Dear [REDACTED]

Re: Your request for access to information under Part II of the Access to Information and Protection of Privacy Act [Our file #ENV/013/2014]

On January 14, 2014 the Department of Environment and Conservation received your request for access to the following information:

"ANY and ALL information and/or data collected by, or contained within, the records of the NL government with regard to the research, surveys, census and/or monitoring of the George River Caribou Herd (GRCH) commencing January 1st, 2013 to present day. Information to include, but shall not be limited to, all data used to determine the estimated population of the GRCH during the aforementioned time period, along with any management and/or recovery strategies that were developed and/or implemented."

The Department of Environment and Conservation sent you an estimate of costs dated February 7, 2014. On March 24, 2014 Environment and Conservation received your request to the following: "All information requested from July 1st, 2013 to present day shall be included and will form an additional request for which an additional fee will apply."

I am pleased to inform you that your request for access to these records has been granted in part. Access to specific text within the records, has been refused in accordance with the following exceptions to disclosure, as specified in the Access to Information and Protection of Privacy Act (the Act):

Section 18 (2) The head of a public body shall refuse to disclose to an applicant a Cabinet record, including an official Cabinet record; a discontinued Cabinet record; and a supporting Cabinet record.

Section 22(1)(a): "The head of a public body may refuse to disclose information to an applicant where the disclosure could reasonably be expected to interfere with or harm a law enforcement matter

Section 30(1): "The head of a public body shall refuse to disclose personal information to an applicant where the disclosure would be an unreasonable invasion of a third party's personal privacy."

As referenced in the previous responses, the Department monitors and manages the George River caribou herd through health monitoring, population and demographic indicators, and the cessation of all hunting activities. These activities make up the three-year, $1.9 million Labrador Caribou Initiative, which commenced in 2011.
In addition, all Crown land applications for Labrador are referred to the Department's Wildlife Division. We are continuing to work with the Government of Quebec and Aboriginal organizations to consider joint management arrangements and long term planning strategies.

In accordance with your request for a copy of the records, the appropriate copies have been enclosed.

Section 43 of the Act provides that you may ask the Information and Privacy Commissioner to review this partial refusal of access or you may appeal the refusal to the Supreme Court Trial Division. A request to the information and Privacy Commissioner shall be made in writing within 60 days of the date of this letter or within a longer period that may be allowed by the Commissioner.

The address and contact information of the Information and Privacy Commissioner is as follows:

Office of the Information and Privacy Commissioner  
34 Pippy Place  
P.O. Box 13004, Stn. A  
St. John's, NL A1B 3V8  

Telephone: (709) 729-6309  
Facsimile: (709) 729-6500

In the event that you choose to appeal to the Trial Division, you must do so within 30 days of the date of this letter. Section 60 of the Act sets out the process to be followed when filing such an appeal.

Please be advised that responsive records will be published following a 72 hour period after the response is sent electronically to you or five days in the case where records are mailed to you. It is the goal to have the responsive records posted to the Office of Public Engagement's website within one business day following the applicable period of time. Please note that requests for personal information will not be posted online.

If you have any further questions, please feel free to contact the ATIPP Coordinator at telephone (709) 729-7393.

Sincerely,

[Signature]  

JAMIE CHIPPETT  
Deputy Minister
September 26, 2013

Dear Sara,

We have completed the progesterone analysis of your caribou samples. Please find attached the progesterone values for the feces from "collared" specimens.

The samples have been identified as either non-pregnant (black font) or diestrus/pregnant (red font) in the table below. There was some discrepancy between the samples we received and those identified on the computer list provided to us (see comments in the table below).

Please do not hesitate to contact us if you have any questions.

Regards,
<table>
<thead>
<tr>
<th>TZ Sample #</th>
<th>Sample ID</th>
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<th>Pregnane (ng/g wet feces)</th>
<th>Fecal Pregnane Assay Comments</th>
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Status and Management of the George River Caribou Herd

Senior Wildlife Biologist: John Piccione
Wildlife Division
Department of Environment and Conservation
Newfoundland and Labrador
January 11, 2014

Background

- George River herd increased from ~5,000 in the 1950s to near 800,000 in the late 1980s;
- 1993 pop. estimate ~ 775,000 animals (photo census)
- 2001 pop. estimate ~ 365,000 animals (photo census)
- 2005 pop. estimate ~ 24,000 animals (photo census)
- 2010 pop. estimate ~ 14,000 animals (photo census)
- 2012 pop. estimate ~ 24,000 animals (photo census, July)
- 2013 Fall estimate ~ ~ 20,000

Population Cycles

Relative Abundance of George River Caribou, Quebec, Labrador

(Adapted from Bengtson et al. 2008, "The Return of Caribou to Ungava")

How are caribou counted?

- Caribou form large groups in summer to avoid insects;
- In 2001, 2010 and 2012, photo census conducted
- In July, groups of caribou were located using radio collared animals;
- Photos of caribou groups were taken from helicopter;
- The number of caribou in each digital photo are counted.
2012 photo census

- 107 collars deployed
- 71 active at census
- Found by VHF telemetry
- 44 photographed for census
- 2 helicopters
- 4 people/helicopter
- 70 hours flying
- July 9 – 17

There are 325 caribou counted in this view.

GRCH Calving Grounds

* 1991 to 2010 = shift of 250km eastward

Calving ground size (in sq) over time:
- 1991
- 1992
- 2009

5,000 - 50,000 - 5,000
Population Demographics

- Cell Recruitment
- Calf Weights
- Adult Survival
- S, L, J Adult Males

Low

Fall 2013 Classifications

- 1400 caribou classified
- Males 22% (LM 7%, M 6%, S 7%)
- Females 72%
- Cows 6% (9.6 calves / 100 cows)

Calf Recruitment

- Average Calfes per 100 Females by Decade for the George River Caribou herd during Fall Classifications.

Exceedingly low calf ratios

- 1970s: 53
- 1980s: 44
- 1990s: 33
- 2000s: 23
- 2010-2012: 8

Scenery images showing caribou herds in various locations.
**Adult Survival**

- Estimated annual mortality rate averaged over 3 years (2009 - 2012) 31% (2013........)

**Percent Large Males**

Percentages of Large Males Caribou in the George River Caribou Herd during Fall Classifications from 2001-2012.

**Age Structure**

- Incisors were pulled from jawbones to conduct cementum aging

**Health Indicators**

Continued Decline of George River Caribou:
- Health Indicators
  - Good condition (Fat ratios good)
  - BSIS Bescoids
  - Low pregnancy rates (45%)
  - Calf weights stable
Compensatory vs Additive Mortality

**Compensatory Mortality**
- the amount of mortality (death) that would occur even without any hunting. No direct suppressing effect on the size of the population.

**Additive Mortality**
- the amount of mortality (death) that occurs in addition to the level of natural mortality.
- Reduced principle (population reduction)
  - Under current conditions for George River caribou - ANY hunting is additive and is driving the population downward at an accelerated rate.

Why not a limited males only hunt?

- Current low numbers + current demographics = Additive mortality
- Unsustainable harvest
- Continued population decline at a faster rate
- Delayed recovery of population
- Delayed time to resumption of future sustainable harvest

The Path Forward: Planning for Recovery

- Assess population and demographic response to hunting ban
- Calving grounds studies and fall classifications
- Predation Studies
- Disease
- Range condition
- Cumulative effects

Moving Forward: Management Planning

- Assessment of the response of the herd to the hunting ban after 2 years.
- Review of ban after 5 years
- Management Plans required to guide long term decision making for caribou herds
- NL and QC – shared herd. Requirement for one Management / Conservation Plan
- Identification of future threshold population target levels for resumption of sustainable harvest

Questions?
Draft Agenda
Meeting between the Province of Quebec and the Province of Newfoundland and Labrador to discuss George River Caribou Management

Quebec City
675, boulevard René-Lévesque Est, 30e étage, Room 30.59B

September 4th, 2013 : 10 h – 16 h
September 5th, 2013 : 9 h – 12 h

1. Update on George River caribou harvest 2012/13

<table>
<thead>
<tr>
<th>Harvest Group</th>
<th>2010/11 Estimated Harvest</th>
<th>2011/12 Estimated Harvest</th>
<th>2012/13 Estimated Harvest</th>
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</thead>
<tbody>
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<td>Labrador Innu</td>
<td>500</td>
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<tr>
<td>Quebec Innu in Labrador</td>
<td>300</td>
<td>700</td>
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<tr>
<td>Regular Licence Holders</td>
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<td>493*</td>
</tr>
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<td>NG beneficiaries</td>
<td>975</td>
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<tr>
<td>Labrador Outfitters</td>
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<tr>
<td>Quebec Sport Harvest (Outfitters)</td>
<td>360</td>
<td>260</td>
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<tr>
<td><strong>GRAND TOTAL</strong></td>
<td><strong>2425</strong></td>
<td><strong>2243</strong></td>
<td></td>
</tr>
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</table>

* Indicates an exceptional harvest year.
Despite the closure of provincial lands to all caribou hunting in Labrador, harvest pressure remained significant in 2013. In addition, there are reports that hunters in Nain recently expressed interest to hunt in the Okak area. Some relatively small groups of caribou currently using the Okak area do not have satellite collars and are therefore perceived as (or assumed to be) members of the Torngat Mountain herd, rather than of the GRCH. It is likely that these individuals are GRCH males that have separated from the larger herd prior to rut. A written reminder that all provincial lands in Labrador are closed to harvest was sent to NG.


Continued monitoring of existing collars for caribou and black bears (in calving grounds area) and ongoing deployment of collars on wolves in GRC winter range.

Field work conducted on calving grounds in June 2013 included:
- deployment of 17 collars on yearling caribou,
- deployment of 6 additional collars on black bears,
- data collection on 30 caribou calves,
- data collection on calf recruitment.

Further analyses to determine impacts of stress levels on caribou pregnancy and prevalence of disease. 2013 / 2014 work to include;
- analysis of reproductive hormones
- collection of hair, fecal and blood samples by WD for analysis in partnership Toronto Zoo, University of Calgary and Laval University.
- additional investigations on physiological effects of parasite (besnoitia).

Photo census July 2014:
NL is obligated to assess / review the hunting ban in 2014. A photo census will be an important and integral step in any assessment of the ban. The census will additionally provide confirmation on the number of caribou in sequence with previous censuses in 2012 and 2010. However, because no budget allocation has been made for fiscal 2014-2015, completion of the census may require additional partners to include TWPCB, NG and others and a budget request for additional funds. Overall cost of the census is expected to be lower than in previous years (approx. 70k) compared to that
in the past when the herd was larger and extended over a broader summer range.

Photo census, as with all surveys, will be in collaboration between QC & NL. Existing collaborative relationship between NL and QC are effective and equate to greater success. All data will continued to be shared among NL & QC governments. Current project collaborations include; collaring of yearling caribou, collaring of black bears on calving grounds, and data sharing on caribou collars.

3. Aboriginal Round Table – provincial response

The aboriginal groups of the QC-Labrador peninsula recently formed an Aboriginal Round Table to discuss/address the steep decline of the GRCH. Also increased concern over the status of the Leaf River and Torngat Mountains caribou herds.

The Round Table was formally established at a meeting in Uashat, QC, April, 2013. The meeting was preceded by an Aboriginal only meeting in Kuujjuaq in January 2013. The next Aboriginal Round Table meeting is scheduled for late September 2013 in Labrador.

Representatives from both NL and QC government have not been invited to attend any of the Aboriginal Round Table meetings.

Members of the Aboriginal Round Table include:
- NG
- Innu Nation
- NunatuKavut
- Nunavik
- QC Innu
- Naskapi
- Cree

The Round Table consists of:

Two elected co-chairs: [REDACTED] (NG) and [REDACTED] (Makivik Corporation); and
an Executive Committee composed of representatives from each nation: [Innu of the Québec region], [Naskapi Nation of Kawawachikamach], [NunatuKavut Community Council], [Innu Nation] and [Grand Council of the Crees of Eeyou Istchee/Cree Regional Authority (GCCEI/CRA)]

On May 31, 2013, Aboriginal groups from NL and QC requested both governments provide funding to establish an aboriginal round table to act as a forum for exchange and support in view of finding solutions, actions and recommendations built upon consensus and respect. NL declined to provide the requested funding at that time, given existing commitments toward the Caribou Initiative ($1.9 million over three years; 2011-2012), support of the harvest ban and additional co-funding (along with NG, the Federal Government, and the TWPCB under the LILCA) for caribou research and monitoring on caribou of the Ungava Peninsula.

**Key Issues: Proposed Path forward: (Round Table)**

- NL suggests that QC and NL work collaboratively to establish a working or technical committee that would contain members of the Ungava Aboriginal Round Table as well government representation from QC & NL to act as a liaison in discussions in the development of a long-term management plan (see below).

- This so called “Liaison Committee” could be led by Directors of both jurisdictions along with one technical expert.

**4. Recovery Plan / Long Term Management Plan**

Long-term Management Plans (or Strategies) are used by all other jurisdictions that manage for caribou. There is currently a shared goal among ALL parties to recover the George River caribou herd to a population level that would sustain harvest. A shared goal is important, as caribou management challenges elsewhere have in some cases been characterized by a divergence of goals and objectives among stakeholders.

Wildlife Division is positioned both legislatively and in terms scientific findings to offer a constructive and cooperative path forward. Preparing a draft management plan framework as a starting point for discussions and seeking the input and support of others will be important first steps.
Key Issues: Proposed Path forward: (Management Plan)

- It is recommended that NL and QC collaborate to draft a framework for a long-term management plan for presentation to Aboriginal groups for input and consideration, with the final management plan to be co-authored by both Aboriginal groups and government. Because this management plan would be co-authored, a single plan (as opposed to separate provincial plans) should be established.

- In general, it will be most efficient for all groups to review, comment and participate in the completion of a Draft management plan framework (prepared by NL and QC), rather than groups duplicating efforts by preparing plans individually.

- In order to increase communication and efficiency of efforts, it is recommended that the intent of government drafting and then subsequently co-authoring of the document be communicated to all Aboriginal groups prior to the next Aboriginal Round Table meeting. Delay in doing so will likely result in duplication of efforts, entrenchment of positions, and act to impede forward progress in reaching the shared goal. For example, production of a management plan for the GRCH is the goal of the Aboriginal Round Table.

- The draft management plan would address comprehensive issues facing GRCH (i.e. not just management of hunting; see draft Table of contents) and include opportunities / suggestions for engagement and participation of stakeholders, particularly Aboriginal groups, in decision making (e.g. decisions on caribou harvest facilitated by use of caribou calculator and opportunities for Aboriginal people to participate in population surveys).

- The direct observations of low caribou numbers by Aboriginal representatives in 2012 – 2013 may bring significant bearing on Round Table discussions. Specifically, some Aboriginal representatives participated in aerial searches for caribou. These searches were largely unsuccessful in locating caribou in areas believed by Aboriginal people to hold caribou.

5. Sharing of technical data

- A collaborative approach between QC & NL is well established
  - Current information shared includes:
    - Field work
    - Collar data for caribou and predators
iii. Research and monitoring plans
iv. Survey costs and resulting data
- Lack of a formal data sharing agreement has been noted and may need to establish this later but has, to date, not hampered sharing.
- ATIPP requests and public access to the data varies among provinces.
- NL currently has 85 collars in the field on the GRCH.
  - 52 of these are on living animals.
  - 8 of these are on dead animals (to be retrieved).
  - 18 are malfunctioning on animals thought to be alive.
  - 7 are malfunctioning on animals thought to be dead.
  - Quebec has 28 collars on GRCH.

6. IEMR and Low Level Flight Mitigation

8. Torngat Mountain Herd

a. Knowledge and Research
  i. Population size of the TMCH is not well understood. A 1980 survey estimated the herd at approximately 5,000 individuals. Anecdotal evidence, supported by recent small group size observations as well as known patterns in other herds (ie GRCH) suggests the current population
is likely less than 1,000. Recent reconnaissance surveys in April and July by TWPCB and QC support this estimate.

ii. During the 1980's and early 1990's, the GRCH (and likely the TMCH) was experiencing unprecedented population growth and the ranges of both GRCH and TMCH overlapped considerably, and Obtaining population estimates of TMCH at that time was difficult owing to this situation.

iii. Caribou management unit boundaries established by NL have the boundary of the GRCH zone extending to the southern boundary of the National Park. However, it is acknowledged that TMCH do occur within this northern GRCH boundary.

iv. Most regulations governing management of wildlife are necessarily based on specified geographic areas as the legal basis of regulation (as opposed to real time movements of species or populations; which is not feasible for enforcement purposes).

v. The current documented range of the TMCH is based on local knowledge and a small number of satellite-collared caribou. There were just 6 caribou collared between the years 1988 and 1997 by NL and QC Governments, 4 collared by QC Government and Makivik in 1997, 10 collared in 2011 by Torngat Wildlife and Plants Co-Management Board Secretariat, QC and NL Government, and another 15 by the same parties in April, 2013.

vi. In 2009-2010 reports from local residents and hunters from Nain suggested that caribou south of Hebron fjord were declining.

v. TWPCB and QC, with funding assistance from NL, conducted reconnaissance flights for Torngat caribou in April and July 2013. These flights served to investigate general abundance and distribution of Torngat caribou, and to also compile observations on demographics and grouping behaviour. Although the surveys were not extensive enough to generate statistically powerful population estimates, the total number of caribou observed on the two flights (300 in April, and 199 in July) provide an important indication of the generally low
number of animals. Further, more extensive and more systematic surveys are being considered for this winter.

vi. NL currently has no dedicated funds for TMHC monitoring. Purchase of collars has been through the Torngat Secretariat with in-kind support for collar deployment provided by the Governments of QC and NL.

b. Harvest

i. No official harvest monitoring is in place for the TMCH. This has been identified as a knowledge gap necessary to manage the herd.

ii. A commercial caribou harvest was initiated from Kangiqsualujjaaq by Nunavik Arctic Foods during the winters of 1994-95 (25 caribou harvested) and 1995-96 (689 caribou harvested). There were concerns that this harvest focused on the TMCH rather than the planned GRCH.

iii. In April 2013, 21 caribou were harvested within the closed GRCH hunting zone, but outside the Park boundary. Based on differences in wintering ranges between the TMCH and the GRCH herds and recent/concurrent collar deployments on the TMCH animals, it is presumed that all 21 harvested caribou were from the TMCH. Harvest occurred during collar deployment for the herd.
SUMMARY OF THE STATUS OF THE GEORGE RIVER HERD
OCTOBER 2013

Current status of migratory caribou in North America
Migratory caribou (*Rangifer tarandus*) are a key component of northern ecosystems and are central to the life of northern inhabitants and to the culture of many Aboriginal communities. During the last few decades, several North American migratory caribou herds have declined\(^5,6,7\). The major threats to the persistence of these herds have been identified and include intensive exploitation (including harvesting and poaching), land uses associated with industrial activities, and climate change\(^5,3\).

Periods of scarcity and abundance of migratory caribou in northern Québec and Labrador have been observed since the 1950's \(^5,6,7\). Since the late 1990's, a sharp numeric and demographic decline of the George River herd (GRH) has been documented (Figure 1). The herd has recently reached its lowest historical population size. Contraction of the annual and seasonal ranges used by the herd have also occurred in parallel with the decline\(^7,8\). Projections of herd size, using long-term biological indicators such as adult survival and recruitment rates, indicate that the decline has continued since the 2012 survey.

![Population size graph](image)

Figure 1. Variation of the population size of the George River herd based on aerial surveys. Estimates from 1973 and 1976 (dark grey circle) represent minimal counts (without error estimates).

Long-term monitoring of GRH
Since the 1970's, biologists from the Québec and Newfoundland and Labrador (NL)
governments have worked jointly to monitor the GRH. Over more than 35 years, the long-term monitoring of the herd has included the gathering of telemetry information from more than 500 collared adult caribou, the completion of 9 aerial surveys and the annual recording of biological indicators (e.g. survival, recruitment rates, adult sex ratios, pregnancy rates, body condition, presence of parasites and diseases). The information gained from this monitoring has been used to delineate annual and seasonal ranges, including calving grounds, and to identify annual migration routes (Figure 2).

Figure 2. Seasonal ranges and migration routes of the George River herd in northern Québec and Labrador. The delineation is based on the satellite telemetry locations of adult females and males collected from 2008 to 2012.
Status of the GRH

Population size
Over the past 20 years, there has been a sharp and continuous decline in the size of the GRH: from 823,000 caribou in 1993 to 385,000 in 2001, 74,000 in 2010 and 27,600 in 2012 (Figure 1). This is a decline of more than 95% of the population size since 1993. According to a recent study, this is the most severe rate of decline ever observed for a migratory caribou herd. From 2010 to 2012, the herd has declined by more than 60%. The biological indicators currently being monitored, including adult survival and recruitment rate, indicate that the decline continues. The most recent population projection furthermore suggests that the GRH may now be under 20,000 caribou.

Biological indicators

Adult survival
A population of migratory caribou is predicted to remain stable or to increase when adult female survival is ≥85%, adult male survival ≥80%11,12,13 and if combined with sufficient recruitment rates. In 1984, annual survival of adult females of the GRH was estimated at 95%14. Recent analyses indicate that, from 2008 to 2011, annual survival of adult females (72%) and males (68%) have remained low10. In 2012, annual survival was estimated at 80% for adult females, 81% for adult males and 58% for female yearlings10. The current survival rates of adult females, adult males and female yearlings remain low and can not ensure stability or increase of the GRH.

Recruitment
Fall recruitment is an estimation of the proportion of calves in the population and is typically presented as the number of calves per 100 adult females. In the 1970’s and 1980’s, recruitment was estimated at around 52 calves per 100 adult females15. Since 1985, the recruitment of the GRH has markedly declined16. In 2010 and 2011, the recruitment was estimated at 16 calves per 100 females and in 2012, at only 7 calves per 100 females17. This ratio corresponds to a proportion of only 5% calves in the GRH in the fall of 2012. The recent and current recruitment rates are very low and are indicative of a population that continues to decline.

Pregnancy rates
The pregnancy rate is estimated in winter and represents the reproductive potential of the GRH, expressed as the percentage of pregnant females in the population. From 1976 to 1982, while the herd was increasing, 94% females were gestating5,18. Pregnancy rate had then decreased to 76% between 1984 and 19935,14 and 75% in 200119. In 2012, the pregnancy rate was estimated at 77%20. Since the peak of the population size reached at the end of the 1990’s, the pregnancy rate of the GRH has remained low, which likely contributes to the low recruitment rates observed in the last decade.

Proportion of large males
The proportion of large males in the fall is used as a biological indicator to describe the health of the herd. Large males are characterised by a large body size and mass, presence of distinctive reproductive attributes (e.g. large neck, large antlers and barb), and are the most active during the reproductive season21. Prior to 2006, between 10 and 12% of male caribou observed during the rut were classified as large males. Since 2007, the proportion of large males has decreased to.
only 3%, suggesting a problem with this segment of the population. In 2012, large males accounted for only 2% of the GRH.  

**Body condition**

Several biological parameters can be influenced by body condition such as the age of first reproduction of females, the date of oestrus in females, the survival of calves and the access to females by males.  

Since 2007, the average birth mass of calves was $6.1 \pm 0.1$ kg. The current body mass of GRH calves at birth (2012: $6.4 \pm 0.2$ kg and 2013: $6.6 \pm 0.2$ kg) can be characterized as a healthy average birth mass. Since 1996, the average body mass of calves in the fall has increased slightly (1986: $44.9 \pm 1.7$ kg; 1993-1998: $44.5 \pm 1.6$ kg; 2000-2002: $47.5 \pm 1.0$ kg). From 2007 to 2009, the calf body mass in the fall was of $51.2 \pm 0.9$ kg and considered to be “good”. No body condition measurement has been collected on GRH calves in the fall since 2009.  

Since the beginning of the 1990’s, the average fall body mass of adult females has increased by about 5 - 8 kg. From 2007 to 2009, female body mass in the fall was of $100.2 \pm 1.1$ kg and considered to be “good”. No body condition measurement has been collected on GRH females in the fall since 2009.  

The recent monitoring of body condition (via body mass, morphologic measurements and fat reserve indices) appears not to lend clear support to the hypothesis that the current demographic changes of the GRH can be mainly explained by a decline in gross body condition or by a direct effect of summer habitat quality on the growth of calves or accumulation of energy reserves by females. Therefore, additional physiological, hormonal and nutritional factors, and a combination of other factors currently impacting the survival of calves and adults need to be investigated to help better understand the demographic decline of the GRH.  

**Annual and seasonal range use**

In the early 1990’s, the annual range size of the GRH was probably at its maximum, covering 664 000 ± 18 000 km². The annual range size has significantly declined since, and was estimated at approximately 174 000 km² between 2008 and 2012. The contraction of the annual range size was matched by a decline in the size of the summer range, winter range and calving ground. Calving ground size and location have substantially changed from 1974 to 2012 marked by a decline in size from 42 800 ± 7 500 km² at the beginning of the 1990’s to 5 930 ± 730 km² in 2006-2010, and an associated easterly shift in its location.  

**Main concerns emerging from the monitoring of biological indicators**

The long-term monitoring of biological indicators corroborates the decline of the GRH demonstrated by the 4 aerial surveys that have been conducted since 1993 (Figure 1). The biological indicators monitored over the past several years suggest that the following elements are of concern:
1) The low proportion of calves in the population: fall recruitment is low, suggesting that very few juveniles are being added to the population each year. Therefore, the age structure of the population is likely unbalanced and the population is getting older each year.

2) The low proportion of gestating females: the pregnancy rates remain low in recent years and this could contribute to the low recruitment recently observed in the population.

3) The low proportion of large males in the population: the proportion of large males in the population has recently declined to very low levels, suggesting that there is a specific problem with the survival of large males.

4) The low survival of adults and yearlings: recent survival rates of adult females, adult males and female yearlings remain low and under the minimum needed to reverse the current state of decline and stabilize the population. This suggests that some factors are affecting the population dynamics directly.

Limiting factors and threats
There are likely multiple interacting factors contributing to the decline of the GRH. It is expected that the relative importance of these factors can vary through time and space. The initial decline of the herd in the early 1990’s is generally thought to be associated with the degradation of habitat resulting from historic high abundance of caribou and intensive use of summer ranges in the tundra. A number of factors (or threats) contributing to or potentially contributing to the ongoing decline of the GRH can be identified. These include (not presented in order of importance or relative contribution):

a) the effect of parasites recently observed and monitored in the population, including the protozoan Besnoitia tarsata which could potentially have a greater impact on males compared to females;

b) the quality, availability, and functionality of habitat throughout the GRH range;

c) the effects of climate change;

d) the effects of land use development and related industrial activities;

e) the effects of predation by wolves and black bears;

f) the harvest from sport, resident and subsistence hunting.

g) the cumulative and compounding effects of multiple factors (or threats)

Ongoing research projects are already gathering information to better describe and understand the effects of parasites and diseases, habitat quality, predation and climate change on the GRH (Caribou Ungava, MDDEFP [Qc] and Wildlife Division [NL]). Management planning is additionally being undertaken to address harvest management, the effects of development activities, the requirement for protected area networks and other land use planning.

Maintaining the availability and functionality of seasonal habitats and connectivity among them is crucial to migratory caribou. Seasonal habitats used by caribou are likely to be impacted by current and future land use development. Ecosystem-based land use planning is therefore needed to minimize the potential impacts of human activities on the quality, availability and functionality of seasonal habitats, and on the migration patterns of caribou.

All monitored biological indicators suggest that any harvesting of the GRH is currently an additive cause of mortality and therefore any harvesting at this time is not biologically sustainable and contributes to the decline of the herd. Since 2010, governments of Québec and
NL have introduced measures to reduce the sport and resident harvest of the GRH. In January 2013, NL announced a complete ban on harvesting of the GRH for a period of five years with a review after two years. Québec has moved in recent years to close all non-Aboriginal harvests of the herd. In parallel, the Inuit from Nunatsiavut and Nunatuksavut have announced a voluntary cessation of harvesting of the GRH for two and one year respectively. Despite the critical status of the herd, some Aboriginal communities of Quebec and NL are still harvesting caribou from the GRH.

Concerns and actions
The current demographic situation of the GR herd is of growing concern. A short-term recovery, allowing for resumption of a sustainable harvest, is unlikely to occur within the next 5 years. The long-term persistence of the herd is furthermore compromised if the current survival and recruitment rates do not show marked improvement.

Five main conclusions can be drawn from the current assessment of the GRH:
1) The GRH declining trend has been continuous for the past 20 years;
2) We are most likely at the lowest historical GRH size;
3) Any harvesting of GRH at current low population levels exerts additive mortality and is not sustainable;
4) The rate of decline of the GRH had never before been observed for a migratory caribou herd;
5) It is unlikely that the current demographic decline will be reversed in the short or medium term.

It is possible that even with cessation of hunting, the current demographic decline may take several years to stabilize and potentially many more years to recover to levels that can support resumption of sustainable harvest.

Both provincial governments are working to ensure the persistence of the herd and are jointly framing a management and conservation plan. Both governments support that biological indicators should be monitored with a high level of scientific precision (survival, reproduction and population size) and that additional herd and habitat conservation measures to address identified threats be effectively implemented.

Joint document from
Department of Sustainable Development, Environment, Wildlife and Parks
Government of Québec, Wildlife Division

and

Department of Environment and Conservation
Government of Newfoundland and Labrador, Wildlife Division
References
10. A. RASILHAS, M. FESTA-BIANCHET and S. D. CÔTÉ, comm. pers. Caribou Ungava, Université Laval, Québec, Québec.
17. MDEPP, Qc, unpublished data.
20. S. McCarty, comm. pers. Wildlife Division, Department of Environment and Conservation, NL.
Monitoring of George River Caribou Herd by Satellite Telemetry
Most recent locations as of time of publication July 8, 2013

Legend
- GRCH Collar Locations
- Roads
- Caribou Management Areas
- Tommot Mountains National Park
- Waterbodies

This data is for the use of the intended recipient only. Further distribution is prohibited.
Monitoring of George River Caribou Herd by Satellite Telemetry
Most recent locations as of time of publication July 22, 2013

Legend
- GRCH Collar Locations
- Roads
- Caribou Management Areas
- Terrigal Mountains National Park
- Waterbodies

This data is for the use of the intended recipient only. Further distribution is prohibited.
Monitoring of George River Caribou Herd by Satellite Telemetry
Most recent locations as of time of publication August 12, 2013

Legend
- GRCH Collar Locations
- Roads
- Caribou Management Areas
- Tengal Mountains National Park
- Waterbodies

This data is for the use of the intended recipient only. Further distribution is prohibited.
Monitoring of George River Caribou Herd by Satellite Telemetry
Most recent locations as of time of publication September 23, 2013

Legend
- GRCH Collar Locations
- Roads
- Caribou Management Areas
- Tongal Mountains National Park
- Waterbodies

This data is for the use of the intended recipient only. Further distribution is prohibited.
Monitoring of George River Caribou Herd by Satellite Telemetry
Most recent locations as of time of publication October 8, 2013

Legend
- GRCH Collar Locations
- Roads
- Caribou Management Areas
- Torngat Mountains National Park
- Waterbodies

This data is for the use of the intended recipient only. Further distribution is prohibited.
Monitoring of George River Caribou Herd by Satellite Telemetry
Most recent locations as of time of publication October 21, 2013

Legend
○ GRCH Collar Locations
Roads
☐ Caribou Management Areas
☐ Tomkat Mountains National Park
☐ Waterbodies

This data is for the use of the intended recipient only.
Further distribution is prohibited.
Monitoring of George River Caribou Herd by Satellite Telemetry
Most recent locations as of time of publication Nov 5, 2013

Legend
- GRCH Collar Locations
- Roads
- Caribou Management Areas
- Tomgal Mountains National Park
- Waterbodies

This data is for the use of the intended recipient only. Further distribution is prohibited.
Monitoring of George River Caribou Herd by Satellite Telemetry
Most recent locations as of time of publication Nov 18, 2013

Legend
○ GRCH Collar Locations
Roads
Caribou Management Areas
Tongat Mountains National Park
Waterbodies

This data is for the use of the intended recipient only. Further distribution is prohibited.
Monitoring of George River Caribou Herd by Satellite Telemetry
Most recent locations as of time of publication Dec 2, 2013

Legend
- GIRCH Collar Locations
- Roads
- Caribou Management Areas
- Torngat Mountains National Park
- Waterbodies

This data is for the use of the intended recipient only. Further distribution is prohibited.
Monitoring of George River Caribou Herd by Satellite Telemetry
Most recent locations as of time of publication Dec 17, 2013

Legend
- GRCH Collar Locations
- Roads
- Caribou Management Areas
- Torngat Mountains National Park
- Waterbodies

This data is for the use of the intended recipient only. Further distribution is prohibited.
Monitoring of George River Caribou Herd by Satellite Telemetry
Most recent locations as of time of publication Dec 30, 2013

Legend
- GRCH Collar Locations
- Roads
- Caribou Management Areas
- Torngat Mountains National Park
- Waterbodies

This data is for the use of the intended recipient only. Further distribution is prohibited.
Monitoring of George River Caribou Herd by Satellite Telemetry
Most recent locations as of time of publication March 18, 2014

Legend
- Roads
- Caribou Management Areas
- Torngat Mountains National Park
- Waterbodies
- GRCH Collar Locations

This data is for the use of the intended recipient only. Further distribution is prohibited.
Monitoring of George River Caribou Herd by Satellite Telemetry
Most recent locations as of time of publication March 18, 2014

Legend
- Roads
- Caribou Management Areas
- Tornagat Mountains National Park
- GRCH Collar Locations

This data is for the use of the intended recipient only. Further distribution is prohibited.
Monitoring of George River Caribou Herd by Satellite Telemetry
Most recent locations as of time of publication March 4, 2014

Legend
- Green Circle: GRCH Collar Locations
- Red Line: Roads
- Blue Area: Caribou Management Areas
- Green Area: Tomcat Mountains National Park
- Light Blue: Waterbodies

This data is for the use of the intended recipient only. Further distribution is prohibited.
Monitoring of George River Caribou Herd by Satellite Telemetry
Most recent locations as of time of publication Jan 20, 2014

Legend
- GRCH Collar Locations
- Roads
- Caribou Management Areas
- Torngat Mountains National Park
- Waterbodies

This data is for the use of the intended recipient only. Further distribution is prohibited.
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Newly born, far well.
Female going straight back to her calf
Female looking for the calf, sniffing ground at proximity
Female looking for the calf, getting closer to it, circling around the calf
Female looking for the calf, getting closer to it, circling around the calf
Initially stayed at proximity than flower with other females

Hair sample lost
Female looking for the calf, getting closer to it, circling around the calf
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Status and Management of the
George River Caribou Herd
Department of Environment and Conservation
Wildlife Division
Community Information Sessions
March 2014
Key undertakings:

- Collar deployments
- Population census, estimates and projections
- Population demographics
- Sharing of findings
- Health monitoring
- Calving ground surveys
- Fall classifications
- Management Planning
Population Decline

- **1993** pop. estimate ~ 775,000
- **2001** pop. estimate ~ 385,000
- **2010** pop. estimate ~ 74,000
- **2012** pop. estimate ~ 24,000

- **2013** Fall projection ~ 19,739
- **2014** Fall projection ~ 16,793
Population Estimates

GRCH Population Census Years and Population Projections from the Most Recent 2012 Census
Population Changes

Relative Abundance of George River Caribou, Quebec/Labrador

(Adapted from Bergerud et al. 2008, “The Return of Caribou to Ungava”)
Population Changes

- Large scale population cycles 40 – 70 years
- Cycles (or fluctuations) also documented in other herds across the North
- Greater severity of the highs and lows in George River caribou population
1406 caribou classified

(Large males 7%)

(Calves 7%)  (9.5 calves / 100 females)
Percentage of Large Male Caribou in the George River Caribou Herd during Fall Classifications from 2001-2012.
Estimated annual mortality rate averaged over 3 years (2009 - 2012) 31% based on collared caribou
Survival calculated June 1 – May 31
Most recent is 1 June 2012 – 31 May 2013

2012 Females:
80% up from 75% in 2011

2012 Males:
81% up from 61% in 2011

2012 Yearlings:
58% up from 46% in 2011

* Survivorship of collared animals only. Ongoing monitoring required to investigate for any trend.
Calf Recruitment

Average Calves per 100 Females by Decade for the George River Caribou Herd during Fall Classifications.

Exceedingly low calf ratios
Health Indicators

- Body mass (Fat ratios good)
- Disease: 80% Besnoitia
- Low pregnancy rate (74%)
- Calf weights stable
1991 to 2010 = shift of 230km eastward

Calving ground size (km²) over time:

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Where are the remains of dead caribou?
How are caribou counted?

What is a photo census?
2012 photo census

- 102 collars deployed
- 90 active at census
- Found by VHF telemetry
- 84 photographed for census
- 2 helicopters
- 4 people/helicopter
- 70 hours flying
- July 8 – 17
- NL, QC, TWPCB
There are 325 caribou counted in this view.
Possible Past, Present and Future Factors in the GR Caribou Population Crash

Density Dependent Effects
- Lack of Forage
- Poor Body Condition
- Poor Calf Condition
- Parasites & Disease

Predation
- Wolf/Bear Pops Have Had Abundant Prey
- Relative contribution to caribou mortality

Harvesting
- No longer compensatory- additive mortality
- Change in Group Dynamics/Behaviours

Catastrophic Events
- Outbreak
- Drowning
- Forest/Bush Fires
- Protest Harvest

Potential Extirpation

Increasing Cumulative Disturbance
- Landscape Development
- Snowmobiles, ATVs, Cars, GPS

Changes in Natural Behaviours, Reduced Foraging, High Stress & Low Reproductive Capacity

Climate Change
- Insect Harassment
- Apparent Competition - Moose
- Food Availability (Freeze/Thaws)
Compensatory Mortality – the amount of mortality (death) that would occur even without any hunting.

Additive Mortality – the amount of hunting related mortality (death) that occurs in addition to the level of natural mortality.

Under current conditions for George River caribou – ANY hunting is additive and is driving the population downward at an accelerated rate.
Why not a limited males only hunt?

- Under current conditions, any hunting mortality is additive
- Under current conditions, any harvest is unsustainable
- Continued population decline at a faster rate
- Delayed recovery of population
- Longer time to resumption of future sustainable harvest
Hunting moratorium: January 2013

- Necessary for conservation purposes
- Assessment after 2 years
- Review after 5 years
- Purpose is to allow the herd time to stabilize and begin to grow again
The Path Forward:

- 5 year moratorium on any hunting
- Population census (summer 2014)
- Assess population and demographic response to hunting ban
- Calving grounds studies and fall classifications
- Predation Studies (wolves and bears)
- Disease investigations
- Range condition / Cumulative effects
Management Planning:

Proposed Inter-provincial George River Caribou Management Plan

• Collaboration with Quebec: shared herd; one management plan

• Preparation of table of contents of management plan

• Proposed writing of plan together with UPCART and stakeholders
LABRADOR CARIBOU INITIATIVE YEAR 2 (2012-2013) PROGRESS REPORT

Newfoundland and Labrador
Department of Environment and Conservation
Wildlife Division
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LABRADOR CARIBOU INITIATIVE YEAR 2 (2012-2013) PROGRESS REPORT

1.0 PURPOSE

- The focus of this document is to summarize George River caribou herd (GRCH) activities during the second year of the 3-year Labrador Caribou Initiative. As part of the 2011/12 budget process, the Labrador Caribou Initiative was approved for $1.9 million over 3 years with $522 thousand of this funding provided in Year 2 of the project. The objectives of this initiative are to enhance monitoring and conservation efforts for the herd to include: increased biological monitoring and research efforts, increased harvest monitoring, enhanced licensing, education and stewardship programs, the formation of stakeholder working groups, advisory and technical committees, and the development and implementation of a management plan for both the short- and long-term conservation of the GRCH.

2.0 BACKGROUND

- The George River caribou herd reached an estimated low of 15,000 in the 1950's, and peaked at nearly 800,000 in the late 1980s (Figure 1). A 1993 census estimated the population at approximately 775,000 caribou. In 2001, the population was estimated to have fallen to 385,000 animals.
- In July 2010, a census was conducted jointly by the Government of Quebec and the province of Newfoundland and Labrador and the final census result placed the GRCH population at 74,000 animals; an 81 per cent decline from the previous census estimate in 2001.
- The census result was supported by other biological indicators of herd health. Low calf recruitment, low adult survival measured from collared caribou, and observations from user groups all corroborate a significant decline in the GRCH.
- Biologists believe the population decline was not precipitated by hunting. However, at the current population level, hunting may now add to natural mortality, possibly exacerbating the current population decline and affecting future recovery efforts.
- The herding nature of caribou, their range expansion into more accessible areas, and the efficiency of modern harvesting methods have put the George River caribou in a very vulnerable situation. Population projections based on current estimates indicated that the liberal harvest strategy employed since the 1980s to maximize benefits and hunting opportunities for aboriginals, residents, outfitters and commercial operators was not sustainable.
- Consultations were held with stakeholder groups in the fall of 2010, and on Nov. 9, 2010, the Department of Environment and Conservation announced the 2010/11 GRC Harvest Management Plan.
- The commercial caribou hunt, non-resident caribou hunting via the use of outfitters, and the resident caribou license transfer system for Labrador residents were suspended during the 2010-2011 harvest season. The allowable harvest was reduced to one caribou per licensed hunter from the current limit of two, and the season opened immediately and closed on April 30, 2011 in open zones.
Approval of a 3 year 1.9 million project was obtained within the Budget 2011/12. The objectives included:

- To monitor GRCH demographics, survival, body condition, and range and habitat use through time and investigate biological factors affecting changes in these indicators of herd health and population trends and size.
- To monitor harvest trends by resident and non-resident hunters, outfitters, commercial operators, and aboriginal groups.
- To consult with all interest groups and gather input from stakeholder working groups for both the short- and long-term management of the GRCH.
- To identify and implement harvest management plans and actions for the conservation and continued use of the GRCH.
- To investigate causes of mortality for different caribou age and sex classes.
- To conduct education and stewardship activities for the conservation of the GRCH.

3.0 SUMMARY OF ACTIONS AND RATIONALE FOR ACTIVITIES IN 2012-2013

A comprehensive plan for the conservation and management of the GRCH must incorporate scientific research, community involvement and support, management and regulations, and education. Activities in the 2012-2013 fiscal year include:

- **Caribou survival, distribution, movements patterns, and fidelity**
  *Action*: 1) Continue monitoring satellite and satellite/GPS collared caribou, 2) purchase, deploy & monitor a larger number of active collars in the GRCH, 3) design the work to ensure that collars are representative of all age/sex cohorts in the population, especially yearlings, and 4) retrieve collars from dead caribou as soon as possible.
  *Rationale*: Survival estimates are an indicator of herd health and population trends. Knowledge of movement patterns, distribution, and fidelity provide information necessary for developing research objectives, informing management actions, and guiding the efforts of population and classification surveys. A larger number of collars deployed will help to make sure that our conclusions from the data are accurate. Retrieving collars will provide cost savings in future collar purchases, as well as provide insight to the cause of death.

- **Calf weights and calf survival from birth to fall**
  *Action*: 1) Record presence of calf with females, 2) record birth weights of calf caribou on calving grounds in the spring.
  *Rationale*: Calf survival and calf weights are key indicators of herd health and population trends and therefore offer insights into how well our management actions are working toward the recovery of the herd.

- **Juvenile survival and adult sex ratios**
  *Action*: 1) Conduct annual fall classification surveys for the GRCH
  *Rationale*: Ratios of young:adult females, when compared provide a measure of summer survival and both sex and calf ratios are an indicator of population health and trends.

- **Pregnancy rates, stress hormone levels, parasite loads, and body condition**
Action: 1) Collect data and samples from all caribou captured for collaring, 2) send samples to appropriate laboratories for analysis. 
Rationale: While caribou are on hand for collaring, the opportunity to collect hair, fecal, and blood samples is presented, as well as to take physiological measurements. This process can inform managers of the herd’s productivity, food resource availability, and stress/pathogen load.

- Caribou predator survival, distribution, movement patterns, and fidelity
  Action: 1) Continue monitoring collars already deployed on GRCH predators, 2) Collar wolves on the GRCH calving range, 3) Collar wolves on the GRCH winter range, 4) Collar bears on the GRCH calving range.
  Rationale: The role of predation in the decline of the GRCH is not well understood. By monitoring the survival, home range size, and ecological behaviors of these predators, wildlife managers can gain insight to the density of predators on the landscape and their relative predation pressure on caribou at different times of the year.

- GRCH Population Estimate
  Action: Conduct a post-calving aerial photo-census of the GRCH given adequate aggregations in July.
  Rationale: Given the severe population decline, and the need for immediate management actions, a population census will validate population modeling projections and provide the necessary information and confidence levels to consider new harvest regulations.

- Harvest monitoring, caribou body condition, and age structure
  Action: 1) Continue monitoring for illegal harvest activities; 2) continue processing and analysis of jawbone, lower leg, fecal, and blood samples from harvested caribou year 1 to assess body condition, age, parasitism, pathogens, and hormone levels.
  Rationale: Body condition affects caribou survival and is an indicator of population health and trends. When a legal harvest is in place, hunters offer a useful and reliable data that can assist managers in learning about herd health and population trends.

- Stakeholder participation
  Action: 1) gather input from stakeholders; 2) meet with stakeholders regularly to address concerns, give updates, and gain input on caribou management issues; 2) initiate a cooperation agreement between the Quebec and Newfoundland and Labrador governments to strengthen a working and cooperative relationship.
  Rationale: The GRCH crosses provincial boundaries, is harvested in First Nations traditional territories, and is used as a resource by local hunters and outfitters. Cooperation by all of these stakeholders is critical to the success of a management strategy.

- Communication and Education
  Action: Develop a series of public outreach materials to be distributed within communities affected by the GRCH to: 1) provide updated information on research and management results, 2) solicit community input, 3) promote understanding and acceptance of management strategies, 4) encourage participation in projects that monitor the health of the herd, 5) improve the use of best harvest practices, 6) build a stronger relationship between communities and wildlife managers, and 7) instill a sense of stewardship.
  Rationale: Increased support and cooperation from the public will help provide the best information for management actions. Support and involvement from the local people is critical to success of the management program.
4.0 Year 2 Activities

4.1 Biological Monitoring Activities

- Purchase of rebuild services for 5 Lotek GPS/Iridium collars for adult GR caribou (3D), and 4 Lotek GPS/Iridium collars for yearling GR caribou (2D).
- Deployment of 10 bear collars (5 2D Lotek Iridium collars, and 5 Lotek Camera Collars (2 belonging to WD, 2 belonging to Caribou Ungava, and 1 belonging to QC)).
- Deployment of 30 adult collars on GR caribou (21 female and 9 male).
- Deployment of 12 expandable yearling collars on GR caribou (all female) during spring calving survey.
- Spring calf condition survey conducted June 5-8th, 2012
  - Thirty calves (11 male and 19 female) were captured, weighed, and had their cord status and hoof wear recorded. The average weight was 6.40 ± 0.20 (SE) kg, with males significantly heavier than females (average 0.88 kg more; t-test, p<0.05). The average weight was similar to that the year before (6.26 kg) and is considered a healthy average weight.
  - Calf birth weight has been positively correlated with fall recruitment (calves/100 females; Couturier et al. 2009; data from 1978 – 2003). Although a linear regression fits ($F = 16.84$, $P = 0.0005$, $R^2 = 0.43$; using data from Couturier et al. 2009 and more recent, unpublished data), other factors affect both parameters. In 2011 the average calf birth weight was 6.26 kg and the fall recruitment was 17%. The slope of the regression line would have predicted a 2011 fall recruitment of 33%. In 2012 the average calf birth weight was 6.40 and the fall recruitment was 5.4%. The slope of the regression line would have predicted a 2012 fall recruitment of 40%. It is possible that this relationship is different when the population numbers are low, as is currently the case. Most of the data used to calculate this correlation was taken when population numbers were high or increasing. In fact, using only data from during the population decline (1994-2012), the strength of this relationship is lost ($R^2 = 0.06$).

- Census (July 12-13th, 2012)
  - A photo census was conducted jointly by biologists from Wildlife NL and Quebec’s Ministry of Natural Resources with funding from Torngat Wildlife and Plants Co-Management Board, using the same method utilized to survey the GRCH in 1993, 2001, and 2010. This method relies on a large number of marked individuals in the population, and the formation of highly aggregated groups (a common behavior in July to seek relief from insects). Groups are photographed and the marked sample of collared caribou in the photographed groups is used to estimate the total number of caribou in the population.
  - Twenty two highly-aggregated groups were photographed and an additional 5 small groups were counted. A total of 22,725 caribou were photographed in highly aggregated groups, which included 84 of the 90 collared caribou. The corresponding population estimate in July was 27,600 with a 90% confidence interval of 24,900-30,400 animals. These results represent a 63% population decline since 2010, and a 96% population decline since 1993.
A news release was made on August 16th, 2012, stating the results of the census, the continued decline despite the harvest management measures, and the importance of working together to support long-term management measures for the future of the herd.

- **Fall classification survey conducted Oct 23-25th, 2012**
  - A total of 1796 caribou were classified
  - The percentage of calves in the population (5.4%) remains below the 15% suggested by Bergerud and Elliot (1986) as a minimum for population maintenance with little potential for growth.
  - Recruitment in terms of calves per 100 females was also low (7.4 calves/100 females) compared to historical classifications (Figure 1), and less than half that measured during the 2010 and 2011 classifications. Couturier et al. (2009) estimated that fall productivity must be 34 calves/100 females for the George River herd to be stable (under the assumption that adult survival is 0.87 (Crete et al. 1996) and current survival estimates are far below this value).
  - The % large males in the population measured during the 2012 fall classification (2.0%), indicates a sustained low since 2009 (Figure 2), while the sex ratio was estimated at 29 males/100 females.

- **Five trips between May 23rd and October 27th to investigate a total of 23 collared caribou mortalities and retrieve all but one collar. Evidence of predation was found at 14 of the sites, 2 mortalities were identified as due to natural causes, 1 was identified as a hunter kill, and the collar was the only thing found at the remaining 5 sites.**

- **Survival rates are estimated from NL and QC collared caribou mortality from June 1st-May 31st annually using MARK. Although still below ideal, survival rates for adult females, adult males, and yearlings all showed a marked increase from 2011/12 to 2012/13 (Table 1).**

- **Health Monitoring**
  Due to the hunting ban put in place for the 2012/13 season, samples and data to inform the health monitoring program was restricted that collected during live caribou captures. There was therefore no new information available regarding bone marrow fat percentages, age distribution via cementum analysis, or besnoitia density via skin samples. As no alarming infection levels were identified in the first year of the Labrador Caribou Initiative, no additional analyses were conducted for blood borne pathogens (Toxoplasma gondii, Neospora caninum, bovine herpesvirus-1, para influenza-3, bovine diarrhea, or west nile virus). It would be informative to run these analyses again within the next few years to monitor any changes in infection levels.

  - The average weight of adult females and males captured in the 2011/12 season was 97.6±1.9 kg and 102.1±5.1 kg respectively, and 98.0±2.4 and 111.3±10.0 kg respectively in the 2012/13 season. The average weight of GRCH females in April over the 70-90's was 94.0±1.9 kg (Bergerud et al. 2008).
  - Assessing the level of besnoitia infection during live caribou handling is done by scoring the density of cysts seen in the sclera on a scale from 0-4. Over the first 2 years of the caribou initiative, besnoitia presence was confirmed in 2/3 caribou and the average infection level score was 1. Given this method of detection is less sensitive, these values correspond well with the 80% infection rate for 2011/12 calculated from skin samples. This is considered a very high prevalence for this
parasite, although the individual infection densities appear to be non-severe. There is still concern for population level effects of besnoitia on breathing, reproduction, and stress levels.

- Fecal samples were collected from 17 adult female caribou and send to the Toronto Zoo for progesterone analysis. 82% of these samples came from pregnant females. This is a lower pregnancy rate than the previous three winters (86-87%). It is also expected that pregnancy rates estimated from captured caribou tend to be overestimates, as targeted females tend to be large, healthy individuals that fall to the back of the group. In 2012, the pregnancy rate of harvested animals was lower (74%) than that of captured animals (85%). Even so, an estimate of 82% is still below the 89% or greater generally required to support a stable or growing population.

- Purchase of cortisol, testosterone, and progesterone hormone concentration analysis services for 153 fecal and 267 hair samples. These results will feed into a collaborative research project examining the relationship between parasite load, stress levels, and reproductive success to gain further understanding on the effects of besnoitia at a population level. Sample analysis is ongoing.

- Predation Pressure
  - Wolves
    Six wolves were collared during year 2 of the Labrador Caribou Initiative. All were adults except one sub adult female, and the body condition was said to be fair-excellent for all animals (no poor). The average weight was 35.1±2 kg, average total length was 1470±87 mm, and average chest girth was 658±25 mm. One female died 18 days after capture of unknown causes. The remaining 5 wolves had collars that malfunctioned 5,7,9,120, and 190 days after deployment. The collar that lasted 190 days was a Telonics collar, while the other 5 were Lotek Iridium collars. During year 1, 4 wolves were collared (3 females and 1 male), and the remaining 4 wolves were not collared at all. Overall, collaring efforts were fairly unsuccessful. Resulting wolf monitoring during 2 of the Labrador Caribou Initiative has been combined with that from year 1, and is summarized in Fig. 3. As demonstrated in Fig 3, collar deployments have been targeted at both the calving and wintering grounds for comparison or wolf home range size and behaviors between these two areas. Further efforts will be necessary to establish estimates of pack home range size and movement patterns across the vast GRCH range. Samples collected for wolves include hair, feces, and blood, which will permit analysis of DNA, stress levels, hormone production, parasites, and diet (no results to date).

- Bears
  Ten bears (6 males and 4 females) were captured during year 2 of the Labrador Caribou Initiative. All were adults except one sub adult male, and the body condition was said to be ‘excellent’ for all bears, except one male said to be ‘poor’. The average weight for males (108.1±13.0kg) was significantly (P<0.01) higher that of females (63.0±2.2kg). Average total body length was 1796.7±40.0 mm for males and 1590±22.7 mm for females, and average chest girth was 976.7±55.7 mm for males and 800±59.1 for females. Samples collected for all bears include a premolar, tissue, hair, and blood, which will allow determination of age, and analysis of DNA, stress levels, hormone production, and diet (no results to date). Five of the bears were fitted with Lotek Iridium 2D camera collars. These collars resulted in minimal success, with one collar being successfully recovered with video footage, one collar being recovered
with successfully recovered with one day of video footage, and the remaining three collars malfunctioning within ~1 month and were not recovered. Alternatively, the 5 bears fitted with Lotek Iridium 2D non-camera collars worked well for the duration of the year, and when combined with the minimal locations recorded from the camera collars, illustrate the home-range dynamics of bears close to the GRCH calving grounds. The resulting movement pattern of males vs. females is quite striking, males moving an average 2.5 km/day more than females (Fig. 4). These efforts will continue in Year 3.

4.2 Population Projections-

- In Year 1, population projections from the 2010 census onwards estimated there would be 30,000 animals in the GRCH in fall 2012. In Year 2, the census put the herd at 27,600 animals in July 2012, confirming the continued decline and increasing the degree of severity of that decline.

- Adult survival and calf recruitment rates suggested that the 2012 fall population would be 24,362; stated in the August 2012 press release as below 25,000 animals.

- A simple model based on herd demographics and mortality rates was used to project the population size to fall 2013 and 2014 (using some data collected in Year 3). Assumptions for the simple model included:
  - Calf recruitment to November of 0.054 in 2012 and 0.07 in 2013.
  - Rate of adult survival of 0.80 across all cohorts except calves.
  - An additional 1000 adult mortalities per year due to illegal harvest.

- Estimates for fall 2013 and 2014 were approximately 19,739 and 15,723 GR animals respectively (Fig. 5).

- Regardless of model or parameter manipulation, the GRCH continues to be in a severe state of decline. Manipulations of parameters such as parturition rates, recruitment rates, or age of 1st reproduction have little effect on the overall results of models and just provide varying degrees of severity to the decline. Adult mortality appears to be the most significant parameter driving the severity of the decline.

- Given the hunting ban review scheduled for fall 2014, a public pressure may exist for a July 2014 census, despite the fairly accurate population projection history with intensive indicator/parameter monitoring.

4.3 Community and Stakeholder Engagement—

- Brochure
  In an effort to provide feedback to hunters who participated in the 2011-12 GRCH health monitoring program, share results and information with the public, and encourage participation in harvest returns in the future; a health monitoring results brochure was prepared (Appendix B). The brochure included stats on participation, the winners of the hunter return prizes, hunter success rates, pregnancy estimates, body condition information, the age distribution of harvested animals, an introduction to besnoitia and its prevalence in the population, blood pathogen levels, and a short summary of hunters’ comments. 2000 brochures were printed and they were mailed to all caribou license holders (with animal-specific results if they were a participant). Remaining brochures were circulated to government offices and stakeholders for distribution. Feedback was positive.
• **T-shirt initiative**

To spread awareness and increase dialogue surrounding GRCH stewardship, a plan was made to engage all stakeholders in the creation of a t-shirt using a drawing introduced at the 2011 Arctic Ungulate Conference (Appendix C). Although developed by the Wildlife Division, the project was implemented through a contract to Intervale Associates Inc. to ensure maximum participation among stakeholders through a coordinated sponsorship. During Year 2 of the initiative, the agreement was put in place with Intervale, the invitation to participate was drafted, the participants were selected, and the t-shirt was designed. Year 3 will see the mailing of invitations to the stakeholder groups, hopefully the participation of all groups, the purchase of t-shirts and the distribution of those shirts to the public. The Wildlife Division intends to see shirts used as prizes for a stewardship contest within Labrador schools, while we look forward to seeing the shirts distributed by other means through other stakeholder groups.

• **Stakeholder Meetings**
  
  - Individual George River Caribou Stakeholder Consultations took place with NunatuKavut, Nunatsiavut, and Innu Nation on April 17th, 18th and 19th respectively. These consultations included Wildlife staff, as well as the Senior Negotiator and Director of Intergovernmental and Aboriginal Affairs.
  
  - The GRCH Advisory Committee met on June 27, 2012 in Goose Bay. Attendees included representatives from Wildlife NL, Nunatsiavut, Nunatuqavut, Torngat Secretariat, Torngat Wildlife and Plants Co-management Board, NL Outfitters Association, and Labrador and Aboriginal Affairs. A summary of the information exchanged during this meeting can be found in Appendix D.
  
  - The Hunting, Fishing and Trapping Coordinating Committee, along with the Nunatsiavut Government and the Torngat Wildlife Plants & Fisheries Secretariat hosted the “Declining Caribou: Shared Concerns, Shared Solutions” Migratory Caribou Workshop in Montreal September 11-13, 2012. A presentation was made on behalf of Wildlife NL by the Senior Manager of Habitat, Game and Fur. Additional representation present included the Divisional Director and a Wildlife Biologist from the Labrador office. The presentation and workshop proceedings can be found in Appendix E.

### 4.4 Harvest Monitoring Activities

- During Year 2, 2 adult female caribou that were collared by WD were shot by hunters and the collar was returned, and 3 caribou collared by QC were shot by hunters.

- There was no legal harvest of GRCH animals, so harvest monitoring by Wildlife staff was greatly reduced in Year 2. Illegal harvest estimates were made by recording information gathered via word of mouth from the public, enforcement officers, the media, or through direct observation during field work. Despite the hunting ban, it is estimated that > 2% of the herd was harvested between Dec 3rd 2012 and March 15th 2013 (Table 2).

### 4.5 Harvest Management Actions

- On August 2, 2011 the Minister of ENVC delayed the start of the 2011-2012 GRC hunting season until further assessment and consultations.

- The GRCH season then opened on 20 December, 2011.
• Provided direction to maintain harvest restrictions implemented for the 2010/11 hunting season with additional measures.
  o These restrictions include the limit of one caribou per resident license, no transfer of licenses, and no commercial or outfitter harvest.
  o Conservation measures for the 2011/2012 hunting season included a reduction in the season length for resident harvest and a voluntary herd health monitoring program. Further, to monitor license sales, licenses were restricted to government offices only.
  o The above restrictions applied to regular license holders.

• On January 28th, 2013, the Minister of ENVC announced an immediate ban on all caribou hunting in Labrador for conservation purposes for a period of five years, with a review after two years.

• The Quebec Government implemented changes for the 2011-2012 season, including a 50% reduction in outfitter permits, subdivision of Zone 23 into a W/E sections, so that the George River and Leaf River herds could be managed separately; closure of sport hunting in the S section of Zone 23; limitation on sport hunting in Zone 24; a reduced season in the Eastern section of Zone 23; and closure of sport hunting in 2012-2013 in the Eastern section of Zone 23 and in Zone 24, subject to the biological information collected in 2011-2012.

• The Quebec sport hunt was closed for 2012-13, and the aboriginal groups reiterated their commitment to harvest monitoring.

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### 5.0 Budget Summary - Year 2

<table>
<thead>
<tr>
<th>George River Caribou Initiative Budget - Year 2</th>
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<tbody>
<tr>
<td>GPS and Satellite based collars</td>
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<td>Immobilizing agent</td>
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<td>Collar data acquisition</td>
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<td>Helicopter and fixed wing flight time</td>
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<td>Travel</td>
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<td>Stewardship, Education, and Harvest Monitoring</td>
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<tr>
<td>Fuel and delivery</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
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6.0 REFERENCES


**Table X-** Survival Estimates for 2011/12 and 2012/13 caribou biological years with sample size and 95% confidence intervals.

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<tr>
<th></th>
<th>June 1&lt;sup&gt;st&lt;/sup&gt;, 2011- May 31&lt;sup&gt;st&lt;/sup&gt;, 2012</th>
<th>June 1&lt;sup&gt;st&lt;/sup&gt;, 2012- May 31&lt;sup&gt;st&lt;/sup&gt;, 2013</th>
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<tr>
<td></td>
<td>Adult F</td>
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<td>Survival</td>
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<td>Lower CI</td>
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<td>Upper CI</td>
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<td>Sample Size</td>
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**Table X-** Estimated number of George River caribou harvested by user group, 2010-11, 2011-12, and 2012-13.

<table>
<thead>
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<th>Harvest Group</th>
<th>2010-11</th>
<th>2011-12</th>
<th>2012-13</th>
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<tbody>
<tr>
<td>Labrador Innu</td>
<td>500</td>
<td>430</td>
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<tr>
<td>QC Aboriginal Groups</td>
<td>300</td>
<td>700</td>
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<td>Labrador License Holders</td>
<td>250</td>
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<tr>
<td>QC Sport Harvest</td>
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<tr>
<td><strong>Total</strong></td>
<td>2860</td>
<td>2243</td>
<td></td>
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</tbody>
</table>

*Includes 12 E license holders

**Section 22**
Fig 1- Average calves/100 females during fall classification surveys for the GRCH, 1973-2010, and calves/100 female estimates for 2010, 2011, and 2012.
Fig 2- Percentage of Large Male Caribou seen in the George River Fall Classifications from 2001-2012.
Fig 3- Results of wolf collaring efforts over the first two years of the Labrador Caribou Initiative; monitoring locations recorded between April 1st 2011 and March 31st 2013.
Fig 4- Results of bear collaring efforts over the first two years of the Labrador Caribou Initiative; monitoring locations recorded between April 1st 2011 and March 31st 2013.
Fig 5- George River Caribou Population Estimates 2001-2014 (Simple model based on herd demographics and survival estimates). Herd survival estimated as 0.83 from 2000-2009, 0.62 from 2010-2012, and 0.80 for 2013 and 2014. Diamonds mark census years and circles represent future population projections of 19,739 in fall 2013 and 15,723 in fall 2014.
APPENDIX A

Labrador – Work Plans 2012/13
Project Title:
Labrador Caribou Initiative – George River Caribou Herd

INTRODUCTION
Project Title: Labrador Caribou Initiative
Leader: Shannon Crowley, David Elliot, Sara McCarthy
Funding Level: $522,000
Purpose: To monitor, investigate, and manage for the long-term sustainability of the George River caribou herd (GRCH).

GOALS AND OBJECTIVES
To recover the GRCH from a declining to an increasing population and to ensure the long-term sustainability of this valuable resource for future generations.

The objectives of this work are:
- To monitor GRCH demographics, survival, body condition, and range and habitat use through time and investigate biological factors affecting changes in these indicators of herd health and population trends and size.
- To monitor harvest trends by resident and non-resident hunters, outfitters, commercial operators, and aboriginal groups.
- To consult with all interest groups and initiate the formation of stakeholder working groups, advisory boards, and technical committees for both the short- and long-term management of the GRCH.
- To identify and implement harvest management plans and actions for the conservation and continued use of the GRCH.
- To investigate causes of mortality for different caribou age and sex classes.
- To conduct education and stewardship activities for the conservation of the GRCH.

STATUS
The GRCH has declined from an estimated 776,000 in 1993 to an estimated 385,000 in 2001. A post calving photo-census in July 2010 shows a continued and accelerated decline with an estimated herd size of 74,000. Although it has been determined that the GRCH has undergone a substantial decline over the last decade, the reason for this decline is not fully understood. One reason for this lack of understanding is the deficiency in information related to the current range utilization and demographic parameters of the population. In addition, it is clear that the success of a management plan for the declining GRCH will depend on the cooperation and participation of all stakeholders.

APPROACH AND DELIVERY
A comprehensive plan for the conservation and management of the GRCH needs to incorporate scientific research, community involvement and support, management and regulations, and education. Activities in the 2012-2013 fiscal year include (please see more detailed individual work plans that are not part of GRCH regular monitoring activities following this document):

Caribou survival, distribution, movements patterns, and fidelity
Action: 1) Continue monitoring satellite and satellite/GPS collared caribou and increase the number of active collars deployed and monitored in the GRCH and to ensure that collars are representative of all age/sex cohorts in the population.

Rationale: Survival estimates are an indicator of herd health and population trends. Movement patterns, distribution, and fidelity provide information necessary for developing research objectives, informing management actions, and guiding the efforts of population and classification surveys. Increasing sample size will make any measured parameter more reliable, reduce scientific and statistical scrutiny, and strengthen the credibility of conclusions based on the data.

Calf weights and calf survival from birth to fall
Action: 1) Record presence of calf with collared females and attach ear tag proximity sensor to calf to record survival. 2) Record birth weights of calf caribou on calving grounds in the spring.

Rationale: Calf survival and calf weights are key indicators of herd health and population trends.

Calf survival and adult sex ratios
Action: 1) Conduct annual fall classification surveys for the GRCH and collar calves in fall.

Rationale: Calf ratios provide a measure of summer survival and both sex and calf ratios are an indicator of population health and trends. Collared calves provide information on fall to spring survival and provide known age animals in study sample.

Harvest monitoring, caribou body condition, and age structure
Action: 1) Increased monitoring efforts of all caribou harvesting groups. 2) Design and implement community monitoring efforts to monitor caribou harvest numbers and demographics, body condition, diseases, pregnancy rates, harvest locations, and environmental conditions. 3) In cooperation with aboriginal groups, use a combination of local representatives/monitors, interviews, surveys, and direct observations common to social science research to gather and analyze data on the harvest of the GRCH. 4) Annually collect jawbone, lower leg, and kidney samples from harvested caribou in the fall to assess body condition by running a public awareness campaign and creating drop-off locations for samples. 5) Collect tissue and organ samples to assess parasites and diseases. 6) Teeth will be sectioned and aged as an indicator of population trends.

Rationale: Body condition affects caribou survival and is an indicator of population health and trends. Harvest levels can have a direct impact on the herd and reliable data on hunting mortality is critical for making management decisions.

Predation Studies
Action: Deployment of satellite collars on wolves in GRCH wintering grounds and on both black bears and wolves on calving grounds.

Rationale: A large knowledge gap exists regarding the cause and degree of various mortality factors in the GRCH. Investigations into mortality factors such as predation on both caribou calves and adults is needed to inform population modeling and management, to understand the nature of the GRCH decline, and to gain insight into the ecology of wolves and black bears on the GRCH calving grounds.

Stakeholder participation
Action: 1) Create a GRCH working group that would meet regularly to address concerns, give updates, and provide recommendations on caribou management issues. 2) Initiate a cooperation agreement between the Quebec and Newfoundland and Labrador governments to create a GRCH Technical and Administrative Committee. 3) Consultations with individual stakeholders of the GRCH.

Rationale: The GRCH crosses provincial boundaries, is harvested in First Nations traditional territories, and is used as a resource by local hunters and outfitters. Cooperation by all of these stakeholders is critical to the success of a management strategy.
Photographic census

Action: To derive an updated population estimate for the George River Caribou Herd to assist in future management decisions.

Rationale: Although the most recent census was conducted only two years ago, survival/mortality rates of collared caribou, fall cow:calf ratios, and anecdotal evidence from various groups indicate the population decline is ongoing and possible more severe than previously thought. An updated estimate of the GRCH population will allow both provincial managers to determine the appropriateness of existing management strategies for the GRCH and inform future management decisions, such as the potential establishment of a Total Allowable Harvest (TAH).

Communication and Education

Action: 1) Hold a series of public outreach workshops in communities affected by the GRCH before the start of every hunting season. The purpose of these workshops would be to provide updated information on research and management results, solicit community input, promote understanding and acceptance of management strategies, encourage participation in projects that monitor the health of the herd, improve the use of best harvest practices, and to build a stronger relationship between communities and wildlife managers 2) Reports, posters, brochures, placemats and other educational materials developed and disseminated regularly.

Rationale: Increased support and cooperation from communities will help provide the best information for management actions. Support and involvement from the local people is critical to success of the management program.

Computer modeling

Action: Continue the development of a caribou population model that can be used to predict the effects of harvest on the herd.

Rationale: This model will serve as an important management tool to predict long-term trends at varying harvest levels and to demonstrate the effects of harvest to all user and interest groups.

Budget: (Year 2)

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<th>Item</th>
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Schedule of Activities:

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<th>Nov</th>
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<tbody>
<tr>
<td>Calf Captures, Targeted Collaring</td>
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<td>Predator collaring and investigations</td>
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<tr>
<td>Population Modeling and Draft Management Plan</td>
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<td>Fall Classification, Caribou</td>
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<td>X</td>
<td></td>
</tr>
</tbody>
</table>
DELIVERABLES
- Telemetry database of filtered and pre-processed spatial data.
- Determination of the causes of mortality and rates for collared caribou.
- Delineation of the current range and habitat use of the GRCH.
- Estimates of calf recruitment, demographics, and cohort specific survival rates.
- Continued development and refinement of population model to predict future population trends and numbers.
- Photographic census of George River caribou herd
- Studies of impacts of predation on George River caribou on calving and wintering grounds
- Continued meetings of Labrador GRCH advisory group
- Consultations with aboriginal communities in Labrador and Quebec
- Stewardship and education materials, presentations, and workshops.
- Continued work on management plan for the George River caribou herd.

Labrador – Work Plans 2012/13
Project Title:
George River Caribou Herd (GRCH) Post calving Aerial Photo census

INTRODUCTION
Project Title: George River Caribou Herd (GRCH) Post calving Aerial Photo census Leaders: Labrador - Shannon Crowley; Québec - Vincent Brodeur (MRNF)
Funding Level: $60,000: Labrador Caribou Initiative
Purpose: To derive an updated population estimate for the George River Caribou Herd to assist in future management decisions.

GOAL AND OBJECTIVES

Goal: To conduct a post calving aerial (helicopter) photo census of the GRCH between 5 and 25 July 2012 to provide an updated population estimate of the herd for management purposes. These efforts are in collaboration with the province of Québec, the IEMR, the Nunatsiavut Government, and the Torngat Secretariat Wildlife and Plants Co-management Board and other partners.

Objective: Information obtained through these processes will be used to evaluate the appropriateness of existing management strategies for the GRCH, and inform future management decisions. Additional demographic parameters will be and have been collected to input into the census extrapolation model required to be used in deriving an accurate population estimate.
- Survival rates estimated from collared adult female, adult male, and yearling caribou.
- Newborn calf weights.
• Body condition of harvested caribou.
• Fall cow:calf ratios, % calves and % adult males.
• Total number of collared caribou alive and total number located and photographed during census.

CURRENT CONDITIONS

The three previous censuses on the GRCH were conducted cooperatively between Québec and Labrador in 1993 (775,000 animals), 2001 (385,000 animals), and 2010 (74,000 animals). For all three surveys, field work was conducted from Outfitter Camps in Québec and from the Wildlife Division’s Hebron field camp in Labrador. The 2012 census will again be in collaboration with Québec. Although the most recent census was conducted only two years ago, survival/mortality rates of collared caribou, fall cow:calf ratios, and anecdotal evidence from various groups indicate the population decline is ongoing and possible more severe than previously thought. Harvest numbers of collared caribou during the 2011/2012 Labrador caribou hunting season indicate that mortality due to hunting may be becoming increasingly additive. An updated estimate of the GRCH population will allow both provincial managers to determine the appropriateness of existing management strategies for the GRCH and inform future management decisions, such as the potential establishment of a Total Allowable Harvest (TAH). In the event a TAH is set, a current population estimate will be necessary to establish appropriate harvest levels.

APPROACH and DELIVERY:

The post calving photo census is critically dependent on the number of PTTs randomly deployed in the GRCH. As part of increased monitoring of GRCH, and additional 59 satellite collars were deployed on GRCH this winter (50 WD, 9 MRNF). Additionally, 12 – 15 collars will be deployed on yearling caribou during the June 2012 calving survey. This will increase the number of active (collar is working correctly and animal is alive) collars on GRCH to approximately 90 (anticipating some mortality prior to July 2012) for the 2012 census (71 collars were active for the 2010 census). This large satellite collar sample will facilitate the identification of the photo census survey area and provide annual survival estimates of adult females, males, and yearlings and seasonal range distributions. Logistical plans from the 2010 census will be used to implement the 2012 census. Additional fuel caches were set up during winter 2012 in the area where the census will likely take place. Field work for the post calving aerial photo census will take place between 5 July and 25 July 2012, coordinated by the NL Wildlife Division in cooperation with a Québec field team. Following field work, individuals will be identified to examine the photographs from the census, count caribou in the photographs, and organize and analyze data. Preliminary results should be available by late summer 2012. Final results will be available following the fall 2012 classification survey. Data from the fall classification is necessary for final calculation of a population estimate.
Labrador – Work Plans 2012/13

Project Title:
George River Caribou Health Monitoring Program

INTRODUCTION
Leaders: Shannon Crowley, David Elliot, Sara McCarthy
Funding Level: $30,000- Labrador Caribou Initiative
Purpose: To monitor the health and status of animals harvested from the George River caribou herd (GRCH), in order to further direct research questions and manage for long-term sustainability for the population as a whole.

GOALS AND OBJECTIVES
To monitor the health and body condition of the GRCH, while identifying potential factors in the population decline, such that its nature can be understood and managed appropriately.

The objectives are:
1) To assemble caribou health monitoring hunter sample packs and distribute them for use by all hunter groups.
2) To collect completed sample packs from hunters in order to estimate population pregnancy rates, body condition, age structure, disease rates, parasite rates, as well as environmental contaminant and stress hormone levels.
3) To promote hunter participation and cooperation in wildlife research initiatives through a prize draw for those who turn in completed sample packs.
4) To provide feedback and answers to participating hunters and the general public who have questions regarding program results and their harvested animals.

CURRENT STATUS
The GRCH has declined from an estimated 776,000 in 1993 to an estimated 385,000 in 2001. A post calving photo-census in July 2010 showed a continued and accelerated decline with an estimated herd size of 74,000. Although it has been determined that the GRCH has undergone a substantial decline over the last decade, with density dependent effects and high predation rates playing a role, all the factors in this decline are not fully understood. Estimations of herd health in terms of pregnancy rates, body condition, age structure, disease rates, parasite rates, and environmental contaminant/stress hormone levels were first empirically attempted under this initiative in the 2011-2012 season. Continuing with these estimates will improve our understanding of the decline and how best to manage the population for recovery. Many participating hunters have shown interest and curiosity in the health and age of their harvested animals, but there has not been a good history of getting information back to them, nor to the public as a whole.

APPROACH AND DELIVERY
Sample Pack Assembly, Distribution, Collection, and Prize Draw
Sample packs will include a pencil, an 8X10 envelope, a data sheet on write in the rain paper, a letter to hunters with instructions, 2 garbage bags, a 12 lb freezer bag, a ziplock, 5 Nobuto blood strips, and a No. 5 coin envelope. Once assembled, they will be distributed to all caribou license vendors, as well as to Nunatsiavut conservation officers and Innu guardians. Completed sample pack drop-off locations will be
set-up within each hunting community and arrangements will be made with contacts to keep received packs frozen. Frozen samples will be shipped to the wildlife division at the end of the season, or picked up directly by wildlife staff. The prize draw will occur a month after the close of the hunting season, and the winners will be announced in a press release, as well as on CBC radio.

Data Collection and Analysis
Information on harvested animal sex ratios and kill locations/dates will be collected directly from data sheets. Fecal samples will be sent to the Endocrine Lab at the Toronto Zoo for analysis of hormone levels, including stress and pregnancy-related hormones. Measurements will be taken from jawbones for information on body condition, before they are boiled, and a tooth is removed. These teeth will be sent to the Matson Lab in Montana for sectioning and ageing. Metatarsal length will be measured for relation to body condition, hair will be plucked from the leg bone to be stored at the wildlife division for DNA cataloguing, skin will be sampled and analyzed for besnoitia cysts by the Kutz lab in Calgary, and the bone marrow will be sampled for fat index analysis in-house. Blood strips will also be sent to the Kutz lab for disease/parasite analysis.

Production of Results Pamphlets
Population pregnancy rates, body condition, age structure, disease rates, parasite rates, and stress hormone levels will be summarized for the 2012-2013 hunting season and presented in a small pamphlet available online and at the wildlife division. Pamphlets will hold an empty space to affix stickers containing animalspecific results, to be mailed to all hunters who participated in the caribou health monitoring program.

Budget:

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit Price</th>
<th>Estimated Quantity</th>
<th>Total Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplies and assembly of sample packs</td>
<td>$3.00</td>
<td>3000</td>
<td>$9000.00</td>
</tr>
<tr>
<td>Analysis of leg bones</td>
<td>$4.50</td>
<td>500</td>
<td>$2250.00</td>
</tr>
<tr>
<td>Analysis of fecal samples</td>
<td>$8.00</td>
<td>500</td>
<td>$4000.00</td>
</tr>
<tr>
<td>Analysis of jawbones</td>
<td>$10.00</td>
<td>500</td>
<td>$5000.00</td>
</tr>
<tr>
<td>Analysis of blood samples</td>
<td>$15.00</td>
<td>500</td>
<td>$7500.00</td>
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<tr>
<td>Purchase of prizes of the draw</td>
<td>-</td>
<td>5</td>
<td>$1200.00</td>
</tr>
<tr>
<td>Production and posting of pamphlets</td>
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<td>1000</td>
<td>$950.00</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td><strong>$29900.00</strong></td>
</tr>
</tbody>
</table>

DELIVERABLES
1) Estimates of biological parameters important for population modeling.
2) Further understanding of the factors driving the continued population decline.
3) Report/pamphlets summarizing health monitoring program findings for the public and participating hunters.
Labrador – Work Plans 2012/13

Project Title: George River Calving Grounds: A Multi-Predator System

INTRODUCTION
Leaders: Shannon Crowley, Sara McCarthy, David Elliott; Partnership with Quebec Government and Lavalle University
Funding Level: $78,000
Purpose: Exploratory pilot project to investigate predator kill rates on George River Caribou during the calving/post-calving season via analysis of collar locations.

GOALS AND OBJECTIVES
Determine the feasibility of estimating wolf and black bear predation rates, as well as George River Caribou Herd (GRCH) mortality rates, during the calving/post-calving season for input into management oriented population models.

The objectives are:
5) Maintain a minimum of 50 active satellite collars on GRCH.
6) Outfit new born calves with UHF ear tags that communicate with their mother’s proximity collars.
7) Deploy new Lotek Iridium collars on wolves and black bears in the GRCH calving/post-calving range.
8) Real-time monitoring of wolf, black bear, and adult female/calf caribou locations to identify locations of mortalities or potential kills via cluster analysis.
9) Prompt ground-investigation of mortality signals and location clusters to identify predator species and/or prey age-class/sex.
10) Establish estimates of caribou mortality and predator kill rates, and employ these newly estimated parameters to inform future population projections and management strategies.

CURRENT STATUS
A post-calving census of GRCH in July 2010 indicated the current size of the population at 74,131 animals; a marked decrease from the previous estimate of 385,000 in 2001. Poor recruitment and mortality rates estimated from fall classification surveys and collar data indicate a persistent decline in population size. Observations of healthy adult caribou with good body condition and average calf birth weights, as well as frequent wolf and caribou kill sightings, point towards predation as a major factor in this continued decline. Quantifying the magnitude of this pressure and gaining an understanding of the related covariates would improve our ability to effectively direct conservation efforts and create sustainable management initiatives.

UHF calf ear tags have not yet been used in Labrador. GRCH calf mortality rates over the first month of life have not been monitored directly. Fall classification surveys in October have monitored recruitment rates, but unknown pregnancy and parturition rates have limited our ability to infer mortality rates from this data.

The wildlife division has purchased 15 Lotek Iridium 2D predator collars to be deployed on wolves and black bears found within the calving grounds of the GRCH. Little is known about the abundance and basic ecology of wolves and black bears in Northern Labrador, including their range overlap with the GRCH, their movement patterns during the calving/post-calving season,
and most importantly, their predation rates on calves and adult caribou during this vulnerable period.

**APPROACH AND DELIVERY**

Field work for this research will be based out of Hebron cabin beginning in the last week of May and continuing to the end of June. An A-star B2 helicopter equipped with a sliding door will be necessary for captures, while a Long Ranger helicopter can be used for mortality and cluster investigations.

Remaining caribou collars are to be deployed under the pre-existing GRCH 2012 Winter Collaring Work Plan, and in May/June 2012 if necessary. Caribou will be captured using a net-gun deployed from a helicopter. 50 of these adult caribou collars are Lotek Iridium collars, which can be programmed remotely. This will allow us to increase location intensity during the calving/post-calving season, such that mortality events can be promptly identified and investigated, and then to decrease location intensity at the end of the season, to prolong battery life.

New born calves will be UHF ear-tagged, weighed and measured during the annual calving survey beginning during the last week of May. Additional efforts will be necessary for this year’s survey to mark and sample calves of previously collared females, or calf-female pairs, as opposed to random calves. As in the past, the intention will be to capture equal numbers of female and male calves, and those selected for capture must be as young as possible (not running quickly), as they will be captured by hand. The helicopter will land 50 meters from the calves, and handling time will be less than 2 minutes. Female’s collars will then be remotely re-programmed to detect their calf’s UHF frequency.

Predators will be captured opportunistically, guided by surveying transects of the calving grounds. Wolves will be captured via net gun when conditions permit, otherwise both wolves and bears will be anesthetized with Telazol. Anesthetic will be delivered via pneu-dart injection system from a hand pistol into the rump of the animal. Wildlife staff will collar, ear-tag, sample (blood, hair, and feces), and take measurements of the predator prior to their release. Efforts will be made to collar representative numbers of both sexes, as well as a range of age classes. These collars are also remotely programmable, and will be made to record and transmit locations at a very high frequency during this intensive monitoring period. As they are equipped with remote release capabilities, predator collar retrieval will not require recapture of wolves and black bears.

Wildlife staff on the calving grounds will closely monitor all collar locations/signals for evidence of caribou mortalities and predator location clusters. This will be possible via the use of a remote internet modem, and frequent location fixes and messages, and will run until the end of June. Criteria warranting predator location cluster investigation has yet to be determined, but will be based on existing research across North America. A Long Ranger helicopter will be available for immediate site investigation once a mortality or cluster has been identified. Once on site of a caribou mortality investigation, staff will identify the cause of death through observation of feces, fur, the predator itself, or the nature of the kill. In the case of predator location cluster analysis, staff will examine the area to determine whether the site was used simply for resting, or was actually the location of a calf or adult caribou kill. After the end of June, there is the potential to continue the study from Goose Bay, with weekly trips to the calving grounds to investigate mortality/cluster sites.

Once field work is complete, staff will be able to calculate calf mortality rates over their first month of life, adult mortality rates, and provide a breakdown of mortality causes. Estimation of wolf and black bear kill rates will be possible, and we will also be able to establish criteria upon which to define predator location clusters as calf or adult caribou kill sites. This will greatly
increase our monitoring potential in the future. From these estimates will come better informed and more comprehensive caribou population models and associated management strategies.

**Budget:**

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<tr>
<th>Item</th>
<th>Cost</th>
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<tr>
<td>Satellite Ear Tags</td>
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<td>Satellite Internet Access</td>
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<td>Helicopter Time</td>
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<td>Fuel</td>
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<td>Incidentals</td>
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</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$78,000</strong></td>
</tr>
</tbody>
</table>

**DELIVERABLES**

1) Telemetry database of spatial data on wolf and black bear distribution and movement within the GRCH calving range.
2) Estimation of predation rates on caribou calves and adults
3) Improved understanding of wolf and black bear ecology in a relatively undisturbed system.
4) Criteria for remote evaluation of predator location clusters for future monitoring of kill rates.
Parasites and Disease

Eighty-six percent of successful hunters did not detect parasites—14% noted bessnotta cysts in the eye and warble fly larvae under the skin, among others.

Researchers at Laval University analyzed skin samples from postmortem bone for bessnotta cyst prevalence, and 80% of the caribou tested positive. This is an extensive jump in the 2007-2008 bessnotta prevalence estimate of 15.8% for the GSCCH and 28% for Leaf River caribou. Effects of bessnotta at a population level are unknown, but a high density of cysts can cause hair loss, create lesions, and lead to cracks in the skin resulting in infection, breathing obstruction, and possible male sterility. Average density was 1.08 cyst per cm² of postmortem skin, with a large standard deviation (1.16). Further work is being conducted to better understand the effects of bessnotta on the GSCCH.

For more information on the GSCCH, please contact the Wildlife Division at (709) 896-5107.

Blood filters paper strips were tested for several known caribou pathogens. Overall, no alarming blood pathogens infection rates were identified.

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Effects</th>
<th>Results</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anaplasma phagocytophilum (coxiella)</td>
<td>Anaplasmosis, arthritis, death</td>
<td>0% positive</td>
<td>Not highly than the 3% prevalence for Mountain sheep.</td>
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<tr>
<td>Neospora caninum (parasite)</td>
<td>Arthritis, normal mortality</td>
<td>0% positive</td>
<td>Similar to 2007-2008 results (3%) and lower than Mountain sheep (20%).</td>
</tr>
<tr>
<td>Brucella abortus (bovine)</td>
<td>Arthritis, normal mortality</td>
<td>0% positive</td>
<td>Similar to 2007-2008 results (3%) and lower than Mountain sheep (20%).</td>
</tr>
<tr>
<td>Rickettsa felis (feline)</td>
<td>Arthritis, normal mortality</td>
<td>0% positive</td>
<td>Similar to 2007-2008 results (3%) and lower than Mountain sheep (20%).</td>
</tr>
<tr>
<td>West Nile Virus (insect)</td>
<td>Arthritis, death</td>
<td>0% positive</td>
<td>Similar to 2007-2008 results (3%) and lower than Mountain sheep (20%).</td>
</tr>
</tbody>
</table>

Hunters’ Comments

Five recurring themes were:
- Very few caribou were seen
- Many hunters and newcomers were on the feed
- Caribou were being disturbed and injured by some hunters
- Body condition appeared generally good
- Evident support for increased conservation and harvest restrictions

Examples of incorrectly and correctly filled Blood filters paper sample strips cannot be used for diagnostic testing. Care must be taken to fill the strip all the way from the tip to the base. Photo courtesy: The Sea Dock Joint Venture.
The George River Caribou Health Monitoring Program was initiated for the 2011-12 hunting season in an effort to better understand factors that might be contributing to the severe population decline. A sample collection kit was included with the sale of all resident and Nonresident 12E caribou licenses. Hunters were asked to record data and collect hair, metatarsus, blood, and fecal samples during their hunt. Successful hunters who turned in their completed sample packages (188) were entered into a draw for prizes. Hunters who did not turn in a sample package were contacted for a telephone survey. With sample package and survey efforts combined, data was collected from 88% of the licences sold. This brochure is a summary of the analysis results to date; there are still some disease, hormone, and DNA analyses yet to be completed.

**Results**

An estimated 13% of licence holders did not hunt, 35% hunted but were not successful, and 52% harvested a caribou. This translates into an overall hunter success rate of 60%. Female caribou accounted for 68% of the reported 2011-12 GRCH harvest.

**Pregnancy**

Hunters who harvested a female caribou were asked to note the pregnancy status of their animal by checking for a fetus in the womb and to collect fecal samples. This information is of interest to the Toronto Zoo reproductive biology laboratory, which is using the data to conduct pregnancy tests. Interestingly, pregnancy rates differed greatly between those estimated in the field (64% pregnant) versus those tested in the lab using hormone analysis (74% pregnant). This result highlights the difficulty of identifying a fetus in the early stages of pregnancy, especially in the freezing cold. Sample collection is a quick and easy way to get precise results. Given that a pregnancy rate for caribou of 60% or greater is generally required to support a stable or growing population, this year’s GRCH rate indicates a further population decline.

**Body Condition**

Bone marrow extracted from the metatarsus was analyzed for its content, and it is an indicator of body condition (see graph, right). The average bone marrow fat score was 66.2% ± 11.4, and was not significantly different between males and females. This value is higher than bone marrow fat percentages found for calving (63.1%) and yearling (64.1%) female George River Caribou from 2007-2009. This suggests most female caribou were able to avoid serious and detrimental body fat loss during the winter, since bone marrow fat is a last fat reserve to be used up by the animal’s body.

More sensitive indicators of body condition, such as kidney or back fat, may be looked at in the future to identify more subtle changes in body condition.

**Age**

Determining a caribou’s age in the field is difficult, even for individuals trained in aging animals based on the degree of tooth wear.

Surveyed hunters were asked to specify whether they harvested a calf, yearling, or adult. Results showed the harvest was 8% yearlings and 62% adult animals. The age distribution of caribou harvested this season was further broken down using cementum analysis of teeth pulled from lower jawbones submitted by hunters (see graph, below).

Monitoring the age distribution of a population can indicate if the population is getting older or younger which has many implications regarding recruitment, productivity, and age-specific survival. The 2011-12 data shows relatively high harvest of younger animals.
APPENDIX C

GRCH Stewardship T-Shirt Design
APPENDIX D

Information update provided after the GRCH Advisory Committee meeting
Current Population Projection

The George River Caribou Herd (GRCH), along with other migratory caribou herds across North America, experiences large-scale population fluctuations over extended periods of time.

Since the early 1990s, the GRCH has been in decline. Recently the decline has been occurring at an alarming rate, as confirmed by population censuses completed in 2001 and 2010. Results from monitoring other indicators of herd health, including calf recruitment, percentage of large adult males, and adult mortality, confirm the decline is significant and continuing.

Collared adult caribou annual mortality rates have been estimated to be at or above 30% over the past four years (2012). As of June 2012, mortality rates and calf recruitment estimates projected a population of fewer than 30,000 animals in Fall 2012.

An annual harvest of 2,500 animals can have huge consequences at such population lows, with a herd size difference of around 47% after only five years of harvest.
Estimated Harvest

<table>
<thead>
<tr>
<th>Harvest Group</th>
<th>2010/11</th>
<th>2011/12*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labrador Innu</td>
<td>500</td>
<td>430</td>
</tr>
<tr>
<td>Quebec Aboriginal groups</td>
<td>300</td>
<td>700</td>
</tr>
<tr>
<td>Labrador Licence Holders**</td>
<td>250</td>
<td>493</td>
</tr>
<tr>
<td>NG beneficiaries in LISA</td>
<td>1370</td>
<td>360</td>
</tr>
<tr>
<td>Labrador outfitters</td>
<td>80</td>
<td>0</td>
</tr>
<tr>
<td>Quebec sport harvest</td>
<td>360</td>
<td>260</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>2860</td>
<td>2243</td>
</tr>
</tbody>
</table>

*2011/2012 still being updated
**combined 12E & regular licences

The Labrador resident/12-E licence phone survey has been almost completed and was successful in contacting 88% of licence holders.

There were a total of 678 provincial resident and 271 Nunatsiavut 12-E licences sold in 2011-2012. It was found that 21% of license holders did not hunt, and of those who did, success was around 68%. The total harvest estimate was 493 caribou, with the minimum being 433 and the maximum being 544.

2011-2012 showed a different trend in harvest pattern, with more animals harvested in January, while in 2010-11, harvest increased towards the end of the season. This reflects a difference in herd movement, location, accessibility, and weather from year to year. Females constituted 69% of the harvest.
The Caribou Health Monitoring Program has had a very successful first year, with 197 sample packages returned, resulting in 179 jawbones, 178 leg bones, 132 fecal samples, and 110 blood samples. This represents a 38% sample package return rate from the estimated number of caribou harvested. Results from these data sheets and samples will provide information on pregnancy status, stress levels, parasite levels, aging, body size, and body condition indices. Results are expected by the end of November 2012.

Hunters noted parasites in 14% of the animals, including besnoitia, stouts, and flukes (in decreasing prevalence).
Field Work

Spring 2012 involved many field work efforts, including gathering body condition information from 30 newborn calves. An increasing mean calf body weight trend is one of the few positive indicators of herd recovery potential. Above 6 kg is considered a threshold to reach a minimum necessary recruitment of around 35 calves per 100 females.

Collar Deployment
Sixty-five collars were active as of June 27, 2012. New iridium collars provide many benefits over the older Argos models, such as real-time locations and more efficient mortality investigations.

New collars allow Wildlife staff to quickly identify dead adult caribou and if possible, do an immediate mortality investigation. For example, from the 10 known deaths this spring (2012), two were due to predators, one of unknown natural causes, and one died giving birth. Collars were retrieved from the other six caribou, but the causes of death were undetermined.

Predator Monitoring
The predator monitoring program included the addition of seven wolf and 10 black bear collars on the calving and wintering grounds. The advisory committee noted the black bear population has increased, and offered support for trying to determine the impacts of these predators on caribou at different stages in their cycle, especially on calving grounds. There was also interest among committee members in viewing the bear camera collar footage.

Monitoring predator movement patterns and watching camera footage will lead to a better idea of the impact wolves and bears have on both adults and calves, but it will not help in monitoring predator population sizes.
**Discussion**

The following issues were brought forward by Advisory Committee meeting participants and discussed:

- Need to identify causes of adult caribou mortality.
- Need to understand why many calves are not surviving their first months.
- Concern that research and monitoring methods contribute to mortalities; Wildlife staff follows protocols re: surveys and how long animals are chased.
- Whenever possible, work is done from the ground.
- Research and monitoring should occur even when the population is deemed healthy.
- Should explore the potential to open more licences for harvesting other wildlife species in the area to alleviate pressure on GRCF and fill gaps for people who rely on the herd.
- Less experienced hunters could result in more injured animals left on the land.
- Hunting parties may be able to harvest just as many animals with minimal disturbance over time.
- Many in the group felt that biologically, there is no support for harvest.
- Management of this herd is a difficult process that requires the full cooperation of all users.
- A proactive approach was deemed essential; stakeholder meetings should continue regardless of the status of the herd.
- This approach would allow grace periods for outfitters to fulfill their contracts.
- We are past the point of a sustainable harvest; if it were possible to establish a biological threshold below which hunting would not occur, it would be helpful to decision makers who could then incorporate social factors.
- This is difficult to do, given that it is not necessarily the population size that matters, but more so the population trend and demographic indicators that determine how a population should be managed.
- Each population cycle is not the same as the last. It is a complicated system, with many interdependent factors.
- Predicting the consequences of extreme management actions, such as promoting a bear-cull, is difficult. We have to be careful with attempts to steer the cycle to our liking.
- Although limiting harvest numbers is useful to population recovery, other methods should be considered.
- Disturbance by snowmobiling and GPS-equipped hunters: chased caribou become exhausted and lose weight over time.
- Perhaps changing hunting methods, assigning specific hunting days, or hunting groups, could benefit the herd.

Given the current and continued population decline of the GRCF, future actions must consider how we will manage the decline. These actions may include the establishment of a Total Allowable Harvest (TAH). To date, and in addition to the advisory committee meetings, unilateral meetings have been held with:

- Nunatsiavut
- TWPCB
- Labrador Innu Nation
- Nunatsiavut
- Naskapi
- Innu members from Quebec
Conclusion

The essence of the GRCH decline is not fully understood. Migratory herds are known to fluctuate, as many wildlife populations do.

However, the GRCH reached such a high abundance in the early 1990s, it appears density-dependent effects (limited food availability in certain areas of their range), lead to great decreases in body condition. This would have led to increased mortality and decreased reproduction. Although forage availability and body condition may have improved, other factors may still have an impact on population growth.

While hunting is not likely a cause of the decline, at low population levels, hunting is known to have significant negative impacts on a population.

The Wildlife Division values your input. Your continued involvement is essential for effective management. The next advisory group meeting will be held in early winter 2012-2013.

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Now it's our turn

At the end of the June meeting, the “Now it’s our turn” project, a campaign to promote stewardship of the GRCH and collaboration among all parties, was introduced. The project would focus on the image below, which has been found to evoke a lot of emotion. The group was asked for ideas and support regarding this project, and feedback was positive.

APPENDIX E

Proceedings of the “Declining Caribou: Shared Concerns, Shared Solutions” Workshop are too long to include here but can be found at:

The presentation given on behalf of NL Wildlife at this workshop can be found at: