.

1. Setting targets and applying them to aerial wolf (dìga) removal activities:
  - a. Targets were established in 2020 (year one of the program) using wolf (dìga) abundance estimates based on caribou (ekwò) density, extrapolated herd size and Ungulate Biomass Index. Wolf (dìga) abundance associated with the Bathurst caribou (ekwò) herd on its winter range was estimated at 49 wolves, and 121 wolves on the Bluenose-East herd's winter range. The targets were set as a range representing 60-80% of the estimate (29-39 on the Bathurst and 73-97 for Bluenose-East range). Because wolf populations will not be impacted by removal rates of 30% or less, and we expect in-migration of wolves to be high with overlapping or nearby winter ranges of adjacent caribou (ekwò) herds, removal efforts will need to remain high. The targets will be assessed on an annual basis and adjusted as necessary.
  - b. If there is overlap of the Bluenose-East and Bathurst winter ranges (December through February) the targets will be combined and applied across the combined winter ranges of the two herds such that removal effort can be allocated to areas of highest wolf (dìga) density.

- c. In circumstances when the winter range of the Beverly herd overlaps with that of the Bathurst and/or Bluenose-East<sup>ii</sup>, wolf (dìga) removal targets will be assessed based on the amount of overlap of the Beverly herd, and the estimated number of wolves associated with the Beverly.
2. Support and effort will be allocated in the following manner:
    - a. If ground harvest in a particular year does not meet the removal targets by March 15<sup>th</sup> aerial removals will be initiated and operate in areas to minimize potential conflict with harvesters.
    - b. Aerial removals will be continued until the target is met or until the operation period has ended.
    - c. Support aircraft may be used to increase search effort and to direct aerial removal crews to wolf (dìga) packs. Wolf (dìga) collar locations will be used to locate removal crews in the general vicinity of wolves. Every effort will be made to avoid the removal of the collared wolf (dìga) or its pack mates.
    - d. Aerial removal crews will attempt to remove all un-collared wolves encountered, removing entire packs, where possible to reduce the possibility of splitting wolf (dìga) packs, which may result in dispersal and/or establishment of additional packs.
    - e. Every effort will be made to recover wolf (dìga) carcasses and transport them for subsequent skinning and necropsy (discussed below in the Monitoring, Research and Assessment section).
    - f. Continue aerial removal efforts each winter for at least 4 more years, if required.
  3. Assessing the effects on caribou (ekwò) and wolves (discussed more fully in Monitoring, Research and Assessment section).
    - a. Depending on environmental conditions, availability of aircraft and other resources, wolf track survey methods (Stephenson 1978, Becker et al. 1998, Gardner and Pamperin 2014) will be used to monitor wolves within the aerial removal areas.
    - b. Wolf (dìga) estimates or minimum counts, and removal efforts will be tracked, assessed and evaluated on an annual basis following the harvest season to determine operational efficiencies and corresponding areas for improvement.
    - c. Correlations between wolf (dìga) removals and caribou (ekwò) demographic rates will be undertaken after the five year completion of the program as there is an expected lag time between initiation of wolf (dìga) removals and caribou (ekwò) population response. Population surveys for Bathurst and Bluenose-East are scheduled to be conducted in June 2021, 2023 and 2025. Calf:cow ratios will be obtained three times a year: in fall, late winter and summer.

### **3: Monitoring, Research and Assessment**

#### **Action 3.1: Collecting Information from North Slave, Tłı̄chq̄ and Nunavut Wolf (Dìga) Harvesters**

Similar to the 2020 Wolf (Dìga) Management Pilot Program, a harvester questionnaire will be required to be filled out and submitted by all wolf (dìga) harvesters in the North Slave Wolf

<sup>ii</sup> The caribou winter range analysis described in section 5.2 of the 2020 Wolf Management Pilot Program Technical Report shows the Beverly herd overlapped with the Bathurst in all four of the previous years and with Bluenose-East and Bathurst in two of the previous four years.



Harvest Incentive Area to collect information on abundance, location, effort and harvest of wolves. Check stations along the winter road will be used to encourage harvesters to briefly stop to answer a series of questions on wolf (diga) observations and harvesting, and provide feedback on the effectiveness of management actions. Successful harvesters will be asked these same questions when submitting their wolf (diga) carcasses (if not reported previously) to ensure the maximum number of harvesters participate. To encourage participation in the survey, the GNWT will provide participating harvesters with a \$25 gift card.

The questionnaires will be undertaken not only by wolf (diga) harvesters that successfully harvest wolves, but also by harvesters who spend time (effort) searching for wolves but are unsuccessful at harvesting. The GNWT updated the Enhanced North Slave Wolf Harvest Incentive Program questionnaire for use in the 2020 Wolf (Diga) Management Pilot Program to help evaluate the relative abundance of wolves. Similarly, Tłıchq harvesters will be asked a series of questions based on their activities at the Tłıchq harvest camps to gather similar information (questionnaires for NWT and Nunavut harvesters and Tłıchq harvest camp participants are provided in the 2020 Wolf (Diga) Management Pilot Program Technical Report).

### **Action 3.2: Monitoring Catch Per Unit Effort**

To assess the effectiveness of the Wolf (Diga) Management Program, the GNWT will monitor “catch per unit effort” (CPUE) which is an indirect measure of the relative abundance of a target species (Rist et al. 2010). This will involve recording the actual number of hours or days spent harvesting (effort), distance travelled (km) and the number of wolves (singles, packs) observed during their trip.

Over the winter, and over several years of documenting catch per unit effort (CPUE) of harvesters and aerial crews, trends should emerge with fewer wolves being observed and harvested per hour of effort or distance travelled. As management efforts begin to reduce wolf (diga) numbers, more time and effort will be required to harvest a declining number of wolves. CPUE will be a key monitoring indicator to help assess whether removals are sufficient to keep wolves at low numbers.

For ground-based harvest, CPUE will be calculated for each harvester and trip based on the number of wolves harvested/sighted per hours travelled (regardless of whether a wolf (diga) was harvested) taken from the harvester questionnaires. CPUE will then be averaged across harvesters daily, weekly, monthly or by season as appropriate.

Search effort will also be calculated for all aerial surveys, collaring and removal efforts by relating the number of wolves observed per hour flown within the caribou herd (ekwò) winter ranges summarized daily, weekly, monthly or by season as appropriate. As the number of wolves removed increases and wolf (diga) density declines, it will take more effort and longer distances for harvesters to observe wolves.

CPUE will likely be influenced by overlapping winter distributions of two or more caribou (ekwò) herds as wolf (diga) densities would be expected to increase under that scenario. As a result, CPUE will need to be interpreted with caution and with reference to caribou (ekwò) and wolf (diga) collar distribution maps.

The 2020 Wolf (Diga) Management Pilot Program identified challenges in sufficiently completing the questionnaires, and in receiving and collating information from harvester questionnaires and aerial removal crews in a timely fashion. Questionnaires will be reviewed and updated prior to

the 2020-21 harvest season and procedures for collection and collation of information improved to address the challenges identified.

### **Action 3.3: Estimating Wolf (Dìga) Removal Levels on Caribou (Ekwò) Winter Ranges**

Wolf (dìga) removal levels are both a key performance indicator for assessing efficacy of harvester training, incentives and harvest camps, efficiency of search and removal techniques, and a key input parameter for evaluating effectiveness of wolf (dìga) removal actions on caribou (ekwò) populations.

Using caribou (ekwò) collar distribution patterns for the past 4 years, the GNWT has conducted geospatial analyses to better understand how the Bathurst, Bluenose-East and Beverly herds have used the landscape and the annual variation in their range use (see 2020 Wolf (Dìga) Management Pilot Program Technical Report). Overwintering caribou (ekwò) ranges can be discrete in some years, and have various degrees of overlap in other years. The geospatial analysis shows that the Beverly herd overlapped with the Bathurst in all four of the previous years (excluding 2019/2020) and with Bluenose-East and Bathurst in two of the previous four years.

Assigning wolves to caribou (ekwò) herds is relatively straightforward when there is little to no spatial overlap among caribou (ekwò) winter ranges. Assignment becomes increasingly uncertain when there is high spatial overlap and a large discrepancy between herd sizes. Considering the geospatial analyses and the most recent caribou (ekwò) collaring data, the GNWT has developed a rationale for allocating wolf (dìga) removal effort and assigning herd identity to target wolves for the 2020 Wolf (Dìga) Management Pilot Program that will be used in future years of the program. The rationale will be revisited on an annual basis considering new information from wolf (dìga) collars, caribou (ekwò) distribution and harvester questionnaires in preparation for each winter harvest period to inform and focus management action on the Bathurst and Bluenose-East herds.

The initial logical framework to assign a wolf (dìga) to a particular caribou (ekwò) herd's winter range is based on the recorded locations and dates of wolf (dìga) kills relative to the monthly spatial probability (or utilization distribution) maps generated from home range analyses of caribou (ekwò) collar data from the Bathurst, Bluenose-East and Beverly herds. Herd affiliation of a wolf (dìga) harvest or removal will be based on which monthly herd distribution the removal location overlaps with and if it overlaps with more than one caribou (ekwò) herd distribution it will be assigned to the herd with the highest overlapping density class (see 2020 Wolf (Dìga) Management Pilot Program Technical Report).

This framework provides an initial approach for assigning wolf (dìga) removal levels to caribou (ekwò) herd winter ranges but will be revisited as new information from wolf (dìga) collars and other sources becomes available. It is important to note that there is uncertainty in whether an assignment of a wolf (dìga) removal based on kill date and location relative to the concurrent distribution of collared caribou (ekwò) is robust and biologically accurate. Movement patterns of collared wolves will provide empirical data to assess this means of assigning wolf (dìga) removals to a caribou (ekwò) herd.

### **Action 3.4: Monitoring Wolf (Dìga) Condition, Diet and Welfare Outcomes**

Consistent with the 2020 Wolf (Dìga) Management Pilot Program, GNWT staff will necropsy, collect biological information and samples, and conduct laboratory analysis of wolves taken under this program. The information collected from the wolves will include:

- Sex;
- Age class;
- Health;
- Condition; and
- Diet.

Efforts will be made to necropsy the majority of wolves taken by both ground and aerial removals. In more remote areas, it may be challenging for harvesters to haul numerous wolf (diga) carcasses (heavy loads) over long distances. ENR will facilitate the collection of as many wolf (diga) carcasses as logistically possible; to maximize the collection of biological data since partitioning carcasses by herd affiliation, age and sex class will reduce sample sizes. It is anticipated that at the very least, most skulls will be processed to obtain a breakdown of the sex and age class structure of the harvest.

ENR will examine a subsample of wolves taken by ground shooting, trapping and aerial shooting to assess the animal welfare outcomes (see Hampton *et al* 2020) of each harvest approach being used. Based on these ongoing assessments, ENR is prepared to increase harvester training as well as training for aerial removal crews should evidence arise that wolves are not being killed quickly and humanely.

To aid in the assessment of animal welfare outcomes the aerial removal crews are required to record information in the field for each removal including:

- Pursuit time
- Pack size
- Number of shots fired
- Estimated time to death
- Documentation of other wildlife present/observed nearby
- Body condition

Details on the necropsies from the 2020 Wolf (Diga) Management Pilot Program are presented in the attached Technical Report.

### **Action 3.5: Monitoring Wolf (Diga) Movements**

The GNWT has applied for an amendment to an existing five year Wildlife Research Permit to continue to deploy and maintain up to 30 satellite collars on wolves (generally 10 each on Bathurst, Bluenose-East and Beverly caribou (ekwò) herds) to support the wolf (diga) monitoring and management actions being proposed. Collared wolves will assist in our understanding of wolves associated with the Bathurst, Bluenose-East and Beverly caribou (ekwò) herds, and their movements within and among these herds both seasonally and annually.

The objectives of the wolf (diga) collaring program are to:

1. Determine how wolves travel among caribou (ekwò) on their winter ranges.
2. Determine broader wolf (diga) movement patterns across caribou (ekwò) ranges on an annual and multi-year basis.
3. Determine fidelity of wolves to den sites and caribou (ekwò) herd ranges.

#### 4. Assist in the evaluation of wolf (dìga) management actions in the NWT.

While, the primary purpose of the collaring program is for the above stated research and monitoring objectives, secondarily the location information will be used to direct wolf (dìga) harvest effort/camp locations and overall aerial removal efforts. Every effort will be made to avoid the removal of collared wolves and their pack mates.

#### **Action 3.6: Monitoring Barren-ground Caribou (Ekwò) Herd Demographic Data for Improvement**

Multiple factors (i.e. environmental, disturbance, predation) are believed to be influencing the health and status of the Bathurst and Bluenose-East caribou (ekwò) herds. It is anticipated that reduction in wolf (dìga) numbers should allow for an increase in caribou (ekwò) cow and calf survival rates, which in turn will contribute to caribou (ekwò) recovery. Monitoring will be done to test and assess the relative effect of wolf (dìga) removal levels on herd-specific monitoring data, including adult female survival (estimated and modelled), age ratios and population trends. The Tłıchq Government program Ekwò Nàxoèhdee K'è (Boots on the Ground) will contribute important information on key caribou (ekwò) indicators such as calf survival and caribou (ekwò) health.

Given the complexity and uncertainty regarding interaction of key factors influencing barren-ground caribou (ekwò) populations, caution is required when attempting to attribute the specific contribution of wolf (dìga) reduction to observed changes in caribou (ekwò) productivity and/or population trends. For example, the influence of other factors such as environmental conditions, biting insect severity indices, anthropogenic disturbance and caribou (ekwò) harvesting may also be affecting caribou (ekwò) productivity and/or survival rates. Modeling caribou (ekwò) population response with covariates for wolf (dìga) removal, and environmental indices such as insect harassment and vegetation productivity will be important for overall analyses.

## **5 Consultation**

This proposal was jointly developed by the GNWT and the Tłıchq Government, and has included discussions with Tłıchq communities and leaders (December 2019 through February 2020). Wolf (dìga) management actions were also discussed at the WRRB's public hearing on the Bluenose-East herd held in Behchokq on April 9-11, 2019. The GNWT conducted consultation with Indigenous governments and organizations on wolf (dìga) management actions in an initial proposal in November/December 2019, on the 2020 Wolf (Dìga) Removal Pilot Program in July 2020 and the current revised proposal as of August 25, 2020. A detailed engagement log is attached.

## **6 Communications Plan**

### **General approach**

The general communications approach will be proactive and aimed at large, but specific audiences. Information about program activities, incentives, training opportunities and other general information will be relayed to key audiences – primarily communities, harvesters and the general public – through a variety of advertising and promotional channels, including print, radio, online and in-person. These communications will be done in Tłıchq Yati, English, French and other Indigenous languages as required and where possible. During the 2020 Pilot Program community

posters were developed to inform Tłıchǫ communities of wolf (dìga) management activities in the area, as well as radio ads and public service announcements. Website and Facebook pages were updated regularly to reflect program activities.

Communications will be aimed at achieving the following objectives:

- Ensuring the public understands the scientific, local and traditional knowledge rationale behind predator management as one aspect of a larger co-management approach for barren-ground caribou (ekwò) recovery.
- Ensuring harvesters are aware of wolf (dìga) harvest incentives and know how to participate in the traditional economy by promoting training opportunities, eligibility criteria, safety information, wildlife regulations and harvesting best practices.
- Amplifying northern voices and knowledge in discussions about the effectiveness of predator management, especially those of our residents and co-management partners.
- Making the public aware of training and incentives that enable and encourage NWT residents to go on the land and participate in the traditional economy.

## 7 Relevant Background Supporting Documentation

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## 8 Relevant Background Supporting Documentation

### Appendix A: Timeline of previous and proposed/proposed management actions for Bathurst and Bluenose-East caribou (ekwǫ) herds

Mgmt Lever	Previous Years										Future Years											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
Harvest Wolves Range																						
Bathurst Herd	2009 <sup>a</sup>	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	
Harvest Management (allowable harvest)	Interim Emergency Measures (0)						Harvest Target (300 8M:1F) <sup>b</sup>		MCBCCA <sup>c</sup> & Ceremonial Harvest (15 M only)		TAH <sup>d</sup> (0)		Caribou Harvest Management (likely continued)									
Wolf Management								Wolf Technical Feasibility Assessment		Joint Wolf Management Proposal		Wolf Reduction Initiated (Revised Proposal)		Wolf Reduction Program Review				Wolf Reduction Program Review				
Range (disturbance) Management							Develop Bathurst Caribou Range Plan (BCRP)		BCRP (approved by GNWT Cabinet & WRRB)		Implement BCRP		BCRP Review Assessment Renewal				BCRP Review Assessment Renewal					
Bluenose East Herd	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	
Harvest Management (allowable harvest)								TAH (750 M only)		TAH (193 M only)		Caribou Harvest Management (likely continued)										
Wolf Management								Wolf Technical Feasibility Assessment		Joint Wolf Management Proposal		Wolf Reduction Initiated (Revised Proposal)		Wolf Reduction Program Review				Wolf Reduction Program Review				

<sup>a</sup> Yellow shading indicates years where calving ground photographic surveys were conducted in previous years or planned for future years. A two-year interval for future calving ground surveys was assumed based on recent joint management proposals submitted by the Tlicho Government and the Government of the Northwest Territories to the Wek'èezhii Renewable Resources Board.

<sup>b</sup> M = Male; F = Female

<sup>c</sup> MCBCCA = Mobile Core Bathurst Caribou Conservation Area implemented in 2015/16

<sup>d</sup> TAH = Total Allowable Harvest

→ Previous actions

-----> Planned or proposed actions



## 8 Relevant Background Supporting Documentation

### Appendix B: Tłıchq Knowledge

The traditional territory of the Tłıchq is vast, and the network of hunting trails extends far into every corner of their lands. The four Tłıchq communities of Behchokq, Whatı, Gametı and Wekweeti are located in the boreal forest, and the land stretches far north of the treeline into the tundra, where many Ekwq hunting grounds are located. The traditional land use areas of the Tłıchq lie within the boundary known as “*Mqwhı Gogha Dè Nııttèè*,” which was outlined by Chief Mqwhı during the negotiations of Treaty 11 in 1921 (Helm 1994). The modern treaty area of *Mqwhı Gogha Dè Nııttèè* is described in an illustrative map to the Tłıchq Agreement<sup>iii</sup>. The traditional land consists of the area between Great Slave Lake and Great Bear Lake, from the Horn Plateau in the southwest, and as far north as the Coppermine River and Contwoyto Lake (2018 Results Ekwq Nàxoèhdee Kè (Boots on the Ground)).

From time immemorial, the barrenland was populated with Inuit and Dene families. Several Inuit families lived and hunted along Contwoyto Lake as well as the large lakes further south to the treeline. From the treeline and north, Dene families lived and hunted as far north as Contwoyto Lake, and some harvested further north towards the Arctic coast. On numerous occasions, Inuit and Dene families met on the barrenlands. The Tłıchq families travelled by canoe and canvas boat to the barrenlands in the fall to hunt caribou. They camped in certain locations with a secure wood supply, such as Ts’iedaa on Ewaànit’ııti (Courageous Lake). While the women and children remained in camp, the trappers ran their dog teams along the shoreline of the large lakes further north towards Contwoyto Lake (Kqk’èeti). These harvesters hunted caribou and trapped wolves, white fox and wolverine throughout the winter months. When spring arrived with warmer temperatures and sunlight, the Tłıchq trappers and their families returned south while the ice was still strong enough to hold the dog teams (2018 Results Ekwq Nàxoèhdee Kè (Boots on the Ground)).

Times have changed from when Tłıchq families used to travel on the barrenlands to hunt Ekwq. Ekwq are not as plentiful as they used to be back then. Ekwq being a staple to the Tłıchq diet and a key species that connects them to their cultural way of life, the Tłıchq have taken it amongst themselves to be stewards of their lands by managing and monitoring the resources within their lands. The Ekwq Nàxoèhdee Kè (Boots on the Ground) program (initiated in 2016) and the Community-based Diga harvesting program (initiated in winter 2019/2020) are two programs that have been implemented by Tłıchq Government to help conserve the ekwq populations.

#### **Ekwq Nàxoède K’è**

Ekwq Nàxoèhdee Kè (Boots on the Ground) is a *Kqk’èeti ekwq* (Bathurst caribou) monitoring program based upon the Traditional Knowledge (TK) of Tłıchq and Inuit indigenous elders and harvesters. The objectives are to monitor the conditions of *Kqk’èeti ekwq* on the summer range, focusing on four key indicators: (1) habitat; (2) *ekwq* health; (3) predators, and (4) industrial development.

Ekwq Nàxoèhdee Kè adopts a biocultural approach to emphasize the Tłıchq as well as Inuit knowledge of the ecosystem in which they live. Biocultural approaches explore the link between biological and cultural diversity, and their interdependency with one another. Our framework of research is based upon two methodologies developed over the course of the program named “We Watch Everything” and “Do as Hunters Do.” Tłıchq learned that the

<sup>iii</sup> Tłıchq Agreement – Part 3 to Chapter 1 - Illustrative Maps - p.17

success of the program is dependent on following exactly what local harvesters and elders have always done on the lake: travel similar routes; set camp at the same historical campsites and walk the same trails. The act of monitoring became an act of trying to position oneself at places where one anticipates Ekwò will move through. In Tìchq, *Kòk'èeti* literally means empty campsite lake, and refers to the many old campsites that have been made at the lake over time. These campsites were chosen for a purpose; namely, for protection from wind or proximity to hunting locations. The program used the same sites for the same reasons (2019 Results, Ekwò Nàxoèhdee Kè (Boots on the Ground)).

Ekwò are a keystone species because of their ecological influence as a herbivore on the plant communities and as a key source of food for predators and scavengers including Dìga, Sahcho (Grizzly Bear), Nògha (Wolverine), Ets'imbaa (Arctic Fox) and Det'òcho (Eagle). As their primary predator, dìga rely on ekwò for food and have a powerful influence on their daily behavior, and seasonal patterns of migration and habitat use. Dìga are often seen denning or travelling near a water crossing, knowing that ekwò will, at one point, enter the narrow funnel. There, a kill can be made with less effort than attempting to hunt one down on open ground. Over the past four years, observations of *dìga* activity on the summer range has increased. Tìchq monitoring efforts have increased yearly, which has improved the chances of wildlife encounters. The frequency of dìga observations during summer months has increased greatly throughout the years (table 1).

Table 1. Results from Ekwò Nàxoèhdee Kè since the program has been established in 2016.

Year	Total Dìga seen	Pups of the year	Active Dens
2016	1		
2017	19	4	1
2018	16	*might have been in den	1
2019	31	7	2

Observations have been made of ekwò kill sites most likely from dìga, attempted chases on ekwò as well as successful attacks by dìga. However, there have not been any chases by nògha or sahcho observed on ekwò, except for one unsuccessful attempt by det'òcho. Nonetheless, there have been many observations of said predator species and they all typically appeared healthy. Another observation noticed over the years, is that monitors have seen more dìga dens and that when pups were observed, they appeared healthy, well-fed and had "lots of muscles". The dìga observations occurred all around Kòk'èeti and Kwìdliachìj, where the teams walked. Concurrent to these observations, many groups of ekwò were migrating through these locations.

Results from 2018 and 2019 show a low ekwò calf abundance. The monitors stated that a contributing factor to the low calf abundance was the high dìga activity observed around Kòk'èeti. It was clear to them that the high dìga activity had an impact on the ability of calves to survive their first few months, while they were still unable to outrun the chase of a dìga. According to harvesters, barren-ground ekwò herds (Bluenose east, Bathurst and Beverly/Ahiak herds) provide a steady and secure supply of meat for dìga throughout the year, as they remain near to and north of the treeline on the central barrens year-round. Although the herds have declined, there are still thousands of ekwò on the land that the dìga can hunt (2019 Results, Ekwò Nàxoèhdee Kè (Boots on the Ground)).

In recent winters, the barren-ground caribou herds (Bathurst, Bluenose-east and Beverly-Ahiak herds) stayed within, or north of, the treeline on the barrenland for most of the year,

including winter. The presence of the Ekwò on the central barrenland throughout summer and winter creates a steady supply of meat for the wolves. The wolves can travel far distances in days, and the ready availability of herds on the barrenland provides caribou meat in relatively close proximity throughout the year. *“Wolves hang around caribou all the time. They follow the herds all winter, all the time,”* said one elder. Furthermore, during summer, when wolf pups are growing, they prefer to eat the meat from calves. Reflecting on his past observations the elder explained, *“for wolf pups, it is good to eat the soft meat from calves.”* (2019 Results, Ekwò Nàxoèhdee Kè (Boots on the Ground).

Wolf hunting in particular is an important conservation measure for the rapidly declining Bathurst caribou herd. The Ekwò Nàxoèhdee Kè program supports the traditional harvesting of predators as well as the Enhanced North Slave Wolf Harvest Incentive program by GNWT-ENR. The incentive is a way to support the traditional economy and generate income through wolf harvesting, which may help offset some of their financial costs. By increasing dìga and fur trapping on the herd range, we can help harvesters develop and maintain their knowledge and on-the-land skills.

### **Community-Based Dìga Harvesting Program**

Through the ongoing decline of the Bathurst and Bluenose East ekwò herds, the Tłıchq Government and Government of the Northwest Territories Department of Environment and Natural Resources have been collaborating with the Wek'èezhii Renewable Resources Board to implement co-management actions to support ekwò recovery. A key recommended action from the Ekwò Nàxoèhdee Kè program and from the 2019 Wek'èezhii Renewable Resources Board hearing was that the Tłıchq Government implement a Community-Based Dìga Harvest Program.

The Tłıchq Government initiated its Community-based Dìga Harvest Program for the 2019/20 harvest season in three phases:

- 1) held a community consultation meeting with Tłıchq harvesters and elders to ensure the program followed and respected Tłıchq protocols of harvesting dìga and planned logistics for the harvesting camps;
- 2) conducted a training workshop for local Tłıchq harvesters with an instructor from the Alberta Trappers Association; and
- 3) established harvester camps to further support training and dìga harvesting by Tłıchq on a rotational basis.

There is a strong spiritual connection between the Tłıchq people and dìga. Archie Wetrade of Gameti, when he gave evidence to the WRRB at its 2019 Public Hearings concerning the Bluenose East Ekwò, had this to say on the subject:

I mentioned that we have to really focus in and work with – because this wolf, it's a spiritual to – to Aboriginal people. We just – they just don't go out there and start shooting wolf. Wolf and the caribou been among the people from the beginning and it – and they're still here. Wolf are not in our way of system. We don't play with – with the wolf. The wolf, they don't play with us. When they take serious against people, there could be a very bad association into – association into – in that system. Wolf have their own technique to take down animals. But in my lifetime, I have never ever heard wolf attack Aboriginal people at all, never, because they respect us and we – we respect them. But also we have to understand that it's out training level in the

community, each community, that we just have to work how we're going to do it for the safety of the public and the children.<sup>iv</sup>

Joe Mantla of Behchokò also provided information on the connection to diga:

Yes, that – I know that the caribou, I guess, you know, that we've heard enough of it and now for the wolf wise says I – I do harvest some wolf from time to time when I have to, but somehow you got to be , you know, careful and you have some technique to do it. And I do have. And then the – at the same time I was taught on the land with my – my dad. He was a great hunter and a great trapper and then the – so although there are some spiritual manner that – that has with the wildlife such as the wolf, that the – that the – some of the people kind of I don't want to handle the wolf because of the – some spiritual nature it has. You've got to be careful how you hand their – their carcass and then it that's including their – their blood. And the – to date they feel kind of reluctant to – to handle them the way as professional people would do. I don't see anything wrong with it if you do it right, because to date, its not like before, you got rubber gloves and all that. You got disinfectant, you know, substance that you could always clean your hand with once you're completed.<sup>v</sup>

A very important process in implementing the Community-based Diga Harvest Program was having the meeting with the Tłıchq elders and harvesters, this meeting occurred in Wekweèti on December 17. Having this meeting allowed for the program to be run following and respecting Tłıchq protocols based on the traditional knowledge gained. Many participants of the meeting voiced the importance of harvesting wolves for the sake of conserving the ekwò populations as well as for the safety of the communities. There were many concerns about the increase of diga surrounding all the Tłıchq communities. Not many Tłıchq hunters currently have experience in harvesting diga and so through the meeting it was suggested that Tłıchq hold a “trapper training” type of course for the participants of the harvesting program. There was a clear objective that came out of the meeting, it was important that for the recovery of ekwò and for the Tłıchq people to continue to live their traditional way of life, the diga population would have to be managed through increasing harvesting efforts.

The training was done at the beginning of January and was very well received by all participants. After completion of the training, the harvesting program was initiated. The program ran from January to March 2020 with little success - only 4 wolves were harvested through the program. After the program was done, surveys were done to identify ways to improve the program for future harvesting seasons. Based on those surveys, the main elements that need improvement were to start preparations for the program much earlier. Preparations would include starting to get bait ready in the fall, ensure the snares and traps are ready to be used, start planning the logistics of the program and meet with participants of the program to start strategizing snaring and trapping techniques so that participants can effectively and efficiently harvest diga. As was mentioned in the meeting with the elders and harvesters, diga are very smart, strong and powerful animals, they will know when they are being hunted and so Tłıchq need to carefully observe their behaviour and thoroughly strategize trapping and snaring them. While the objective is to harvest diga, Tłıchq choose to do so in the most respectful manner so that diga are not disrespected.

<sup>iv</sup> WRRB Transcript of Bluenose East Herd Public Hearing. Behchokò, NT. April 9, 2019. Day 2 of 3. P. 97-8.

<sup>v</sup> WRRB Transcript of Bluenose East Herd Public Hearing. Behchokò, NT. April 11, 2019. Day 3 of 3. P. 164-5.

## References

Wek'èezhii Renewable Resources Board (2019). Transcript of Bluenose East Herd Public Hearing., (pp. 97-98, 164-165). Behchoko.  
 Tłıchq Government (2017). Ekwò Nàxoèhdee Kè- Boots on the Ground 2017 Results.  
 Tłıchq Government (2018). Ekwò Nàxoèhdee Kè- Boots on the Ground 2018 Results.  
 Tłıchq Government (2019). Ekwò Nàxoèhdee Kè- Boots on the Ground 2019 Results.  
 Tłıchq Agreement. Chapter 1 part 3: Illustrative Maps (p. 17).

## 9 Time Period Requested

**Identify the time period requested for the Board to review and make a determination or provide recommendations on your management proposal.**

Management actions proposed here would apply from January 1, 2021 until July 1, 2024. Tłıchq Government and the GNWT suggest that management actions be reviewed annually or whenever key additional information becomes available.

## 10 Other Relevant Information

**If required, this space is provided for inclusion of any other relevant project information that was not captured in other sections.**

Attachments:

2020 Wolf (Diga) Management Pilot Program - Technical Report

Engagement Log

Summary of Caribou Population Modelling of Varying Wolf Removal Levels on the Bathurst and Bluenose-East Herds

Plain Language Summary - 2020 Wolf Management Pilot Project

## 11 Contact Information

**Contact the WRRB office today to discuss your management proposal, to answer your questions, to receive general guidance or to submit your completed management proposal.**

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**APPENDIX B      WRRB Technical Response to Summary of Wolf  
Incidental Sightings from Bathurst and Bluenose-East  
Barren-ground Caribou Surveys, GNWT ENR, August 13,  
2020**

## **WRRB technical response to Summary of Wolf Incidental Sightings from Bathurst and Bluenose-East Barren-Ground Caribou Surveys, GNWT ENR, August 13, 2020**

**Background:** Wolf sightings are opportunistically recorded during caribou sex and age aerial surveys and, as an index, the sightings are expressed as the number of wolves seen per 100 flying hours. Currently, in the NWT, wolf abundance is not monitored which raises the possibility that the incidental wolf sightings may index wolf abundance (density). Indices are recognized as being tricky to apply without measuring detection (Anderson 2003). Efforts are underway to determine if the wolf sighting rate has utility to estimate abundance (D. Cluff pers. comm.) although as an index to abundance, the wolf sighting rate depends on, for example, consistency in detecting the wolves during the caribou surveys.

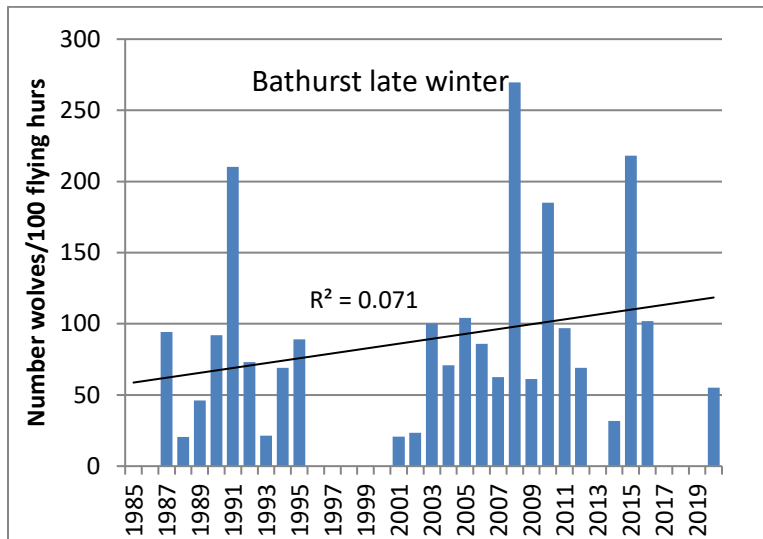
The incidental sightings on the fall and late winter caribou ranges are also an index of the encounter rate between the wolves and caribou. Encounter rates are a component in theoretical predator-prey models that can underpin caribou recovery actions. The encounter rate with caribou is a component of the functional response, which describes how the consumption of prey by individual predators' changes with prey density (Holling 1959).

As the Bathurst herd has declined, the wolves have also declined (their numerical response) at least, on the Bathurst herd's summer range (Klaczek 2015) which suggests that the predator-prey ratio is relatively stable. Vucetich et al. (2011) discuss the importance of the predator-prey ratio to describe wolf-prey relationships. On the summer ranges, the wolves relative to their den sites are territorial but on the winter ranges, although the wolves are in packs, they are not occupying spatially predictable territories (D. Cluff pers. comm.).

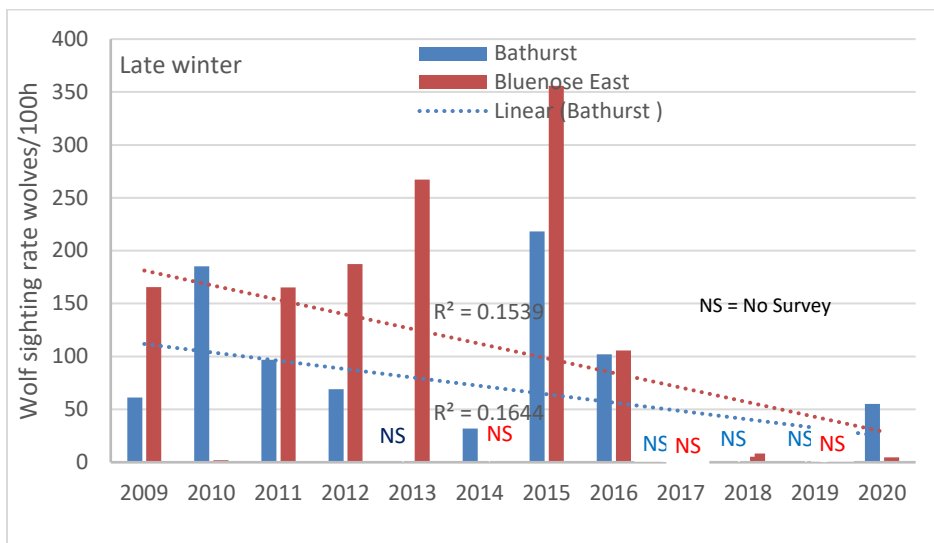
The Wek'èezhì Renewable Resources Board (WRRB) recognized the importance of predator incidental sightings when through Recommendation #4-2019 (Kòk'èetì Ekwò), WRRB requested the incidental sightings to improve the understanding of the role of predators on the decline of the herd. In August 2020, the Government of the Northwest Territories provided a summary of predator sightings. WRRB has drafted the following exploration of the wolf sightings rate in the context of wolf management and adaptive management. For other predators, the incidental sightings for grizzly bears and wolverine will be incorporated into technical feasibility assessment for those two species.

1. For the late winter caribou sex and age composition surveys, the trend is a decrease in time for hours flown (sampling effort), which is assumed to indicate the area searched. The wolves counted do not correlate with hours flown or number of caribou classified.

- The wolf sighting rate (wolves seen /100 h flying time) for the Bathurst herd since the peak in caribou numbers in 1986 is annually variable which limits describing a trend (mean  $87.4 \pm 12.95$  SE wolves/100h; CV 14.8%) suggesting that the rate of wolves encountering caribou has persisted during the caribou and wolf decline (Figure 1).



**Figure 1**



**Figure 2**

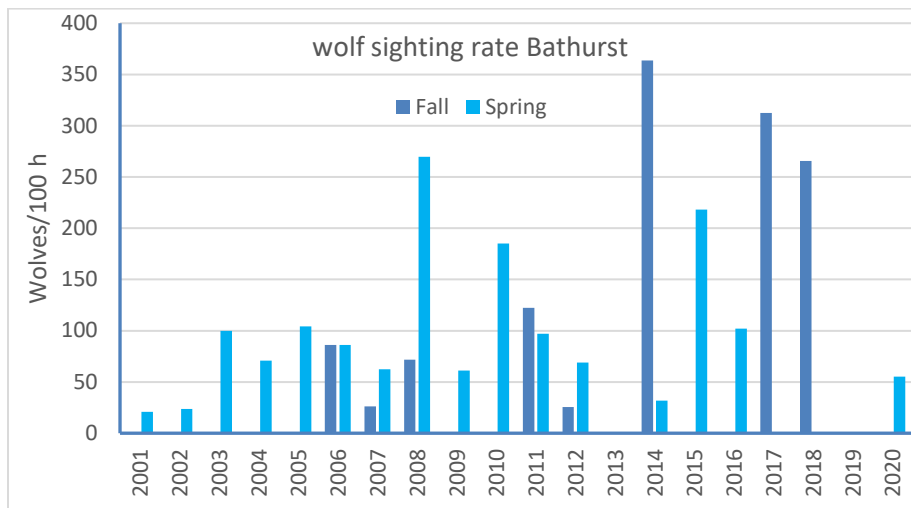
- Using a subset of the Bathurst data to cover the same period as data available for the caribou composition surveys for the Bluenose East herd; the trends are a decline in the wolf sighting rate for both herds (2009-2020): Bathurst ( $r^2=0.154$ ) and Bluenose East ( $r^2=0.114$ ). However, the absence of surveys 2017-2019 limits interpretation (Figure 2).



- The sighting rate tended to be higher for the Bluenose East herd for late winter but lower in the fall: sample effort may be a factor as fewer hours were flown.

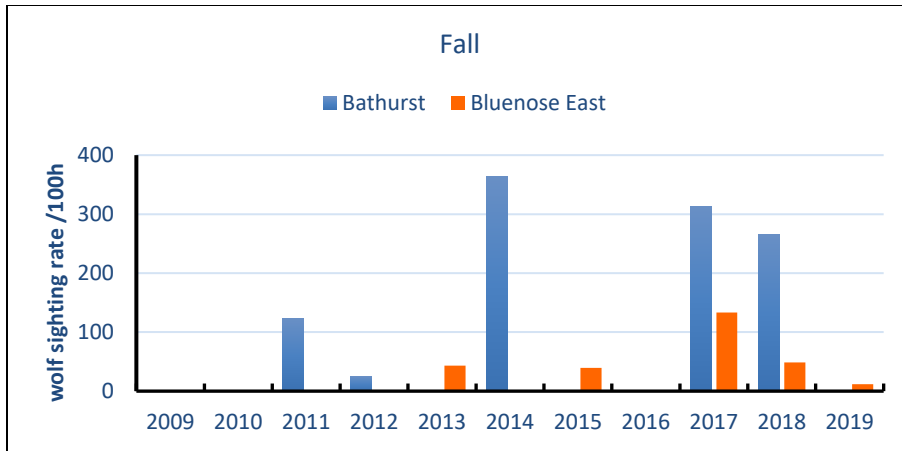
Late winter Wolves/100 h	Mean	SE
Bathurst	102.4	23.27
Bluenose East	140.1	41.25

- The wolf sighting rates during the caribou fall composition surveys for the Bathurst herd are annually variable but between 2014 and 2018, were overall higher than late winter sighting rates (Figure 3). There are 6 winters when both fall, and late winter wolf sighting rates are available: fall rate was higher than the late winter rate in 3 years. In 2019, no wolves were seen but search hours were low which may suggest a reduction in the wolf sighting rate (Figure 3).



**Figure 3**

- On the Bathurst herd's fall ranges, the high sighting rate since 2014 may suggest that emigration and or pup production/survival has increased (or detection has changed). This raises the question of whether an increase in the wolves is a compensatory response to wolf decline measured in 2014 (Klaczek 2015).
- The wolf sighting rate on the Bluenose herd in fall is lower than for the Bathurst herd in contrast to late winter but the sample effort is less (fewer surveys for Bluenose East) and both herds were not often surveyed in the same year (Figure 4).

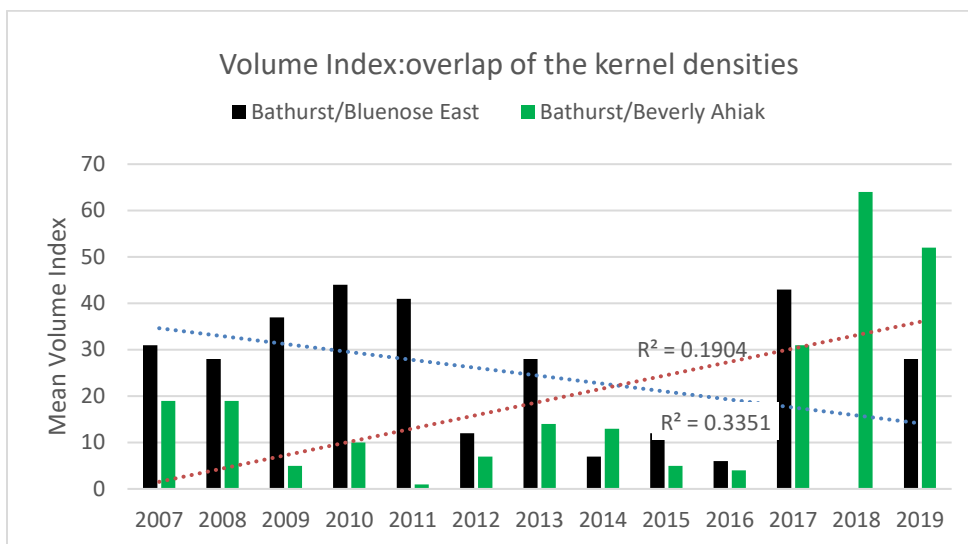


**Figure 4**

- Mean pack size on the Bathurst herd's late winter range ( $3.4 \pm 0.22$  SE) was similar to that recorded for the Bluenose East herd's late winter range and did not consistently vary 1986-2019.

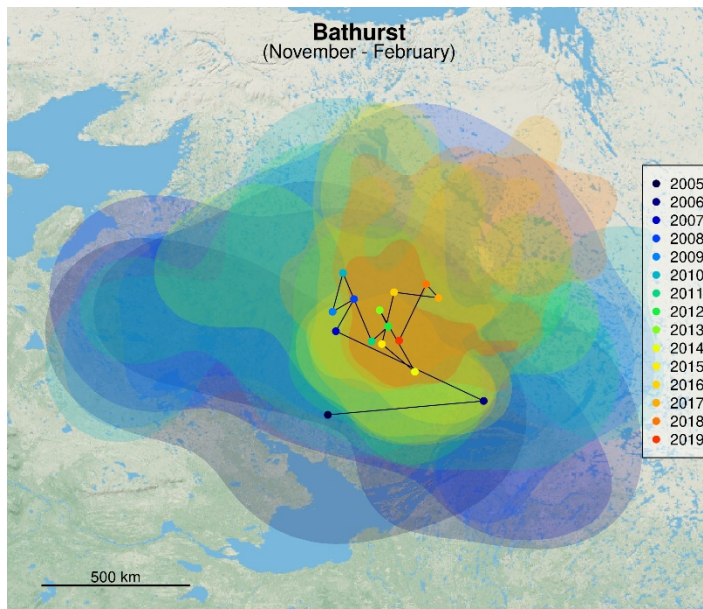
### Changes in the overlap of winter ranges between the Bathurst and its neighboring herds

- An implication of the winter range overlap is a possible increase in the wolf sighting rate on the Bathurst herd if more wolves were present from neighboring herds.
- An index to the overlapping kernels for herd distribution is the Volume Index (Gurarie et al. In Prep.). The trend is for a recent (2017) increase in overlap between the Bathurst and the Beverly/Ahiak ( $r^2 = 19\%$ ) and a decrease for the Bathurst with Bluenose East ( $r^2 = 34\%$ ) (Figure 5).



**Figure 5**

3. However, the rate of sightings on the Bathurst herd's winter range relative to the overlap index for the entire winter is unclear as sample size is a limitation especially 2017-19 missing wolf sighting rate.
4. The centroids indicate a shift to the northeast above the tree line especially since 2016 which has likely contributed to an increasing recent overlap with the Bevely/Ahiak herd's winter range



**Figure 6. Annual overlapping polygons (95% kernel) and centroids for Bathurst herd winter range (Gurarie et al. In Prep.).**

## Summary

1. We acknowledge that while wolf sighting rate is a readily available indicator for wolves encountering caribou, annual variability in the detectability of the wolves and possible duplicated sightings add uncertainty and limit inferences. However, given the lack of information on wolf predation on migratory tundra caribou, examining the sightings data is prudent and may emphasize the need for a more standardized approach.
2. The wolf sighting rate did not appear to decline during the first 20 years of the Bathurst decline (1986-2008) and then possibly declined 2009-2019 during the period when the caribou decline accelerated and wolf abundance declined on the summer range (Klaczek 2015, Adamczewski et al. 2019).
3. The robustness of the wolf sighting rate as an indicator should be further examined as to if and how it contributes as a pre-wolf removal baseline given complexity of the combined effect of the caribou decline, the wolf numerical

response (summer range) and on-going wolf harvesting (both in Nunavut and the NWT).

## Citations

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